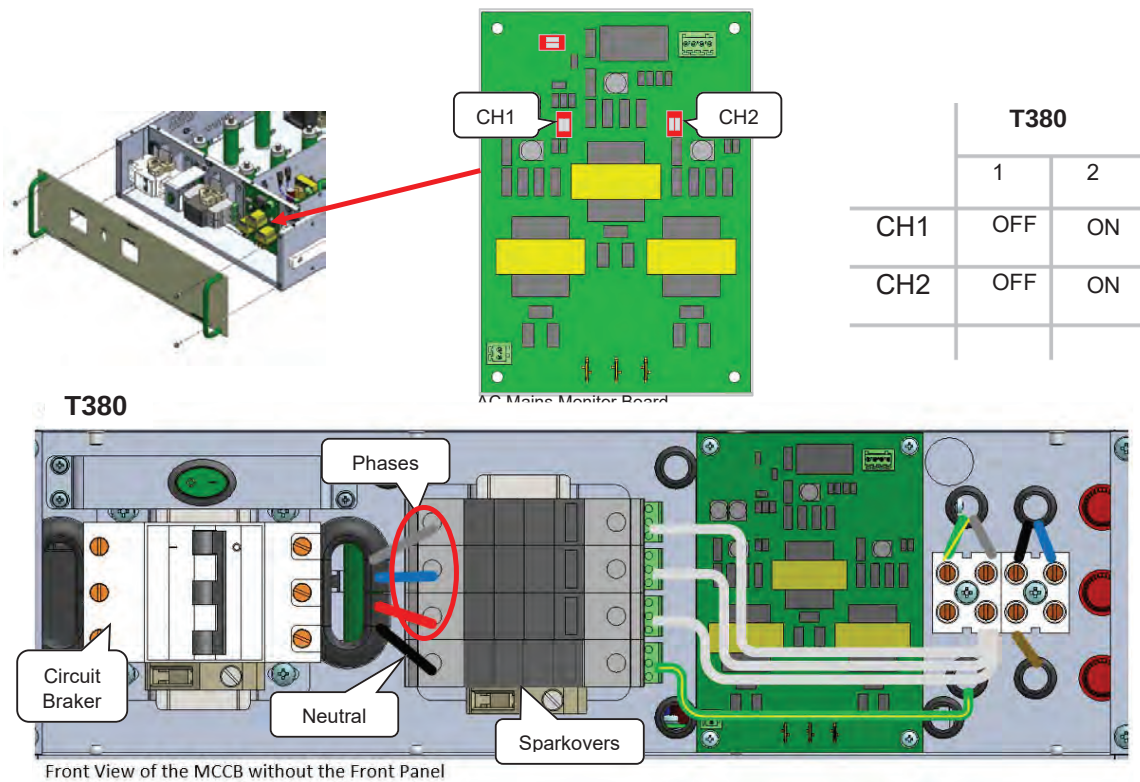
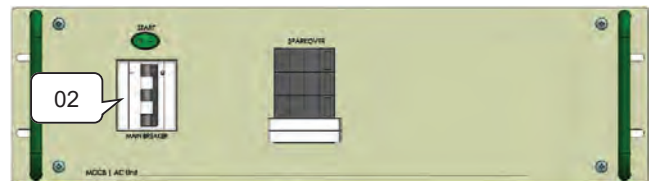




4.7.2. Circuit Breakers



MCCB AC Mains M220 / B220 (Front View)



MCCB AC Mains T220 / T380 (Front View)

Equipment	CIRCUIT BREAKERS TYPE			
	M208 (01)	B240 (01)	T208/T240 (02)	T380 (02)
EC702HP-BB2 MOD GV 40098	50A	50A	32A	20A
EC703HP-BB2 MOD GV 40099	63A	63A	50A	32A
EC704HP-BB2 MOD GV 40100	80A	80A	63A	32A

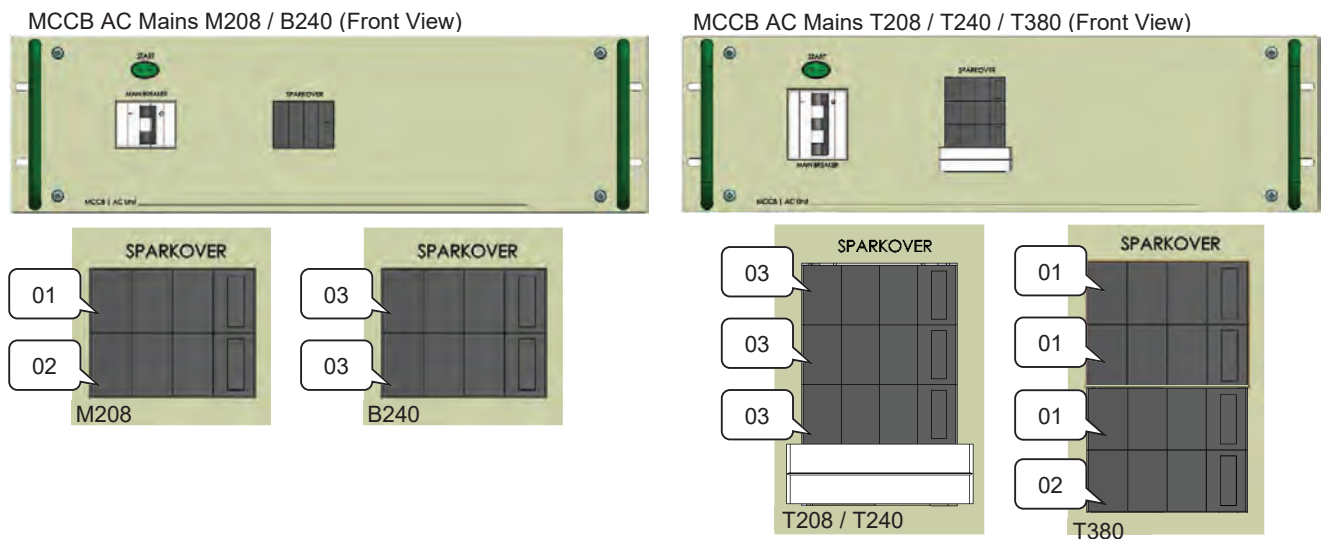
4.7.3. Sparkover - Phase Surge Protection Device (SPD)

It is a device that limits overvoltages in the mains by diverting the current line to ground in order to limit the amplitude of this overvoltage to a value that is not dangerous to the equipment. It is connected in parallel between the line and the ground and has high impedance. Once the transient overvoltage appears in the system, the impedance of the device decreases and directs the current to the earth, protecting the equipment.

When this occurs, the device signals a red flag, indicating that it requires a replacement:

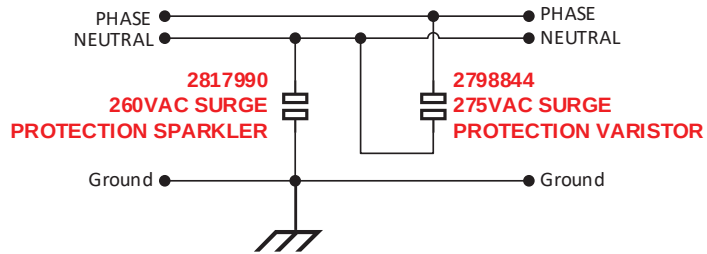


Sparkovers types:

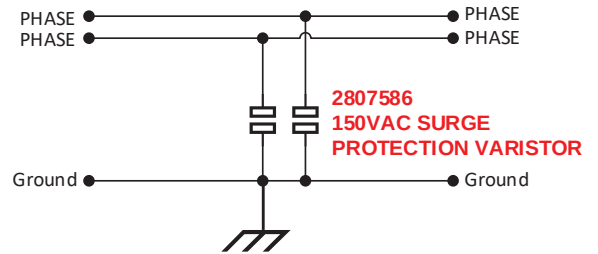


01	2798844 – 275VAC SURGE PROTECTION VARISTOR
02	2817990 – 260VAC SURGE PROTECTION SPARKLER
03	2807586 – 150VAC SURGE PROTECTION VARISTOR

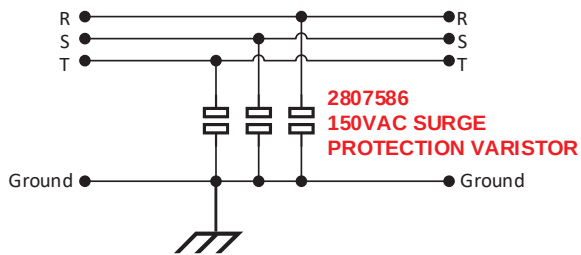
M208



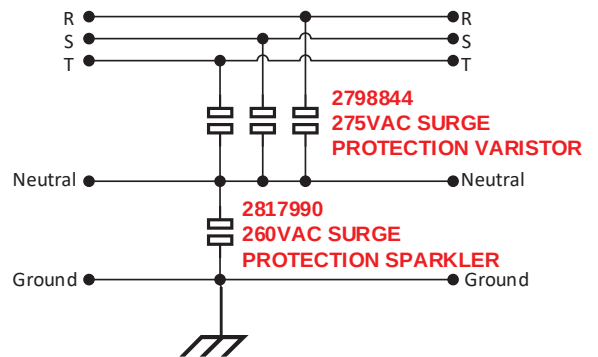
B240



T208 / T240



T380



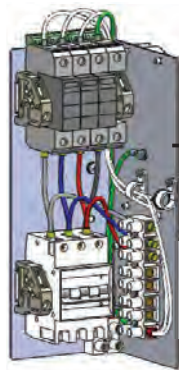
4.8. AC Mains Protection Unit

The AC Protection Unit is **only present on EC701HP-BB2**. Is responsible for the AC Power distribution and Equipment AC Power protection.

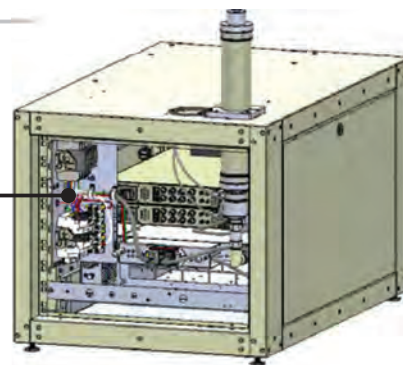
Characteristics:

- ⇒ Surge Protection Device (SPD)
- ⇒ Circuit Breaker
- ⇒ AC Line Input
- ⇒ AC Mains Internal distribution
- ⇒ AC Mains Available:

M208	1 Φ 190~240VAC Neutral GND
B240	2 Φ 190~240VAC GND
T208 / T240	3 Φ 190~240VAC GND
T380	3 Φ 190~240VAC Neutral GND



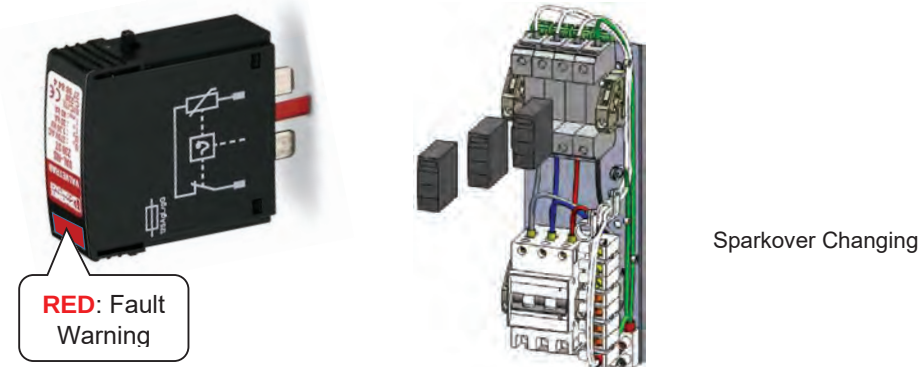
Mains
Protection
Unit



EC710MP-BB – Rear View

4.8.1. Sparkover - Phase Surge Protection Device (SPD)

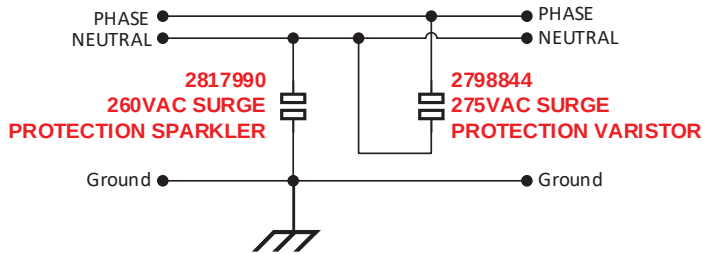
It is a device that limits overvoltages in the mains by diverting the current line to ground, in order to limit the amplitude of this overvoltage to a value that is not dangerous to the equipment. It is connected in parallel between the line and the ground and has high impedance. Once the transient overvoltage appears in the system, the impedance of the device decreases and directs the current to earth protecting the equipment. When this occurs, the device signals a red flag, needing for its replacement:



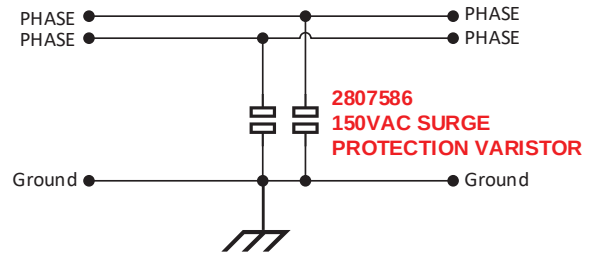
Sparkovers types:

2798844 – 275VAC SURGE PROTECTION VARISTOR
2817990 – 260VAC SURGE PROTECTION SPARKLER
2807586 – 150VAC SURGE PROTECTION VARISTOR

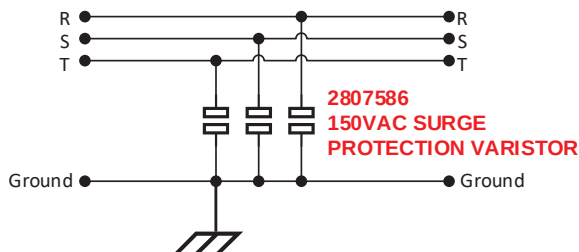
M208



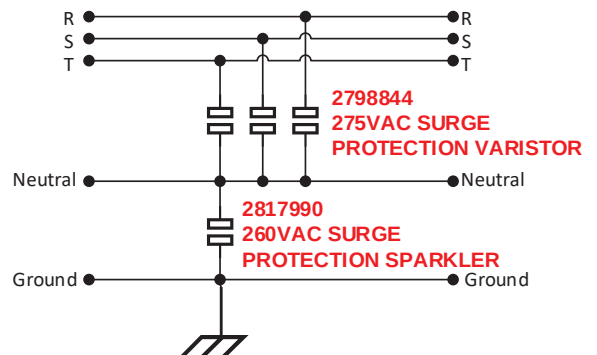
B240



T208 / T240



T380



About AC MAINS TYPE, see Section 8 – Attachments, USA AC Mains Types for E-



Never open the device: there is a risk of electric shock. If necessary, contact Comark customer support.



Before connecting the device to the AC Mains, one must ensure that the grid Voltage meets the equipment's settings.

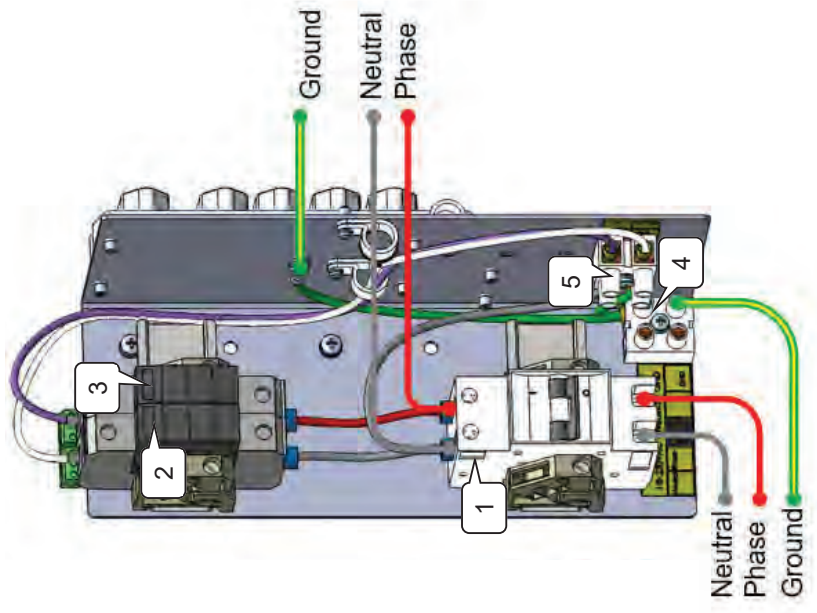
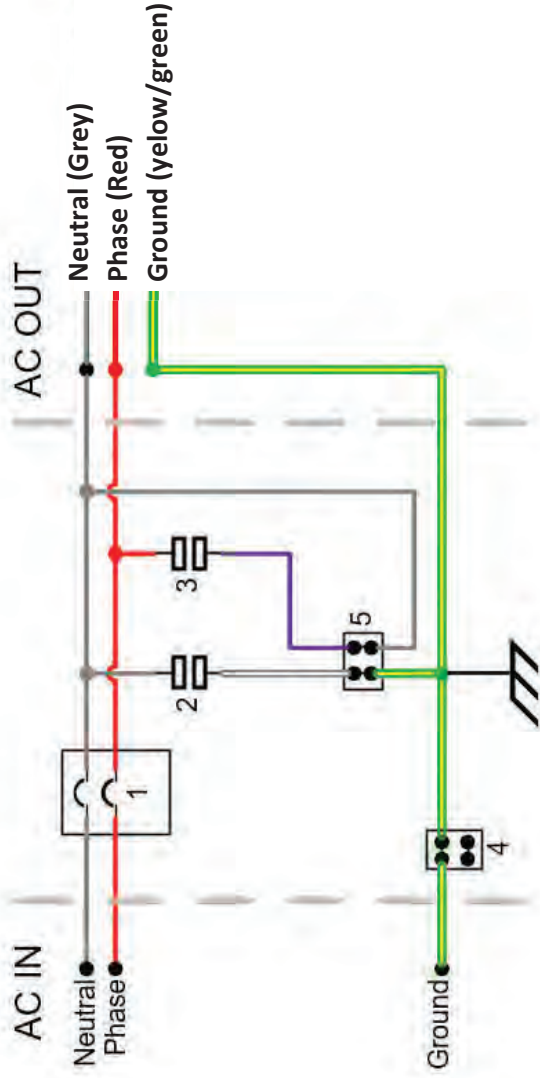


Never expose the equipment to rain, moisture, or direct sunlight in order to avoid the risk of fire or electric shock.

