Leading Conversion Technology for Power Resilience

NEXT GEN 50 TO 100 KW

ZINC FIVE

User Manual V1.0

THE NEW GENERATION OF POWER CONVERTERS

- DUAL AC AND DC OUTPUT CONVERTER
  Commercial Power as default source
- AC AND DC BACKUP IN A DC ENVIRONMENT
  Leverage your existing DC infrastructure
- ONE STOP SHOP
  Wide output power range
- HARSHEST AC INPUT CONDITIONS
  Without compromising the quality of the AC output

Address: CE+T S.a, Rue du Charbonnage 12, B 4020 Wandre, Belgium
www.cet-power.com - info@cet-power.com

Leading Conversion Technology for Power Resilience

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Release Note:

Version	Release date (MM/DD/YYYY)	Modified page number	Modifications
1.0	10/22/2020	-	Draft release of the manual

1. Introduction to CE+T

CE+T Power designs, manufactures, and markets a range of products for industrial operators, with mission critical applications, who are not satisfied with existing AC backup system performances and related maintenance costs.

Our product is an innovative AC backup solution that unlike most UPS's available.

- Maximizes the operator's applications uptime;
- Operates with lowest OPEX;
- Provides best protection to disturbances;
- Optimizes footprint.

Our systems are:

- Modular
- Truly redundant
- Highly efficient
- Maintenance free
- Battery friendly

CE+T power puts 60+ years expertise in power conversion together with worldwide presence to provide customized solutions and extended service 24/7 - 365 days per year.

2. Abbreviations

AC	Alternating current
CB	Circuit Breaker
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
DSP	Digital Signal Processor
ECI	Enhanced Conversion Innovation
EMBS	External Maintenance Bypass Switch
EPC	Enhanced Power Conversion
ESD	Electro Static Discharge
ETH	Ethernet
G	Ground / Grounding
HTTP	HyperText Transfer Protocol
HTTPS	Secure HyperText Transfer Protocol
LAN	Local Access Network
MBB	Measure Box Battery
MBP	Manual By-pass
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker
MET	Main Earth Terminal
MIB	Management Information Base
N	Neutral
NTP	Network Time Protocol
NUA	Non-Urgent Alarm
PCB	Printed Circuit Board
PE	Protective Earth (also called Main Protective Conductor)
PPE	Personal Protective Equipment
PWR	Power
REG	Regular
SNMP	Simple Network Management Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TRS	True Redundant Structure
TSI	Twin Sine Innovation
TUS	TSI Universal Synchronization
UA	Urgent Alarm
USB	Universal Serial Bus

3. Warranty and Safety Conditions*

WARNING:

The electronics in the power supply system are constructed in an IP20 frame. Installation of the system must be in an environment which meets or exceeds IP35 standards. The room (or building) must be protected from the ingress of:

- particles >2.5 mm diameter
- low pressure water jets from all directions
- corrosive airborne contaminates

Important Safety Instructions, Save These Instructions.

3.1 Disclaimer

- The manufacturer declines all responsibilities if equipment is not installed, used, or operated according to the instructions herein by factory certified technicians according to local regulations.
- Warranty does not apply if the product is not installed, used, or handled according to the instructions in the manual. Manufacturer may waive warranty if the system is not installed and commissioned by factory trained technician.
- This equipment is shipped with a SHOCKWATCH monitor. If the SHOCKWATCH shows that the equipment was exposed to excessive force the warranty will be void.
- When shipped by truck, the truck must be equipped with Air Ride handling.

3.2 Technical care

- This electronic equipment can only be repaired or maintained by a “qualified employee” with adequate training. Even personnel who are in charge of simple repairs or maintenance are required to have knowledge or experience related to product maintenance.
- Please follow the procedures contained in this Manual, and note all the “DANGER”, “WARNING” AND “NOTICE” marks contained in this Manual. Warning labels must not be removed.
- Qualified employees are trained to recognize and avoid any dangers that might be present when working on or near exposed electrical parts.
- Qualified employees know how to lock out and tag out machines so the machines will not accidentally be turned on and injure employees working on them.
- Qualified employees are trained in OSHA and NFPA safety related work practices, and NFPA 70E Arc Flash Protection and PPE requirements.
- All operators are to be trained to perform the emergency shut-down procedure.
- Never wear metallic objects such as rings, watches, or bracelets during installation, service, and maintenance of the product.
- Maximum operating ambient temperature for the UPS is 40°C (104°F). Battery temperature range may vary.
- Insulated tools must be used at all times when working with live systems.

* These instructions are valid for most CE+T Products/Systems. Some points might however not be valid for the product described in this manual.

- When handling the system/units pay attention to sharp edges.
- This product is suitable for use in a computer room.

3.3 Installation

- This product is intended to be installed only in restricted access areas as defined by UL60950 and in accordance with the National Electric Code, ANSI/NFPA 70, or equivalent agencies.
- The user must observe the recommended UL listed upstream and downstream circuit breaker requirements as defined in this manual.
- Please use extreme caution when accessing circuits that may be at hazardous voltages or energy levels.
- The modular converter rack is a dual input power supply. The complete system shall be wired in a way that both input and output leads can be de-energized when necessary.
- To comply with local and international safety standards N (input) and PE shall be bonded. The bonded connection between N (input) and PE must be removed once the AC input is connected. Refer to section 7.5.3, page 28.
- AC and DC circuits shall be terminated with no voltage / power applied (de-energized).
- The safety standard IEC/EN62040-1-1 requires that, in the event of an output short circuit, the converter must disconnect in 5 seconds maximum. The parameter can be adjusted on Inview or equivalent device; however, if the parameter is set at a value > 5 seconds, an external protection must be provided so that the short circuit protection operates within 5 seconds. Default setting is 60 seconds.
- The system is designed for installation within an IP20 environment. When installed in a dusty or humid environment, appropriate measures (air filtering) must be taken. Installation of filters may result in de-rating of module.
- Environmental Conditions for UPS System (not including batteries)
  - Storage Conditions: -40 to 70°C
  - Battery Storage Conditions: Consult Battery Manufacturer

    (Batteries shall not be stored, unused, for greater than 6 months)
  - Relative Humidity: 0 – 95%, non-condensing
  - Altitude above sea without de-rating: Less than 1500 m
    Greater than 1500 m: de-rating at 0.8% per 100 m

3.3.1 Handling

- The cabinet shall not be lifted using lifting eyes.
- Remove weight from the cabinet by removing the converter modules. Mark converter modules clearly with shelf and position for correct rebuild. This is especially important in dual or three phase configurations.
- Empty module positions must not be left open. Replace with blank module or cover.
- This equipment is shipped with a SHOCKWATCH monitor. SHOCKWATCH monitor should be inspected upon receipt of shipment. If the SHOCKWATCH shows that the equipment was exposed to excessive force the warranty will be void.

3.3.2 Surge and Transients Protection

The mains (AC) supply of the modular converter system shall be equipped with Lightning surge suppression and Transient voltage surge suppression suitable for the application. Follow manufacturer's recommendation for installation. Selecting a device with an alarm relay for function failure is advised.

All sites are considered to have a working lightning surge suppression device in service and installed close enough to ensure effective protection in accordance with best industry practice.

- Indoor sites Min Class II.
- The modular converter system/rack can reach hazardous leakage currents. Grounding must be carried out prior to energizing the system. Grounding shall be made according to local regulations.

3.3.3 Other

- Insulation test (Hi-Pot) must not be performed without instructions from the manufacturer. Irreparable damage may occur.

3.4 Maintenance

- The modular converter system/rack can reach hazardous leakage currents. Grounding must be carried out prior to energizing the system. Grounding shall be made according to local regulations (NEC - NFPA 70).
- Prior to any work conducted on a system/unit make sure that AC input voltage and DC input voltage are disconnected.
- Converter modules and shelves contain capacitors for filtering and energy storage. Prior to accessing the system/modules after power down, wait at least 5 minutes to allow capacitors to discharge.
- Some components and terminals carry high voltage during operation. Contact may result in fatal injury.

3.5 Replacement and Dismantling

- ESD Strap must be worn when handling PCB's and open units.
- CE+T cannot be held responsible for disposal of the Converter system and therefore the customer must segregate and dispose of the materials which are potentially harmful to the environment, in accordance with the local regulations in force in the country of installation.
- If the equipment is dismantled, to dispose of its component products, you must comply with the local regulations in force in the country of destination and in any case avoid causing any kind of pollution.

