Leading AC Backup Technology

RMS SYSTEM- 120VAC

User Manual V7.1

BEYOND THE INVERTER

THE NEW GENERATION OF POWER CONVERTERS

- DUAL INPUT INVERTER
  The Commercial Power as default source
- AC 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

www.cet-power.com

Table of content

1. Abbreviations

TSI	Twin Sine Innovation
EPC	Enhanced Power Conversion
REG	Regular
DSP	Digital Signal Processor
AC	Alternating current
DC	Direct current
ESD	Electro Static Discharge
MET	Main Earth Terminal
MBP	Manual By-pass
TCP/IP	Transmission Control Protocol/Internet Protocol
USB	Universal Serial Bus

2. Safety instructions

- The modular inverter system/rack can reach hazardous leakage currents. Earthing must be carried out prior energizing the system. Earthing shall be made according to local regulations.
- Prior any work conducted to a system/unit make sure that AC input voltage and DC input voltage is disconnected.
- Inverter modules and shelves comprise capacitors for filtering and energy storage. Prior to accessing to the system/ modules wait min 5 minutes to allow capacitors to discharge.
- AC and DC circuits shall be terminated with no voltage / power applied.
- Some components and terminals carry high voltage during operation. Contact may result in fatal injury.
- Warning labels must not be removed.
- Never wear metallic objects such as rings, watches, bracelets during installation, service and maintenance of the product.
- Insulated tools must be used at all times when working with live systems.
- When handling the system/units pay attention to sharp edges.
- ESD Strap must be worn when handling PCBs and open units.
- The modular inverter system/rack is not supplied with internal disconnect devises on input nor output.
- The modular inverter rack is a dual input power supply. The complete system shall be wired in a way that both input and output leads can be made powerless in a single action.
- REG systems can be seen as independent power sources. To comply with local and international safety standards N (output) and PE shall be bonded.
- EPC system that have no AC input wired and connected to comply with local and international safety standards N (output) and PE shall be bonded. The bonded between N (output) and PE must be removed once the AC input is being connected.
- The safety standard IEC/EN62040-1-1 requires that, in case of output short circuit, the inverter must disconnect in maximum 5 seconds. Parameter can be adjusted on T2S; however, if the parameter is set at a value > 5 seconds, an external protection must be provided in order that the short circuit protection operates within 5 seconds. Default setting is 60s.
- The equipment must be installed and commissioned by skilled technicians according to instructions in this manual.
- Local regulations must be adhered.
- The manufacturer declines all responsibilities if equipment is not- installed according to -instructions herein -by skilled technician -according to local safety regulation.
- Warranty does not apply if the product is not installed, used and handled according to the instructions in the manuals.
- All operators are to be trained to perform the emergencyshutdown procedure
- CE+T cannot be held responsible for disposal of the Inverter system and therefore the customer must segregate and dispose 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 the products it consists of, you must stick to the local regulations in force in the country of destination and in any case avoid causing any kind of pollution.
- Inverter System contains output over current protection in the form of circuit breakers. In addition to these circuit breakers, the user must observe the recommended UL listed 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.
- 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.

- For technical support for any CE+T products, or product training, please call your local CE+T America representative or CE+T America directly at 678-405-4636
- To download the latest documentation and software, please visit our website at www.cet-power.com.

2.1 Handling

- The cabinet shall not be lifted using lifting eyes.
- Remove weight from the cabinet by unplugging the inverters. Mark inverters clearly with shelf and position for correct. This is especially important in dual or three phase configurations.
- Empty inverter positions must not be left open. Replace with module or cover.

2.2 Surge and transients

The mains (AC) supply of the modular inverter system shall be fitted with suitable Lightning surge suppression and Transient voltage surge suppression for the application at hand. Manufacturer's recommendations of installation shall be adhered. It is advisory to select device with alarm relay for function failure.

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

- Indoor sites Min Class II
- Outdoor sites Min Class I + Class II or combined Class I+II

2.3 Other

- Isolation test must not be performed without instructions from the manufacturer.

3. TSI TECHNOLOGY

Inverter modules carrying the TSI logo and the EPC mark is a triple port converter (AC in, DC in, AC out). Sinusoidal output converted from mains or/and DC.

Typical loads

- Resistive load
- Inductive and resistive
- Capacitive and resistive
- Non linear (electronic)

3.1 EPC-mode

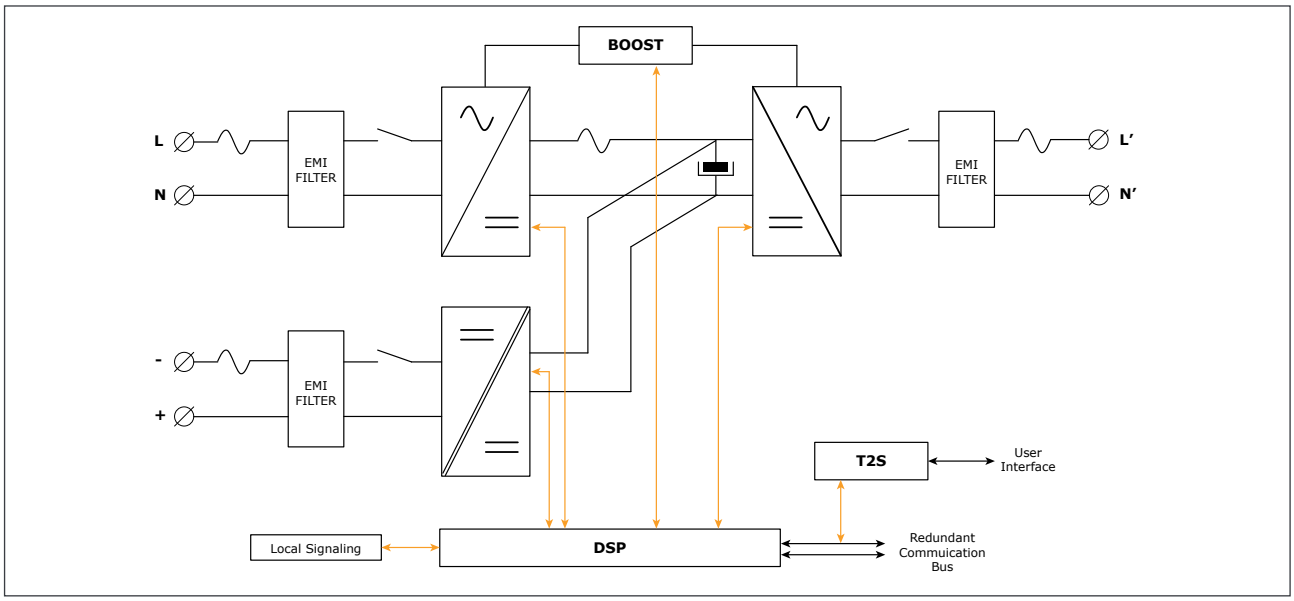
Mains input (AC) is by default priority whilst DC works as backup.
Switching time between AC input and DC input is 0ms (source transfer).
Regardless of supply source the output voltage is always conditioned, low THD (sineoidal output).

The BOOST functionality enables multiples the nominal current for a period of >20ms in the event of down stream failures. The upstream breakers does not have to be oversized to prevent tripping. The overload capacity is 150% for 15 seconds.

The system efficiency is 95%[1] which reduce the overall energy consumption. When running on backup typical efficiency is >90%.

The TSI works according to True Redundant Structure (TRS) that features decentralized logic, redundant communication bus and three levels of, individually independent, disconnection.

The functionality is all included in every inverter module, running them in parallel provides a modular system with no single point of failure, always conditioned output, high system efficiency, 0ms source transfer time and controlled down stream clearing capacity.



1 | Media EPC (95%), Bravo EPC (96%)

3.2 On-line EPC

DC is the priority source of supply whilst mains (AC) work as the secondary source of supply.
Switching time between DC input and AC input is 0ms (source transfer).
Regardless of supply source the output voltage is always conditioned, low THD (sinusoidal output) Boost function is enabled without delay

3.3 Safe mode

Safe mode use DC as primary source of supply while mains (AC) is standby.

Mains (AC) is normally disconnected through internal inlet relay and is only connected when down stream clearance is required (boost) or DC is unavailable.

The transfer between DC and AC result in transfer time, typical 10ms

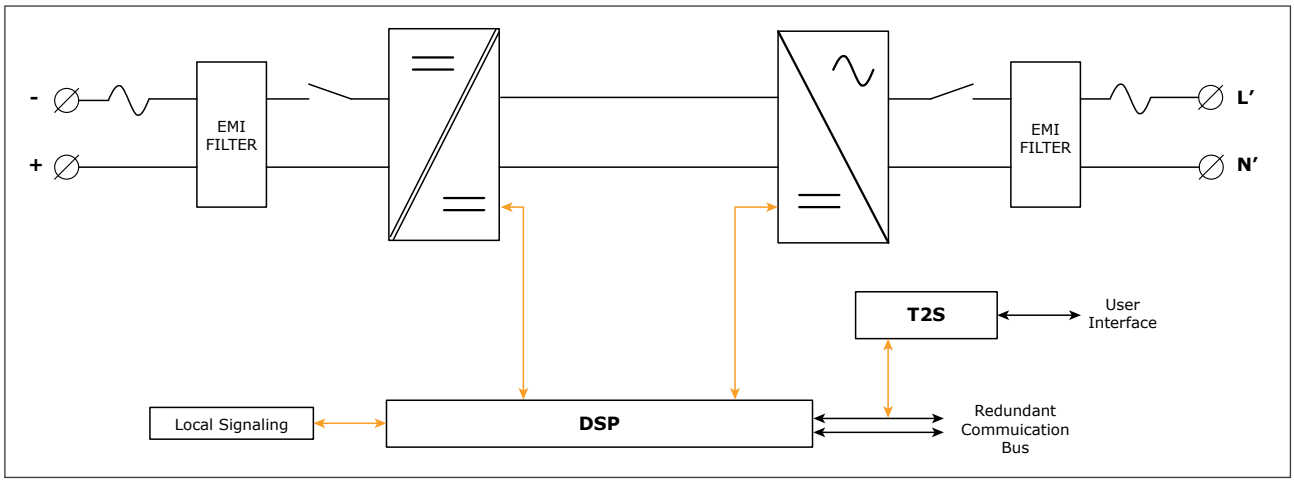
3.4 REG-mode

Inverter modules carrying the TSI logo and the REG mark is a traditional converter (DC in, AC out). Sinusoidal output converted from DC input.