4.8.2. M208 Mains Protection Unit – 208VAC WILD

LEG

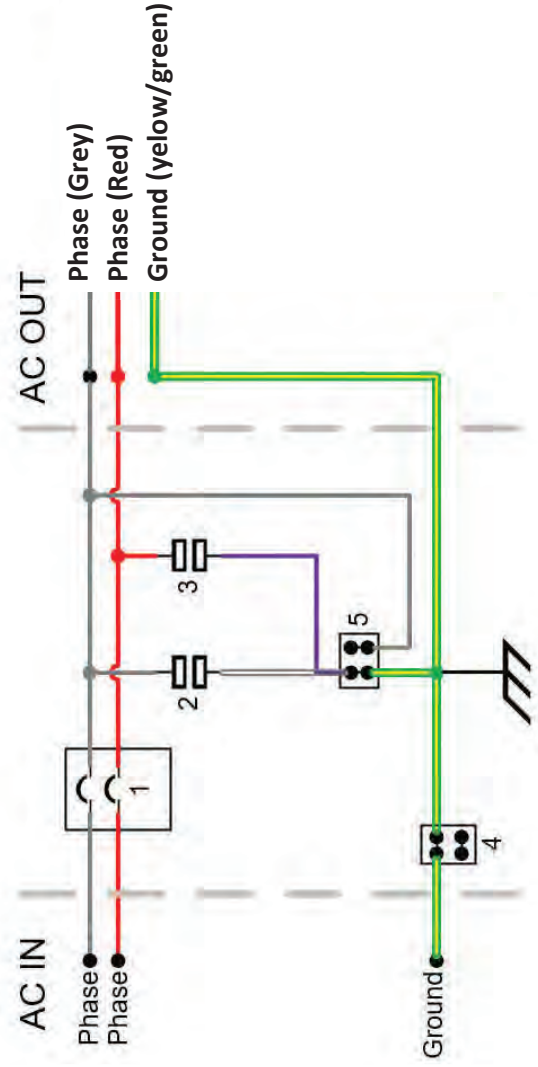
1 Φ 208VAC
Neutral
GND



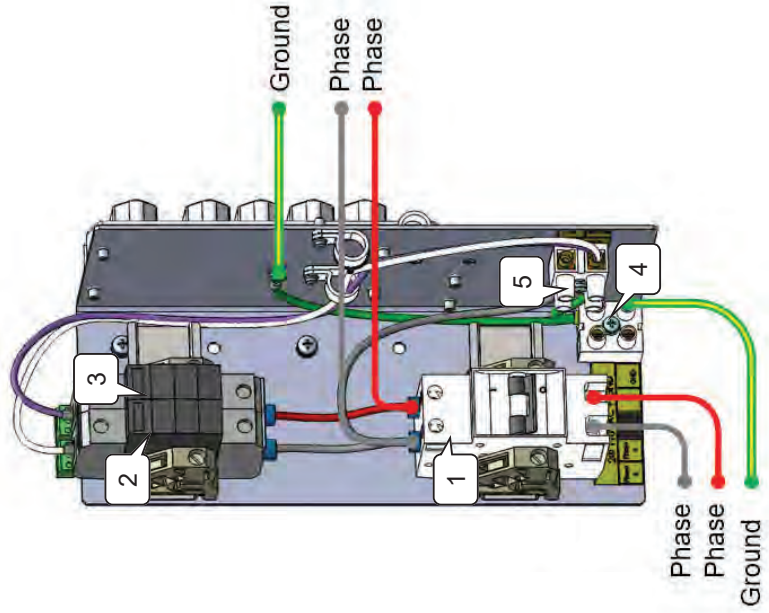
1	Bipolar Circuit Breaker 25A 5SL1 225-7MB
2	Sparkler F-MS 12 ST- TVS 260 VAC
3	Varistor VAL-MS 230 ST - 275Vac
4	GND / Neutral Input Connector
5	GND / Neutral Protection Connector

4.8.3. B240 Mains Protection Unit –SINGLE PHASE 240 VAC

2 Φ 240VAC
GND



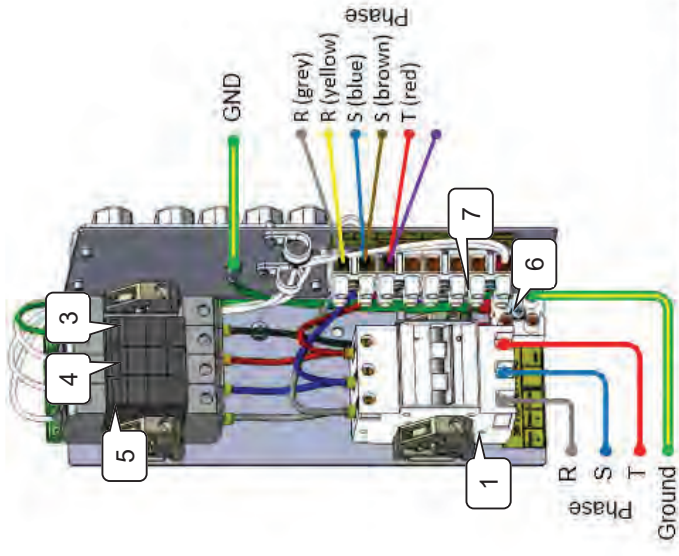
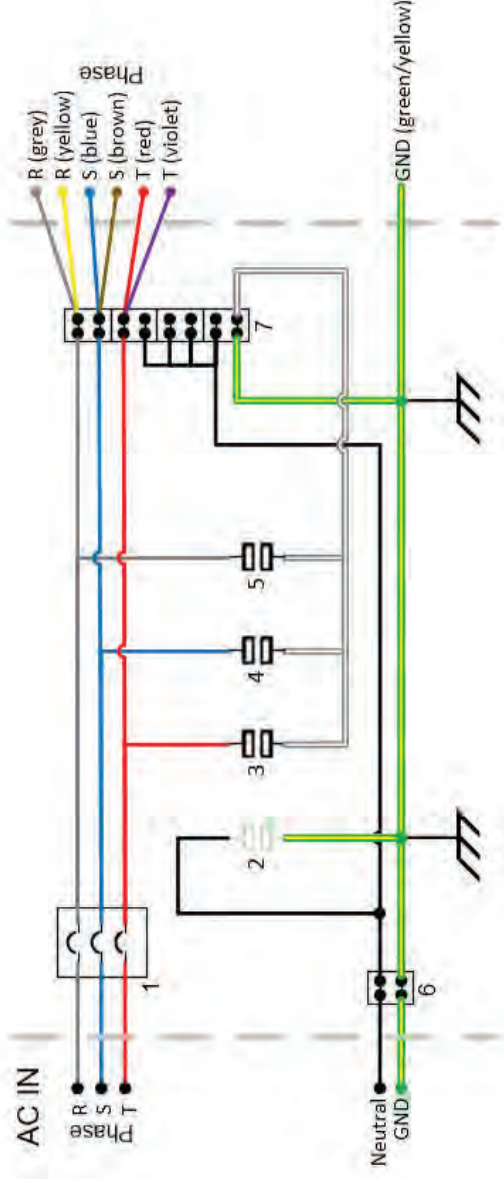
1	Bipolar Circuit Breaker 25A 5SL1 225-7MB
2	Varistor VAL-MS 120 ST - 150Vac
3	Varistor VAL-MS 120 ST - 150Vac
4	GND / Neutral Input Connector
5	GND / Neutral Protection Connector



4.8.4. T208 / T240 Mains Protection Unit – WYE THREE PHASE 208VAC - DELTA THREE PHASE 240VAC

3 Φ 190~240VAC
GND

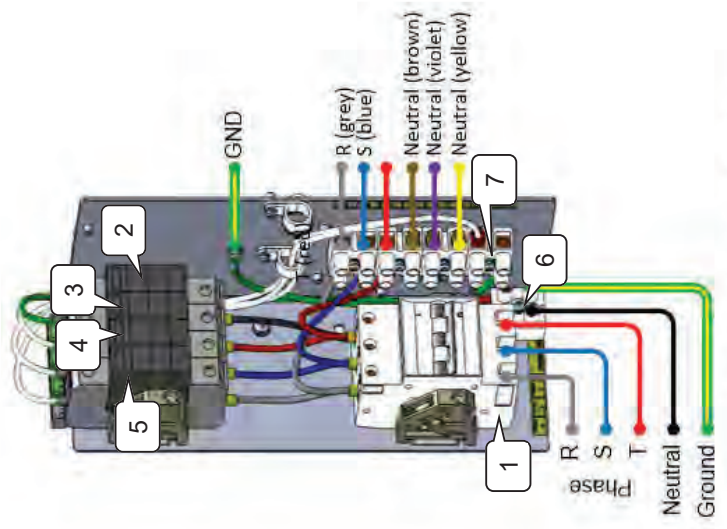
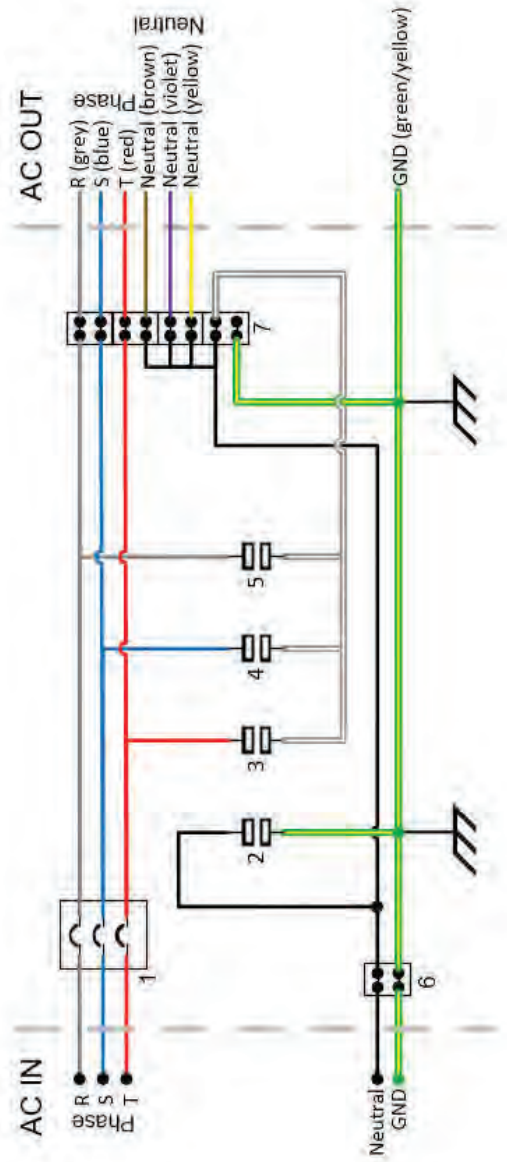
1	Tripler Circuit Breaker 20A 5SL1 320-7MB
2	NOT USED
3	Varistor VAL-MS 120 ST - 150VAC
4	Varistor VAL-MS 120 ST - 150VAC
5	Varistor VAL-MS 120 ST - 150VAC
6	GND / Neutral Input Connector
7	GND / Neutral Protection Connector and Output connectors



4.8.5. T380 Mains Protection Unit

3 Φ 220VAC
Neutral
GND

1	Tripler Circuit Breaker 20A 5SL1 320-7MB
2	Sparkler F-MS 12 ST- TVS 260 VAC
3	Varistor VAL-MS 230 ST - 275VAC
4	Varistor VAL-MS 230 ST - 275VAC
5	Varistor VAL-MS 230 ST - 275VAC
6	GND / Neutral Input Connector
7	GND / Neutral Protection Connector and Output connectors



4.8.6. Changing AC Mains

Once the mains power is set at the factory, there is the possibility to change its input type feature for the following cases:

AC Main Factory Set	Setup Change Possibility			
	M208	B240	T208 / T240	T380
M208	Factory Set	USE B220 Setup See 6.6.3	Not Available	Not Available
B240	USE M220 Setup See 6.6.2	Factory Set	Not Available	Not Available
T208 / T240	USE Setup Change See 6.6.7	USE Setup Change See 6.6.8	Factory Set	USE T380 Setup See 6.6.5
T380	USE Setup Change See 6.6.7	USE Setup Change See 6.6.8	USE T220 Setup See 6.6.4	Factory Set



For unavailable cases, it is necessary to replace the complete AC Mains Module for the compatible electrical grid. Contact Comark customer support.



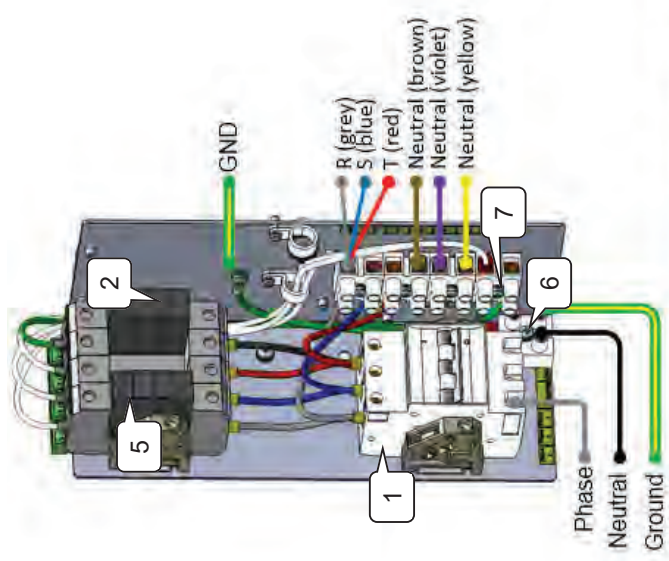
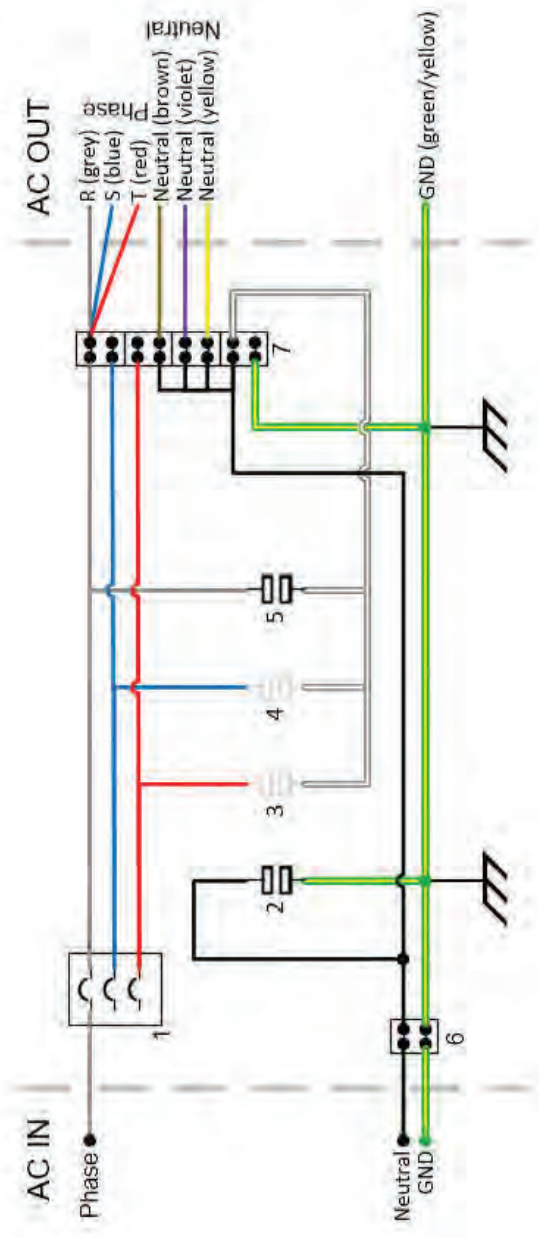
When replacing the AC Mains type, pay attention to circuit breakers, varistors and sparklers models for their characteristics. Each type of AC Mains uses different values of these protection components.

Using these protection components outside the features described in this manual may cause damage to the equipment.

4.8.7. T208/T240 and T380 – Change to M208

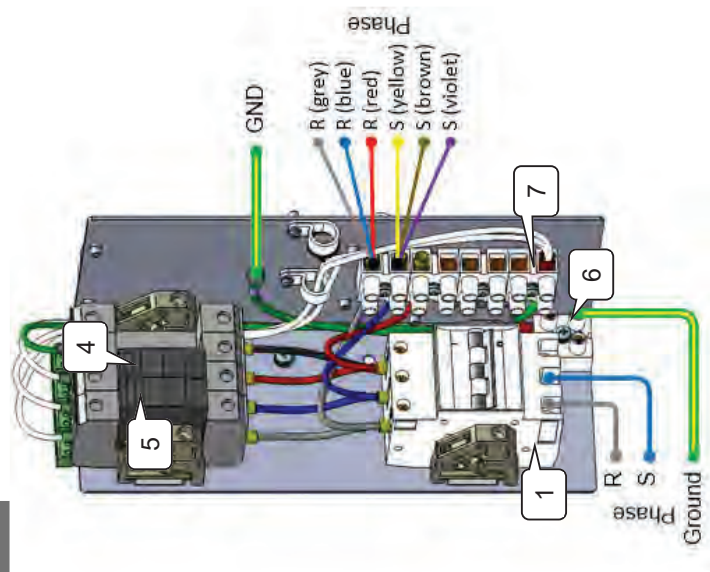
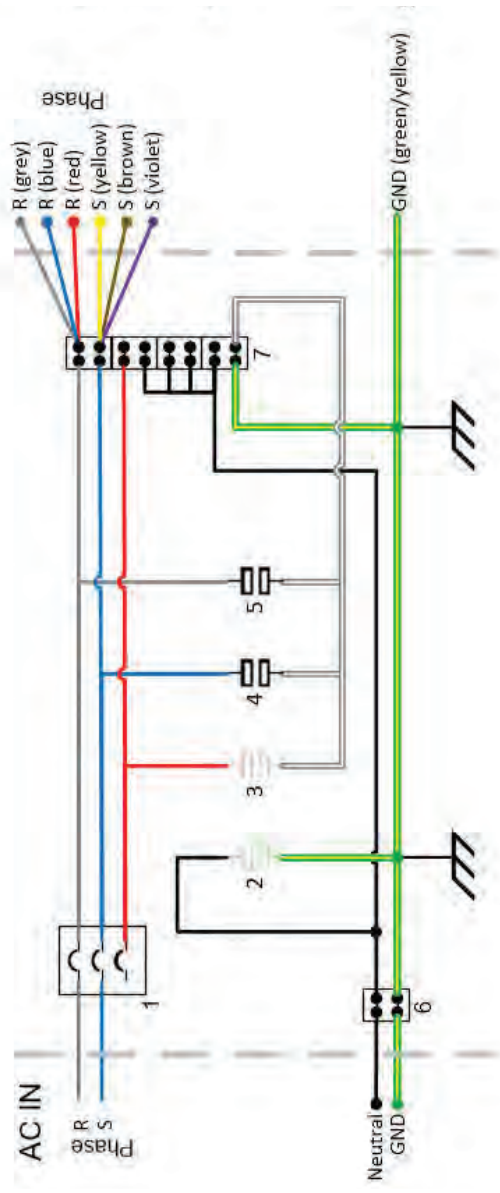
E-Compact HP-BB2 Series

1	USE Circuit Breaker 25A
2	Sparkler F-MS 12 ST- TVS 260 VAC
3	NOT USED
4	NOT USED
5	Varistor VAL-MS 230 ST - 275VAC
6	GND / Neutral Input Connector
7	GND / Neutral Protection Connector and Output connectors



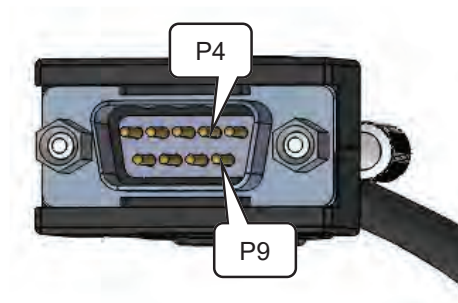
4.8.8. T208/T240 and T380 – Change to B240

1	USE Circuit Breaker 25A
2	NOT USED
3	NOT USED
4	Varistor VAL-MS 120 ST - 150VAC
5	Varistor VAL-MS 120 ST - 150VAC
6	GND / Neutral Input Connector
7	GND / Neutral Protection Connector and Output connectors



4.9. Exciter Interface

The transmitters of the E-Compact High-Power family have a monitoring interface for external exciters to communicate with the CM8001 Control Module. There are two interfaces, one for the main driver and one for the backup:



Control I/O In	Parameters	Status
P4	Exciter Status	Exciter Status to respective CM 8001 Controller.
P9	VCC	+5 VCC

DB9 Male – Exciter Communication

Section 4 – Installation

1. Overview

This section provides general information for planning the installation of the E-Compact High-Power Line Transmitters, such as recommendations regarding shelter, tower, antennas, cables, grounding, power line, prevention against transients, etc.

2. Inspection

The package and the equipment must be inspected upon delivery in order to detect eventual visible damages. If there are signs of violation or physical damage (which points to transportation problems), the corresponding evidences should be described in the delivery documentation provided by the transport company. Such notice would be used to establish the responsibilities for the product's integrity.

Comark carries out operating tests at the factory on every transmitter in order to ensure proper operation after delivery to the user. Nevertheless, if the equipment does not operate after the start-up and there is no evidence of transportation damage, it might be necessary to send the equipment back to the factory for repair or replacement. In such a case, please get in contact with Comark customer support.

3. Installation Recommendations

3.1. Preventive Protection

Voltage transients with a duration of micro and nanoseconds are a constant challenge for solid state circuits. The downtime and the equipment maintenance make the preventive protection the best warranty against these surges. This protection can be in many forms, from isolation transformers and no-breaks to the more efficient but more expensive AC Voltage Protectors. Since lightning is the most common cause of transients, AC Voltage Protectors are the best choice.

An efficient AC Voltage Protection must be able to dissipate the energy to a low voltage, sufficient enough to guarantee the protection of the electronic components. The protection must always be placed transversely to the AC line, even during blackout periods. In addition, it must be immediately and automatically turned-on and ready in case of repeated transients.

3.2. Tower

For the installation of the TV transmission and reception system, the tower must be made with hot-dip galvanized steel. A lightning protection system should be installed in the tower as well as nocturnal beacons bulbs with red glass.

