CONTROLLED POWER COMPANY

TROY, MICHIGAN

# TrueLITE

## MODEL ELS - EMERGENCY LIGHTING INVERTER

***OWNERS MANUAL***

## *58.5kW - 112.5kW*

***THREE PHASE***
***CENTRALIZED EMERGENCY LIGHTING INVERTER***

**IMPORTANT SAFEGUARDS**
**WHEN USING ELECTRICAL EQUIPMENT, BASIC SAFETY PRECAUTIONS**
**SHOULD ALWAYS BE FOLLOWED INCLUDING THE FOLLOWING:**
**READ AND FOLLOW ALL SAFETY INSTRUCTIONS**
**SAVE THESE INSTRUCTIONS**

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**This manual contains detailed instructions for the installation, start-up and operation of the Emergency Lighting Inverter. Read the manual carefully before installation. For information on using the Inverter, the manual should be kept close at hand and consulted before carrying out any operation on the system.**

**This device has been designed and manufactured in accordance with the standards for the product, for normal use and for all uses that may reasonably be expected. It may under no circumstances be used for any purposes other than those envisaged, or in any other ways than those described in this manual. Any interventions should be carried out in accordance with the criteria and the time-frames described in this manual.**

## ABOUT THIS MANUAL

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# TrueLITE, Model ELS - MODEL NUMBER GUIDE

| Product | - | Input | Output | Freq | - | Output kVA / kW | - | Battery | Network Communications | Relay Contacts |
|---|---|---|---|---|---|---|---|---|---|---|
| ELS | | N = 480/277V | N = 480/277V | X = 60Hz | | 58.5KW<br>72KW<br>90KW<br>112.5KW | | S = 90 min<br>D = 60 min<br>C = 30 min<br>N = Other Battery Option | 0 = None<br>1 = TCP/IP, MODBUS TCP, BACnet/IP; or MODBUS RS485 | 0 = Standard Alarm Contacts & REPO<br>1 = Standard Alarm Contacts & REPO, plus Expansion Relay Card |

**NOTE:** ADD A **-S SUFFIX** TO MODEL NUMBER FOR SEISMIC-RATED MODELS

**MODEL NUMBER EXAMPLE**

**ELS - NNX - 90KW - S10 - S**

Description

90KW UL924 Listed Emergency Lighting Inverter, 480/277 VAC Input - Output, 90 Minutes Runtime, Network Communications, Standard Alarm Contacts & REPO, Seismic-Rated.

# INTRODUCTION

Controlled Power Company engineers and manufactures the industry's highest quality Emergency Lighting Inverters, capitalizing on over 45 years of expertise. We have an enviable reputation for quality, which is reflected in the design, workmanship, and performance of our products.

The TrueLITE Model ELS is an Emergency Lighting Inverter designed and built to provide a high level of quality, performance, reliability and energy savings. It is unique in that it offers 4 different modes of operation that are field-selectable based input power conditions, lighting design, and the desire for high operating efficiency. The Model ELS can also be configured for a single input source, or a dual input source (separate Inverter bypass input). The Model ELS features advanced diagnostics, monitoring, remote communication options, and automatic testing compliant with NFPA 101. Output power ratings range from 58.5kW through 112.5kW. All Inverters are UL 924 Listed as Emergency Lighting Equipment with 90 minutes of battery backup time. Other runtimes are available and listed UL 924 Auxiliary Lighting and Power Equipment. Runtimes of 30, 60, and 90 minutes are C-UL Listed to CSA C22.2 No. 141-15.

### *COMPLETE GALVANIC SEPARATION*

The Model ELS Inverter features an output isolation transformer on the Inverter as part of the Inverter circuit inside the Inverter cabinet, providing galvanic isolation between the load and the battery with improved versatility in system configuration, allowing:

- Complete Inverter output galvanic isolation for critical infrastructures from the battery DC power source.
- Two truly separated supply inputs (utility and bypass), which can be taken from two different power sources (with different neutrals).
- No neutral input connection is required at the Inverter's rectifier input stage. A neutral connection is only required at the bypass input, if an output neutral is required.
- No effects to the Inverter output performance or reduced impact of the Inverter power components while supplying specific loads; in addition the Inverter transformer minimizes the impact of third harmonic disturbances, prevents the effects of energy back-feed into the Inverter when supplying industrial load applications and can supply unbalanced loads.
- High Inverter short circuit current to clear faults which occur between phase and neutral on load side (up to three times nominal current).

Output transformer housed within a cabinet which allows for a significant reduction in the footprint and provides space savings.

### *ZERO IMPACT SOURCE*

The Model ELS features the added advantages of the Zero Impact Source formula offered by an IGBT-based rectifier assembly. This eliminates problems connected with installation in networks with limited power capacity, where the Inverter is supplied by a generator set or anywhere there are compatibility problems with loads that generate current harmonics. The Model ELS Inverters have zero impact on the power supply source, whether it is a utility grid or generator set:

- Input current distortion $\leq$ 3%.
- Input power factor 0.99.
- Power walk-in function that ensures progressive rectifier start up.
- Start-up delay function, to restart the rectifiers when mains power is restored if there are several Inverters in the system.

### *ZERO IMPACT SOURCE CONTINUED*

This provides savings in installation costs via:

- A smaller electrical infrastructure.
- Smaller circuit protection devices.
- Less wiring.

### *FLEXIBILITY*

The TrueLITE Model ELS is an LED-compatible emergency lighting inverter designed and built to provide a high level of quality, performance, reliability and energy savings. It is unique in that it offers (4) different modes of operation that are field-selectable based on input power conditions, lighting design, and the desire for high operating efficiency. These modes are On-Line, Standby-On (ECO-mode), Smart Active, and Standby-Off

### *BATTERY CARE SYSTEM: MAXIMUM BATTERY CARE*

The Model ELS includes a range of features designed to prolong battery life and reduce usage by using different recharging methods. These features include deep discharge protection, current limitation, and voltage compensation based on ambient temperature.

### *MAIN FEATURES*

- Compact size.
- Reduced weight for transformer based Inverters.
- Double load protection, both electronic and galvanic, towards the battery.

### *ADVANCED MONITORING*

The Model ELS Inverter has a front panel mounted graphic display providing Inverter information, measurements, status updates and alarms in multiple languages, with wave form displays including voltage/current and providing a kWh reading that can be used to measure loads and calculate a PUE (power usage effectiveness) ratio.

### *APPLICATIONS:*

- Correctional Facilities
- Theaters / Concert Halls
- Auditoriums
- School / University Buildings
- Conference / Banquet Centers
- Sports Facilities
- Healthcare Facilities
- Worship Facilities
- Shopping Malls
- Casinos
- Subway / Train Stations
- Industrial Manufacturing

# SPECIFICATIONS

## GENERAL SPECIFICATIONS

### *Power*

| | |
|---|---|
| Ratings (kVA/kW) | 58.5, 72, 90, 112.5 at 1.0 (unity) power factor |
| Topology | True on-line double conversion uninterruptible power with selectable ECO-mode for higher efficiency operation |

### *Electrical Input*

| | |
|---|---|
| Nominal Voltage | 480/277 VAC, three phase (wye), 60Hz |
| Voltage Range | +15% to -10% at full load without battery usage. +15%, -30% voltage tolerance, load dependent or with battery assistance |
| Operating Frequency | 57 Hz to 63 Hz |
| Power Factor | 0.99 at nominal voltage and battery charge from 25% to 100% of the load |
| Current Harmonics | ≤ 3% THD at 100% load |
| Power Walk-In | 0 to 30 seconds (programmable) |

### *Electrical Output*

| | |
|---|---|
| Nominal Voltage | 480/277 VAC, three phase (wye), 60Hz |
| Voltage Regulation | ± 1% with balanced load; ± 3% with 100% unbalanced load |
| Frequency | ±0.05% while in battery operation mode |
| Overload | Up to: 110% for 60 minutes, 125% for 10 minutes, 150% for 1 minute |
| LED Inrush Rating | Peak overload capability of 1200% to accommodate inrush current from LED fixtures / drivers |
| Voltage Distortion | 2% THD maximum with linear load; 3% THD with non-linear load |
| Efficiency | On-Line mode 93%; Standby-On (ECO-mode) / Smart Active modes up to 98.5% |

### *Battery*

| | |
|---|---|
| Type | Valve-regulated, sealed lead acid, maintenance-free |
| Testing | NFPA 101 compliant automatic periodic self-testing, as well as a manual test feature |
| Runtimes | Standard and optional runtimes available |
| Nominal Voltage | 480 VDC |
| Charger | 3-stage, temperature compensated, < 1% ripple filtered |
| Recharge Time | 24 hour recharge (runtimes up to 90 minutes), UL 924 and CSA compliant |

### *Certifications*

| | |
|---|---|
| Safety | UL 924 Listed - Emergency Lighting and Power Equipment<br>C-UL Listed to CSA C22.2 No. 141-15 - Emergency Lighting Equipment<br>UL 924 Listed - Auxiliary Lighting and Power Equipment<br>NFPA 101, 111, NEC, and local codes |
| EMI Compliance | FCC Part 15, Subpart J, Class A |
| Quality | ISO 9001:2015 |

### *General*

| | |
|---|---|
| Electrical Input Configuration | Single source or a dual source input. The dual source configuration allows one source to feed the main input and a second source (or circuit) to feed the inverter bypass input. |
| Diagnostics | Continuous system self-check, including battery health |
| Static Bypass | Automatic bypass on overload or system failure |
| Internal Bypass | Mechanical bypass switch that provides an uninterrupted bypass of the inverter system |
| Maintenance Bypass | Optional, external, wall mounted, 3-CB wrap-around bypass |
| On-Line Mode | Under all input power conditions, the inverter output supplies the load with power that is isolated, as well as voltage and frequency regulated |
| Standby-On Mode (ECO-Mode) | When the bypass input source is within voltage and frequency limits, it powers the load and provides an operating efficiency up to 98.5% |
| Smart Active Mode | Automatically defines whether to operate in Standby-On (ECO-Mode) or On-Line Mode based on the quality / stability of the incoming power source |
| Standby-Off Mode | Output of the inverter is normally off and exclusively feeds emergency lighting that is only meant to be energized in the case of a power outage |
| Emergency Power Off (EPO) | Guarded EPO push button, and REPO connection for customer's normally closed contact or push button |

### *Communications*

| | |
|---|---|
| Monitor and Display | A wide graphic LCD display provides the user a detailed overview of the inverter's status, electrical parameters, battery measurements, and features a one-line operational diagram |
| Communication Port | RS232 serial communications access via DB9 connector for factory setup and authorized field service access. |
| Network Communications | Optional remote monitoring and reporting via Ethernet TCP/IP, BACnet/IP, MODBUS TCP/IP, or MODBUS RS485 |
| Relay Interface | 3 (Form C) output relay contacts reflect On Static Bypass, Battery Discharging, and End of Battery Discharging. These 3 contacts are user-programmable and may be reassigned to display other available event/alarm messages. |

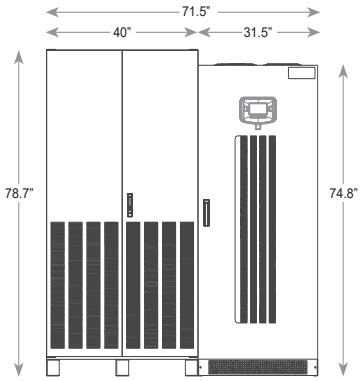
### *Environmental*

| | |
|---|---|
| Operating Temperature | 20°C to 30°C for UL 924 Listed models Emergency Lighting and Power Equipment, and C-UL Listed models to CSA C22.2 No. 141-15<br>0°C to 40°C for UL 924 Auxiliary Lighting and Power Equipment Listed models.<br>Optimum battery performance and life at 25°C |
| Storage Temperature | Inverter at -20°C to 50°C. Battery storage at 25°C for 6 months before charging is required. For each 9°C rise, reduce storage time by half |
| Relative Humidity | < 95% non-condensing |
| Audible Noise in (ECO-Mode) | < 65 dba at 1 meter (58.5kW – 90kW models)<br>< 68 dba at 1 meter (112.5kW model) |
| Elevation | 3281 feet (1000 meters) without derating |

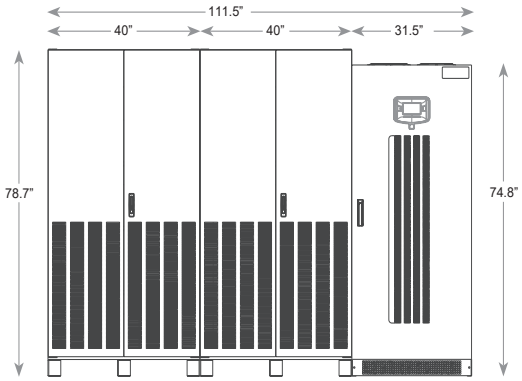
## INVERTER AND BATTERY CABINET CONFIGURATIONS

In each of the (4) cabinet configurations below, the inverter cabinet depth is 33.5" and is the deepest of all the cabinets in that configuration. Specific inverter models and their cabinet configurations, weights, and BTU's are detailed in the Model Number matrix on the Back Cover.

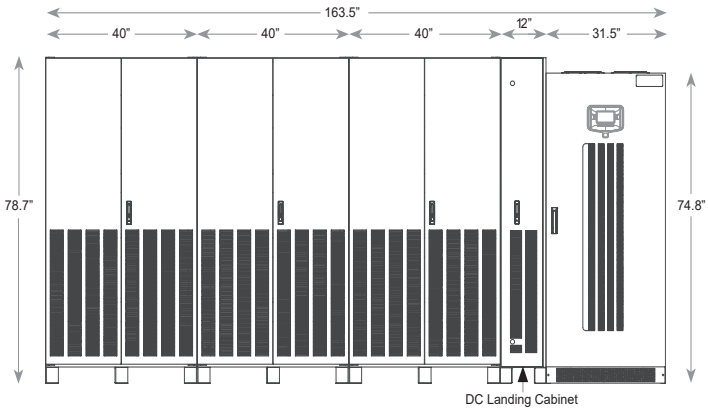
### Configuration A



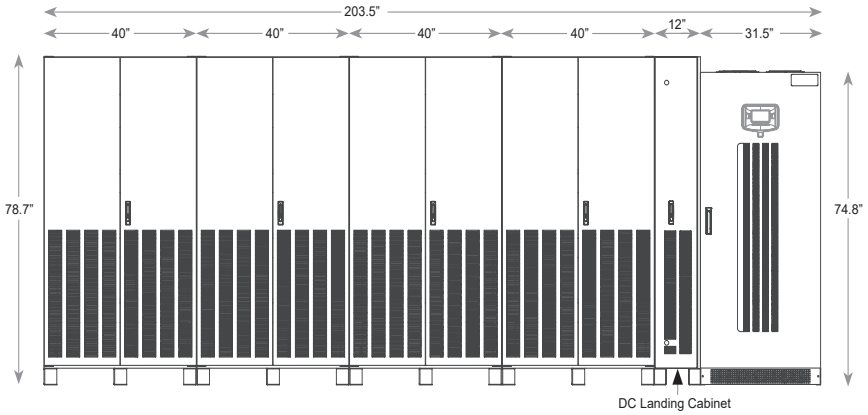

### Configuration B




### Configuration C




### Configuration D




A field-installed DC Landing Cabinet is included whenever (3) or (4) battery cabinets are provided, and is reflected in the dimensions of Configurations C and D above. The DC cable connections from each battery cabinet's circuit breaker are landed on the positive and negative bus bars within the landing cabinet. A single DC connection is then made from the landing cabinet to the inverter's DC input.

**Configuration E - Not Shown - See *"APPENDIX C - INSTALLATION DRAWINGS"***

**CONFIGURATIONS WITH TCE OPTION ARE NOT SHOWN - SEE *"APPENDIX C"* FOR MORE INFORMATION**

# IMPORTANT SAFEGUARDS

## WHEN USING ELECTRICAL EQUIPMENT, BASIC SAFETY PRECAUTIONS SHOULD ALWAYS BE FOLLOWED INCLUDING THE FOLLOWING:

## READ AND FOLLOW ALL SAFETY INSTRUCTIONS

# SAVE THESE INSTRUCTIONS

## SYMBOLS

In this manual, some operations are shown by graphic symbols to alert the reader to the dangerous nature of the operations:

| | |
|---|---|
|  | **DANGER / RISK OF ELECTRIC SHOCK -** Possibility of serious injury or substantial damage to the device, unless adequate precautionary countermeasures are taken. |
|  | **CAUTION -** This symbol indicates some important information which must be read with care. |
|  | **RISK OF EXPLOSION** |
|  | **NOTE** |
|  | **GROUND CONNECTION** |
|  | **ELECTROSTATIC SENSITIVE DEVICE** |
|  | It is recommended to read this part of the manual. |

## PROTECTIVE EQUIPMENT TO BE WORN

Maintenance operations must not be carried out on the device without wearing the Personal Protective Equipment (PPE) described below.

Personnel involved in the installation or maintenance of the equipment must not wear clothes with wide sleeves or laces, belts, bracelets or other items that may be dangerous, especially if they are metallic. Long hair must be tied in such a way as to ensure that it is not a hazard.

The following signs show the protective equipment that should be worn. The various items of PPE must be selected and sized according to the nature of the hazard (particularly electrical) posed by the equipment.

| | |
|---|---|
|  | **ACCIDENT PREVENTION FOOTWEAR**<br>**USE: ALWAYS** |
|  | **PROTECTIVE CLOTHING**<br>**USE: ALWAYS** |
|  | **WORK GLOVES**<br>**USE: ALWAYS** |
|  | **PROTECTIVE EYE WEAR**<br>**USE: ALWAYS** |
|  | **HELMET**<br>**USE: WHEN THERE ARE SUSPENDED LOADS** |

# *SAFETY PRECAUTIONS CONTINUED*

## INSTALLATION, SERVICE AND USER PRECAUTIONS

### DANGER

**This Inverter contains LETHAL VOLTAGES. All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the Inverter.**

### WARNING

**To reduce the risk of fire or electric shock, install this Inverter in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Do not operate near water or excessive humidity (95% maximum).**

**Input and output over-current protection and disconnect switches must be provided by others. High ground leakage current may be present. Do not operate the equipment without a proper protective ground.**

### CAUTION

**Batteries can present a risk of electrical shock or burn from high short circuit current. Observe proper precautions. Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.**

**There is a risk of explosion if batteries are replaced by an incorrect type. Replace with same type and rating only.**

**Proper disposal of batteries is required. Refer to your local codes for disposal requirements. Never dispose of batteries in a fire**

## IMPORTANT SAFETY INSTRUCTIONS

**This manual contains important instructions for all models and should be followed during installation and maintenance of the Inverter. Please read all instructions before operating the equipment and save this manual for future reference.**

**READ AND FOLLOW ALL SAFETY INSTRUCTIONS**

- Do not use outdoors.
- Do not route wiring across or near hot surfaces.
- Do not install near gas or electric heaters.
- Use caution when servicing batteries. Battery acid can cause burns to skin and eyes. If acid is spilled on skin or in eyes, flush acid with fresh water and contact a physician immediately.
- Equipment should be installed where it will not readily be 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.

## SAVE THESE INSTRUCTIONS

## DEFINITION OF "OPERATOR" AND "SPECIALIZED TECHNICIAN"

The professional figure responsible for accessing the equipment for ordinary maintenance purposes is defined with the term ***operator***.

This definition covers personnel that know the operating and maintenance procedures for the equipment, and that have been:

1. Trained to operate in accordance with the safety standards relating to the dangers that may arise where electrical voltage is present.

2. Trained to use Personal Protective Equipment and to carry out basic first aid.

The professional figure responsible for the installation and start-up of the equipment, and for any extraordinary maintenance, is defined with the term ***specialized technician***.

This definition covers personnel that, in addition to the requirements listed above for a general operator, must also:

1. Have been suitably trained by the manufacturers or their representative.

2. Be aware of installation, assembly, repair and service procedures, and have a specific technical qualification.

3. Must have a background of technical training, or specific training relating to the procedures for the safe use and maintenance of the equipment.

## EMERGENCY INTERVENTIONS

The following information is of a general nature.

### FIRST AID INTERVENTIONS

Company regulations and traditional procedures should be followed for any first aid intervention that may be required.

### FIRE FIGHTING MEASURES

1. Do not use water to put out a fire, but only fire extinguishers that are suitable for use with electrical and electronic equipment.

2. If exposed to heat or fire, some products may release toxic fumes into the atmosphere. Always use a respirator when extinguishing a fire.

# *RECEIVING THE INVERTER*

## REMOVING THE PACKAGING AND POSITIONING THE DEVICE

On delivery, the packaging must be inspected to ensure that it is whole and that it has not been crushed or dented. Check in particular that neither of the two impact resistant devices on the packaging is red; if one of them is red; follow the instructions on the packaging.

The essential details of the device are provided on the shipping document. The marking, weight and dimensions of the various items making up the packing list are shown.

Check the state of the device by means of a visual inspection of both the inside and the outside. Any dents seen mean that it has suffered shocks during shipping, which could compromise the normal operation of the device.

The list of material provided may vary depending on the order specifications. As a general rule, the packaging should include the following: this manual, the installation drawing, the warranty and eventual accessories.

**IMPORTANT NOTICE**

This shipment has been carefully inspected, checked and properly packaged at our company.

When it was delivered to the carrier it was in good condition and technically it became your property at that time. Thus, any damage, whether obvious or hidden, must be reported to the transportation company within FIVE days of receipt of the shipment at your premises to avoid forfeiting claims for damages.

**FOR ALL SHIPMENTS DAMAGED IN TRANSIT**

Leave the items, packing material and carton “AS IS”. Notify your carrier’s local office and ask for immediate inspection of the carton and contents.

After inspection has been made by the carrier, and you have received acknowledgment in writing as to the damage, notify our Customer Service Department to make any required repair arrangements.

It is your responsibility to follow the above instructions or the carrier will not honor any claims for damage. Also, if there are any shortages or questions regarding this shipment, please notify us within FIVE days.

Please note that we cannot be responsible for any service work or back-charges unless authorized by us in writing, before the work is performed.

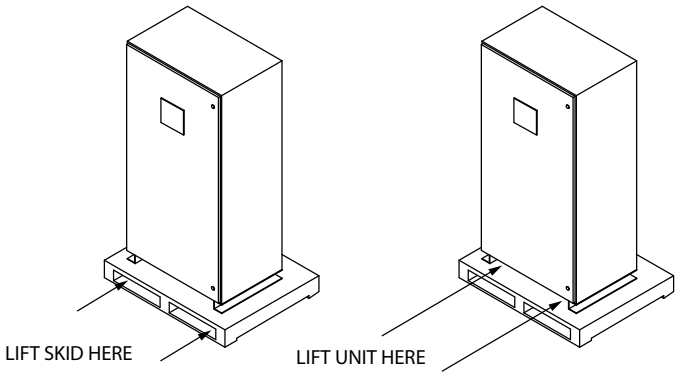
## HANDLING

**In order to avoid the risk of the device overturning, ensure that it is firmly secured to the fork-lift truck by means of appropriate ropes before moving it.**

The equipment must only be handled by adequately trained personnel. It can be unloaded from the vehicle and put into place by lifting the box or the wooden deck to which the equipment is secured with a fork-lift truck. A fork-lift truck should be used for the permanent positioning of the equipment, in accordance with the instructions provided below.

1. Insert the forks of the fork-lift truck in the lower part of the device, from the front or back, and ensure that they stick out about 12 inches on the other side.

2. Secure the device to the fork-lift before moving it.




When being moved the cabinet should be handled with care; shocks or drops can damage it. Once in position, remove the packaging carefully in order not to scratch the device. The packaging should be removed as follows:

1. Cut the bands
2. Slide away the carton from above.
3. Remove the screws securing the cabinet to the wooden base.

## STORAGE

In the following situations:

- installation not immediately after delivery;
- de-installation and storage while awaiting relocation,

Place the device in covered premises that are protected from direct contact with atmospheric agents and dust. The following environmental values are those allowed in the storage area:

Temperature: -13°F to +167°F ( -25 to + 75 °C)
Relative humidity: 30-95 % max.

If it is necessary to store the unit, be sure to place it in a clean dry area. **For extended storage, the batteries must be charged for 24 hours every 6 months. Failure to do so will result in weak or bad batteries which WILL NOT be covered under the warranty.** Consult factory for charging instructions while in storage. **THE DC CIRCUIT BREAKER MUST REMAIN OFF WHILE IN STORAGE.**

## INSTALLATION CONSIDERATIONS

**This unit is intended for installation in a temperature controlled, indoor area free of conductive contaminants.**

### CHOICE OF LOCATION

The unit has been completely inspected and extensively tested under various load conditions prior to shipment. Care to install it at a proper location will assure long trouble-free operation.

The unit is air cooled with the air intake at the front middle and bottom and exhausts at the top. Therefore, it should be installed in a clean, dry place with enough clearance to allow a free flow of air. Allow enough space for maintenance at the front of the unit.

Prior to installing the Inverter, be sure to take into consideration the site you have selected. Inverters produce heat and therefore require ventilation as well as accessibility. Consider these factors:

| | |
|---|---|
| • Ventilation | • Input Source Voltage |
| • Size of the Inverter | • Receiving Facilities |
| • Weight Load | • Distribution of Power |
| • Audible Noise Requirements | • Room Temperature |
| • Remote Emergency Power Off (Repo) | • Clearances |
| • Monitors | • Accessibility |
| • Options | • Excessively Long Power Runs |
| • Clean Environment | • Proper Ground Techniques |

### AMBIENT CONDITIONS

- Ensure that the floor can support the weight of the Inverter and battery cabinet(s).
- Avoid dusty environments (the indoor area must be free of conductive contaminations).
- Avoid narrow environments that could hinder normal maintenance operations.
- Avoid placing the device in areas exposed to direct sunlight or heat.
- Ensure that the ambient temperature conforms to the following:
  - Minimum operating temperature: +32°F ( 0 °C)
  - Maximum temperature for 8 hours a day: +104°F (+ 40°C)
  - Average temperature for 24 hours: +95°F (+ 35°C)

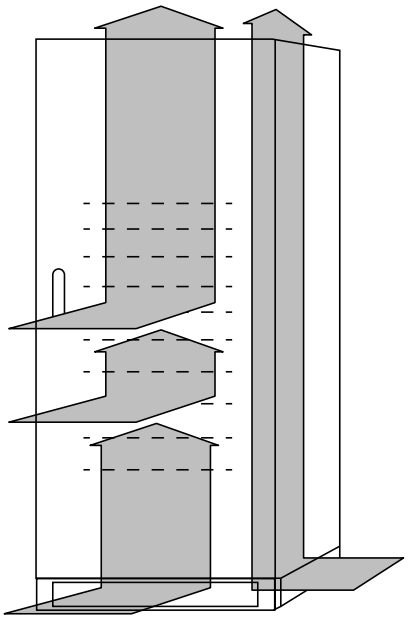
### DIMENSIONS OF THE PREMISES

For the mechanical dimensions of the cabinets, refer to the ***"INSTALLATION DRAWINGS", Page 90*** supplied with the Inverter and the battery cabinet. These drawings provide the following data:

- The position of the holes in the base to secure the device to the floor, where applicable.
- A view of the floor support for the sizing of a structure to raise the cabinet, where applicable.
- Conduit entry points.
- The position of the fans on the top of the Inverter, for the positioning of a structure to convey the warm air discharged by the equipment outside the premises, where applicable.
- The input, output and battery cables section.
- The power dissipated by the equipment (KW).

## INSTALLATION CONSIDERATIONS CONTINUED

### COOLING OF THE PREMISES



The recommended operating temperature for the lifetime of the Inverter and of the batteries is between 20 and 25°C. The lifespan of the battery depends on the operating temperature; as the operating temperature increases, the lifespan of the batteries is decreased. A heat dissipation system is recommended to keep the temperature of the premises housing the equipment within the field 20-25°C.

The heat dissipation needed for the correct operation of the Inverter is brought about by the air current made by the fans located inside the Inverter (forced convection) and by the air around the side panels (natural convection).

In order to ensure proper air circulation, and therefore the correct operation of the Inverter, measures must be taken during installation to avoid any obstructions to the free circulation of air. These include the following:

- Ensure a distance of at least 24 inches from the ceiling, so as not to hinder air extraction.
- Leave a free space of at least 36 inches at the front of the equipment to ensure both the circulation of the air and installation and maintenance operations.
- With natural convection the thermal load is dissipated to the outside through the walls; thus a cabinet placed against a wall or in a hollow dissipates less heat than one located in a free environment. The following rule must be observed: ***Leave at least one of the three side walls free: right, left or back.***
- The bottom side kick panels must not be mounted for installations where cabinets are placed side by side.

## BATTERY AND INVERTER CABINET ASSEMBLY

Using the provided hardware, connect the inverter cabinet and battery cabinet(s) together as shown in ***"Appendix C - Installation Drawings" and the "C & C Battery Installation Manual"***. Move the system into place and secure it to the floor prior to battery installation, ***Page 90.***

## SECURING THE UNIT TO THE FLOOR

Secure the system to the floor (if required) prior to battery installation. Secure the unit to the floor using the mounting holes as shown in ***"Appendix C - Installation Drawings" (hardware NOT provided), Page 90.***

## SEISMIC BRACKETS

Attach the siesmic brackets to the inverter with the provided hardware as shown in ***"Appendix C - Installation Drawings"***. Secure the unit to the floor (hardware NOT provided) using the mounting holes and seismic brackets, ***Page 115***.

## ACCESSING THE INVERTER TERMINALS

The following operations must be performed while the Inverter is disconnected from the utility mains power, switched off and all the input and output power switches on the equipment are open. Before performing connection, open all the input and output power switches and check that the Inverter is completely isolated from all power sources: battery and AC power line. In particular, check that:

- The Inverter input line is completely isolated.
- That the battery circuit breaker/disconnect is open.
- All the Inverter power and load connection switches (SWIN, SWBY, SWOUT and SWMB) are in the open position.
- No dangerous voltages are present (use a multimeter).

The first connection to be performed is the protective wire (earth ground cable) which has to be inserted into the terminal labelled PE. The Inverter must operate with the grounding system connected.

Do not connect the output neutral to the input neutral.

**CAUTION**: If the input connection is Delta the Inverter can supply only Delta load.
The output neutral must not be connected unless the Inverter is the Wye version supplied with an input neutral. TRANSFORMER BOXES (optional) are available for converting the distribution systems from 3 to 4 wires.

**CAUTION**: If a three-phase non-linear load is connected to the output, the current on the neutral conductor can reach a value equal to 1.5 times the value of the phase current. Dimension the input/output neutral cable appropriately taking this fact into account.

**CAUTION**: The Inverter cannot feed from a corner ground or mid-point grounded delta supply source.

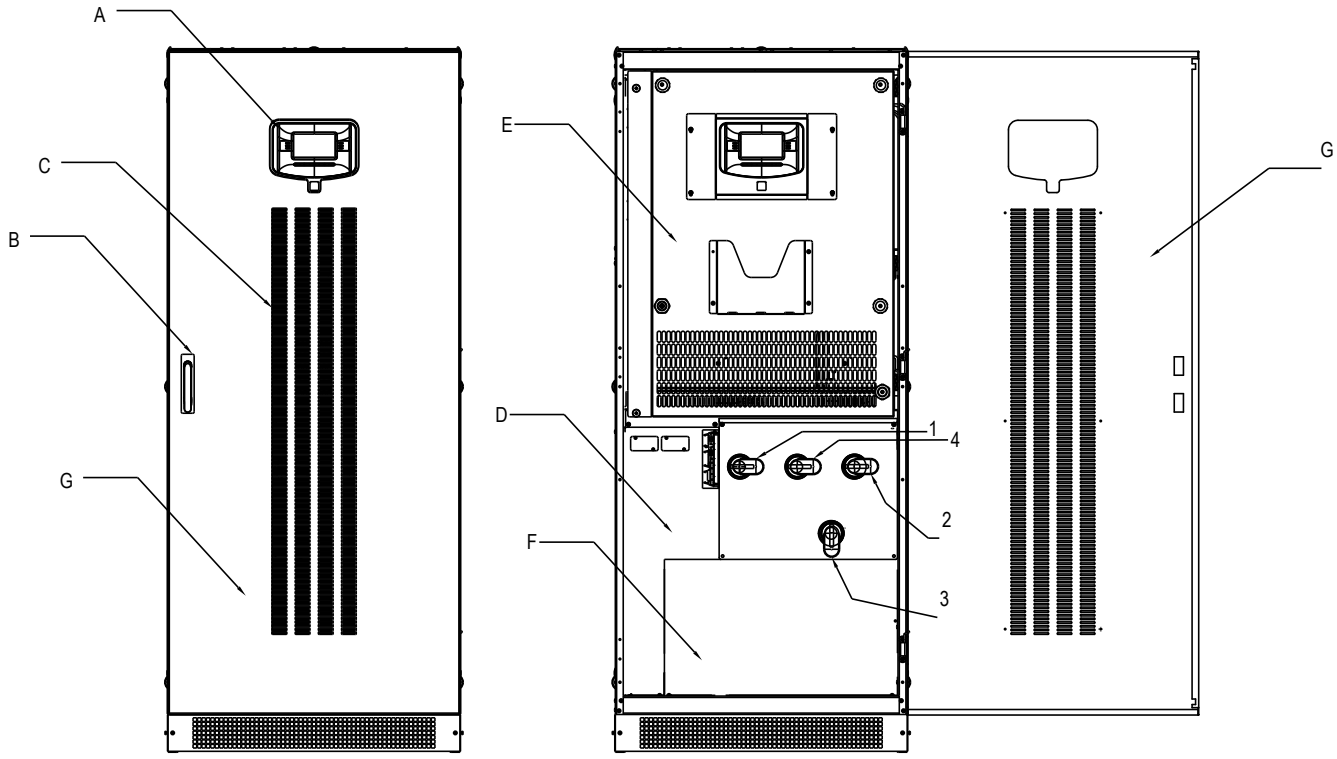
**CAUTION**: Use only lugs or cables with tin-plated eyes for the connections.

**CAUTION**: Ensure correct phase rotation at the input and output terminals Ensure correct polarity battery connections

The DC input requires a disconnect means which is provided in each supplied battery cabinet ordered with this unit. AC and DC cables and cable lugs are to be provided by others as part of the Inverter installation.

Each model can be configured for a delta input source with a delta connected load or for a Wye input with a Wye connected load. If the load requires a neutral connection (i.e. Wye), then an input neutral must be provided. Refer to the Power Connection terminals diagrams later in this section for details concerning configuration of the neutral to ground bond. See ***"Installation - Connection of Power Cables for ...", Page 25 - Page 28***.

## COMPONENT LOCATION 58.5kW - 72kW

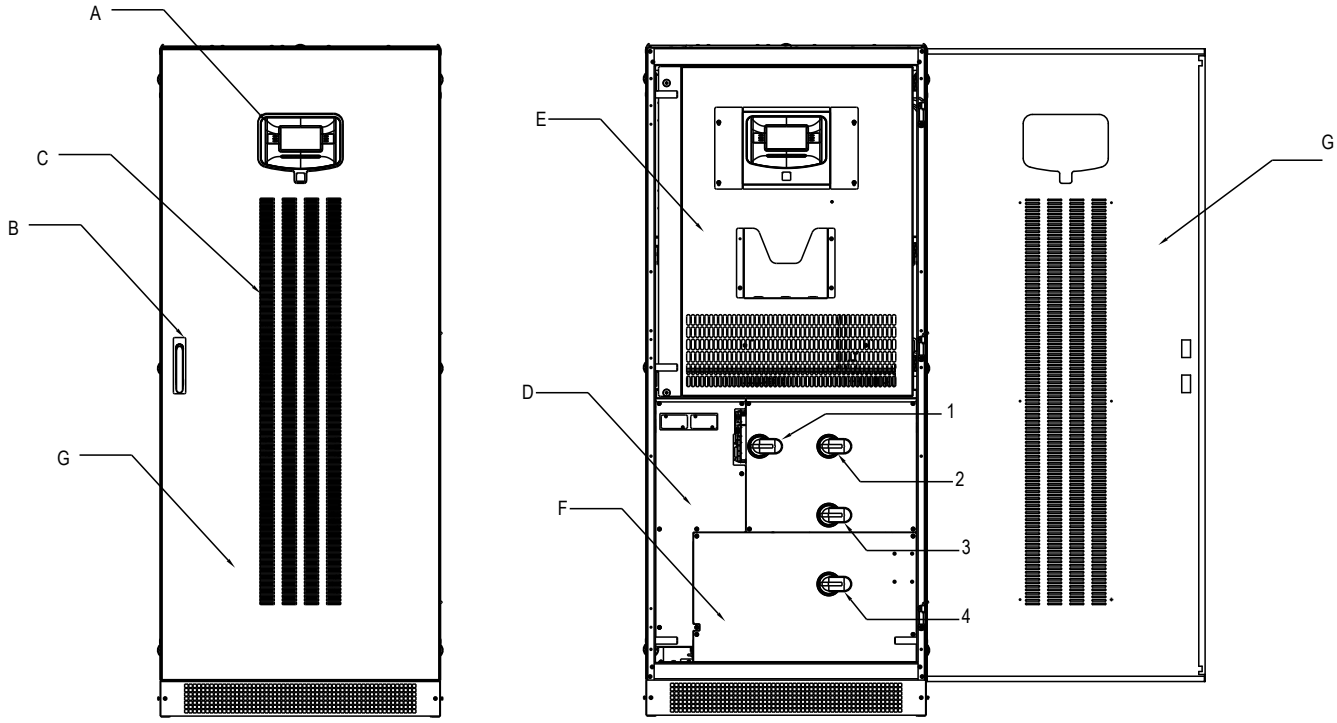



A. Control panel with graphic display
B. Door handle
C. Ventilation grilles
D. Communication area
E. Front Cover panel with ventilation grilles
F. Switch cover panel
G. Door

1. SWIN: Input power switch
2. SWOUT: Static switch output
3. SWMB: Mechanical bypass switch
4. SWBY: Static switch bypass input

See ***"Connection of Power Cables for Single Input Unit"*** for switch functions. ***Page 25.***

## COMPONENT LOCATION 90kW - 112.5kW



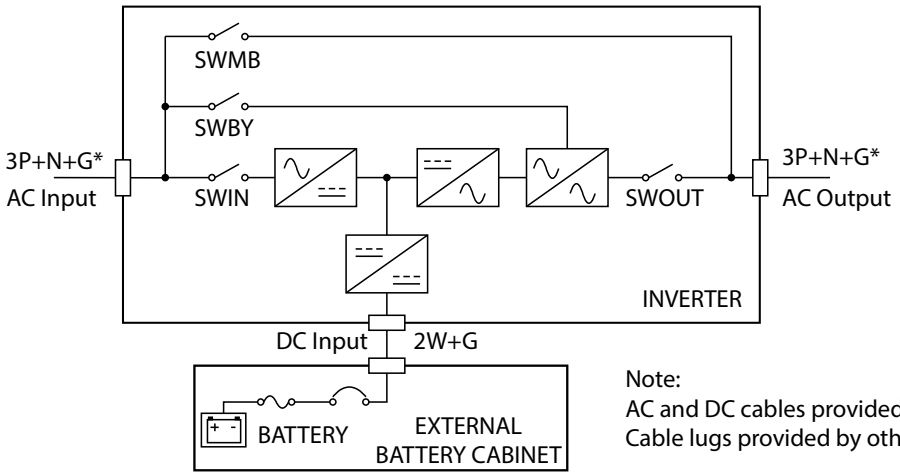

A. Control panel with graphic display
B. Door handle
C. Ventilation grilles
D. Communication area
E. Front Cover panel with ventilation grilles
F. Switch cover panel
G. Door

1. SWIN: Input power switch
2. SWOUT: Static switch output
3. SWMB: Mechanical bypass switch
4. SWBY: Static switch bypass input


See ***"Connection of Power Cables for Single Input Unit"*** for switch functions. ***Page 25.***

## INVERTER IN SINGLE CONFIGURATION

The Inverter is designed to work as Single input Unit or as Dual input Unit.

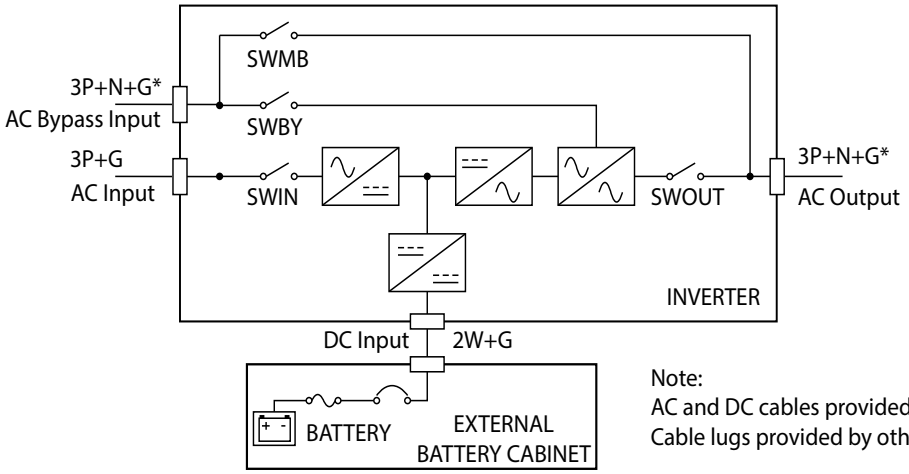



Note:
AC and DC cables provided by others
Cable lugs provided by others.

* For wye-wye configuration.

In delta-delta configuration
N is not connected.

**SCHEMATIC DIAGRAM: SINGLE INPUT UNIT**




Note:
AC and DC cables provided by others
Cable lugs provided by others.

* For wye-wye configuration.

In delta-delta configuration
N is not connected.

