ANYWAVE
COMMUNICATION TECHNOLOGIES

MHPTV User Manual

October 18, 2019 - Version 3.0

MEDIUM-HIGH POWER TV TRANSMITTERS

Copyright Notice

FCC Compliance

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense

The antenna(s) used for this transmitter must be fixed-mounted on the outdoor permanent structures. RF exposure compliance is addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of §1.1307(b)(3).

Changes or modifications not expressly approved by Anywave Communication Technologies, Inc. could void the user's authority to operate the equipment.

Disclaimer

Information provided by Anywave Communication Technologies is believed to be accurate and complete; however, no liability can be assumed for its use.

The manufacturer makes no representations or warranties, either expressed or implied, by or with respect to anything in this manual, and shall not be liable for any implied warranties of fitness for a particular purpose or for any indirect, special, or consequential damages. Information in this document is subject to change without notice and does not represent a commitment on the part of the manufacturer.

USE OF THIS PRODUCT IN A MANNER OTHER THAN DESCRIBED IN THIS MANUAL MAY RESULT IN DAMAGE TO THE EQUIPMENT AND/OR PERSONAL INJURY.

PLEASE READ THIS MANUAL IN ITS ENTIRETY BEFORE ATTEMPTING TO OPERATE THE EQUIPMENT. CONTACT ANYWAVE WITH ANY QUESTIONS OR CONCERNS YOU MAY HAVE.

Unpacking

Carefully unpack the equipment and perform a visual inspection to determine if any apparent damage has occurred during shipment. Please notify the delivery carrier and Anywave immediately if shipment damage has occurred. Retain all original shipping materials.

Please locate and reference the Packing Check List to verify you have received all components of your system. Retain the Packing Check List for future reference.

Also, please identify and remove all packing materials and supports (foam pads, etc.) prior to the initial turn-on of the equipment.

Returns and Exchanges

Written approval and a Return Material Authorization number (RMA) are required from Anywave for all equipment returns. Please direct all return inquiries to the Anywave Service Department at support_us@anywavecom.com, providing the Sales Order number and Serial Number(s) of the equipment. Complete details regarding the nature and circumstances of your return must be included in your RMA request. Proper handling and return shipping instructions will be provided with an approved RMA number.

Technical Support

Technical support and troubleshooting assistance for Anywave Transmitters are available through the Anywave Technical Support Department during normal business hours (9:00 AM - 5:00 PM Central Time) at (847) 415-2258 (option 2). After hour Emergency Support is available at (847) 415-2258 (option 3). Email questions anytime to support_us@anywavecom.com and a Technical Support Engineer will respond as soon as possible.

Anywave Communication Technologies Inc.
300 Knightsbridge Parkway, Suite 150, Lincolnshire, IL 60069
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WARNING

THE VOLTAGES, CURRENTS, AND RF ENERGY IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY WARNINGS, INSTRUCTIONS, AND REGULATIONS.

IN THE CASE OF EMERGENCY, ENSURE THAT ALL POWER HAS BEEN DISCONNECTED.

ALWAYS DISCONNECT POWER BEFORE REMOVING COVERS, ENCLOSURES, OR SHIELDS. DO NOT PERFORM SERVICE ON THE EQUIPMENT WHEN ALONE OR FATIGUED. KNOW YOUR EQUIPMENT AND DO NOT TAKE RISKS.

This manual is provided as a general guide for trained and qualified personnel well aware of the dangers inherent in handling potentially hazardous electrical transmission equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment and must ONLY be performed by qualified personnel exercising due care. Anywave Communication Technologies, Inc. shall not be responsible for injury or damage resulting from improper handling or from the use of improperly trained or inexperienced personnel performing such tasks.

All local building and electrical codes, as well as fire protection standards, must be observed in the installation and operation of the equipment.

Contents

1. Introduction

This User Manual contains operational instructions for the Anywave MHPTV Transmitter fitted with 1, 2, 3, 4, 5, 6, or 8 PA drawers, delivering output powers as shown below (after the BPF). Please note that trained and qualified personnel are required to operate, install, maintain, and service this transmission equipment.

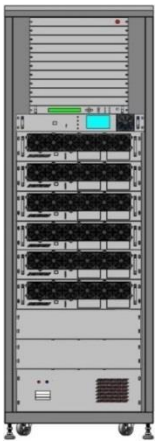
1100W ATSC
1000W COFDM

2200W ATSC
2000W COFDM

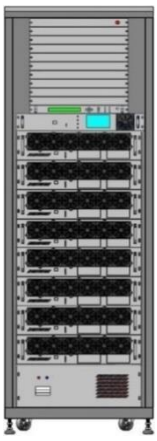
3300W ATSC
3000W COFDM

4400W ATSC
4000W COFDM

5500W ATSC
5000W COFDM



6600W ATSC
6000W COFDM



8800W ATSC
8000W COFDM

1.1 TX System Configuration

The operation of the MHPTV Transmitter is essentially the same independent of the Exciter modulation standard implemented - DTV (ATSC, ATSC 3.0, DVBT/T2, ISDBT, DTMB, etc. The differences are in the Exciter setup and configuration (please reference your specific Exciter user manual for details).