The following information about the tower must be obtained:

- a) It features special insulator supports for the descent of the lightning rod cords with a space of 1.5m (5') maximum between them.
- b) There must be a lightning signaling system every 20m (65') along the tower.
- c) It must be painted with orange and white stripes every 2m (6.5'). with a special paint that complies with local regulations.
- d) It must endure winds of up to 150 KM/h (93 mph).

In a retransmission station the tower is the highest and therefore, the most vulnerable device to be hit by lightning and because of it, the tower is used as a part of the protection system. The lightning protection device used in these cases is called lightning rod and has the function of guiding the electrical discharge safely, avoiding other parts of the system to be hit and damaged by it.

The use of a lightning rod is MANDATORY. The project and installation of grounding and lightning protection systems must be performed by specialized companies. Eventual damage to the equipment caused by missing or malfunctioning arrester is not covered by warranty.

3.3. Fastening of cables, antennas and connectors

Please observe the following items when installing antennas:

Direction of Antennas and Aperture Angles

Use a pocket compass when directing the antenna. Use a field strength meter for the fine adjustment of the reception antenna.

Height

It mainly depends on the receiving signal and the transmission conditions (obstructions, attended area, etc). It's very important to verify how far the antenna is from the lightning protection device, since the antenna must stay inside its cone protection.

Distance between the Rx and Tx Antennas

They should be placed as far as possible from each other in order to isolate the transmitted signal from the received signal.

Polarization

It is very important to verify the polarization of the received signal, which can be vertical, horizontal or circular.

Phasing

When receiving a signal with vertical polarization, the system must be mounted vertically, otherwise the gain of the antenna will be drastically reduced, likewise in case of a signal with horizontal polarization. To receive a signal with circular polarization with a non-circular antenna, the system can be mounted either vertically or horizontally.

Stacking antennas

When using this system, the distance between them depends on the kinds of antenna used and the kind of stacking used. This must be studied thoroughly in order to obtain the best solution for each case.

Cables and Connectors

All cables must be carefully installed in order not to be twisted during the installation process. When using 7/8" or 1/2" cables, please pay attention to their bending that must not be made in spaces smaller than 80cm (31"). The cables can't force the connectors in the Input/Output of the equipment. The entry holes for the cables in the shelter must be done in a way to avoid the water that runs along them to get inside.

Follow the manufacturer's instructions when assembling them. All splices done outside the shelter must be isolated with a special plastic tape and/or plastic insulation material.

Avoid using silicon to coat the isolation made with auto-fusion tape. It has been verified that the silicon chemical characteristics may provoke the drying of the auto-fusion tape.

3.4. Indoors Equipment Installation

Small equipment must be placed on a table in a way to provide easy access from all sides and be at least 1m (3') from the walls.

Do not compromise the equipment's air flow by placing objects on its top panel, its natural ventilation.

The equipment must be placed directly on the shelter's floor if it is flat and it must be placed at least 1m (3') from the walls to avoid obstruction of its ventilation system.

Some of these air outlets must be connected to the outside of the shelter through PVC tubing.

The AC cable has two terminations to be used exclusively in the equipment.

3.5. Equipment Grounding

Assemble the grounding separately from the power supply, with a rig and a grounding terminal that come with the equipment.

Normally, the retransmission sites are located in the highest spot of the chosen location, making them more vulnerable to lightning strikes.

These discharges carry a great amount of electric energy, putting at risk not only the antenna and its structure but also the equipment in the shelters. In order to minimize this effect and guarantee their protection and continuous service during thunderstorms with lightning, the use of a reliable grounding system is mandatory.

Lightning is a transient, high-current electric discharge that happens between the ground and the clouds therefore the most important part of a lightning protection system are the parts that are on the ground. In order to maintain the low impedance of the technical grounding system, it must be carefully executed in a way that the electric field energy is drained away without affecting the equipment. In order to define a system, the characteristics of the soil resistivity must be taken into consideration.

To determine the behavior of the soil capacity to drain the currents, its resistivity must be measured. For an adequate protection this value should not exceed 5, being zero the ideal value

Generally, the grounding method used for TV transmitters is a system with a single vertical electrode made with copper measuring 2.5m (8') or more.

In case the conditions and characteristics of the soil are of high resistance or high incidence of lightning discharges, the grounding system must be thoroughly analyzed.

It is very important to notice that the grounding systems of the equipment and the lightning rod are independent and should never be connected to each other. A poorly elaborated grounding system can cause damages to the equipment that won't be covered by the warranty.

3.6. Electric Installation Grounding

The shelter installations receive power through an aerial power line. Moreover, because of it, the lightning discharges that might hit the power lines generate power surges that can reach the shelter and consequently the equipment.

To protect the equipment against eventual power surges, we recommend the use of gas filled surge protectors, after an isolation transformer with electrostatic shield.

When installing the grounding system, please observe the following items:

- Connect all equipment casings to the grounding system using the grounding rig that comes with them.
- Connect the gate and all the wires from the fence to the grounding system. Connect the neutral wire from the public power line to the grounding system.
- Connect the rig from the lightning rod to the grounding system with the shortest connection possible, avoiding cable splices.
- The tower's structure must also be connected to the grounding system. Use porcelain isolators to insulate the lightning rod rig.

3.7. Power Supply

Before plugging the equipment to the power supply, verify the voltage in the outlet to make sure that it is correct. If its variation is greater than 10%, it is necessary to use a power stabilizer to correct the voltage.

The power provided by the stabilizer must be at least 30% greater than the consumption of the equipment

4. Equipment Assembly



Only trained personnel should conduct physical assembly on site.



Observe the requirements described in this manual in Sections 1 (Care, Warranty and Service) and Section 2 (Minimum Installation Requirements).

The following precautions must be taken when positioning the transmitter at the installation site:

- (1) The air intake (front) and the air outlet (rear) must be completely unobstructed.
- (2) The transmitter rack should be positioned to ensure easy access from either side. The distance between the transmitter and the walls of the shed must be at least 1m (3').
- (3) In case of installation on a site containing other transmitters connected, do not position the transmitter in a location that can receive hot air from other transmitters.

4.1. Assembly

- (1) Unpacking the transmitter and drawers.
- (2) Position the rack where the equipment is installed in compliance with the following issues:

- Antenna cable
- AC Power Supply
- RF Cable
- Transport Stream (ASI) cables
- Grounding point

- (3) Visual Inspection:

Remove the lateral and rear panel of the transmitter and proceed to a visual inspection searching for any alteration that may have happened during the transportation of the equipment.

Pay special attention on the RF and signal cable connectors, ie. loose screws.

Check the power switches located on the left of the rear panel of the units, make sure they are in the "ON" position.

- (4) Grounding:

For personal and equipment safety reasons, connect the ground of the of the transmitter room to the ground of equipment before proceeding to the next steps.

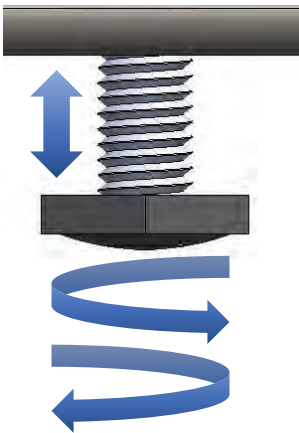
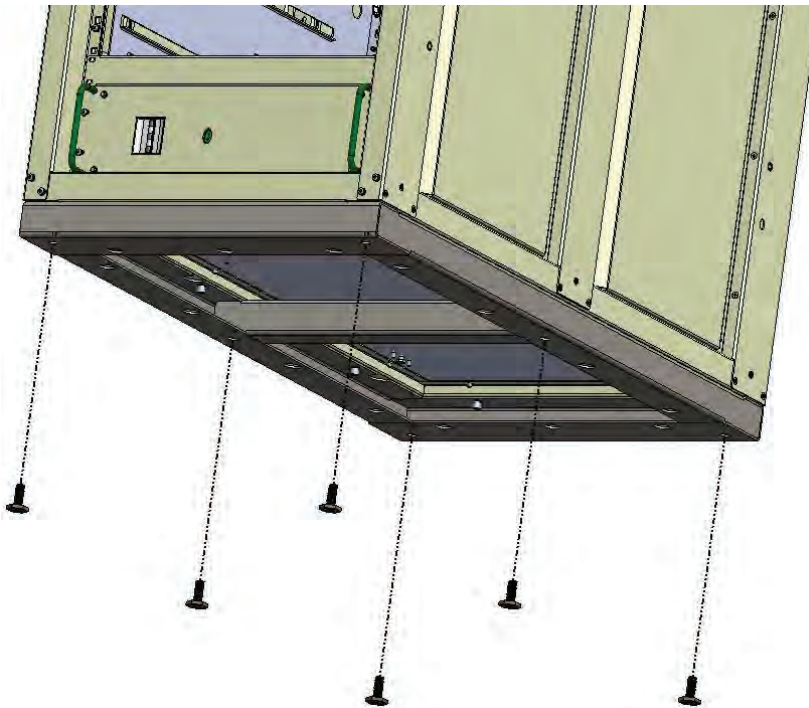


FOR CABINET 25RU



**BEFORE START THE MOUNTING,
INSTALL THE ADJUSTABLE FEET**

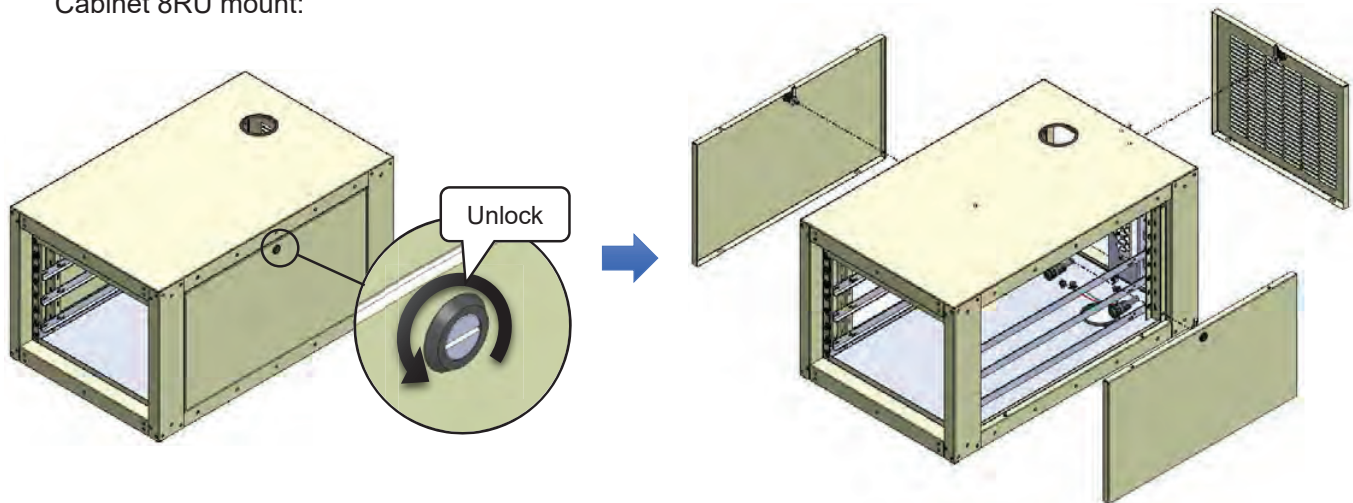
- 1) – Attach the six adjustable feet to the rack's base.



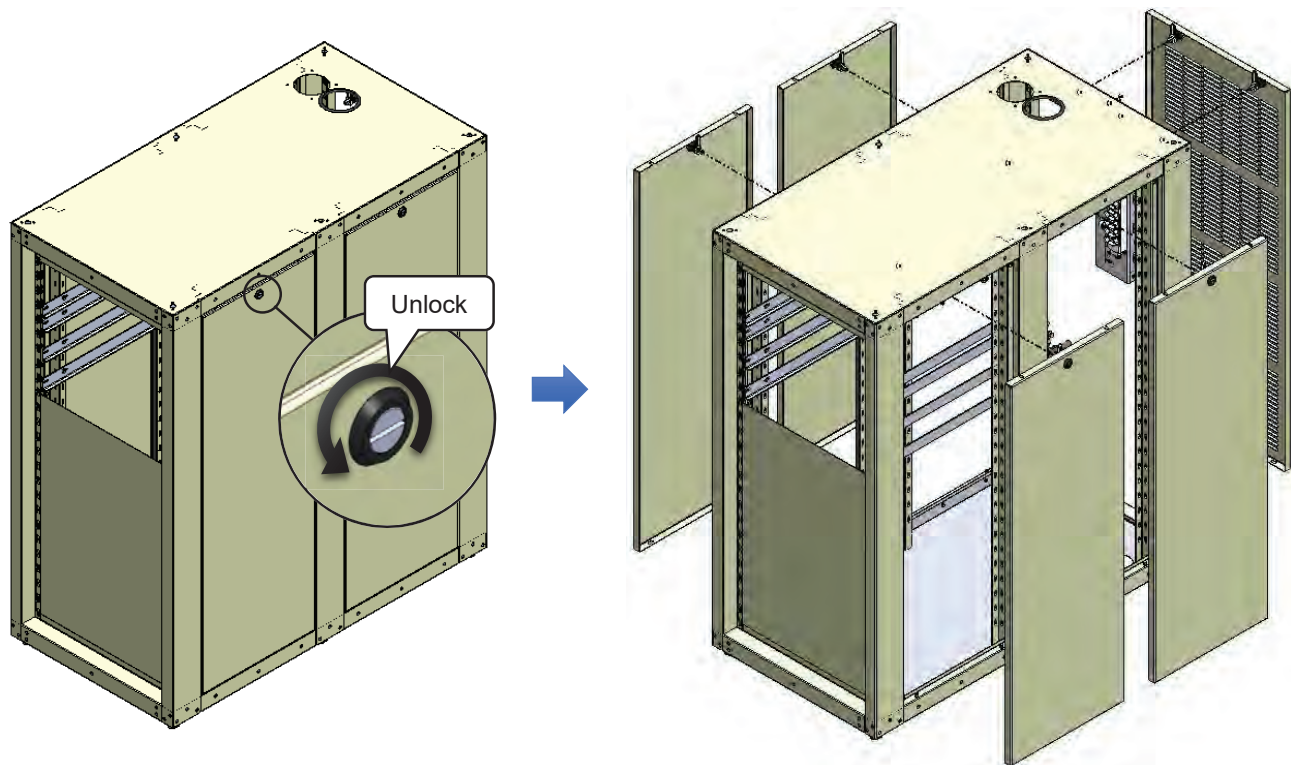
- 2) – Adjust the six feet until that the cabinet is flush with the floor.

(5) Remove the cabinet rear and side housings to facilitate equipment mount.

Cabinet 8RU mount:



Cabinet 25RU mount:

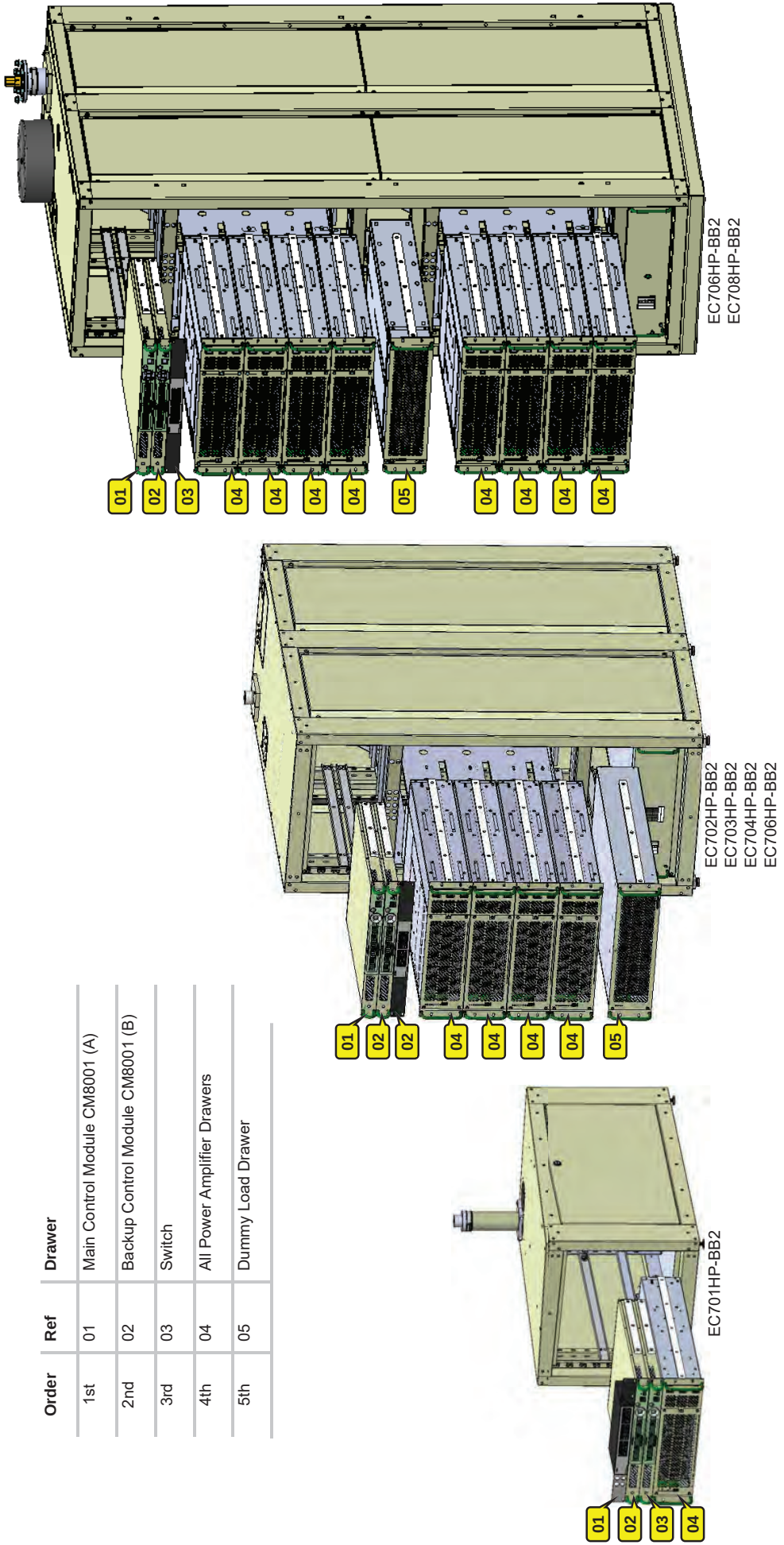


When finalizing the assembly and the equipment is operating normally, close the cabinet with the housings.

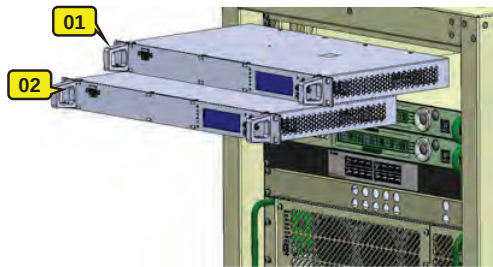
(6) Assembly Drawers:

Mount the drawers to the rack in the following order:

Order	Ref	Drawer
1st	01	Main Control Module CM8001 (A)
2nd	02	Backup Control Module CM8001 (B)
3rd	03	Switch
4th	04	All Power Amplifier Drawers
5th	05	Dummy Load Drawer



(7) Install the Customer Exciter (Not Included):



Ref	Drawer
01	Main Exciter (A)
02	Backup Exciter (B)

(8) Screw in all rack drawers:



4.2. Internal Connections

The following connections must be made:

- RF cables
- AC power cables and grounding
- Control Modules cables
- Rejection loads drawer cables
- Ethernet* Switch
- Transport Stream cables (ASI)

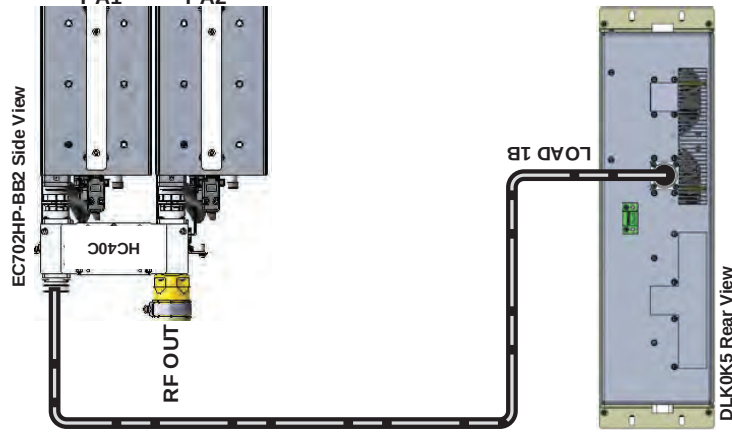
(9) Loosen all the fixed cables inside the rack by removing yellow clamp ties:



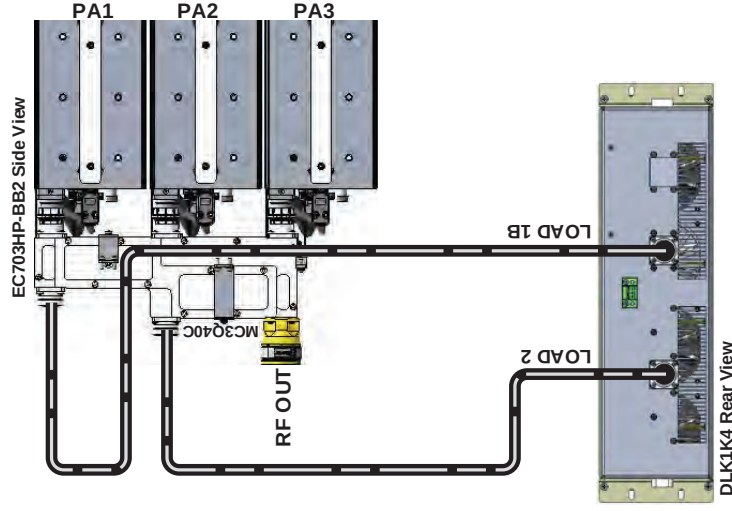
(10) Plug the RF Output Hybrid Combiners cables:

Connect the cables between the Dummy Loads Drawers and the Hybrid Combiners. Does not apply to model EC701HP-BB2.