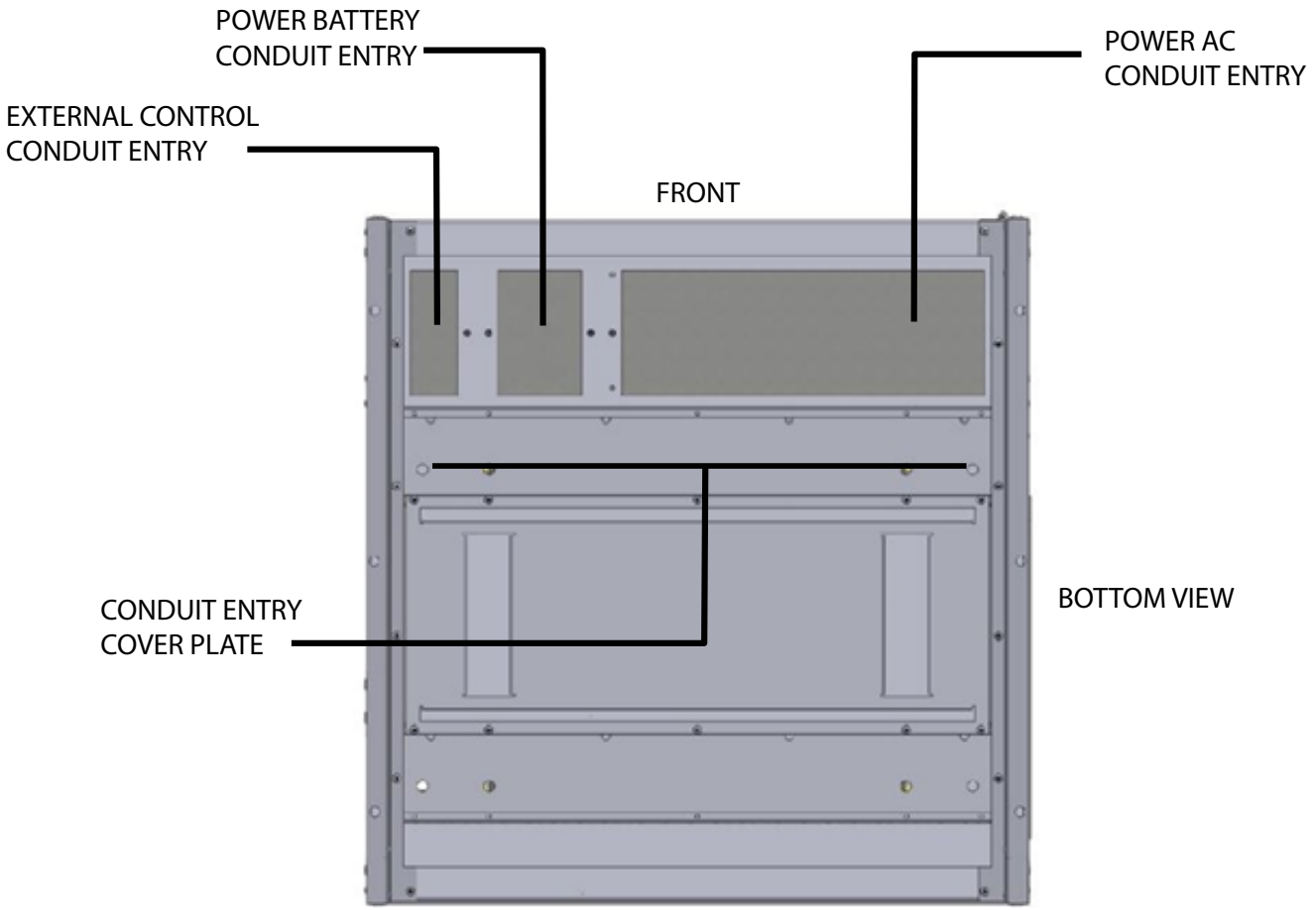
**SCHEMATIC DIAGRAM: DUAL INPUT UNIT**

## CONDUIT ENTRY POINTS

The cables can enter in the Inverter from the bottom or from the top with the optional (Top Entry Cabinet)

Proceed as follows in order to open the Inverter

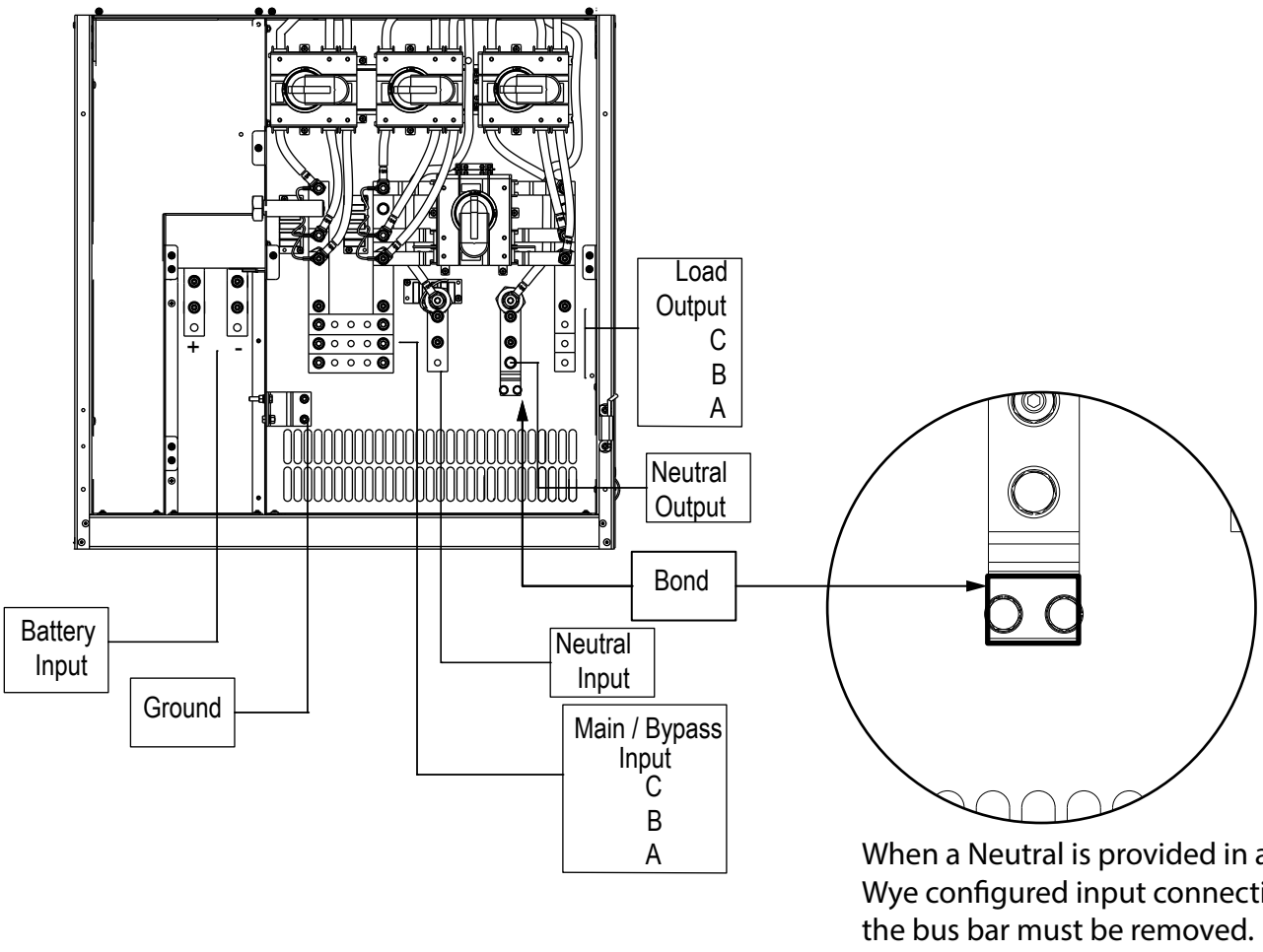
- Open the door
- Remove the switch cover panel
- Remove the bottom cable entry cover plates
- Drill or punch conduit holes in the cover plates
- Route the power cable through the bottom to the Inverter terminals in base to your configuration (see the next paragraphs)



## CONNECTION OF POWER CABLES FOR SINGLE INPUT UNIT

Connect the input, output and battery cables to the terminals as shown in the figure below:

**58.5kW - 72kW POWER CONNECTION TERMINALS**




NOTE: For the Input, Output and Battery connections, respect the order from the top to bottom, or right to left, as described above. The label marked “N” present on the terminal identifies the neutral terminal.

The single input is a factory default configuration. Do not remove the bypass jumper. The input phase connections are made using bolts to one of the three holes in the bus bar. Do not loosen the bolts that attach the bus bar.

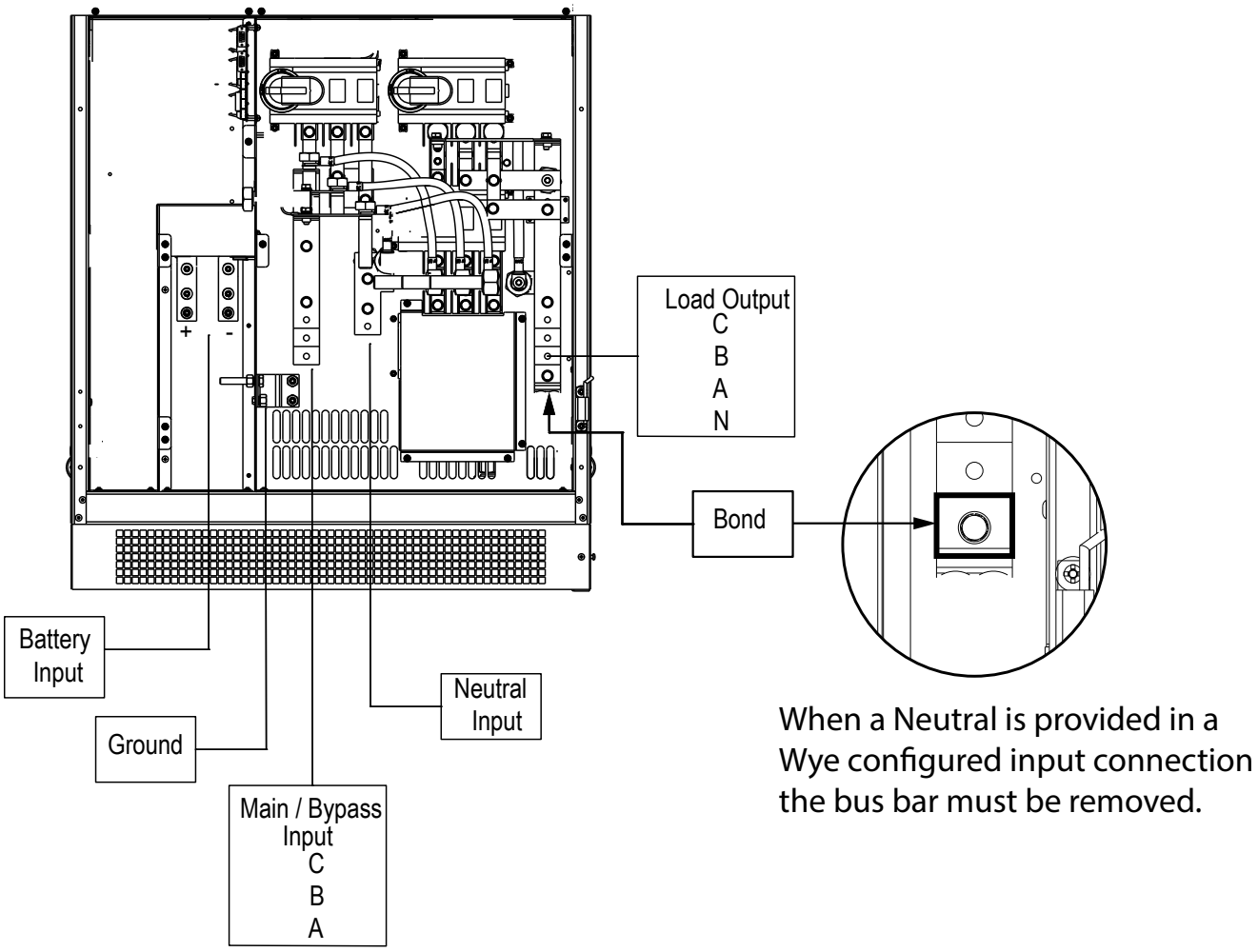
Bond: The Inverter is provided with a separate bus bar that connects the Neutral Output to the frame Ground for delta input connection. This is required to meet NEC grounding code for separately derived neutrals. **WHEN A NEUTRAL IS PROVIDED IN A WYE CONFIGURED INPUT CONNECTION THE BUS BAR MUST BE REMOVED.**

Once installation has been completed inside the equipment, put the switch cover panel back and close the door.

## CONNECTION OF POWER CABLES FOR SINGLE INPUT UNIT

Connect the input, output and battery cables to the terminals as shown in the figure below:

**90kW - 112.5kW POWER CONNECTION TERMINALS**




Note: For the Input, Output and Battery connections, respect the order from the top to bottom, or right to left, as described above. The label marked “N” present on the terminal identifies the neutral terminal.

The single main is a factory default configuration. Do not remove the bypass jumper.

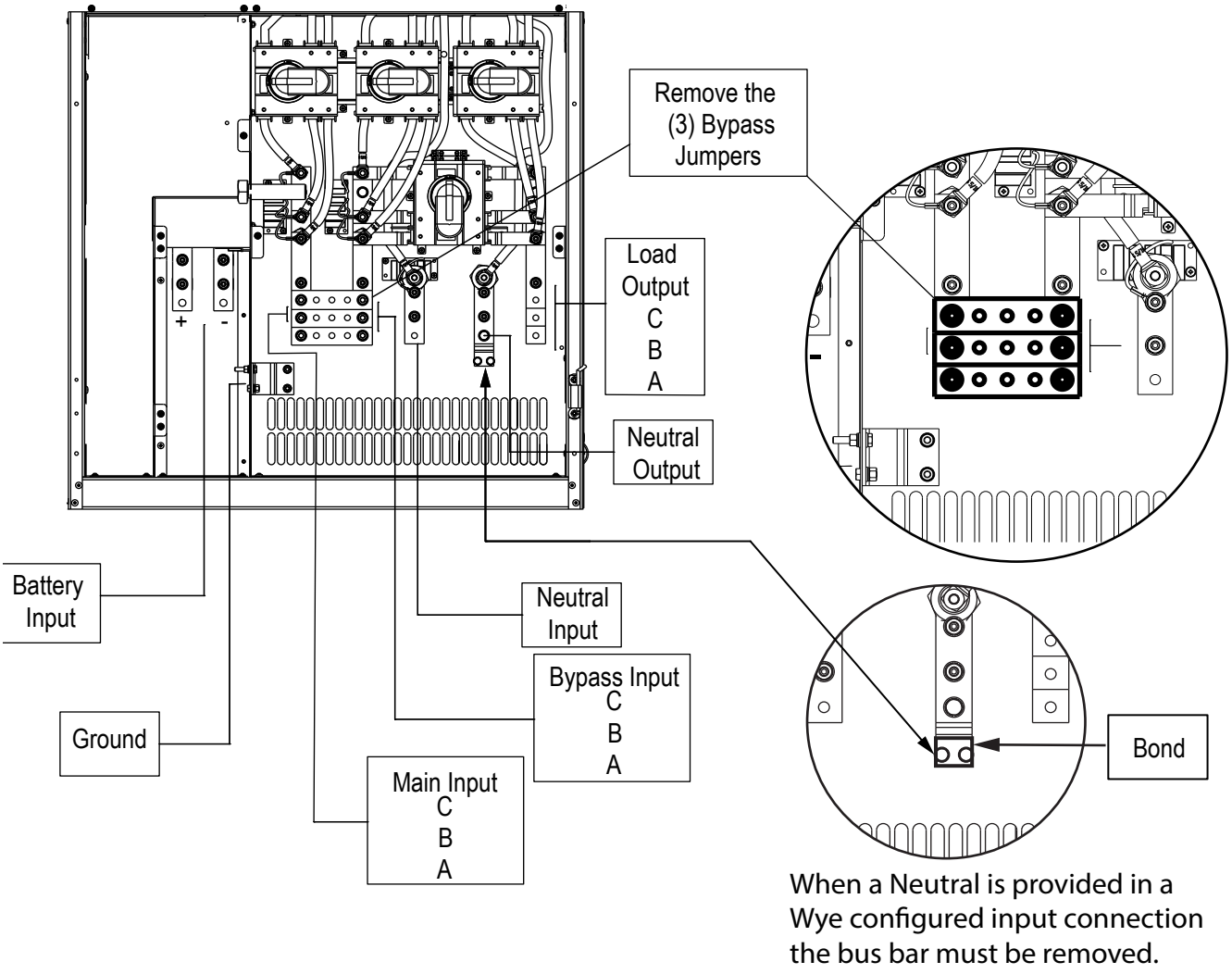
Bond: The Inverter is provided with a separate bus bar that connects the Neutral Output to the frame Ground for delta input connection. This is required to meet NEC grounding code for separately derived neutrals. **WHEN A NEUTRAL IS PROVIDED IN A WYE CONFIGURED INPUT CONNECTION THE BUS BAR MUST BE REMOVED.**

Once installation has been completed inside the equipment, put the switch cover panel back and close the door.

## CONNECTION OF POWER CABLES FOR DUAL INPUT UNIT

Connect the input, output and battery cables to the terminals as shown in the figure below:

**58.5kW -72kW POWER CONNECTION TERMINALS**




**Remove the jumpers present between the SWIN and SWBY.**

The input phase connections attach using bolts through the holes that were previously used to attach the bus bars. The main (rectifier) input is located on the left and the bypass input is on the right. The neutral input comes from the bypass source; no neutral is to run from the rectifier input source, although the rectifier source must be a grounded Wye.

Note: For the Input, Output and Battery connections, respect the order from the top to bottom, or right to left, as described in the boxes. The label marked “N” present on the terminal identifies the neutral terminal.

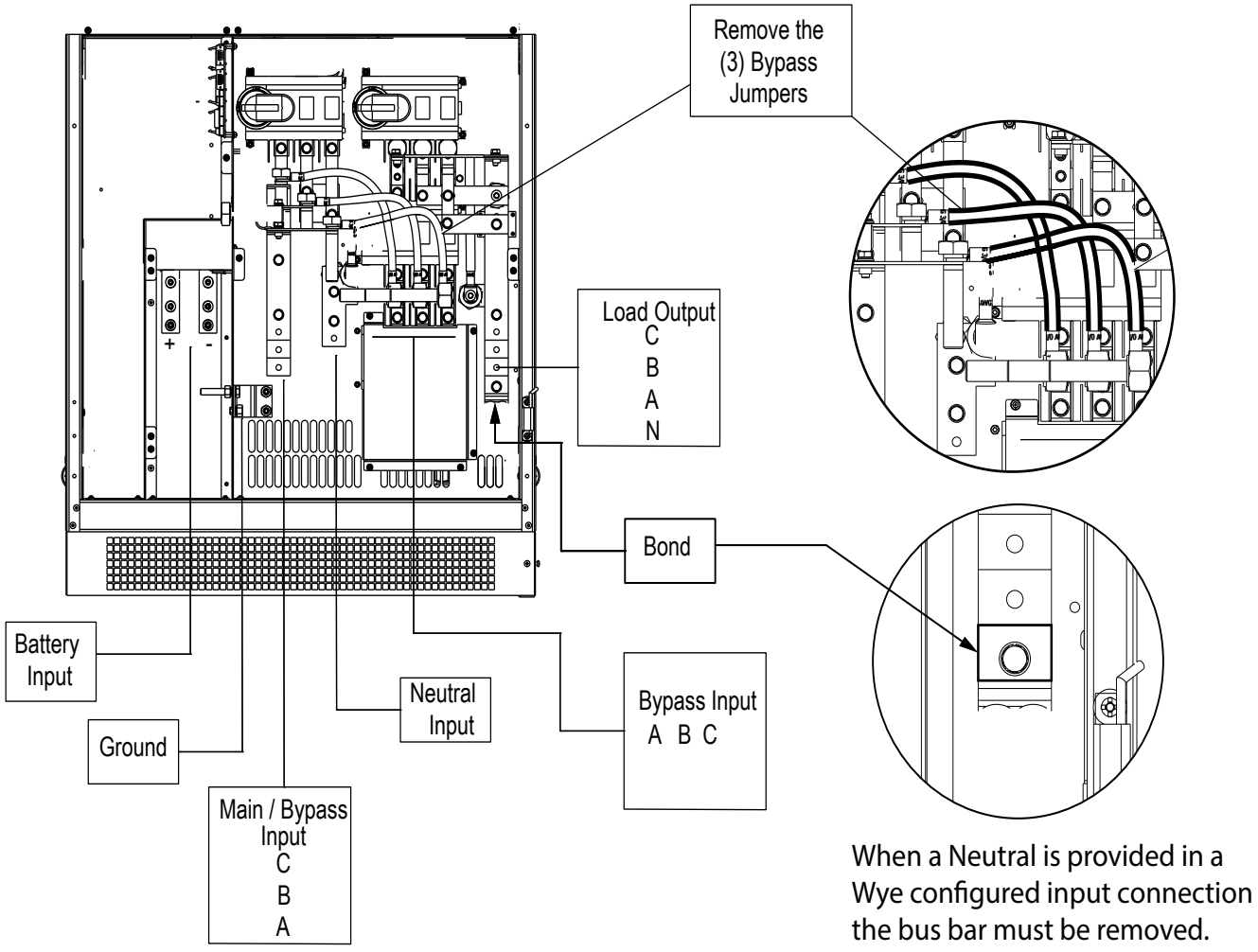
Bond: The Inverter is provided with a separate bus bar that connects the Neutral Output to the frame Ground for delta input connection. This is required to meet NEC grounding code for separately derived neutrals. **WHEN A NEUTRAL IS PROVIDED IN A WYE CONFIGURED INPUT CONNECTION THE BUS BAR MUST BE REMOVED.**

Once installation has been completed inside the equipment, replace the switch cover panel and close the door.

## CONNECTION OF POWER CABLES FOR DUAL INPUT UNIT

Connect the input, output and battery cables to the terminals as shown in the figure below:

**90kW - 112.5kW POWER CONNECTION TERMINALS**




**Remove the jumpers present between the SWIN and SWBY.**

Note: For the Input, Output and Battery connections, respect the order from the top to bottom, or right to left, as described in the boxes. The label marked “N” present on the terminal identifies the neutral terminal. The neutral input comes from the bypass source; no neutral is to be run from the rectifier input source, although the rectifier source must be a grounded Wye.

Bond: The Inverter is provided with a separate bus bar that connects the Neutral Output to the frame Ground for delta input connection. This is required to meet NEC grounding code for separately derived neutrals. **WHEN A NEUTRAL IS PROVIDED IN A WYE CONFIGURED INPUT CONNECTION THE BUS BAR MUST BE REMOVED.**

Once installation has been completed inside the equipment, replace the switch cover panel and close the door.

## MINIMUM WIRE SIZE REQUIREMENTS

| INPUT (FOR SINGLE INPUT UNIT) | | |
|---|---|---|
| **MODELS** | **PHASE AND NEUTRAL CONDUCTOR** | **GROUND WIRE** |
| 58.5kW | 1 | 6 AWG |
| 72kW | 2/0 | 6 AWG |
| 90kW | 3/0 | 6 AWG |
| 112.5kW | 250 kcmil | 4 AWG |

| RECTIFIER INPUT (FOR DUAL INPUT UNIT ONLY) | | |
|---|---|---|
| **MODELS** | **PHASE CONDUCTOR** | **GROUND WIRE** |
| 58.5kW | 1 | 6 AWG |
| 72kW | 2/0 | 6 AWG |
| 90kW | 3/0 | 6 AWG |
| 112.5kW | 250 kcmil | 4 AWG |

| BYPASS INPUT (FOR DUAL INPUT UNIT ONLY) | | |
|---|---|---|
| **MODELS** | **PHASE AND NEUTRAL CONDUCTOR** | **GROUND WIRE** |
| 58.5kW | 2 | 6 AWG |
| 72kW | 1/0 | 6 AWG |
| 90kW | 2/0 | 6 AWG |
| 112.5kW | 4/0 or 250 kcmil | 4 AWG |

| OUTPUT | | |
|---|---|---|
| **MODELS** | **PHASE AND NEUTRAL CONDUCTOR** | **GROUND WIRE** |
| 58.5kW | 2 | 6 AWG |
| 72kW | 1/0 | 6 AWG |
| 90kW | 2/0 | 6 AWG |
| 112.5kW | 4/0 or 250 kcmil | 4 AWG |

| BATTERY | | |
|---|---|---|
| **MODELS** | **PHASE CONDUCTOR** | **GROUND WIRE** |
| 58.5kW | 3/0 | 6 AWG |
| 72kW | 4/0 | 6 AWG |
| 90kW | 300 kcmil | 6 AWG |
| 112.5kW | 400 kcmil | 4 AWG |

**CAUTION: Use at least 75° C rated copper wire. Minimum wire size is based on full load ratings applied to NEC Code Table 310-16. Code may require a larger AWG size than shown in this table because of temperature, number of conductors in the conduit, or long service runs. Follow local requirements. Branch circuit protection must be provided for the input circuits as part of the installation.**

## RECOMMENDED CABLE LUGS

| BOLT SIZE | WIRE | THOMAS AND BETTS CONNECTIONS |
|---|---|---|
| 5/16 | 6 AWG | 51436 |
| | 4 AWG | 54140 |
| | 1/0 | 54109 |
| | 2/0 | 54110 |
| | 4/0 | 54112 |
| | 250 kcmil | 54172 |
| 3/8 | 2/0 | 54160 |
| | 300 kcmil | 54114 |
| | 400 kcmil | 54116 |

Per NEC article 300-20(2), all three-phase conductors must be run in the same conduit. Neutral and ground must be run in the same conduit as the phase conductors.

Conduit is to be sized to accommodate one neutral conductor the same size as the phase conductor and one ground conductor. If two neutral conductors or an oversized neutral conductor are to be installed, check the size of the conduit needed to accommodate the extra wire or size and use that conduit size in place of the conduit size listed. Conduit sizes can be chosen from NEC Table C1, type letters RHH, RHW, RHW-2, TW, THW, THHW, THW-2.

## EXTERNAL OVER CURRENT PROTECTION DEVICE AND TERMINALS

**CAUTION to reduce the risk of fire, connect only to a circuit provided with branch circuit protection with maximum current rating per the table, below, in accordance with the National Electrical Code, ANSI/NFPA 70.**

| INPUT (FOR SINGLE INPUT UNIT) | | | | | |
|---|---|---|---|---|---|
| MODELS | NOMINAL CURRENT | MAXIMUM CURRENT | OCP CURRENT | OCP DEVICE RATING | BOLT SIZE (INCHES) |
| 58.5kW | 78.2A | 89A | 111.3A | 125A | 5/16 |
| 72kW | 96.3A | 109A | 136.3A | 150A | 5/16 |
| 90kW | 120.3A | 136A | 170A | 175A | 5/16 |
| 112.5kW | 150.4A | 160A | 200A | 200A | 5/16 |
| OCP = Over Current Protection Device, must be rated for branch circuit protection. | | | | | |

| RECTIFIER INPUT (FOR DUAL INPUT UNIT ONLY) | | | | | |
|---|---|---|---|---|---|
| MODELS | NOMINAL CURRENT | MAXIMUM CURRENT | OCP CURRENT | OCP DEVICE RATING | BOLT SIZE (INCHES) |
| 58.5kW | 78A | 90A | 112.5A | 125A | 5/16 |
| 72kW | 94A | 109A | 136.3A | 150A | 5/16 |
| 90kW | 118A | 136A | 170A | 175A | 5/16 |
| 112.5kW | 147A | 160A | 200A | 200A | 5/16 |

| BYPASS INPUT (FOR DUAL INPUT UNIT) | | | | |
|---|---|---|---|---|
| MODELS | NOMINAL CURRENT | OCP CURRENT | OCP DEVICE RATING | BOLT SIZE (INCHES) |
| 58.5kW | 70.4A | 88.0A | 100A | 5/16 |
| 72kW | 86.7A | 108.4A | 125A | 5/16 |
| 90kW | 108.4A | 135.5A | 150A | 5/16 |
| 112.5kW | 135.5A | 169.3A | 175A | 5/16 |

| OUTPUT | | |
|---|---|---|
| MODELS | NOMINAL CURRENT | BOLT SIZE (INCHES) |
| 58.5kW | 70.4A | 5/16 |
| 72kW | 86.7A | 5/16 |
| 90kW | 108.4A | 5/16 |
| 112.5kW | 135.5A | 5/16 |

**CAUTION Output circuit protection requirement is determined by distribution circuit. Smaller wire may be used for load wiring if rated load current is not needed and the appropriate circuit protection is applied. Output circuit protection must be provided as a part of the installation.**

## EXTERNAL OVER CURRENT PROTECTION DEVICE AND TERMINALS CONTINUED

**CAUTION to reduce the risk of fire, connect only to a circuit provided with branch circuit protection with maximum current rating per the table, below, in accordance with the National Electrical Code, ANSI/NFPA 70.**

| BATTERY - 30 MINUTE RUNTIMES | | | | | |
|---|---|---|---|---|---|
| MODELS | NUMBER OF BATTERY CABINETS | NOMINAL CURRENT | MAXIMUM CURRENT | OCP DEVICE RATING PER BATTERY CABINET | BOLT SIZE (INCHES) |
| 58.5kW | 1 | 127@480Vdc | 159.5A@400.8Vdc | 200A | 3/8 |
| 72kW | 2 | 156A@480Vdc | 196.4A@400.8Vdc | 125A | 3/8 |
| 90kW | 2 | 195A@480Vdc | 235.8A@400.8Vdc | 150A | 3/8 |
| 112.5kW | 2 | 244A@480Vdc | 294.8A@400.8Vdc | 200A | 3/8 |

| BATTERY - 60 MINUTE RUNTIMES | | | | | |
|---|---|---|---|---|---|
| MODELS | NUMBER OF BATTERY CABINETS | NOMINAL CURRENT | MAXIMUM CURRENT | OCP DEVICE RATING PER BATTERY CABINET | BOLT SIZE (INCHES) |
| 58.5kW | 2 | 127@480Vdc | 159.5A@400.8Vdc | 100A | 3/8 |
| 72kW | 2 | 156A@480Vdc | 196.4A@400.8Vdc | 125A | 3/8 |
| 90kW | 3 | 195A@480Vdc | 235.8A@400.8Vdc | 100A | 3/8 |
| 112.5kW | 3 | 244A@480Vdc | 294.8A@400.8Vdc | 125A | 3/8 |

| BATTERY - 90 MINUTE RUNTIMES | | | | | |
|---|---|---|---|---|---|
| MODELS | NUMBER OF BATTERY CABINETS | NOMINAL CURRENT | MAXIMUM CURRENT | OCP DEVICE RATING PER BATTERY CABINET | BOLT SIZE (INCHES) |
| 58.5kW | 2 | 127@480Vdc | 159.5A@400.8Vdc | 100A | 3/8 |
| 72kW | 3 | 156A@480Vdc | 196.4A@400.8Vdc | 100A | 3/8 |
| 90kW | 3 | 195A@480Vdc | 235.8A@400.8Vdc | 100A | 3/8 |
| 112.5kW | 4 | 244A@480Vdc | 294.8A@400.8Vdc | 100A | 3/8 |

**CAUTION: Input and output circuit protection must be provided by others as part of the Inverter installation.**

**NOTE: Cables and lugs are not supplied.**

| TORQUE SPECIFICATIONS | | |
|---|---|---|
| BOLT SIZE (INCHES) | TORQUE LOAD | |
| 5/16 | 10 lbf-ft | 13.5 Nm |
| 3/8 | 22 lbf-ft | 30 Nm |
| 1/2 | 37 lbf-ft | 50 Nm |

## DIFFERENTIAL (GFI)

If the Inverter protection against electric shock uses a differential current device (Ground Fault Interrupter), it will have to have the following characteristics:

- Sensitivity 300mA
- Sensitive direct current and unidirectional components (Class A or Class B)
- Insensitive to transient current pulses
- Delay greater than or equal to 0.1 s.

### NEUTRAL

**In the standard version without an isolation transformer on the bypass line, the neutral from the mains power supply is connected to the output neutral of the Inverter.**
**THE ELECTRICAL SYSTEMS UPSTREAM AND DOWNSTREAM OF THE INVERTER MUST BE EXACTLY THE SAME (DELTA-DELTA or WYE-WYE)**

When operating in the presence of mains supply, a differential breaker (GFI) installed on the input will intervene as the output circuit is not isolated from the input circuit.

When operating without mains supply (from battery) the input differential breaker will intervene only if it is able to switch as a result of leakage current without any voltage at its poles (for example a differential breaker with an auxiliary relay is not suitable). However it is possible to install additional differential breakers on the output of the Inverter, possibly coordinated with those on the input.

## BACK FEED PROTECTION

The Inverter is provided with a redundant device to prevent voltage back feed on the input line due to an internal fault. This protection device works by switching off the Inverter if the current flow is faulty, thereby causing voltage back feed on the bypass line during operation from the Inverter. If the fault occurs when the Inverter is operating from the battery, the load will not be powered.

The control logic allows the function of the relay to be reconfigured, for example for the back feed alarm, and then the free voltage contact can be used to control the triggering of a switch located on the Inverter input.

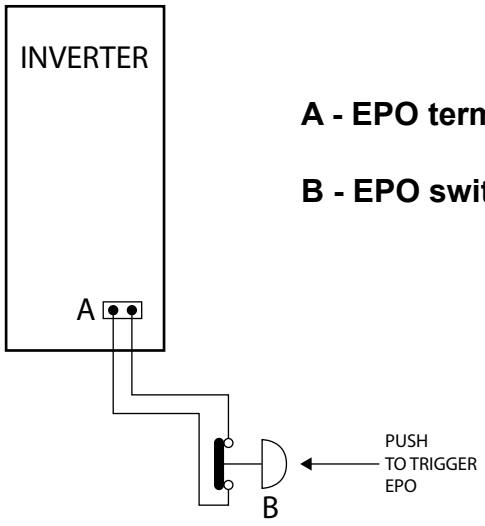
## EMERGENCY POWER OFF DEVICE (EPO)

The Inverter has an EPO (Emergency Power Off) function. In the event of an emergency using this function the Inverter shuts down the rectifier, Inverter, static switch and completely disconnects the power to the load

The Output circuit of the Inverter should not be considered safe, unless the Inverter is Off and the input power source to the Inverter has been removed by opening the input disconnect devices which are external to the Inverter, including the battery.

This function can be activated from the button (under a hinged clear plastic cover) on the control panel or by a remote contact. This button must be depressed and held down until the Inverter shuts down.

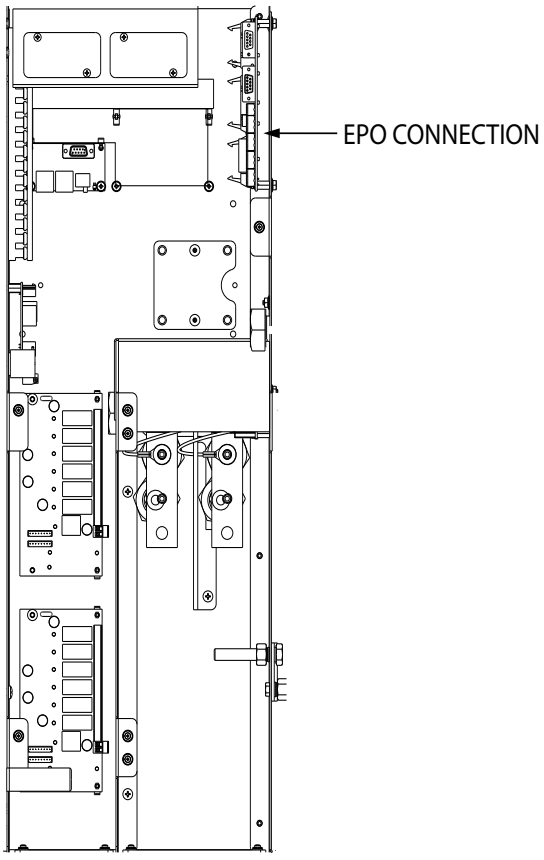
To connect an external EPO to the remote contact follow this procedure.




**A - EPO terminal board located on the Inverter**

**B - EPO switch (not provided).**

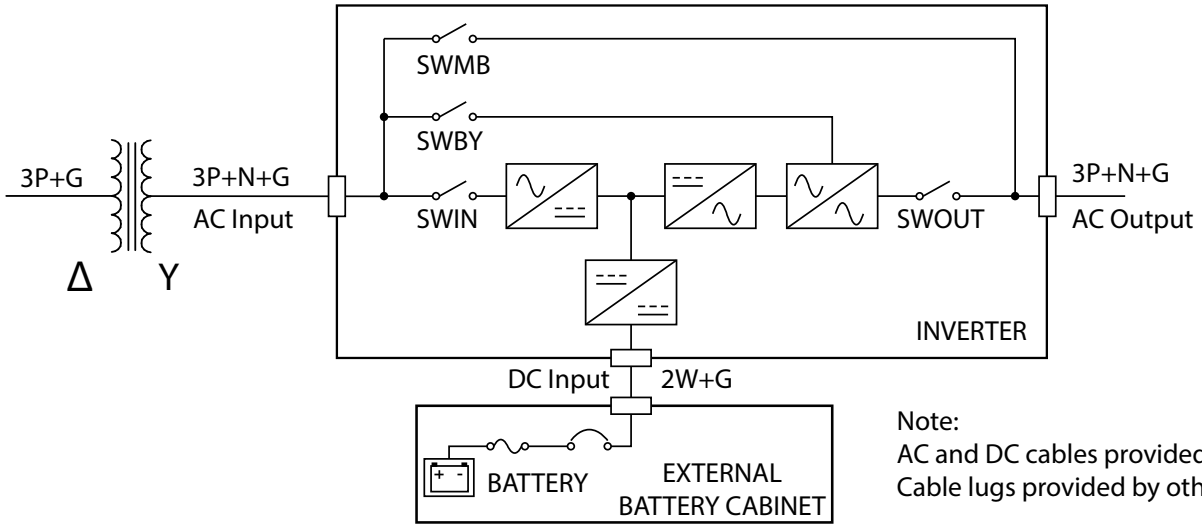
On the Inverter, the jumper on the EPO terminals must be removed, and the wires from the auxiliary contact of the button must be connected in place of the jumper. The contact must be closed with the button in the rest position and must open when the button is pressed.



## MAINS, LOAD AND BATTERY CONNECTIONS

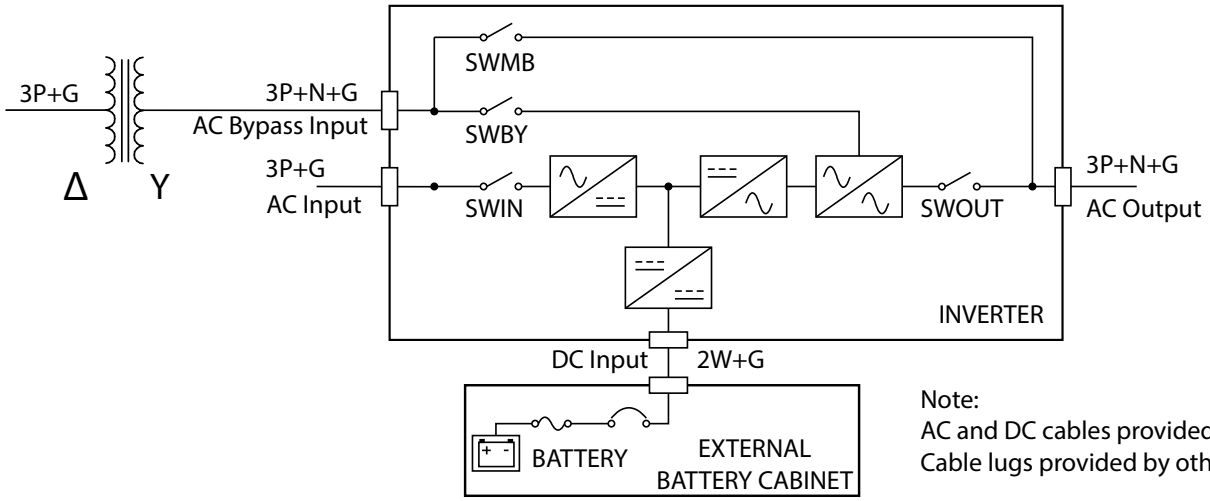
**Input line without neutral**

A transformer must be inserted either on the mains supply line or on the bypass line (as shown in the drawings) if the load requires a neutral.




Note:
AC and DC cables provided by others
Cable lugs provided by others.

**SCHEMATIC DIAGRAM: SINGLE POWER LINE WITH INPUT TRANSFORMER INSERTED TO CREATE NEUTRAL**




Note:
AC and DC cables provided by others
Cable lugs provided by others.