MHPTV Transmitters are fitted with Doherty (Hi-Efficiency) PAs. Please contact Anywave technical support for assistance if you wish to operate on a frequency other than your specified channel.

The table below highlights the MHPTV output power levels (ATSC and COFDM), cabinet dimensions, and power consumptions for the 1, 2, 3, 4, 5, 6, and 8 PA systems.

MHPTV Series - UHF							
Number of Amplifiers	1	2	3	4	5	6	8
Output Power (RMS) ATSC (1)	1300	2600	3800	5000	6000	7500	10000
Output Power (rms) ATSC (2)	1100	2200	3300	4400	5500	6600	8800
Output Power (RMS) COFDM (1)	1150	2300	3500	4500	5700	6800	9100
Output Power (rms) COFDM (2)	1000	2000	3000	4000	5000	6000	8000
Output Connector	1 5/8”					3 1/8”	
Height (inches / mm)	53.5 / 1358		70.6 / 1794			81.2 / 2063	
Width (inches / mm)	28.5 / 725		28.5 / 725			28.5 / 725	
Depth (inches / mm)	33.5 / 850		43.5 / 1100			43.5 / 1100	
AC Input Voltage (3)	240VAC Single φ (1, 2 or 3PA) or 208VAC Three φ						
AC Input Frequency	50 / 60 Hz						
Consumption - Max. - KW	3.3	6.5	9.7	12.8	15.9	19.2	25.6
Consumption - Typical. - KW	3.1	6.2	9.3	12.4	15.6	18.7	24.9
Current Rating Per φ typ – (1φ/ 3φ) (3)	13.0 / 8.7	25.9 / 17.3	38.9 / 26.0	34.6	43.2	51.9	69.2

(1) Power measured before Band Pass Filler

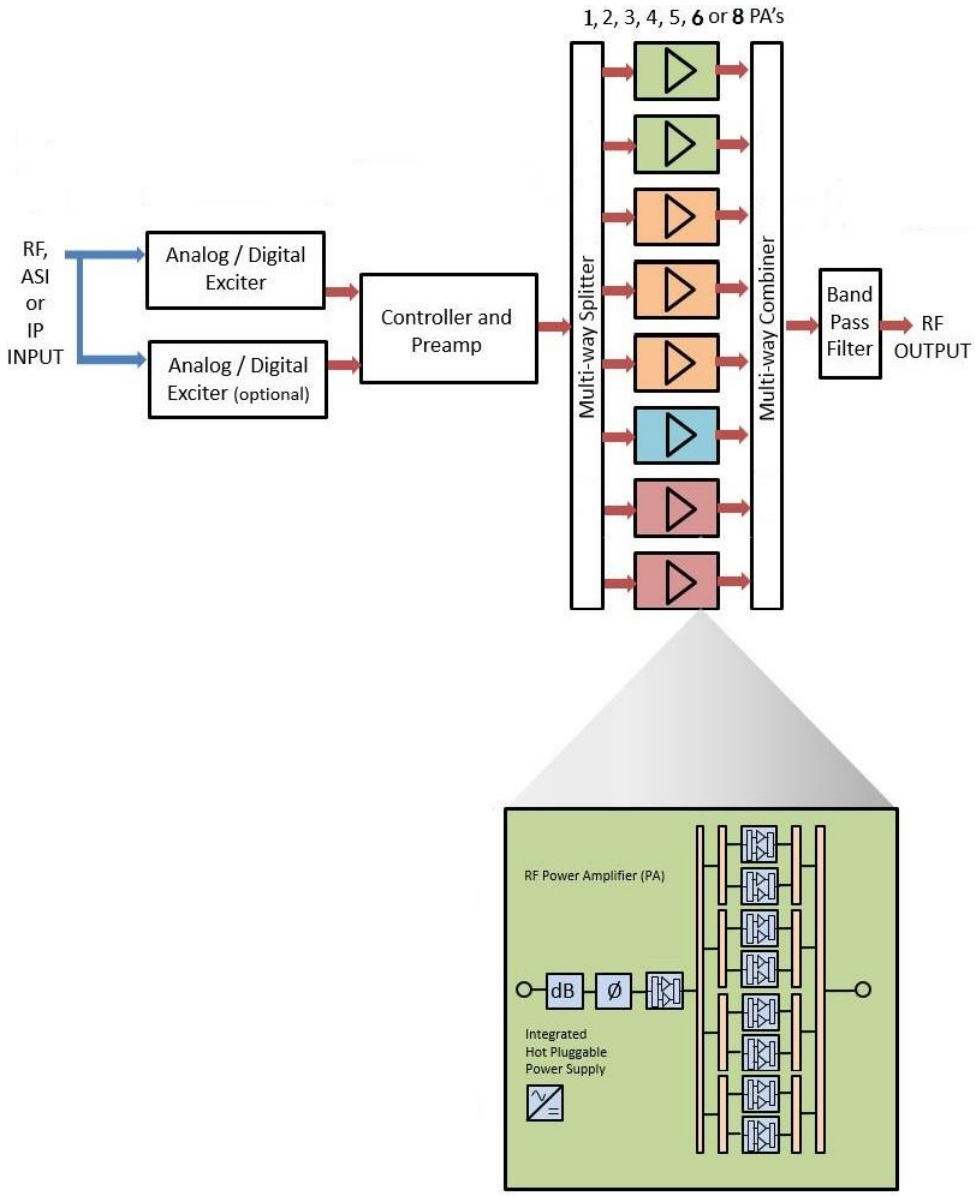
(2) Power measured after Band Pass Filler