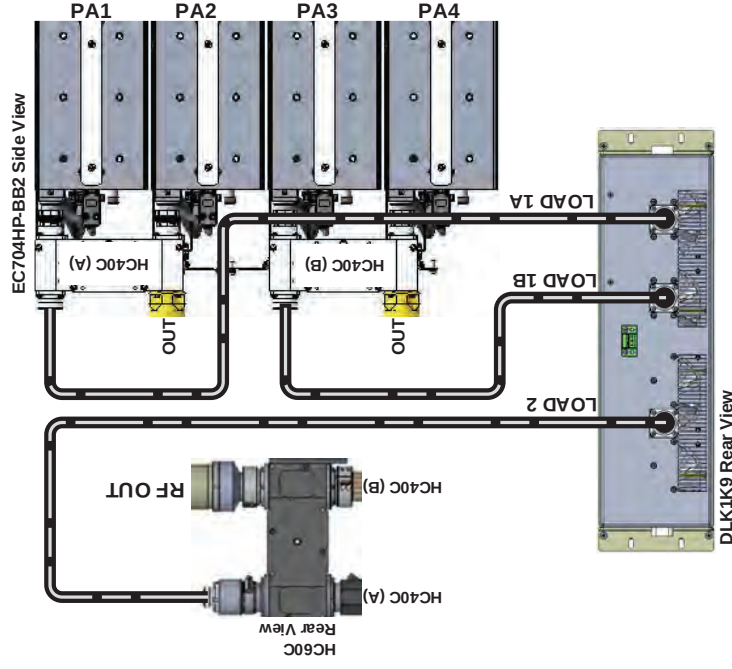
EC702HP-BB2



EC703HP-BB2

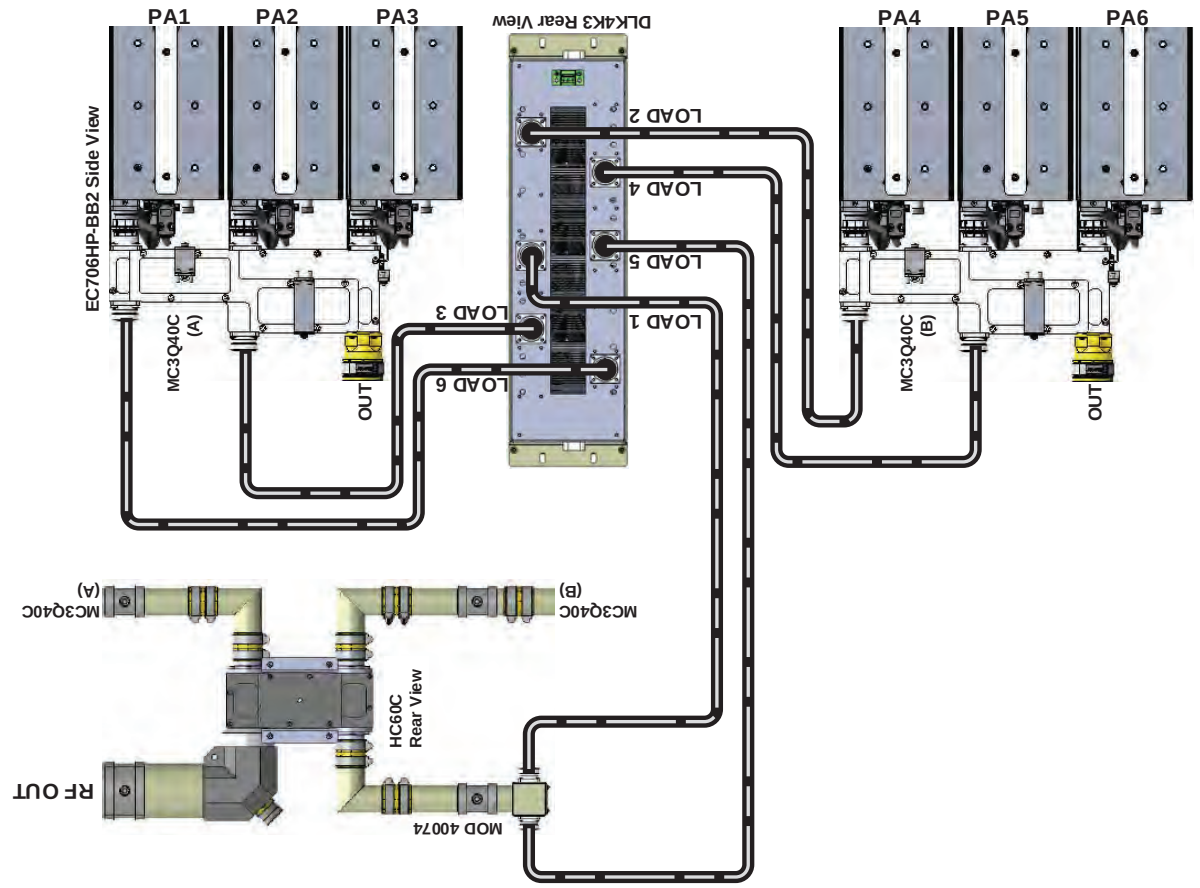


EC704HP-BB2



RF 50 Ω Coaxial Cable
DIN 7/16" Connector

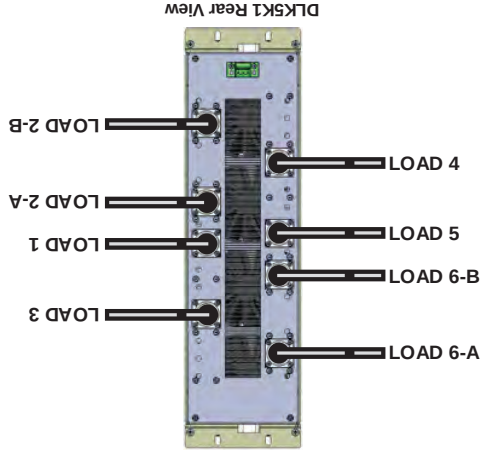
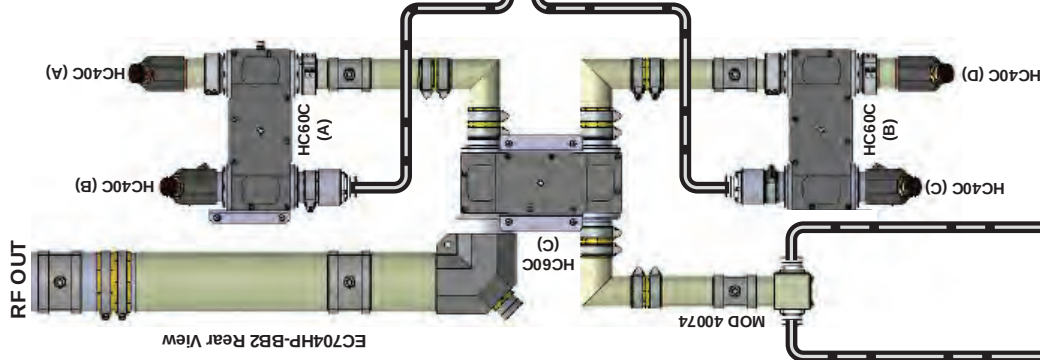
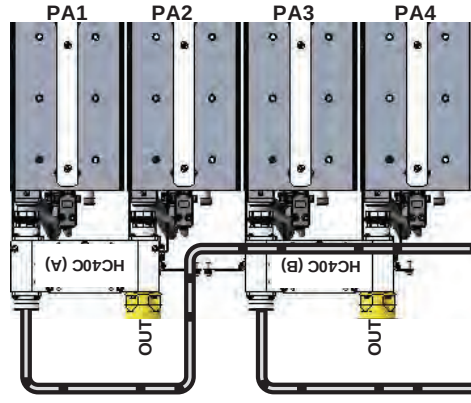
EC706HP-BB2



RF 50 Ω Coaxial Cable
DIN 7/16" Connector

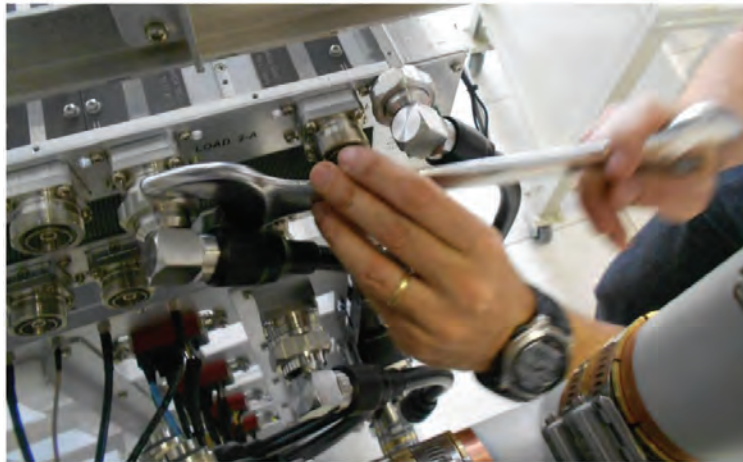
EC708HP-BB2

EC708HP-BB2 Side View

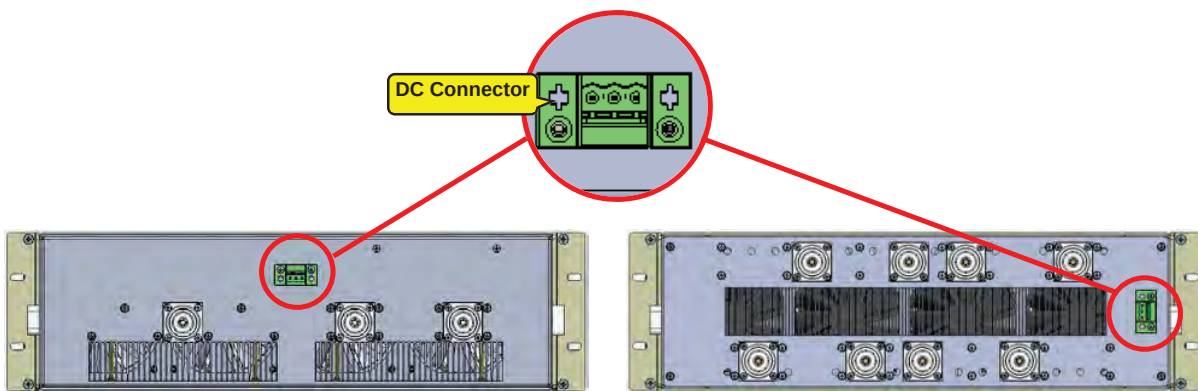


RF 50 Ω Coaxial Cable
DIN 7/16" Connector

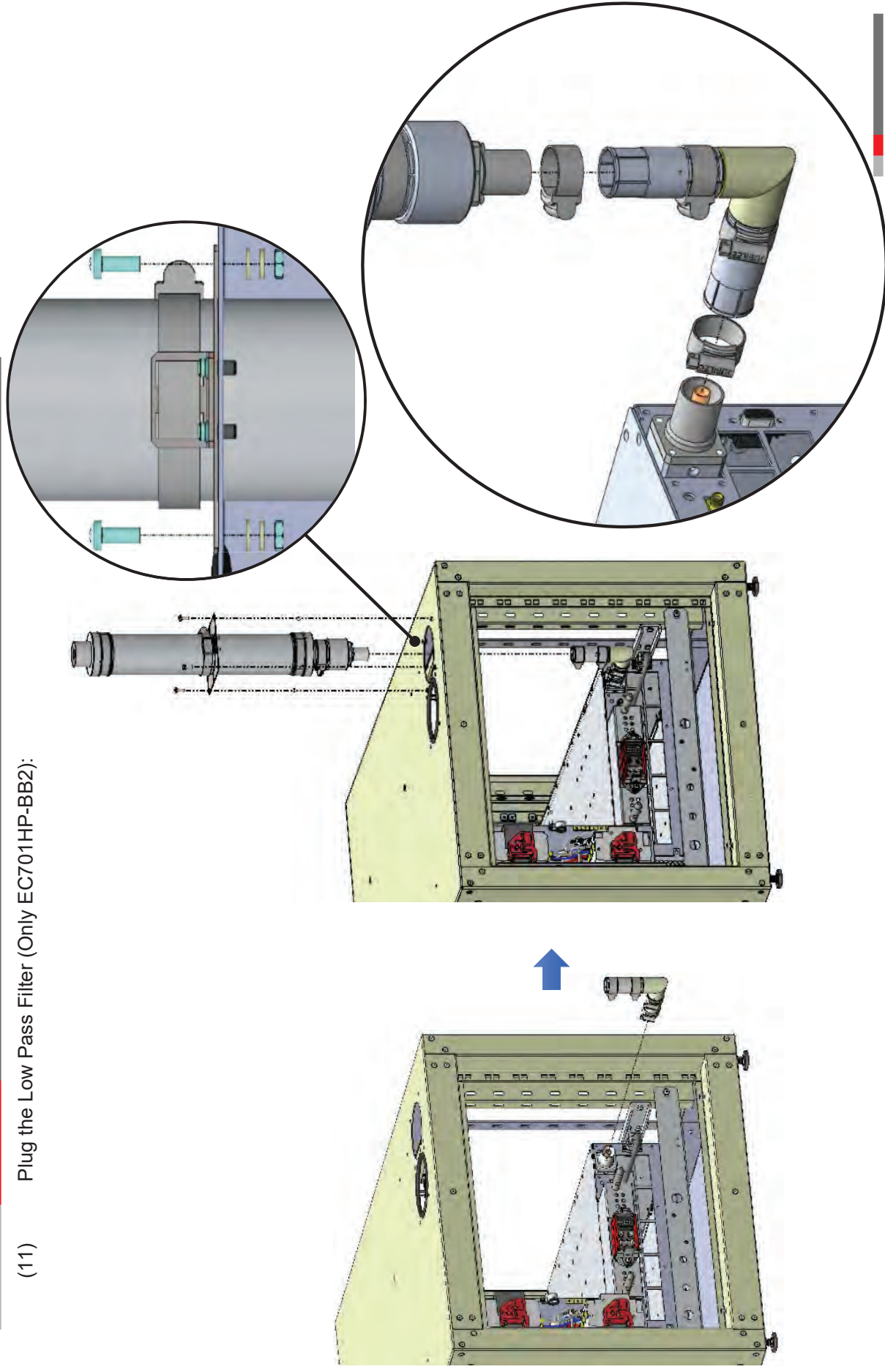
Tighten the Dummy Load Drawer connectors with a wrench.

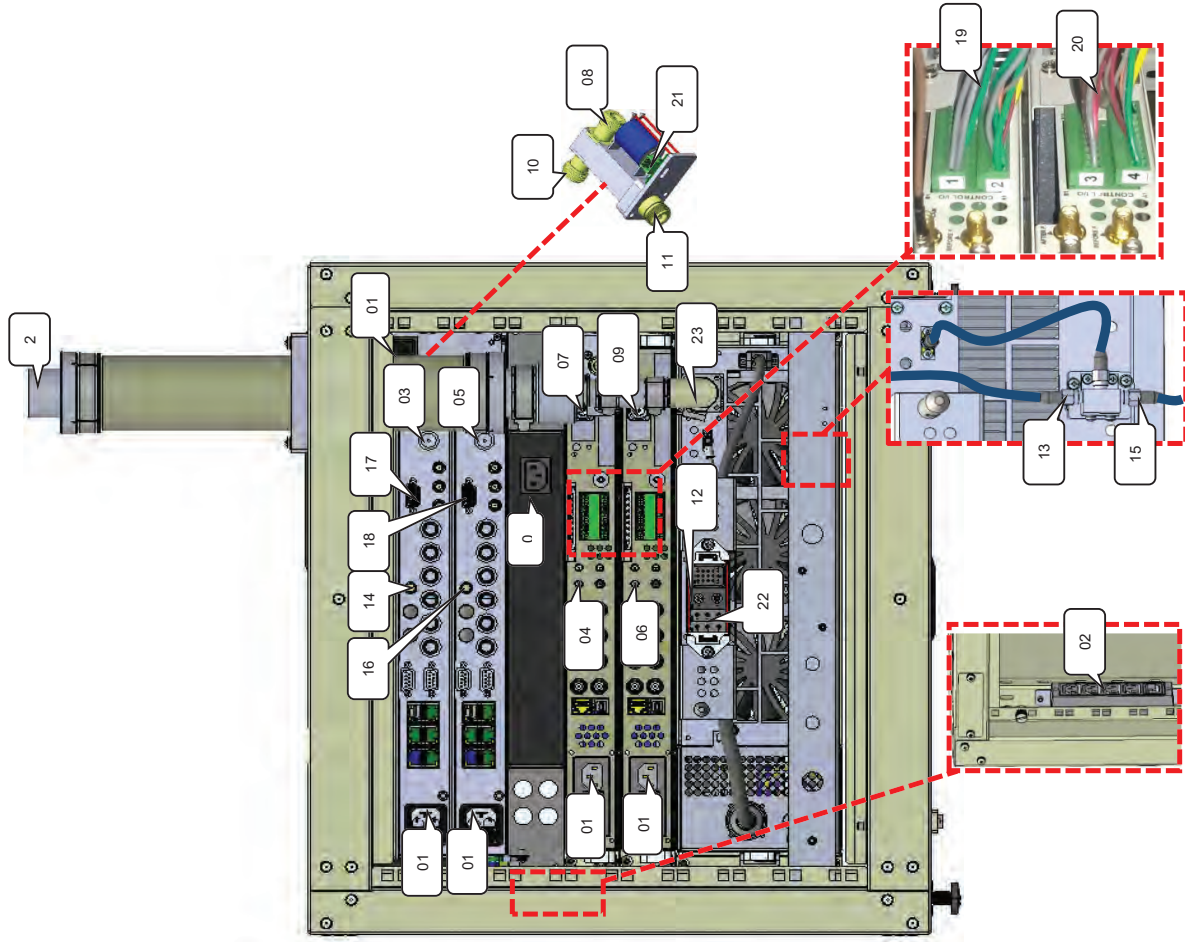


Plug the DC connector on Dummy Load Drawer:



(11) Plug the Low Pass Filter (Only EC701HP-BB2):