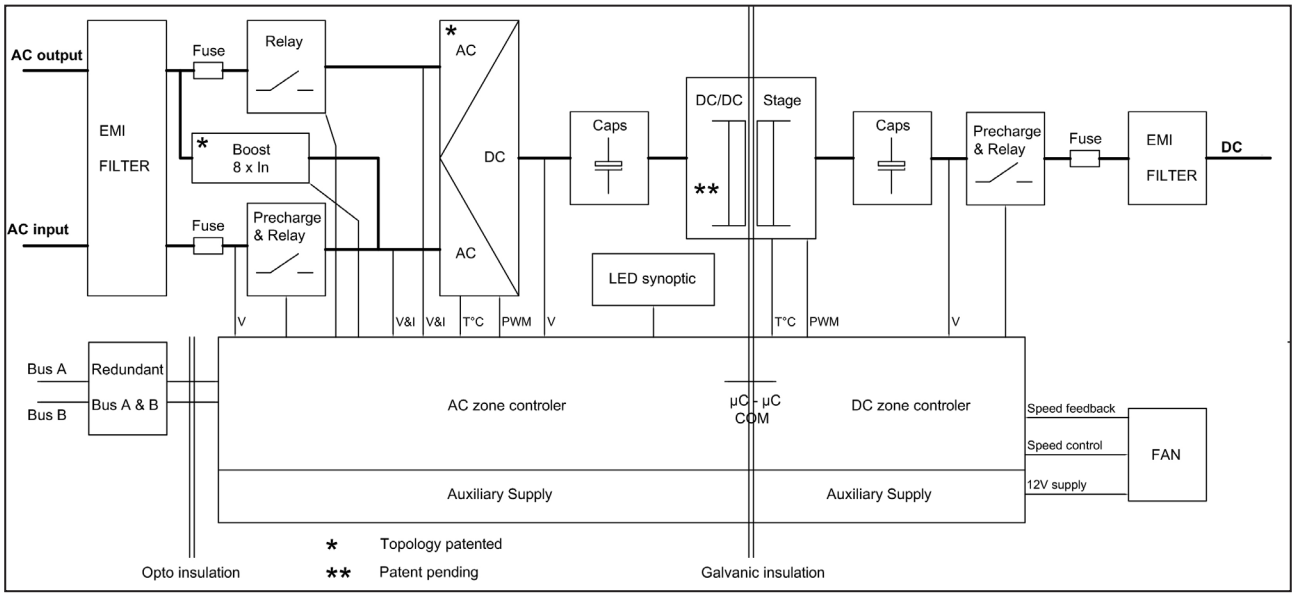
3.6 Documentation

- To obtain soft copies of the latest equipment documentation, please visit www.cet-power.com
- To obtain the most recent firmware for your equipment, please visit my.cet-power.com (authorized vendors only)

4. ECI Technology[1]

Sierra module built with ECI technology and it is a triple port converter. This module delivers a pure sinusoidal output and ripple free DC output from AC mains or battery.

The below block diagram gives an explicit description of the topology and its operation.



ECI technology has **AC to DC**, **DC to AC**, and **DC to DC** converters to provide constant and disturbance-free output power regardless of the input source.

The power flows either from AC or DC source under the control of the DSP controller. Thanks to internal energy buffering for transferring the load between two input sources by 0 ms.

ECI can detect short circuit conditions at the AC output level and start the BOOST mode function. This mode will provide 8x of the nominal current to clear the fault within 20ms, and thus keeping other critical loads in operation.

Sierra module works on True Redundant Structure (TRS) that features decentralized, independent logic, and redundant communication bus.

Each Sierra module has three levels of protection, and it will help to isolate from other modules in case of any fault in the corresponding module. Due to this functionality in each module, it provides no single point of failure in modular systems.

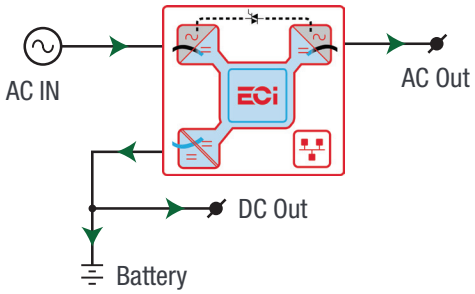
The Sierra modular systems provide quality output power with higher efficiency.

1 Information and data given in this chapter is intended to serve as an overview of the ECI Technology. Detailed features and parameters for each individual module type in the range may differ and should be referred to in the dedicated data sheet.

4.1 EPC mode

When the Sierra power modules are in EPC mode, the AC Mains is the primary source and DC source works as a backup. When AC mains is present, the sierra module takes energy from the AC source and feed to:

- **AC Load** via a double conversation to provide a pure sine wave.
- **DC load** and also charges the battery with a regulated DC.



The total output power of a module can be shared between the AC load, DC load and charging power based upon the requirement.

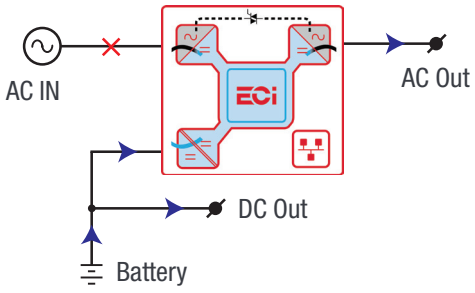
If the AC source is not present, the module seamlessly switches to DC source without impacting the critical loads and resumes to EPC mode once AC source returns. The transfer time between AC to DC and DC to AC is 0 ms.

The EPC mode provides a higher efficiency of ≥ 94.5% without compromising the purity of the output sine wave.

4.2 Back up mode

In back up mode, the Sierra power modules operate from the DC source (Battery) and feed to:

- AC Load via a double conversation to provide a pure sine wave.
- DC load directly (Unavailable on UPS units).



5. Building Blocks

5.1 Sierra 25 - 120 Vac

Telecom / Datacom:	Input	52 Vdc 120 Vac, 50/60 Hz
	Output	52 Vdc 120 Vac
	Power	2.75 kVA / 2.25 kW

- The Sierra converter is a triple port converter.
- Each converter can supply 2.25 kW on any **DC**, **AC** or combination of **both AC** and **DC** output ports. AC output load is the highest priority. Even if AC output is fully loaded (2.25 kW), still 300 W is available for DC output.
- Hot swappable and hot pluggable.
- The front LED's indicate the converter status and output power.
- Module is equipped with soft start.
- Fan is equipped with alarm and run time meter. The fan is field replaceable.
- 435 mm (D) x 102 mm (W) x 88 mm (H).
- 5 Kg.

5.1.1 Specifications

Model	Sierra 25 - 48/120
Part Number: Module / shelf	T721330201 / T724330000
Cooling / Audible noise	Fan forced cooling / <65db @1meter
MTBF	240 000 hrs (MIL-217IF)
Dielectric strength DC/AC	4300 Vdc
RoHS	Compliant
Operating T° / Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-3 Class 3.1 -20°C to 65°C, power de-rating from 40°C to 65°C / Max RH 95% for 96 hours per year
Storage T° / Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-1 Class 1.2 -40°C to 70°C / Max RH 95% for 96 hours per year
Public transport T°/Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-2 Class 3.1 -40°C to 70°C / Max RH 95% for 96 hours per year
Material (casing)	Zinc coated steel
AC Input Data	
Nominal voltage	120 Vac
Voltage range	90 - 140 Vac
Brownout	1600 W @ 90 Vac / 2550 W @ 100 Vac linear decreasing
Power factor	> 0.99
Frequency (Synchronization range)	50 Hz (47 – 53 Hz) / 60 Hz (57 – 63 Hz)

Model	Sierra 25 - 48/120
DC Input Data	
Nominal voltage / range	52 Vdc / 40-60 V
Nominal current	52.3 A @ 52 Vdc & 2.25 kW
Maximum input current (for 15 seconds) / voltage ripple	63 A / < 10 mV_{RMS}
AC Output Data	
Efficiency AC to AC (EPC) / DC to AC / AC to DC	94.5% / > 92.5% / > 92.5%
Nominal voltage (Adjustable)	120 V (100 - 130 Vac)
Frequency / frequency accuracy	50 or 60 Hz / 0.03%
Nominal Output power	2.75 kVA / 2.25 kW @ 52 Vdc
Short time overload capacity	125% (15 seconds)
Admissible load power factor	Full power rating from 0 inductive to 0 capacitive
Total harmonic distortion (resistive load)	< 3%
Load impact recovery time (10% - 90%)	≤ 0.4 ms
Nominal current	22.9 A @ 48 Vdc
Crest factor at nominal power	3 : 1 for load P.F. ≤ 0.7
Short circuit clear up capacity 0-20 ms	200 A for 20 ms - Available while Mains is available at AC input port / 34A RMS in DC/AC
Short circuit current after >20 ms -15 s	42 A RMS
AC output voltage stability	±1% from 10% to 100% load
DC Output Data	
Nominal Voltage / range	53.5 Vdc / 40-60 V
Maximum power	2.25 kW
Maximum current	46.8 A @ 52 Vdc
Reverse polarity protection	Yes
Efficiency AC to DC	> 92.5%
In Transfer Performance	
Max. Voltage interruption / total transient voltage duration (max)	0 sec / 0 sec
Signaling & Supervision	
Display	Synoptic LED
Supervision / Part number	Inview X / T602004200
Remote on / off	On rear terminal of the shelf through Inview X
Battery Monitoring / Part number	MBB (Measure Box Battery) / P602006000
Safety & EMC	
Electrical Safety	UR-1778
EMC	EN 61000-4-2 / EN 61000-4-3 / EN 61000-4-4 / EN 61000-4-5 / EN 61000- 4-6 / EN 61000-4-8 / ETSI EN 300386 v1.9.1 / FCCpart 15 class A

5.2 Sub-rack

- The Sierra shelf shall be integrated in min 600 mm deep cabinets, Inch/ETSI mounting.
- The Sierra shelf house max four (4) converter modules.
- The Sierra shelf is designed with individual DC input / output, Common AC input and Common AC output.
- Optional rear cover for IP 20 in open rack.
- Max 12 kVA per shelf.
- 480 mm (D) x 19” (W) x 2U (H).
- 6 Kg empty.

5.3 User Interface - Inview X

Inview X is an advanced monitoring and controller unit for power systems. It allows the user to easily view, access, configure the system information through LCD screen graphic display and web interface. The home screen of both LCD and web interface provides a summary of system power, modules, batteries, and events information.

The Ethernet ports in Inview X allow multiple communication points for remote communication, Web interface, and connecting the accessories such as Measure Box Battery, Measure Box DC load, and Measure Box AC.