(3) 4, 5, 6, 8 PA Current Rating is for 208V 3 ϕ

1.2 TX Overview

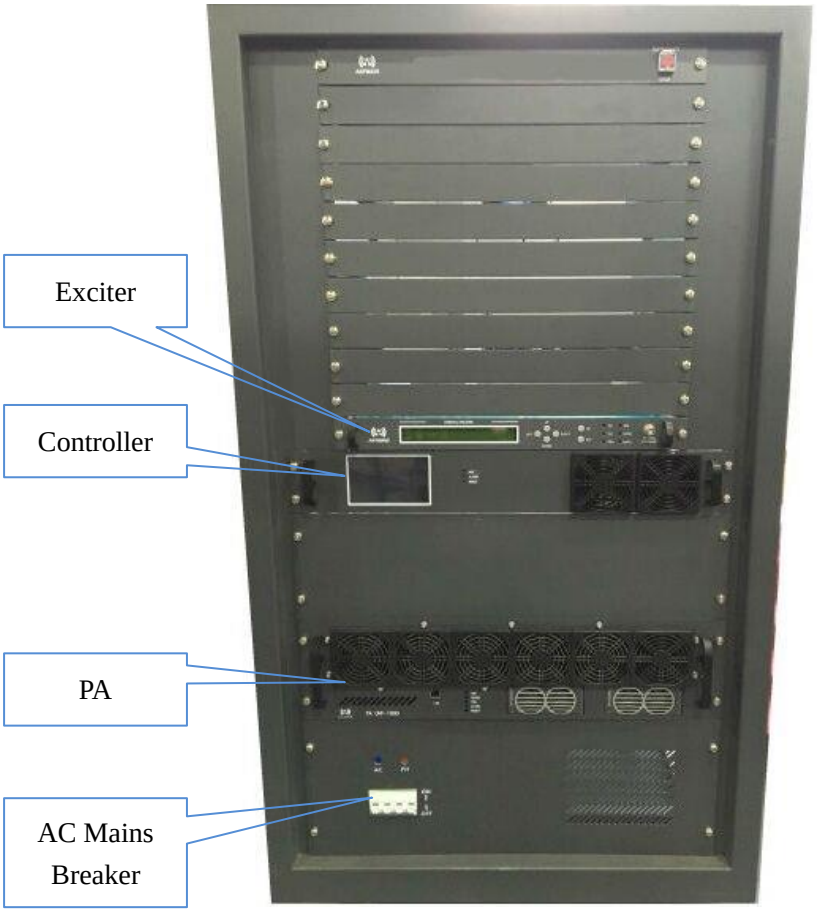
1.2.1 System Block Diagram

A hi-level System Block Diagram of the MHPTV TX is shown below. The MHPTV system essentially consists of an Exciter, a Controller (with built-in preamp), 1,2,3,4,5,6, or 8 Power Amplifiers with corresponding input Splitter and output Combiner, and a Band Pass (mask) Filter.