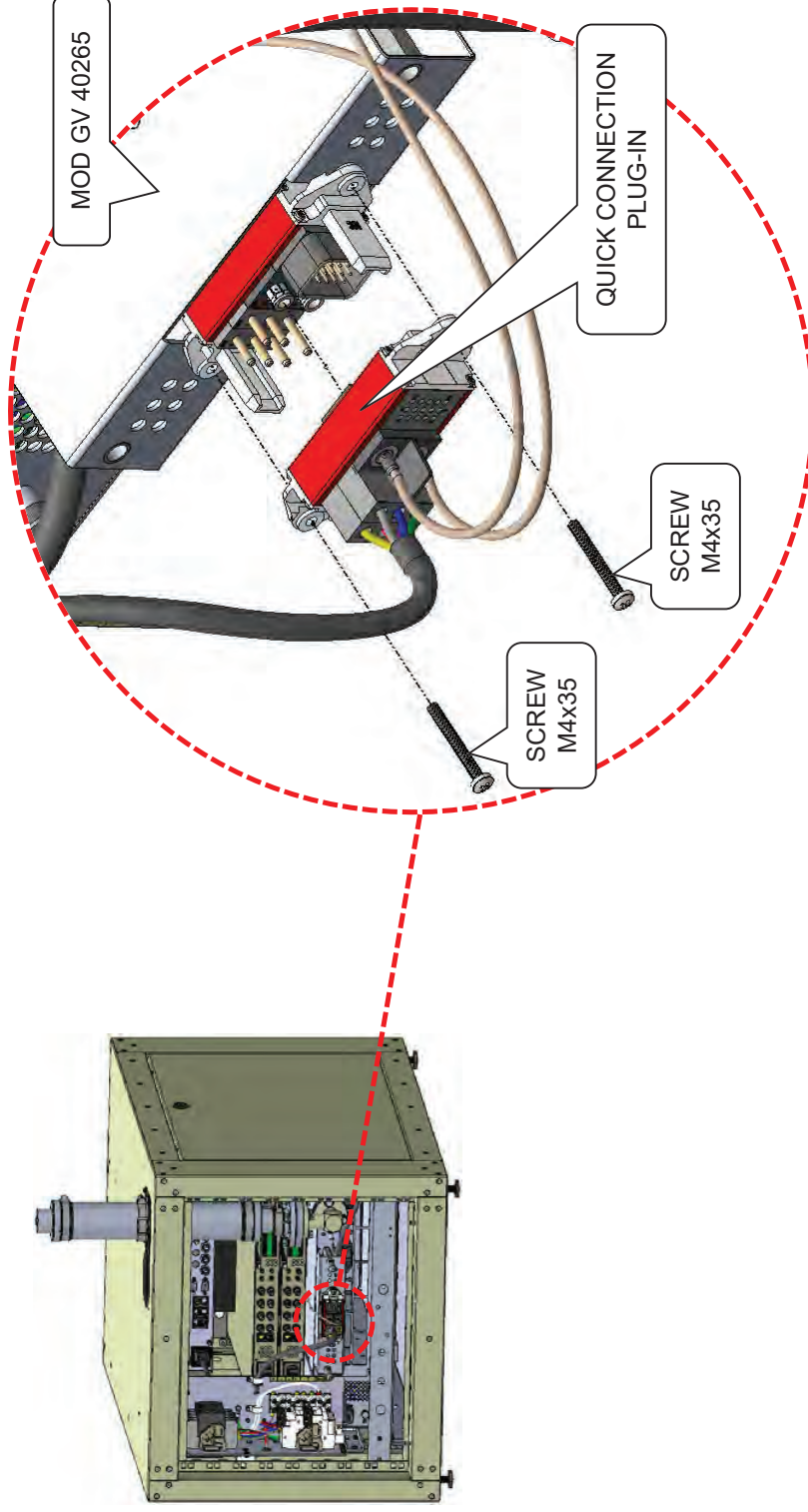




Interconnection

AC Power	01	AC Input- Exciter / Control Module CM8001 / Switch / Power Supply	02	Outlet Power Strip
	03	Main Exciter (A) RF Output	04	Main Control Module CM8001 (A) Tuner In
RF Signal	05	Backup Exciter (B) RF Output	06	Backup Control Module CM8001 (B) Tuner In
	07	Main Control Module CM8001 (A) RF Out	08	Coaxial Relay "Modulador A" port A
	09	Backup Control Module CM8001 (B) RF Out	10	Coaxial Relay "Modulador B" port
	11	Coaxial Relay Output	12	Power Amplifier Drawer RF Input
RF Sample	23	Power Amplifier Drawer RF Output	24	Low Pass Filter Input.
	13	Power Amplifier Drawer RF Sampler A	14	Main Exciter (A) Before Filter Connection
	15	Power Amplifier Drawer RF Sampler B	16	Backup Exciter (B) Before Filter Connection
Control Connectors	17	Main Exciter Control A		
	18	Backup Exciter Control B		
	19	Main Ctlr CM8001 Control I/O 1 / 2		
	20	Backup Ctlr CM8001 Control I/O 3 / 4		
	21	Coaxial Relay Control		
	22	Control / AC Power Supply - Power Amplifier Drawer		

(12) Quick Connection Plug-In (Only EC701HP-BB):



(13) Internal Drawers Interconnections (EC702HP BB2, EC703HP-BB2, EC704HP-BB2,)

Interconnection

AC Power	01	AC Input- Exciter / Control Module CM8001 / Switch	02	Outlet Power Strip
	03	Main Exciter (A) RF Output	04	Main Control Module CM8001 (A) Tuner In
RF Signal	05	Backup Exciter (B) RF Output	06	Backup Control Module CM8001 (B) Tuner In
	07	Main Control Module CM8001 (A) RF Out	08	Coaxial Relay "Modulador A" port A
	09	Backup Control Module CM8001 (B) RF Out	10	Coaxial Relay "Modulador B" port
	11	Coaxial Relay Output	12	Splitters (SEE SPLITTERS INTERCONNECTION PER MODEL)
RF Sample	13	Reflectometer Sample Output A	14	Main Exciter (A) Before Filter Connection
	15	Reflectometer Sample Output B	16	Backup Exciter (B) Before Filter Connection

Connections



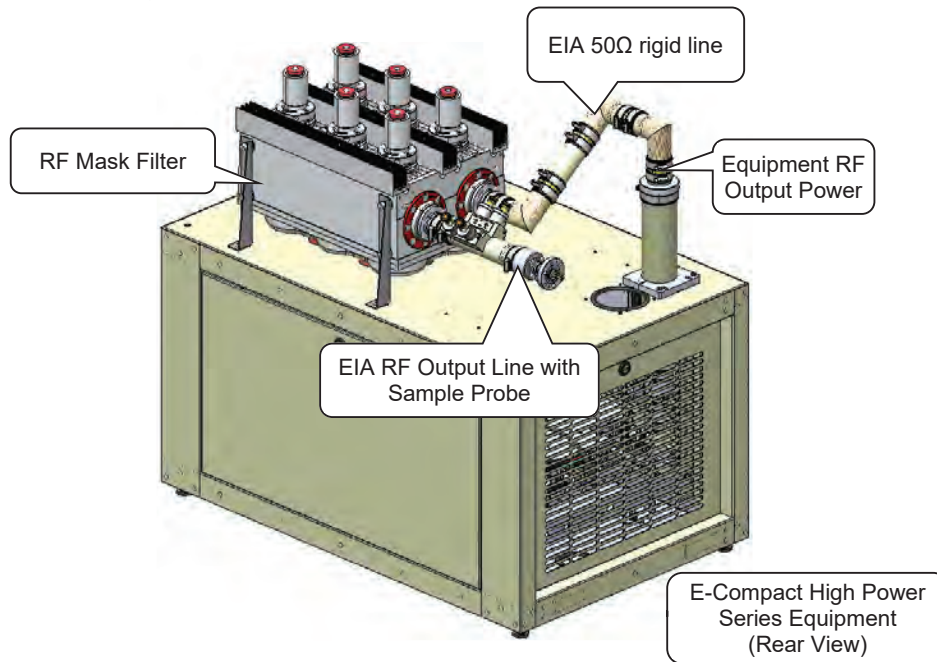
Control Connectors	17	Main Exciter Control A
	18	Backup Exciter Control B
	19	Main Ctlr CM8001 Control I/O 1 / 2
	20	Backup Ctlr CM8001 Control I/O 3 / 4
	21	Coaxial Relay Control
	22	Control / DC Power Supply Dummy Load Drawer

4.3. External RF Connections

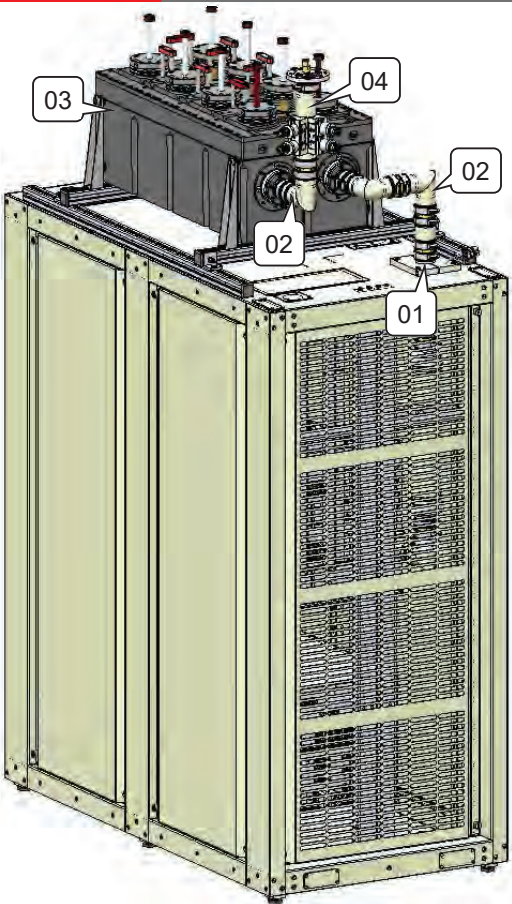


External RF connections are not supplied with the equipment and should be made with EIA 50 Ω rigid line or 50 Ω Coaxial Cables.

The E-Compact High Power Series Output Devices must follow the connection sequence as show in the diagram below:

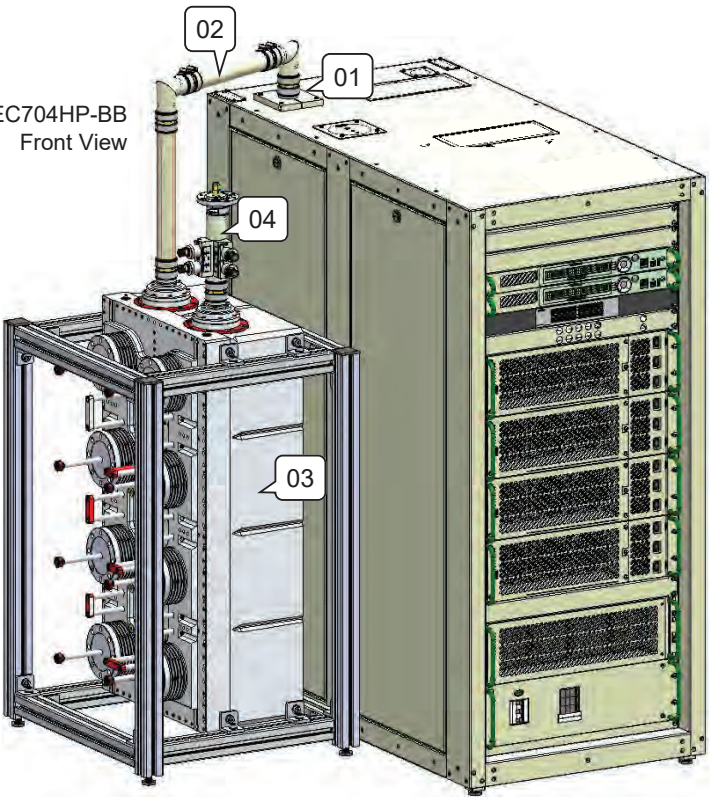


EC702HP-BB
EC703HP-BB
Rear View



01	RF Output Power
02	EIA 1-5/8" Rigid Line
03	RF Filter Mask
04	EIA 1-5/8" RF Line with Sample Probe

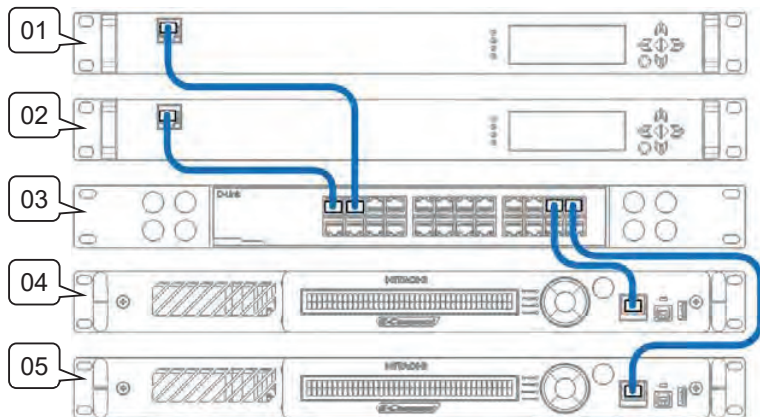
EC704HP-BB
Front View



01	RF Output Power
02	EIA 1-5/8" Rigid Line
03	RF Filter Mask
04	EIA 1-5/8" RF Line with Sample Probe

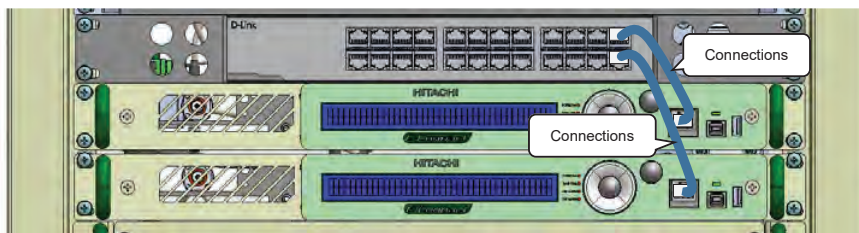
4.4. Ethernet Connections

Connections between the switch module and the Telesupervision Module, Exciter 1, Exciter 2, Control Module 1, and Control Module 2 use Cat5 cables with RJ45 connectors.



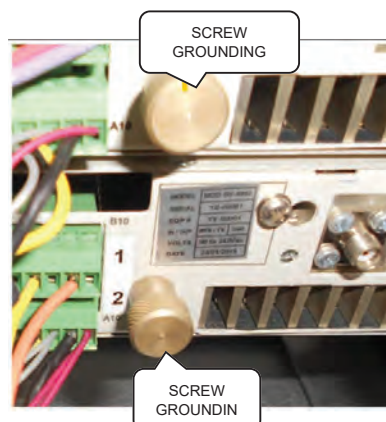
01	Main Exciter (Not Included)
02	Backup Exciter (Not Included)
03	Switch Module
04	Main Control Module Drawer – MOD GV 40056
05	Backup Control Module Drawer – MOD GV 40056 (Optional)

1. Connection between the switch module and CONTROL PORT connector of the transmitter top panel.
2. Connection between the switch module and the front Ethernet port of the CM8001 Controller A.
3. Connection between the switch module and the front Ethernet port of the CM8001 Controller B.



4.5. Internal Ground Connections

Connect the grounding mesh in the GND screw on the rear panel of each control module.



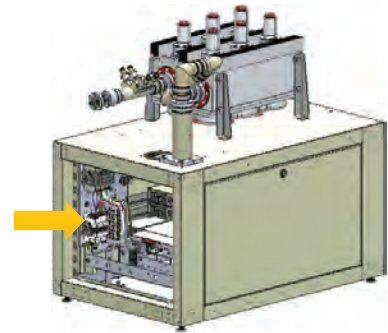
4.6. AC Electrical Line Connection



Prior to energizing the transmitter, make sure that the circuit breaker and the power switch (ON / OFF) are switched off or disabled.

4.6.1. Electrical line connection (EC701HP-BB2):

The Electrical Line is connected to the AC Unit:

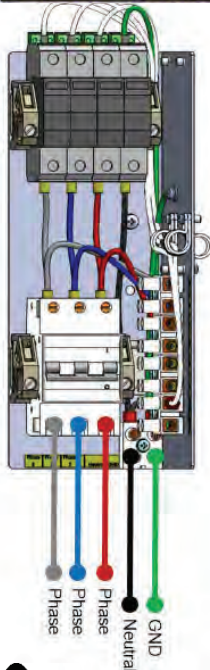


Before Connecting the Machine to the AC Mains, one must ensure that the grid Voltage meets the equipment's settings. If you have any questions, please refer to Section 3 item 6.7. "AC Mains Protection Unit" of this manual.

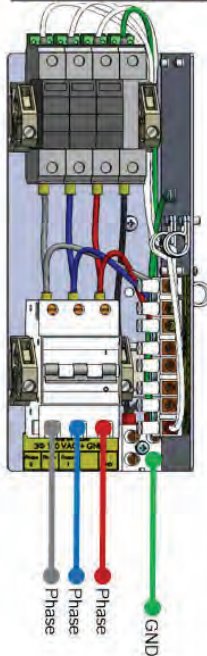


Connection modes according to the Grid Voltage:

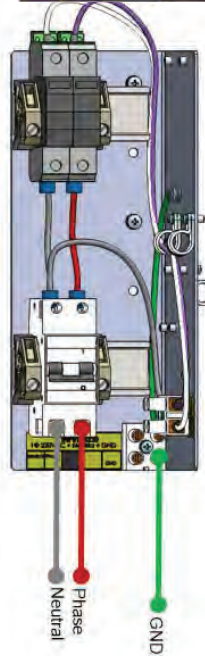
WYE 3-PHASE 380VAC INPUT 3Φ 220VAC + Neutral + GND				
Phase A	Phase B	Phase C	Neutral	GND



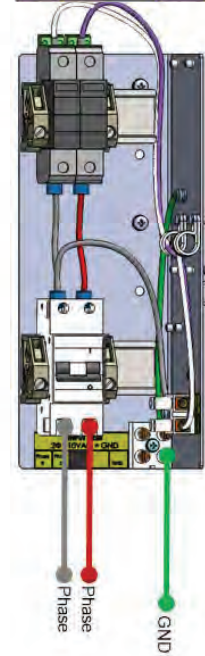
3-PHASE 180-240VAC INPUT 3Φ 120VAC + GND				
Phase A	Phase B	Phase C		GND



N-PHASE 180-240VAC INPUT 1Φ 208VAC + NEUTRAL + GND				
Neutral	Phase B			GND



180-240VAC INPUT 2Φ 120VAC + GND				
Phase A	Phase B			GND



Never invert Neutral with Phase.

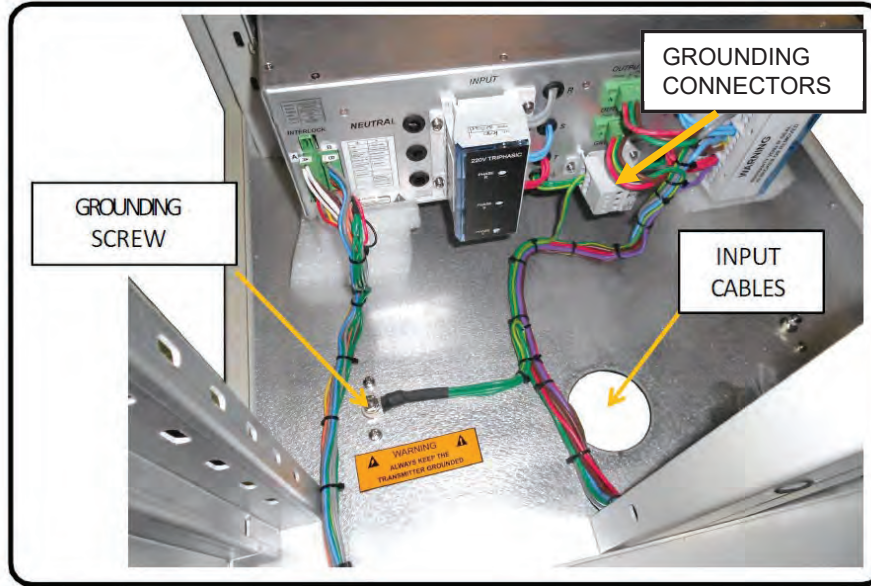


The screws must be properly tightened in order to avoid sparks.

4.6.2. Electrical line connection (EC702HP-BB2, EC703HP-BB2, EC704HP-BB2):

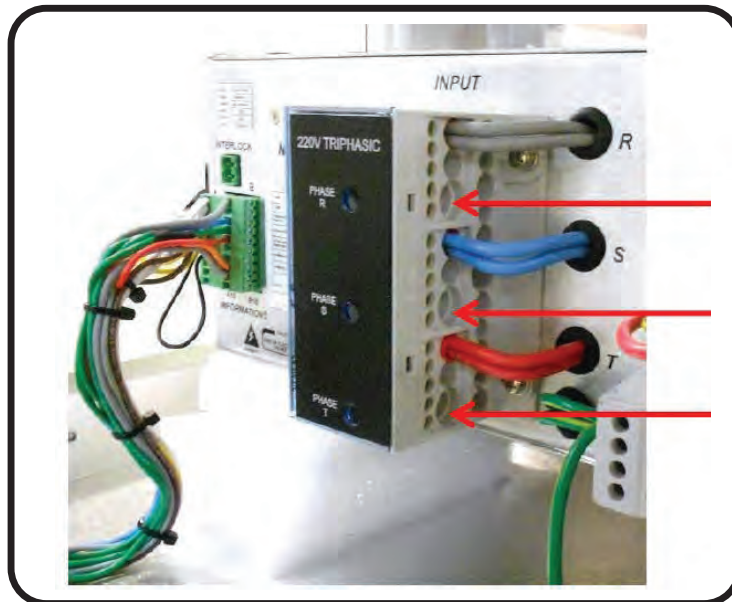
The electrical line is connected to the MCCB Drawer.