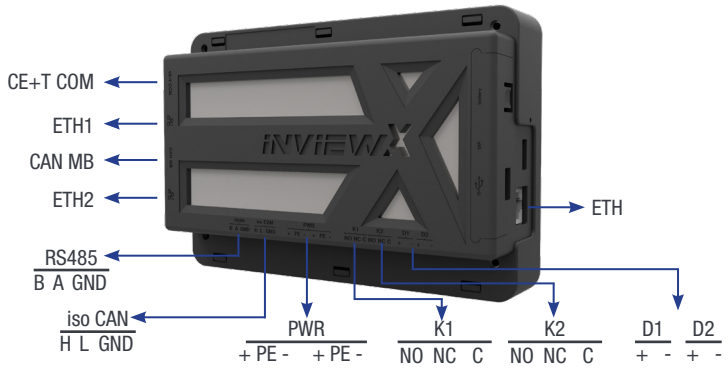
Inview X interface provides the user access to the configuration and setup files of the modules that are connected in the system. It is also a controller for DC regulation.

Inview X can monitor up to 50 modules and featured with:

- 7” LCD touch screen display
- Two Digital Inputs
- Two Output Relay contacts
- Records 5000 events as FIFO

5.3.1 Inview X - Connections

Inview X composed of multiple network ports and inbuilt free potential contacts.



- **CE+T COM** port is dedicated to establish a connection between Inview X and Sierra - shelf.
- **ETH1 and ETH2** ports are used for network connectivity, and user can access the system information through the web interface.
- **CAN MB** port is used to share the system information to the accessories such as Measure Box Battery and Measure Box DC Load. It also provides the +12 Vdc power up to three accessories which are connected in series.
- **iso CAN** is used for CAN communication.
- **RS485** is used for Modbus communication.
- **USB** port is used to access the Inview X configuration and setup files.
- **Digital Inputs (D1 and D2):** Two potential free Digital Inputs are available for customer connections.
    - Digital Input 1 is assigned for MBP operation if used.
    - Digital Input 2 is assigned for Surge Arrester if used.
- **Output Relays (K1 and K2)**: Two output relays are available and can be used for Major and Minor Alarms
- **Power**: The unregulated separate +48 V power supply is required for powering Inview X and this power should not be shared with other devices. (CET can provide Auxiliary Power Supply converter; the part number is T602004120).

5.4 Measure Box Battery (MBB)

Measure Box Battery is a unit which monitors the Battery. It is composed of multiple digital inputs and analog outputs. They are used for:

- Battery management
    - Voltage (V1 to V3)
    - Current (I1 to I3)
    - Temperature (T1 and T2)
    - Driving the Low Voltage Disconnection
- 8 Digital Input (D1 to D8)
- 6 Output Relay (k1 to K6)

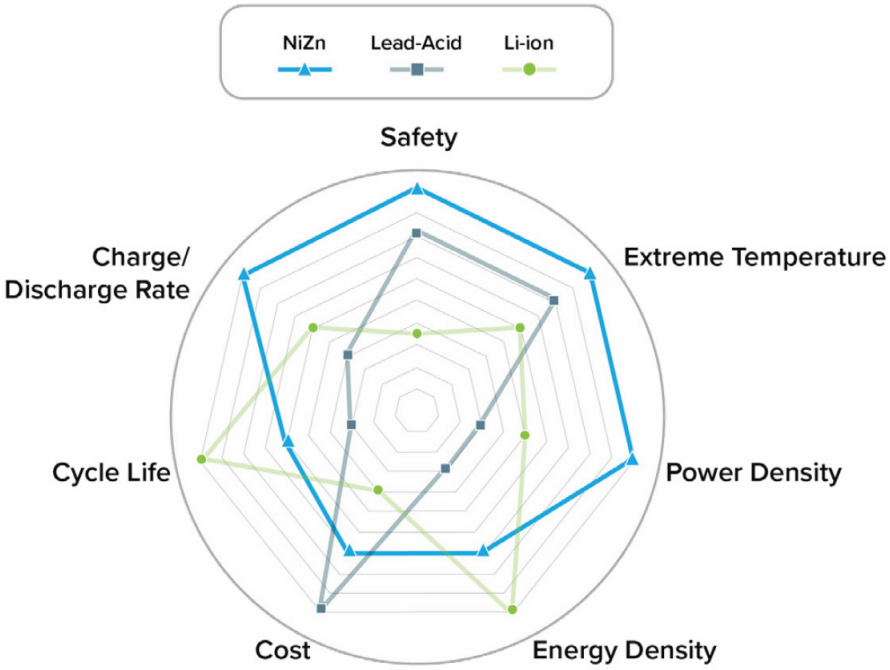
Note: Some digital inputs and relay outputs may be used for internal monitoring and may not be available for customer use. Refer to MBB user manual for more information.

5.5 Battery - ZincFive

ZincFive is a nickel-zinc (NiZn) rechargeable battery. Power protection for Mission Critical IT in data center and industrial facility environments is vital to operations and revenue. Nickel-zinc batteries are the ideal batteries for UPS backup, surpassing volatile lead-acid and lithium-ion batteries across multiple critical parameters. They are less hazardous and more powerful than lead-acid, safer than lithium-ion and environmentally friendly.

5.5.1 NiZn Technology Benefits

By significantly extending the cycling capability of a NiZn battery without compromising the high-performance properties inherent to the chemistry, ZincFive has introduced a rechargeable battery featuring a wide range of customer benefits over lead-acid and lithium-ion batteries.



5.5.2 Specifications

Part number	Z5 13-80 HSF
Electrical	
Nominal Voltage	13V
Operating Voltage Range at 25°C	10V (0% SoC) – 15.2V (100% SoC)
Nominal Capacity C/2 at 25°C	80Ah
Max Continuous Discharge Power (100% to 0% SoC)	8,000W (>15°C)
Cycle Life	500 (100% DoD) to 250K (1% DoD)
Impedance	2.5mΩ
Lead Acid Equivalent at 80A Discharge (1C) Rate	Typical 250Ah (C100)
Charge Voltage	15.2V CV until 4A Cutoff at 25°C
Chemistry	NiZn Starved Aqueous Electrolyte (Alkaline, No acid)
Environmental	
Operating Temperature Range	-20°C to +50°C
Storage Temperature Range	-20°C to +60°C
Design Life	>15 years at 25°C
Transport	No Transportation Restrictions

Mechanical	
Terminal	M6*10mm Bolt
Terminal Torque (Initial and annual re-torque)	Initial 6Nm (54 in.-lb.)Annual re-torque should not exceed 5.8Nm (50 in.-lb.)
Length (in/mm)	10.9/276.86
Width (in/mm)	6.9/175.26
Height (in/mm)	7.4/187.96
Weight (lbs/kg)	33/15
Certifications	
UL/CSA	UL-1989, CSA 22.2 No. 60896-21

*All Specifications Valid at 25°C *All Specifications Subject to Change

5.5.3 Handling and Storage

- **Precautions for safe handling:** Batteries should be handled and stored carefully to avoid short circuits. NEVER disassemble a battery. Do not breath cell vapors or touch internal material with bare hands.
- **Conditions for safe storage, including any incompatibilities:** The ingredients are contained in a sealed case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, hazardous materials are fully contained inside the battery. The battery should not be opened or exposed to heat because exposure to the following ingredients contained within could be harmful under some circumstances. Do not store in disorderly fashion or allow metal objects to be mixed with stored batteries. Keep batteries between -30° and 35°C for prolonged storage.
- Store batteries in a dry, dust & vapor free environment. Recommended storage temperature is 25±10°C.

CAUTION! Storage of batteries at temperatures outside recommendations may shorten battery lifespan.

Note: For more information on the battery, refer to https://www.zincfive.com/data-center-ups.

5.5.4 Battery Replacement

- System ships, by default, with ZincFive Z5 13-80 HSF batteries. Replace only with equivalent batteries.
- All batteries must be at the same state of chare prior to connecting the battery string.
- If replacing batteries with a non-zinc chemistry, contact CE+T for instructions on changing the charge profile.

DANGER! Do not mix battery types as installed in a system.

5.6 Surge Arresters

The mains (AC) supply of the modular converter system shall have suitable Lightning surge suppression and Transient voltage surge suppression installed. The manufacturer's recommendations of installation shall be followed. It is recommended to select a device with an alarm relay for function failure.

Indoor sites are considered to have a working lightning surge suppression device in service.

- Indoor sites Min Class II.

Lightning surges in converter circuits can cause immediate and catastrophic equipment failure. Surges from induced lightning and power switching operations are smaller but are more numerous and can result in equipment mis-operation, lockup or damage.

Some areas are more susceptible to lightning than other areas, whereas the intensity dramatically increases with the altitude.

The selection of the surge arresters, as well as their installation, shall adhere to strict rules. Not adhering to these rules could simply void their actions. The selection of the surge arrester and its physical implementation cannot be covered in this document. The installer must analyze the local conditions and he should require the site to be inspected to cover his liability.

In any case, converter damages that could be related to improper protection are not covered by CE+T product warranty.

Caution: For continued protection against the risk of fire, replace only with the same type and rating of fuse.

6. Next Gen Design and Description

6.1 Next Gen 50, 80, and 100 kW System Design

Next Gen 50, 80, and 100 kW systems are cabinetized modular converters specifically designed for clean and temperature- controlled environments.