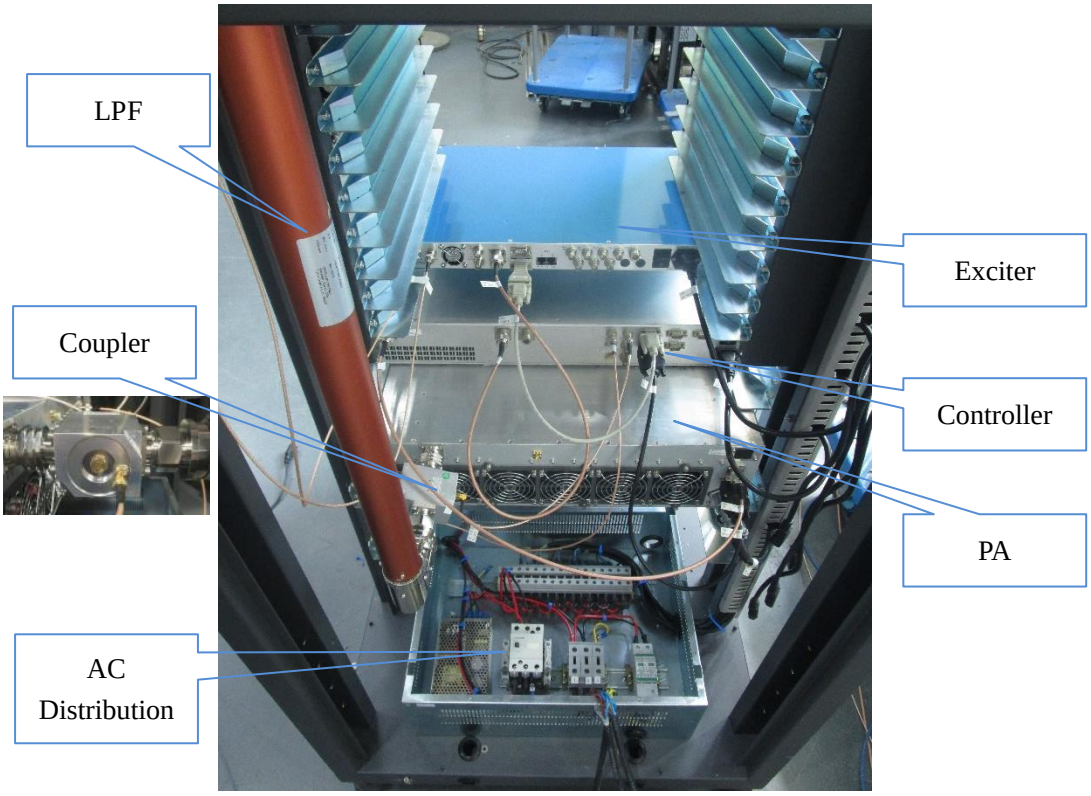


1.2.2 1-PA TX

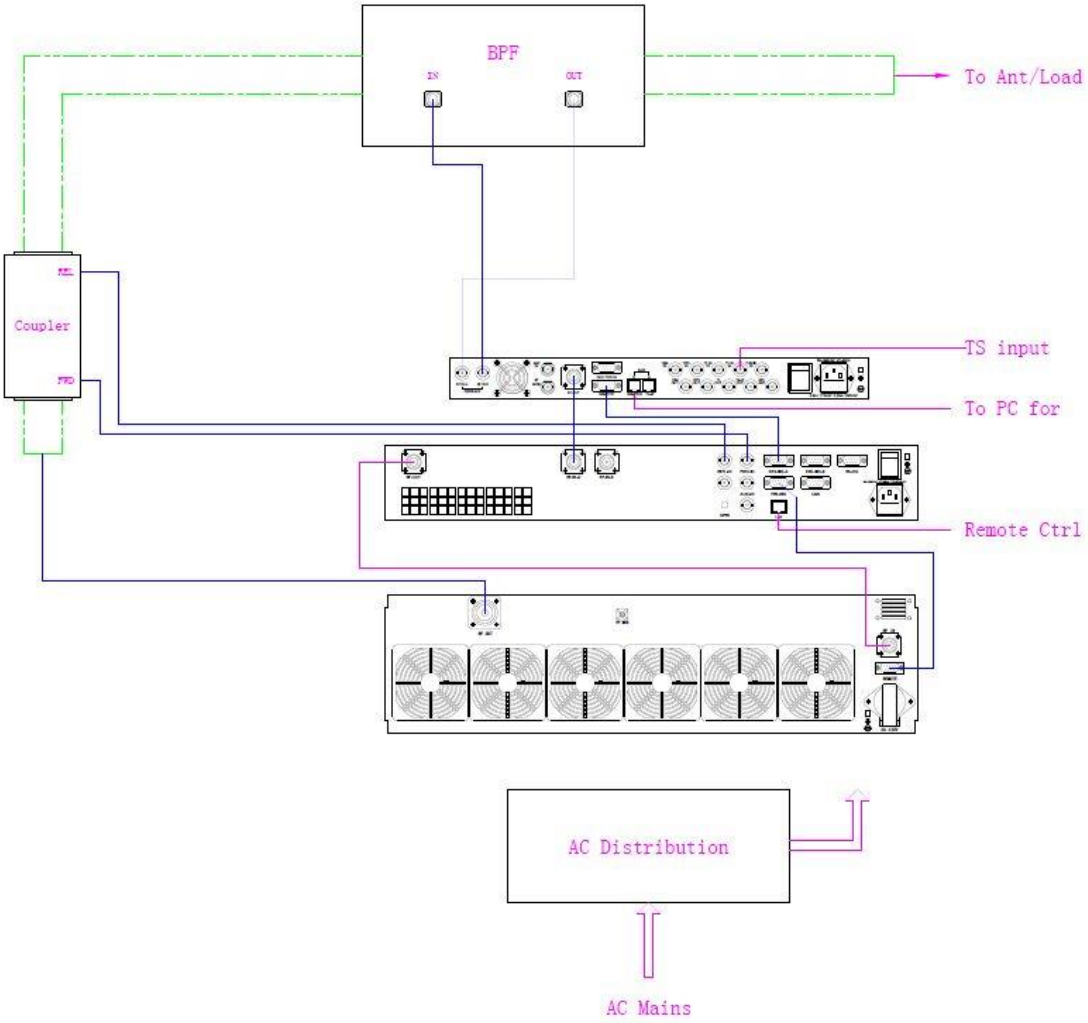
The Anywave 1-PA MHPTV Transmitter comes in single and dual exciter configurations. Photos of a single exciter system are shown below. The main subsystems (as seen from the front) include one or two Exciter(s), one Controller (with a touchscreen LCD, and built-in preamp), one PA-8D-C-FA power amplifiers (8-power transistors per PA), and one AC Mains Breaker.