- DC input only.
- The output voltage is always conditioned, low THD (sinusoidal output)
- The overload capacity is 150% for 15 seconds
- The inverter efficiency is >90%[2].

The TSI works according to True Redundant Structure (TRS) that features decentralized logic, redundant communication bus and three levels of, individually independent, disconnection.

Isolation test must not be performed without instructions from the manufacturer.



2 I Media (90%), Bravo (91%)

4. Building blocks

4.1 Inverter

Telecom / Datacom: -48VDC / 120VAC/240VAC, 60Hz

- The TSI Media is a 1500VA/1200W triple port inverter.
- All versions available in EPC or REG.
- The TSI inverter modules are hot swappable and hot pluggable.
- The module operator interface is LEDs showing converter status and output power
- Inverter modules run in single phase or three phase configurations.
- Fan is equipped with alarm and run time meter. The fan is field replaceable.
- 10.2” (D) x 4” (W) x 3.4” (H)
- 2.4 Kg

4.2 Sub-rack

- The Media shelf shall be integrated in standard 19 inch network bay frames/relay rack mopunting structures or enclosures.
- The Media shelf house max four (4) inverter modules and one (1) monitor unit.
- The extension shelf house max four (4) inverter modules and one (1) monitor blank.
- The Media shelf is designed with Common DC input, Common AC input and Common AC output.
- Optional rear cover for IP 20 in open rack
- Max 6kVA per shelf
- 17” (D) x 19” (W) x 2U (H)
- 7.9 Kg empty

4.3 Monitor unit T2S

The T2S monitors max 32 inverters in one bus

The T2S provides

- Alarm monitoring
- Record the latest 200 events. Fi-Fo
- 3 outgoing alarms
- 2 digital input
- MOD bus
- CAN bus
- USB front connector

5. Accessories

5.1 Manual by-pass

The MBP is a manually activated switch that permits the user to transition the load to the AC Mains temporarily so the Inverter System may be serviced safely.

During standard operation, the MBP switch is placed in the UPS position, allowing the system inverters to operate from incoming AC or DC sources.

When placed in the BYPASS mode, all inverter modules are placed in active standby mode and cannot deliver power to the load. If the AC Mains should be interrupted while the system is in BYPASS, the load may experience a loss of power. It is recommended that all load equipment cease critical operations, all data is backed up and that an alternate AC Mains source be available before placing the system in BYPASS mode.

To activate the BYPASS mode, rotate the switch lever clockwise from UPS through to

BYPASS. Once the switch is in the BYPASS mode, the inverters are placed in standby.

Before beginning any maintenance procedure, confirm that the AC and DC voltage is turned off at the voltage source

NOTE! When the system is in by-pass the load is subjected to mains disturbances.

WARNING

IF ATS (automatic transfer switch) IS INSTALLED UPSTREAM. MAKE SURE THAT THE ATS SWITCH DOES NOT ALLOW TRANSFER BETWEEN AC SOURCE OUT OF SYNC. THE MAXIMUM ALLOWED PHASE SHIFT IS 10°. A “BREAK BEFORE MAKE” OF MIN 100mS IS REQUIRED.

5.2 RMS T BOX unit

5.2.1 T BOX BREAKERS

All RMS Inverter Systems includes UL recognized circuit breakers for AC and DC input as well as AC output circuits.

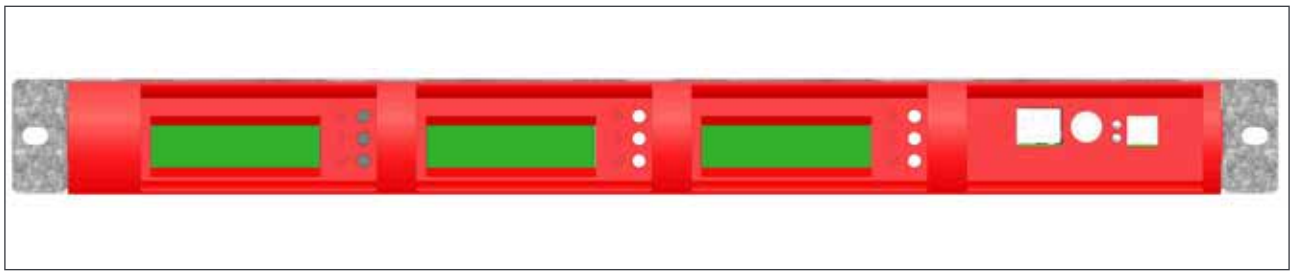
These circuit breakers are not in lieu of UL listed ,upstream and downstream circuit breakers to be selected in accordance with recommendation and installed by the user.

DC Input circuit breakers are installed in the system. These circuit breakers are 200 Amps rated dual throw breakers. One circuit breaker is installed in single inverter shelf systems while two are used in dual shelf systems. These circuit breakers are used to break the circuit from the DC input source to the individual inverter shelves within the system. Systems with only one DC circuit breaker have cover plates installed in the in the open slot.

AC Input circuit breakers are installed in the system. One circuit breaker is installed in single inverter shelf systems while two are used in dual shelf systems. These circuit breakers are used to break the circuit from the AC input source to the individual inverter shelves within the system. In all cases, each AC input circuit breaker is a single pole, magnetic breaker rated at 65 Amps. Systems with only one AC circuit breaker have cover plates installed in the in the open slot.

6. Monitoring accessories

6.1 Can Dis shelf



The CanDis shelf has room for 1-3 display units and 1 TCP/IP agent.

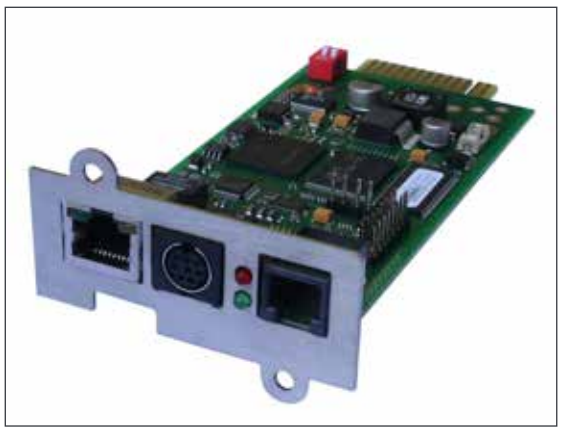
6.1.1 Display

Backlit 2 line dot matrix

The display show two values simultaneous

6.1.2 TCP/IP Agent

The TCP/IP interface board is mounted on the CanDis shelf and is powered within the system.



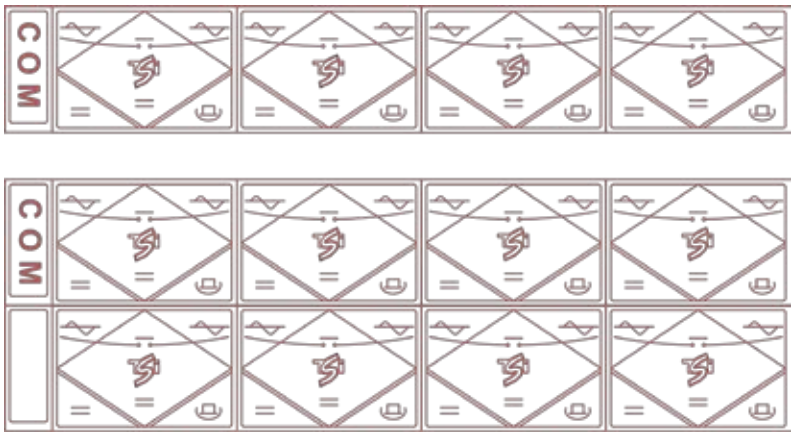
7. System Design

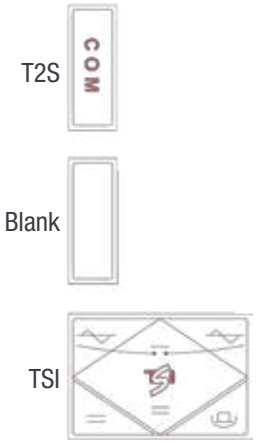
7.1 Single/Dual phase

The systems designed are divided in single or dual phase system.

7.1.1 Single Phase system

The Single phase system is a pre assembled and configured single phase inverter system comprising 19" inverter sub rack, inverter modules, monitor device and RMS T-box.
The RMS system is normally mounted in a 19" rack.
The RMS system is available as single phase, -48VDC, EPC-mode.
A RMS system comprises of max 7 inverter modules(10.5KVA) +1 inverter module for Redundancy.