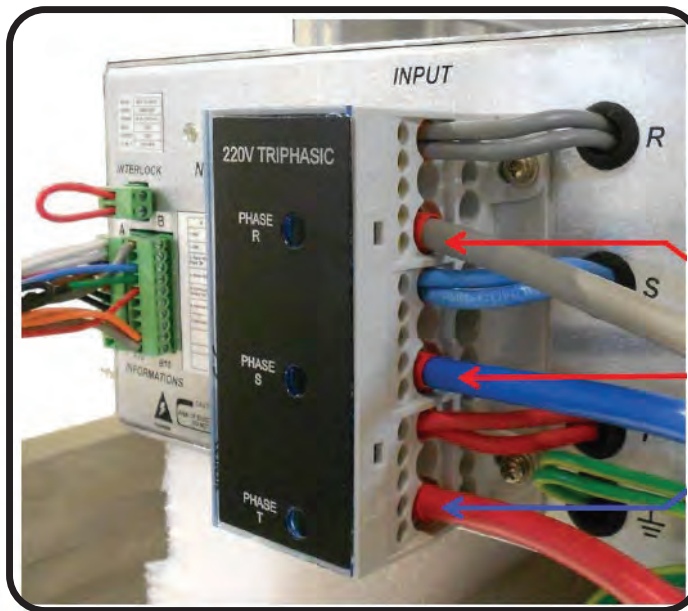
The rack bottom features an inlet for the AC and GND cables:



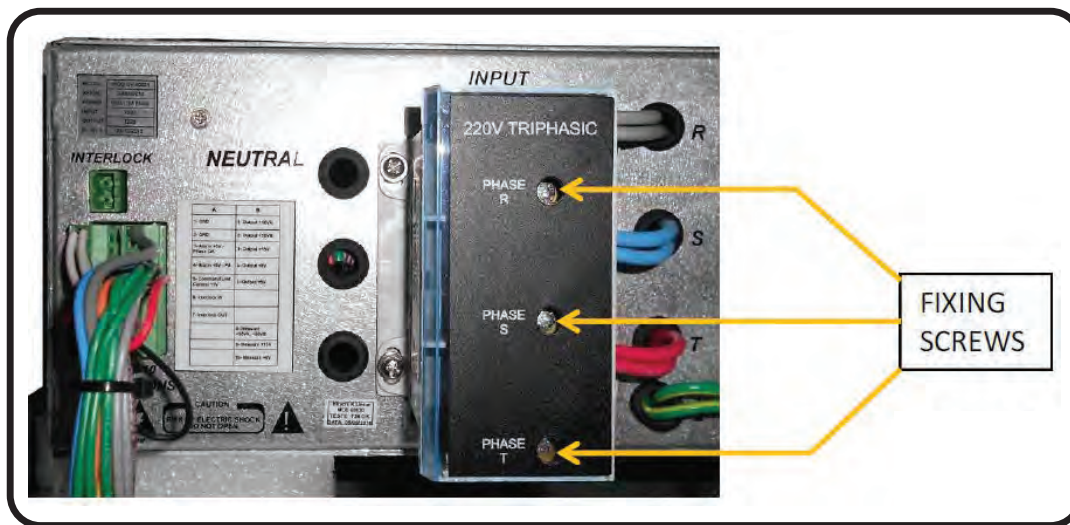
Connect the grounding cable to the grounding screw shown in the picture above. The other power cables plug into the MCCB.

Insert the cables (phases or phases-neutral; see AC mains) into the respective holes of the INPUT connector. Observe the Identification label on the INPUT connector:





Fix the Screws:



The screws must be properly tightened in order to avoid sparks.



See MCCB AC mains Type in section 3, item 5.1.4.2 - System Structure.

Section 5 - Initial Activation

1. Overview

After finishing the installation, the equipment is ready to be activated. It is important to observe that the transmitter is configured at the factory with the parameters that were supplied by the customer at the time of purchase, such as the channel output, power, MER, etc.

One should check the functionality and performance of the RF power, DC currents, temperature, alarms, and communication.



Never turn on the equipment without connecting it to an Antenna or RF Load as this may cause serious damage to the equipment.



First, you must ensure that the general circuit breaker is off. Ensure that the POWER ON / OFF button are in the OFF position (all Drawers).



Make sure the channel configured in the Exciter is the same as the Mask Filter and the antenna.



Check if the Antenna VSWR for the operating channel is better than -23dB of Return Loss.



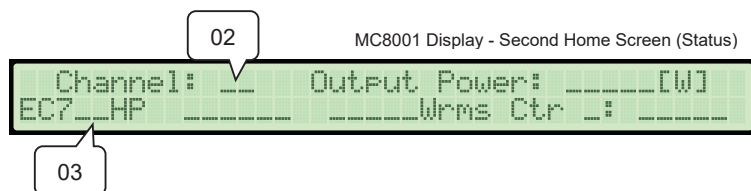
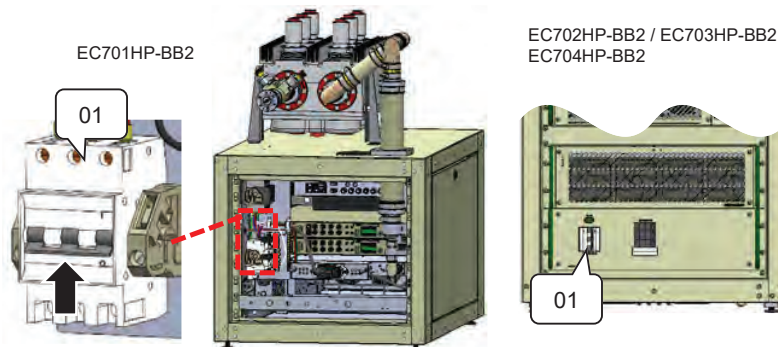
Using a voltmeter, check that the AC Mains of the equipment is within its characteristics.

2. Activation



The steps of this activation must be followed to avoid damage to the equipment.

1 st	Before powering ON, check if all ON/OFF key Drawers are OFF.
2 nd	Trigger the circuit breaker on (01).
3 rd	Power ON the Exciters (Rear Panel) and the CM8001 Module Control.



8 th	For EC702HP-BB or Higher: Turn ON MCCB Green Start Key (04)
9 th	In the Power Amplifier Drawer 1 Switch ON the three Power Supplies (05)
	Check the Drawer Communication Status. In the Main Module Control Display Interface:
10 th	>Measurements [2000] > Communications Status [2500] Pxx = OK

4 th	Check if both the Exciter (Main and Backup) are configured for the correct channel. Perform the same with the Mask Filter and the Antenna.
5 th	Check if both the Module Control CM8001 (Main and Backup): The channel is the same as the Exciter (02) The description of the Equipment is correct (03)
6 th	Check if the Main Exciter and Main Module Control CM8001 are active.
7 th	Check if the Programmed Power in Main Module Control CM8001 is 0 (ZERO) Watts: Display Interface: >Measurements [2000] > Power [2100] > Programmed Power [1/3]

11th

Check the **ALL** Power Supply and Current when
0 (Zero) Watts Transmitter FWD Power:

In the Main Module Control Display Interface:

>Measurements [2000] > Drawers [2300]

> Power Supply [2310]

Power Supply $\approx$ 45.5V

>Measurements [2000] > Drawers [2300]

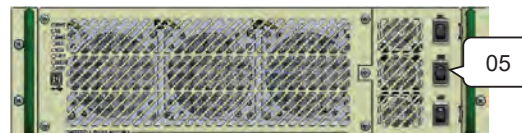
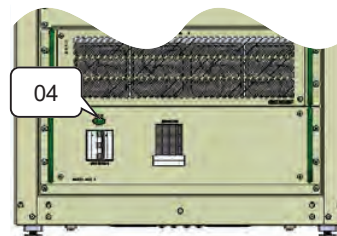
> Current [2320]

$I \approx 0.30A$ (for each PA)

12th

Repeat steps 9th, 10th and 11th for the other
Power Amplifiers drawers. Following your
numeral order.

EC702HP-BB2 / EC703HP-BB2
EC704HP-BB2



13 th	Set the Programmed Power in Main Module Control CM8001 to 10% of the total power of the equipment. Display Interface: >Measurements [2000] > Power [2100] > Programmed Power [1/3]
14 th	Check: - Alarms Occurrences: >System Alarms/Log [3000]> Current Alarms [3100]: No alarms - Reflected Power: >Measurements [2000] > Power [2100] > Reflected [2/3]: The REF power must be less than 2% of the FWD Power. - Check the ALL Power Supplies, Current and Temperature in the Power Amplifiers Drawers: >Measurements [2000] > Drawers [2300] > Power Supply [2310] Power Supply ≈ 45,5V (all) >Measurements [2000] > Drawers [2300] > Current [2320] All must be of the same current value >Measurements [2000] > Drawers [2300] > Temperature [2330] Below 55°C (131°F).
15 th	Set the Programmed Power in Main Module Control CM8001 to 25% of the total power of the equipment. Display Interface: >Measurements [2000] > Power [2100] > Programmed Power [1/3] Repeat the check from the 14th step.
16 th	Set the Programmed Power in Main Module Control CM8001 to 50% of the total power of the equipment. Display Interface: >Measurements [2000] > Power [2100] > Programmed Power [1/3] Repeat the check from the 14th step.
17 th	Set the Programmed Power in Main Module Control CM8001 to 75% of the total power of the equipment. Display Interface: >Measurements [2000] > Power [2100] > Programmed Power [1/3] Repeat the check from 14th step.
18 th	Set the Programmed Power in Main Module Control CM8001 to 100% of the total power of the equipment. Display Interface: >Measurements [2000] > Power [2100] > Programmed Power [1/3] Repeat the check from the 14th step.



If there is an alarm during the power startup, it is advisable to zero the output power of the transmitter to seek the solution, then contact Comark customer support.



Check if there is any abnormal or differential heating in the connection joints between the transmitter, filter, antenna, and combiner's imbalance load. If there is any abnormal warming in an isolated way, this may indicate some flaw or imperfection in that connection. This must be checked before further increasing the transmitter power.



When operating under normal conditions, the modules located at the transmitter's rear may reach up to 55°C (131°F). This is due to the fan speed control, which is responsible for keeping the transistor's temperature at 60°C (140°F), as well as the presence of aluminum heatsinks and high thermal dissipation pallets. All passive devices are located at the rear panel and operate within the temperature ranges recommended by the manufacturer.

3. Main Operations.

3.1. Power Changing

The alteration of the transmitter power is possible and accessible to the customer through the screen POWER SETUP ([1100]) by the software navigation Menu in the digital display (section 3, item 5.1.4.2 - System Structure).

3.2. Communication

Ethernet Communication:

This equipment has a Web Page server accessed by the Ethernet port located on the front panel of the Module Control MC8001. Once the Control Module is connected to the Switch, this graphical interface can be accessed by connecting to one of the Switch ports.

Further details are described in Section 6 - WEB Interface of this manual.

USB Communication:

The communication of the digital exciter via USB port, is only possible with the use of the software GUI8001 (optional).

4. Forbidden operations

There are transmitter parameters which are configured at the factory which are defined on the purchase of the transmitter. There are also parameters that are set at the factory - and as previously noted, were provided at the purchase – which cannot be changed.

- Channel
- Equipment Model

There are other parameters that are configured in the factory that might be reconfigured using a password. The careful use of the password is to prevent unauthorized access that can cause the appearance of a reflected power at the transmitter which then causes a power decrease due to the protective action of the transmitter.

5. Protections

5.1. Reflected Power

If the incidence of reflected power at the transmitter due to any external or internal factor occurs, refer to the measurement screen (MEASUREMENTS [2000]) by browsing the software's navigation Menu, according to instructions given in the Operation Section of the Digital Control System.

If the value of the reflected power exceeds the value of 2%* of the rated power, the control will immediately signal through the Current Alarm LED, which triggers the routine protection against reflected power. This gradually decreases the value of the forward power until the amount of power reflected returns to less than 2% of the rated output. At this time, the software gradually increases the value of the forward power, foreseeing the possible disappearance of the reflected power. Thus, the equipment oscillates between an increase and decrease of the direct power around the power value that provides a reflected power of 2% of rated power, always seeking the return to the rated power of equipment.

The 2% value to generate the reflected power alarm is fixed, ie. the alarm always occurs when the reflected power is 2% of the nominal power of the EQP. The reflected value that will make the EQP reduce direct power is configurable from 2 to 5%. To change this value, go to Setup Menu-> Alarms Mask-> Reflected and change as needed.

5.2. Over-excitation

If an excessive increase in the value of the excitation signal level occurs, the control, through the ALC, interacts with the exciter, to maintain a constant output power in its rated value.

5.3. AC Mains Line Protection

Each piece of equipment has its own independent power supply, all of which have equal protection features.

- Protection against short circuit
- Surge Protection

Basically, the surge protection on the network is performed by inserting the varistors between phases and between phase and earth, thus absorbing peak voltage, not allowing it to damage the power supply. Protection against short-circuit is carried out by monitoring the current in the output of the power supply. If the current exceeds a pre-set reference value, it understands that the source output is shorted and should be disabled through the shutdown pin.

5.4. Transmitter Operating Temperature Configuration

The transmitter's operating temperature is measured on the power modules' transistors and is configurable between 40°C (122°F) and 60°C (140°F).

Configuration is done through the front panel Menu: Setup Menu "PA Temperature Control" (Setup Menu [1M00]).

This configuration varies according to room temperature and the transmitter's efficiency, and it is necessary to optimize operating temperature and the equipment's lifespan.

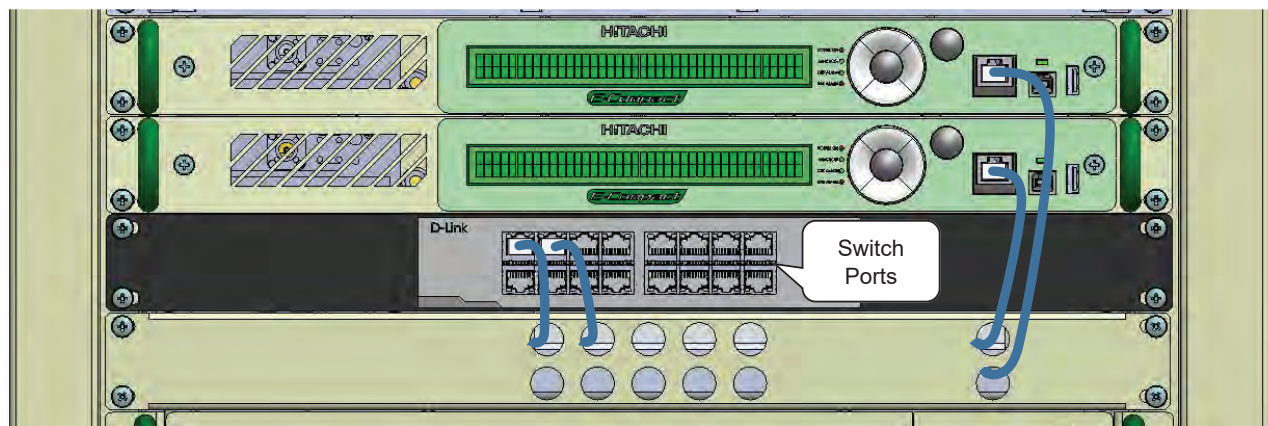
This configuration shall be made when the equipment is activated following the procedure below:

1. With the transmitter running at operational power for at least 30 minutes, access the web or the PA USB interface to verify fan rotation.
2. Check fan rotation for all fans in all PA's.
3. Temperature adjustment must be done in order to obtain fan rotations between 5500 rpm and 6000 rpm.
4. If the highest rotation is below 5500 rpm, the temperature control must be lowered. If it is above 6000 rpm, the temperature must be raised.
5. Configure temperature through the Setup Menu's "PA Temperature Control". Lower or raise the temperature according to the description in step 4 above. It is recommended that the procedure starts in steps of 2°C.
6. Once configured, wait 5 minutes until the transistor temperature stabilizes.
7. Repeat steps 3 through 6 until fan rotation is within range (5500 rpm to 6000 rpm).

Section 6 - WEB Interface

1. Overview

The system configuration can also be performed by the Ethernet connection on the Switch Module. This interface enables the interaction between the system control and the user. In order to access the interface, a PC should be connected to the Ethernet port, using a UTP CAT5 with RJ45 connectors with standard EIA / TIA- 568- B, both connected to the Switch.



All of the equipment parameters such as transmission power level, power supply measurements, alarm verification, and all of the possible functional selections may be accessed two different ways.

- ⇒ Front Panel – All of the equipment measurements and configurations may be accessed through the front panel, as shown in the operation section.
- ⇒ Local or remote PC.

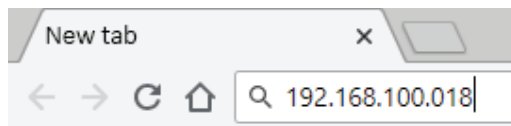
It is possible to change and/or monitor all of the parameters and measurements as is done at the front panel through the WEB server. To accomplish this, it is necessary to configure the IP / Mask / Gateway.



If the multicast stream is on the same network that will be used for WEB interface access, a Managed PoE Ethernet Switch must be used to isolate this access from the multicast stream. For more information contact Comark customer support.

2. Configuring the System

The WEB interface can be accessed through the Main or the Backup Control Module CM8001 via a web browser through one of the IP addresses configured in the Control Module itself.



For navigation, you must use a recent internet browser, updated in its latest version. To control the device through the web interface, we recommend Chrome or Firefox.

To configure the IP address, use the display navigation interface of the Control Module by accessing the [4000] Remote Access Menu (see section 3, item 5.1.4.2 - System Structure).

Default Configurations:

Main Control Module MC8001:

IP Address	192.168.100.018
Subnetwork Mask	255.255.255.0
Gateway	192.168.100.001

Backup Control Module MC8001:

IP Address	192.168.100.019
Subnetwork Mask	255.255.255.0
Gateway	192.168.100.001

3. Browsing the System

3.1. Access Password

Enter the password, login and confirm.

Setup in factory:

Login : user

Password : linear

3.2. Startup

The equipment management interface is subdivided into six tabs as shown below:

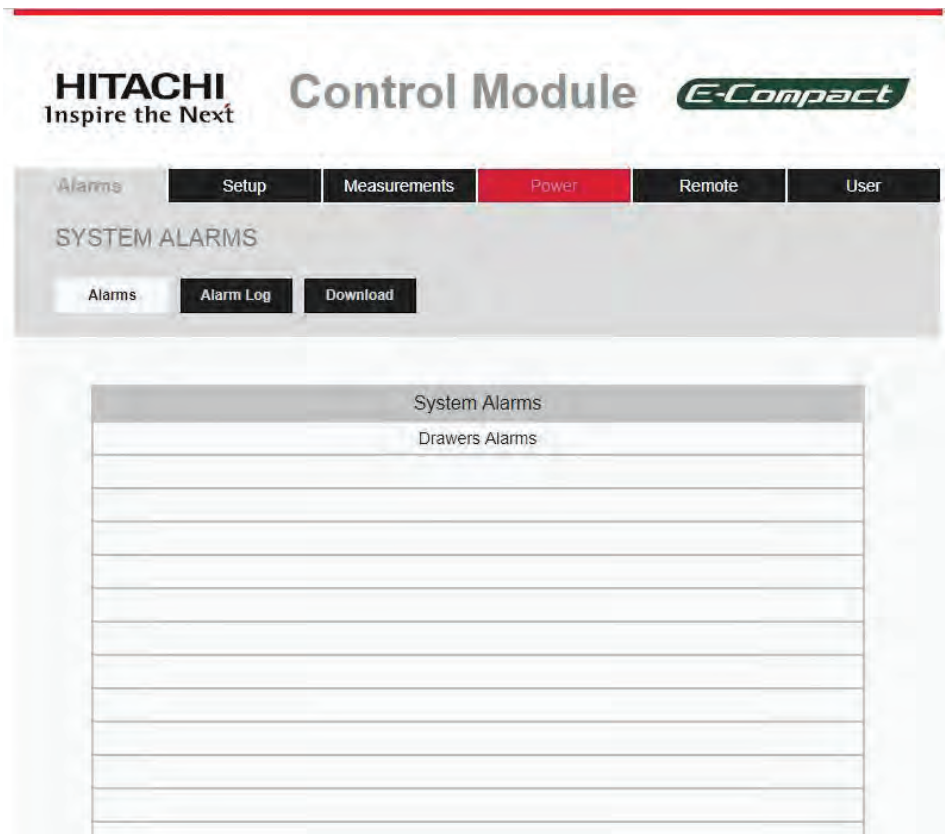
- ⇒ Alarms – Verification of existing alarms (System Alarms).
- ⇒ Setup – Power Setup, import, and export files.
- ⇒ Measurements – Verification of system measures.
- ⇒ Power – Check the power supply voltage measurements, current, and module temperature amplifier.
- ⇒ Remote – Change system settings (IP Address/ Netmask/ Gateway).
- ⇒ User – Change / configure password (Current Password/ New Password/ Confirm New Password).