- Telecom grade design
- The system cannot be directly against a wall. A minimum rear clearance of 12 inches is required
- The system is intended for Central Offices only
- Based on Sierra 25 - 120 Vac / 48 Vdc Power Module
- Fully modular
- Support redundant configurations
- Cabinet NEMA 1 (IP 20)
- System designed for either top or bottom cable entry

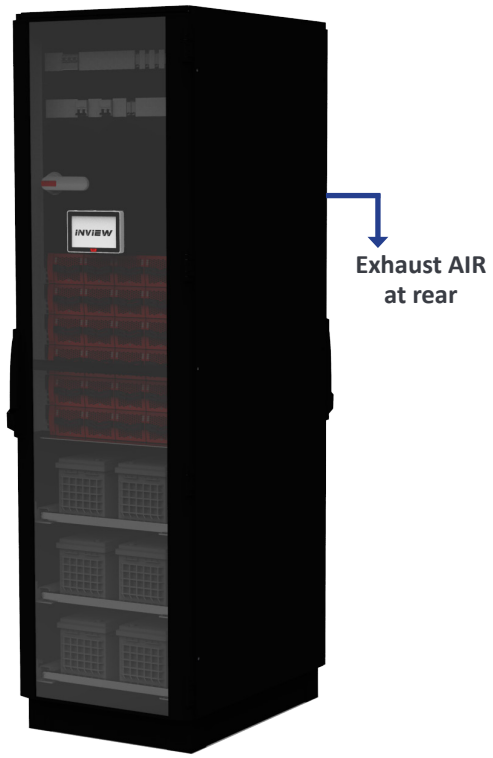


Figure 1. *Next Gen System - 50 kW*
84.28" H x 23.62" W x 31.50" D
2100mm H x 600 mm W x 800 mm D
490 lbs / 223 kg (empty)

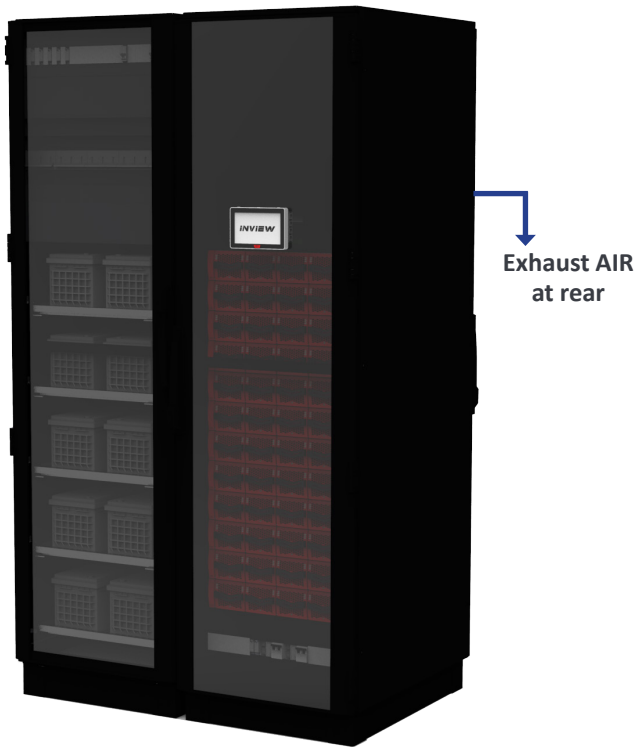


Figure 2. *Next Gen System - 100 kW*
(2x) 2100mm H x 600 mm W x 800 mm D
(2x) 84.28" H x 23.62" W x 31.50" D
1120 lbs / 562 kg (empty)

6.2 Next Gen 50, 80, and 100 kW System Description

Next Gen 50, 80 and 100 comes fully equipped with

- Inview controller's and remote monitoring capabilities.

6.2.1 Next Gen 50 kW System - General arrangement

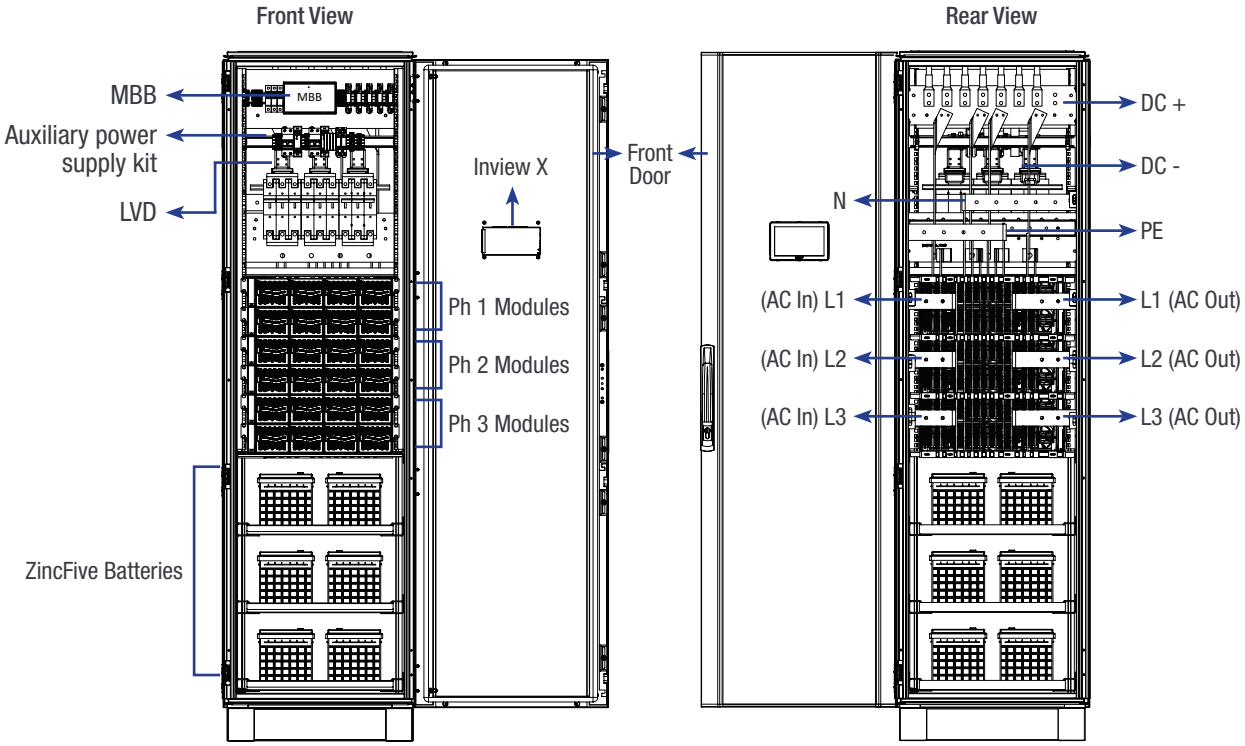


Figure 3. *Next Gen 50 kW System - General Arrangement*

Note: Rear view drawing is shown with cover removed.