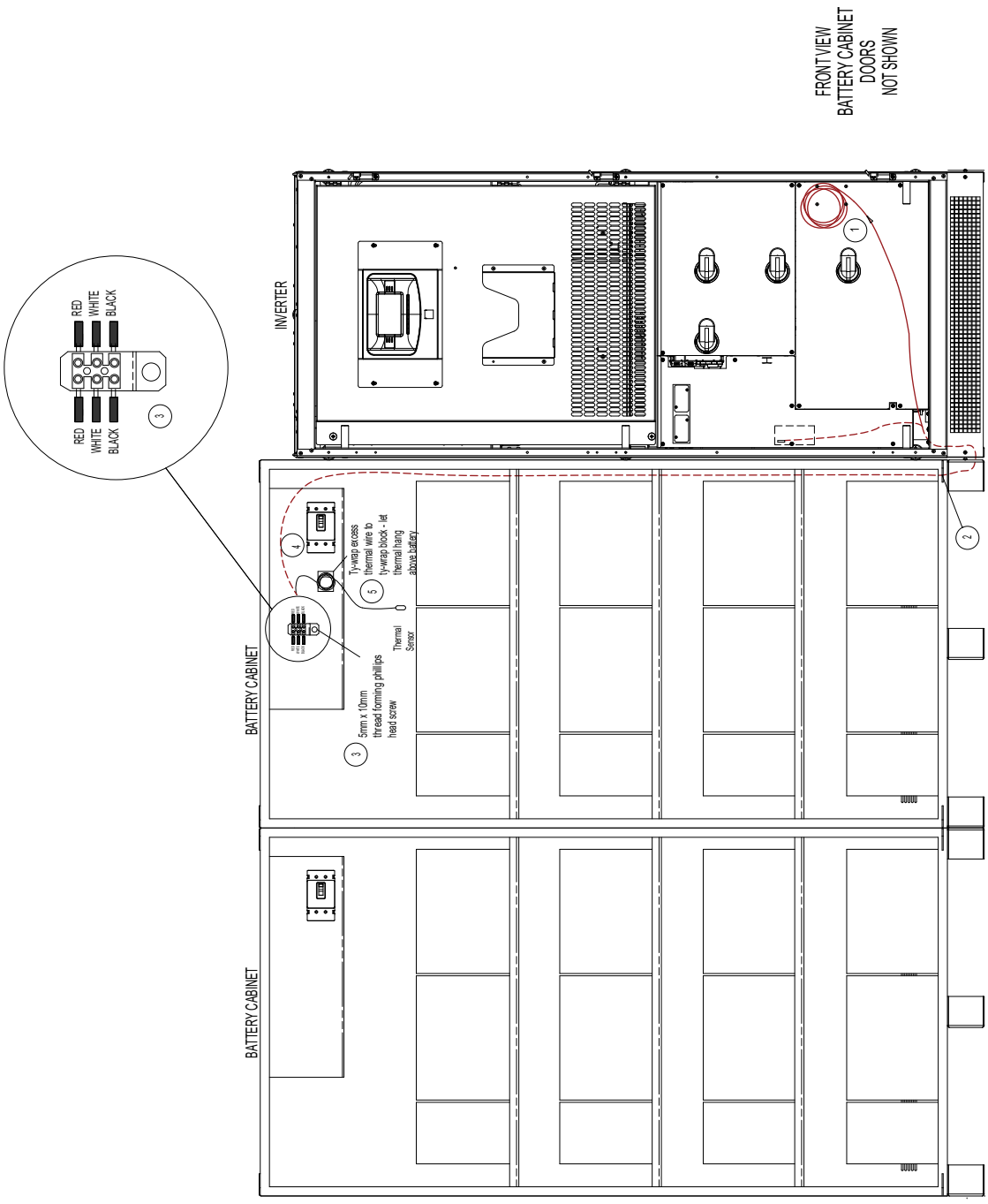
**SCHEMATIC DIAGRAM: MAIN POWER SUPPLY AND SEPARATE BYPASS WITH INPUT TRANSFORMER INSERTED TO CREATE NEUTRAL**

## BATTERY CONNECTIONS

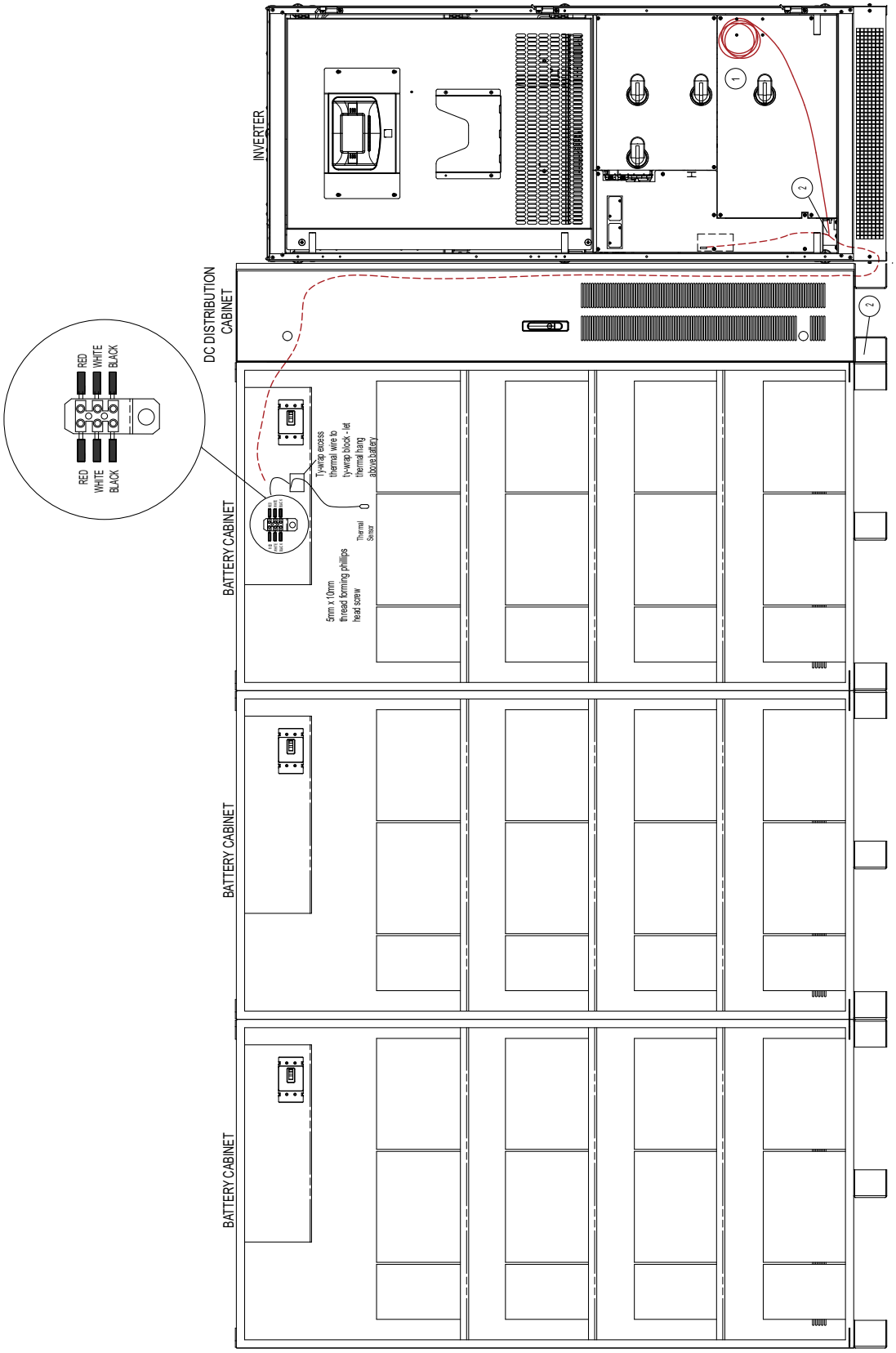
The Battery connection should be made in accordance with the manual for the battery cabinet.

# INSTALLATION CONTINUED

## BATTERY TEMPERATURE THERMAL PROBE INSTALLATION



## BATTERY TEMPERATURE THERMAL PROBE INSTALLATION CONTINUED

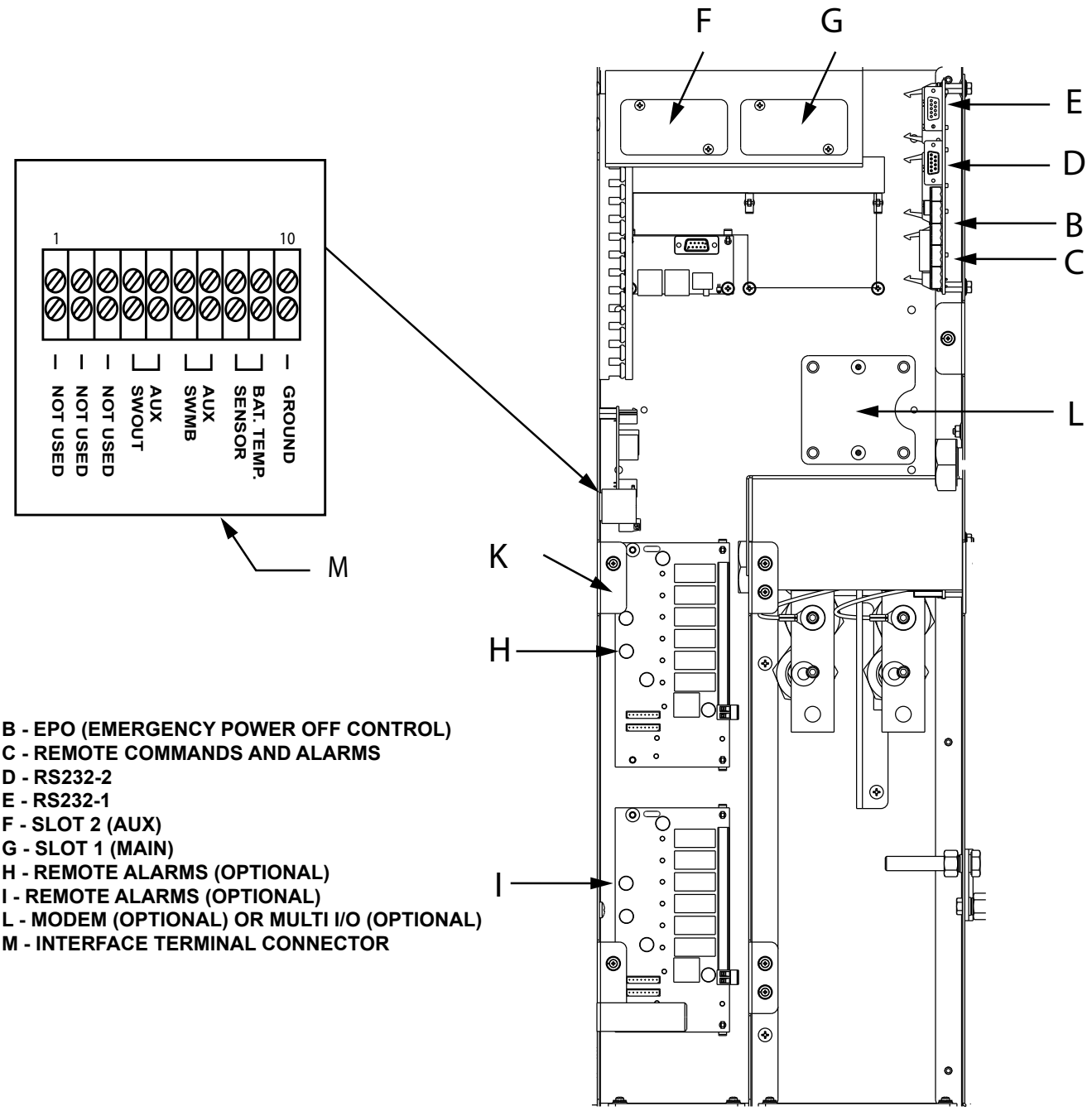



1. Remove Ty-Wrap and uncoil the Thermal Sensor Lead. The one end of the lead is already attached to the circuit board.
2. Carefully remove the electrical tape from the ends of the Red and White leads.
3. Feed the Thermal Sensor Lead back through the opening it comes from, down and through the bottom of the Inverter Cabinet and the up through the bottom of the DC Distribution Cabinet as shown.
4. Mount the connector with the supplied 5mm x 10mm thread forming phillips head screw as shown above.
5. Attach the three open ended leads into the connector as shown.
6. Attach the supplied thermal sensor to the other side of the terminal as shown - Ty-wrap excess thermal wire to ty-wrap block - let thermal hang above battery.

FRONT VIEW
BATTERY CABINET
DOORS
NOT SHOWN

## CONNECTION OF SIGNALS AND REMOTE COMMANDS

In order to access the interface cards, open the door and remove the protection panel secured with screws (K) as shown in the drawing:




**B - EPO (EMERGENCY POWER OFF CONTROL)**
**C - REMOTE COMMANDS AND ALARMS**
**D - RS232-2**
**E - RS232-1**
**F - SLOT 2 (AUX)**
**G - SLOT 1 (MAIN)**
**H - REMOTE ALARMS (OPTIONAL)**
**I - REMOTE ALARMS (OPTIONAL)**
**L - MODEM (OPTIONAL) OR MULTI I/O (OPTIONAL)**
**M - INTERFACE TERMINAL CONNECTOR**

**TORQUE SPECIFICATIONS FOR TERMINAL BLOCKS ON CUSTOMER INTERFACE BOARD**

| AWG WIRE SIZE RANGE | TORQUE LOAD | |
|---|---|---|
| #22 -12AWG | 4.4 lbf-ft | 6 Nm |

## CONNECTION OF SIGNALS AND REMOTE COMMANDS CONTINUED

### (C) - REMOTE COMMANDS, ALARMS AND EPO

The card is equipped with a terminal board with 14 positions.

**POWER SUPPLY**: Power supply 12Vdc 80mA (max.) [pins 10 and 11].
**ALARMS**: 3 potential-free change-over contacts for alarms (they are capable of switching up to 30 VAC or DC at UP to 1 A).
**COMMAND**: 1 command programmable from the panel [pins 11 and 12].

| INTERFACE REMOTE COMMAND ALARMS AND EPO | | | |
|---|---|---|---|
| **PIN** | **NAME** | **TYPE** | **FUNCTION** |
| 1, 2, 3 | RL 1 | OUTPUT 1 | Bypass / fault, the contact changes position when the Inverter switches the load onto the bypass line either during normal operation (e.g. due to overload) or as a result of a fault in the Inverter stage. **SEE NOTE BELOW.** |
| 4, 5, 6 | RL 2 | OUTPUT 2 | Battery discharging, the contact changes position when the load is powered from the battery due to a mains power failure. |
| 7, 8, 9 | RL 3 | OUTPUT 3 | End of battery discharge, the contact changes position when, during a mains outage, the remaining time for battery discharge has reached the minimum value defined. Once this time has passed, the load will remain unpowered (the factory-set end of discharge pre-alarm value is 5 minutes). |
| 10 | +12V | POWER | Power supply +12Vdc 80mA (max.) [pins 10 and 11] |
| 11 | GND | POWER | |
| 12 | IN 1 | INPUT 1 | INVERTER OFF. Connect pin 11 to pin 12 (for at least 2 seconds).<br>**NORMAL OPERATION** - If the INVERTER OFF command is received, the Inverter switches the power supply of the load onto the bypass line (load is not protected should there be a mains outage).<br>**EMERGENCY OPERATION** - If the STOP INVERTER command is received, the Inverter shuts down (load is not powered). **SEE NOTE BELOW.** |
| 13, 14 | EPO | INPUT EPO | If the jumper on the connector is opened, the voltage on the Inverter output will be cut. The Inverter is factory-fitted with the EPO terminals short circuited. If this input is used, the Inverter can be shut down in a hazardous situation from a remote position simply by pressing a button. |

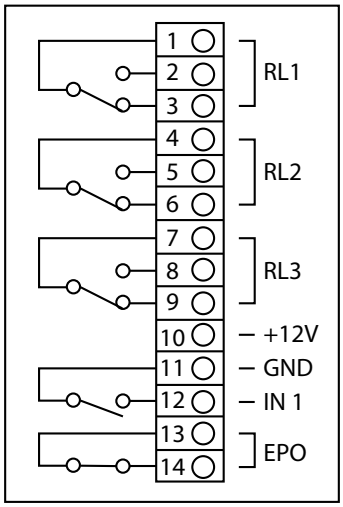
**NOTE**: If the Inverter installation includes a Maintenance Bypass Switch (MBS) Cabinet, this connection is required to be connected to the MBS and is not available for other use. An Optional Remote Alarm interface can be installed if a second function is required in this case.

Warning: if only the mains power supply is removed, for example by opening the switch of the power supply panel, as a means to shut down the Inverter in an emergency the Inverter will keep the load powered using the energy in the batteries.

The functions of the three contacts and the command may be reprogrammed via the display panel. The ALARMS and the COMMAND are factory-set in the following way:

## CONNECTION OF SIGNALS AND REMOTE COMMANDS CONTINUED

The position of the contacts as shown is without the alarm present. The contacts can take a max. current of 1A with 24Vac.




Please refer to "***APPENDIX A", Page 86*** for the list of alarms and commands that can be programmed. The change of function may be made by authorized technical support personnel.

**(D, E) - RS232**

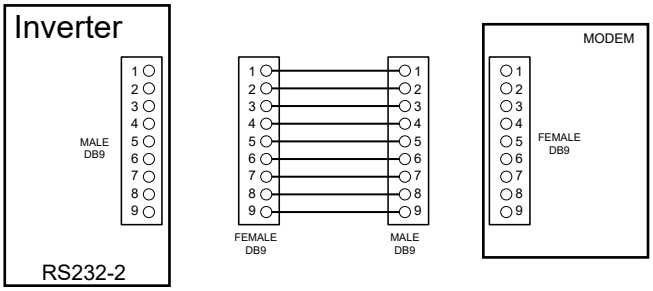
2 DB9 connectors are available for RS232 connection. The factory-set transmission protocol is the following:

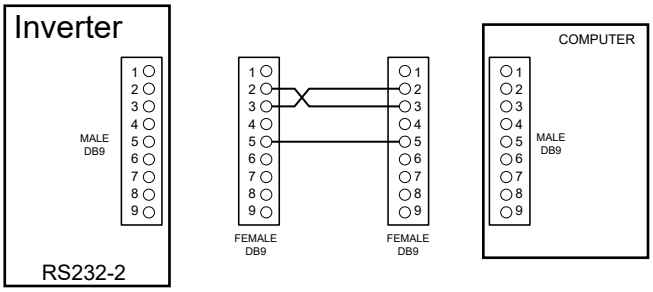
9600 baud, -no parity, -8 bits, -1 stop bit.

The transmission speed may be varied from 1200 to 9600 baud, using the PERSONALIZATIONS menu on the CONTROL PANEL. Depending on the distance of transmission, the recommended values for the transmission speed are: 9600 baud 50m, 4800 baud 100m, 2400 baud 200m, 1200 baud 300m.
See the diagrams below for the connection procedure.

**(D) - DB9 FEMALE RS232-2**

For connection with a computer, use a standard RS 232 cable. See the diagram for connection with a modem.

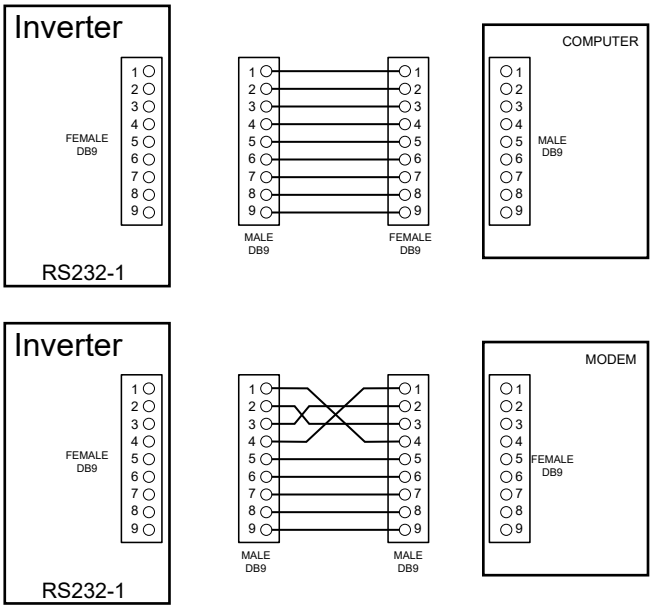


## CONNECTION OF SIGNALS AND REMOTE COMMANDS CONTINUED

**(E) - DB9 MALE RS232-1**

For connection with a modem use a cable standard. See the diagram for connection with a modem.




**(F, G) - SLOT 2 (AUX) AND SLOT 1 (MAIN)**

The following cards may be inserted (optional):

F, G - NetMan-204-UL (on SLOT 1 (Main) or SLOT 2 (AUX). Device for management of the Inverter's on the Ethernet. It can send information on the status of the device with various protocols:

- TCP/IP UDP.
- SNMP (for communications with NMS).
- HTTP (to display the status with a browser).
- TFTP (to configure or update the device when connected to the network).

The main function of this device is to integrate the Inverter into the LAN network ensuring a high level of reliability of communication with the server to enable full management and control of the Inverter.

- MULTICOM card (on SLOT 1 main or SLOT 2 aux) This device may be used to:

    - add a serial port to the Inverter.
    - monitor the Inverter using MODBUS/JBUS protocol on RS485 or PROFIBUS (Multicom 401).

    Note: each card connected precludes the use of a standard RS232 port, as follows:

    - The use of SLOT 1 (main) inhibits the use of RS232-2.
    - The use of SLOT 2 (aux) inhibits the use of RS232-1.

**(H, I) - REMOTE ALARMS (2 OPTIONAL CARDS)**

H, I - 6 outputs: potential-free contacts for alarms (programmable from the display panel) (they are capable of switching up to 30 V AC or DC at UP to 1 A), 2 inputs (programmable from the panel) and (1) 12V DC maximum 100mA auxiliary input.

## CONNECTION OF SIGNALS AND REMOTE COMMANDS CONTINUED

### (L) - MODEM (OPTIONAL)

L - Model compatible with the communication standards between the Inverter and the software provided.
Note: the modem must be connected to an RS232 port (D and E), a standard RS232 port may not therefore be used.

### MULTI I/O (OPTIONAL)

(L) - The function of this accessory is to convert external signals from the Inverter (e.g. temperature of environment, temperature of battery premises, etc.) into signals by means of relay contacts or via serial output RS485 in MODBUS protocol. It has the following characteristics:

- 8 inputs (e.g. humidity, smoke, etc. sensors).
- Communication with the Inverter via serial port.
- 8 relays configurable with 8 events on the Inverter.
- RS232 output port with configurable messages.
- RS485 output port MODBUS /JBUS with configurable messages.

### BATTERY TEMPERATURE SENSOR (OPTIONAL)

**(M) -** The Inverter has a connector for connection of the kit, which consists of a sensor to be placed inside the battery cabinet. The use of the temperature sensor allows the Inverter control logic to regulate the values of the charge and maintenance voltage according to the working temperature of the battery.

### BATTERY TEMPERATURE ALARM (OPTIONAL)

The battery temperature alarm is active only when connected to the aforementioned external probe, which measures the temperature within the battery enclosure. The temperature value to start the alarm can be changed with the following procedure:

1. The following sequence of numbers must be entered into the display to access settings. Press the front panel display buttons 3, 5, 151515, 7.

2. Press 3, 5, 327171, 7 to access the battery temperature settings.

3. Press key 5 or 6 as necessary to adjust the minimum battery temperature [default:0 ; range:0-10].

4. Press key 7 or 8 as necessary to adjust the maximum battery temperature [default:50 ; range 20-60].

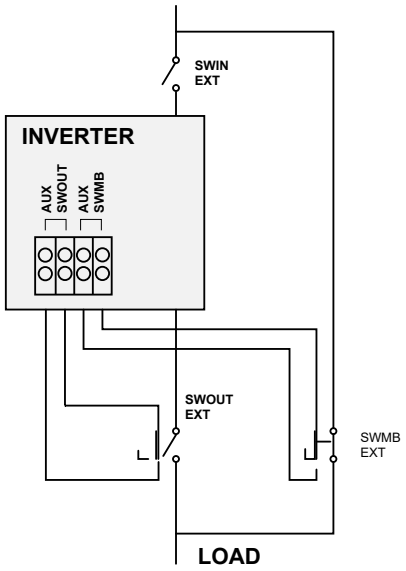
5. Press 1 to exit from the battery temperature menu.

6. The alarm temperature value is now adjusted.

## CONNECTION OF SIGNALS AND REMOTE COMMANDS CONTINUED

**SWOUT AND SWMB AUX.**

**(P, Q) -** Terminals to be used for connection of the auxiliary contacts of switches inserted in the Inverter system; Inserting additional disconnect switches to supplement those already in the Inverter means that the whole system can be replaced without interrupting the power supply to the load.




Additional output disconnect switch SWOUT EXT, additional bypass disconnect switch SWBY EXT of the external maintenance bypass. The auxiliary contacts SWOUT EXT and SWBY EXT must be connected to terminals P and Q. For safe removal, place the Inverter onto bypass, close SWBY EXT, open SWIN EXT and SWOUT EXT and disconnect the Inverter. Contact SWOUT EXT must be in the same position as the switch while SWBY EXT must be in the opposite position (auxiliary open with switch closed, vice versa with switch open).

Note:

- The auxiliary switch of SWMB EXT must open in advance, before closing the power contact.
- The auxiliary switch of SWOUT EXT must close in advance, before opening the power contact.

| INTERFACE TERMINAL CONNECTOR | | | |
|---|---|---|---|
| **PIN** | **NAME** | **TYPE** | **FUNCTION** |
| 1 | NOT USED | - | - |
| 2 | NOT USED | - | - |
| 3 | NOT USED | - | - |
| 4 | AUX SWMB | INPUT | Normally close contact used to indicate when the SWMB EXT is closed |
| 5 | AUX SWMB RETURN | INPUT | |
| 6 | AUX SWOUT | INPUT | Normally open contact used to indicate when the SWOUT EXT is closed |
| 7 | AUX SWOUT RETURN | INPUT | |
| 8 | BAT. TEMP. SENSOR | INPUT | Battery temperature sensor |
| 9 | BAT. TEMP. SENSOR RETURN | INPUT | |
| 10 | GROUND | INPUT | Ground |

## START-UP PROCEDURE

*MAINS POWER SUPPLY*

**THE MAINS POWER SUPPLY HAS TO BE PRESENT IN ORDER TO START UP THE INVERTER**

The Inverter output terminals will be powered in this phase and all loads connected will receive voltages. All users must therefore be warned before carrying out the start-up procedure.

*BATTERY CABINET (WHERE APPLICABLE)*

The battery cabinet must be provided with a disconnect device for it to be connected to the Inverter. This disconnect device must be closed only when the Inverter is started up regularly. During the Inverter start-up phase the disconnect device must remain in the open position.

Once the INPUT/OUTPUT and battery cables have been connected to the Inverter terminals and before putting the switch cover back in place, check that:

- All the input/output terminals are securely tightened.
- The input and output ground conductor is connected correctly (yellow/green earth grounding cable).
- Check the polarity of the battery connections.

Replace the switch cover.

For the first start-up, the following operations should be carried out in this order:

1. Close input power switch SWIN.
2. Press button 1 twice, select the language and then press button 8 to return to the basic menu.
3. After a few seconds, messages on the status of the Inverter will start to be shown on the first line of the display panel; these will include the following message relating to the battery disconnect:

***"WAIT: DO NOT CONNECT THE BATTERY"***

4. Close the static switch bypass line input switch SWBY.
5. Close the static switch output switch SWOUT.
6. Do not close the external battery circuit breaker/disconnect device.

Once these operations have been carried out, the humming of the fans and the sound of the buzzer will be heard.

Close the external battery circuit breaker/disconnect ***only when the following message is no longer shown*** on the first line of the display panel: "***WAIT: DO NOT CONNECT THE BATTERY"***

Note: If multiple battery cabinets are present, all breakers must be closed within one minute after the ***"WAIT: DO NOT CONNECT THE BATTERY"*** message disappears. If this time constraint is a problem, do the following:

1. Disable the automatic battery test by pressing button 3 then 5 on the control panel, followed by entering the code 323232.
2. Close all of the battery cabinet circuit breakers.
3. Re-enter the code 323232 to enable the battery test.

Configure the value of the battery capacity according to the instructions - See ***"Operation - Monitor - Battery", Page 69.***

## START-UP PROCEDURE CONTINUED

After the start-up operations have been completed, perform a manual battery test, press button 3 and then 2 on the control panel. At the end of the test, after approx. 8 seconds, with the Inverter started correctly and with the battery connected on the signals and control panel, the two green input and output LED's must be lit continuously.

***SWMB***

The mechanical bypass switch SWMB must not be closed during normal operation of the Inverter. SWMB should only be closed during Inverter maintenance operations in order to keep the load powered See ***"Bypass Operation", Page 50.***

When the Inverter is first started up, it is in on-line mode. See ***"Operating Modes", Page 46*** and ***"Operation - Monitor - Operation in Standby-On", Page 46*** and ***"Smart Active Operation"***, ***Page 76*** to set Standby-on / Smart active operating mode.

***CONFIGURATIONS***

**CONTACT THE FACTORY FOR OTHER OPERATING MODES.**

Once the Inverter has been installed, check that the message ***"NORMAL OPERATION"*** appears on the first line of the display panel.

## BATTERY OPERATION CHECK

***Applicable only with battery present.***

After installation, a mains outage even of just a few seconds can be simulated to check operation. The battery does not need to be charged to perform this test.

With the Inverter in normal operation, open switch SWIN located at the Inverter input (rectifier). The buzzer should sound immediately. The display on the CONTROL PANEL should appear similar to the illustration shown in ***"Operation - Monitor - Control Panel View", Page 58*** of this manual (with 5=ON). OUT (Green LED) and BATT. (Yellow LED) on the Control Panel should be ON.

Check that the load connected to the Inverter is powered. In this state, the power supplied to the load is being provided by the batteries. Close the input power switch SWIN to return to normal operation. The IN and OUT LEDs on the CONTROL PANEL will be GREEN. The batteries will recharge automatically.

***BATTERY BACKUP TIME***

Before a full battery discharge test can be carried out, the battery must be charged to full capacity. Charge for at least 24 hours for 90 minute backup times.

The backup time obtained on the first discharge may be slightly less than expected; a number of charge and discharge cycles are needed to improve this value.

Battery capacity does not remain constant over time, but increases after some charge and discharge cycles; it then remains constant for several hundreds of cycles before decreasing permanently.

Battery life will be reduced if the battery is operated at temperatures greater than 20° C.

# OPERATING MODES

The various Inverter operating modes are described below.

***SETTINGS***

The operating mode is set when the Inverter is installed; it may be changed subsequently but this should always be done by a qualified service technician.

**ON - LINE (DEFAULT SETTING)**

Load is always powered by the Inverter, in the event of an input mains failure the load continues to be powered from the Inverter using the energy stored by the batteries.

**ON – LINE**: The load is always powered by the Inverter, with stabilized voltage and frequency, using the energy from the mains power supply (INPUT). If there is a fault in the INPUT, the Inverter will switch to the batteries in zero time and the batteries will supply energy to the Inverter to keep the load powered for the backup time of the batteries. When the INPUT is restored the batteries will be automatically recharged by the rectifier.

**STANDBY - ON / SMART ACTIVE**

Load is powered from the mains, in the event of an input mains failure the load is powered from the Inverter using the energy stored by the batteries.

In **Standby On** or **Smart Active**, the load is powered from the bypass line (if the mains power supply is within acceptable limits); if there is a fault on the mains power supply the load switches automatically onto the inverter, powered by the battery.

**Standby On:** The switch from Inverter to bypass line may be immediate (time set = 0) or delayed (up to 180 minutes). For the switch to take place, the bypass line has to remain within acceptable limits for the delay time set. In Standby On mode, the rectifier remains powered and keeps the batteries charged. If the bypass line voltage or frequencies go outside of acceptable limits, the load is automatically switched onto the Inverter output. With Standby On operation, the energy dissipated by the system can be reduced, leading to considerable saving. Before using this function it must be ensured that, in the event of a mains outage, the load powered can tolerate an interruption of the power supply of around 2-5 ms, and that it can tolerate any mains interference.

This operating mode is normally used for loads that are not particularly sensitive. While operating in this mode, the letter N will be displayed on the second line of the BASIC MENU, near the Inverter model.

**Smart Active:** The Inverter autonomously activates On-Line or Standby-On operation according to the quality of the power supply (see the ***"Operation - Monitor - Smart Active Operation"*** menu, ***Page 76***). When Smart Active mode is activated, the power supply is monitored for a few minutes, after which, if the voltage has remained within the pre-set values, the load is switched onto the bypass line; otherwise the load remains powered by the Inverter, while the observation time is approx. one hour. After this time, provided there has been no disturbance, the load switches onto the bypass line; otherwise the logic starts monitoring again for approx. one hour. The advantage of this operating mode is its efficiency, which is greater than 98%.

While operating in this mode SMART A will be displayed on the first line of the BASIC MENU and the letter M will appear in the second line of the BASIC MENU, near the Inverter model.

**STANDBY - OFF (WITH MAINS PRESENT, LOAD IS NOT POWERED)**

Load is not powered, in the event of an input mains failure the load is powered from the Inverter using the energy stored by the batteries.

**STANDBY-OFF:** If there is a mains power supply, Inverter output is zero. The RECTIFIER remains on and keeps the battery charged. The output voltage is only present when the mains power supply fails. The system remains with output voltage = 0V while the voltage and the input frequency are within an acceptable range. When the mains power supply is restored, the Inverter is automatically reset to Standby-Off mode.

When operating in this mode the letter F will be displayed on the second line of the BASIC MENU, near the Inverter model.

**PERSONALIZATIONS**

Using the CONTROL PANEL (from the basic menu press keys 3 and 5 and the access code 436215), the following factory-set electrical parameters can be modified within a limited range (See ***"Operation - Monitor", Page 58***):

- Language.
- Value of the RATED VOLTAGE OUTPUT.
- BATTERY parameters.
- End of battery discharge pre-alarm.
- Shutdown due to power lower than a set value (AUTO-OFF in power).
- Daily programmed shutdown (AUTO OFF time).
- Acceptable frequency and voltage range on the BYPASS line.
- Bypass frequency range.
- Modem configuration.
- RS232-1 and RS232-2 ports.
- Standby-on operation.
- Smart active operation.
- Date and time.

Also see ***"Appendix D - Factory Presets", Page 116.***

## PROCEDURE TO TRANSFER THE LOAD FROM INVERTER ONTO THE MAINTENANCE BYPASS

There are three types of bypass: static bypass, mechanical bypass, and the optional maintenance bypass. The purpose of bypass is to provide a path for electrical power to flow from the bypass input to the load. The bypass path provides no conditioning of the power, so any disturbance at the source will be present at the load. The reasons to use the bypass path include: failure of Inverter, overload of Inverter, desire to operate with lower power dissipation, and to allow maintenance operations on the Inverter. If the Inverter is part of a parallel system, additional concerns and procedures regarding bypass apply. These issues are covered in the ***"Operation - Monitor"*** section, ***Page 58***.

Back feed protection is provided to assure that the Inverter output can never be connected to a de-energized bypass input, even if there is a failed component in the Inverter. This is to protect service personnel working on circuits that connect to the bypass input. As a part of back feed protection, it is necessary that several signal wire connections exist between the Inverter and the optional Maintenance Bypass Cabinet (MBS). The proper wiring of these connections is described in the User's Handbook for the MBS. These connections carry signals that restrict operation of the MBS breakers such that back feed is prevented. If the breakers are properly sequenced per the instructions that follow, this protection will not be apparent to the user.

### STATIC BYPASS

The Static Bypass Is an automatic electronically switched bypass path. It is engaged if the Inverter is overloaded or if the Inverter fails. Also, the static bypass is the normal source of power to the load if the Inverter is in "Standby On" Mode or if it is in "Smart Active" Mode, with the Inverter assuming the load if the bypass source becomes unsuitable.

Generally, the static bypass is controlled automatically, but some manual control is possible (See ***"Maintenance", Page 80***). The static bypass can be disabled by opening switch SWBY, but this should only be done at the operator's risk in that power to the load will be lost in the event of an Inverter overload or an Inverter failure. Also,

If the static bypass is disabled, it is not possible to transfer to and from mechanical bypass without load power interruptions.

### THE MECHANICAL BYPASS SWITCH "SWMB"

The SWMB Is physically connected in parallel with the Static Bypass Switch, but it is operated via rotation of a manual handle. Before operating SWMB, the operator should verify that the bypass source is satisfactory: as a minimum check, verify that the bypass source lamp (LED1 at upper left) on the front panel is steady green and that the legend "BYPASS VOLTAGE FAIL" is not present on the display. If the load is already being supported by the Static Bypass, the yellow "Load on Bypass" lamp (LED4, upper right) will be steady (or flashing if the load exceeds the Inverter rating). See ***"Maintenance", Page 80*** regarding the indicators. After SWMB is closed, the yellow Load on Bypass lamp will flash and the Inverter will stop. If desired, the Inverter can be completely shut down without interrupting power to the load: Leave SWMB closed, but open SWIN, SWBY, SWOUT, and all battery disconnect breakers. CAUTION: while operating the load through SWMB, battery operation is not possible, so the power to the load is dependent upon the quality of the power supplied to the bypass input of the Inverter. To return to normal operation, close SWIN, SWBY, and SWOUT, then open SWMB. When the display no longer shows:

"Wait: DO NOT connect the BATTERY", the disconnect breakers in each battery cabinet should be closed. Refer to ***"Start-Up Procedure", Page 44*** for the proper and complete procedure for connecting the battery.

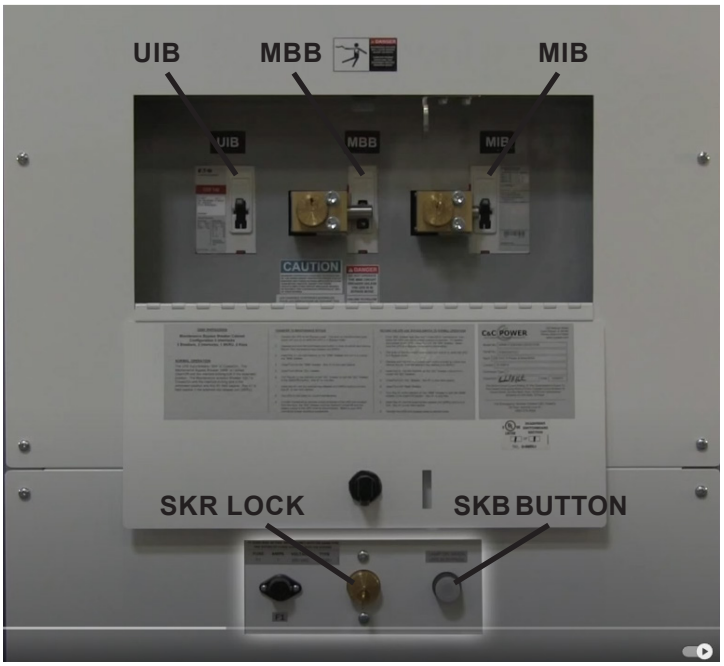
**THE MAINTENANCE BYPASS SWITCH CABINET (MBS)**

Is an option that facilitates servicing the Inverter without removing power from the load. There are three MBS models available to match the Inverter power ratings. The main functional components of the MBS are three circuit breakers that are used as disconnect switches. We will designate them “BKR1” (UIB - Inverter Input Breaker), “BKR2” (MBB - Maintenance Bypass Breaker), and “BKR3” (MIB - Maintenance Isolation Breaker). The breakers each have three positions: off (down), on (up), and tripped (in between off and on). To turn on a tripped breaker, reset the breaker by pushing the handle down to the off position, and then raise it to the on position. If a breaker will not reset or trips as being turned on, the back feed prevention interlock is active and the proper conditions (as described below) will have to be present before the breaker can be operated. When closed, BKR1 supplies power from the supply (utility) to the bypass input of the Inverter. For single input Inverter configurations, it also supplies power to the rectifier input. When closed, BKR3 connects the output of the Inverter to the load. When closed, BKR2 bypasses the path through BKR1, the Inverter, and BKR3 and connects the supply directly to the load. BKR2 and BKR3 must never be closed at the same time unless the Inverter is in bypass mode. It does not matter which type of bypass, but bypass via SWMB is the simplest to engage. There are signals that support an interlock function to prevent BKR2 from being closed unless BKR3 is open or the Inverter is in bypass mode. For the Inverter to be able to issue this signal, the Inverter controls must be powered. Always observe proper switching sequence to avoid loss of power to the load. Refer to the User’s handbook for the MBS. Common switching operations are also described, below. There are also some problem scenarios listed.

| BREAKER | BREAKER REFERENCE | NAME | DESCRIPTION |
|---|---|---|---|
| BKR1 | 1 | UIB | Inverter Input Breaker |
| BKR2 | 2 | MBB | Maintenance Bypass Breaker |
| BKR3 | 3 | MIB | Maintenance Isolation Breaker |

# MAINTENANCE BYPASS OPERATION

**To transfer from normal mode on the Inverter to maintenance bypass -**




1. INVERTER - OFF / BYPASS

   Press the following sequence of keys to access the menu: 3, 6 :

   Exit the menu by pressing key 8 or any other key with a sequence other than the one described here. Pressing keys 4, 7, 2, 6, 3 in succession as shown on the display, this activates the command for bypass with shutdown of the Inverter. The command is executed after a few seconds' delay to allow for cancellation. When this command is active, the following alarm is shown on the display: "BYPASS COMMAND ACTIVE; 8=DEACTIV. ". To return to normal operation, including after system shutdown, the command has to be cancelled by pressing key 8, or by sending the key code through the RS232.

   NOTE: To mask the command code 47263, insert code 436213 on the panel from the PERSONALIZATIONS menu, Page 47, (keys 3, 5).

2. The "Lamp On When UPS In Bypass" (SKB) button must be illuminated to proceed. Press and hold the SKB Button while removing Key A1 from the SKR Lock.
3. Insert Key A1 into the MBB Breaker lock and turn to release the breaker.
4. Turn OFF the MBB Breaker, this makes Key A1 captive.
5. Turn OFF the MIB Breaker, the lock bolt should already be withdrawn.
6. Turn Key B1 to lock the MIB to the OFF position, Key B1 is now free.
7. Insert Key B1 into the SKR Lock and turn. The unit is now in Maintenance Bypass Mode.

**For Total Inverter Shutdown**

1. Follow the steps above then Turn OFF the UIB Breaker.
2. Open ALL battery breakers.

**C&C POWER KIRK KEY INTERLOCK OPERATION - MAINTENANCE BYPASS CONFIG 42 AND 44 - YOUTUBE**

**To transfer from maintenance bypass to normal mode -**

1. Press and hold the illuminated SKB button and remove Key B1 from the SKB Lock.
2. Insert Key B1 into the MIB Breaker Lock and turn to retract the lock bolt.
3. Turn the MIB Breaker ON.
4. Turn OFF the MBB Breaker, then turn Key A1to lock out the MBB Breaker and remove Key A1.
5. Insert Key A1 into the SKR Lock and turn to lock. Key A1 is now captive.
6. On the Monitor, turn the Inverter from Bypass to Normal Mode (See - "***To transfer from normal mode on the Inverter to maintenance bypass" - Step 1, Page 50***, for instructions on how to access the Inverter - Off / Bypass Menu.. The SKB button should now be de-illuminated.
7. The unit is now in Normal Mode.

**To Return to Normal Operation after Total Inverter Shutdown**

1. Follow the steps above then Turn ON the UIB Breaker.
2. Close ALL battery breakers. See ***Startup Procedure, Page 44*** to continue with Norrmal Operation.

## COMMON BYPASS OPERATION

**Normal start-up with load unpowered -**

1. Verify that BKR2 (MBB) is open; open it if closed.
2. Verify that SWBY is open.
3. Close BKR1 (UIB) and BKR3 (MIB).
4. Perform a normal Inverter start-up as per ***"Start-Up Procedure", Page 44***.

**Need to get power to the load, but the condition of the Inverter is uncertain -**

1. Verify that the load is truly not powered.
2. Verify that the utility source is suitable (applying power to the load using the MBS is at the operator's risk).
3. Verify that BKR1 (UIB) and BKR3 (MIB) are open; open them if necessary.
4. Close BKR2 (MBB). The load is now powered via the MBS. The Inverter is not functional and battery supported operation is not possible.

**Need to operate the Inverter as part of maintenance, but wish to maintain power to load -**

1. If Inverter is running, perform transfer from normal mode to MBS, as instructed, above. After opening BKR3 (MIB), the Inverter can be left powered (via BKR1 (UIB)) and/or its mode can be changed as desired.
2. If BKR2 (MBB) is already closed, close BKR1 (UIB) to apply power to the Inverter. If the Inverter is dual input, there is another supply that must be applied to power the rectifier.
3. There is some risk in starting the Inverter while the load is powered via BKR2 (MBB) (MBS mode). A fault in the Inverter could cause the upstream circuit protection (circuit breaker or fuse) to operate, removing power from both the faulted Inverter input and the MBS input and, therefore, the output.

## BYPASS TROUBLESHOOTING

**MBS will not allow BKR2 (MBB) to close -**

1. Check to see that the Inverter is on bypass (SWMB is closed).
2. The Inverter controls must be powered (BKR1 (UIB) and SWBY should be closed).
3. Verify that the back feed prevention interlock signals were properly wired as part of the installation (refer to the C & C Battery Installation Manual for the MBS) and that this wiring has not been damaged.