3.3. Alarms

Through Alarms interface, it is possible to monitor alarms detected in the transmitter. If there are alarms the Alarms tab flashes red.

3.3.1. Alarms

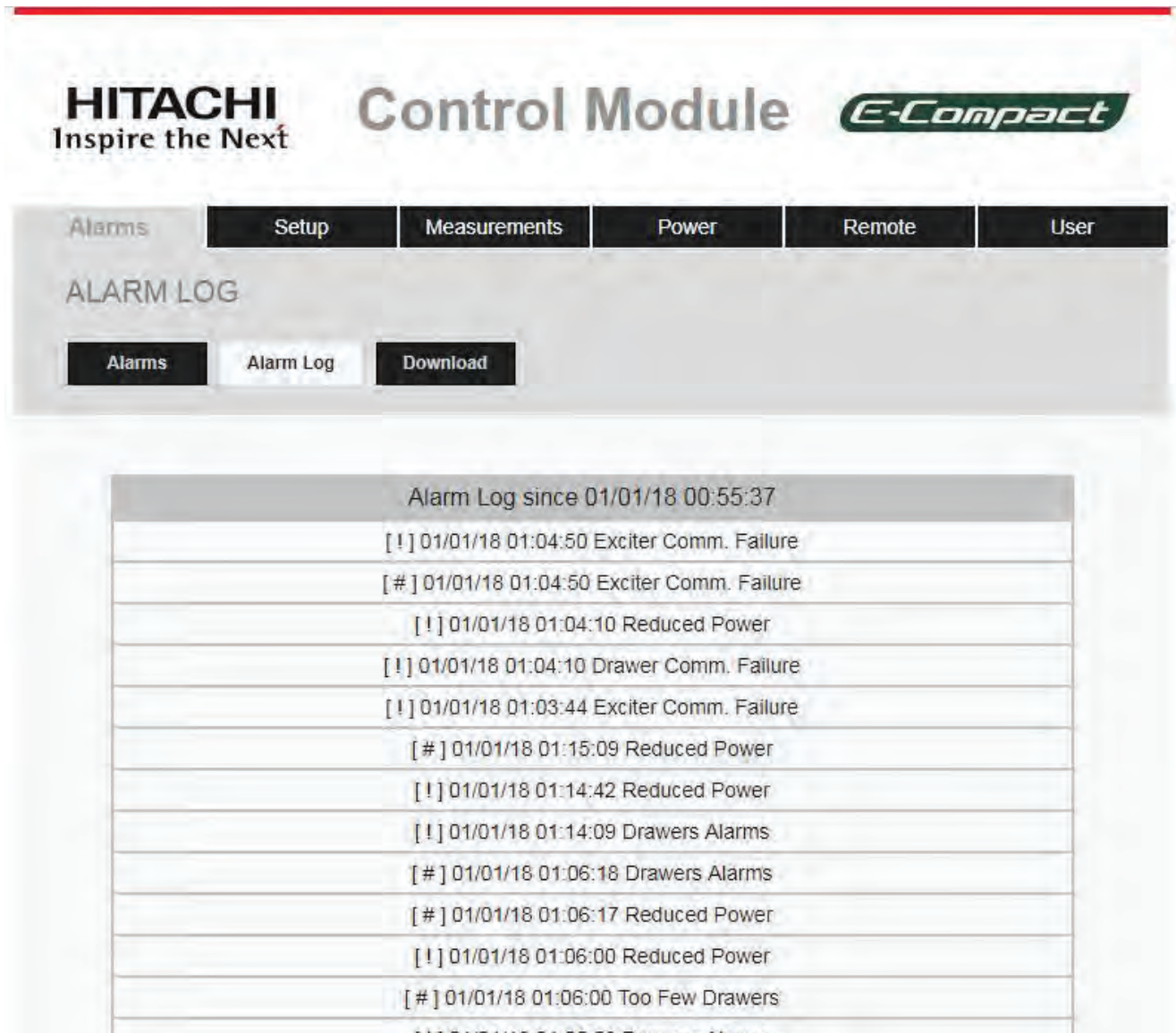
Shows the alarms that are occurring.



The alarm significance table is found in section 3, item 5.1.4.2 - System Structure.

3.3.2. Alarm Log

View the list of alarms that ran during the Machine operating period.



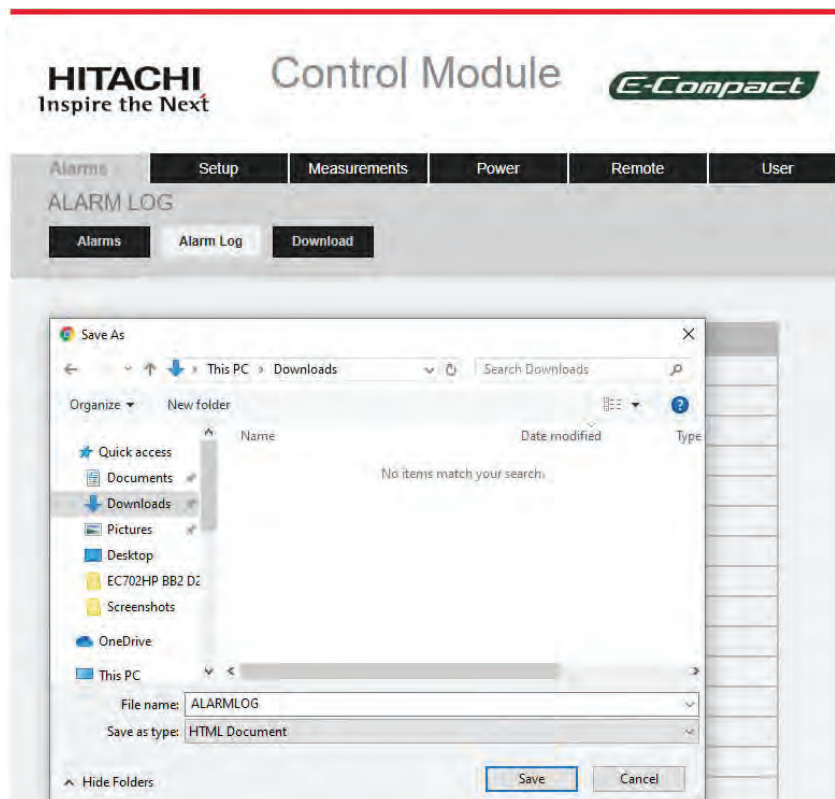
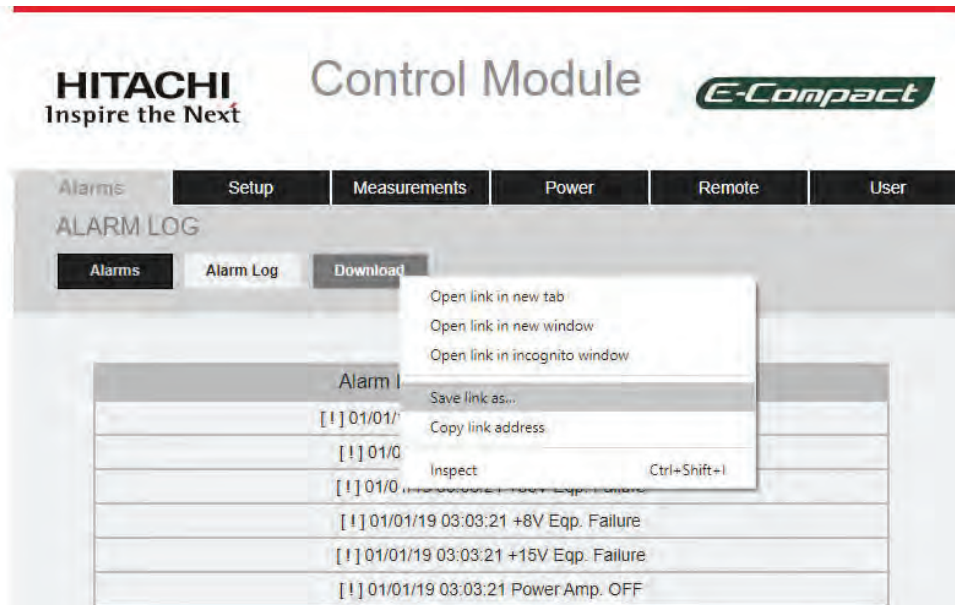
The symbol '[!]' before log indicates the date and time when the alarm occurred.

The symbol '[#]' before the log indicates the date and time when the alarm ended.

The alarm significance table is found in section 3, item 5.1.4.2 - System Structure.

3.3.3. Download Alarm Log

Through this screen you can save the list of alarms generated for further analysis. To save the file, click the right button and then select Download.



3.4. Setup

To set the power level of the transmitter, it is necessary to access the item “Setup” starting from the home screen.

3.4.1. Power Setup

Changes the output power of the equipment.



3.4.2. Transmitter

This screen allows you to restart the transmitter.

The screenshot displays the Hitachi Control Module E-Compact web interface. At the top, the Hitachi logo and 'Inspire the Next' tagline are on the left, 'Control Module' is in the center, and the 'E-Compact' logo is on the right. Below this is a navigation bar with tabs: Alarms, Setup (selected), Measurements, Power, Remote, and User. Under the 'Setup' tab, there is a 'TRANSMITTER SETUP' section with sub-tabs: Power, transmitter (selected), Exciter, and File. The 'transmitter' sub-tab contains a 'Transmitter Reset' section with a table:

Transmitter Reset		
Exciter B	Active	
Transmitter Reset		RESET

Below this is an 'Exciter' section with a table:

Exciter	
Exciter IP	192.168.100.19

At the bottom of the 'Exciter' section is an 'APPLY' button.

3.4.3. Exciter

CM8001 is a control Module, the Exciter is installed by the customer. One should always check the third party exciter's manual for remote access. This menu has no functionality.

3.4.4. File

Because it is only the MC8001 Control Module, the Exciter is installed by the customer. For upload Transistor Bias Adjustments or Power Sensor Call, it is recommended that you check your Customer Exciter manual for remote access. This menu has no functionality.

3.5. Measurements

This screen displays information regarding the System, Power, Exciter, System Power, and Communication statuses. To access it, select the Measurements tab.


Control Module


Alarms
Setup
Measurements
Power
Remote
User

SYSTEM MEASUREMENTS

System Information	
Standard	ATSC 3.0
Channel	Ch. 23 / EC702HP
Exciter Status	B / Active
Operational Power	1440W
uC Software Version	CM5A0001v1.01
Digi Software Version	CMDG0001v1.00
Hardware Version	CIP 8753D / CIM 3930F

Power		
Programmed	1440.0 [W]	
Forward	1440.0 [W]	
Reflected	09.0 [W]	
ALC Reference Voltage	4.99 [V]	
Reflectometer Voltage	4.34 [V]	

Exciter Status	
Exciter Status	OK

Exciter Power Supply			
+ 3.3 V	OK	+ 15 V	OK
+ 5 V	OK	+ 28 V	OK

Communication Status			
Power 1	OK	Power 2	OK

System Power Supply			
+ 8 V	OK	+ 15 V	OK
+ 50 V	OK		

3.6. Power

3.6.1. Measurements

This screen allows one to view power drawer information. To verify this information, select Power on the home screen.


HITACHI
 Inspire the Next

Control Module



Alarms
Setup
Measurements
Power
Remote
User

POWER AMPLIFIER 1

Power 01

Power 02

Measurement

Cur. Alarms

Past Alarms

Celsius

Fahrenheit

Power Supply 1 Measurements					
Input Voltage	218.5 [Vac]	Temperature	100.0 [°F]	Software Version	PAM30002v1.00
Output Voltage	50.7 [Vdc]	Output Current	14.24 [A]		

Power Supply 2 Measurements					
Input Voltage	223.0 [Vac]	Temperature	98.6 [°F]	Software Version	PAM30002v1.00
Output Voltage	50.6 [Vdc]	Output Current	14.17 [A]		

Power Supply 3 Measurements					
Input Voltage	221.6 [Vac]	Temperature	97.7 [°F]	Software Version	PAM30002v1.00
Output Voltage	50.4 [Vdc]	Output Current	14.27 [A]		

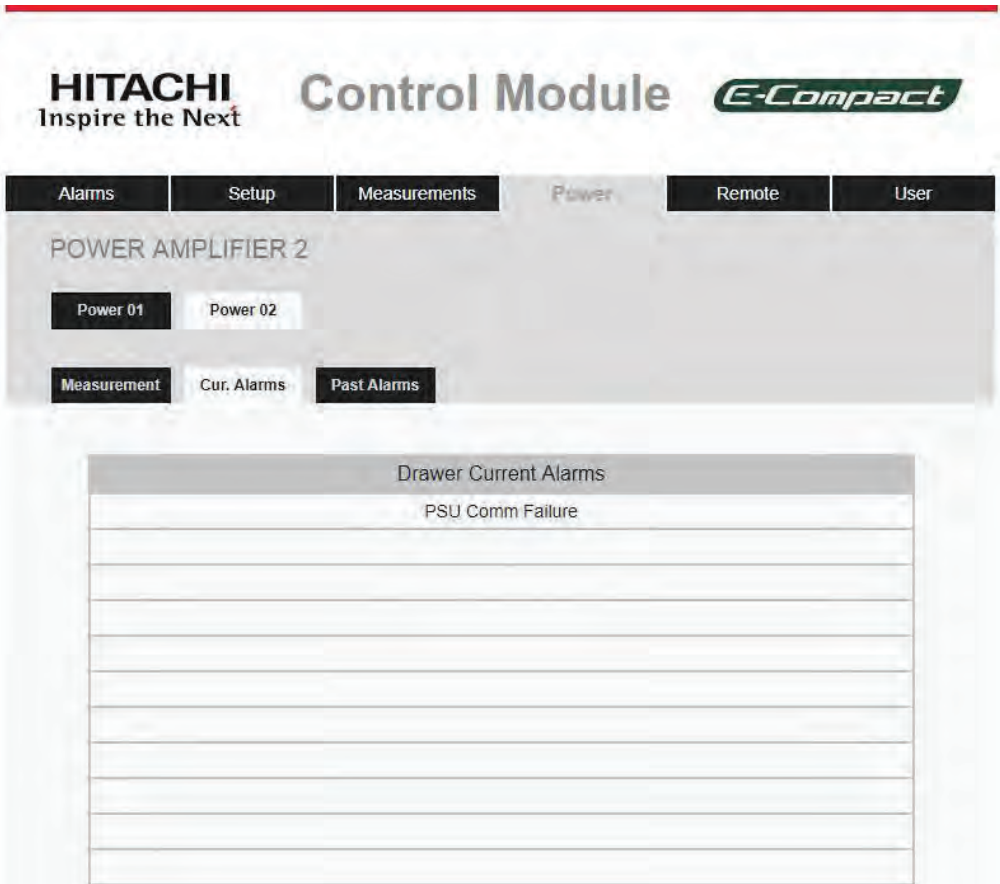
Driver Measurements					
Input Voltage	50.6 [V]	Pre Driver Curr.	0.24 [A]	RF Input Level	+7.1 [dBm]
Temperature	124.0 [°F]	Driver Current	2.81 [A]	RF Output Level	+42.8 [dBm]
Software Version	PAM30002v1.00				

Power Amplifiers Measurements					
Module	Current [A]	Temperature [°F]	Vgs Peak [V]	Vgs Carrier [V]	Software Version
PA1	5.38	119.8	0.324	1.625	PAM30002v1.00
PA2	5.96	120.2	0.324	1.654	PAM30002v1.00
PA3	5.58	119.8	0.324	1.682	PAM30002v1.00
PA4	5.70	117.3	0.322	1.661	PAM30002v1.00
PA5	5.94	117.9	0.320	1.632	PAM30002v1.00
PA6	5.76	118.9	0.327	1.656	PAM30002v1.00
PA7	5.87	118.6	0.324	1.632	PAM30002v1.00
PA8	5.82	117.9	0.320	1.651	PAM30002v1.00

General Measurements					
Input Air Temp.	71.6 [°F]	FAN1 Rotation	5880 [rpm]	VGS Peak	0.30 [V]
FWD Power	861 [W]	FAN2 Rotation	5820 [rpm]	Current Carrier	0.30 [A]
RFD Power	25 [W]	FAN3 Rotation	5880 [rpm]	Software Version	PAM40005v1.00
FAN Rotation [%]	21%				

3.6.2. Cur. Alarms

Visualize the alarms that are occurring on the Power Amplifiers Drawer.



The alarm significance table is found in section 3, item 5.1.4.2 - System Structure.

3.6.3. Past Alarms

View the list of alarms that ran during the Power Amplifier Drawer operating period.

The alarm significance table is found in section 3, item 5.1.4.2 - System Structure.

3.7. Remote

This screen allows the user to read system information and configure the machine for operation in remote mode. Through this configuration, it can monitor all parameters and measures through the front panel as well as through the WEB server. To view remotely, it is necessary to configure the IP / Mask / Gateway selecting the Remote option.

The screenshot displays the 'Remote' configuration page of the Hitachi Control Module E-Compact. The page has a header with the Hitachi logo and 'Inspire the Next' slogan, followed by 'Control Module' and the 'E-Compact' logo. Below the header is a navigation bar with tabs: Alarms, Setup, Measurements, Power, Remote (selected), and User. The main content area is titled 'REMOTE ACCESS' and contains two tables for configuration.

SNMP	
SNMP MIB	Download
Read Community	public
Write Community	private
SNMP Version	v2c
Trap Destination	192.168.100.80
Enable Traps	OFF

Network	
IP Address	192.168.100.17
Netmask	255.255.255.0
Gateway	192.168.100.1

APPLY

3.8. User

It is possible to change the password through the interface. To access this, select the User tab.

The screenshot shows the 'Hitachi Control Module E-Compact' web interface. At the top, there is a navigation bar with tabs: 'Alarms', 'Setup', 'Measurements', 'Power', 'Remote', and 'User'. The 'User' tab is selected. Below the navigation bar, the title 'USER CONFIGURATION' is displayed. The main content area contains a 'Password' section with three input fields: 'Current password:', 'New Password:', and 'Confirm New Password:'. Each field has a corresponding text input box. Below these fields is a red 'APPLY' button.

Password	
Current password:	
New Password:	
Confirm New Password:	

APPLY

Current password: Field for entering the current password system.

New Password: Field for entering the new password.

Confirm New Password: Field for typing the new password for confirmation.

After the desired changes made, click the Apply button to apply the settings.

Section 7 – Preventive Maintenance

1. Overview

This section is dedicated to the necessary procedures for proper preventive, periodic and corrective maintenance in order to guarantee a TV transmitter that works properly and for a longer period of time.



Only trained and authorized people should be allowed to open the transmitter. The non-compliance of this item might result Warranty loss.

IMPORTANT:

- ⇒ The life expectancy of the equipment depends on its working conditions.
- ⇒ Environments with controlled temperature increase the life span of the components.
- ⇒ In the semester inspections, if there is a noise or an abnormal vibration in the fan located inside the equipment, it should be replaced. This same procedure should be followed for the front panel fans in the power drawers or the excitation module.

2. Preventive Maintenance

2.1. Cleaning

Initial steps

- ⇒ Unplug the equipment from the power outlet,
- ⇒ Remove the side and top covers,
- ⇒ Disconnect all RF cables from the rear panel.