6.2.2 Next Gen 80 and 100 kW System - General arrangement

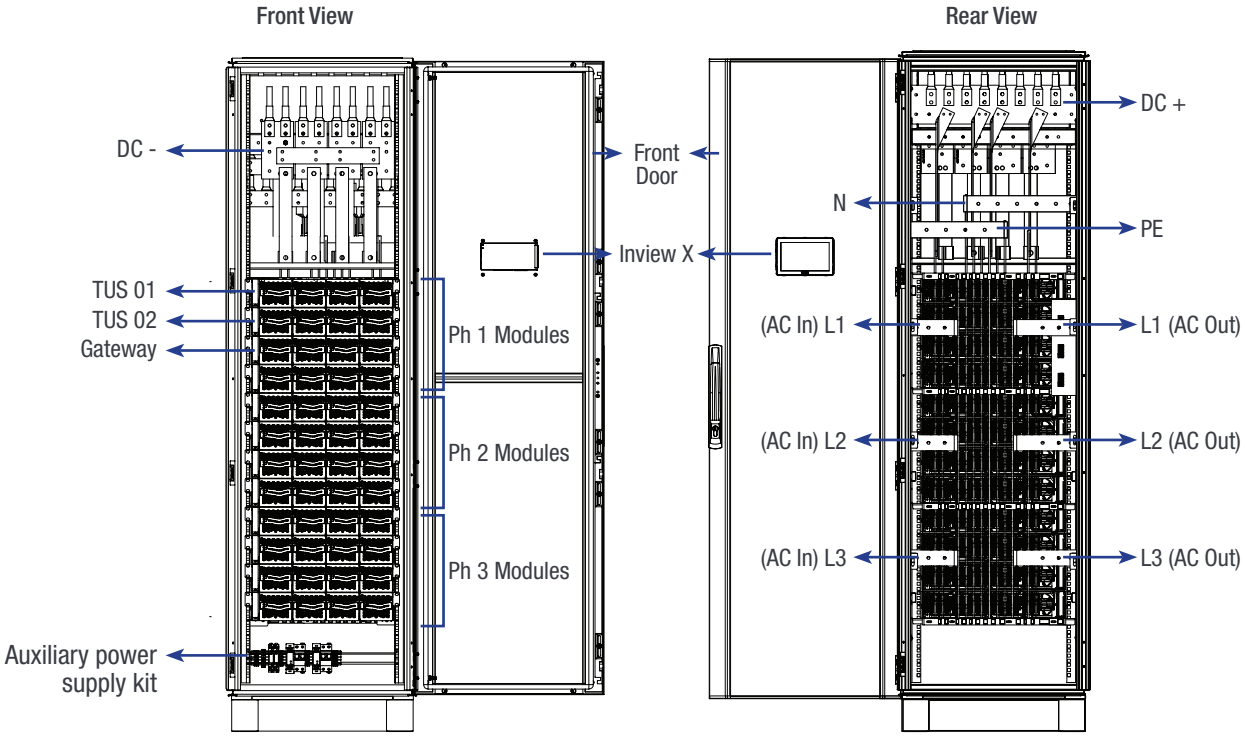


Figure 4. *Next Gen 80 & 100 kW Power Cabinet - General Arrangement*

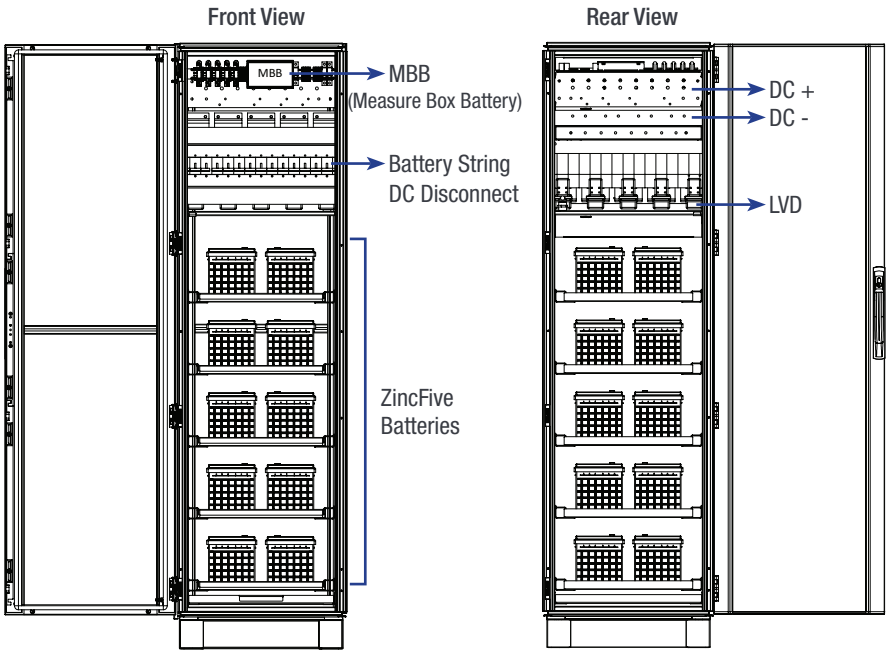


Figure 5. *Next Gen 80 & 100 kW Battery Cabinet - General Arrangement*

Note: Rear view drawing is shown with cover removed.

6.3 Installation Considerations

- All models of Next Gen are Listed according to UL 1778 - 5th edition (File E323449).
- All models of Next Gen are FCC compliant according to report L1R90028 issued by SGS Germany on June 19th, 2017.

6.3.1 Battery Configuration

When the system maximum load is less than or equal to 50 kW, the batteries are installed in the same cabinet. If it is more than 50 kW, the batteries are installed in a separate cabinet.

The nominal input of the UPS system is 52 V. Each string has four batteries, and they are connected in series as below image to provide 52 V. Batteries are interconnected by using the copper plate and M6 bolt, with torque of 6 Nm.

- M6-20mm Battery Intercell Connectors
- M6-18mm Battery Cable Connections

Unit ships standard with ZF 13-80 HSF batteries. Use only the specified hardware (with flat & lock washers) for battery terminal connections. Torque battery terminals to 6 Nm.

- 100 kW system (52 Vdc): 5 strings to provide 52 V, 400 Ah
- 50 kW system (52 Vdc): 3 strings to provide 52 V, 240 Ah

The maximum battery autonomy for all UPS systems is five minutes.

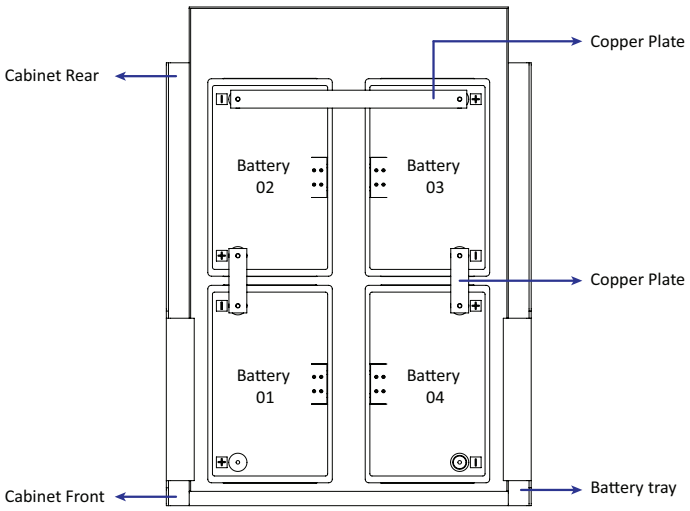


Figure 6. *Battery arrangement* per battery shelf

6.3.2 Three Phase Configuration – 208 VAC (L-L-L-N+G)

Three-phase systems are 120 VAC L to N and 208 VAC from phase to phase. Input and output are made with 4 wires + (PE) Ground. An AC input neutral must be connected in a Wye configuration. The AC output may be connected in either Delta or Wye.

System Model	Max power (kVA)	Max power (kW)	Max number of Modules* (+ Redundant Modules)
UPS with Z5 Batteries			
NxtGn-UPS-0Z5-048-100 -3-100-048-048-208	123.75	101.25	45 + 3
NxtGn-UPS-0Z5-048-100-3-080-039-048-208	99.00 **	81.00 **	36 + 3
NxtGn-UPS-0Z5-048-050-3-047-024-024-208	57.75	47.25	21 + 3

Table 1. *Three Phase 208 VAC - System Details*

* :Number of modules must be multiple of 3, with the same number in each phase in order to comply with UL recommendations.

** : System ships pre-configured for 81 kW (99 kVA), but is expandable up to 101.25 kW (123.75 kVA).

System Model	DC ***			
	Rated Current Nominal	Number of Feeders	Recommended Breaker per Feeder	Recommended Cable @ 75°C
UPS with Z5 Batteries				
NxtGn-UPS-0Z5-048-100-3-100-048-048-208	2,146.9	5	600 A	NA
NxtGn-UPS-0Z5-048-100-3-080-039-048-208	1,717.5 ****	5		
NxtGn-UPS-0Z5-048-050-3-047-024-024-208	1,001.9	3		

Table 2. *Three Phase 208 VAC - DC Details*

*** : Systems ship with DC breakers & cable pre-installed from the factory.

**** : When shipped as 80 kW system, rated DC current is as shown. When expanded to 101.25 kW, rated DC current is 2,146.9 A.

System Model	AC Input and Output		
	Recommended Breaker	Recommended Cable	
		@ 75°C	@ 90°C
UPS with Z5 Batteries			
NxtGn-UPS-0Z5-048-100-3-100-048-048-208	450 A	NA	2 x 300
NxtGn-UPS-0Z5-048-100-3-080-039-048-208			
NxtGn-UPS-0Z5-048-050-3-047-024-024-208	200 A	1 x 4/0 AWG	NA

Table 3. *Three Phase 208 VAC - AC Details*

6.4 External Maintenance Bypass Switch

- CE+T offers specialized bypass units compatible with your inverter system. If an external bypass is required, please consult your sales representative.
- EMBS units from other manufacturers are not compatible due to UL restrictions.
- Part numbers:

UPS System	EMBS Part Number
NxtGn-UPS-0Z5-048-100-3-100-048-048-208	T30950N144
NxtGn-UPS-0Z5-048-100-3-080-039-048-208	T30950N144
NxtGn-UPS-0Z5-048-050-3-047-024-024-208	T30950N072
Bottom Plinth for End-of-Aisle Applications	T30900F000

Table 4. *EMBS Part Numbers*

7. System Installation

7.1 Site Preparation

- Refer to section 6, page 19 to identify the type of system and configurations.
- Input and output protections.

When installing Next Gen systems, UL489 listed AC upstream (input), and downstream (output) circuit breakers are required.

At Input
Branch circuit protection breaker should be provided in upstream switchgear regardless of any protective device already installed at the input of the Next Gen.

At Output
An appropriate branch protection should be provided between Next Gen and the loads.

Output distribution should be structured to guarantee tripping segregation. Contact the manufacturer for recommendations and calculation methodology.

- Refer to section 6, page 19 for sizing protections and connecting cables. All cables must be copper rated for min 90°C (194°F).
- All cables must be C-UL-US or CSA Listed cables.
- All cables lugs must be C-UL-US or CSA listed. They must be sized according to the rated current of the converter system and to the customer terminal connection.
- Wire all positions for future expansion.
- Input AC / Output AC / Input DC / Signal cables shall be separated.
- Cable crossings shall be done in 90 deg angles.
- Empty converter positions shall be covered with blanks.
- Next Gen is designed for temperature controlled (35°C / 95°F max) and clean environments. The presence of airborne particles such as urban dust, sand, metallic dust, and corrosive vapors is forbidden. Install only in a controlled environment.

7.1.1 Transformer and Generator Sizing

The converter is capable of operating at 125% of rated capacity for 15 seconds.

- Transformers supplying AC to the converter should be sized at a minimum of 1.25 times the kVA rating of the converter to meet this requirement.
- Generators supplying emergency AC to the building and to the converter should be sized at a minimum of 2 times the kVA rating of the converter.

7.2 Unpacking the system

CE+T cabinets are always fixed upright on a pallet and then wrapped.

The NextGen UPS system is delivered with each cabinet in an upright position, bolted to its own pallet. Each crate is equipped with a shock-watch device for easy indication if unit has been mis-handled during shipment.

Uncrate the unit from its shipping crate and perform a thorough inspection for any damage as well as a complete inventory of equipment and accessories.

Uncrate the batteries as per the instructions provided in the battery shipment.

7.3 Module packing

Modules ordered with the system are packed separately in a carton or a pallet.

Module packing material shall be taken apart and stored in case of return under warranty. Improper packing of a returned module may void the warranty.

7.4 Anchoring the cabinet to the floor

The Next Gen cabinet contains eight holes of each 15 mm diameter at the bottom for floor fixing. Place the system in an upright position on the floor and fix it with four holes. (Refer below footprint for the holes marking).