**BKR2 (MBB) in the MBS trips when power is applied -**

1. This is likely due to a procedural error. Note that BKR2 (MBB) and BKR3 (MIB) must not be closed at the same time unless the Inverter is powered and the Inverter is in bypass mode.
2. It is likely that BKR3 (MIB) is closed and the back feed prevention interlock function is preventing BKR2 (MBB) from staying closed.
3. Since the Inverter is not powered, the signal that indicates that the Inverter is in bypass mode cannot be generated.
4. Open BKR3 (MIB) and close BKR2 (MBB). BKR2 should close and stay closed.
5. If power to the Inverter is not required, open BKR1 (UIB).

## INVERTER AND LOAD SHUTDOWN

**CAUTION: TO DISCONNECT THE LOAD FROM THE OUTPUT OF THE INVERTER, BOTH SWITCHES SWOUT AND SWMB MUST BE OPEN (OFF).**

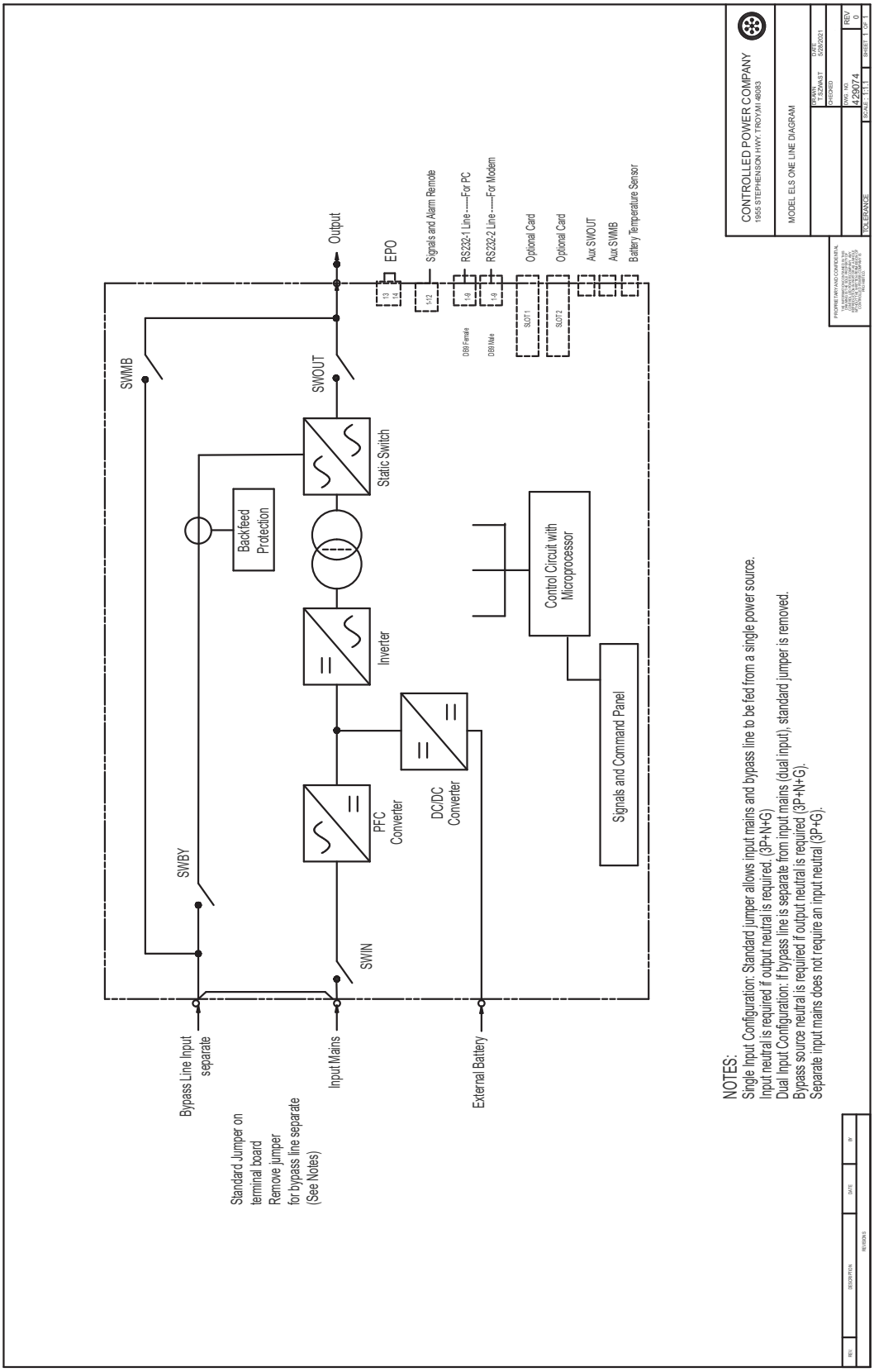
This operation will shutdown the load connected to the output.

1. Open the load switch.
2. Open SWOUT, static switch output switch.
3. Open SWIN, input power switch.
4. Open SWBY, static switch bypass input.
5. Open the battery cabinet circuit breaker/disconnect.

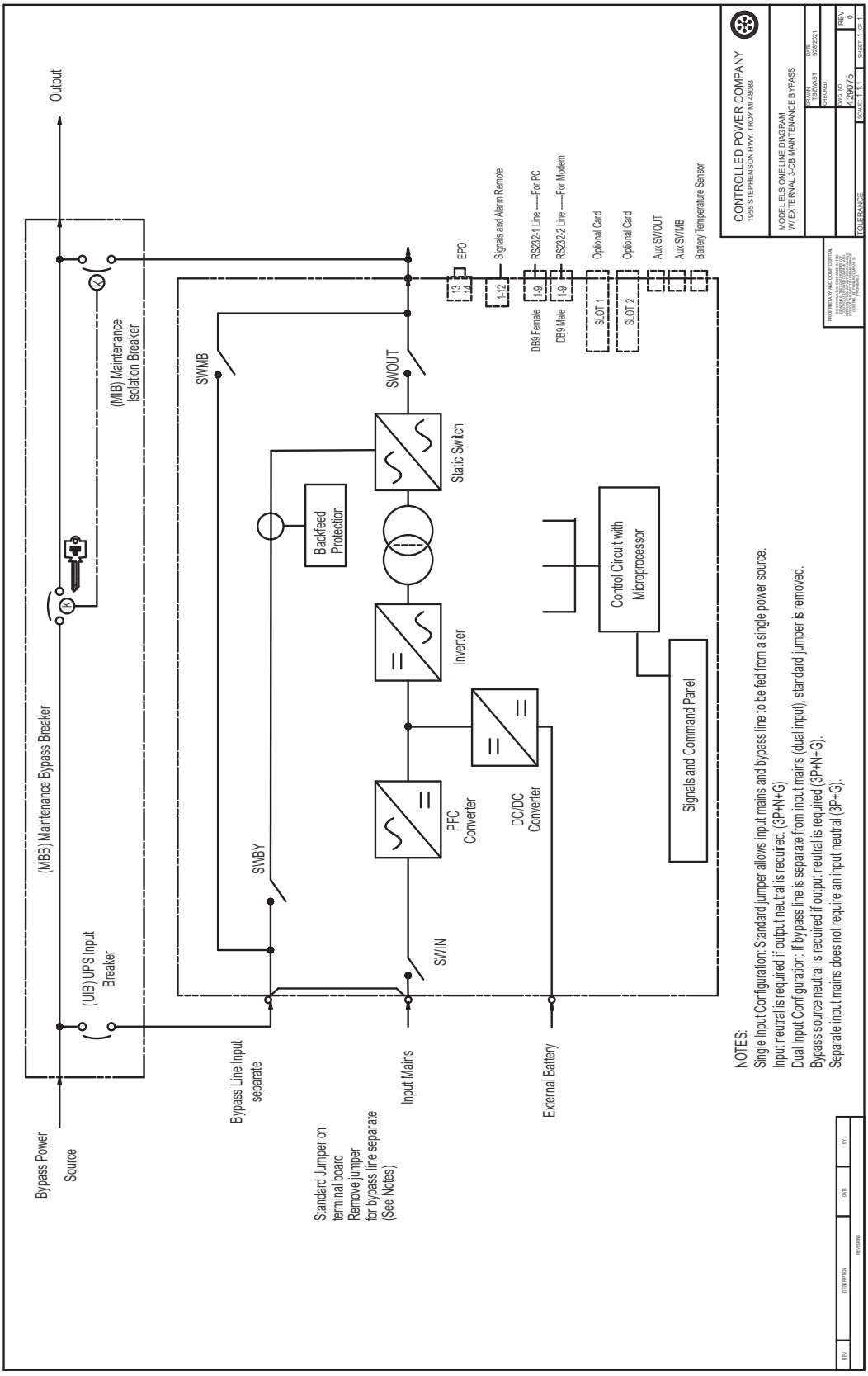
The load is no longer powered, and after a few seconds the Inverter display panel will also shut down. Use a multimeter to check that no voltages are present on the input power terminals.

Note: Neutral is not interrupted by the Inverter (the input neutral is also present at the Inverter output). Follow the instructions in the section on ***"START-UP PROCEDURES", Page 44*** to restart the Inverter.

## ONE LINE DIAGRAM - NO WRAP AROUND BYPASS



## ONE LINE DIAGRAM - WITH WRAP AROUND BYPASS



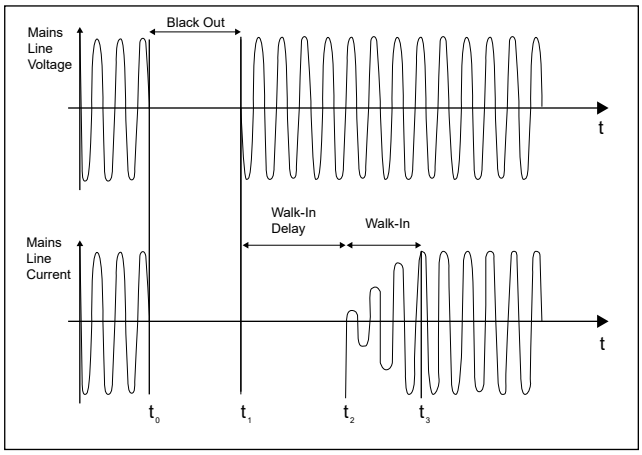
The Inverter is made up of the following sub-assemblies:

## IGBT RECTIFIER

This represents the input stage and its function is to convert the AC voltage of the power supply line into DC voltage.

Rectifier start-up can be programmed from the display panel. The following in particular can be set:

A delay in start-up t1 – t2 from 0 to 120s (This allows a non simultaneous start-up of several Inverter's connected to the same mains); The time for the start-up, t2 – t3, from 0 to 30s (this avoids overloading a generator that may be located at the Inverter input).




The rectifier carries out the following functions:

- Feeds the Inverter with DC voltage.
- Automatically charges the battery.
- Optimizes the input power factor by means of an automatic charging system.

The system for the cyclical recharging of the battery has two phases. The first phase consists of recharging the battery with limited current and increasing voltage (up to the preset charge value "Vb_max"). This phase is maintained until the battery is fully charged (Batt=100%Ah), which is detected by measuring the current entering the battery.

In the second phase, with the battery fully charged, the battery charger is deactivated so as to remove any residual current in the battery in order to lengthen its lifespan and to prepare the rectifier for the optimization of the input power factor.

At this point a 24 hour cycle is automatically initiated to check the state of charge of the battery, initiate an automatic momentary discharge to verify the condition of the battery, and recharge to full capacity. See "***Operation - Monitor - Key Menu 3, 2: Battery Test", Page 67*** of this manual to customize or disable this function.

## BATTERY

This is the energy reserve to power the load when power is no longer supplied to the Inverter. The batteries supplied in the external Battery Cabinet are sealed and maintenance free. Each Battery Cabinet contains a circuit breaker disconnect. If a battery pack other than the Battery Cabinet is used then the battery supply must be provided with a disconnect device and a protection device (circuit breaker or disconnect with fuses).

When there is no MAINS voltage present (black out), or when the mains goes outside of the specified limits (frequency or voltage), the load is powered with the energy accumulated in the battery. In this phase of operation the energy required by the equipment connected to the Inverter output is supplied by the battery, which has previously been charged. The DISPLAY PANEL located on the front of the Inverter shows the expected residual BACKUP TIME, calculated according to the power supplied and the state of charge of the batteries. The value provided is an estimate, since the power required by the connected load may change during discharging. The backup time can be increased by disconnecting some of the connected equipment. When the remaining backup time goes lower than the value preset as the END OF BACKUP TIME PRE-ALARM (factory-set at 5 minutes), the buzzer increases the sound frequency while the yellow BATTERY LED starts flashing. At the end of battery discharge the Inverter will interrupt the power supply to the loads. When the MAINS voltage is restored, the Inverter automatically restarts and starts recharging the batteries.

## INVERTER

This is the output stage, the function of which is to convert the DC voltage from the RECTIFIER or from the BATTERY into stabilized sinusoidal AC voltage. The inverter stage output is isolated from the input and from the batteries by a galvanic isolation transformer. In the on-line mode of operation, the inverter stage is always supplying clean, regulated power to the emergency lighting loads.

## STATIC SWITCH

This device allows the synchronized switching, automatic or manual, and in zero time, of the voltage to the load from a protected source (Inverter output) to an unprotected source (bypass line) or vice versa.

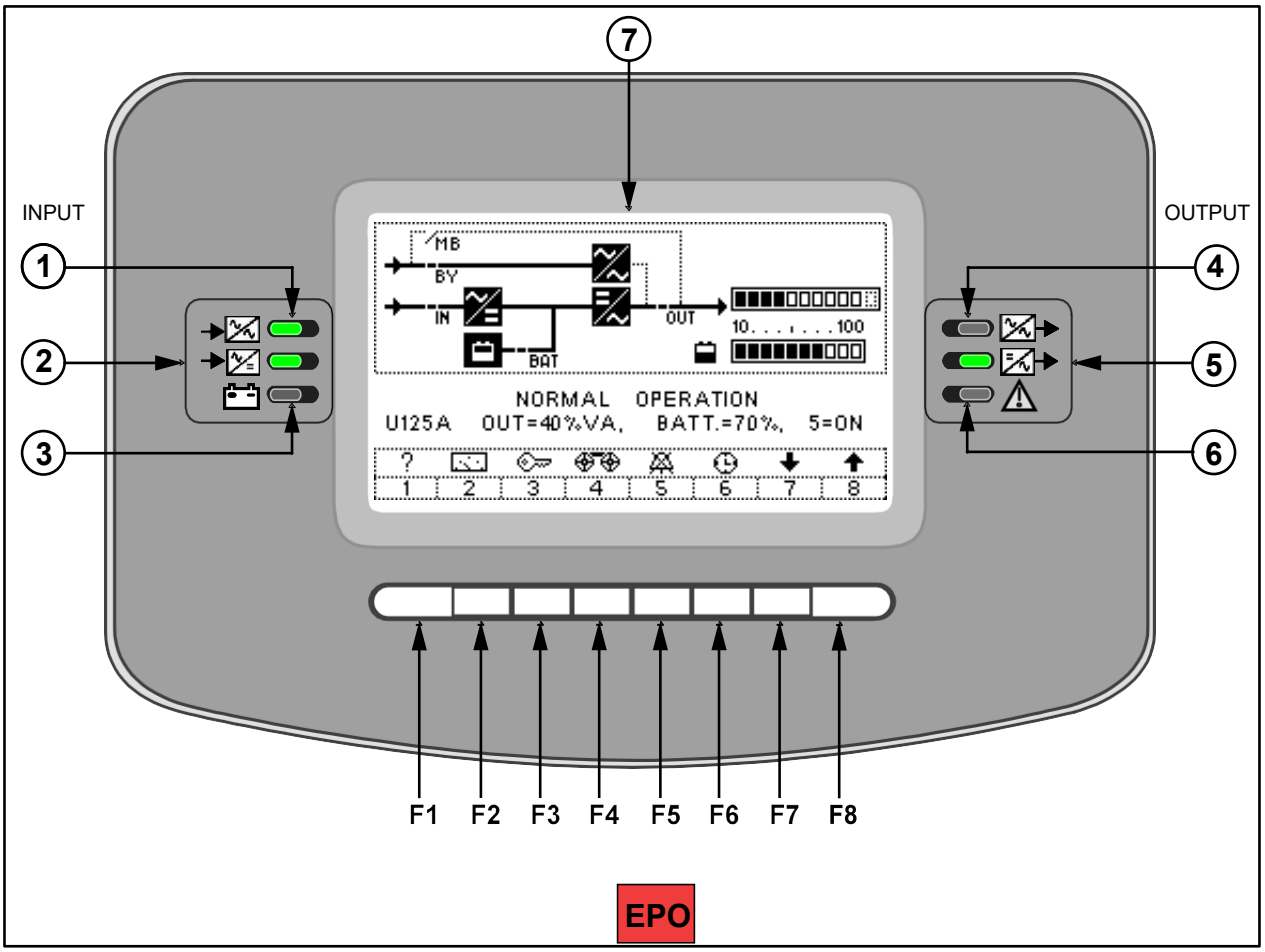
The Inverter is provided with a device to prevent the back feed of voltage to the input line after an internal fault, known as **"BACK FEED PROTECTION"**.

## MECHANICAL BYPASS (SWMB )

This is a mechanical bypass switch. The Inverter can be bypassed by closing SWMB and opening switches (SWIN, SWBY and SWOUT) while keeping the load on the output powered. This operation is necessary when maintenance operations must be carried out inside the equipment without interrupting the power supply to the load.
The mechanical bypass switch is sized for the rated power of the Inverter.

**CAUTION** – When the mechanical bypass switch SWMB is closed lethal voltages are present inside the Inverter. Extreme care must be exercised when performing maintenance on a Inverter with mains voltage present and the SWMB closed. Controlled Power recommends only using the mechanical bypass for keeping your load powered if the Inverter has failed. For maintenance we recommend the use of a external maintenance bypass switch. Consult the factory for more details.

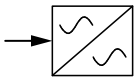
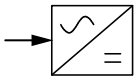
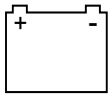
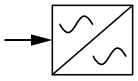
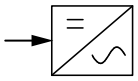
## CONTROL PANEL VIEW




1. LED Bypass line indicator
2. LED Mains line indicator
3. LED Battery powering the load
4. LED Load on bypass
5. LED Normal output
6. LED Alarm for internal fault Graphic display

F1, F2, F3, F4, F5, F6, F7, F8 = FUNCTION KEYS. The function of each key is shown at the bottom of the display and it varies according to the menu.

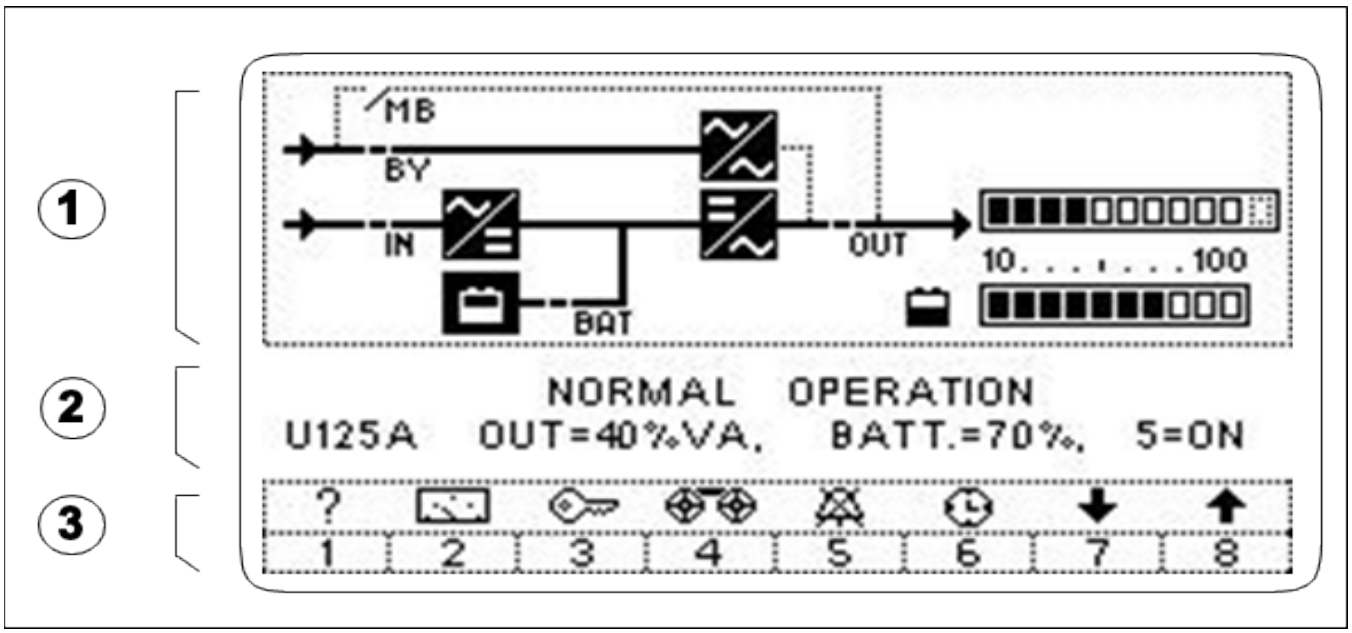
EPO = Emergency Power Off button.

| LED STATUS INDICATORS | | | | | |
|---|---|---|---|---|---|
| **INDICATOR** | **SYMBOL** | **COLOR** | **FUNCTION** | **STATE** | **MEANING** |
| 1 |  | Green | Bypass line indicator | ON | Input Bypass line is present and correct |
| | | | | Flashing | Input Bypass line is present but not correct |
| | | | | OFF | Input Bypass line is not present |
| 2 |  | Green | Mains line indicator | ON | Mains is present and correct |
| | | | | Flashing | Mains is present but not correct |
| | | | | OFF | Mains is not present |
| 3 |  | Yellow | Battery powering the load | ON | When the battery is supplying the load |
| | | | | Flashing | The “LOW VOLTAGE ON BATTERY PRE-ALARM” is active, or the BATTERY DISCHARGE OR SWB OPEN alarm is active |
| | | | | OFF | When the battery is not supplying the load |
| 4 |  | Yellow | Load on bypass | ON | The system output is switched onto the automatic bypass line |
| | | | | Flashing | The system output is switched onto the automatic bypass line with the output power greater than 100%VA, or the manual bypass switch SWMB is closed |
| | | | | OFF | When the system output is switched onto Inverter or the output is switched onto the bypass line and both switches SWOUT and SWMB are open, or when the TOTAL BLOCK command is active |
| 5 |  | Green | Normal output | ON | The system output is fed from Inverter on normal or stand-by operation, the output power is correct since it is less than 100%VA and the output switch SWOUT is closed |
| | | | | Flashing | The system output is switched onto Inverter, the output power is greater than 100%VA, or switch SWMB is closed. Flashes only when the battery reaches a pre low battery alarm condition. |
| | | | | OFF | The system output is switched onto automatic bypass, or switch SWOUT is open. |
| 6 |  | Red | Alarm for internal fault | ON | An internal fault is present |
| | | | | Flashing | - |
| | | | | OFF | There are no internal faults. |

## GRAPHIC DISPLAY

A wide graphic display is present on the Inverter door, which allows the user to have a close-up, detailed overview in real time of the status of the Inverter. The user can switch the Inverter on and off, consult electrical mains, output, battery measurements etc. [1] and perform the main unit settings.

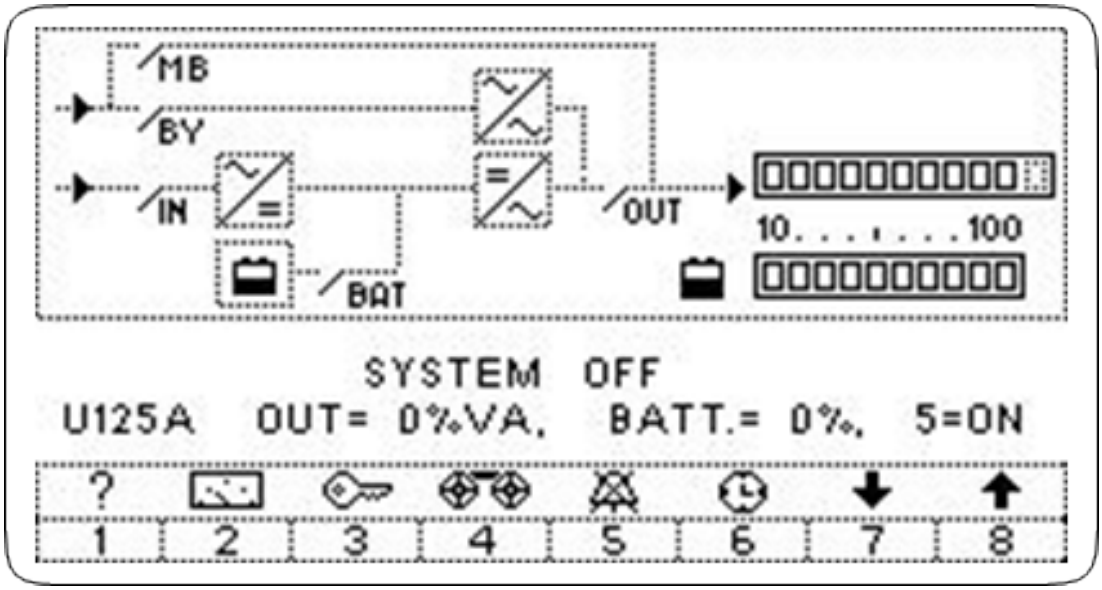
Picture of a display on the Inverter operating on “Normal Operation” with 40% output load and battery 70% charged.




The display is divided into four main areas, each one with its own specific role.

| | | |
|---|---|---|
| 1 | **OPERATION DIAGRAM** | Area of the display where the Inverter status of operation is shown by means of shapes with filled lines when they are active and with dotted lines when they are inactive. |
| 2 | **INVERTER MESSAGES AND MAIN OPERATING VALUES.** | Area where the Inverter operating status is displayed by means of two text lines. The first line displays messages that are explained in the “alarm message” paragraph. The second line displays the main operating values about system, output load, battery, buzzer and alarm message number. |
| 3 | **KEY FUNCTION** | Area that shows the key function by means of numbers and icons. The key function is also indicated in the sub menus, on the two text lines with the related number. When a key is pressed the related box change to filled line. |

[1] The precision of the measurements is: 1% for voltage measurements, 3% for current measurements, 0.1% for frequency measurements. The indication of residual autonomy time is only an ESTIMATE; it must not, therefore, be considered a precise measuring instrument.



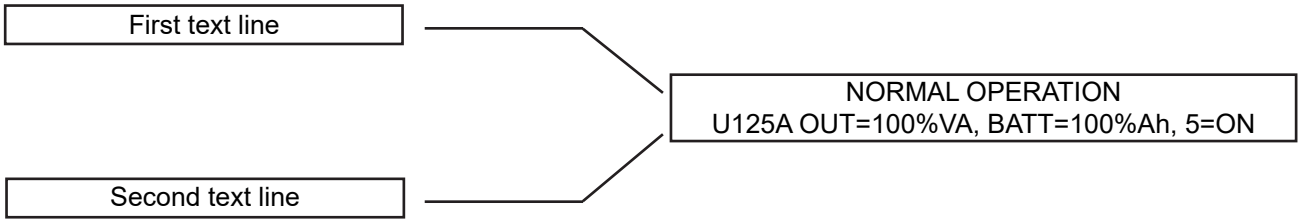

Inverter display with all items OFF

| DISPLAY ITEM ICONS | | |
|---|---|---|
| **ACTIVE** | **INACTIVE** | **MEANING** |
| | | Input converter |
| | | Output Inverter |
| | | Bypass line switch |
| | | Battery |
| MB | MB | Manual bypass line switch |
| BY | BY | Bypass line input switch |
| BAT | BAT | Battery switch |
| BAT | OUT | Output switch |
| IN | IN | Main line input switch |
| OUT 10 . . . . . 100 | OUT 10 . . . . . 100 | Output load (40%VA or 0%VA) |
| 10 . . . . . 100 | 10 . . . . . 100 | Battery(70%Ah or 0%Ah) |

| KEY NUMBERS AND ICONS | | | |
|---|---|---|---|
| KEY OFF / ON | | ICON | MEANING |
| 1 | 1 | ? | Information or n. 1 |
| 2 | 2 |  | Measures or n. 2 |
| 3 | 3 |  | Commands or n. 3 |
| 4 | 4 |  | History or n. 4 |
| 5 | 5 |  | Buzzer OFF/ON or n. 5 |
| 6 | 6 |  | Display date/hours or. n. 6 |
| 7 | 7 |  | Decrease value or sub menu or n. 7 |
| 8 | 8 |  | Increase value or previous menu or n. 8 |

## BASIC MENU (TEXT LINES AREA)

If no commands have been inserted, the first text line shows messages to inform about status of operation.




In each operating condition, the display returns to the "basic menu" after two minutes from the last command inserted with the keys. The basic menu shows the signal messages relating to the current operating state.

**The first line of the basic menu shows:**

When there are no alarms present the first text line of the main menu shows a fixed message, “NORMAL OPERATION”

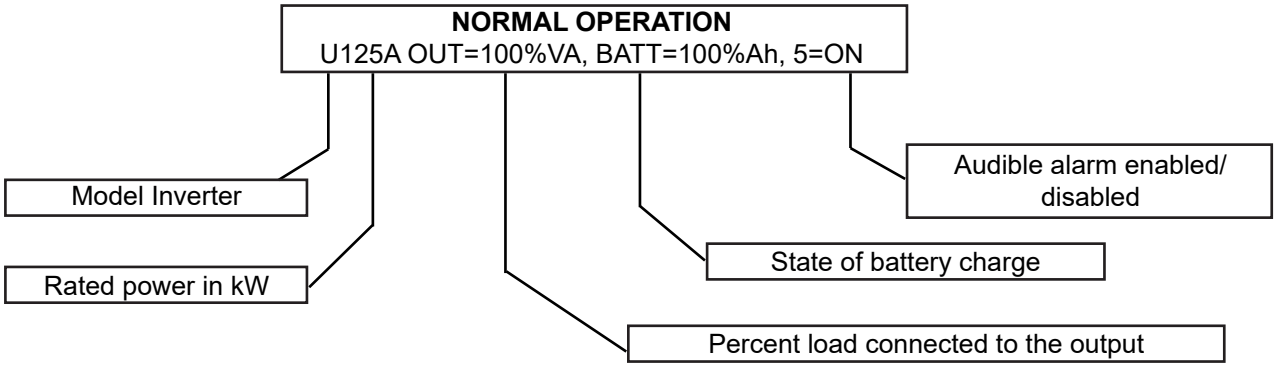
**NORMAL OPERATION**
U125A OUT=100%VA, BATT=100%Ah, 5=ON

When some alarms are present, the first text line of the main menu shows each active ALARM message, “ALARM MESSAGES”, one at a time for a few seconds:

**ALARM MESSAGES**
U125A OUT=100%VA, BATT=100%Ah, 5=ON

**The second line of the basic menu shows:**

The second line displays the main operating values about system, output load, battery, buzzer and alarm message number




The message U125A indicates an Inverter model with 112.5kW rated power, operating with 60Hz output frequency.

## BASIC MENU (TEXT LINES AREA) CONTINUED

The message OUT changes to BY when the load is not powered from the Inverter (normal operation) but from the mains through the bypass line.

The message OUT=100%VA changes to OUT= SWMB when the load is powered through the mechanical bypass switch, and the output current cannot be provided.

The value 100%VA provided in the example is obtained from the measurement of the output current. The number indicates the output current with the value relating to the absolute rated value and the value indicated is the greater of the effective current and the peak current.

**BATT= 100%Ah**: example of the current state of the percentage of battery recharge. The value 100%Ah is obtained from the measurement of the charge current and the time taken to recharge. The number indicates the recharge value as a percentage according to the capacity of the battery connected and to the quantity of charge used during battery operation. The system automatically remains in rapid charging for all the time needed to supply the battery with the quantity of charge lost during the discharge.

The indication "%Ah" changes to "min." (minutes) during operation in the event of a mains failure or when the battery is discharging. In this case the numeric value refers to the remaining minutes of operation, calculated according to the current supplied by the battery and to the state of charge of the battery.

**NOTE**: The backup time shown is calculated according to the measurement of the discharge current present at that time, the stored value relating to the capacity of the battery connected and the stored value relating to the percentage of recharge prior to discharge. The backup time shown should nevertheless be considered as indicative due to the many different factors affecting it. If considerable differences are noted between the expected value and the actual time of a discharge with constant load, the stored data relating to the battery must be checked, as must the state of the battery.

**5=ON**: example of the message showing whether or not the audible alarm is enabled; if disabled, the message changes to 5=OFF.

## LANGUAGE SETTING MENU (KEYS 1, 1)

From the keys menu, press 1 twice to access the languages menu. The following languages are available:
Italian, English, French, German, Spanish, Dutch, Swedish, Polish, Hungarian, Turkish, Czech, Russian, Romanian and Portuguese.

The system will show all subsequent messages using the language chosen. The selected language remains stored even after the shutdown and restart of the system. The current language can only be changed by accessing the LANGUAGES menu.

Use keys 1 and 8 to return to the basic menu.

## MEASUREMENTS MENUS (KEY 2)

The measurements with two line displayed, are selected from the basic menu by pressing key 2.

**IN=100,100,100%V, 60.2Hz -** Measurement of the three voltages, neutral phase and input frequency. The voltage is indicated as a percentage of the rated voltage; for example 100% is equivalent to 277V.

**101,101,101%A -** Measurement of the three input currents. The input currents are expressed as a percentage of the rated value.

**BY=277,277,277Vln(480V) -** Measurement of the three input phase voltages of the bypass line, with the concatenated voltage (the average of the three values) in brackets
.
**60.1Hz** - Frequency of the bypass line.

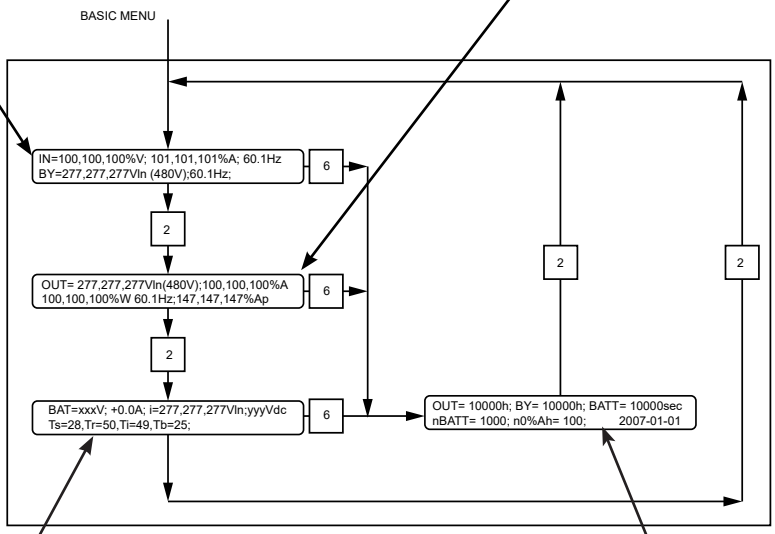
**OUT=277,277,277Vln -** Measurement of the three output phase voltages of the Inverter, with the concatenated value in brackets.

**100,100,100%A -** Measurement of the three output currents. The output currents are expressed as a percentage of the rated value.

**100,100,100%W -** Measurement of the active output power. The power is expressed as a percentage of the rated power.

**60.1Hz -** Output frequency.

**147,147,147%Ap -** Measurement of the three peak currents as a percentage relating to the three output phases during operation from Inverter. During operation from bypass, the message OUT changes to BY.




**BATT=xxxV -** Battery voltage value

**+0.0A -** Battery current, positive with Battery discharging, negative with battery charging;

**i=277,277,277Vln -** Inverter output voltage;

**yyyVdc -** Input Inverter DC voltage

**Ts=28, Tr=50, Ti=49, Tb=25 -** Temperature of the system, and of the rectifier and Inverter modules, Tb is present only if the external temperature the sensor is installed.

**OUT=10000h -** Hours of normal operation

**BY=10000h -** Hours of operation from bypass

**BATT=10000sec -** Time spent in operation from battery

**nBATT = 1000 -** Number of times the battery has discharged

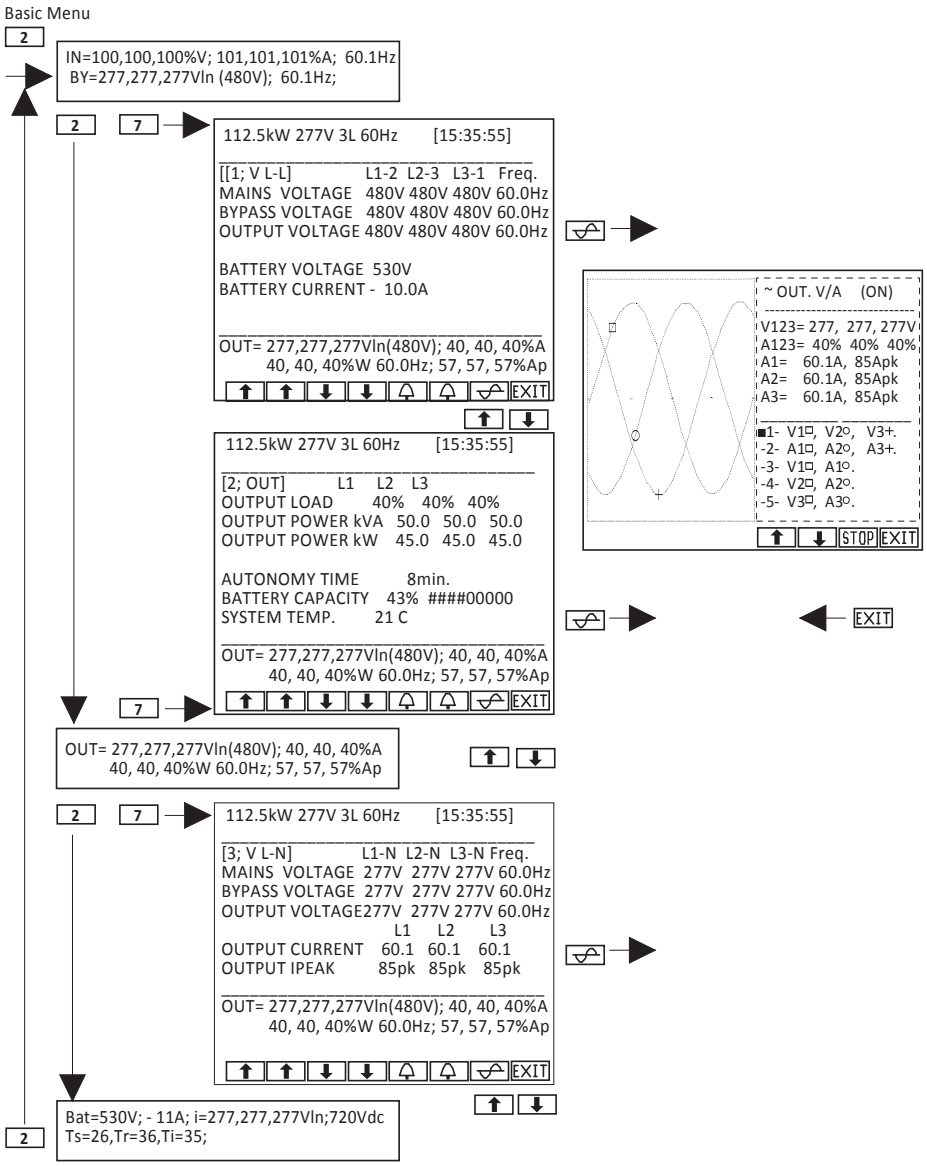
**n0%Ah = 100 -** Number of times the battery has discharged fully

**2007-01-01 -** Data stored on first start-up of the Inverter.

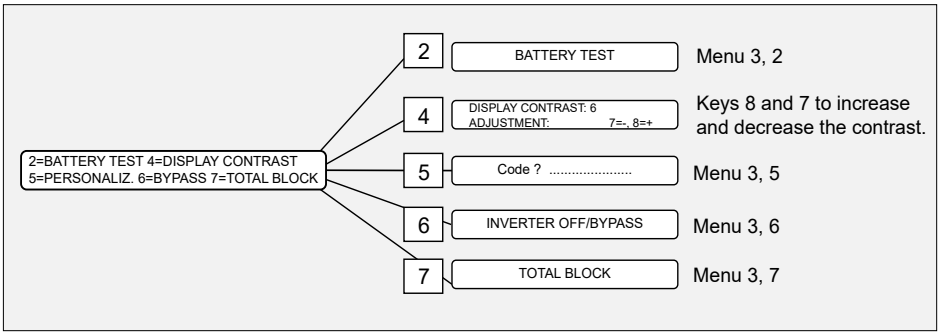
These are HISTORY data, and remain stored even when the device is switched off and may not be reset.

## FULL PAGE MEASUREMENTS AND OUTPUT WAVEFORMS (KEY 2, 7)

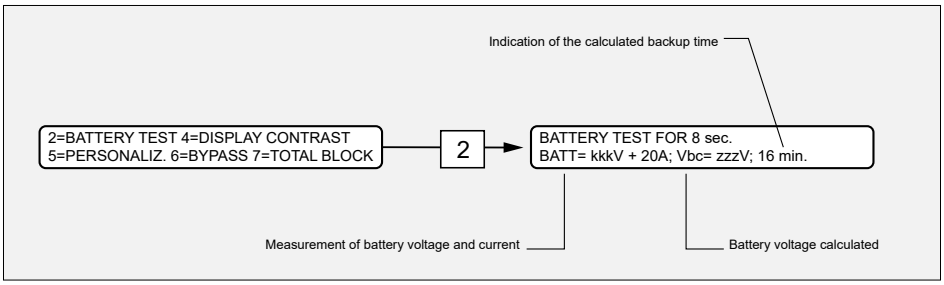
The full page measurements and output voltage and current waveform are selected by pressing key 7 from the two line measurement menu.




## CONTROLS MENU (KEY 3)



## KEYS MENU 3, 2: BATTERY TEST




This activates the cycle to check the state of efficiency of the battery, which lasts 2 minutes. Press key 8 to interrupt the test and return to the basic menu before this time has elapsed. The battery test cycle lowers the rectifier output voltage so that the battery can be evaluated with the real supply on the load even when the power supply voltage is present. The rectifier output voltage is only lowered if the bypass line voltage is present, in order to avoid any disruption to the output load without the support of the bypass. The battery test cycle is activated:

- Manually.
- Automatically every 60 sec. after each failed test (for three times), or each time the system is restarted.
- Automatically every 30 days from system start-up.
- Automatically during operation without mains power supply.

At the end of each test, the alarm is activated if the voltage measured is lower than the calculated voltage; the charge value stored and the backup time indicated are subsequently halved. A new test is performed 60 sec. after activation of the alarm and if the result is negative the alarm is activated once again for another 60 sec.

The alarms continue to halve the charge value stored until the calculated battery voltage is less than the voltage actually measured. In practice, this battery control system produces an alarm each time the battery is seen to have less than half of the expected charge. If this alarm is on PERMANENT, it indicates that the battery is inefficient, the battery circuit is interrupted or the battery disconnect has remained open. If this alarm is on TEMPORARY, it indicates a reduction in the efficiency of the battery; the more frequent the alarm, the more serious the problem.