7.1.2 Dual Phase system

The Dual phase system is a pre assembled and configured dual phase inverter system comprising 19" inverter sub rack, inverter modules, monitor device and RMS T-box.
The RMS system is normally mounted in a 19" rack.
The RMS system is available as dual phase, -48VDC, EPC-mode.
A RMS system comprises of max 8 inverter modules (12KVA).

7.2 RMS System

- Dual input (AC and DC) inverter modules (EPC)
- 95% efficiency at normal operation (EPC)
- Always conditioned and filtered output voltage
- Seamless transfer (0ms) between primary and secondary source of supply
- No single point of failure
- Flexible AC output distribution
- Full modularity
- Full redundancy

8. Installation of Media Single shelf/ Dual shelves

- Read safety instructions prior starting any work
- Do NOT attempt to use lifting eyes to erect the cabinet.
- System is preferable handled without modules.
- Pay attention to the module position, make sure that modules are repositioned in the same slot.
- T2S is always mounted in the first shelf, left hand position.
- In dual phase systems modules are configured per phase 1 (A, R), phase 2 (B, S) . These are not interchangeable. Make sure that modules from one phase are not mixed with modules from another phase.

RMS Inverter Systems can be used to provide up to 10.5 kVA of protected AC power in single phase configuration (12 kVA for dual phase input) to the mission critical loads. The RMS Inverter System is designed to be housed in a standard 19 inch cabinet system or open network bay/relay rack. The system combines CE+T TSI technology inverters rated at 1,500VA per unit (Media Inverter Module) and a T2S controller to supply bulk AC output power. Media inverter modules feature CE+T unique Enhanced Power Conversion (EPC) capability. The EPC feature processes all incoming AC mains supply to ensure clean, reliable power is delivered to the point of load.

The RMS Inverter System receives AC voltage and -48 vdc power supplied by the customer. Internally, the system converts the incoming power to a high voltage DC and generates a clean AC source for output power. The system is designed to operate from either of the input source by selecting the priority through hyper terminal. Output power is available at any time that at least one of the input sources within the threshold.

The RMS Inverter System is comprised of a single termination and control box, one or two inverter module shelves, media inverter modules, and internal interconnects/wiring. The termination box provides access for customer input and output AC wiring and isolated connections for DC input wiring. The termination box also contains a maintenance bypass switch, AC input and output circuit breakers, and DC input circuit breakers. Circuit breakers are sized for maximum expansion capability of delivered systems. Additionally, users are also required to comply with upstream and downstream AC circuit breakers

RMS Systems may be purchased in one or two shelf configurations. Single phase systems are scalable and can be N+1 redundant from 1.5 to 10.5 kVA as follows:

- Single Phase, 6 kVA (scalable from 1.5 to 6 kVA) single shelf configuration.
- Single Phase 10.5 kVA (scalable from 1.5 to 10.5 kVA) dual shelf configuration.

Dual phase systems are scalable to 12 kVA total capacity. All dual phase systems are dual shelf configurations, scalable from 1.5 to 6 kVA per phase (12 kVA total power).

RMS Inverter Systems are delivered with one or two Media shelves integrated with a termination box. The configuration supplied is dependant upon the output power and number of AC phases required.

Each inverter shelf is capable of housing 4 inverter modules, rated at 1,500 VA each. One shelf is also equipped with a T2S controller module. The T2S controller is used to control and program the complete system. Inverter modules are installed based on output power requirements. Inverter module outputs operate in parallel thus allowing systems to be easily configurable. Media inverter modules are designed to produce a 1,500 VA output power. The maximum single phase system output allowable is 10.5kVA (7 media modules). Up to 8 modules can be applied for N+1 redundant or dual phase applications. For dual phase systems, it is recommended that the same number of media modules be installed in each single shelf (phase).

Each shelf is connected to the appropriate phase when set up as a dual phase system at the factory. These connections must not be changed in the field. Customer connections are as shown.

8.1 Mounting in 23 inch Open Relay Rack\Network Frame

CE+T offers adapter plates for use in mounting the RMS Inverter System into 23 inch open relay racks. These can be ordered by contacting CE+T

All RMS Inverter Systems are designed for 19 inch mounting applications but may be mounted in 23 inch, two post, open relay rack\network frame assemblies if required in application.

NOTE:Mounting adapters defined herein are not intended for use in 4 post relay rack.

To mount RMS Inverter Systems in a 23 inch installation, mounting adapters as defined above, are required and are shipped in sets of two per part number. [The mounting adapters may not be shipped with your RMS Inverter System, if not ordered at the same time the unit was ordered.]

When mounting single shelf RMS Systems (RMS-1-6 series products), 1 set of CET6010018 adapter plates are required. In all dual shelf systems (RMS-1-10 and RMS-2-12 series products), you will need one set each of CET6010018 and 6010019.

Actual product may vary slightly from that shown here

The CET adapter plates are designed to accommodate universal rack mounting.

- 1. Mount the CET6010018 parts to the 23 inch open relay rack as shown below. Ensure that plates are mounted at even height.
- 2. Mount the CET6010019 parts to the 23 inch open relay rack as shown below. Ensure that plates are mounted at even height, just below CET6010019 parts. STEP TWO NOT REQUIRED FOR ALL RMS-1-6 SYSTEMS.
- 3. Mount the system to the adapter plate fastener holes.

1

2

3

8.2 Mounting (RMS SYSTEM)

When planning the installation of an RMS Inverter Systems, consideration must be given to special requirements and clearances from vertical surfaces and other adjacent systems and equipment.

A minimum of 20 inches deep and 19 inches wide is required for fixing the RMS Inverter System.

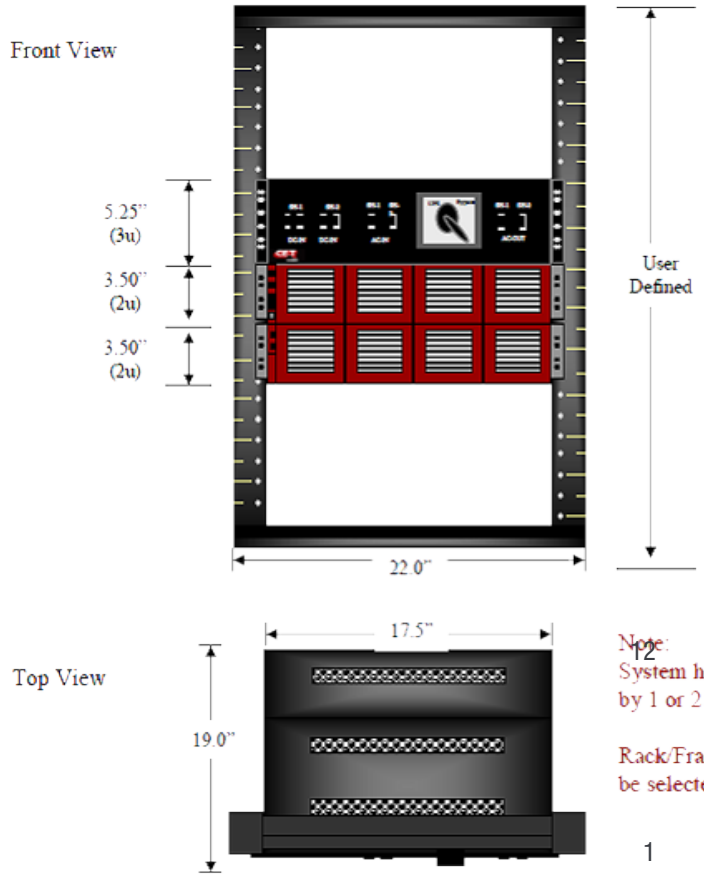


Figure 11. RMS Inverter System Mounted in Network Frame

When an open frame rack is used to mount an RMS System, always secure the framework to the floor with anchors approved for the specific application and location. The frame must

be secured prior to installing the RMS Inverter System Components. If there is question regarding the appropriate anchors and framework to use, please refer to the frame work supplier, local building codes and building drawings as necessary for additional information.

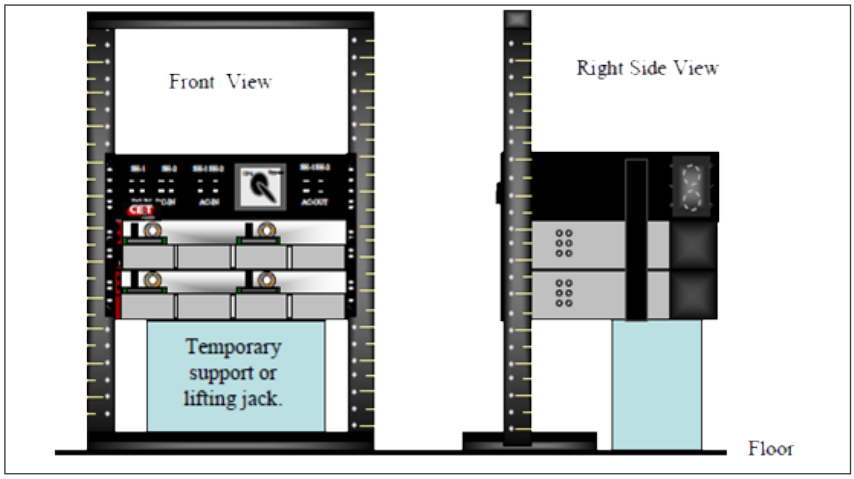
NOTE: If a frame mounted system is to be moved, always lift the system by the frame. The RMS Inverter System is not designed for direct lifting.