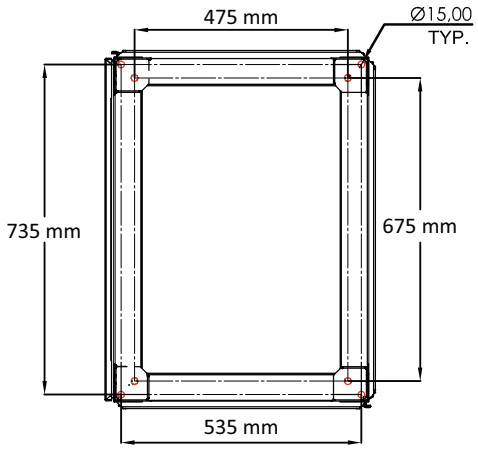


Figure 7. *Anchor hole locations*

Note: When installing the system, allow for a front clearance of 36 inch, and a rear clearance of 12 inch to allow for adequate working space and heat dissipation. Consult your local jurisdiction for any deviations.

7.5 Cabling

Check section 6, page 19 to identify system configuration. Refer section 6.3, page 22 for cable sizes and ratings for DC, AC input, and AC output. Also refer to section 7, page 25 for important safety notices.

7.5.1 Cable Inlets

Use appropriate collar to fix the conduits to the cabinet roof panel.

The top panel may be removed to facilitate placement of conduit knockouts where needed without introducing foreign contaminates into the system. The electrical contractor may place the AC knockouts at any point in the cabinet top cover.

Cables entrances should be protected by bushings, UL category NZMT2, rated for minimum. 50°C.

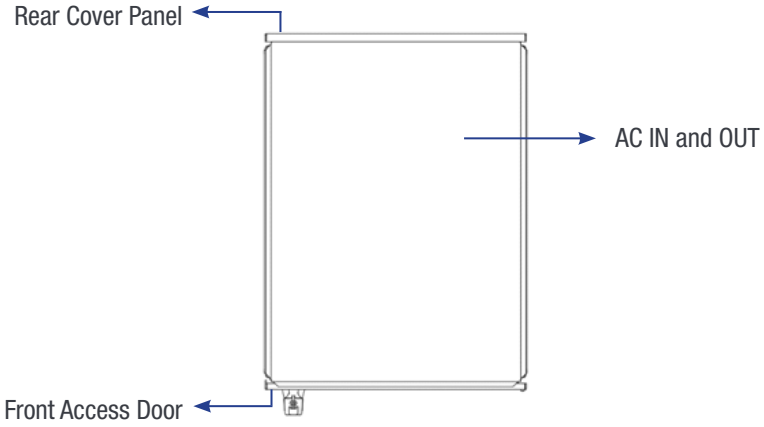


Figure 8. *Top cabling - Positions*

Note: When placing conduit knockouts in top panel, the panel may be removed to avoid contamination of system interior with metal shavings.

Alternatively, cable entry into the system may also be through the cabinet bottom in a raised floor application. Remove the necessary bottom entry panels when installing the AC cables from the bottom.

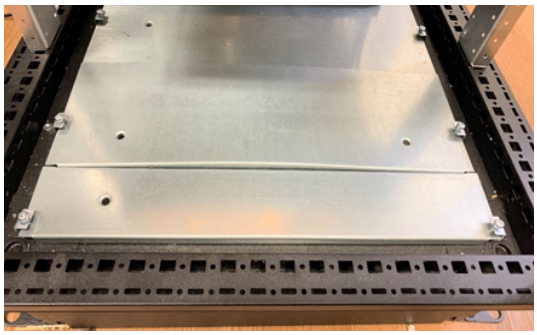


Figure 9. *Bottom cabling - Positions*

7.5.2 Grounding

The main protective conductor connection is made to the X2 (AC IN) terminal, which is marked with a symbol for identification.

The ground must be terminated even if commercial Mains are not available. Recommended cable cross section is the size equal (min) to Neutral cable cross section.

The ground has to be connected in accordance with local code and NEC - NFPA 70. Next Gen is only intended for Common Bonding Network (CBN).

7.5.3 AC Input and Output

If local codes require grounding of this circuit, use the PE output terminal bonding that circuit to the enclosure and ground the enclosure to a suitable grounding electrode in accordance with local code requirements.

WARNING! Recommendation of IEC 60364 4. 43
431.3 Disconnection and reconnection of the neutral conductor in multi-phase systems

Where disconnection of the neutral conductor is required, disconnection and reconnection shall be such that the neutral conductor shall not be disconnected before the line conductors and shall be reconnected at the same time as, or before, the line conductors.

7.5.3.1 Torque - AC Input and Output

System	AC IN and OUT	Lug type	Torque ft-lb	Metric Equivalent	CE+T Standard Torque ft-lb
NextGen UPS	3/8-24 UNF Bolt connection on copper bar	Single hole (Hole - 3/8")	17.70	M10	17.70

Table 5. *AC Input and Output - Torque details*

7.5.4 DC Input

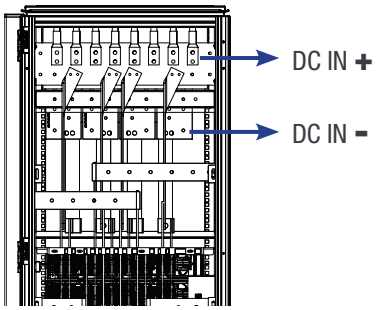


Figure 10. *DC Position*

7.5.4.1 Single feed DC Input

The UPS unit is equipped with common DC input points to facilitate ease of connection to the DC source, or battery. Use only compatible double-hole lugs when installing the DC cable connections.

- DC positive is a single bar with (8x) termination points for customer use. Each point is a double-hole (3/8 in) with hole spacing set at 1 inch. Use only 3/8 inch (or M10) hardware when making DC connections.
- DC negative has four (4x) bars and they are inter-connected with a horizontal bar.

Note: Screws, nuts and cable shoes are not included in the delivery.

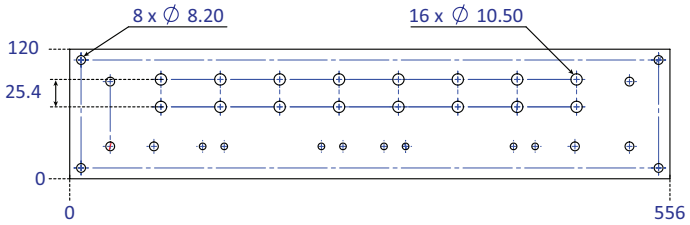


Figure 11. *DC Positive bar hole details*

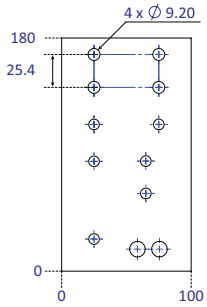


Figure 12. *DC Negative bar hole details*

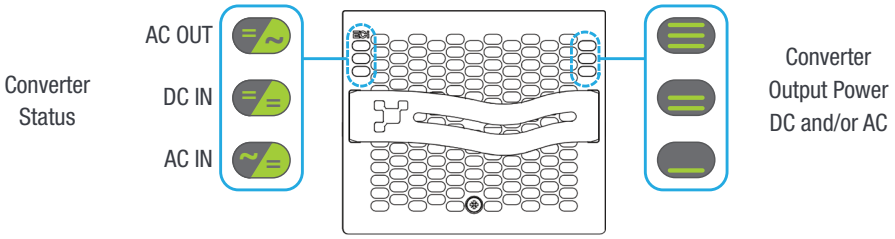
7.5.4.2 Torque - DC Input

System	DC	Lug type	Torque ft-lb	Metric Equivalent	CE+T Standard Torque ft-lb
NextGen UPS	3/8-24 UNF Bolt connection on copper bar	Double hole (Hole - 3/8")	17.70	M10	17.70

Table 6. *DC Input - Torque details*

8. Operation

8.1 Converter module



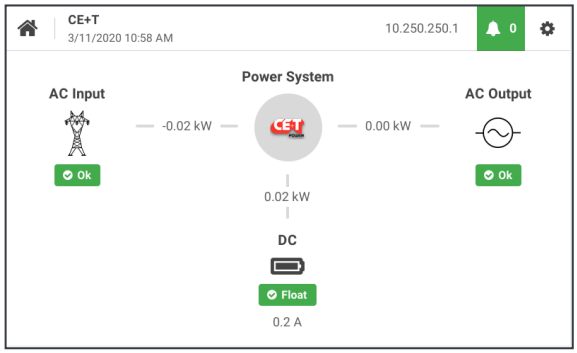
Converter Status LED	Description	Remedial action
OFF	No input power or forced stop	Check environment
Permanent green	Normal Operation	
Blinking green	Converter OK but working conditions are not fulfilled to operate properly	
Blinking green/orange alternatively	Recovery mode after boost (10 In short circuit condition)	
Permanent orange	Starting mode	
Blinking orange	Modules cannot start	Check Inview
Blinking red	Recoverable fault	
Permanent red	Non recoverable fault	Replace module

Output Power (redundancy not counted)						
<5%	5% to 40%	40 to 70%	80 to 95%	100%	100% = overload	Output Power (redundancy not counted)
×	×	×	≡	≡	≡	Status output power LED
×	×	=	=	=	=	
—	—	—	×	—	—	
1B	1P	2P	2P	3P	3B	Behavior (B = Blinking, P = Permanent)

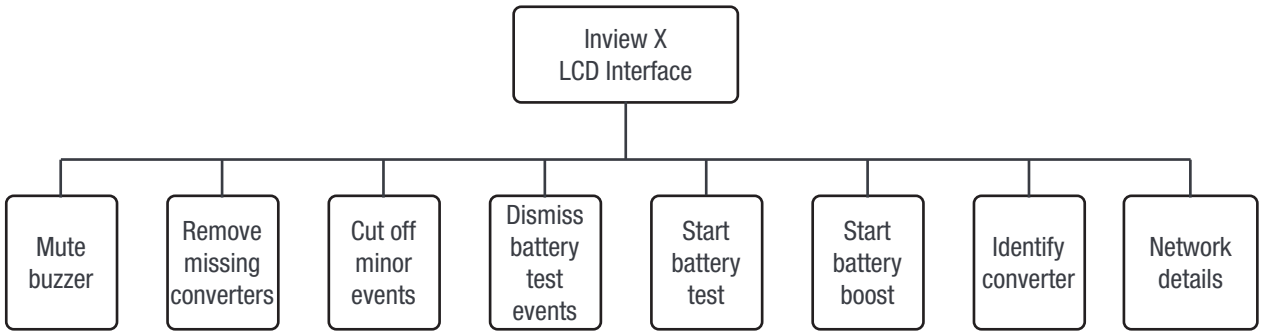
8.2 Inview X - LCD Display

Inview X LCD interface is a 7-inch touch screen and it is password protected. Through the LCD interface, the user can view and access the system details. Once the system is powered on, the Inview X is up and ready for operation.