**Adjusting automating battery testing time (323234)**
Setting battery test day, frequency and duration

Changing of battery test interval e duration
Battery Test : h= 8: 0, days= 1, 8sec
Adjustment: 2-/3+, 5-/6+, 7-/8+

-h=8:0 = hours of the day to start the autm. Battery test.
(Note: this “hours” is the same used by timer Auto-ON)

-days=1 = Number of days between two autom. battery tests, range 1-99 days (Factory Default = 30 Days).

-8sec = test duration, range 8-120 sec (Factory Default = 120 Seconds).

**Disabling the BATTERY TEST: press keys 3, 5: “CUSTOMIZING”, insert code 323232, with battery test disabled the code o=02 will be shown in the basic menu of the display. To reactivate the test, insert code 323232 again.**

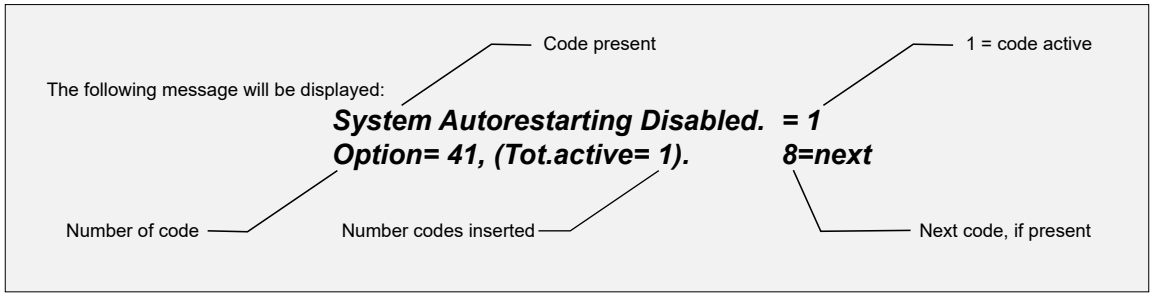
## CUSTOMIZING

The "CUSTOMIZING" menu is accessed by means of key 5 from the COMMANDS menu; an intermediate menu will then be displayed in which a CODE has to be entered.

Access by CODE ensures that unauthorized persons cannot modify the operating parameters of the equipment.

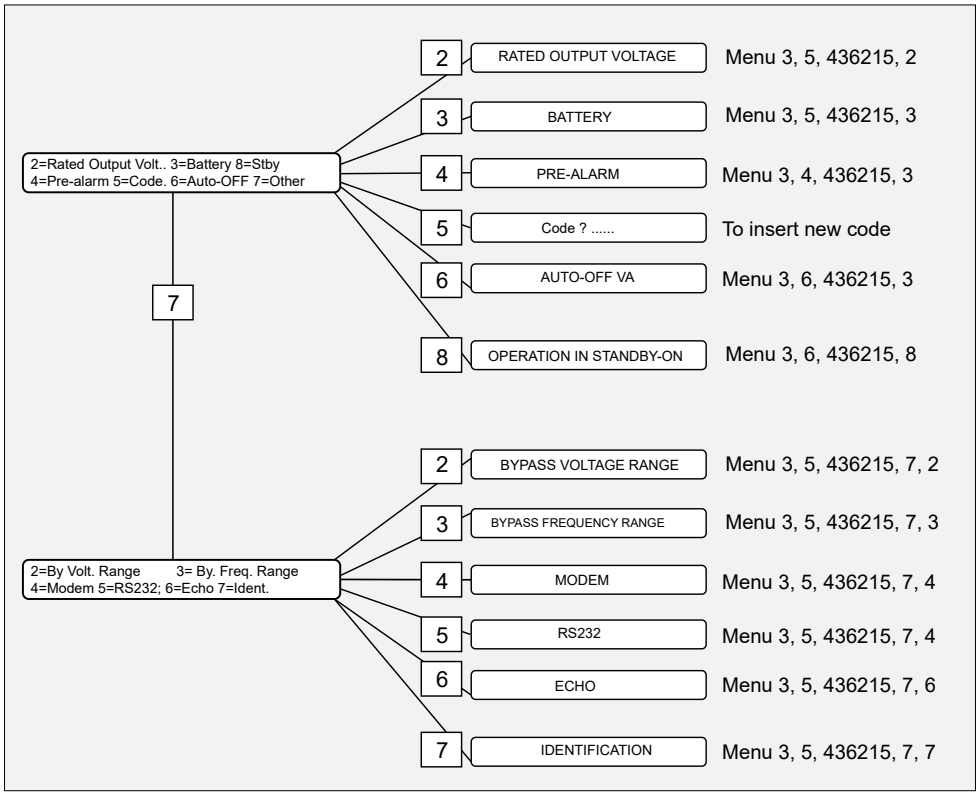
The use of the codes to modify the operation of the equipment (such as the frequency converter, stabilizer, rectifier start-up delay, etc.) are the prerogative of the service personnel.

The activated codes may be displayed (if present) with the following sequence of keys from the basic menu: 7 + 4 then by scrolling through the alarms with keys 7 and 8.




## KEYS MENU 3, 5: CODE 436215

The code is no longer required for 2 minutes after it has previously been inserted. The next menu can only be accessed by inserting the correct code, otherwise it returns to the basic menu.



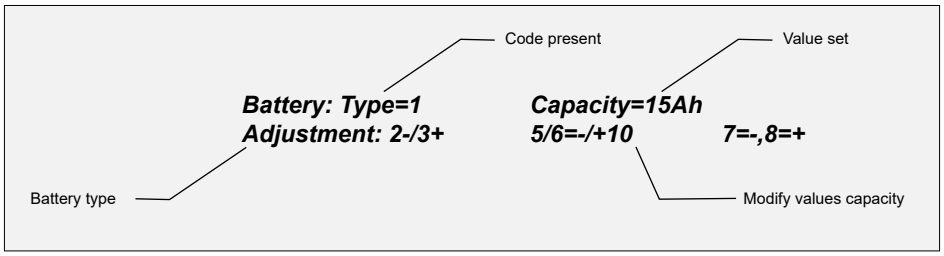
## RATED OUTPUT VOLTAGE

Press the following sequence of keys to access the menu: 3, 5, 436215, 2

Keys 7 and 8 can be used to decrease or increase the rated output voltage. The value displayed is the voltage between phase and neutral “Vln”. The value set modifies the operation of the Inverter, during normal operation. The new output value voltage also changes the reference value for the acceptable range of the voltage at the bypass line input.

## BATTERY

Press the following sequence of keys to access the menu: 3, 5, 436215, 3.




On initial installation the rated capacity value of the connected battery must be inserted; this value is usually printed on the battery container.

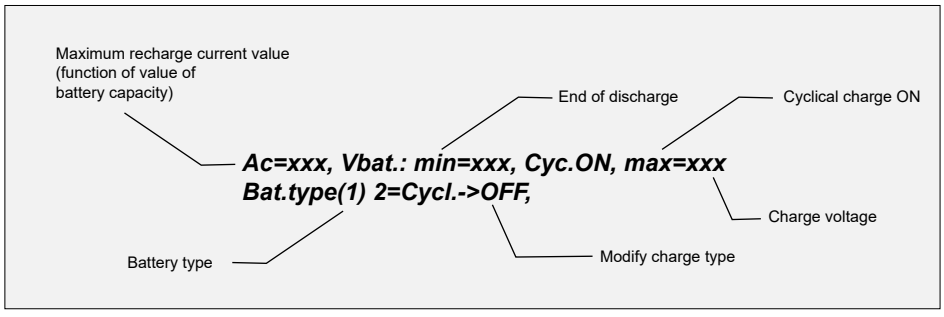
**BATTERY CAPACITY**

It is important to insert the correct battery capacity value, since this value is used by the system logic to calculate the backup time. If not set otherwise, this value is assumed to be equal to the Inverter power. e.g. at 90kW the value set by default is 100Ah. Factory Default = 150Ah.

**Battery type = for high intensity discharge batteries change from value 1 (normally pre-set for normal batteries) to value 2; value 3 is to be used for open vase batteries.**

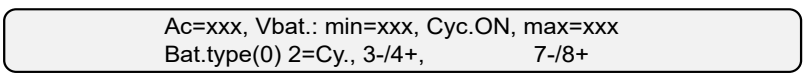
### CYCLICAL BATTERY RECHARGING (FACTORY SET):

Select type 1 or 2 and then press key 4 to display the pre-set voltage values:




**a**

Select type 0 and then press key 4 to modify the voltage values reset by keys 3,4 and 7,8.




**b**

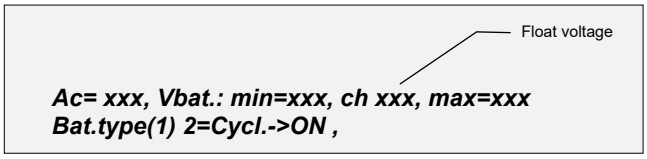
## BATTERY CONTINUED

### RECHARGING AT TWO VOLTAGE LEVELS (CONFIGURABLE):

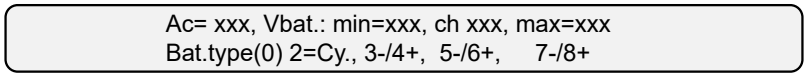
This type of recharging is effected with two current levels (EN 50272-2); the first phase comprises rapid charging (U1) with limited current, while in the second phase charging is with float voltage (U2).

> NOTE: this type of recharging may be configured on site and is mainly used for special type batteries such as open vase and NiCd.

For batteries of type 1, 2 or 3, press key 2 from menu **a** to change from cyclical charge to charging at two levels



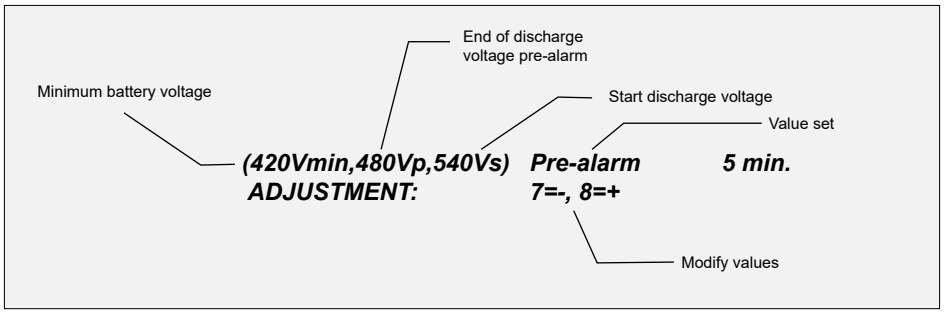

For batteries of type 0, press key 2 from menu **b** to change from cyclical charge to charging at two levels.




Use keys 3,4; 5,6 and 7,8 to set the values

## PRE-ALARM

Press the following sequence of keys to access the menu: 3, 5, 436215, 4.




Press key 1 to exit the menu. The menu above will appear with batteries of type 1, 2 or 3.

Voltage values Vmin, Vp and Vs are not fixed values but are a function of the battery discharge current, [Vp= Vmin+5V+10*(battery current [A]/battery capacity [Ah]).

Keys 7 and 8 can be used to decrease or increase the time to activate the pre-alarm before the system blocks due to end of battery discharge. Variations in the field of 1 minute are possible from 2 to 254 minutes.

The pre-alarm signal is activated when the remaining calculated time is lower than the pre-alarm value set or when the battery voltage is lower than the pre-alarm voltage value Vp.

***PRE-ALARM***

A wide safety margin must be provided for the use of the pre-alarm function, since the expected backup time may not provide for increases in the output load power, and may not make allowance for sudden, unexpected battery defects..

## TYPE “0” BATTERY

With the battery set to type 0, the following menu is displayed:

> (420Vmin,480Vp,540Vs) Prealarm : 5min
> Adjustment: (4=setV), 7=-,8=+

When key 4 is pressed, the program proposes the setting of the three voltage values.

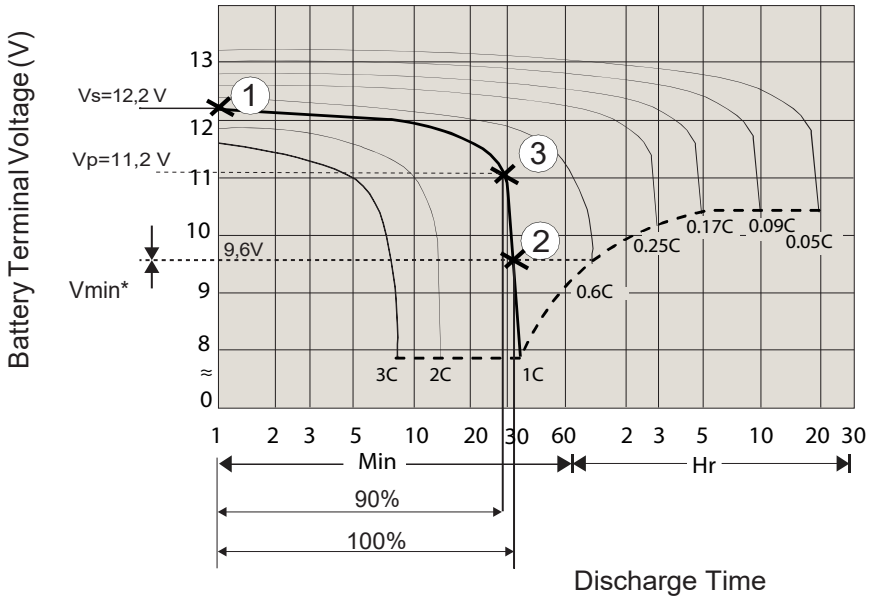
> Vbat.test: Vmin., Vp, Vs: 420, 480, 540V
> Adjustment: 3-4+, 5-6+, 7-8+

***PRESET VALUE***

With the three factory preset voltage values, the display panel may indicate an incorrect backup time during discharge.

### BATTERY TYPE “0” SETTING

The three values to be set are linked to the battery discharge regime (relationship between discharge current / battery capacity in Ah). Example: for a 100Ah battery with a discharge current of 100A, the regime is 1.




The three values, Vs, Vmin and Vp, are obtained from the discharge characteristic curve, supplied from manufacturer, relating to the ***battery discharge regime*** 1C has been determined:

**Vs** - Start of discharge voltage **(1)**, intersection with the x-axis (battery terminal axis), [The value must be multiply for 40, number of batteries].

**Vmin** - Minimum voltage value (end discharge battery ), point of intersection with the dashed curve (if this value is lower than Vmin* set up Vmin=Vmin* **(2)**. [The value must be multiply for 40, number of batteries]

**Vp** - Battery voltage with discharge at 90% of the total time **(3)**.

## AUTO-OFF "VA"

***Press the following sequence of keys to access the menu: 3, 5, 436215, 6:***

| |
|---|
| Automatic Switch-OFF when Output < 0%VA<br>Adjustment: (5=Toff,Ton) 7=-,8=+ |

Press key 1 to exit the menu.

Keys 7 and 8 can be used to decrease or increase the percentage threshold of the output load for the AUTO-OFF function and switching the system to the bypass line; variations of 1% are possible in the field from 0 to 99% of the rated output load.

For shutdown with mains present, when the output power reaches < of the value set, the battery charge value must be > 60%. Once this value is reached the system is deactivated.

For shutdown with power output < value set, it must be verified that the battery capacity value is > 60%.
Shutdown is not immediate, but is delayed by the time set as the end of battery discharge pre-alarm (standard value 5 minutes); in this phase the “end of discharge pre-alarm” contact of the remote alarms card is switched, after this time the output is switched to the bypass line if this voltage is present and the voltage also remains present at the output.

The load remains switched to the bypass line while the output power remains lower than the "AUTO-OFF" value, then the system waits for an increase in the load before effecting the automatic return to normal operation. The “AUTO-OFF” function may be used to shut down the system during operation from battery, simply by shutting down the output load. In normal operation, the “AUTO-OFF” function may be used to reset consumption since the power circuits are deactivated, the battery remains isolated and only the control circuits, with consumption equivalent to a light bulb, remain active.

## AUTO-OFF TIMER

***Press the following sequence of keys to access the menu: 3, 5, 436215, 6, 5:***

```
AUTO-OFF Timer: Toff >0: 0', Ton= 0: 0'
ADJUSTMENT: (5=Toff, 6=Ton) 7=-, 8=+
```

Press key 1 to exit the menu. The keys have the following functions:

- 6 to modify the value Ton
- 5 to modify the value Toff

Toff and Ton are time values used by the system to affect an automatic daily shutdown and restart cycle. The timer cycle is inhibited when Toff = Ton. When the internal clock reaches the time Toff, if the mains voltage is present and the percentage of recharge is less than 60%, only the following is displayed:

```
AUTO-OFF Timer: Toff= 20:00', Ton= 7:00'
H100, OUT100% BATT= 50%Ah 5=ON
```

The system waits until the battery recharge exceeds the value of 60% before deactivating.
When the internal clock reaches the time Toff ( 20:00' ), if the mains voltage is present and the percentage of recharge is greater than 60%, or the mains voltage is not present and operation is from battery, the following is displayed:

```
AUTO-OFF Timer: Toff= 20:00', Ton= 7:00'
H100, OUT100% OFF:4 min 5=ON
```

The "end of discharge pre-alarm" contact for remote alarms is also switched. In this case the system remains active for the next 4 minutes, after which the system switches onto the bypass line and then deactivates.

**There is no output voltage after deactivation.**

The interval between the start of the alarm and deactivation is equal to the interval selected as PRE-ALARM. When the internal clock reaches the time Ton ( 7:00' ), if the mains voltage is present, the system automatically reactivates and returns to normal operation.

## BYPASS VOLTAGE RANGE ADJUSTMENT

**Press the following sequence of keys to access the menu: 3,5,436215, 7, 2:**

Press key 1 to exit the menu. Keys 7 and 8 can be used to decrease or increase the value, as a percentage, of the acceptable range for the voltage at the bypass line input, with respect to the rated output value. With the Inverter in standby-ON mode, the menu is as follows:

```
(StbyON=15%) BY. VOLTAGE RANGE = +/- 15%
ADJUSTMENT: (5-, 6+)              7=-, 8=+
```

Keys 5 and 6 can be used to reduce or increase the percentage of the acceptable range of the bypass voltage in STBY ON mode.

## BYPASS FREQUENCY RANGE ADJUSTMENT

**Press the following sequence of keys to access the menu: 3,5,436215,7, 3:**

Press any key other than 7 or 8 to exit the menu. Keys 7 and 8 can be used to decrease or increase the value, as a percentage, of the acceptable range for the frequency at the bypass line input. The choice is between the values +/- 1%, and +/- 5% relative to the rated system value of 60 Hz.

## MODEM

**Press the following sequence of keys to access the menu: 3, 5, 436215,7, 4:**

MODEM enable = 0,
ADJUSTMENT: (5=dial, 6=send) 7=-, 8=+

Press key 1 to exit the menu.
Keys 7 and 8 can be used to decrease or increase the control value for management of the modem. The choice is between the values of 0 to 5. The initial value is 0.

0 = the modem connected to the RS232 port is deactivated. Terminal 20 of the RS232 connector assumes a low level (-12V) (DTR signal deactivated). **NOTE** the configuration MODEM=0 is essential when the modem is not used and the RS232 connector is used for connection to the remote panel.

**1**= signal DTR is activated (terminal 20 at +12V), the modem is enabled to reply (it should be remembered that a remote panel connected to the RS232 connector in place of the modem remains off).

**2**= signal DTR is activated, the modem is ready to reply and for automatic calls.

After an "internal fault" alarm has been on for 30 seconds, the system automatically dials the stored "DIAL" number. When it receives the modem's receiving reply it sends a message made up of the Inverter acronym, the stored "SEND" number, a copy of the text shown on the display, the alarm code and the date and time of transmission. **NOTE**: for correct operation, use a modem that has already been configured to recognize "HAYES" type commands and that is able to dial the telephone number using pulses or tones as required by the telephone line that is to be used.

Example of messages sent to the modem in the event of an "INTERNAL FAULT 5" alarm. Assuming that the settings are as follows: Modem =2, Dial=23456, Send=123456.
30 seconds after the start of the persistent alarm, the system sends the modem the command: *ATD 23456*

On receiving the message "CONNECT" from the modem, the system sends: *Inverter 123456 INTERNAL FAULT: 5 100, OUT=100%VA, BATT= 78%Ah, 5=ON a=00200300 1999-12-21, 13:12:28*
The system then sends the sequence to close the communication: +++ ATH
Lastly, signal DTR is also lowered for 0.5 sec.

If the telephone line is engaged or the remote modem does not reply, the system tries to call again every 5 minutes until it manages to connect, provided that the alarm condition is still present.

**3**= like 2 with automatic call when any alarm is verified.
**4**= like 2 with automatic call only for alarm 10, and with sending of message only after the reply from the remote modem has been acknowledged by the reception of the character "}".
This mode ensures that the receiving computer does not lose any messages.
**5**= like 4 with automatic call when any alarm is verified.

## "DIAL /SEND" MODEM

**Press the following sequence of keys to access the menu: 3, 5, 436215,7, 4, 5 (6):**

```
MODEM dial n.=6543210///////// <=2..3=>
ADJUSTMENT: (5=dial, 6=send) 7=-, 8=+
```

Press key 1 to exit the menu.
Keys 7 and 8 can be used to decrease or increase the figure on which the cursor is positioned. The cursor is moved by means of keys 2 and 3, and is indicated initially by the character '_'. Each number may assume values from 0 to 9, the symbol / indicates that the corresponding figure is disabled. A correct "dial" number must start with a figure from 0 to 9, the setting /6543210 is ignored. Select menu 35746 or press key 6 when menu 35745 is active to set the "send" number.

## RS232

**Press the following sequence of keys to access the menu: 3, 5, 436215, 7, 5:**

Press key 1 to exit the menu. Keys 7 and 8 for RS232-1 (3 and 4 for RS232-2) can be used to decrease or increase the baud value for the transmission speed. The choice is between the values 1200, 2400, 4800, 9600.

## ECHO

**Press the following sequence of keys to access the menu: 3, 5, 436215, 7, 6:**

Press key 1 to exit the menu. Keys 7 and 8 can be used to decrease or increase the number used to enable the "ECHO" function. The number may vary from 0 to 1 to disable or enable the function. When the function is enabled the system automatically sends a copy message of the display with the addition of the code "a= " and the current date and time to the RS232 output. The message is sent for each variation in the state of the alarms (that is, any change in code a=.....).

## IDENT

**Press the following sequence of keys to access the menu: 3, 5, 436215, 7, 7:**

Press key 1 to exit the menu. Keys 7 and 8 can be used to decrease or increase the number used for the identification of a single unit in systems with several Inverter connected to a single RS232 serial line. The basic number is 0 and may be changed between values from 0 to 7.

## OPERATION IN STANDBY-ON

**Press the following sequence of keys to access the menu: 3,5,436215,8:**

```
Stby= 2sec. Stby_ON= 0
Adjustment: 4=Sma.ON,          5-,6+        7=-,8=+
```

Press key 1 to exit the menu. Press key 8 Stby=1 to change the Inverter from ON-LINE mode to STANDBY-ON mode. Press key7 to change the Inverter from STANDBY-ON mode to ON-LINE mode. The switch onto the bypass line may be immediate when “Stby = 0 min.” or delayed by means of keys 5 and 6. The backup line must be available for the time set within the acceptance field before the switch over can take place (see “PERSONALIZ. BYPASS VOLTAGE FIELD” menu, ***Page 73***). The setting remains stored even during a shutdown due to a power failure. For a description of the operation see ***“Operating Modes - Setting Modes”, Page 46***.

## SMART ACTIVE OPERATION

**Press the following sequence of keys to access the menu: 3,5,436215,8,4:**

SMART ACTIVE S. Stby = 4 min. Stby_ON = 1
Adjustment: 4=Sma.OFF, 5-,6+ 7 = -, 8 = +

Press key 1 to exit the menu. When the Smart Active function is activated via key 4, Stby_ON goes to 1. The setting remains stored even during a shutdown due to a power failure. There is a delay of 30 Seconds to 4 minutes before transfer to SMART ACTIVE mode. For a description of the operation see ***"Operating Modes - Setting Modes", Page 46***. When the code is inserted the basic menu becomes:

NORMAL OPERATION SMART A.
P200, M OUT= 99%VA, BATT= 100%Ah, 5=ON

## INVERTER - OFF / BYPASS

**Press the following sequence of keys to access the menu: 3, 6 :**

Exit the menu by pressing key 8 or any other key with a sequence other than the one described here. Pressing keys 4, 7, 2, 6, 3 in succession as shown on the display, this activates the command for bypass with shutdown of the Inverter. The command is executed after a few seconds' delay to allow for cancellation. When this command is active, the following alarm is shown on the display: *"BYPASS COMMAND ACTIVE; 8=DEACTIV. ".*

To return to normal operation, including after system shutdown, the command has to be cancelled by pressing key 8, or by sending the key code through the RS232.

**NOTE**: To mask the command code 47263, insert code 436213 on the panel from the PERSONALIZATIONS menu, ***Page 47,*** (keys 3, 5). Repeat the operation to display the code again.

## TOTAL BLOCK

**Press the following sequence of keys to access the menu: 3, 7 :**

Total System Shut-OFF Command = 47263
WARNING, the Output Voltage will be OFF

Exit the menu by pressing key 8 or any other key with a sequence other than the one described here. Pressing keys 4, 7, 2, 6, 3 in succession as shown on the display activates the command for TOTAL BLOCK of the system. When this command is active, the display shows the alarm *BLOCK COMMAND ACTIVE; 8=DEACTIV*.

The command is executed after a few seconds' delay to allow for cancellation. This command is useful to achieve full deactivation in an emergency, operating remotely via the RS232 line. To reactivate the Inverter, close switch SWBY or, if applicable, press button 8.

**NOTE**: To mask the command code 47263, insert code 436213 on the panel from the PERSONALIZATIONS menu (***Page 47)*** (keys 3,5). Repeat the operation to display the code.

## "RECORDER": RECORDED EVENTS (KEY 4)

**Press the following sequence of keys to access the menu: 4**

```
message alarm stored
a=FFFF-FFFF;  2005,12,31/14:45:50          n=100
```

Return to the basic menu by means of key 1. Key 2 activates the submenu "RECORDED VOLTAGES MEASUREMENTS". Keys 3, 4 and 5 keep their normal functions.

Key 6 activates submenu 4, 6 " RECORDED CODES" and allows the exchange of stored alarm message with the display of the corresponding status codes at the time of the stored event, and vice versa. The status codes allow a more in-depth analysis by the trained personnel.

## RECORDED VOLTAGES MEASUREMENTS

**Press the following sequence of keys to access the menu: 4, 2, 2, 2**

```
IN=100,100,100%V,50.0Hz; BATT=430V,+100A
BY=400V,50.0Hz;n 35 OUT=400,50.0Hz,100%
```

The "RECORDED VOLTAGES MEASUREMENTS" menu is accessed via key 2 (press 2 again to access the other measurement menus from menu 4 "RECORDED EVENTS" or menu 4, 6 "RECORDED CODES" only. Press key 1 to return to the basic menu immediately.

In the example, n 35 (flashing) indicates that the measurements shown refer to the state relating to recorded event number 35. The meaning of the measurements is the same as those in menu 2.

## RECORDED CODES

**Press the following sequence of keys to access the menu: 4, 6**

```
s=FFFF c=FFFF b=FFFF r=FFFF-FF the=FFFF-FF
a=FFFF-FFFF; n=100, 1992,12,31/14:45:50
```

The "RECORDED CODES" menu is accessed with key 6 from menu 4 "RECORDED EVENTS" and menus 4, 2; 4, 2, 2; 4,2,2,2 that is, the recorded measurement menus. Return to the basic menu by means of key 1.

Apart from key 6, the other keys have the same functions as those described for menu 4, and the messages on the lower line also remain the same.

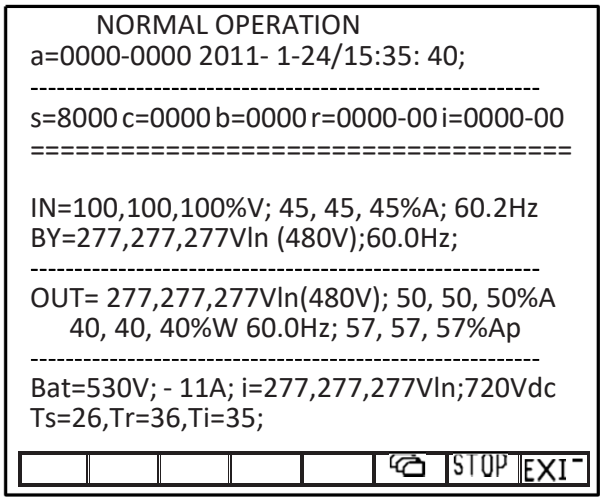
The upper line: s=FFFF c=FFFF b=FFFF r=FFFF-FF i=FFFF-FF, shows the internal codes recorded at the time of the event.

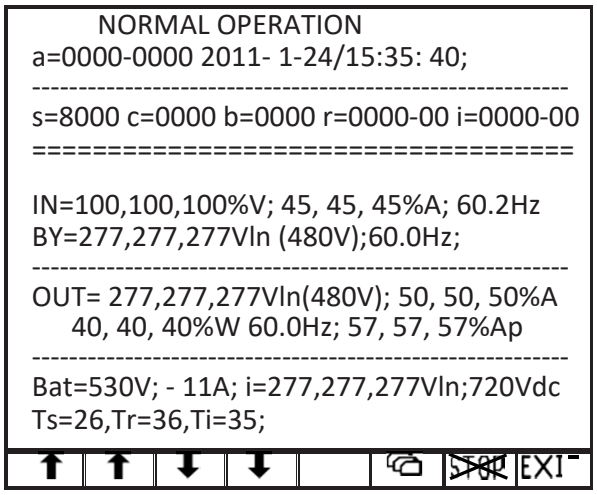
Use key 6 to return to menu 4 while keeping the current event; you can then switch several times from the description of the event with the "stored alarm message" to the one with the internal codes.

## RECORDED VALUE ON FULL PAGE

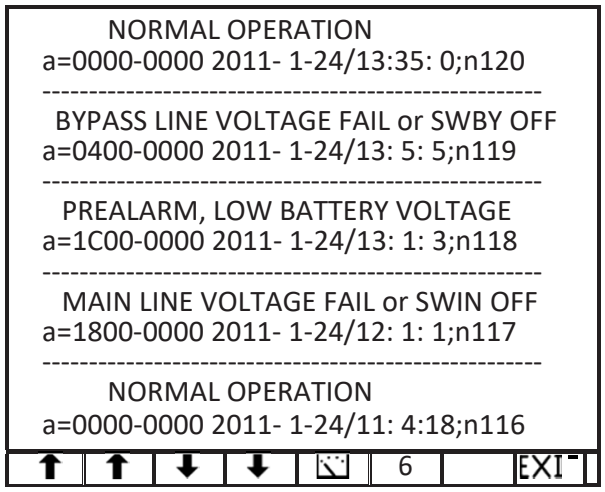
The "RECORDED VALUE ON FULL PAGE" menu is accessed with key 4 from menu 4.

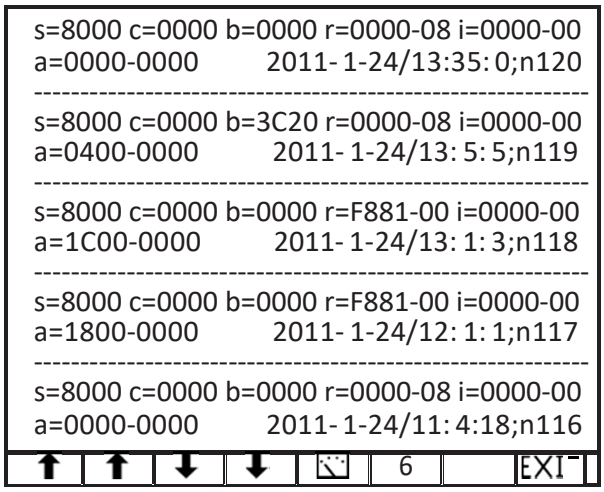
On this page, when the “stop” key is not cross marked, are shown all present measurements and internal codes, and the past measurements when the “stop” key is marked. When the “STOP” key is cross marked it is possible to look to the other past value recorded by arrow keys.




This key switch to the page showing the message and codes of 4 past events and it is possible to look to the other past events by arrow keys.




This key switch to page with all codes and measurements displayed of 1 event.
The key “6” switch from code with message line to full lines code.

## DISABLING THE AUDIBLE ALARM (KEY 5)

**Press the following sequence of keys to access the menu: 5**

During operation from the basic menu, the operator can permanently disable or re-enable the audible alarm (buzzer) by pressing key 5. "5=ON" is shown in the basic menu when the audible alarm is enabled and "5=OFF" when the audible alarm is disabled. Key 5 in other menus may only be used to disable the sound, when no other functions are envisaged for this key. The command is stored even during a shutdown due to a power failure.

## "CLOCK": DATE/TIME (KEY 6)

**Press the following sequence of keys to access the menu: 6**

The "DATE/TIME" menu is accessed via key 6 from the basic menu. The display shows the current contents of the internal calendar and clock with the following format: DATE/TIME = ymd/h = years, months, days / hours, minutes, seconds.

The contents can be modified via the menu by inserting the personalization code 436215. This code remains active for 2 minutes after it has been inserted.

The next menu can only be accessed by inserting the correct code, otherwise the system returns to the basic menu. Press keys 2, 3, 4, 5 or 6 to select which value to change.

```
DATE/TIME = Xmg/h = 2003 12 31/24:60'60
ADJUSTMENT:          7=-, 8=+
```

In this case the year's value is to be changed; the flashing symbol X superimposed over the letter shows which field has been selected. Press keys 7 or 8 to decrease or increase the selected value by one unit; press any one of the other keys to exit the menu.

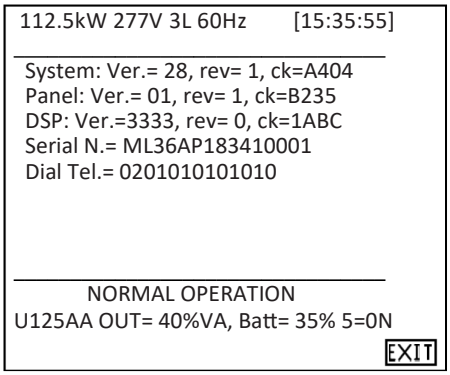
## "ARROW DOWN": INTERNAL CODES, FIRMWARE VER. (KEY 7)

**Press the following sequence of keys to access the menu: 7**

```
s=FFFF c=FFFF b=FFFF r=FFFF-FF i=FFFF-FF
a=FFFF-FFFF; INTERNAL CODES; ver.10……
```

The "INTERNAL CODES" menu is accessed from the basic menu via key 7. The codes represented provide information on the operating status of the Inverter and about system firmware version. This information is used by the service personnel.

Pushing more key 7 it is shown the page with information about other firmware version, serial number and service telephone number.



## MAINTENANCE

***** WARNING *****

**RISK OF ELECTRICAL SHOCK**

**THE LIGHTING INVERTER RECEIVES POWER FROM MORE THAN ONE SOURCE. BE SURE ALL UTILITY CIRCUIT BREAKERS ARE IN THE OFF POSITION AND THE DC CIRCUIT BREAKER IS OFF BEFORE SERVICING.**

**SEE "SAFETY PRECAUTIONS"**

The inverter is designed and produced to last a long time, even in the most severe service conditions. It should be remembered however that this is electronic power equipment, which requires periodic maintenance. Moreover, some components have a limited lifespan and as such must be periodically checked and replaced should conditions so dictate: in particular the batteries, the fans and in some cases the electrolytic capacitors. It is therefore recommended to implement a preventive maintenance program which should be entrusted to specialized personnel authorized by the manufacturer. Our Technical Support Team will be happy to recommend the various personalized options for preventive maintenance.

### PERIODIC MAINTENANCE

(TO BE CARRIED OUT BY TRAINED PERSONNEL AND WITH DOORS CLOSED)

The following operations (which must be done with the doors closed) should be carried out periodically (e.g. once a month, or more frequently in particularly difficult environmental conditions):

- Ensure that the air intake slots (located on the front door and at the back of the cabinet) and the output grilles located on the top of the cabinet are clean.
- Ensure that the Inverter is working properly (the message "NORMAL OPERATION" will appear on the display panel). If an alarm message is displayed, check the meaning in the manual before contacting the technical support service.
- Perform a battery test via the display panel.

### INTERNAL MAINTENANCE

(TRAINED PERSONNEL ONLY)

**Maintenance inside the Inverter may only be carried out by trained personnel. The Inverter is designed to power the load when it is disconnected from the mains power supply. High voltage is present inside the Inverter even when the mains power supply and the battery have been disconnected.**

After disconnecting the mains power supply and the battery cabinet, trained service personnel must wait at least ten minutes for the capacitors to discharge before working on the inside of the equipment.

## BATTERY MAINTENANCE
(TRAINED PERSONNEL ONLY)

**SERVICING OF BATTERIES SHOULD BE PERFORMED OR SUPERVISED BY PERSONNEL KNOWLEDGEABLE OF BATTERIES AND THE REQUIRED PRECAUTIONS. KEEP UNAUTHORIZED PERSONNEL AWAY FROM BATTERIES. SEE *"SAFETY PRECAUTIONS"***

**BATTERIES INSTALLED WITHIN THIS ENCLOSURE ARE A PART OF A CONTROLLED POWER COMPANY UL 924 LISTED EMERGENCY LIGHTING POWER SYSTEM. BATTERIES OF A SPECIFIC MANUFACTURER AND MODEL ARE REQUIRED TO MAINTAIN THE SYSTEM'S UL 924 LISTING. CONTACT THE FACTORY FOR SERVICE, AS WELL AS FOR BATTERY REPLACEMENT AT 1-800-521-4792.**

The system automatically controls the efficiency of the batteries every 24 hours, and sounds an alarm when the efficiency is lower than that calculated, according to the stored capacity value (See *"Keys menu 3, 2: Battery Test",* ***Page 67***.

The lifespan of the batteries is linked to the operating temperature and to the number of charge and discharge cycles the battery has experienced. The capacity is not constant, but increases after some charge and discharge cycles; it then remains constant for several hundreds of cycles before decreasing permanently.
Preventive maintenance of the battery entails:

- Keeping the operating temperature within the range of 20 - 25°C.
- Performing two or three discharge and charge cycles during the first month of use.
- Carrying out this operation every six months after the first month of use.

Since the batteries are a source of energy, opening the battery circuit breaker/disconnect does not eliminate the voltage inside the battery cabinet. DO NOT TRY TO ACCESS THE INSIDE OF THE BATTERY CABINET. THERE ARE ALWAYS DANGEROUS VOLTAGES AROUND THE BATTERIES. If the batteries are thought to be faulty in any way, please contact Technical Support.

If the batteries need to be replaced, this must be done by a specialized technician. The replaced parts must be sent to a specialized company for disposal by means of recycling. Batteries are classified by law as "toxic waste".

## BATTERY MAINTENANCE CONTINUED

## VOLTAGES, TEMPERATURES & OHMIC READINGS

Record keeping is an important part of stationary battery maintenance and warranty coverage. This information will help in establishing a life history of the battery and inform the user if and when corrective action needs to be taken. See *"Battery Maintenance Report",* ***Page 83***.

While it is acceptable to operate at temperatures less than 77°F (25°C), it will require longer charging time to become fully recharged. Also, the capacity will be less at operating temperatures below 77°F (25°C). After installation and when the batteries have been on float charge for one week, the following data should be recorded:

1. Battery string terminal voltage
2. Charger voltage
3. Individual battery float voltages
4. Individual battery ohmic readings
5. Ambient temperatures
6. Terminal connections should be checked to verify that the installer did torque all connections properly. Micro-ohm readings should be taken across every connection. Refer to meter manufacturer's instructions for proper placement of probes. If any reading differs by more than 20% from its initial installation value, re-torque the connections. If the reading still remains high, clean contact surfaces as required.

## ANNUAL INSPECTION

1. Conduct a visual inspection of the batteries.
2. Record the battery string voltage.
3. Record the charge voltage.
4. Record the individual battery voltages. The accuracy of the DMM (Digital Multimeter) must be .05% (on DC scale) or better. The DMM must be calibrated to NIST traceable standards. Because float readings are affected by discharge and recharges, these readings must be taken when batteries have been on continuous, uninterrupted float for at least one month. Batteries should be within +/- 0.30 volts of the average battery float voltage.
5. Record the ambient temperatures.
6. Record individual battery ohmic readings.
7. Record all interunit and terminal connection resistances. Micro-ohm readings should be taken during this inspection. If any reading differs by more then 20% from initial readings taken, re-torque the connection. Recheck the micro-ohm reading. If the reading remains high, clean the contact surface accordingly.

**Battery Cleaning** - Batteries, cabinets, racks and modules should be cleaned with clear water or a mixture of baking soda and water. Never use solvents to clean the battery.

**Capacity Testing** - Capacity test should not be run unless the battery's operation is questionable. Do not discharge the batteries beyond the specified final voltage. When discharging at higher rates, extra connectors may need to be added to prevent excessive voltage drop. When performing capacity testing and recording data use IEEE 1188 instructions. Should it be determined that any individual battery(ies) or cell(s) need to be replaced, contact the factory.