RMS Inverter Systems are heavy. When mounting the system into a rack or enclosure, the system should be firmly supported from below at the height of installation until the system is fully secured with mounting hardware. Your RMS Inverter System is delivered as a complete, assembled system without media inverter modules installed, The system is fastened together for shipping with a mounting plate on each side of the

front mounting guides. The mounting plates are on the back side of the structure

Lift the RMS Inverter System to be installed into position leaving several inches out, away

from the mounting rack or enclosure. Support the system firmly from underneath and rest the unit on the support . With the system firmly rested on a support structure, remove the 6 shipping fasteners installed. Once these are removed, keep the mounting plate from each side as this will be used in permanently mounting the system. Slide the system against the structure to be mounted into, aligning mounting holes of the system with the structure.



NOTE: Structure mounting hardware and fasteners are not provided with the RMS Inverter System. Mounting hardware should be provided as part of the structure used to contain the RMS Inverter system.

Reinstall shipping fasteners (screws) and mounting plates in their original position for additional support. Fasteners should extend through the mounting plate, RMS System mounting brackets, and mounting structure. Use at least three fasteners on each side of the system. A minimum of 1 fastener on each side should secure the termination box and each mounting shelf individually. Use as many fasteners as feasible to secure the system to the structure. Fasteners should be firmly tightened prior to removing the temporary support used during installation.

8.3 Electrical installation (RMS TBOX)

8.3.1 Pre requisites

- All cables shall be halogen free and rated min 90 deg C.
- AC Input / AC output respect phases.
- Wire all positions in the sub-rack for future expansion.
- Input AC / Output AC / Input DC / Signal cables shall be separated.
- Cable crossings shall be done in 90 deg angles.
- Empty inverter positions shall be covered with blanks

8.3.2 Surge suppression

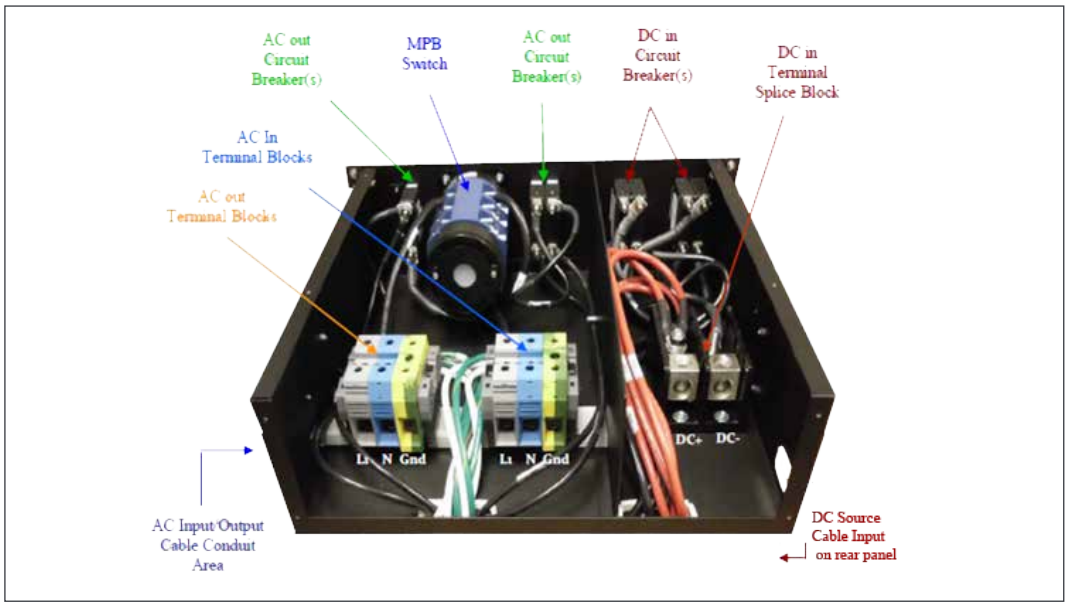
The mains (AC) supply of the modular inverter system shall be fitted with suitable Lightning surge suppression and Transient voltage surge suppression for the application at hand. Manufacturer's recommendations of installation shall be adhered. It is advisory to select device with alarm relay for function failure.

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

- Indoor sites Min Class II
- Outdoor sites Min Class I + Class II or combined Class I+II

8.3.3 Terminations

All terminations are clearly marked.



8.3.3.1 Grounding

"PE CHASSIS GROUND"

PE Chassis ground shall be wired to MET or distributed earth bar connected to MET

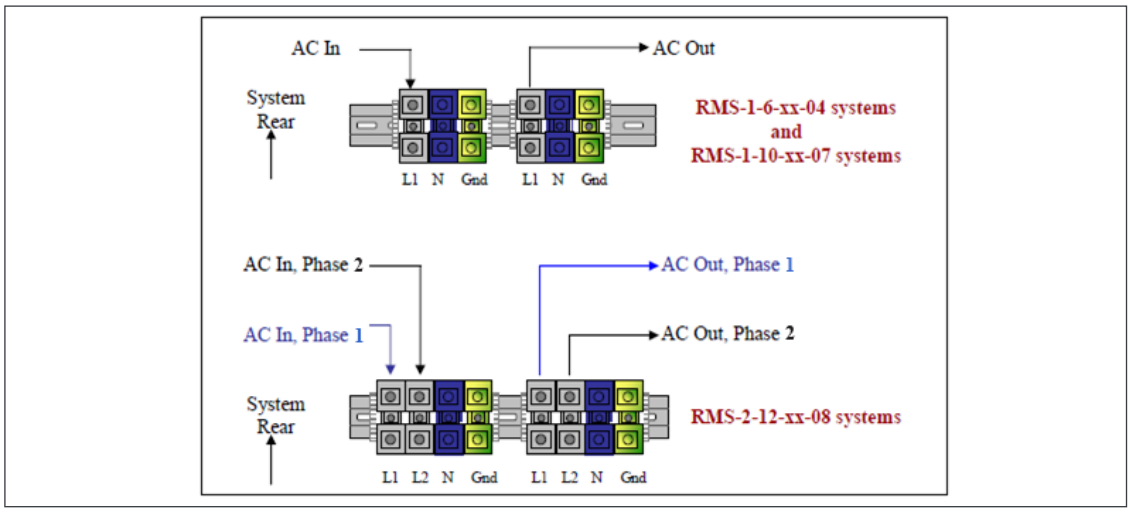
According to local regulations.

Lightning strikes, AC grid switching, or other aberrations on the power lines have the potential to cause high energy transients which can cause systems damage. A low impedance ground path(<25 ohms), is required to maintain acceptable systems voltages and currents. The ground system provides a single point path to ground and should be a clean, good connection, free of high impedance obstacles (i.e., paint, etc.)

Locate the AC terminal block section inside the RMS Termination Box. The ground (PE)

terminal blocks are green and yellow.

Strip the AC source ground wire insulation back approximately 1 inch. Insert the AC ground cable for AC source input to the Gnd terminal block receptacle on the AC Input terminal block group. Securely tighten down the wire receptacle of the terminal block with an allen wrench. Repeat this for the AC Output cable ground on the AC Output terminal block. System ground connections are now complete.



8.3.4 AC input

Using the same stripping techniques as previous, strip the insulation on the neutral wires for the AC source input and the AC output wiring. The neutral line terminals blocks are located next to the PE terminal blocks on each AC input and AC output section, respectively. Insert the input and output neutral cables into the appropriate terminal block receptacles and tighten down securely using an allen wrench.

TAKE CARE TO WIRE THE NUETRAL LINES TO THE APPROPRIATE TERMINAL BLOCK FOR INPUT AND OUTPUT CABLING

For Dual Phase Systems , perform the above step for both phase 1 and phase 2 cables. TAKE CARE TO WIRE PHASE 1 AND PHASE 2 CABLES TO THE APPROPRIATE TERMINAL BLOCKS LABELED PHASE 1 AND PHASE 2. This is imperative for proper systems operation

8.3.5 AC output

Using the same stripping techniques as previous, strip the insulation on the AC output wires for the AC output wiring. Insert the AC output cable into the appropriate terminal block receptacles and tighten down securely using an allen wrench

For Dual Phase Systems (RMS-2-12-xx-08), perform the above step for both phase 1 and phase 2 cables. TAKE CARE TO WIRE PHASE 1 AND PHASE 2 CABLES TO THE APPROPRIATE TERMINAL BLOCKS LABELED PHASE 1 AND PHASE 2. This is imperative for proper systems operation

8.3.6 DC input

Place DC Circuit Breakers in the off position. DC Source cables shall enter the RMS termination box through the DC Input opening on the left rear side. DC cable connections are made through a power splice/stud block. The DC input section of the RMS termination box is designed to accept a nominal -48 Vdc input (from 42 to 58 Vdc). The DC+ connection is referenced to ground in these systems

DC VOLTAGES ABOVE 60 VDC SHOULD NOT BE CONNECTED AND COULD CAUSE DAMAGE TO THE SYSTEM.

Remove the DC conductor input cover plate and discard.