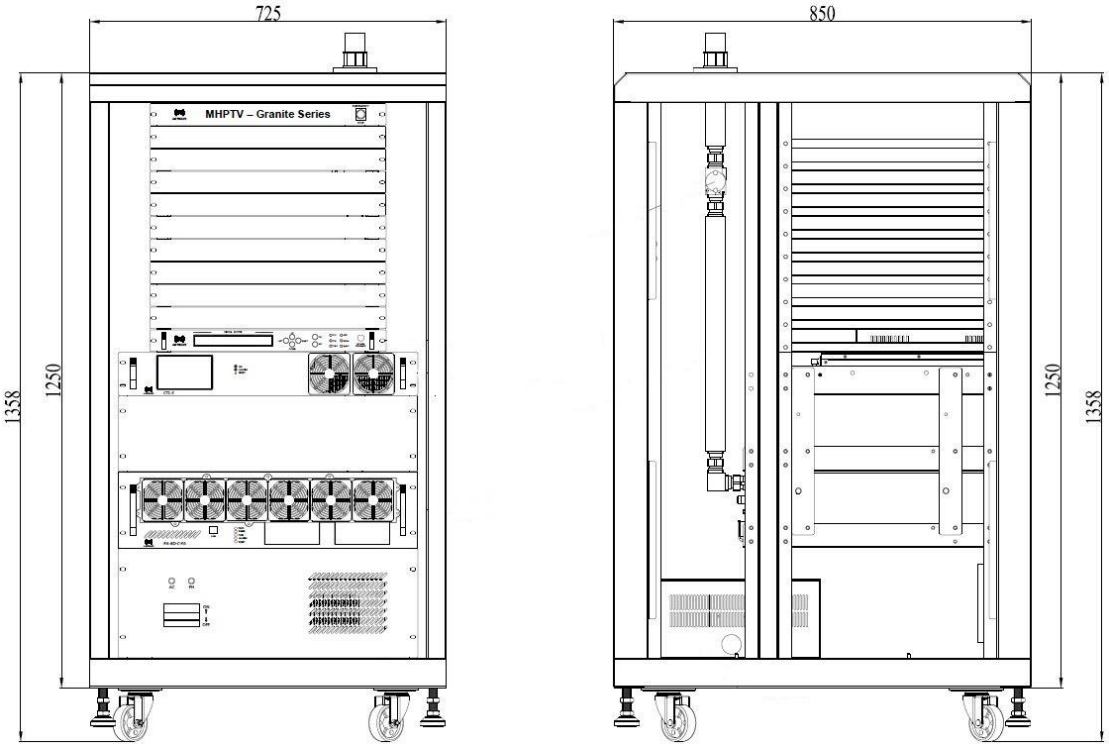
From the rear view of the TX cabinet, several other main components can be seen which include one AC Distribution System, one 2-port directional coupler and one Low Pass Filter (installed in the cabinet).



The diagram below shows the overall system interconnect between the various modules in the 1-PA MHPTV system.