## BATTERY MAINTENANCE REPORT

INSPECTION DATE _____ NO. OF UNITS/STRING _____

COMPANY _____ TYPE _____

ADDRESS _____ DATE NEW _____

BATTERY LOCATION AND/OR NUMBER _____ DATE INSTALLED _____

INDIVIDUAL BATTERY READINGS

CHARGER OUTPUT _____ AMP AIR TEMPERATURE _____ °F

TOTAL CHARGER STRING VOLTAGE _____ PANEL METER VOLTS _____

| UNIT # | VOLTS | OHMS OR MHOS | UNIT # | VOLTS | OHMS OR MHOS | UNIT # | VOLTS | OHMS OR MHOS | UNIT # | VOLTS | OHMS OR MHOS | UNIT # | VOLTS | OHMS OR MHOS | UNIT # | VOLTS | OHMS OR MHOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 41 | | | 81 | | | 121 | | | 161 | | | 201 | | |
| 2 | | | 42 | | | 82 | | | 122 | | | 162 | | | 202 | | |
| 3 | | | 43 | | | 83 | | | 123 | | | 163 | | | 203 | | |
| 4 | | | 44 | | | 84 | | | 124 | | | 164 | | | 204 | | |
| 5 | | | 45 | | | 85 | | | 125 | | | 165 | | | 205 | | |
| 6 | | | 46 | | | 86 | | | 126 | | | 166 | | | 206 | | |
| 7 | | | 47 | | | 87 | | | 127 | | | 167 | | | 207 | | |
| 8 | | | 48 | | | 88 | | | 128 | | | 168 | | | 208 | | |
| 9 | | | 49 | | | 89 | | | 129 | | | 169 | | | 209 | | |
| 10 | | | 50 | | | 90 | | | 130 | | | 170 | | | 210 | | |
| 11 | | | 51 | | | 91 | | | 131 | | | 171 | | | 211 | | |
| 12 | | | 52 | | | 92 | | | 132 | | | 172 | | | 212 | | |
| 13 | | | 53 | | | 93 | | | 133 | | | 173 | | | 213 | | |
| 14 | | | 54 | | | 94 | | | 134 | | | 174 | | | 214 | | |
| 15 | | | 55 | | | 95 | | | 135 | | | 175 | | | 215 | | |
| 16 | | | 56 | | | 96 | | | 136 | | | 176 | | | 216 | | |
| 17 | | | 57 | | | 97 | | | 137 | | | 177 | | | 217 | | |
| 18 | | | 58 | | | 98 | | | 138 | | | 178 | | | 218 | | |
| 19 | | | 59 | | | 99 | | | 139 | | | 179 | | | 219 | | |
| 20 | | | 60 | | | 100 | | | 140 | | | 180 | | | 220 | | |
| 21 | | | 61 | | | 101 | | | 141 | | | 181 | | | 221 | | |
| 22 | | | 62 | | | 102 | | | 142 | | | 182 | | | 222 | | |
| 23 | | | 63 | | | 103 | | | 142 | | | 183 | | | 223 | | |
| 24 | | | 64 | | | 104 | | | 144 | | | 184 | | | 224 | | |
| 25 | | | 65 | | | 105 | | | 145 | | | 185 | | | 225 | | |
| 26 | | | 66 | | | 106 | | | 146 | | | 186 | | | 226 | | |
| 27 | | | 67 | | | 107 | | | 147 | | | 187 | | | 227 | | |
| 28 | | | 68 | | | 108 | | | 148 | | | 188 | | | 228 | | |
| 29 | | | 69 | | | 109 | | | 149 | | | 189 | | | 229 | | |
| 30 | | | 70 | | | 110 | | | 150 | | | 190 | | | 230 | | |
| 31 | | | 71 | | | 111 | | | 151 | | | 191 | | | 231 | | |
| 32 | | | 72 | | | 112 | | | 152 | | | 192 | | | 232 | | |
| 33 | | | 73 | | | 113 | | | 153 | | | 193 | | | 233 | | |
| 34 | | | 74 | | | 114 | | | 154 | | | 194 | | | 234 | | |
| 35 | | | 75 | | | 115 | | | 155 | | | 195 | | | 235 | | |
| 36 | | | 76 | | | 116 | | | 156 | | | 196 | | | 236 | | |
| 37 | | | 77 | | | 117 | | | 157 | | | 197 | | | 237 | | |
| 38 | | | 78 | | | 118 | | | 158 | | | 198 | | | 238 | | |
| 39 | | | 79 | | | 119 | | | 159 | | | 199 | | | 239 | | |
| 40 | | | 80 | | | 120 | | | 160 | | | 200 | | | 240 | | |
| AVG. VOLTAGE | | | AVG. VOLTAGE | | | AVG. VOLTAGE | | | AVG. VOLTAGE | | | AVG. VOLTAGE | | | AVG. VOLTAGE | | |

READINGS TAKEN BY: _____ REMARKS / RECOMMENDATIONS _____

READINGS SHOULD BE TAKEN AT INSTALLATION AND ANNUALLY THEREAFTER _____

# GENERAL CHARACTERISTICS

| INVERTER MODELS | 58.5kW | 72kW | 90kW | 112.5kW |
|---|---|---|---|---|
| **MECHANICAL DATA** | | | | |
| Width (inches [mm]) | 31.50 [800] | | | |
| Depth / height (inches [mm]) | 33.46 [850] / 74.80 [1900] | | | |
| Ventilation | Forced | | | |
| Max current dispersion | 300mA max | | | |
| Noise at 1m from front (0÷100% load)(dBA) | 65 | 65 | 65 | 68 |
| Applicable Standards | • UL 924 Emergency Lighting and Power Equipment<br>• UL 924 Lighting and Power Equipment, Auxiliary (OUST)<br>• UL Standard 1778 2nd Edition<br>• National Electrical Code (NFPA-70)<br>• NEMA PE-1<br>• CUL to CSA C22.2 No.141-15 Emergency Lighting Equipment<br>• ASME, ASA-C-39.1-1984<br>• FCC Part 15 Subpart J Class A<br>• NEC, OSHA, IEEE587, ANSI C 62.41-1980 | | | |
| **INVERTER MODELS** | **58.5kW** | **72kW** | **90kW** | **112.5kW** |
| **INPUT RECTIFIER** | | | | |
| Rated voltage | 480Vac 3-phase | | | |
| Rated voltage tolerance without contrib. of battery @100% load | -10%, +15% | | | |
| Voltage tolerance in battery mode or load depending | -40%, + 15% | | | |
| Input frequency tolerance | from 45 to 65Hz | | | |
| Rated current absorbed (480 V) (A) | 76 | 94 | 118 | 147 |
| Rated power absorbed (480 V)-(kW) | 63 | 78 | 98 | 122 |
| Maximum current absorbed at full load and with battery recharging (A) | 89 | 109 | 136 | 160 |
| Maximum power absorbed at full load and with battery recharging (kW) | 73 | 90 | 113 | 140 |
| Power factor at rated voltage (480 V) and battery charge from 25% to 100% of the load | >0.99 | | | |
| Current Harmonic Distortion (THDi) (with mains distortion <1%) | | | | |
| % load | | | | |
| 100% | ≤ 3 | | | |
| 75% | ≤ 5 | | | |
| 25-50% | ≤ 8 | | | |
| Progressive start of rectifier (Power Walk-in) | from 0 to 30 seconds (configurable) | | | |
| Delay of progressive start of rectifier (Power Walk-in delay timer)) | from 0 to 120 seconds (configurable) | | | |
| **INVERTER MODELS** | **58.5kW** | **72kW** | **90kW** | **112.5kW** |
| **INTERMEDIATE D.C. CIRCUIT** | | | | |
| Jars /Cells | 40 / 240 | | | |
| Ripple voltage with recharged battery (%) | Approx. 0 | | | |
| Max recharge current (A) | | | | |
| Full load | 16 | 20 | 24 | 30 |
| Load 90% | 27 | 33 | 42 | 50 |
| Load 80% | 38 | 47 | 51 | 70 |
| Load ≤ 70% | 49 | 60 | 76 | 95 |

# GENERAL CHARACTERISTICS CONTINUED

| INVERTER MODELS | 58.5kW | 72kW | 90kW | 112.5kW |
|---|---|---|---|---|
| **INVERTER** | | | | |
| Rated power Pf 0.9 (kW) inductive | 65 | 80 | 100 | 125 |
| Active power Pf 1 (kW) | 58.5 | 72 | 90 | 112.5 |
| Rated power reduction factor (kVA/kW) for Pf =0.8/0.9 capacitive | 0.85/0.89 | | | |
| Rated voltage | 480Vac 3-phase + N | | | |
| Rated frequency | 60Hz | | | |
| Rated voltage adjustment field | +5% - 10% | | | |
| Static variation | ± 1% | | | |
| Dynamic variation | ± 5% | | | |
| Recovery time within ± 1% | 20ms - Conforms to standard EN-62040-3, Class 1 | | | |
| Crest Factor (Ipeak/Irms) | 3:1 | | | |
| Voltage distortion with linear load | 1% (typical), 2% (max) | | | |
| Voltage distortion with non linear load | < 3% | | | |
| Stability of frequency with Inverter synchronized with the bypass mains | ± 2% (adjustable from ± 1% to ± 6% from control panel) | | | |
| Stability of frequency with Inverter not synchronized with the bypass mains | ± 0.05% | | | |
| Speed of frequency variation | 1Hz/sec | | | |
| Dissymmetry of the phase voltages with balanced and unbalanced load | ≤ 1% | | | |
| Voltage phase shift with balanced and unbalanced load | 120 ± 1° | | | |
| Overload with reference to the rated power: Three phase | 110% for 60min , 125% for 10min , 150% for 1min | | | |
| Mono phase | 200% for 7 second | | | |
| Short circuit current - Phase / Phase | 180% for 1 second with current limiting | | | |
| Short circuit current - Phase / Neutral | 300% for 1 second with current limiting | | | |
| Inverter efficiency (%) | 95% | | | |
| Normal mode AC/AC efficiency | 93% | | | |
| Normal mode heat rejection (BTU/Hr) | 15,033 | 18,500 | 23,120 | 28,900 |
| **INVERTER MODELS** | **58.5kW** | **72kW** | **90kW** | **112.5kW** |
| **BYPASS** | | | | |
| Rated voltage | 480Vac 3-phase + N | | | |
| Rated voltage tolerance | ± 15% (adjustable from ± 10% to ± 25% from control panel) | | | |
| Rated frequency | 60Hz | | | |
| Frequency tolerance | ± 2% (adjustable up to ± 6% from control panel) | | | |
| Switching onto bypass with synchronized Inverter (Inverter in “Normal Mode”) | Approx 0ms | | | |
| Switching onto bypass with Inverter out of sync (Inverter in “Normal Mode”) | 20ms | | | |
| Switching from bypass to Inverter (Inverter in “Stand-by On mode”) | from 2 to 5ms | | | |
| Delay in transfer onto Inverter after switching onto bypass | 4 sec | | | |
| Power overload capacity of the bypass line (kW) | 110 % for 60 minutes, 125 % for 10 minutes, 150 % for 1 minute | | | |
| Short circuit capacity of the bypass line (x rated current) | | | | |
| 1 second | 20 | 15 | 12 | 10 |
| 500 ms | 23 | 18 | 15 | 12 |
| 200 ms | 26 | 21 | 17 | 14 |
| 100 ms | 30 | 22 | 18 | 15 |
| 10 ms | 40 | 30 | 25 | 20 |

# APPENDIX A - ALARM MESSAGES

| ALARMS | | |
|---|---|---|
| **A=** | **EVENT MESSAGE** | **DESCRIPTION** |
| 0 | NORMAL OPERATION | No Alarms are present |
| 1 | DISTURBANCES ON BYPASS LINE | Alarm present when there is interference on the bypass line, such as voltage peaks or harmonic distortion, while the voltage and frequency are correct. WARNING: in this case the Inverter is not synchronized with the bypass line; if the bypass is forced with SWMB, with the remote commands or from the panel, the load may undergo a sudden variation in voltage. |
| 2 | MANUAL BYPASS, SWMB ON | The mechanical bypass switch SWMB is closed, thus preventing the Inverter from returning to normal operation. The load is powered directly from the input and will remain unpowered if there is a mains failure. |
| 3 | BYPASS LINE VOLT. FAIL or SWBY, FSCR OFF | The Inverter does not recognize the bypass line because it is outside the acceptable range or because SWBY is open, |
| 4 | MAIN LINE VOLTAGE FAIL or SWIN OFF | The power supply voltage is not correct, the load is powered with the energy stored by the battery. This alarm is present if one of the following conditions occurs:<br>• The supply voltage or frequency of the rectifier power supply line is not within an acceptable range (see General Characteristics, ***Page 84***)<br>• SWIN is open<br>• rectifier fault |
| 5 | PRE ALARM, LOW BATTERY VOLTAGE | Alarm present if the residual backup time is lower than the time set for the pre-alarm (the factory-set value is 5 minutes). |
| 6 | LOW BATTERY CHARGE or CLOSE SWB | A BATTERY TEST performed by the Inverter logic with the mains power supply present detected a battery voltage lower than the value calculated (see *BATTERY TEST* menu, ***Page 67***). |
| 7 | LOW INPUT VOLTAGE or OUTPUT OVERLOAD [W] | Alarm present if one of the following conditions occurs:<br>• The power supply voltage in input is insufficient to power the load (see General Characteristics, ***Page 84***)<br>• The active power [W] of the output load is greater than the rated value. |
| 8 | OUTPUT OVERLOAD | This indicates that the required load power, which is supplied by the Inverter, is greater than the allowed rated power, thus the value indicated, expressed as a percentage %VA, exceeds the value of 100%. The same alarm is also activated when the peak load current exceeds the maximum value allowed.<br><br>When this alarm is present the load must be reduced, otherwise the system will automatically transfer to the bypass line within a time that is inversely proportional to the value of the overload. |
| 9 | BYPASS FOR OUTPUT VA < AUTO-OFF VALUE | This message is present when the load power in %VA is lower than the “AUTO- OFF” value set. The %VA value for AUTO-OFF is factory-set at zero (thus the alarm condition cannot be checked). |
| 10 | INTERNAL FAULT: | Alarm codes used by customer service. |
| 11 | TEMPORARY BYPASS, WAIT | This indicates that the load is powered from the bypass line and the system is in the condition prior to the automatic return to normal operation with power supplied from the Inverter. This temporary operation may take place, as an example, during the start-up phase or while waiting for the return to Inverter after a bypass due to overload. |
| 12 | BYPASS FOR OUTPUT OVERLOAD | This indicates that the load is powered from the bypass line and is greater than the rated value; the value indicated on the panel, expressed as a percentage %VA, exceeds the value of 100%.<br>The load must be reduced to prevent damage to the Inverter.<br>The load must be reduced in order to return to NORMAL OPERATION. Wait a few minutes to allow cooling (e.g. the time for the return to NORMAL OPERATION is 60s if the load goes down to 50%, and 8 minutes if it goes down to 75%). |

| ALARMS | | |
|---|---|---|
| **A=** | **EVENT MESSAGE** | **DESCRIPTION** |
| 13 | BYPASS COMMAND ACTIVE; 8=COMMAND OFF | Alarm present when the system has been deactivated and switched onto the bypass, by means of a specific command inserted via the keyboard. The command remains stored also during shutdown due to a mains power supply failure. The system does not return to normal operation when the mains power supply is restored if the block has been set intentionally and not deactivated. |
| 14 | REMOTE BYPASS COMMAND: ACTIVE | Alarm present when the system has been deactivated and switched onto the bypass, by the command applied with the “signals and remote commands” connector. The command is not stored, and the system returns to normal operation when the command is cancelled, provided there is a power supply voltage. |
| 15 | OVERTEMPERATURE or FAN FAILURE | Alarm when one of the internal temperatures on the system card, the Inverter power modules, the rectifier power modules or the transformers has exceeded the maximum value allowed. This may be caused by:<br>• Operation in an environment where the temperature is too high<br>• A fault in the fans. |
| 16 | INSULATION LOSS | Indicates that a signal of “insulation loss” has been received from an external device |
| 17 | INPUT VOLTAGE SEQUENCE NOT OK | Indicates that the sequence of the phases at the bypass line input is not correct. It is normally sufficient to switch any two phases over in order to obtain normal operation. |
| 18 | OUTPUT OFF, CLOSE SWOUT OR SWMB | Alarm when there is no output voltage because SWOUT and SWMB are both open at the same time. |
| 19 | SYSTEM OFF COMMAND ACTIVE; 8=COMMAND OFF | Alarm present when the command for total shutdown from the panel or through the RS232 connection, COMMAND STORED, has been initiated. The system executes the shutdown command with a few seconds’ delay to allow for cancellation. The command remains stored even during shutdown due to a power outage. When the power supply is restored, the system does not return to normal operation if the block that has been intentionally set is not deactivated; to deactivate it close SWBY or, if required, press 8. |
| 20 | REMOTE SYSTEM OFF COMMAND: ACTIVE | Same as the previous alarm, with command present from the “REMOTE” connector. |
| 21 | MEMORY CHANGED: CODE= | Code 1 the memory has been changed and the operating parameters have returned to standard values. If non-standard values were previously set, these must be personalized again. Switch the display off and then on again in order to remove the alarm. NOTE: codes other than 1 may be displayed temporarily during variations due to personalization, but this does not affect normal operation. |
| 22 | TIMER OFF ACTIVE | Alarm when the daily timer set for the control of the automatic shutdown and restart cycles starts operating. The values of Toff and Ton are factory-set to zero (thus the timer condition is disabled). |
| 23 | SYSTEM OFF | The system is OFF therefore the output load is not feed. |
| 24 | BATTERY TEST ACTIVE | The battery test is operating |
| 26 | Fuse FAULT | Some optional fuses are blown |
| 27 | Battery discharge Fail | The optional battery discharging test failed. |
| 28 | NOT USED | Alarm number not used. |
| 29 | High battery temperature | The battery temperature is over the limit. |
| 30 | Slave Inverter off by rectifier or SWIN OFF | In a system with common battery the Inverter was switched off because the input stage failed or switched off. |
| 31 | Fan FAULT | Failure in some fans (available only when installed the fan alarm option) |

# APPENDIX A - ALARM MESSAGES CONTINUED

| ALARMS | | |
|---|---|---|
| **A=** | **EVENT MESSAGE** | **DESCRIPTION** |
| 34 | Brake circuit fail | The optional brake circuit has a failure |
| 35 | Brake circuit Overload | The optional brake circuit has an overload |
| 36 | Rectifier switched OFF by Remote command | The input converter stage is switched off by a remote command. |
| 37 | WAIT starting: NOT connect the BATTERY | The input converter is starting, it needs to wait before connecting the battery |
| 38 | Inverter SERVICE | The unit operation time exceeded the set time to require service. |
| 39 | BATTERY SERVICE | The battery operation time exceeded the set time to require service. |
| 40 | Battery charge < set level [Ah%] | The system is waiting to start in normal operation, after a complete battery discharging, because the battery is not charged above the requirement. |
| 41 | Input switch OFF | The external optional input switch is OFF. |
| 42 | INSULATION LOSS A.C. | The external optional ac input insulation checking device, detected the ac. insulation lossing. |
| 43 | INSULATION LOSS D.C. | The external optional dc output insulation checking device, detected the ac. insulation lossing. |
| 44 | Motor Generator parallel mode (rem.com)” | Optional operation |
| 45 | Overtemperature On Bypass line transf. | Optional signal coming from an external transformer insert in the input by-pass line |
| 46 | Inverters OFF | The Inverters are commanded to be OFF from an external command |

# APPENDIX B - OPTIONAL REMOTE COMMANDS

Technical support personnel may modify the COMMAND that can executed from the standard “INV.OFF” remote input or from the optional remote input/output card.

| COMMAND | | |
|---|---|---|
| **NAME** | **DESCRIPTION** | **TYPICAL APPLICATION** |
| Battery charge inhibition | Disables the recharging of the battery, keeping the recharge current to a minimum, independently of the load. This is done with the contact kept closed; if reopened, the command is cancelled. | When there is a generator, this allows its output power to be used only to supply the load and not also to recharge the battery. |
| Inhibition of synchronization with backup mains | Disables the use of the bypass line and the synchronization of the Inverter. In the event of an overload or fault, the Inverter blocks and the load remains unpowered. This is done with the contact kept closed; if reopened, the command is cancelled. | To be used when the frequency of the generator or of the backup mains is highly unstable and it is thus preferred to inhibit the synchronization of the Inverter. |
| Battery disconnector contact | Activates the battery discharging or disconnected alarm. To be used to indicate the opening of a battery switch located external to the Inverter. A closed contact must be provided when the external switch is opened. | Displays the status of the battery disconnector. |
| Standby ON | Forces the selection of the Inverter Standby-ON operation. This is done with the contact kept closed; if reopened, the command is cancelled. | To be used when the load may support mains interference or frequency variations and it is thus preferred to improve system efficiency. The load is powered if there is a mains power failure. |
| Battery test | Starts the automatic battery test when the Inverter is in normal operation. Any automatic battery test underway is terminated immediately. This is achieved by switching the contact from open to closed. | Checks state of the battery. |
| Battery test (with rectifier on) | Starts the manual battery test that continues until a block command is received or until the full discharge of the battery. Terminates any manual battery test underway. This is achieved by switching the contact from open to closed. | Checks state of the battery. NOTE: During this test the rectifier remains on with output voltage low in order to allow the supply of current by the battery and to prevent Inverter shutdown after battery discharge. |
| Manual battery charging | Starts the “single first time recharge”. Terminates the first time charging underway. This is achieved by switching the contact from open to closed. | Activates manual remote battery charging |
| Activation of block on Bypass | Bypass command by means of blocking the Inverter as a result of switching onto the bypass line. NOTE: The command is only executed if the bypass line is present with correct values. This is achieved by switching the contact from open to closed. | Load unpowered in the event of a mains outage. To be used for non-critical loads, the battery does not discharge during a mains power failure |
| Inhibition of block on bypass | Resets the bypass command. This is achieved by switching the contact from open to closed. | Cancels the previous action and disables the Inverter block. |
| INVERTER ON/OFF | UNCONDITIONAL INVERTER block command (the command is executed even if there is no bypass line). The Inverter only switches onto bypass if the bypass line is present (otherwise the load remains unpowered). This is done with the contact kept closed; if reopened, the command is cancelled. | Load unpowered in the event of a mains outage. To be used for non-critical loads, the battery does not discharge during a mains power failure. |
| Rectifier off | UNCONDITIONAL rectifier blocks command. This is done with the contact kept closed; if reopened, the command is cancelled. | Shuts down the rectifier and discharges the battery. |

## ELS MODEL NUMBERS

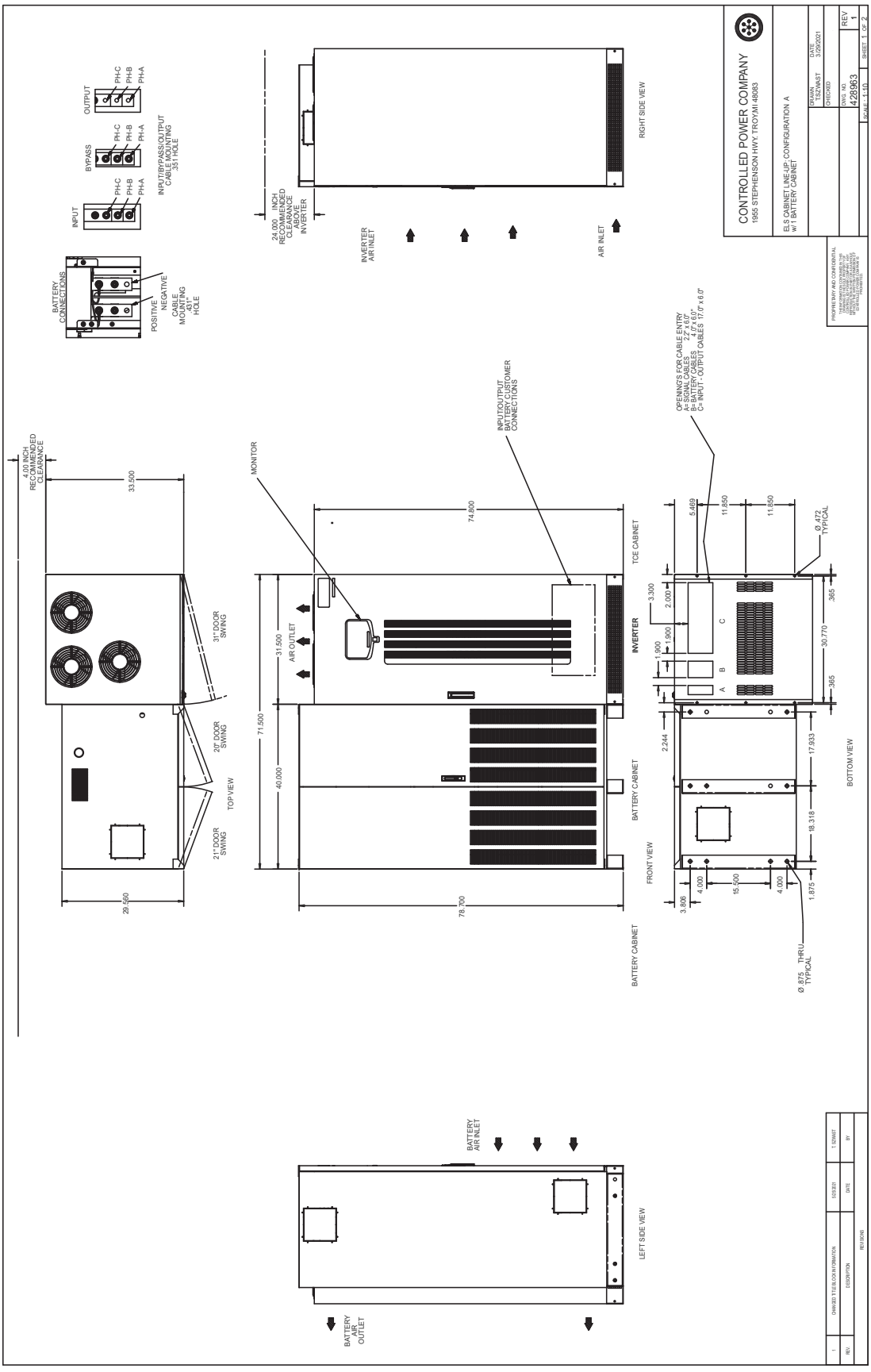
| MODEL NUMBERS | kVA / kW | BATTERY RUNTIME (MINUTES) | INVERTER WEIGHT (LBS) | TOTAL BATTERY WEIGHT (LBS)[1] | BTU / HR (FULL LOAD)[3] | | CABINET CONFIGURATION[4] |
|---|---|---|---|---|---|---|---|
| | | | | | ON-LINE MODE | ECO-MODE | |
| ELS - NNX - 58.5KW - S** | 58.5 | 90 | 1500 | 8960 | 13,964 | 2992 | B |
| ELS - NNX - 58.5KW - D** | 58.5 | 60 | 1500 | 7040 | 13,964 | 2992 | B |
| ELS - NNX - 58.5KW - C** | 58.5 | 30 | 1500 | 4480 | 13,964 | 2992 | A |
| ELS - NNX - 72KW - S** | 72 | 90 | 1500 | 13,710[2] | 17,186 | 3683 | C |
| ELS - NNX - 72KW - D** | 72 | 60 | 1500 | 8960 | 17,186 | 3683 | B |
| ELS - NNX - 72KW - C** | 72 | 30 | 1500 | 5690 | 17,186 | 3683 | B |
| ELS - NNX - 90KW - S** | 90 | 90 | 1610 | 13,710[2] | 21,483 | 4604 | C |
| ELS - NNX - 90KW - D** | 90 | 60 | 1610 | 10,830[2] | 21,483 | 4604 | C |
| ELS - NNX - 90KW - C** | 90 | 30 | 1610 | 7040 | 21,483 | 4604 | B |
| ELS - NNX - 112.5KW - S** | 112.5 | 90 | 1742 | 18,190[2] | 26,854 | 5754 | D |
| ELS - NNX - 112.5KW - D** | 112.5 | 60 | 1742 | 13,710[2] | 26,854 | 5754 | C |
| ELS - NNX - 112.5KW - C** | 112.5 | 30 | 1742 | 8960 | 26,854 | 5754 | B |

[1] Total battery weight includes all battery cabinets with batteries installed. Add total battery weight and Inverter weight together for a total system weight.

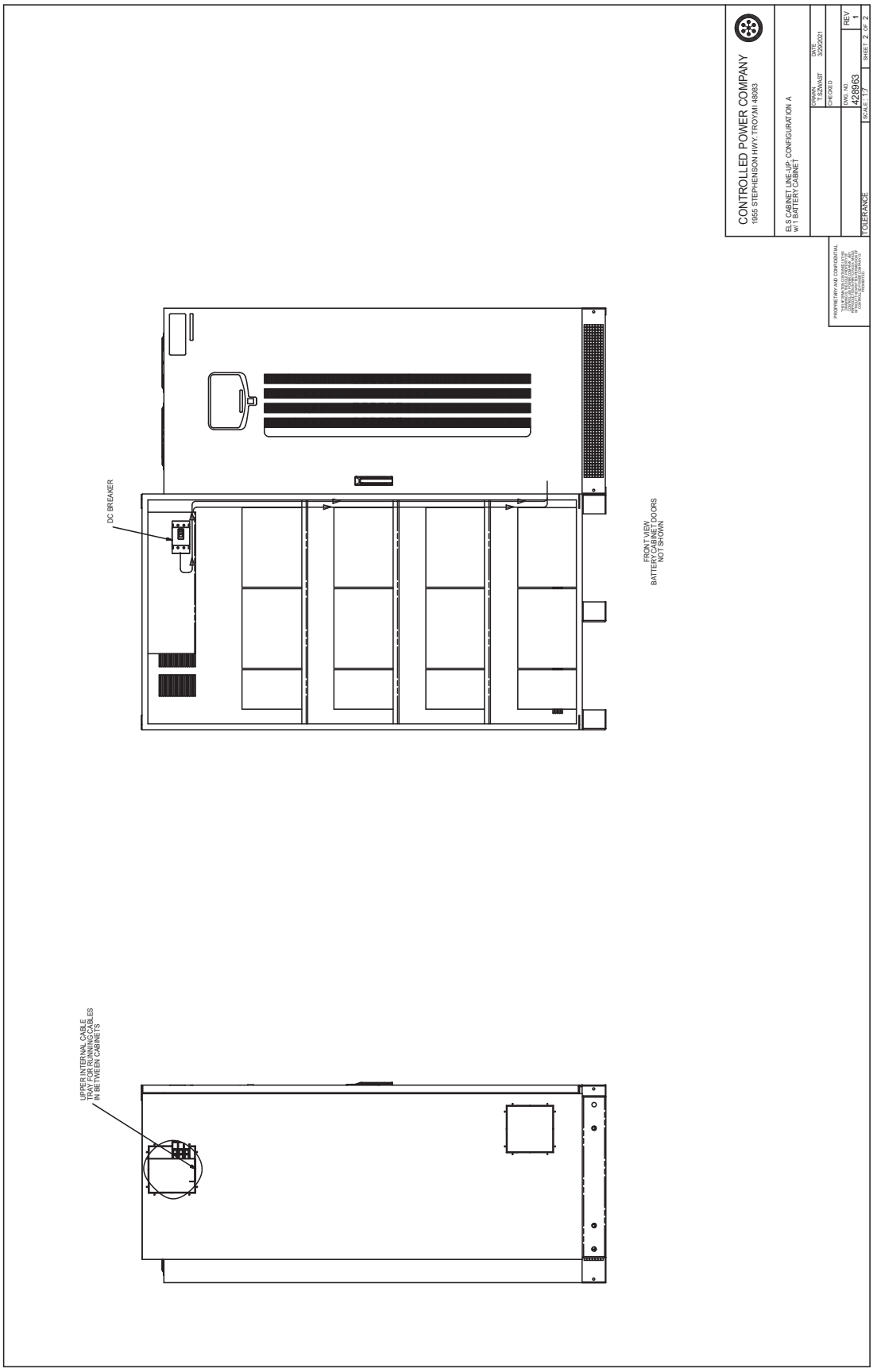
[2] Total battery weight also includes the DC Landing Cabinet.

[3] Only On-Line Mode and ECO-mode BTU/HR are shown above. ECO-mode BTU/HR reflects Standby-On Mode. BTU/HR in Smart Active Mode may be higher, depending on the quality of the incoming power source. BTU/HR in Standby-Off Mode will not exceed ECO-mode levels.

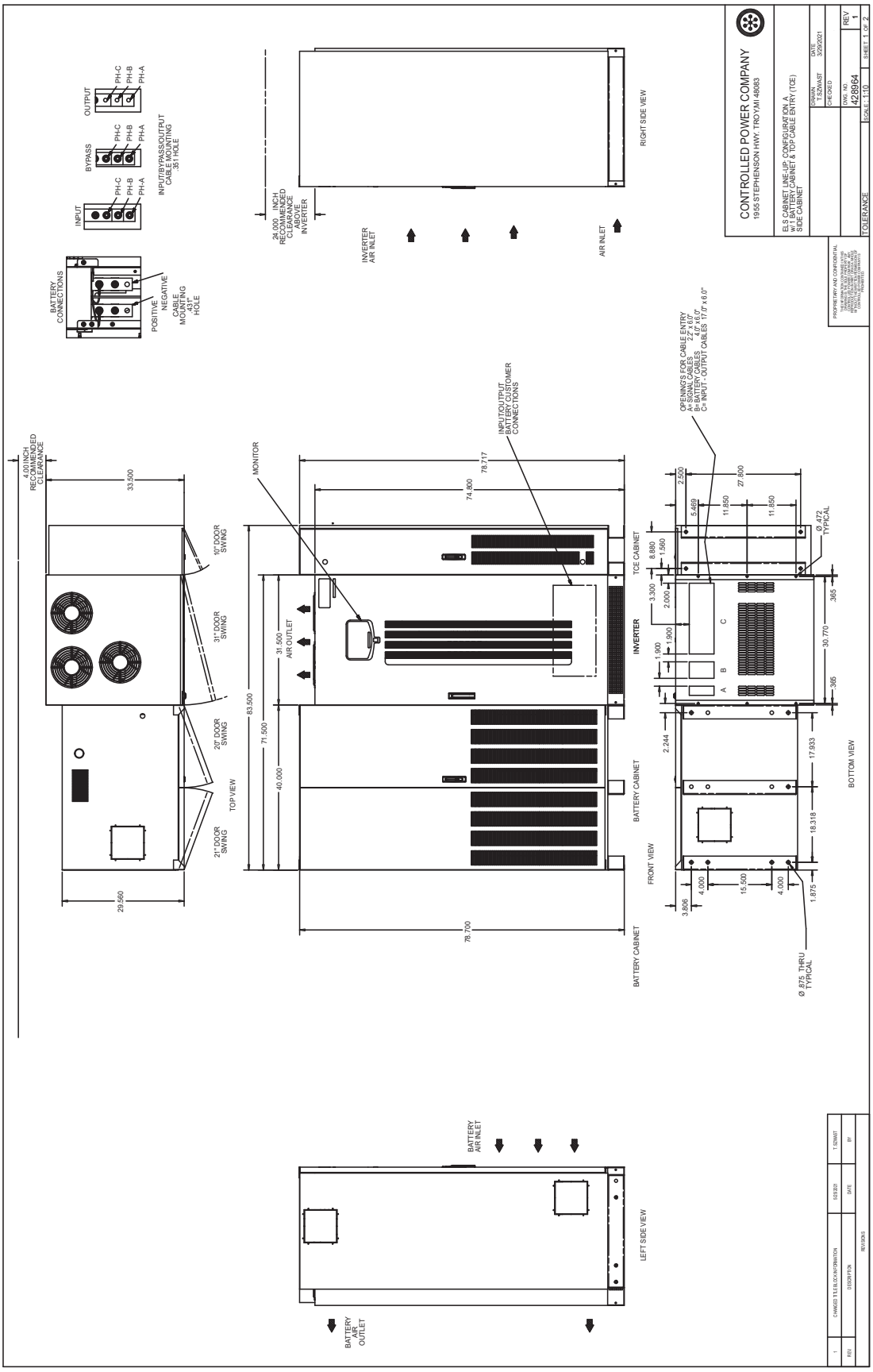
## CABINET OUTLINE - ELS CONFIGURATION "A" WITH 1 BATTERY CABINET - PAGE 1



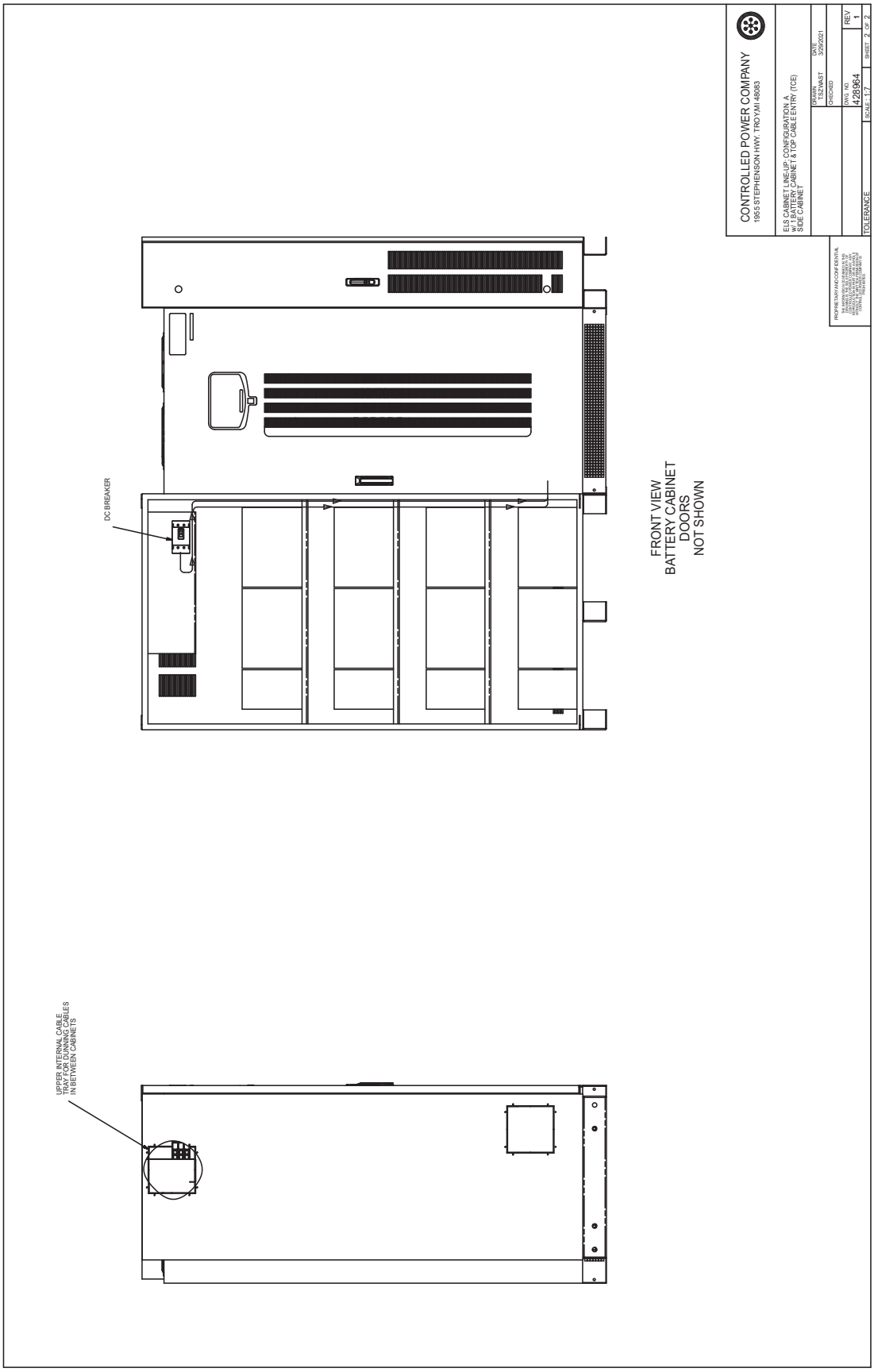
## CABINET OUTLINE - ELS CONFIGURATION "A" WITH 1 BATTERY CABINET - PAGE 2



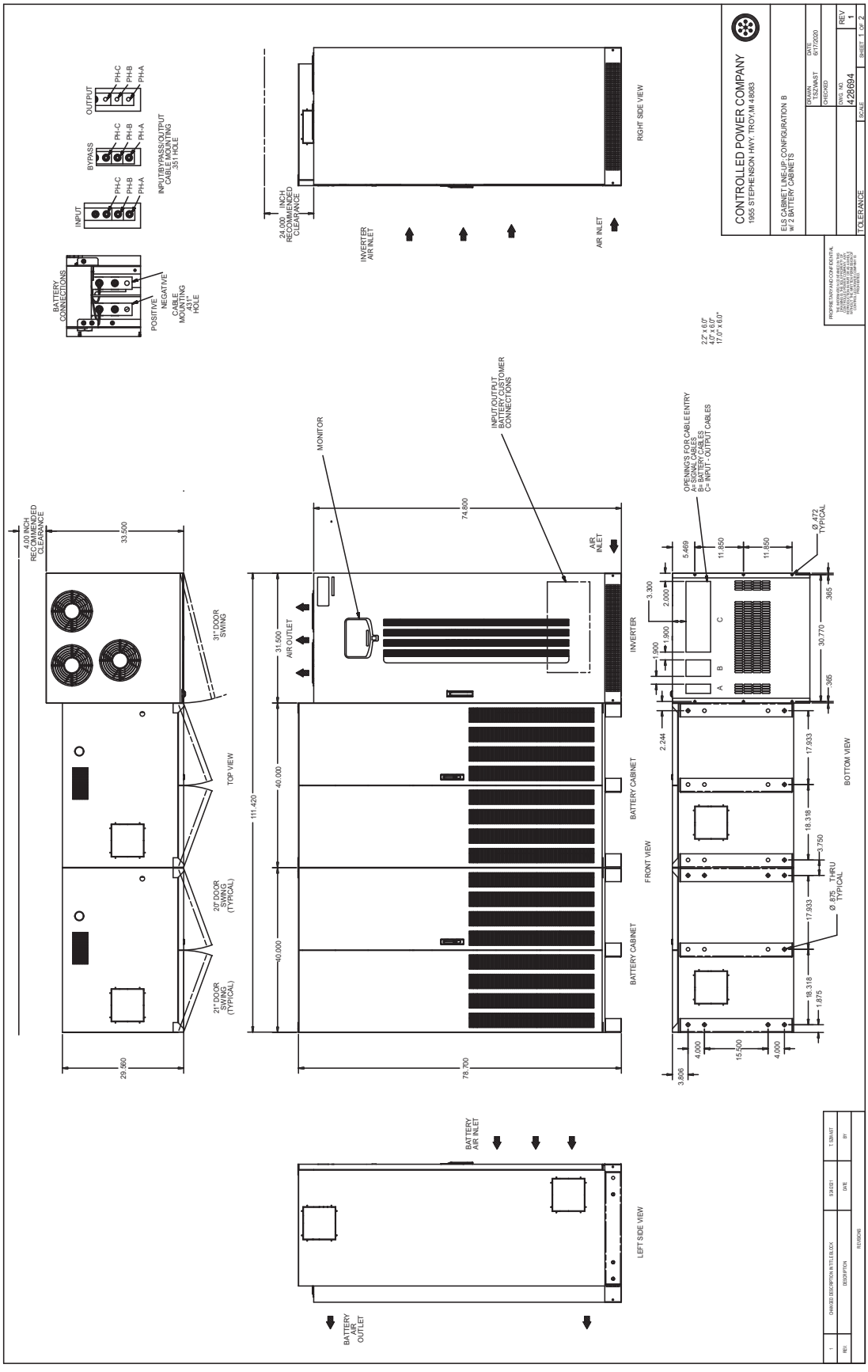
## CABINET OUTLINE - ELS CONFIGURATION "A" WITH 1 BATTERY CABINET AND TCE - PAGE 1