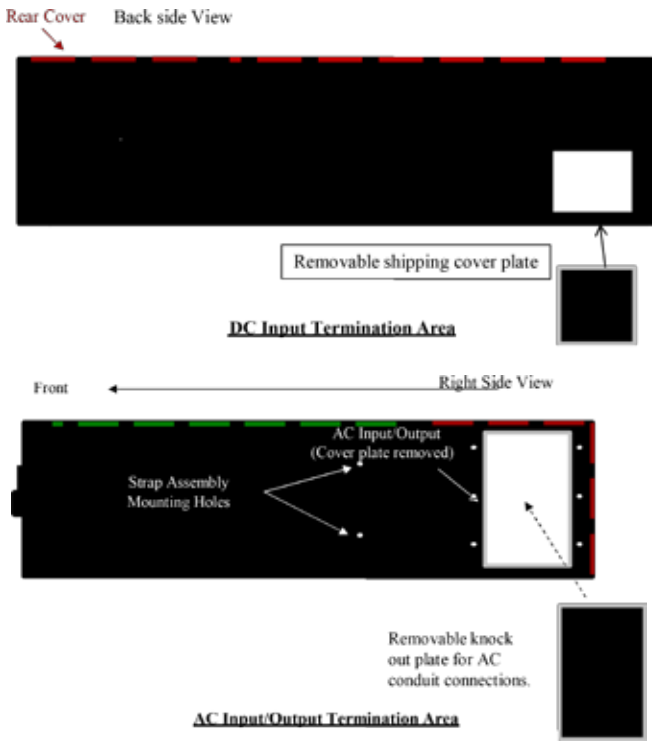
Remove clear plastic safety cover from the DC Stud Block. DO NOT DISCARD SCREWS. Strip the DC input wires as described previously. Install the DC+ cable first for -48 Vdc

input systems. Insert the stripped cable into the DC+ receptacle and securely tighten with a large allen wrench.

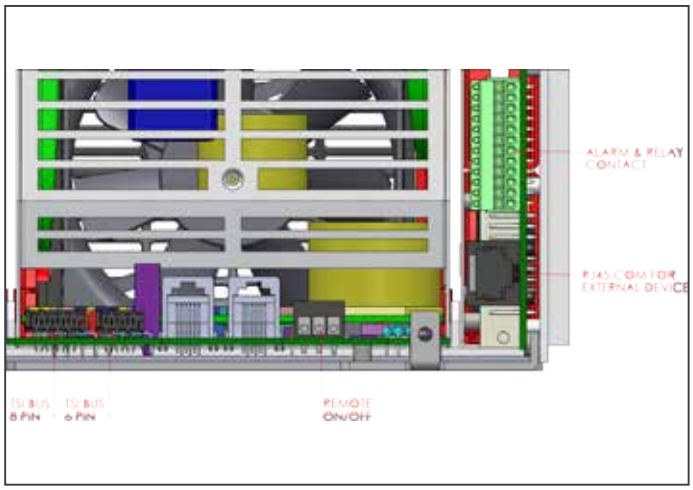
Repeat this process for the DC- cable.

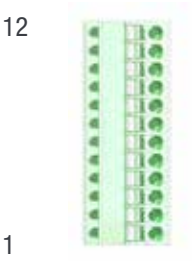
Re-install the clear plastic safety cover on the DC Input Stud Block.

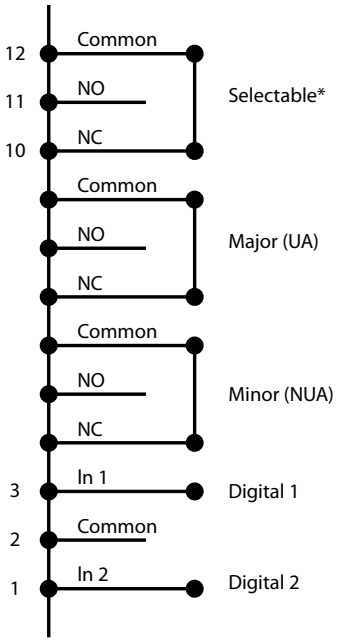
This concludes the DC wiring section. Re-install the back cover of the termination box



8.3.7 Signalling







Relay characteristics (Selectable, Major, Minor)

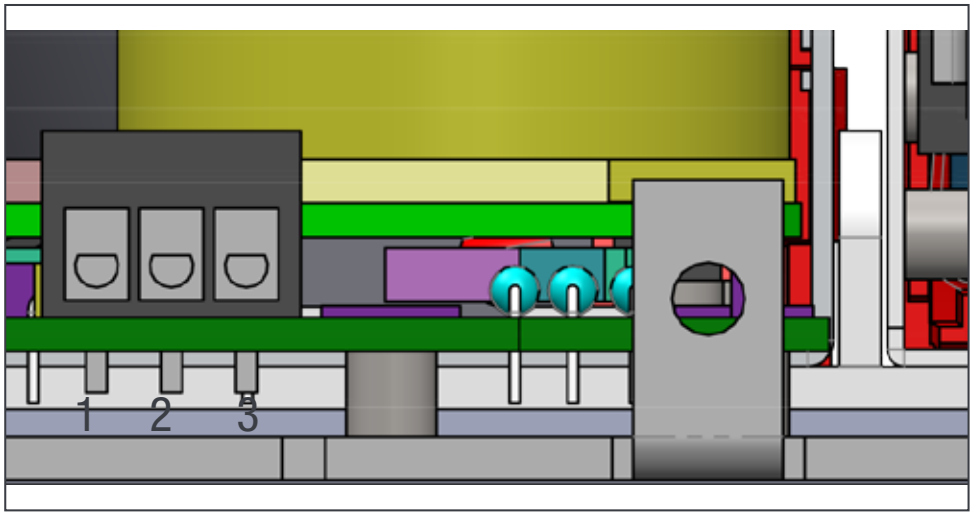
- Switching power 60W
- Rating 2A at 30VDC / 1A at 60VDC
- Max wire size 1mm^2

Digital input characteristics (Digital In 1 / 2)

- Signal voltage +5VDC (galvanic insulated)
- Max wire size 1mm^2

8.3.8 Remote ON/OFF

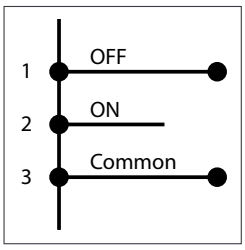
Notice: The shelf is by default equipped with a connection between pin 3 and 2. If remote ON/OFF is not used the strap shall remain in all connected shelves. Should the remote ON/OFF be used ,all straps must be removed and in one (1) shelf replaced with a changeover contact or emergency button.



- The remote ON/OFF switch the output AC OFF.
- Input AC and input DC is not affected by the remote ON/OFF.
- The remote ON/OFF can be connected to any shelf.
- The remote ON/OFF requires changeover contacts, one input opens as the other close. If both transitions are not picked up the status is not changed

Relay characteristics (Remote ON/OFF)

- Signal voltage +5VDC (galvanic insulated)
- Max wire size 1mm2



Functional table for remote ON/OFF function

#	Pin 1-3	Pin 2-3	Status	Indication
1	Open	Open	Normal operation	All (Green)
2	Closed	Open	OFF	AC output (OFF) AC Input (Green) DC Input (Green)
3	Open	Closed	Normal operation	All (Green)
4	Closed	Closed	Normal operation	All (Green)

8.3.9 Internal bus (TSI Bus 6 pin / TSI Bus 8 pin)

- In PACK/A la Carte systems the internal Bus is pre installed
- The internal bus comprise of a 6 pole ribbon cable and an 8 pole ribbon cable.
- The internal bus connectors are sensitive and special caution should be taken during installation to keep them out of harms way
- The internal bus is connected from the first shelf to the last shelf.

8.3.10 Rear cover

- The rear cover provides IP 20 to the rear terminations
- The rear cover is fixed in the rear of the sub-rack.

8.3.11 Connection Table – AC Input

The AC input supply recommended breaker and minimum cable cross section shall be as follows

Power (kVA)		AC Input		
		Screw terminal		
1ph	2ph	Peak Current Calculated	Fuse/CB	Cable AWG
6		56A	63A	6
10.5		98A	100A	2
	12	56A	2x63A	2x6

8.3.12 Connection Table – DC Input

The DC input supply recommended breaker and minimum cable cross section shall be as follows

Power (kVA)		DC Input		
		Screw terminal		
1ph	2ph	Peak Current Calculated	Fuse/CB	Cable
6		140A	160A	0 AWG
10.5		245A	250A	250 kcmil
	12	280A	300A	300 kcmil

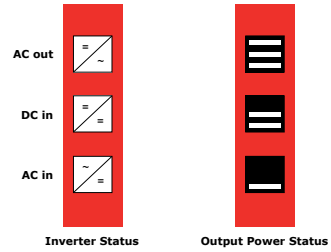
8.3.13 Connection Table AC Output

The AC Output supply recommended breaker and minimum cable cross section shall be as follows

Power (kVA)		AC Output		
		Screw terminal		
1ph	2ph	Peak Current Calculated	Fuse/CB	Cable AWG
6		55A	63A	6
10.5		97A	100A	2
	12	55A	2x63A	2x6