Note: Interface graphics and layout may change based on firmware version.



8.2.1 Menu Structure



8.3 Inview X - Web Interface

The Inview X web interface provides efficient and user-friendly access to the system, and it can be accessed to the laptop through ETH port.

This section provides an overview of the web interface, refer the Inview user manual for detailed information.

8.3.1 Login

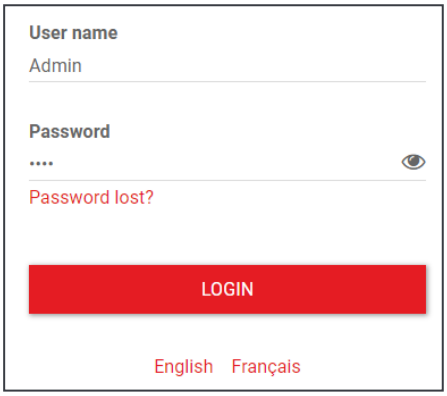
Open the web browser and type the default IP address **10.250.250.1** in the address field and press enter.

Note: Use any one of the following latest version of web browser: Google Chrome, Mozilla Firefox, Safari or Microsoft edge.

Inview X has three login – Basic, Expert and Admin. All three login is password protected.

The default password for all three logins is “1234”.

Basic login can only browse the pages and download the files, but Expert and Admin login can access and also modify the system parameter values.

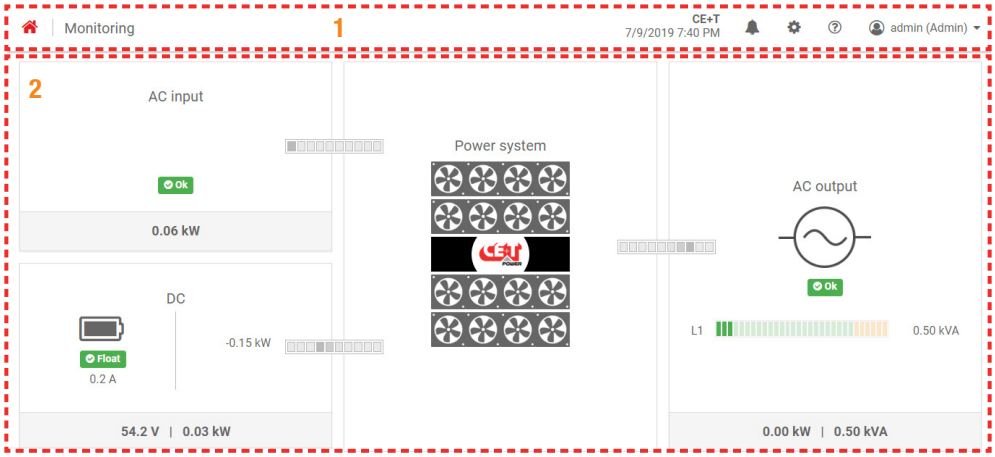


An auto-logout feature is available to avoid a user being connected all the time. When no action is performed for more than 10 minutes, the session will expire and goes to login screen.

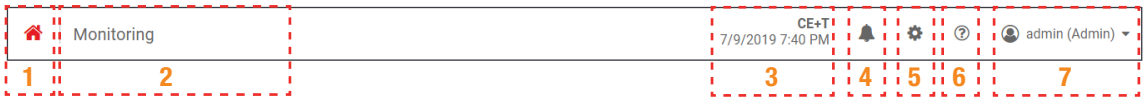
8.3.2 Interface Areas

1 → Header

2 → Main Page



8.3.2.1 Header



The tabs in header provide quick access to the corresponding pages.

1 → **Home**: Clicking on goes to the home page from any page you are accessing in the interface.

2 → **Breadcrumbs:** Provide navigation of the page. It trails all levels so that user can know where you are within the interface and can go to any previous menu.

3 → Display the date, time and the site name of the system.

4 → **Events:** Clicking on goes to Events and Logs page.

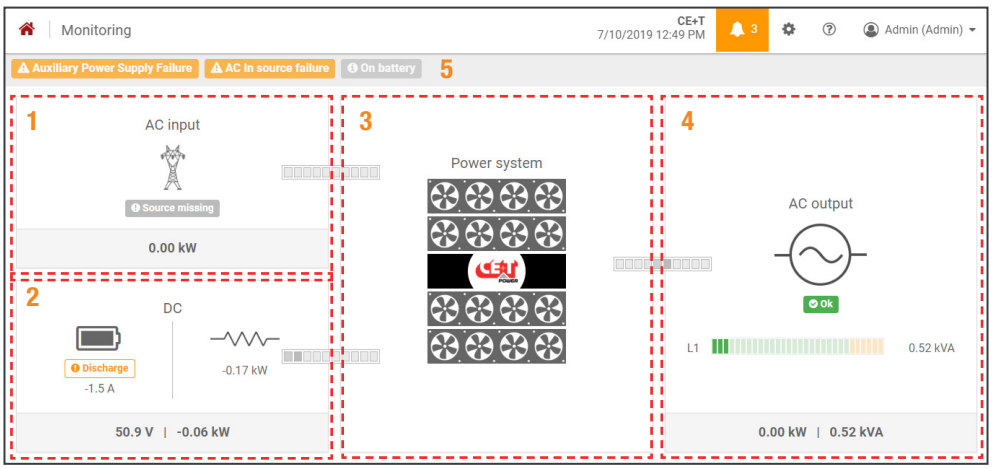
5 → **Settings:** Clicking on provides access to Users, Parameters and Maintenance pages.

6 → **Info**: Clicking on in the home page, provides brief information about the system, while in other pages provide the latest three ongoing events.

7 → **Account**: Provides the information of which account is logged in (Basic, Expert or Admin). Clicking on drop-down arrow user can access the following pages:

- **Administration** - Provide quick access to Users, Parameters and Maintenance pages.
  Note: Administration page will only be visible when logged in as Expert.
- **About** - Provides the information of Inview product details and network connectivity details.
- **Logout** - An act of logging out of an Inview X.

8.3.2.2 Home Page



1 → **AC Input**: Clicking on the AC Input region displays the page contain all measurements regarding AC Input.

2 → **DC:** Clicking on the DC region displays the page contain all measurements regarding Battery and DC Output.

3 → **Power System**: Clicking on the Power System region display the page contain regarding system information such as overall system power and also in each phase, configured modules, active modules, and list of detected modules and accessories.

4 → **AC Output**: Clicking on the AC Output region displays the page contain all measurements regarding AC Output. Also displays current power fed to the load on each phase.

5 → **Notifications**: Display the current generated alarms and events.

Note: For more information on the Inview display, refer to the Inview manual available upon request.

8.4 Switching off the system

Perform the following steps to switch off the system:

CAUTION! When switching OFF the system, the power to the critical load will be disconnected.

1. Switch OFF AC Output Breakers.
2. Switch OFF AC Input Breakers.
3. Switch OFF DC Input Breakers.
4. Switch OFF the Upstream and Downstream Breakers.

DANGER! Risk of electric shock. Capacitors store hazardous energy. Wait at least five minutes after disconnecting all sources of power before removing any protective covers.

DANGER! Risk of electric shock. This power equipment receives power from more than one source. Disconnect AC and DC sources to de-energize this unit prior to servicing.

9. Inserting/removing/replacing - modules

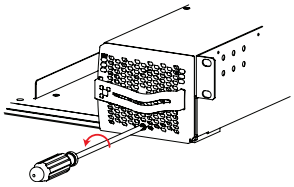
9.1 Sierra Converter

- The Sierra converter is hot swappable.
- When a new module is inserted in a live system it automatically takes the working set of parameters.
- When a new module is inserted in a live system it is automatically assigned to the next available address.

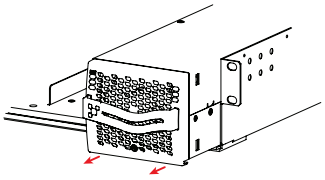
9.1.1 Removal

Notice: When one or several converter modules is/are removed access to live parts becomes possible. Replace module(s) with blanks without delay.

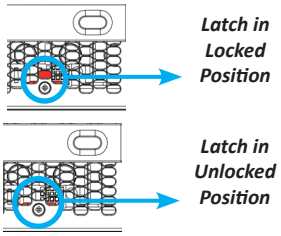
1. Rotate the screw counter-clockwise with a #P1 Phillips-head screwdriver to unlock the latch.
2. Hold the front handle and pull the module out.
3. Replace with a new module or a blind unit.