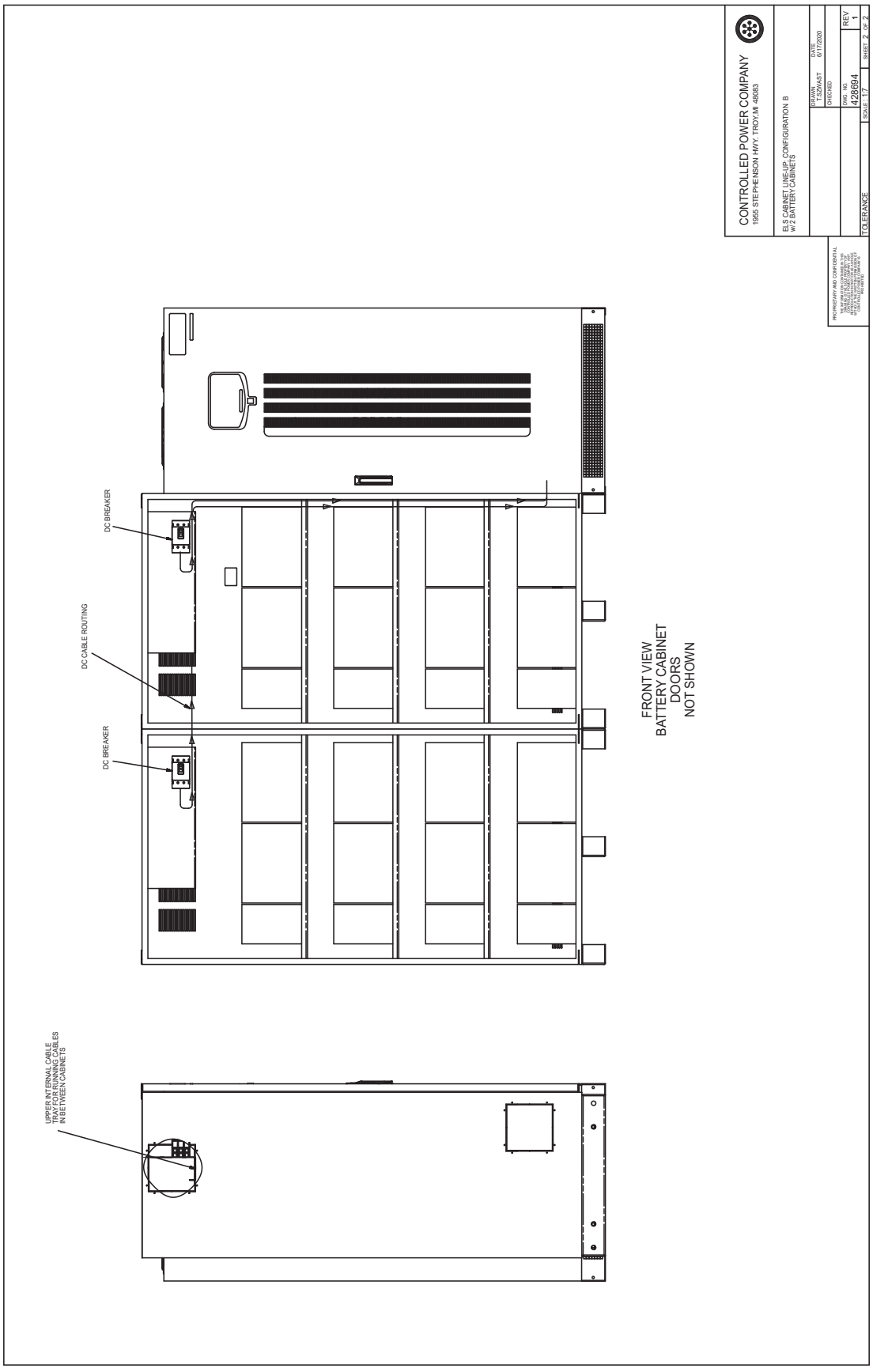
## CABINET OUTLINE - ELS CONFIGURATION "A" WITH 1 BATTERY CABINET AND TCE - PAGE 2



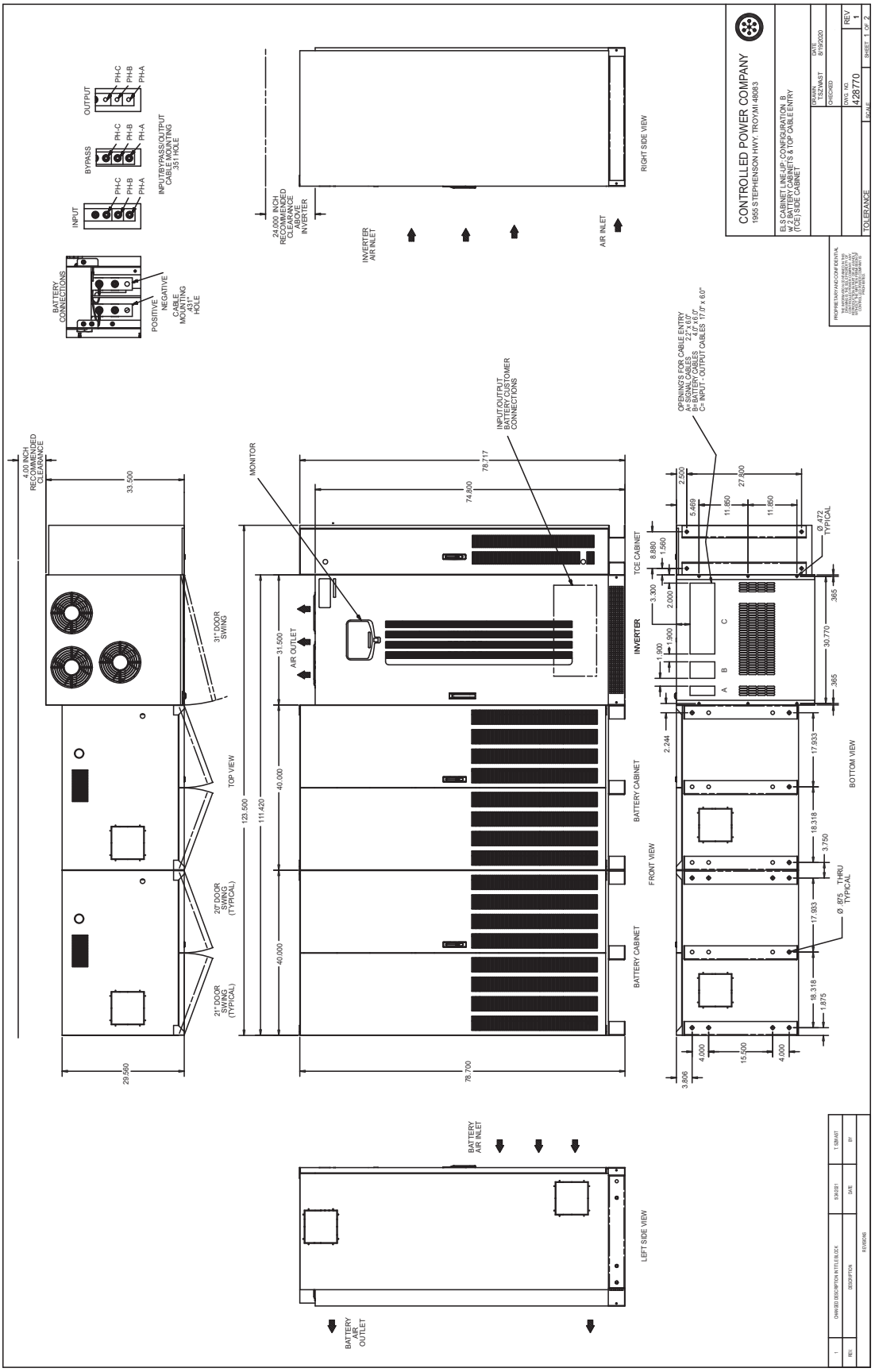
## CABINET OUTLINE - ELS CONFIGURATION "B" WITH 2 BATTERY CABINETS - PAGE 1



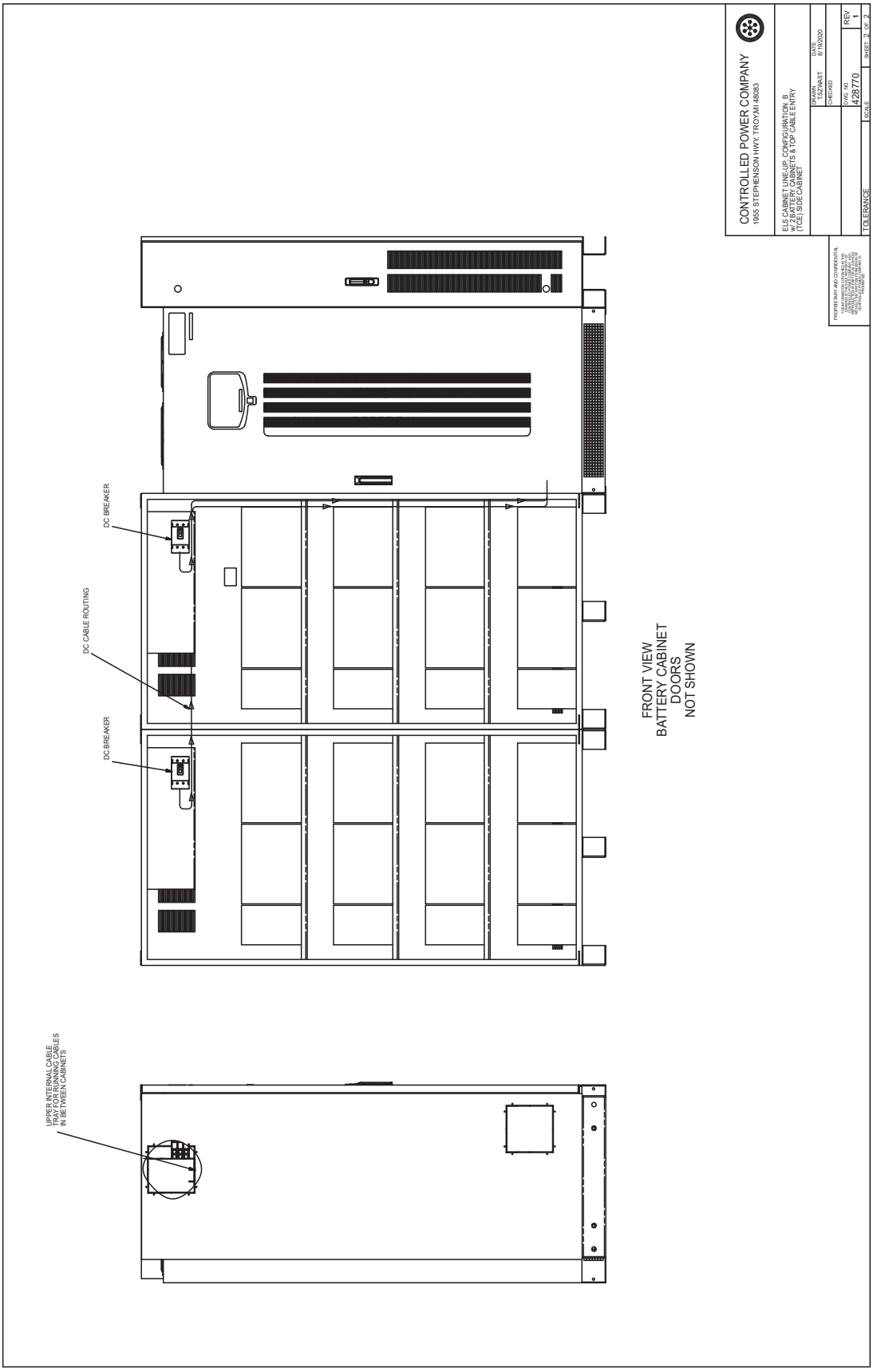
## CABINET OUTLINE - ELS CONFIGURATION "B" WITH 2 BATTERY CABINETS - PAGE 2



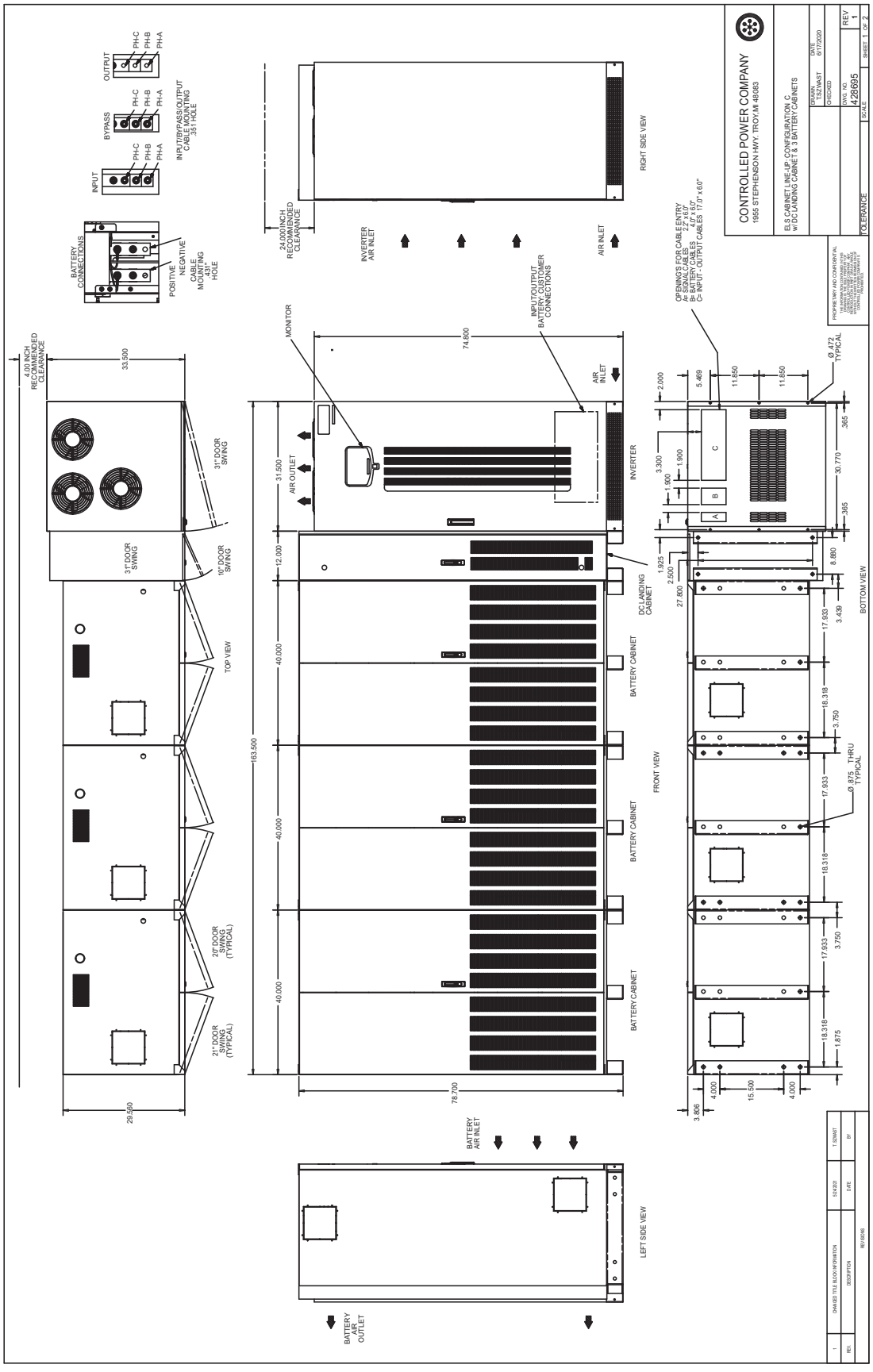
## CABINET OUTLINE - ELS CONFIGURATION "B" WITH 2 BATTERY CABINETS AND TCE - PAGE 1



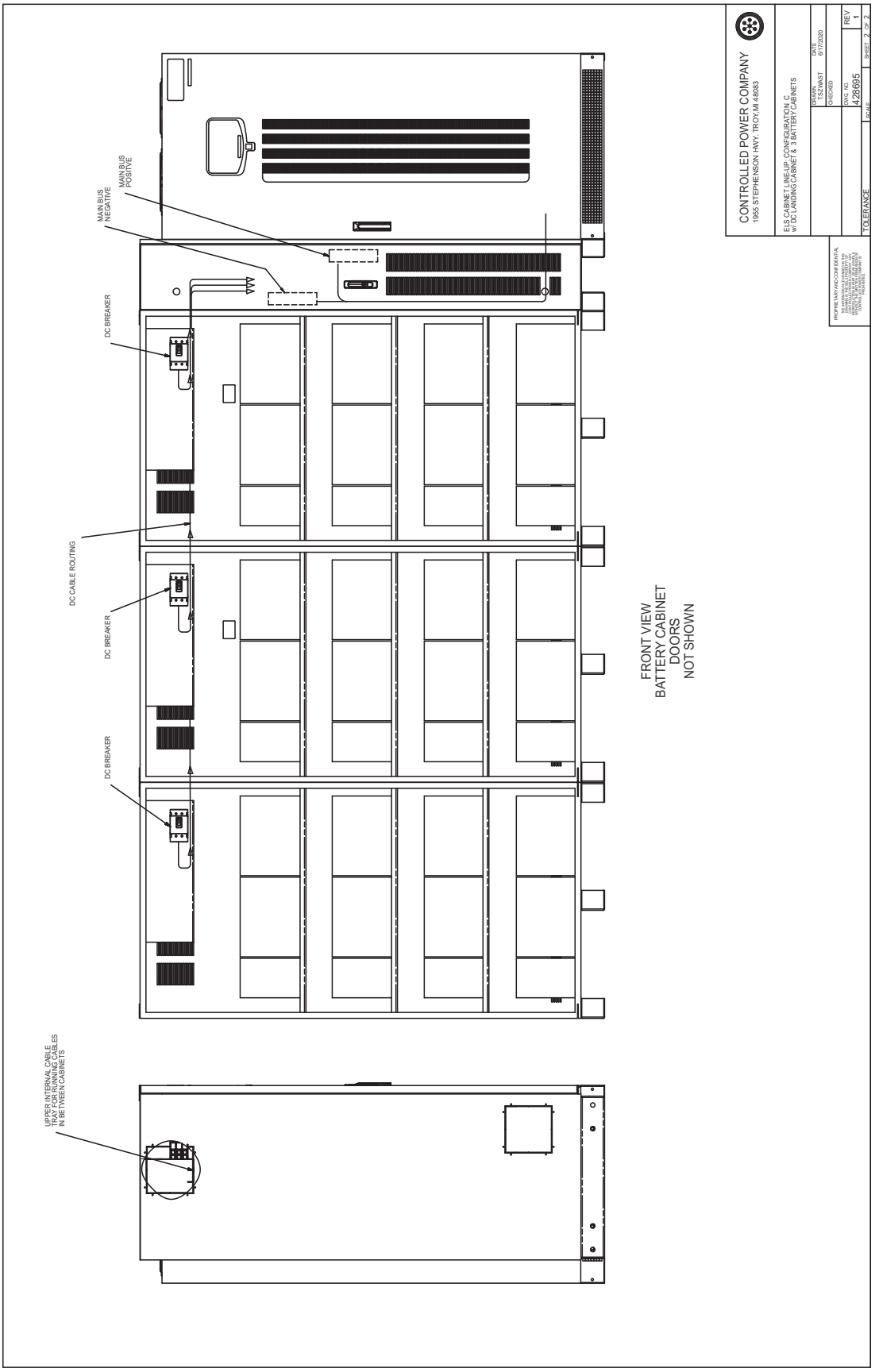
## CABINET OUTLINE - ELS CONFIGURATION "B" WITH 2 BATTERY CABINETS AND TCE - PAGE 2



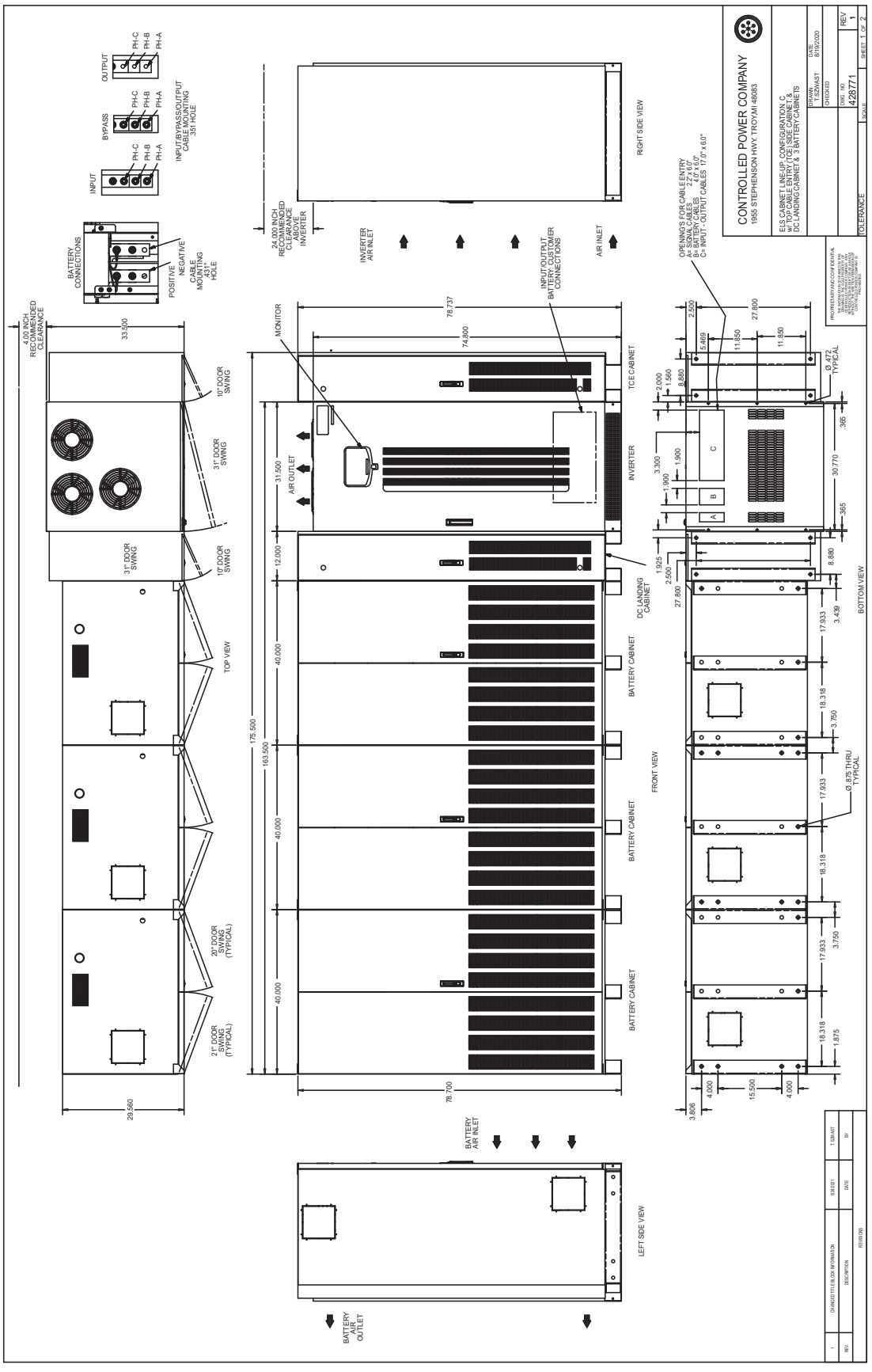
## CABINET OUTLINE - ELS CONFIGURATION "C" WITH 3 BATTERY CABINETS - PAGE 1



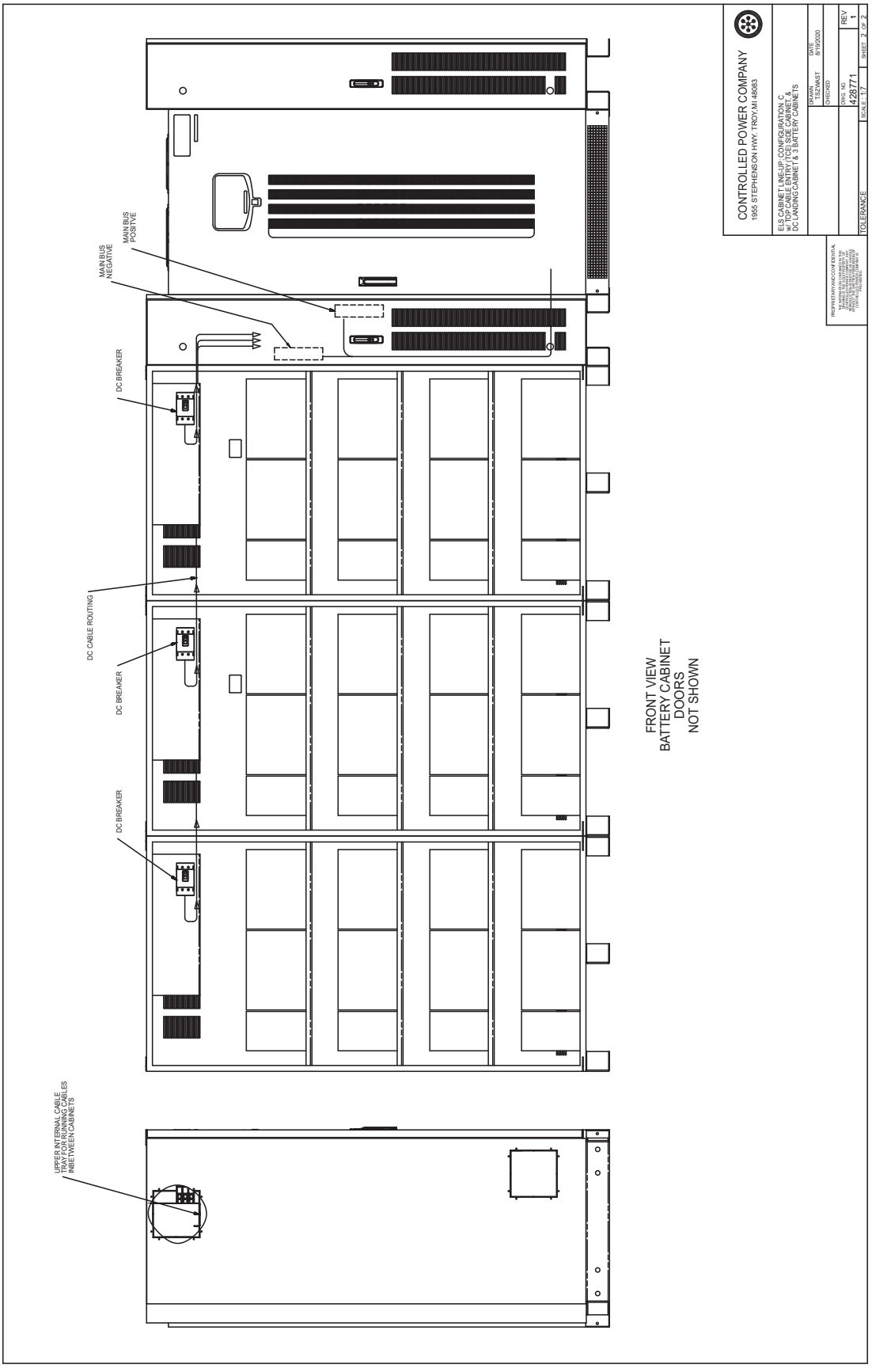
## CABINET OUTLINE - ELS CONFIGURATION "C" WITH 3 BATTERY CABINETS - PAGE 2



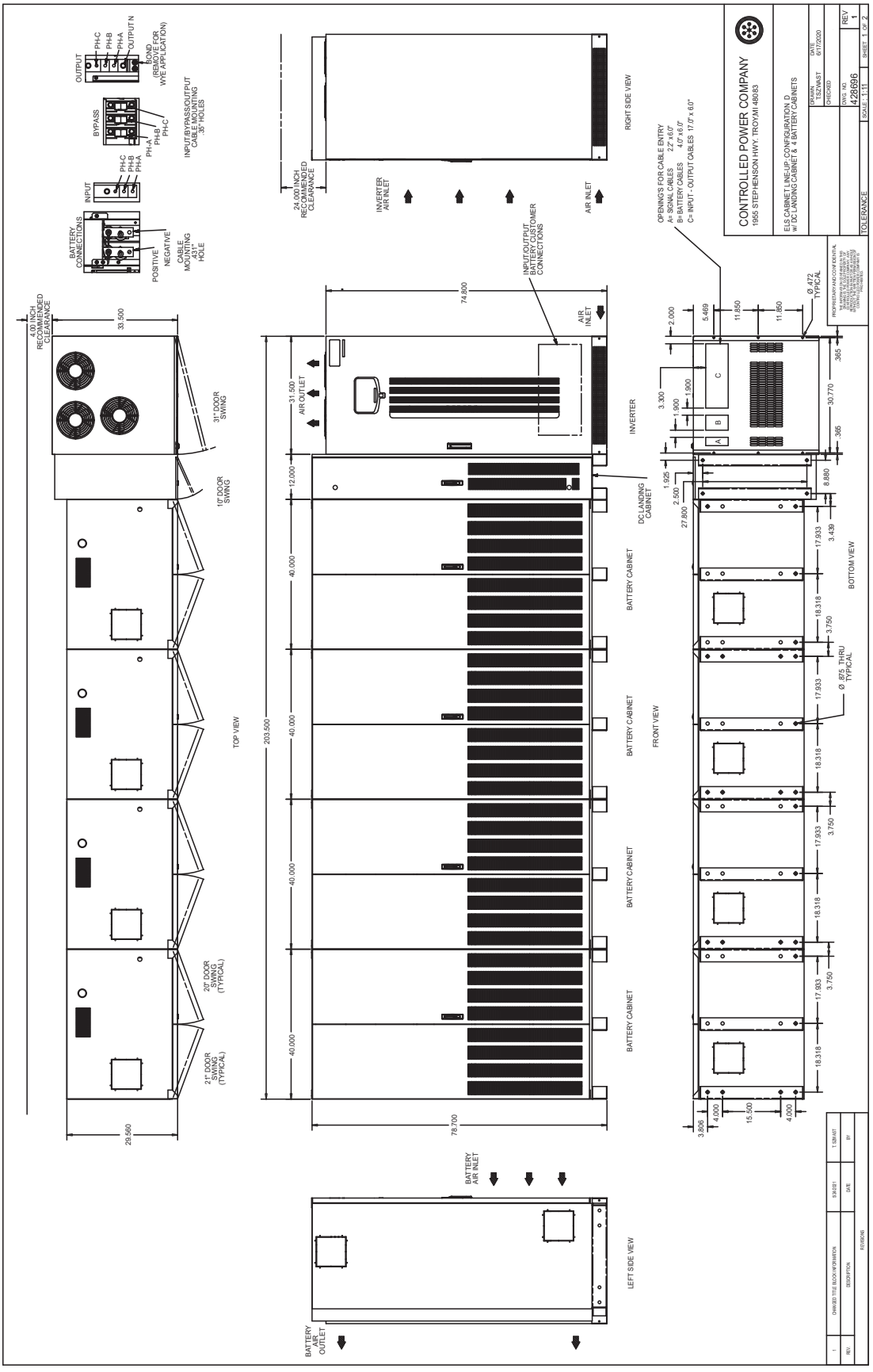
## CABINET OUTLINE - ELS CONFIGURATION "C" WITH 3 BATTERY CABINETS AND TCE - PAGE 1



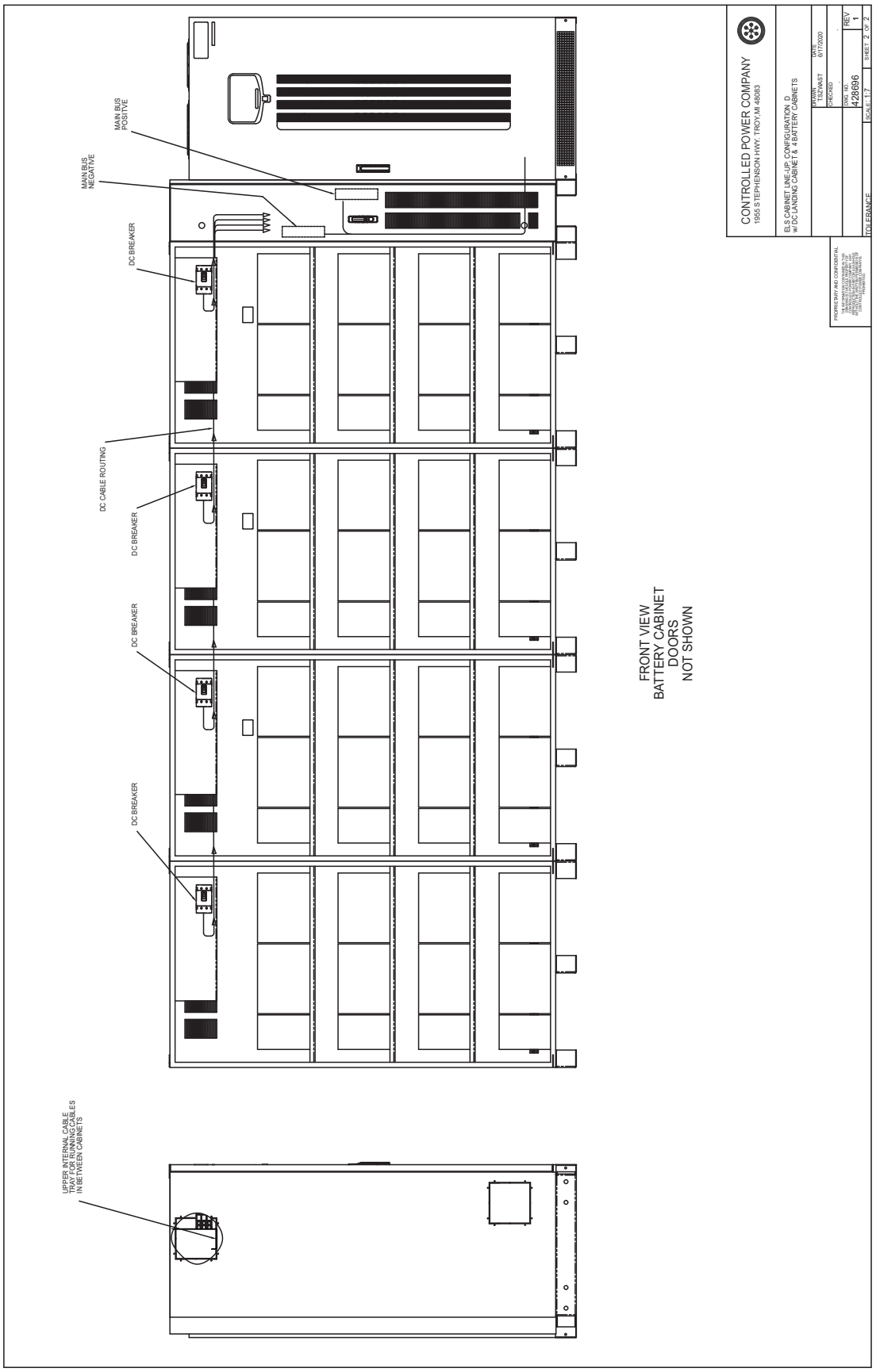
## CABINET OUTLINE - ELS CONFIGURATION "C" WITH 3 BATTERY CABINETS AND TCE - PAGE 2



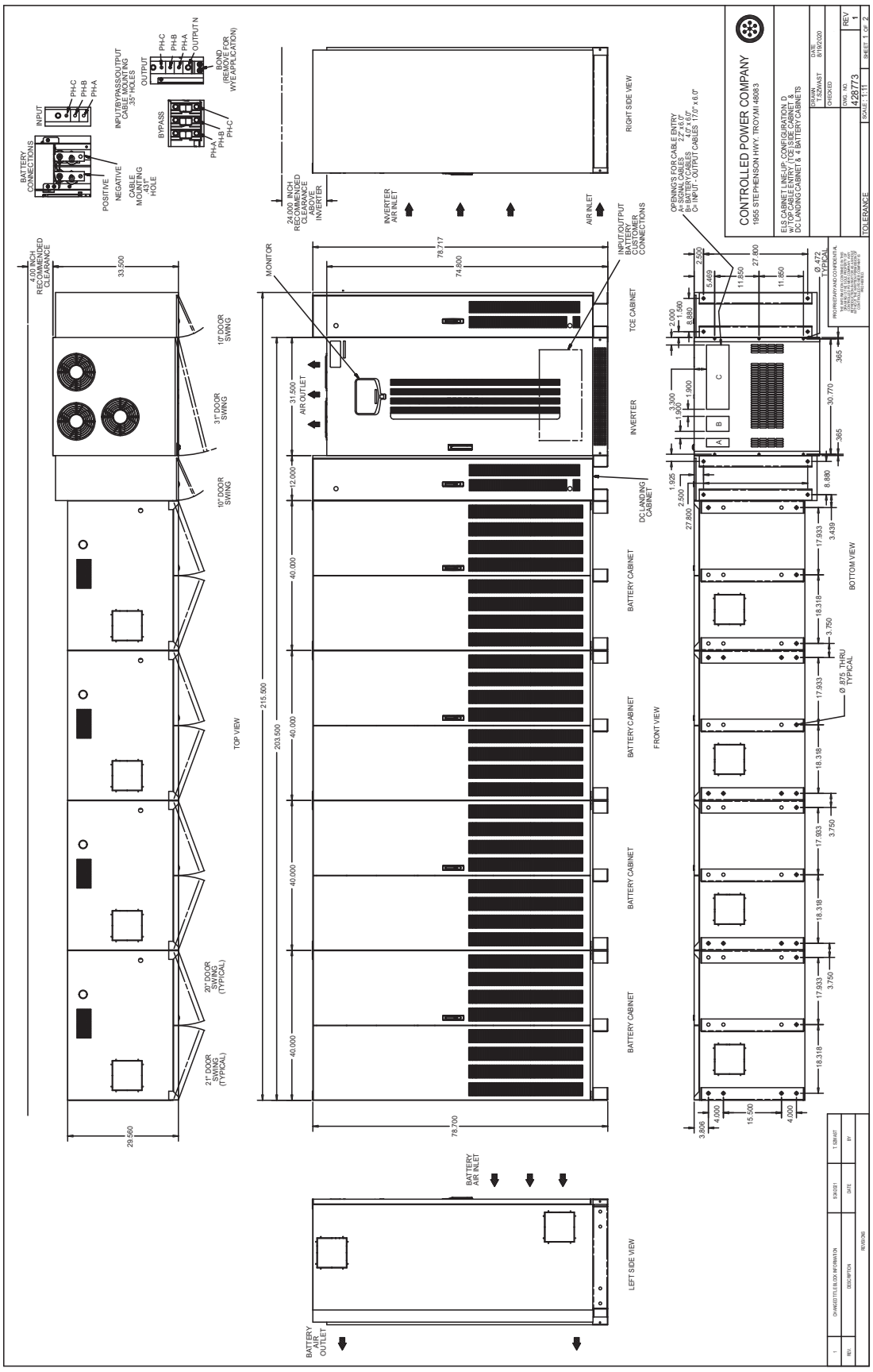
## CABINET OUTLINE - ELS CONFIGURATION "D" WITH 4 BATTERY CABINETS - PAGE 1



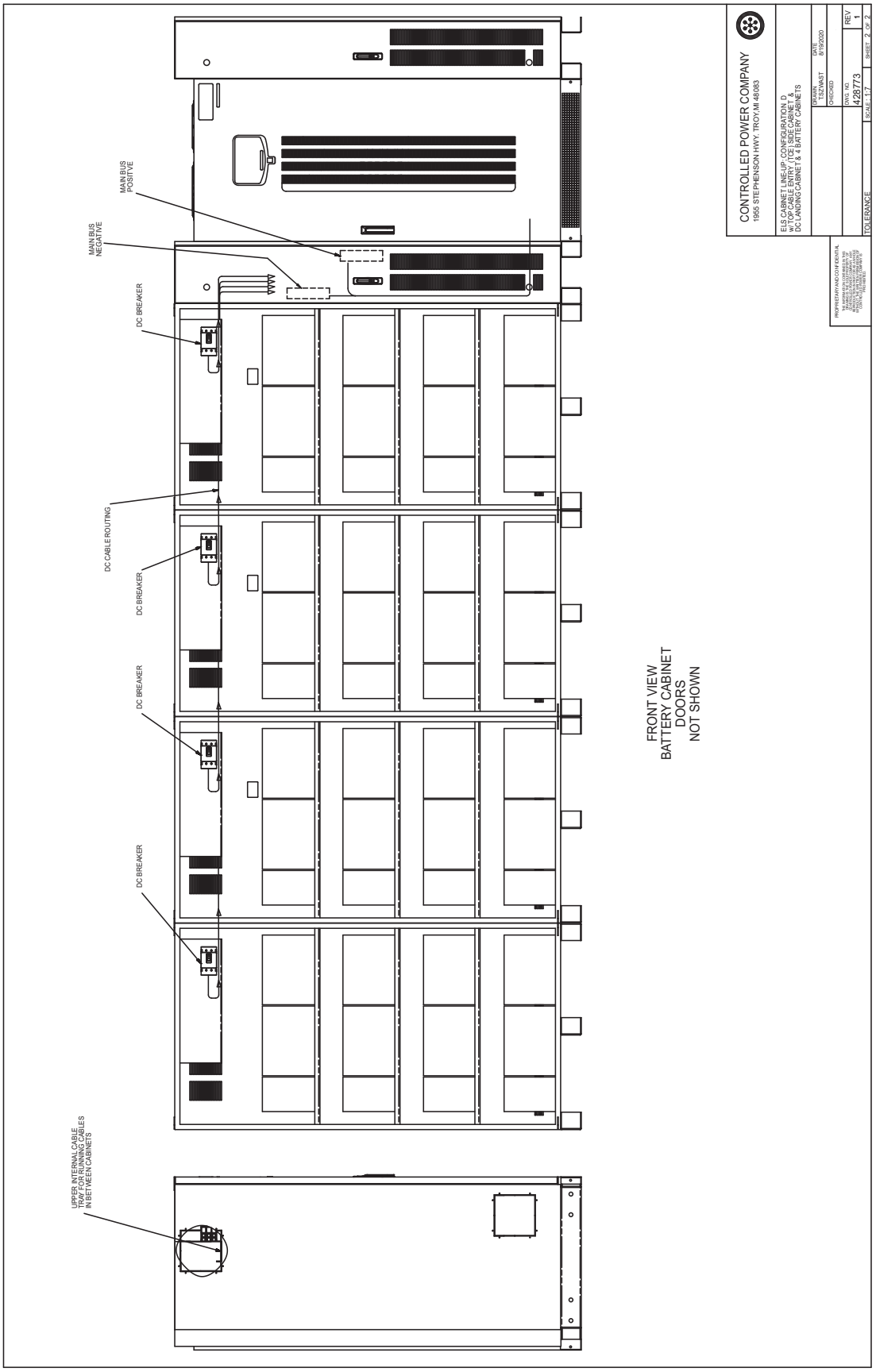
## CABINET OUTLINE - ELS CONFIGURATION "D" WITH 4 BATTERY CABINETS - PAGE 2



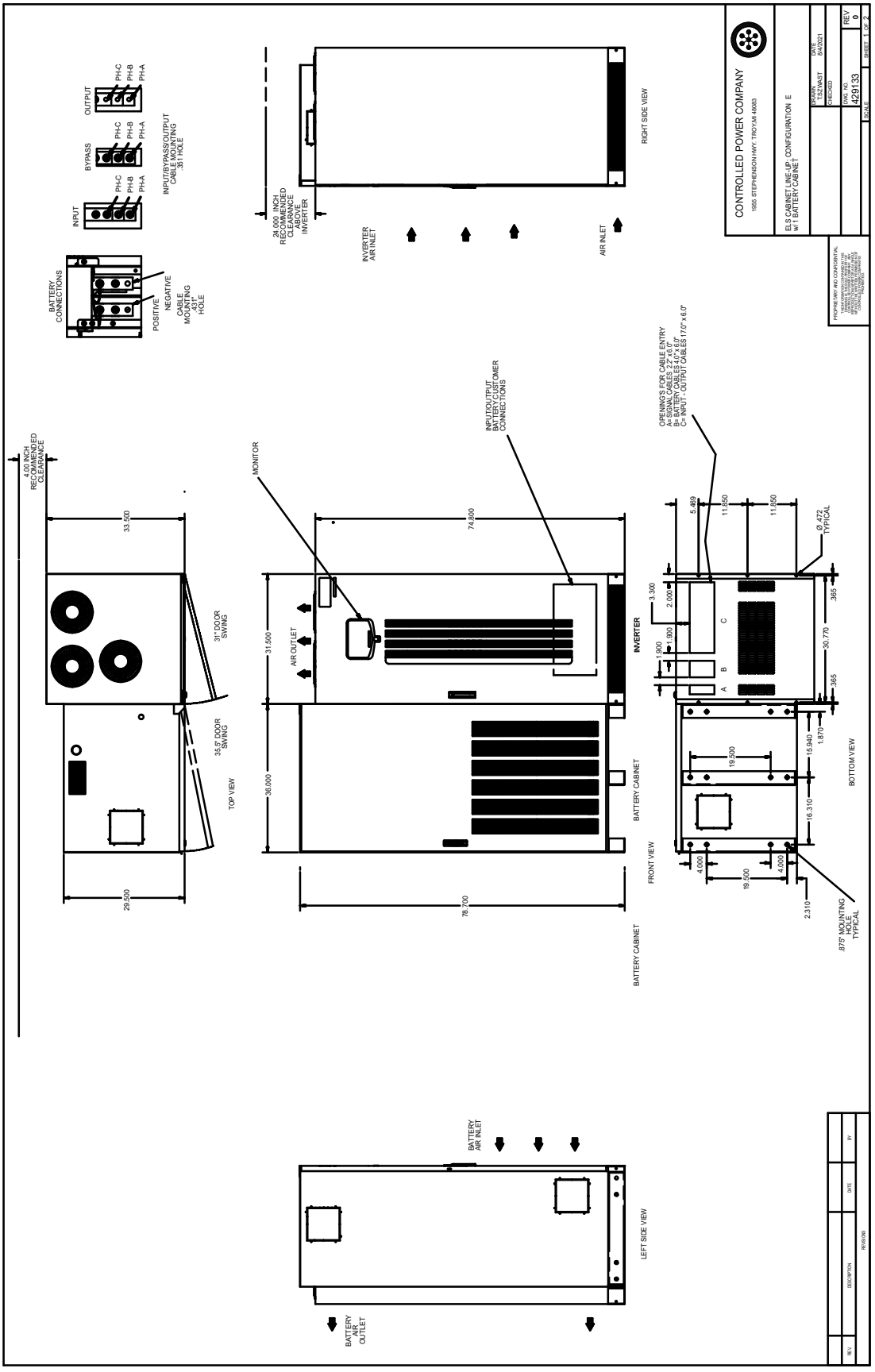
## CABINET OUTLINE - ELS CONFIGURATION "D" WITH 4 BATTERY CABINETS AND TCE - PAGE 1