9. Interface

9.1 Inverter module

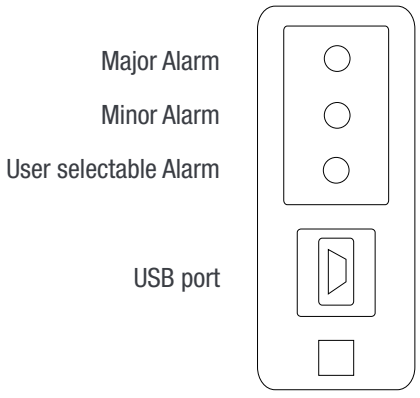


Inverter Status LED	Description	Remedial action
OFF	No input power or forced stop	Check environment
Permanent green	Operation	
Blinking green	Converter OK but working conditions are not fulfilled to operate properly	
Blinking green/orange alternatively	Recovery mode after boost (10 In short circuit condition)	
Permanent orange	Starting mode	
Blinking orange	Modules cannot start	Check T2S
Blinking red	Recoverable fault	
Permanent red	Non recoverable fault	Send module back for repair

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)

9.2 T2S

- Alarm indication on T2S (Urgent / Non Urgent / Configurable)
  - Green: No alarm
  - Red: Alarm
  - Flashing Exchanging information with inverters (only Configurable alarm)
- Outgoing alarm relay delay
  - Urgent 60 seconds delay
  - Non urgent 30 second delay
- Parameter setting via Laptop or Copy/Paste.
- Factory default according to list of set values, see Table of set values

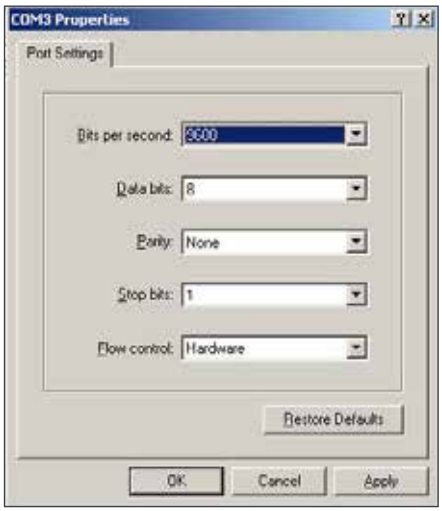


10.System set up

- Parameter set up requires Hyper terminal installed on laptop
- USB cable type A to B (not included)
- T2S driver “CET_T2S.inf“installed on laptop.
- Available for download at http://www.acbackuptsi.com
  - Username: T322010000
  - Password: No password required (enter)
- Read T2S manual for detailed setup

10.1 Communication setting

- Bits per second 115200
- Data bits 8
- Parity None
- Stop bits 1
- Flow control None



10.2 Menu access

Root Menu

- 1 > System cinfiguration
  - 0 > Return to previous menu
  - 1 > Send config file to T2S
  - 2 > Read config file from T2S
  - 3 > Restore default settings (no more available since version 2.5)
  - 4 > Restore factory settings (no more available since version 2.5)
- 2 > System information's selection
  - 0 > Return to previous menu
  - 1 > Module information's
    - 0 > Return to previous menu
    - 1 > Variables set 1
    - 2 > Variables set 2
    - 3 > Variables set 3
    - 4 > Variables set 4
    - \+ > Next page
    - \- > Previous page
  - 2 > Phase information
    - 0 > Return to previous menu
    - 1 > Variables set 1
    - 2 > Variables set 2
    - 3 > Variables set 3
  - 3 > Groups information
    - 0 > Return to previous menu
    - 1 > Display AC group information
    - 2 > Display DC group information
  - 4 > Alarms information
    - 0 > Return to previous menu
    - 1-1 > Page slection
  - 5 > History of the log display
    - 0 > Return to previous menu
    - 1-14 > Page number selection
    - 16 > Clear log
    - 17 > Save log to a file
  - 6 > Module errors information
    - 0 > Return to preceding menu
    - 1-32 > detailled Modules errors
- 3 > System actions selection
  - 0 > Return to previous menu
  - 1 > System actions
    - 0 > Return to index
    - 1 > Turn ON system
    - 2 > Turn OFF system
    - 3 > Change Date and time setting
  - 2 > Inverter Module action
    - 0 > Return to previous menu
    - 1-4 > Page number selection
    - 5 > Identify selected Module
    - 6 > Turn ON selected Module
    - 7 > Turn OFF selected Module
    - 8 > Change address of sel. Module
    - 9 > Change phase of selected Module
    - 10 > Automatic address assignment
    - 11 > Change DC group of selected Module
    - 12 > Change AC group of sel. Module
    - 13 > Notify changed fan of sel. Module
    - \+ > Increment selector
    - \- > Decrement selector
  - 3 > T2s actions
    - 0 > Return to index
    - 1 > Force refresh of configuration textes and constants
    - 2 > Force refresh of events description texts
- 4 > Security Access
  - 0 > Return to index
  - 1 > Enable Password protection

11.Inserting/removing/replacing modules

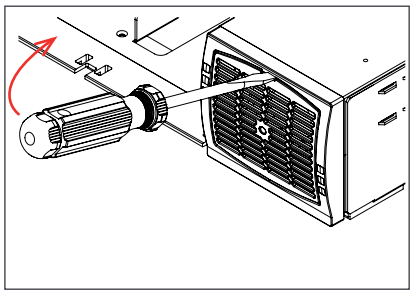
11.1 TSI Inverter

- The TSI inverter is hot swappable.
- When a new module is inserted in a live system it automatically adapt to working set of parameters.
- When a new module is inserted in a live system it automatically assigns the next available address.

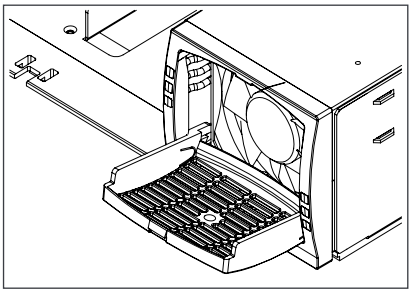
11.1.1 Removal

Notice: When one or several inverter modules is/are removed it gains access to live parts. Replace module with blinds without delay.

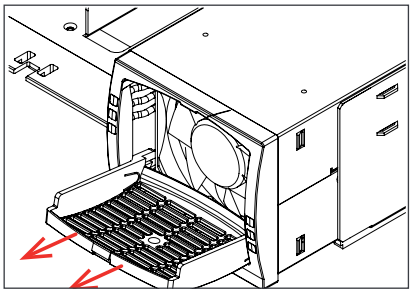
- Inverter module is not switched off when opening the handle. The handle only fixes the module to the shelf.
- Use a screw driver to release the latch of the handle
- Open the handle
- Pull the module out
- Replace with new module or blind unit



A) Use screwdriver to release the latch



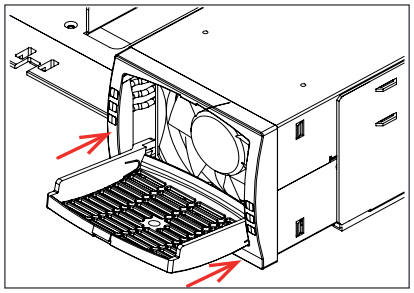
B) open the cover completely



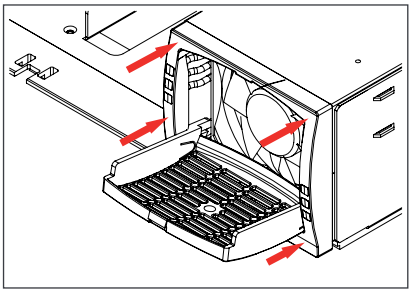
C) Use the cover as a handle to remove the module

11.1.2 Inserting

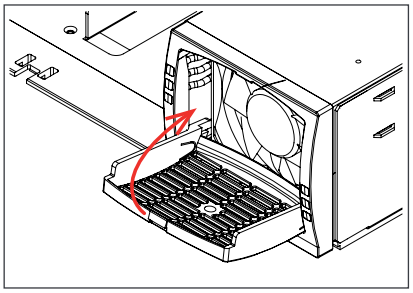
- Use a screw driver to release the latch of the handle
- Open the handle
- Push firmly until the unit is properly connected.
- Close the cover and latch in position



A) Slide the module in



B) Push firmly till the connection is properly engaged

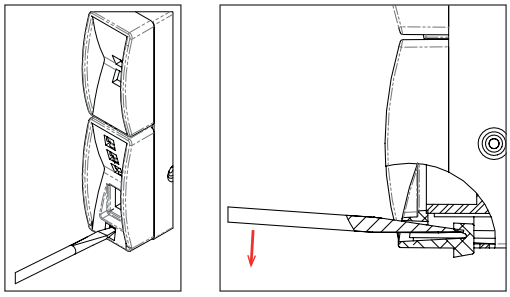


C) Close the cover and latch the module in place if too hard redo step B

11.2 T2S

11.2.1 Removal

- Use a small screw driver to release the latch keeping the T2S in position
- Pull the module out



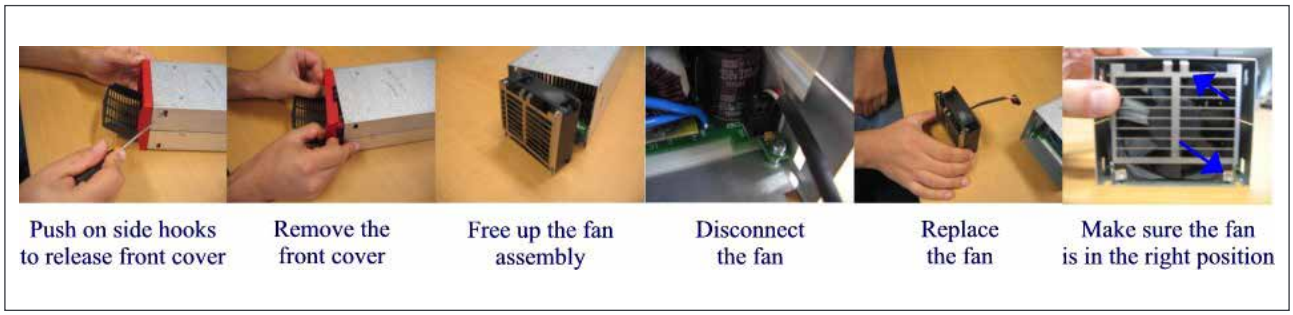
11.2.2 Inserting

- Push the module firmly in place until the latch snaps in position

11.3 Fan replacement

The FAN life is approx 45.000hours. The inverter modules have fan runtime meters and fan failure alarm. Fan failure can result from failing fan or driver circuit.