Procedure:

- (1) With an air blower, remove all of the accumulated dust from the inside of the equipment, in the front and rear panels, sides, superior and inferior covers.
- (2) Clean the panels and the measurement instruments with a dry and soft cloth.
- (3) Remove the dust from the input of the air filters located in the inferior panel, side, and rear covers.



Do not allow any kind of particles or dust to get in to the filter cavities.

- (4) If you can't use an air blower, use a brush with soft bristles to avoid scratching the equipment.
- (5) When you are done cleaning the equipment, put the side covers back in place, redo all RF and power connections and turn the equipment on. Follow the activation procedure.

2.2. Visual Inspection

Remove the side covers.

- (1) Verify if all the connections in the modules, as well as the RF connections in the equipment and the irradiant system are correct.
- (2) Verify if there is water from rain coming through the RF cables or water dripping from the shelter's ceiling.
- (3) Verify all the air inputs and outputs of the equipment to make sure they are not blocked.
- (4) When you finish the visual inspection, put the side covers back.

2.3. Reading Verification

Make all the possible measurements through the instruments and take notes of the results. Compare the obtained results with the quality control sheets, which come with the equipment. The monthly verification of these measurements helps to prevent any abnormality that may occur.

Section 8 - Attachments

1. MCCB AC mains type conversion

1.1. Overview

In this topic we will demonstrate how to configure the MCCB drawers to operate on the 50Hz or 60Hz AC Mains frequencies and also how they are configured for the AC mains type (M208, B240, T208/T240 and T380).

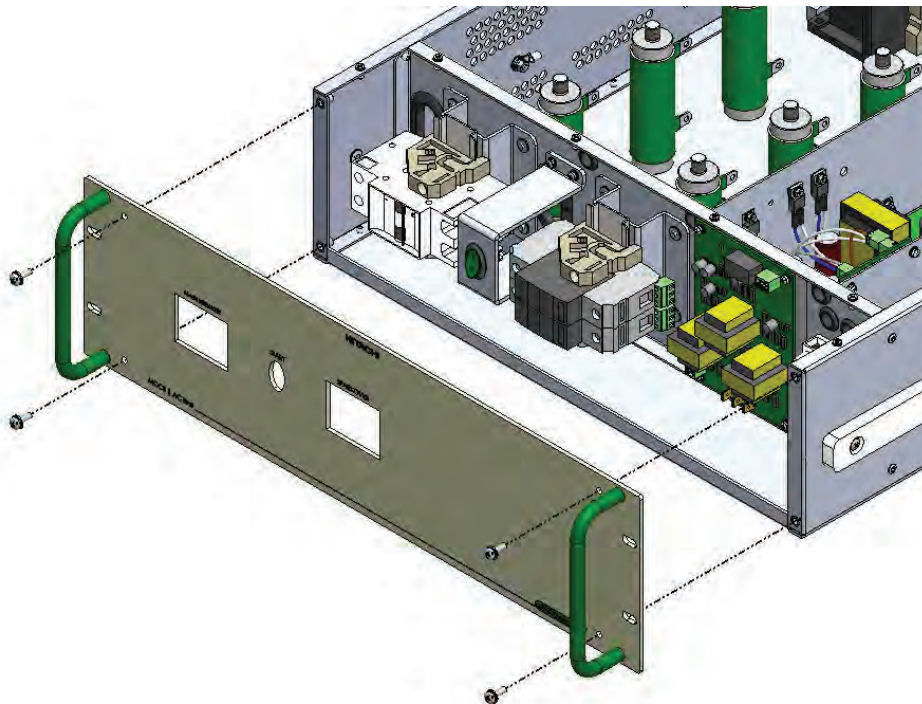
The MCCB AC mains type conversion will be performed on the front panel of the MCCB. You will need to remove the MCCB panel for selection of the reading board T220 or T380, change the breaker to the correct value, change the position of the sindal connector, and change the sparkovers.

This conversion does not apply to the EC701HP-BB model.



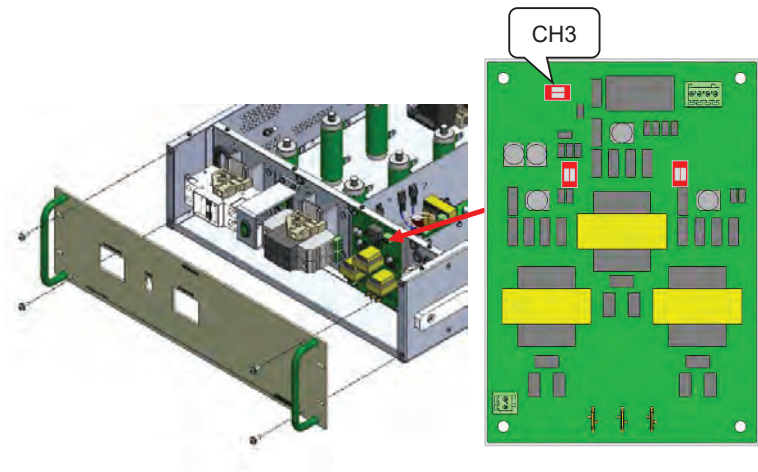
The MCCB AC mains type conversion must be changed by "trained" personnel as this may create risks to the customer and the transmitter.

Removing the front panel of the MCCB:



1.2. AC Mains frequency Setup (50Hz – 60Hz)

(1) Set the switch of the circuit board indicated below:



The diagram shows a 3D perspective of the circuit board assembly on the left and a 2D top-down view of the green PCB on the right. A red arrow points from the CH3 switch on the PCB to the assembly. A callout bubble labeled 'CH3' points to the switch. The PCB has several yellow rectangular labels and two red switches.

	Switch	
CH3	1	2
50Hz	ON	ON
60Hz	OFF	OFF

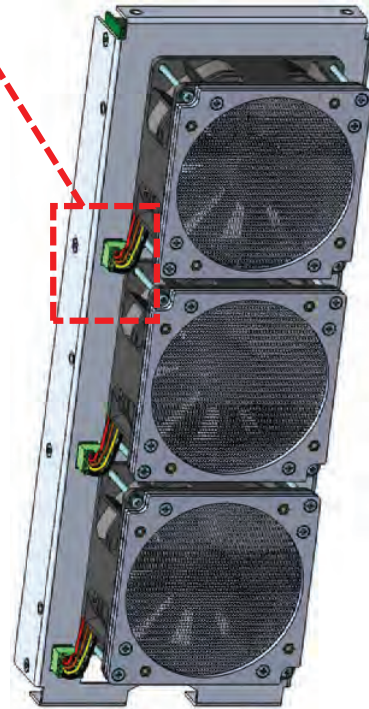
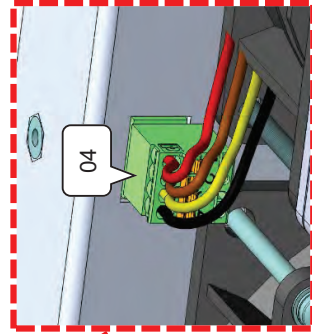
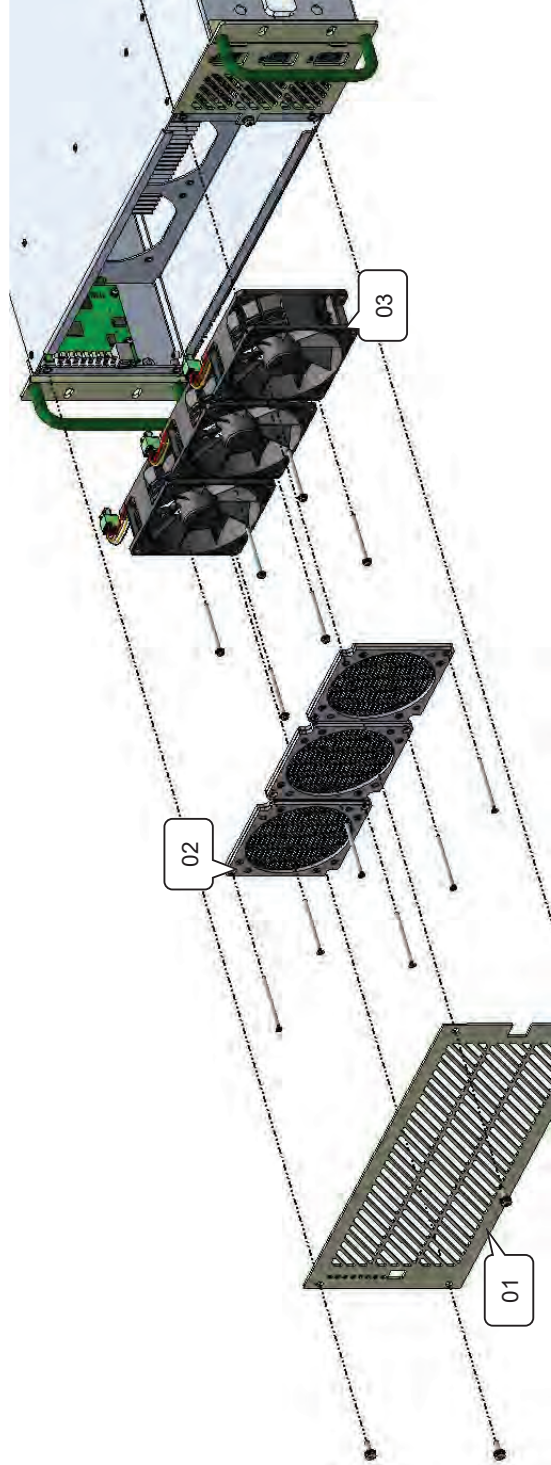
(2) In the CM8001 Control Module, by accessing the display interface, set the corresponding “Power Line Frequency” in the "Factory Setup" Menu:



The screenshot shows a green LCD display with the text: "Factory Setup: 12/12 [50000]" and "-> Power Line Frequency: 60 [Hz]". A red bracket is drawn under the "60 [Hz]" text.

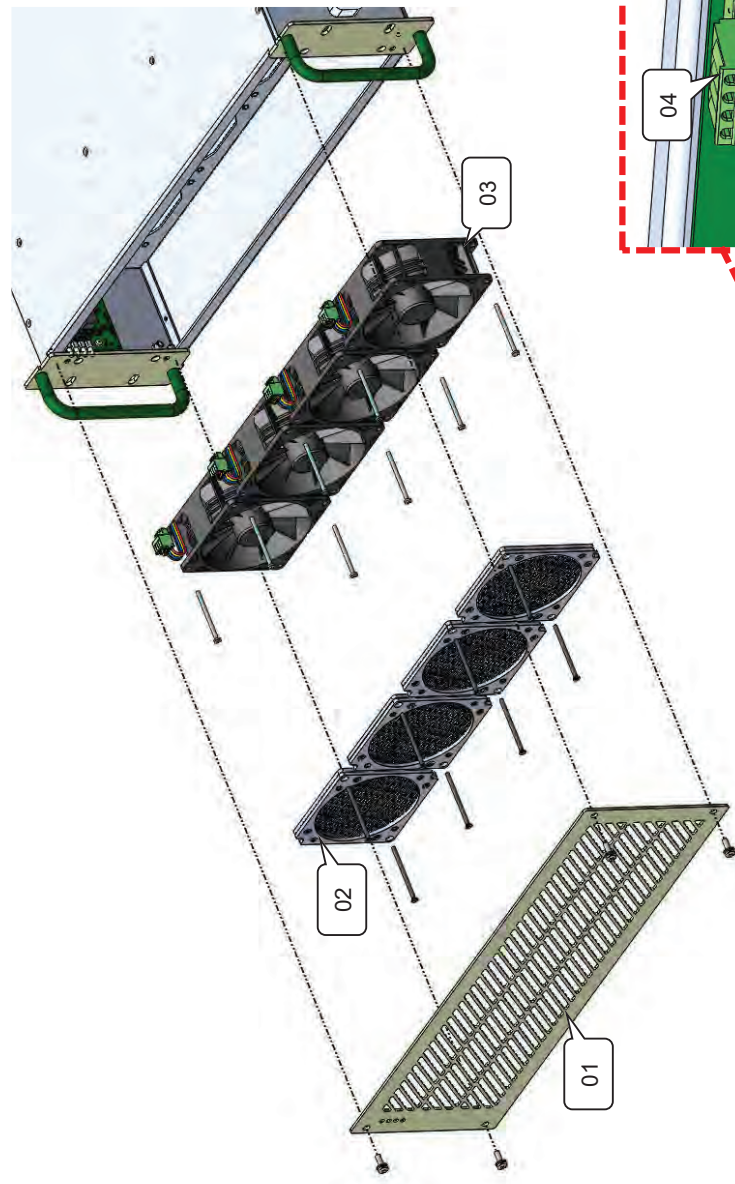
Frequency Change

2. POWER AMPLIFIER DRAWER: Fan Filter Access for Cleaning / Fan Replacement

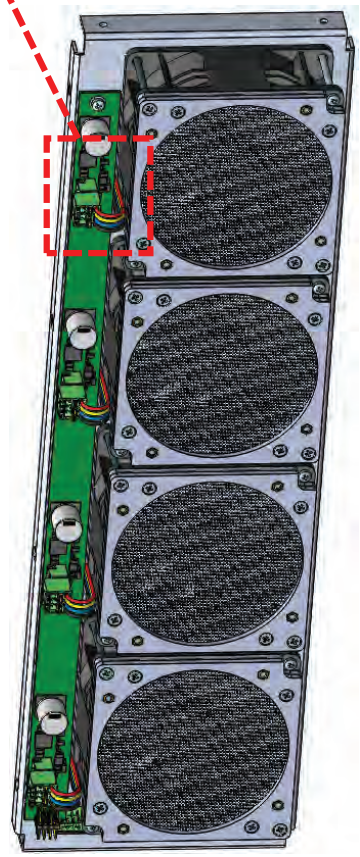
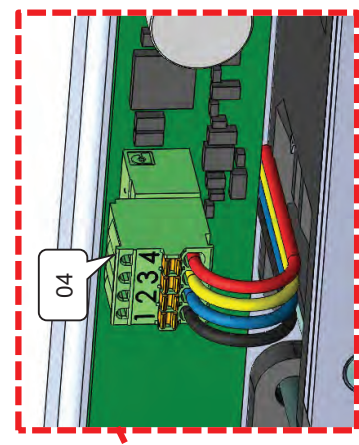


01	Front Panel	
02	Fan Filter	
03	Fan	
04	Fan DC Connector	

3. DUMMY LOAD DRAWER: Fan Filter Access for Cleaning / Fan Replacement

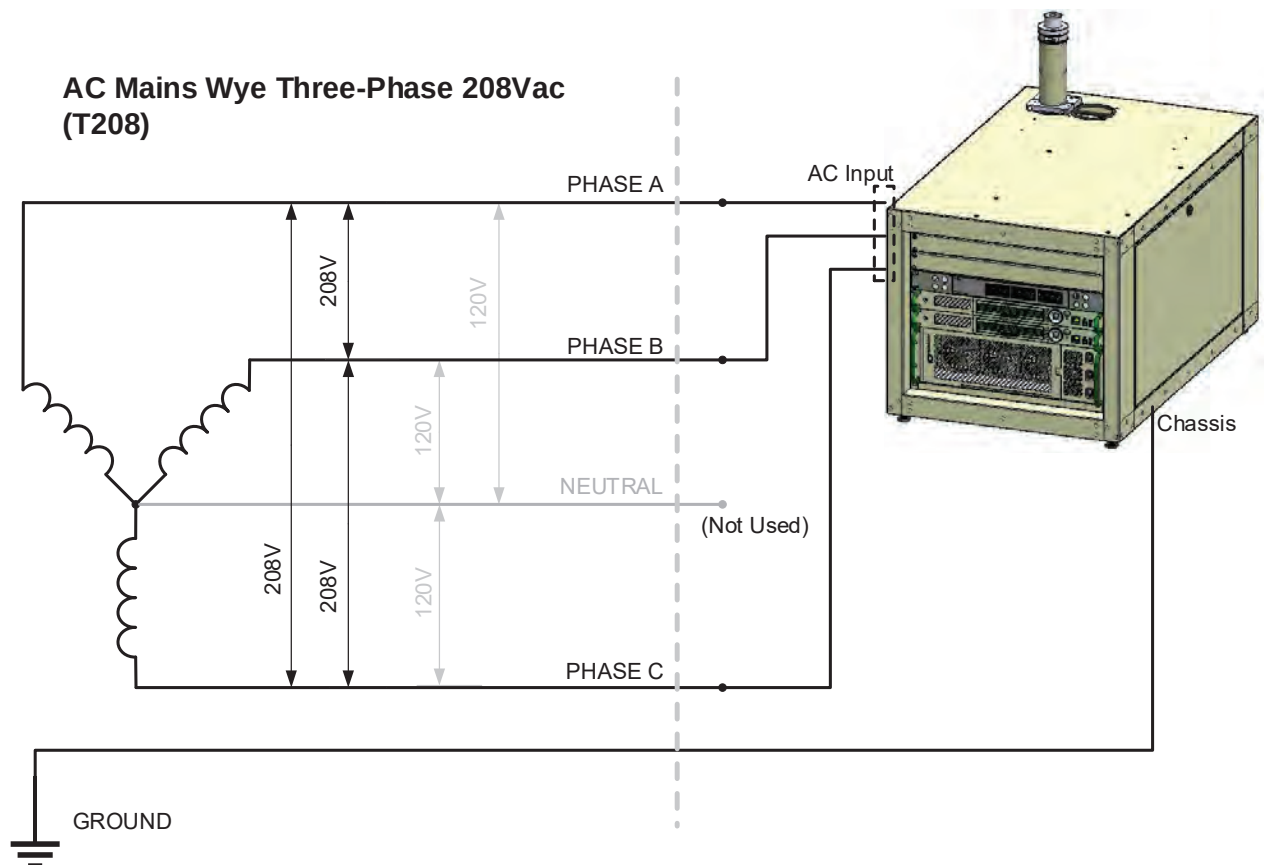
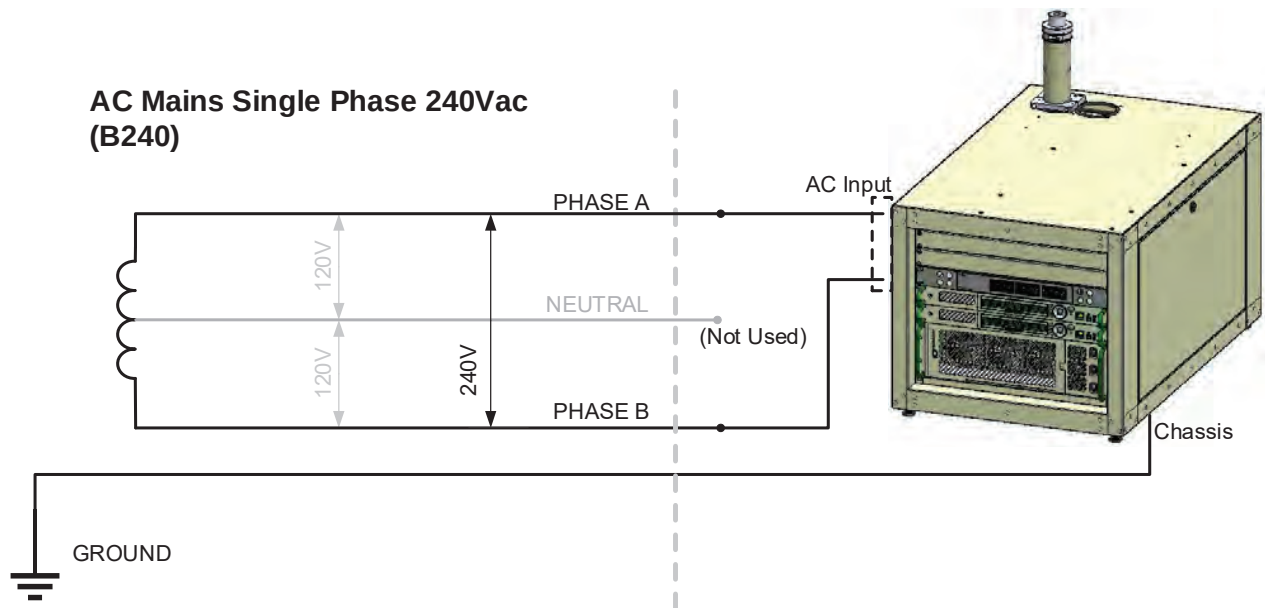


01	Front Panel
02	Fan Filter
03	Fan
04	Fan DC Connector



4. USA AC Mains Types for E-Compact Series

Common Electrical Services



Uncommon Electrical Services