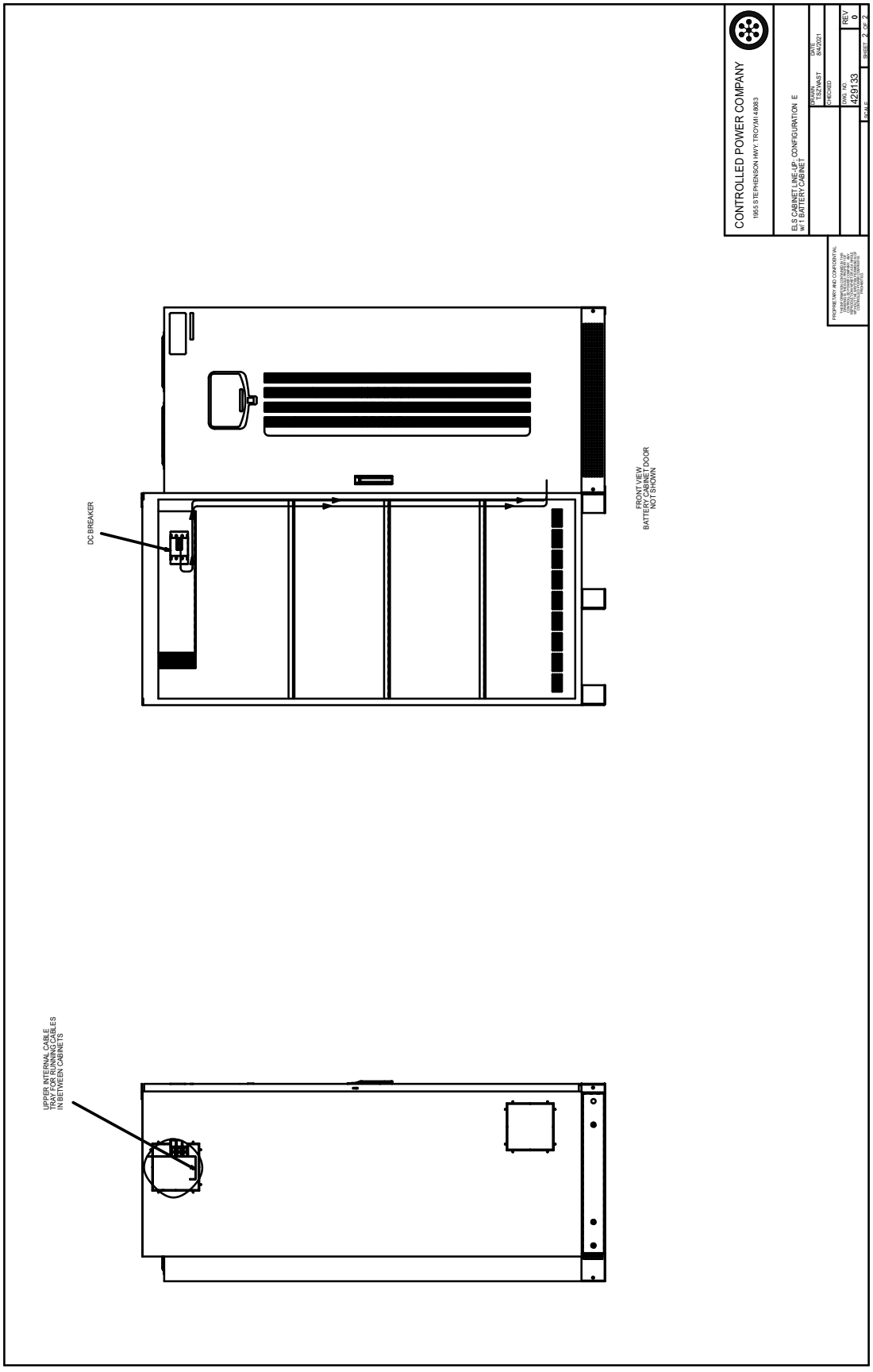
## CABINET OUTLINE - ELS CONFIGURATION "D" WITH 4 BATTERY CABINETS AND TCE - PAGE 2



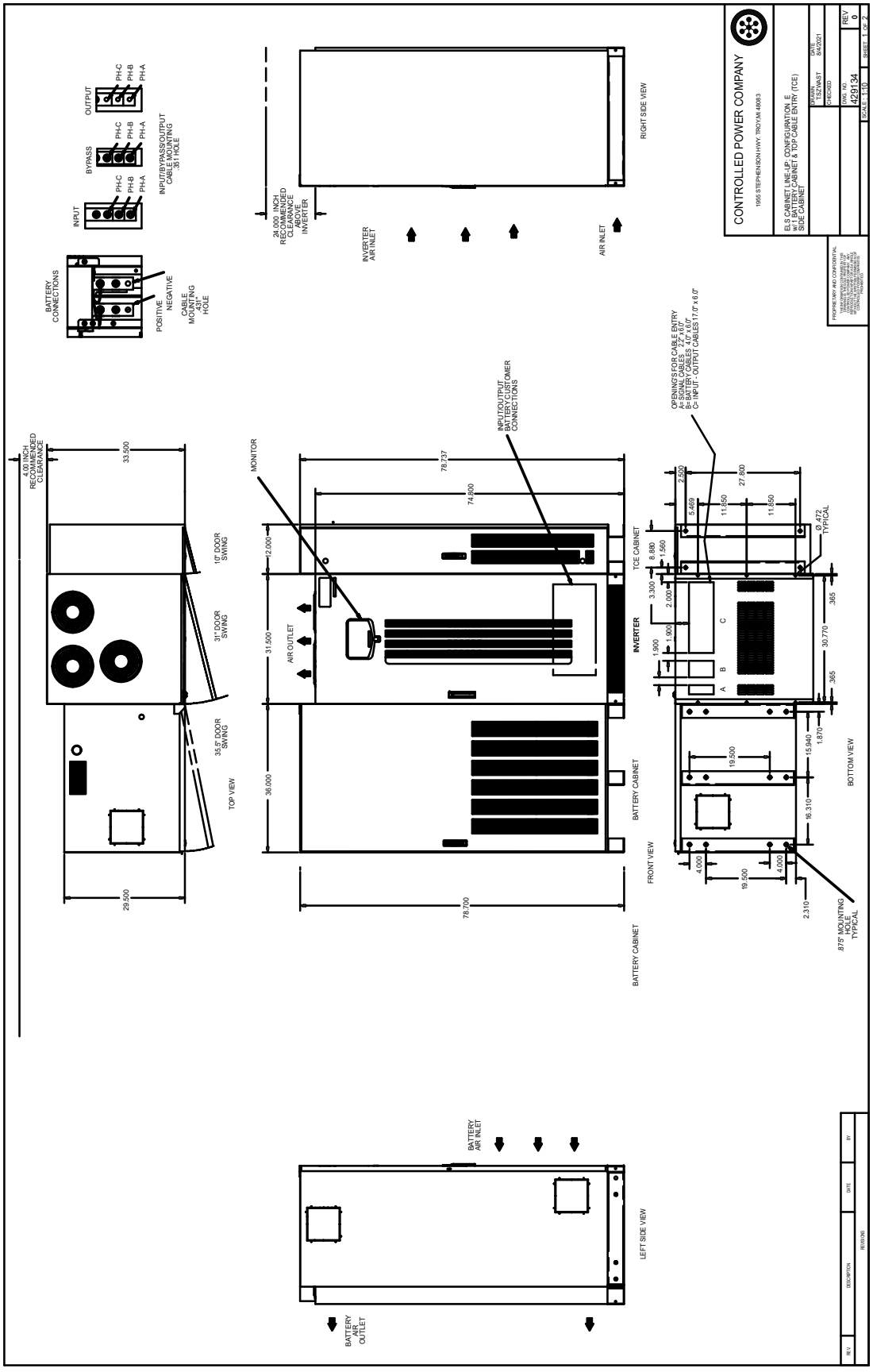
## CABINET OUTLINE - ELS CONFIGURATION "E" WITH 1 BATTERY CABINET - PAGE 1



## CABINET OUTLINE - ELS CONFIGURATION "E" WITH 1 BATTERY CABINET - PAGE 2



## CABINET OUTLINE - ELS CONFIGURATION "E" WITH 1 BATTERY CABINET AND TCE - PAGE 1



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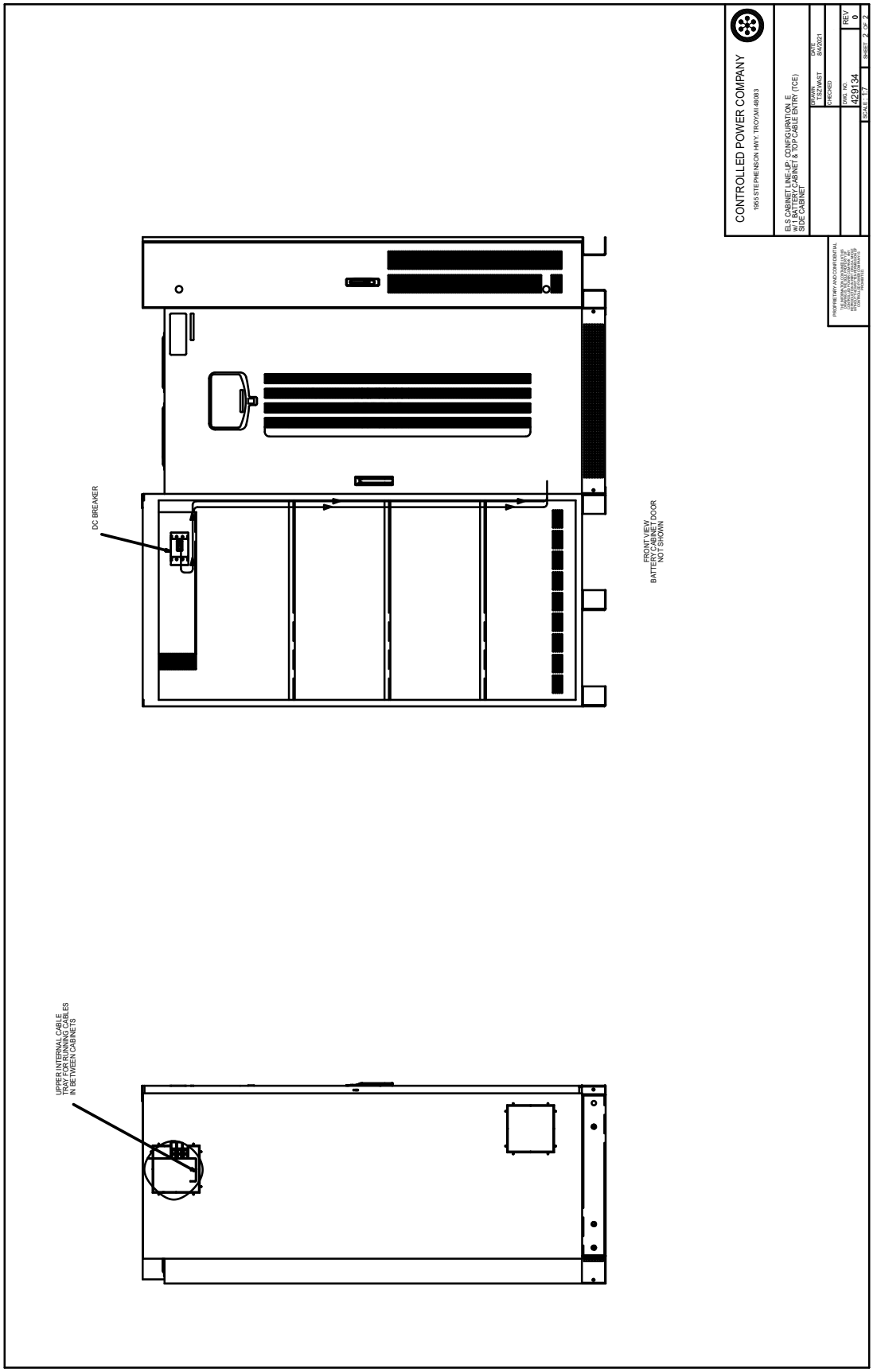
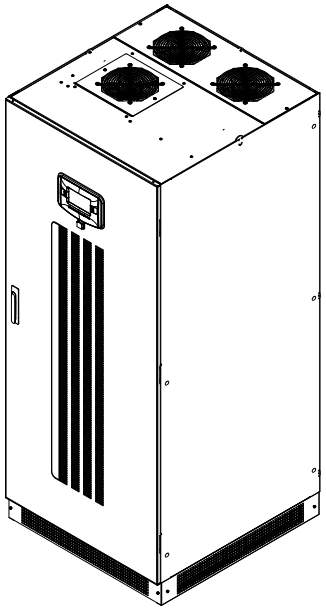


INSTALLATION INSTRUCTIONS
Read "User Manual" before starting with installation

| General characteristics for environmental consideration | | | | | |
|---|---|---|---|---|---|
| TrueLITE Model ELS | | ELS 58.5 | ELS 72 | ELS 90 | ELS 112.5 |
| Rated Power | kVA/ kW | 65/58.5 | 80/72 | 100/90 | 125/112.5 |
| Power loss (kW) 50%load/100%load | kW | 2.0/4.4 | 2.5/5.4 | 3.1/6.8 | 3.9/8.5 |
| Air flow | m³/h | 3000 | | | |
| Max ambient temperature | °C/°F | 40/104 | | | |
| Altitude without derating | m/feet | 1000/3300 | | | |
| Relative Humidity | | ≤ 95% non condensing | | | |
| Dimensions and weight | | | | | |
| Inverter weight | kg / lb | | 680 / 1500 | 730 / 1610 | 790 / 1742 |
| Dimensions WxDxH | mm / in | | 800x850x1900 / 31.5x33.46x74.8 | | |
| Footprint area | m² / ft² | | 0.85 / 9.146 | | |
| Opening for Cable Entry | | | | | |
| TOP | m² / ft² | NA | | | |
| BOTTOM | | 0.089 / 0.96 | | | |



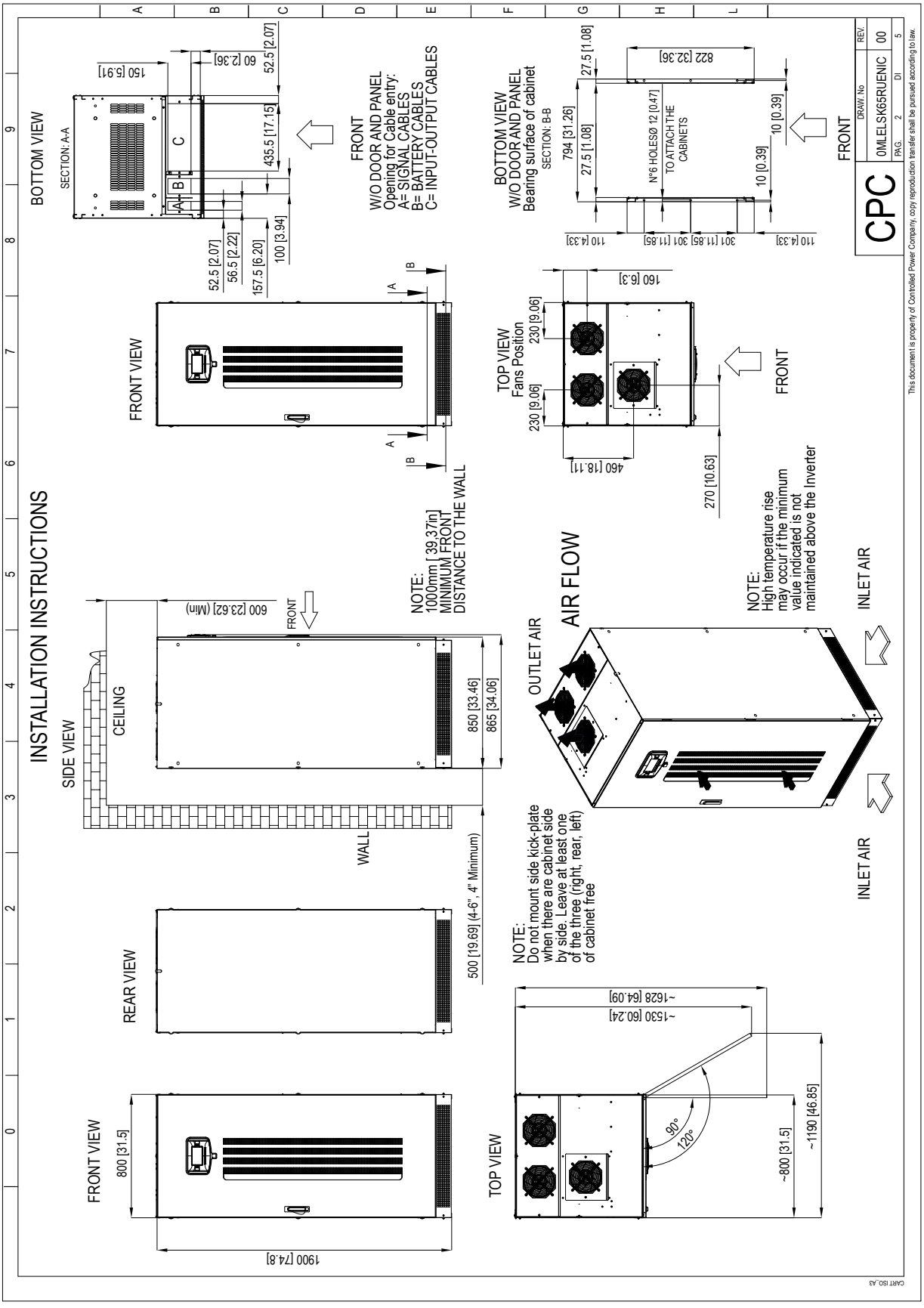
| POWER CONNECTIONS | | | | |
|---|---|---|---|---|
| WARNING | The Inverter is provided with Bond that connects the Neutral Output to the frame Ground for delta input connection. This is required to meet NEC grounding code for separately derived neutrals.<br>When a Neutral is provided in a Wye configured input connection, the bond should be removed, in accordance with Local code requirements.<br>Refer to NEC article 250(Grounding and Bonding) for identify system of grounding and size of Equipment grounding conductor | | | |
| | Branch OCP devices must be provided as parts of plant. | | | |
| | Use at least 75°C rated copper wires. The size of cables are reported from NEC Table 310.16. Could be required a larger awg size than shown in these tables, because of temperature, number of conductors in conduit or long service runs. | | | |
| TrueLITE size(kW) | 58.5 | 72 | 90 | 112.5 |
| INPUT AC LINE - SINGLE LINE | | | | |
| Input Line 3Ph + N + PE 277/480V 60Hz | | | | |
| Branch-OCP device size (A) | 125 | 150 | 175 | 200 |
| Phase and neutral cond. size (kcmil/Awg) | 1 Awg | 2/0 Awg | 3/0 Awg | 250 kcmil |
| INPUT AC LINE - DUAL SEPARATE LINE<br>(Remove the busbars connecting Input Mains line and Bypass Line See details on picture) | | | | |
| Input Mains 3Ph + PE 480V 60Hz | | | | |
| Branch-OCP device size (A) | 125 | 150 | 175 | 200 |
| Phase and neutral cond. size (kcmil/Awg) | 1 Awg | 2/0 Awg | 3/0 Awg | 250 kcmil |
| Input Bypass Line 3Ph + N + PE 277/480V 60Hz | | | | |
| Branch-OCP device size (A) | 100 | 125 | 150 | 200 |
| Phase and neutral cond. size (kcmi/Awg) | 2 Awg | 1/0 Awg | 2/0 Awg | 4/0 or 250kcmil |
| Output 3Ph + N 277/480V 60Hz | | | | |
| Branch-OCP device size (A) | 100 | 125 | 150 | 200 |
| Phase and neutral cond. size (kcmi/Awg) | 2 Awg | 1/0 Awg | 2/0 Awg | 4/0 or 250kcmil |
| Battery DC Input | | | | |
| Branch-OCP device size (A) | 160 | 200 | 250 | 300 |
| Phase and neutral cond. size (kcmi/Awg) | 3/0 Awg | 4/0 Awg | 300kcmil | 400kcmil |
| *If "CPC BBX 1900 480V UL L8 3U" battery cabinets are provided, the OCP device is included in the cabinet. For other applications read "User Manual" Battery connections.<br>.<br>Ground terminal of Battery Cabinet must to connected to Ground terminal of Inverter Cabinet. | | | | |

| CPC | EDIT. F.Mastropasqua | APPR. B.Boldrini | DATA: 13 / 05 / 19 | DRAW. No | REV. |
|---|---|---|---|---|---|
| | VARIATION: added seismic version page 5 | | | 0MLELSK65RUENIC | 00 |
| | REPLACE: | Scala: 1:20 | Peso/Weight 560.63 Kg | PAG. 1 | DI 5 |
| NOTE: ... | TITLE: MAN ELS UL 65-125 DRW EN ... | | | | |

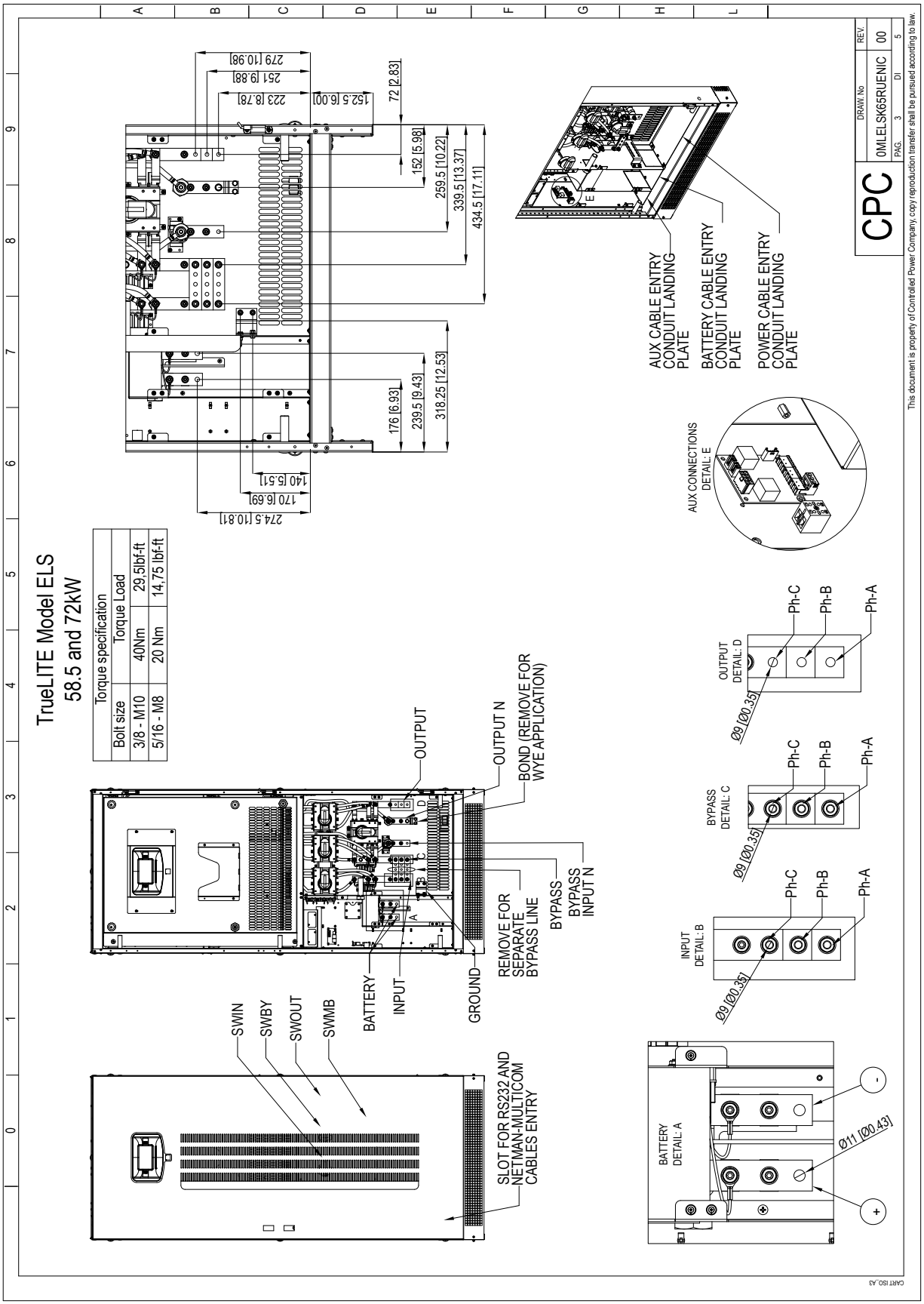


CART.ISO_A3

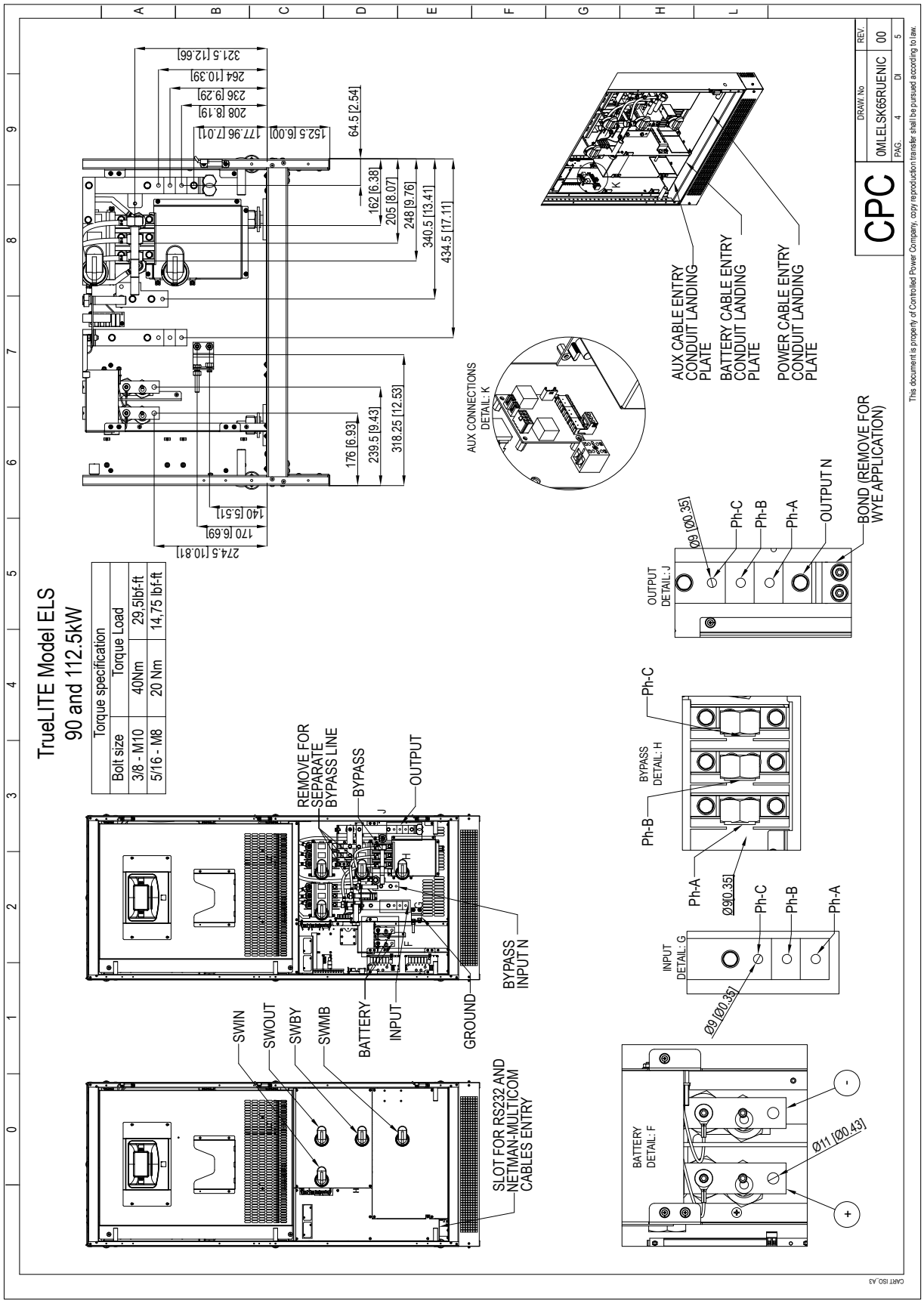
## INSTALLATION INSTRUCTIONS CONTINUED



INSTALLATION INSTRUCTIONS CONTINUED



## INSTALLATION INSTRUCTIONS CONTINUED



SEISMIC BRACKET INSTALLATION

THE TrueLITE INVERTER IS SPECIAL SEISMIC CERTIFICATION APPROVED AND IS IBC COMPLIANT (IBC 2006, 2009, 2012 AND 2015)

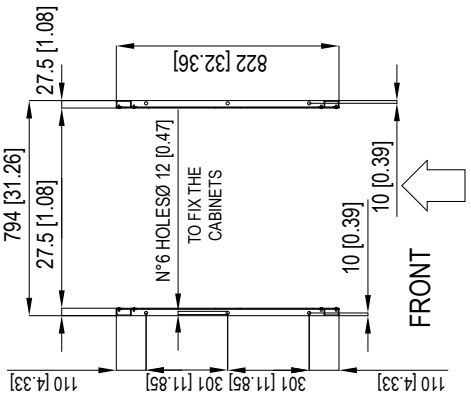
# TrueLITE - W/O TCE -Seismic Version

SEISMIC CRITERIA:

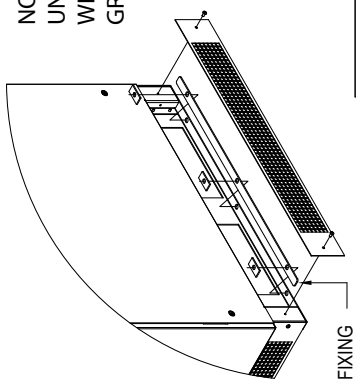
$S_{DS}$ (g) = 2.00 z/h = 1.0 Ip = 1.5 (ROOF LEVEL OR BELOW)

$S_{DS}$ (g) = 2.50 z/h = 0.0 Ip = 1.5 (GROUND LEVEL OR BELOW)

BOTTOM VIEW
W/O DOOR AND PANEL
Bearing surface of cabinet
Seismic Version
SECTION: B-B

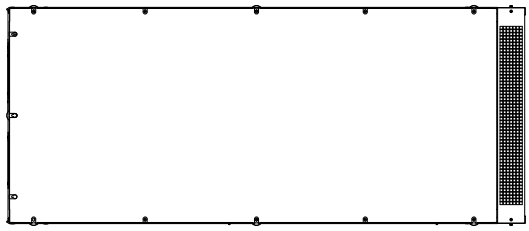



NOTE:
UNIT IS MOUNTED
WITH 3 / 8" (M10)
GRADE 8 BOLTS

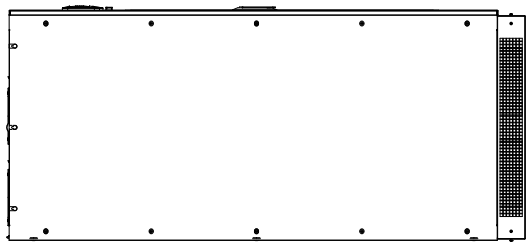


INSERT FLAT FIXING
SUPPORT ON BOTH SIDES

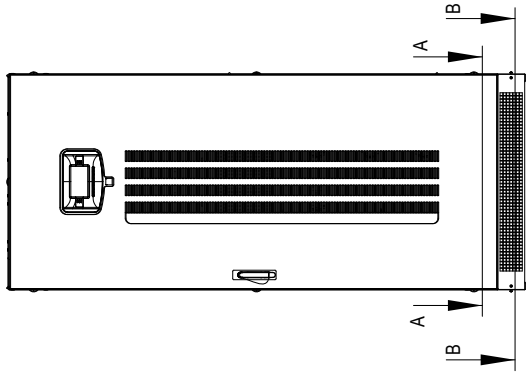
REAR VIEW



LEFT SIDE VIEW



FRONT VIEW




CPC

| DRAW. No | REV. |
|---|---|
| 0MLELSK65RUENIC | 02 |
| PAG. 5 DI 5 | |



CART ISO_A3

# *APPENDIX D - FACTORY PRESETS*

| ITEM | FACTORY SETTING |
|---|---|
| Language | ENGLISH |
| Rated Voltage Output | 480/277V |
| Battery Parameters | FACTORY SET AT: |
| Capacity | 290 Ah |
| Type | 0 |
| Battery Min. | 420 |
| CH (Float) | 544 |
| Max. (Maximum Charge) | 576 |
| Discharge Pre Alarm | 5 Minutes |
| Automated Battery testing | ENABLED |
| Test Frequency | 30 DAYS |
| Test Duration | 120 SECONDS |
| Shutdown due to power lower than a set value (Auto-Off in power) | DISABLED |
| Daily programmed shutdown (Auto Off time) | DISABLED |
| Bypass Voltage Range | -15%  +10% |
| Bypass Frequency Range | ± 5% |
| Modem configuration. | 0 |
| RS232-1 and RS232-2 ports | 9600 |
| On-Line Mode | ENABLED |
| Standby-on operation | DISABLED |
| Smart active operation | DISABLED |
| Audible Alarm | ENABLED |
| Date and Time | SHIPPED AT EST |

## INVERTER CONFORM TO:

This device has been designed and manufactured in accordance with the standards for the product.

- UL 924 Emergency Lighting and Power Equipment
- UL 924 Lighting and Power Equipment, Auxiliary (OUST)
- UL Standard 1778 2nd Edition
- National Electrical Code (NFPA-70)
- NEMA PE-1
- CUL to CSA C22.2 No.141-15 Emergency Lighting Equipment
- ASME, ASA-C-39.1-1984
- FCC Part 15 Subpart J Class A
- NEC, OSHA, IEEE587, ANSI C 62.41-1980

The conformity to these norms allow to put the CE mark.

## WARNING

This is a product for commercial and industrial application in the second environment – installation restrictions or additional measures may be needed to prevent disturbances (EN 62040-2 C3).

## Contact Controlled Power Company.

**CONTROLLED POWER COMPANY NATIONWIDE CUSTOMER SUPPORT**

Controlled Power Company offers total customer support that assures your critical equipment is maintained properly for trouble free operation.

**WHAT A CUSTOMER SUPPORT PLAN OFFERS:**

**HOT LINE:** 24 hour toll free 1-800-521-4792.

**REMEDIAL MAINTENANCE :** Covers all on-site repairs, parts, freight, labor and travel expenses.

**RESPONSE:** Immediate 24 hour phone support. If problem is not solved Controlled Power will make every effort to have your system running within 48 hours.

**BATTERIES:** Batteries are covered under a 15 year pro-rate schedule, beginning from the shipment date. The battery pro-rate does not cover labor, freight, battery disposal, travel or living expenses.

**PREVENTIVE MAINTENANCE:** Optional preventive maintenance includes the following:

**Annual battery run down certification for 90 minutes per NFPA 101 Life Safety Code, Section 5- 9.3 and NFPA 70 (N.E.C. 70) National Electric Code.**

- Testing all emergency circuitry
- Inspection
- Exercising all circuit breakers
- Input and output parameter check
- Complete battery inspection and testing
- Re-torque all high current terminals
- Calibration
- Clean internal and external
- Cooling fan check
- Air intake / exhaust check
- Written report
- **Battery certification report**

**START UP:** Includes installation inspection (wired properly, location, environment), Unit inspection (internal and external), Unit power up, Operation verification including options. One visit, includes all travel expenses.

| PLAN | ON SITE COVERAGE | PARTS COVERED | FIELD REPAIR LABOR COVERED | FACTORY REPAIR LABOR COVERED | FREIGHT COVERED | TRAVEL EXPENSES COVERED |
|---|---|---|---|---|---|---|
| SILVER | NONE | YES | NO | YES | NO | NO |
| GOLD | M-F 8AM-4PM | YES | YES | YES | YES | YES |
| PLATINUM | 24-7 | YES | YES | YES | YES | YES |

**TRAINING AND PARTS**

For Customers who maintain their own equipment, Controlled Power offers hands on training at our training facility and part kits. For more information, contact Controlled Power Customer Support Department at 1-800-521-4792.

Individual components are available upon request, please contact the factory for specific part numbers and prices. When contacting the Parts Department, please have the unit's full model number and serial or system number. Call 1-800-521-4792.

**This Warranty applies only to the original purchaser who must properly register the product within thirty (30) days of receipt.**

**https://controlledpwr.com/customer-support/warranty-registration/**

Controlled Power Company warrants that our products and their components will remain free from defects in material and workmanship for the duration of the respective warranty period* from the date of shipment and agrees to replace, F. O. B. its factory, any parts which fault through defect in material or workmanship during such period. Non payment for the product to either the reseller, rep, distributor or the factory direct will result in revocation of warranty, technical support and service contracts. **Warranty begins from date of factory Start Up (mandatory) or 90 days from ship date; whichever comes first.**

Start Up includes all travel and living expenses. Start-Up description: Testing all emergency circuitry - Calibration - Inspection - Exercising all circuit breakers - Cooling fan check - Input and output parameter check - Air intake / exhaust check - Complete battery inspection and testing - Re-torque all high current terminals - Battery certification report (where applicable) - Input/Output verification - Written report. User training to be done at time of start up (no return visits). Product installation is required to be complete before start up can be scheduled.

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Products:

- Emergency Lighting Inverter (Model ELS) / 2 Years parts only*, 1 Year On-Site Labor*, Batteries 1 Year full*, 14 year pro-rated*.

  * Warranty begins from date of factory Start Up (mandatory) or 90 days from ship date; whichever comes first.

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1. This Warranty shall be effective only if and so long as the system is installed and operated in the manner specified in the manual which accompanied the product, and is operated within the ratings on the nameplate of the system.

2. This Warranty shall be effective provided the purchaser pays the cost of transporting the faulty component(s) to and from Controlled Power Company's factory at the purchaser's own expense, unless the item covered under service contract with Controlled Power Company. There is no cost for installation of the replacement component(s) when done at the factory. Otherwise installation of the replacement component(s) are the responsibility of the purchaser, unless the item is covered under service contract with Controlled Power Company. If after inspection the faulty component has been caused by misuse or abnormal conditions in the judgment of Controlled Power Company, the purchaser will be charged for repairs based on parts and labor required. This Warranty does not cover fuses, light bulbs, and other normally expendable items. Controlled Power Company service personnel are not included in this warranty unless covered by a Controlled Power Company service contract.

3. This Warranty shall be void if any alteration is made to the system, or any of its components are altered by anyone other than an authorized Controlled Power Company service person, without the written permission of Controlled Power Company.

4. This Warranty is in lieu of all other warranties, expressed or implied. Controlled Power Company neither assumes, nor authorizes any person to assume for it, any liability other than that specifically set forth in this Warranty. Except for its obligations, Controlled Power Company assumes no liability or responsibility for personal injury, loss of life, consequential or other damages resulting from defects in, or failure of, the system or any of its components.

**https://controlledpwr.com/customer-support/warranty-registration/**