- Let the module rest at least 5 minutes prior to initiating work.
- The inverter front must be removed. Use a blunt tool to depress the latches on the module side fixing the front to the module.
- Remove the fan and unplug the supply cord.
- Replace with new fan and connect supply cord
- Replace front, make sure that the front latch properly.
- Plug in
- Check fan for operation
- Access T2S and reset the fan run time alarm from within the action menu



12.Manual By-pass

Manual By-Pass has to be operated by trained people only.

When system is in manual by-pass the load is subjected to mains voltage without active filtering.

The manual by-pass is not possible to operate remotely

12.1 Pre requisites

Commercial AC must be present, and inverter must be synchronized with it before operating MBP. The upstream commercial breaker must be correctly sized .

The by-pass switch disconnect AC output voltage on the shelves to load but has no action on the input AC and DC feeding on inverter

12.2 Manual by-pass

12.2.1 UPS to By-pass

1. Turn switch to Bypass
2. Switch AC and DC in OFF before handling inverter shelves and modules

12.2.2 By-pass to UPS

1. Switch AC and DC input ON
2. PAUSE, wait until the inverter modules have come to full operation (30-60seconds)
3. Turn switch to UPS.

13.Finishing

- 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 according to recommendations and local regulations.
- Make sure that all cables are strained relived.
- Make sure that all breakers are according to recommendation and local regulations.
- Make sure that DC polarity is according to marking.
- Re tighten all electrical terminations.
- Make sure that no inverter/controller positions are left open.
- Cover empty inverter positions 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.

14.Commissioning

The DC breaker is a protection device. When modules are plugged in a system please make sure the corresponding DC breaker is engaged in the ON position. Failure to observe this rules will result not to have all module operating when running on DC and have module failure when AC input recover from fault condition.

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

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

Equipments are not cover by warranty if procedures are not respected.

14.1 Check list

DATA	
Date	
Performed by	
Site	
System serial number	
Module serial numbers	
T1S/T2S serial number-Specify T1S/T2S	
ACTION	**OK/ N.OK**
Unplug all inverters except one inverter per phase (Just pull off the inverter from the shelf, to interrupt electrical contacts)	
Check the commercial AC before closing the AC input breaker.	
Switch ON the commercial AC	
Check if inverters are working (Green led)	
Check the DC power supply and switch ON the DC breakers	
Plug in all inverters one by one	
Check output voltage (on bulk output or on breaker)	
Check if inverters are working properly	
Check if system has no alarm (Disable the alarm if any)	
Read configuration file and review all parameters. Some parameters must be adapted according to the site (LVD, load on AC, AC threshold level)	
Switch OFF ACin and check if system is working on DC	
Switch ON ACin and check if system correctly transferred load on AC	
Switch OFF system and start on AC only	
Switch OFF system and start on DC only	
Check if display working properly (if this CANDIS option is present)	
Check if TCPIP working properly (if this option is present)	
Test on load (if available)	
ALARM	
Switch ON AC input and DC input and check that no alarm are present	
Pull out one inverter and check alarm according to redundancy	
Pull out two inverters and check alarm according to redundancy	
Switch OFF AC input (commercial power failure) and check the alarm according to the configuration	
Switch OFF DC input (DC power failure) and check that the alarm according to the configuration	
Check the different digital input according to the configuration (when used)	

15.Trouble shooting

Inverter does not power up:	Check that the inverter is properly inserted
	Reposition inverter to verify that slot is not damaged
	Check AC input present and in range (AC breakers)
	Check DC input present and in range (DC breakers)
	Check for loose terminations
Inverter does not start:	Check that T2S is present and properly inserted
	Check remote ON/OFF terminal
	Check that Manual By-pass is in normal position
	Check the configuration and setting
	Check threshold level
Inverter only run on AC or DC:	Check the configuration and setting
	Check threshold level
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:	Mind the default time delay (UA: 60s, NUA: 30s)
	Check configuration file
No information on CanDis:	Check that T2S is present and properly inserted
	Check that the RJ45 cable is connected between T2S shelf and CanDis shelf
No value on TCP/IP:	Check that the RJ45 cable is connected between T2S shelf and CanDis shelf
	Wait approx 2 minutes to allow the system to collect serial data.

16.Maintenance

Maintenance shall only be performed by properly trained people.

16.1 Access T2S with lap top

- Download system LOG FILE and save
  - Analyze log file and correct errors
- Download system CONFIGURATION FILE and save
  - Check/correct configuration file according to operation conditions
  - Check/correct alarm configuration
- Check module internal temperature for deviation between modules
  - Temperature deviation may indicate build up of dust. Clean with compressed air
- Check module/system load
- Check/Correct inverter mapping (DC group/AC group/ Address)
- Change configuration file to validate that system operates on both supply sources
- Check outgoing alarm, consult configuration file what actions will generate alarm

16.2 Manual check

- Validate input voltage (AC input, DC input, AC output) with multi-meter
- Replace dust filter
- Take a snap shot of the cabinet

16.3 Optional

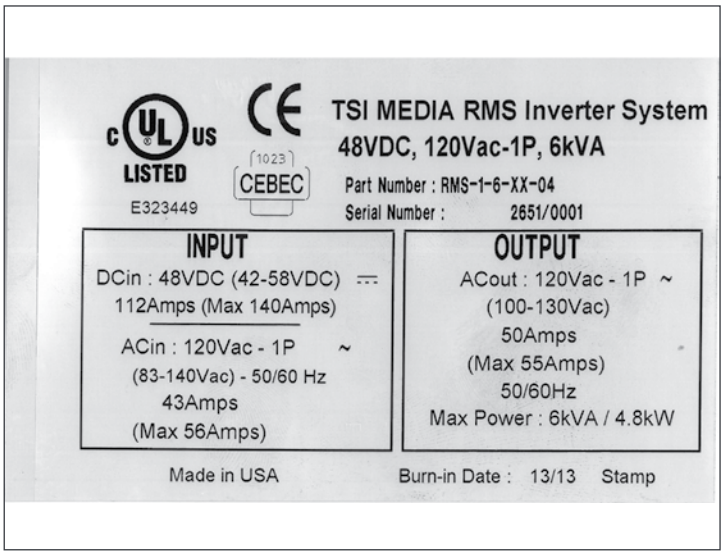
- With an infrared camera check termination hot spots
  - Tighten terminations

16.4 Manual by-pass

- If mains failure during operation the load is lost
- Perform a manual by-pass operation