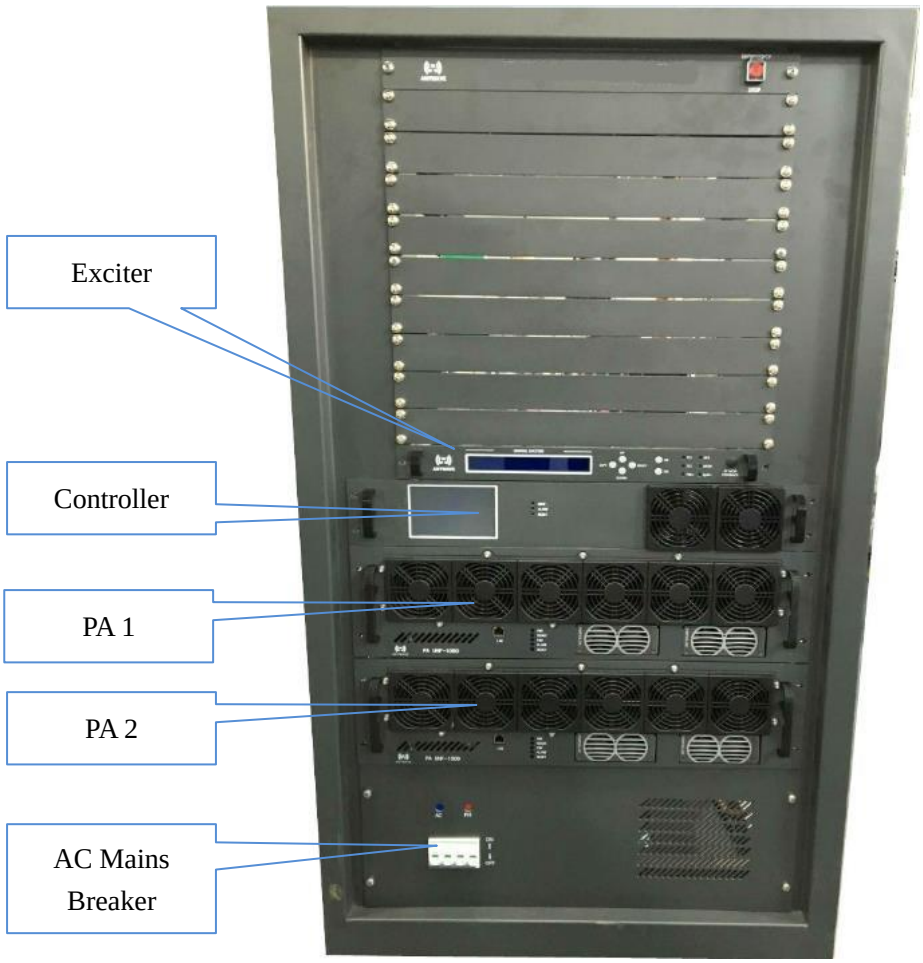


The 1-PA MHPTV system Cabinet dimensions are shown below. Please note: if the BPF (not shown) is mounted on top of the TX cabinet – then the additional height of the BPF must be considered in the overall system height.