1. Unlock the Latch

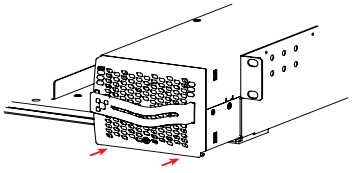


2. Pull the module out

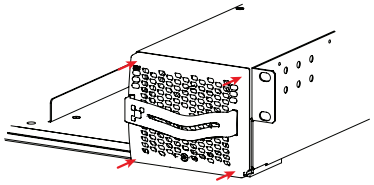


9.1.2 Inserting

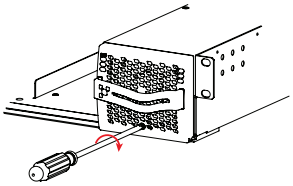
1. Verify module compatibility (AC & DC Voltage match system configuration).
2. Place the module in the shelf and slide in.
3. Using the module handle, push firmly until the unit is properly connected.
4. Rotate the screw clockwise with a #P1 Phillips-head screwdriver to lock the latch.
5. The module will start up and take the first address available on the bus.



2. Slide the module in



3. Push firmly till the connection is properly engaged.



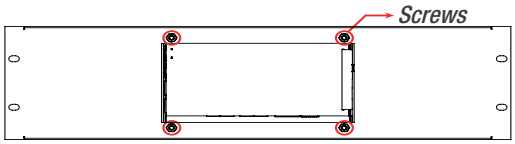
4. Lock the latch.

9.2 Inview X

9.2.1 Replacement of Panel Mount Display

Before removing the Inview X display, take special note of where each cable / wiring harness is connected to the installed display unit.

1. Remove all cable connections from the front and rear of the display.
2. Remove the mounting screws (4x) from the rear of the display mounting panel.
3. Remove the Inview X display unit.
4. Place the new Inview X display unit into the door panel.
5. Using the screws removed in step 2, affix the display unit to the door panel.
6. Reattach all cables and wires removed in step 1.



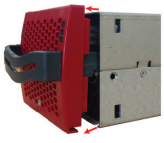
Fix it with four screws

9.3 Fan replacement

The FAN life is approximately 60,000 (Sixty Thousand) hours. The converter modules have fan runtime meters and fan failure alarms. Fan failure can result from a failing fan or driver circuit.

1. Let the module rest at least 5 minutes before initiating work.
2. The converter front cover must be removed. Use a screw driver and remove the screws on both side of the module.
3. Free up the fan. (Note the fan connector and wires position).
4. Disconnect the supply cord, and remove the fan.
5. Replace with new fan and connect supply cord.
6. Place the front cover and tighten the screws on both sides of the module.
7. Check fan for operation.
8. Access Inview and reset the fan run time alarm from within the action menu.

Remove the screws



Remove the front cover

Disconnect the fan

Take the new fan

Make sure the fan is in the right position

10. Final check

- Make sure that the sub-rack/cabinet is properly fixed to the cabinet/floor.
- Make sure that the sub-rack/cabinet is connected to Ground.
- Make sure that all DC and AC input breakers are switched OFF.
- Make sure that all cables are sized according to recommendations and local regulations.
- Make sure that all cables have strain relieved.
- Make sure that all breakers are sized according to recommendation and local regulations.
- Make sure that DC polarity is according to marking.
- Torque all electrical terminations according to recommendation and local regulations.
- Make sure that no converter/controller bays are left open.
- Cover empty converter bays with blanks.
- Make sure that the Remote ON/OFF is appropriately wired according to local regulations.
- Make sure that the point of AC supply meets local regulations.

11. Commissioning

The converter module DC input breaker acts as a protective device. When the modules are inserted into a system the DC breaker can then be turned ON to activate the DC input of the module.

Installation and commissioning must be done and conducted by trained people fully authorized to act on installation.

It is prohibited to perform any insulation test without instruction from manufacturer.

Equipment is not covered by warranty if procedures are not followed.

11.1 Check list

Refer the document “Commissioning Procedure” and available on request.

12. Trouble shooting

12.1 Trouble shooting

Converter module does not power up:	Check AC input present and in range (AC breakers)
	Check DC input present and in range (DC breakers)
	Check that the converter is properly inserted
	Remove converter to verify that slot is not damaged, check connectors
	Check that module(s) is (are) in OFF state
	Check for loose terminations
Converter system does not start:	Check that Inview X is present and properly inserted
	Check remote ON/OFF terminal
	Check the configuration and setting
	Check threshold level
Converter only run on AC or DC:	Check AC input present and in range (AC breakers)
	Check DC input present and in range (DC breakers)
	Check the configuration and setting
	Check threshold level(s)
No output power:	Check output breaker
All OK but I have alarm:	Check configuration file and correct No of modules
	Download/clear log file
No output alarm:	Check the default time delay (UA “Major Alarm” - 60s, NUA “Minor Alarm” - 30s)
	Check configuration file
No information on display:	Check that Inview X is present and properly inserted

12.2 Defective modules

Unless input power is down, all LED's on each module should be green (see section 8, page 30). No light, orange light, red or flashing light are abnormal conditions. Collect and record the module information. If no fix can be found, replace the module.

12.2.1 Replacing modules

Refer to section 9, page 34 to remove and re-insert modules.

12.2.2 Return defective Inview controller

If no display in the Inview or no communication with the laptop is evidence of failure, proceed as per section 12.2.4, page 39.

12.2.3 Return defective shelf

There are no active devices on the converter module shelf. Due to this failure of the shelf is uncommon and difficult to validate. If it is determined that the shelf is faulty please dispose as per section 12.2.4, page 39.

12.2.4 Return defective modules

- A repair request should follow the regular logistics chain:
  End-user => Distributor or Value Added Reseller => CE+T Power.
- Before returning a defective product, a RMA number must be requested through the http://my.cet-power.com. Repair registering guidelines may be requested by email at tech.support@cetamerica.com.
- The RMA number should be mentioned on all shipping documents related to the repair.
- Be aware that products shipped back to CE+T Power without being registered first will not be treated with high priority!
- While returning the defective module, should mention all the details in the RMA document.

12.2.5 Return defective batteries

- Consult the battery manufacturer or local service representative for proper battery replacement and disposal instructions.

12.3 Spare Parts

CE+T Recommends that the following spare parts are maintained on site in critical facilities applications.

Item	Part Number	Effect on system when failed
Sierra_25-48-120 Power Module	T7213302Z1	Reduced load capacity
Inview X Panel Mount Controller	T602004200	Loss of remote monitoring Battery Charging Safe Mode
Inview_GW Triple Port	T602004050	Loss of remote monitoring Battery Charging Safe Mode
Battery Measure Box	P602006000	Loss of charging temperature compensation Loss of LVD control (LVD will not change state)
Temperature Probe	V092099366	Loss of charging temperature compensation
NEXTGEN – SYNC MODULE	P602004051	No affect – redundancy built in - Loss of phase control if all TUS modules fail

13. Service

For Service

- Check Service Level Agreement (SLA) of your vendor. Most of the time they provide assistance on call with integrated service. If such SLA is in place, you must call their assistance first.
- If your vendor doesn't provide such assistance (*) you may contact CE+T by calling toll free Number +**1-855-669 - 4627**(**) or tech.support@cetamerica.com

Normal service hours are 8:00 AM to 5:00 PM Eastern Time, Monday through Friday, except closing periods for holidays or inclement weather.

Critical/emergency conditions by calling **+1-855-669-4627** or emailing tech.support@cetamerica.com

(*) CE+T will redirect your call to your vendor if he has such SLA in place.

(**) Valid in USA and Canada only.

(***) Messages that are not Major Incident or Emergency will be served at the next scheduled working day.

14. Maintenance Task

As maintenance can be performed on live system, all tasks should be performed only by trained personnel with sufficient knowledge on ECI products.

Tasks:

1. Verify all module addressing is correct. Correct if necessary (i.e.: 1st module in slot 1 should have module addressed as #1).
2. Verify all modules AC input assignments match AC output phase assignment. Do not change output phase assignments.
3. Download and save a copy of system Configuration file.
4. Download and save a copy of system History Log file.
5. Record all module serial numbers and associated temperatures.
6. If present, replace the door air filter.
7. Clean the system and modules with vacuum. (this step may be performed while on bypass – step 13)
8. Re-Torque all battery terminals to 5.8 Nm. (this step may be performed while on bypass)
9. Wipe down cabinet exterior with a dry dust-cloth.
10. Check all internal electrical connections for hot-spots using an infrared camera.
    a) Removal of some cover panels may be necessary. Re-install cover panels when finished.

Note: Steps 11, 12, & 13 are recommended, but not required. Consult building manager prior to performing these steps.

11. Simulate a module failure:
    a) Remove one module from the system.
    b) Verify alarm is active.
    c) Verify alarm on remote monitoring.
    d) When module fan has stopped spinning, reinsert module into system.
12. Simulate a loss of Mains AC. (Do not perform if no DC is present on the system.)
    a) Open AC input breaker.
    b) Verify alarm is active.
    c) Verify alarm on remote monitoring.
    d) Restore Mains AC to system when alarm has been verified.

Warning! When system is on BYPASS, the load is subject to any Mains AC disturbances. Appropriate precautions should be taken to ensure continuity of power to the critical load.

13. If system is equipped with an external bypass, test the function of the bypass. While system is on external bypass, perform the following checks:
    a) Verify all non-manufacturer connected cables are torqued as per the unit's user manual.
    b) If necessary, update individual module firmware.

14. If necessary, update the Inview and MBB firmware.
15. Clear the History Log file.
16. Take a photo of system.
17. Take a photo of system data plate.