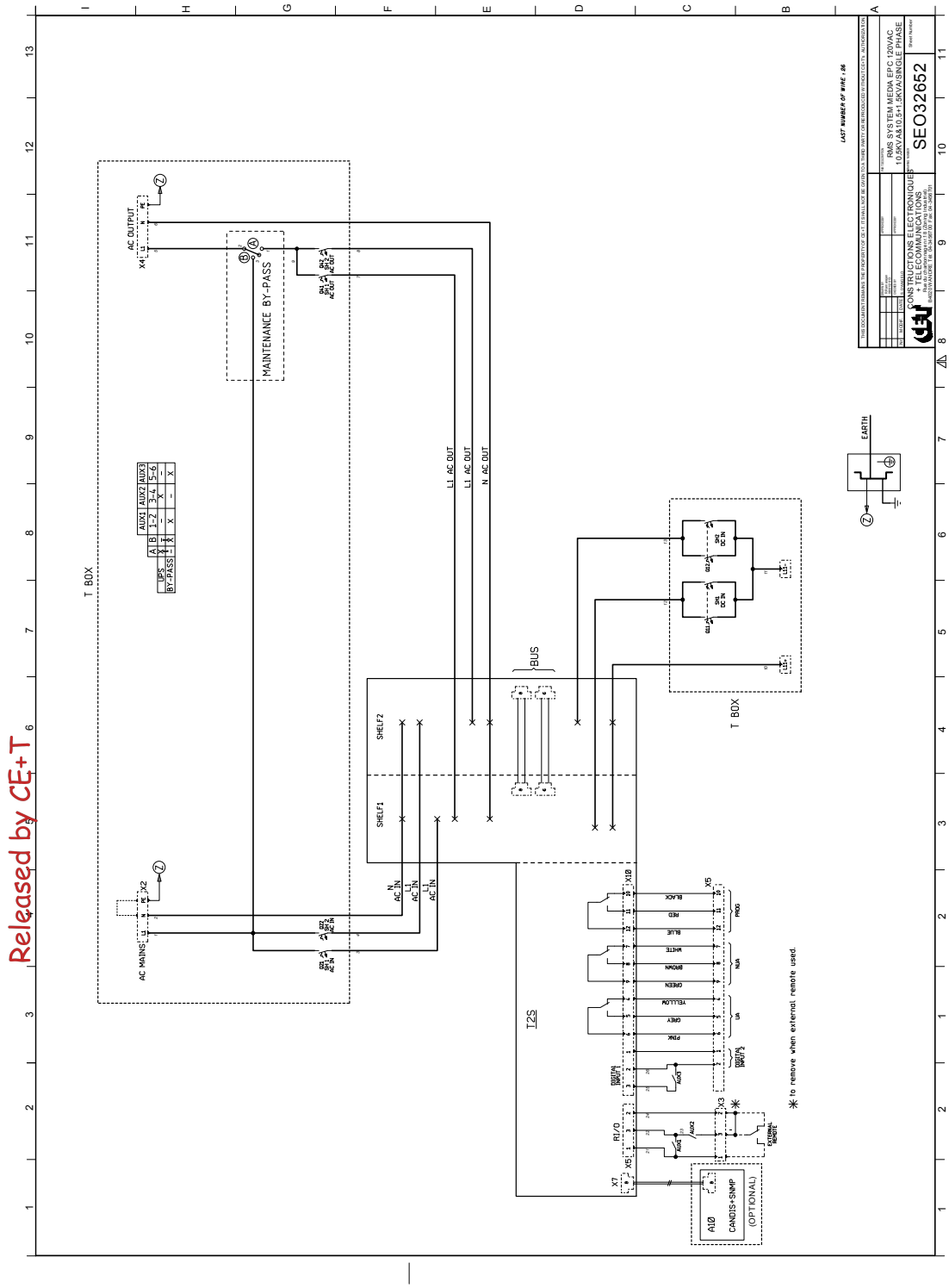
17.Defective modules

- A repair request should follow the regular logistics chain:
  End-user => Distributor => CE+T Power.
- Before returning a defective product, a RMA number must be requested through the http://my.cet-power.com extranet.
  Repair registering guidelines may be requested by email at repair@cet-power.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!
  (Label shown here is only for representation)

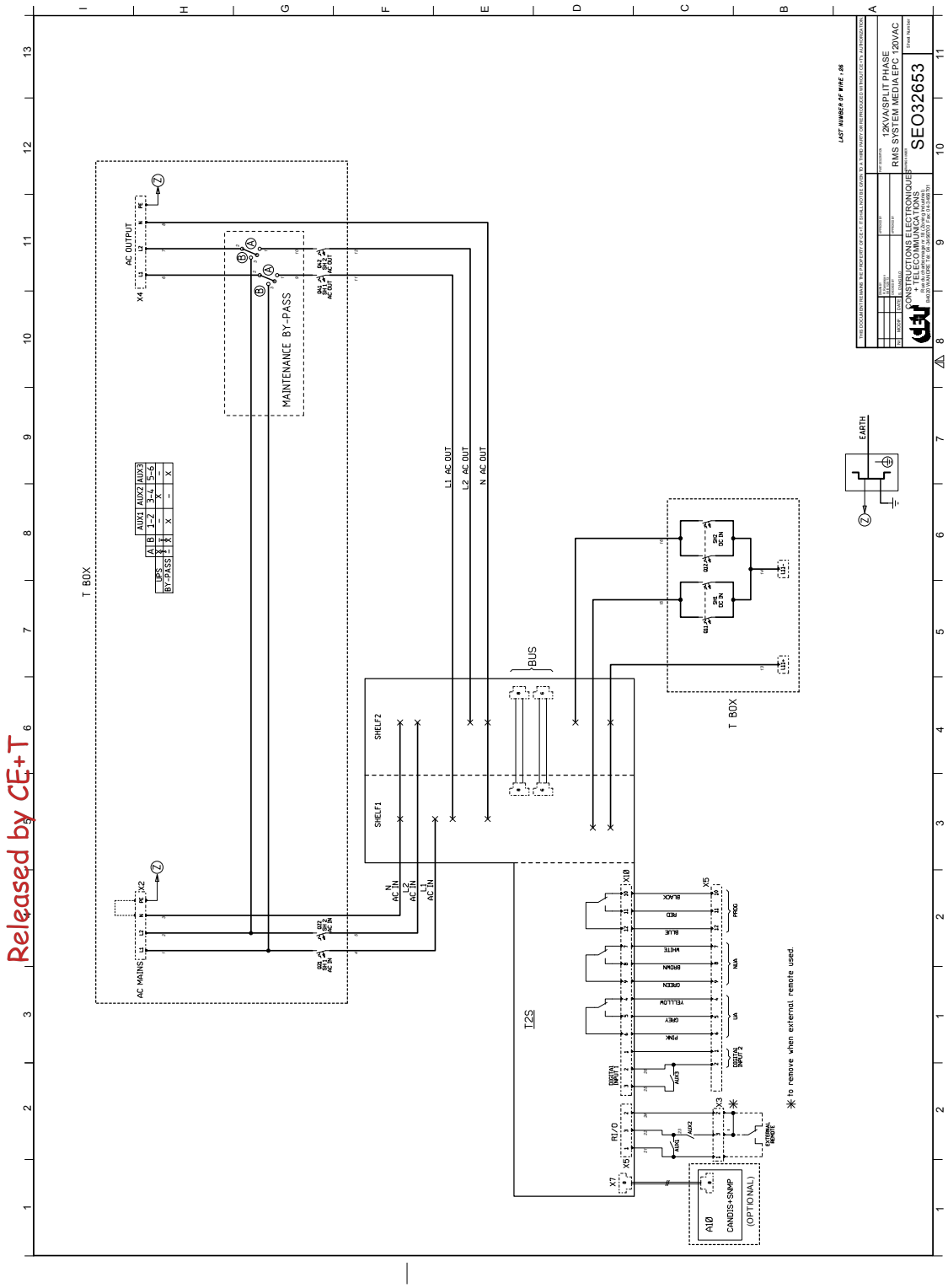


18.Appendix

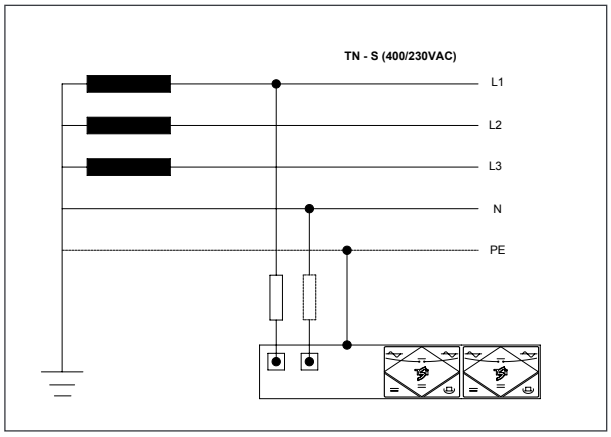
18.1 Single phase circuit diagram

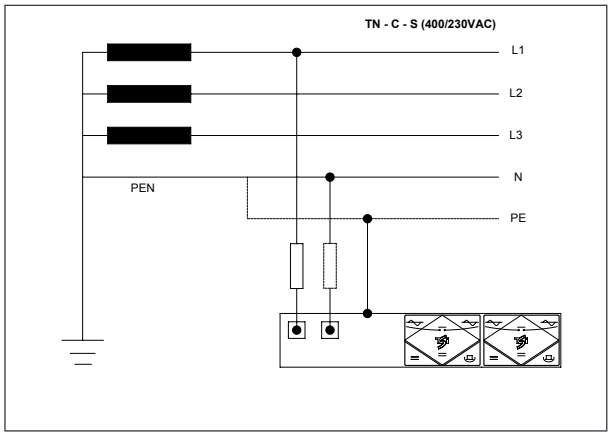


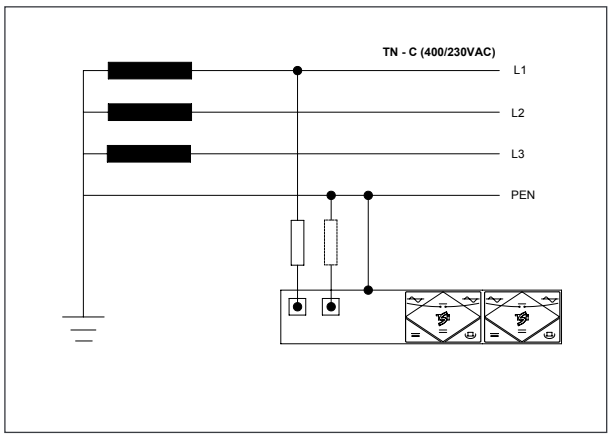
18.2 Dual phases circuit diagram

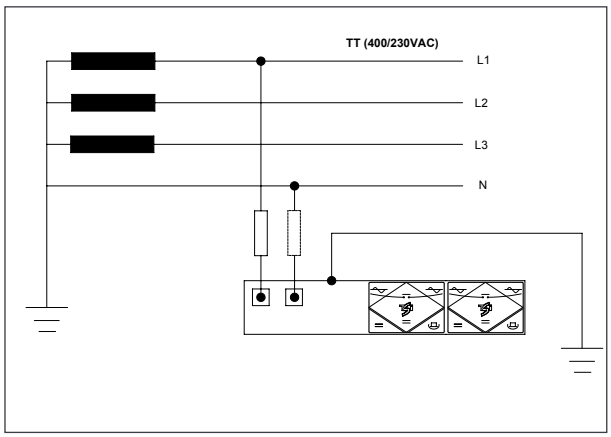


18.3 Mains connection, Single phase









18.4 Mains connection, Dual phases