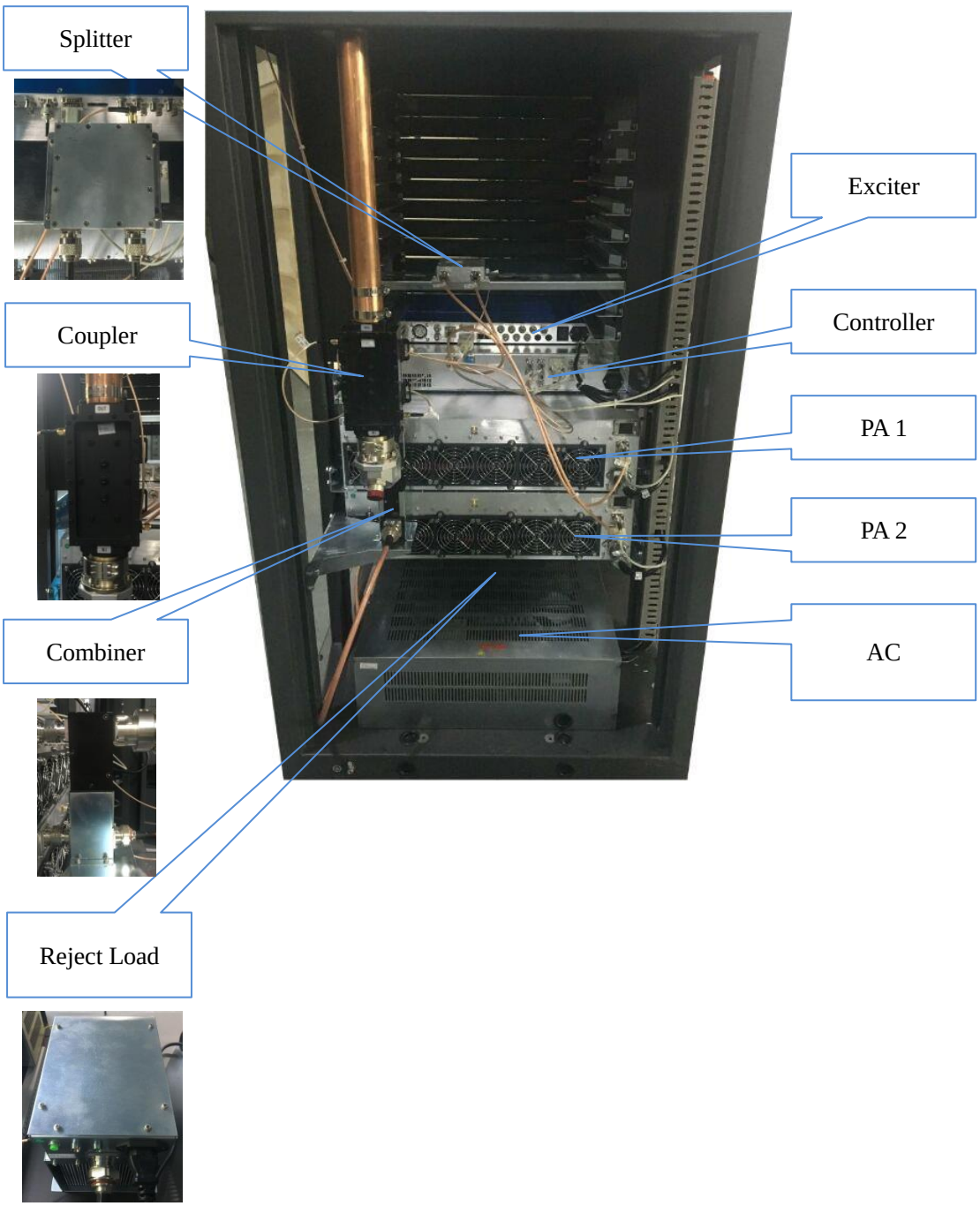


1.2.3 2-PA TX

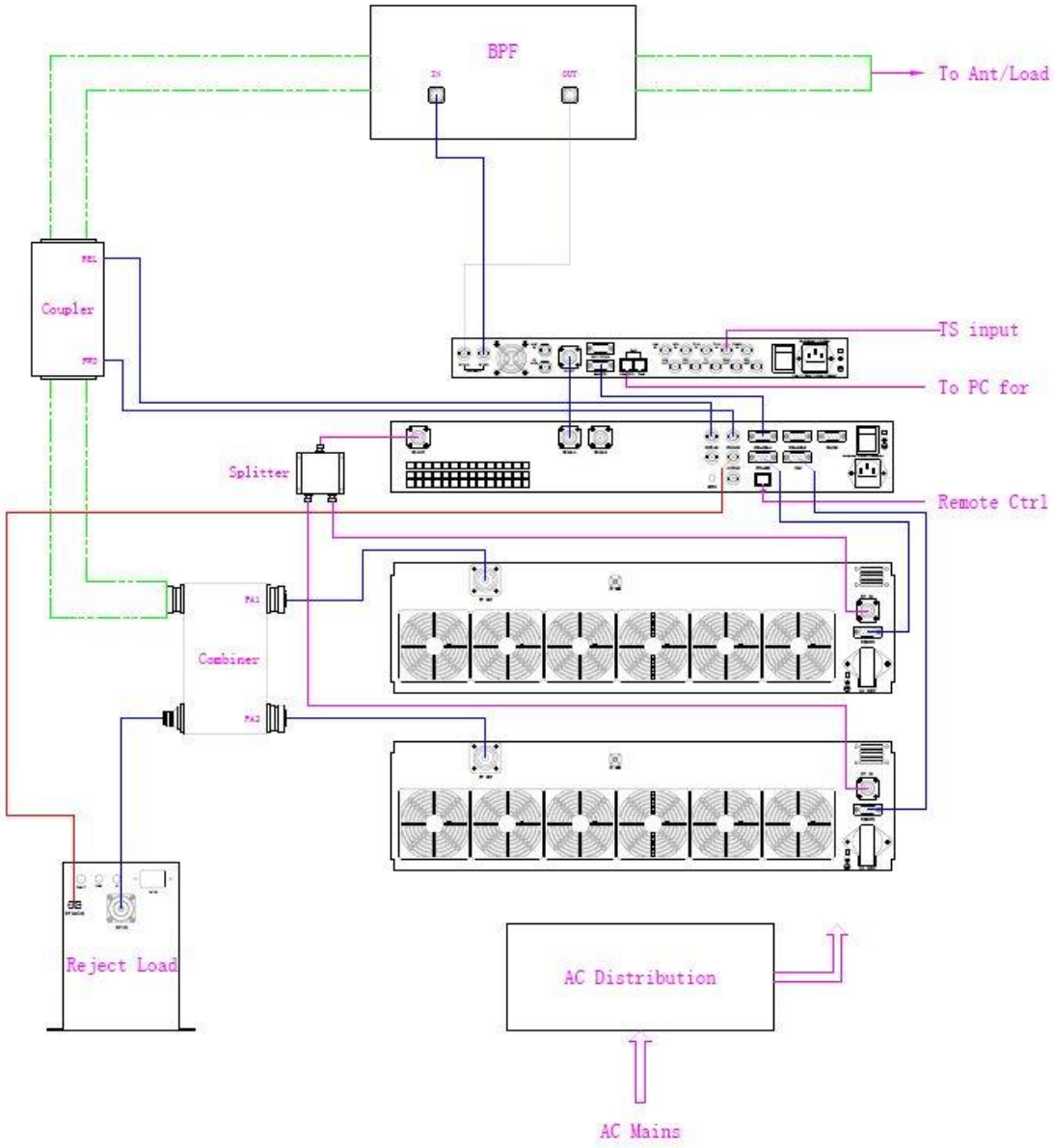
The Anywave 2-PA MHPTV Transmitter comes in single and dual exciter configurations. Photos of a single exciter system are shown below. The main subsystems (as seen from the front) include one or two Exciter(s), one Controller (with a touchscreen LCD, and built-in preamp), two PA-8D-C-FA power amplifiers (8-power transistors per PA), one AC Mains Breaker, one Low Pass Filter –installed external to the cabinet), and a channel mask Band Pass Filter (BPF) – optional –installed on the floor next to the cabinet rack (by default).



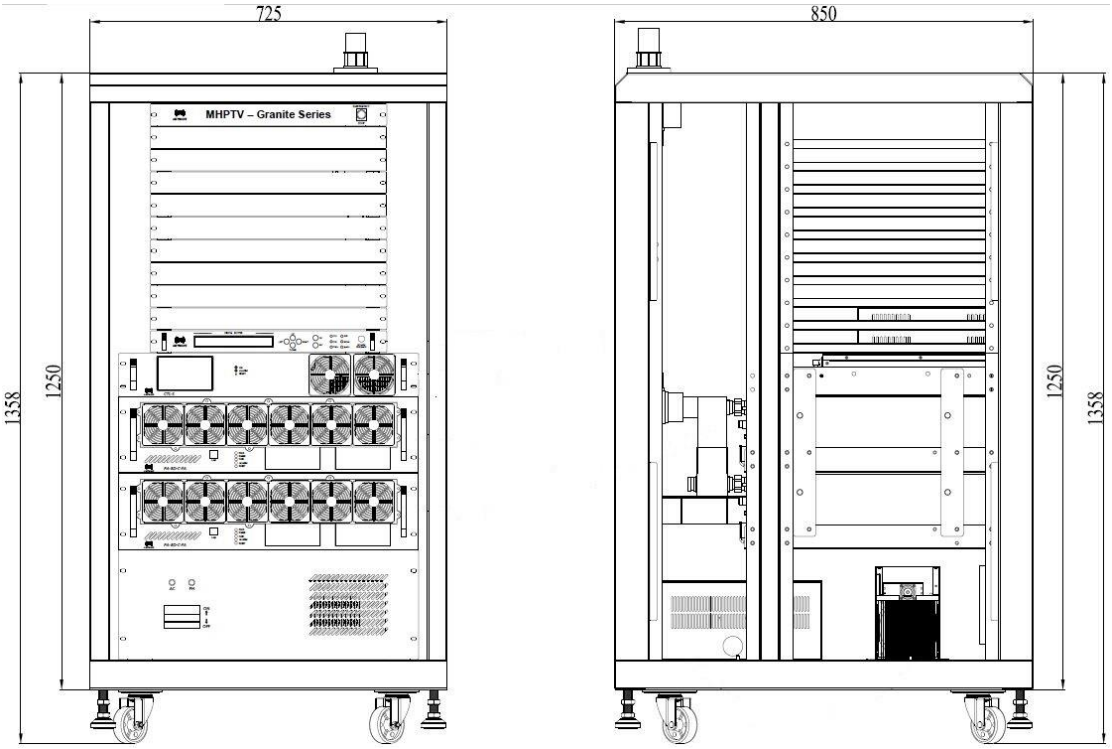
From the rear view of the TX cabinet, several other main components can be seen which include an AC Distribution System, one 2-way Splitter and Combiner, one 2-port Directional Coupler, and one Reject Load.



The diagram below shows the overall system interconnect between the various modules in the 2-PA MHPTV system.

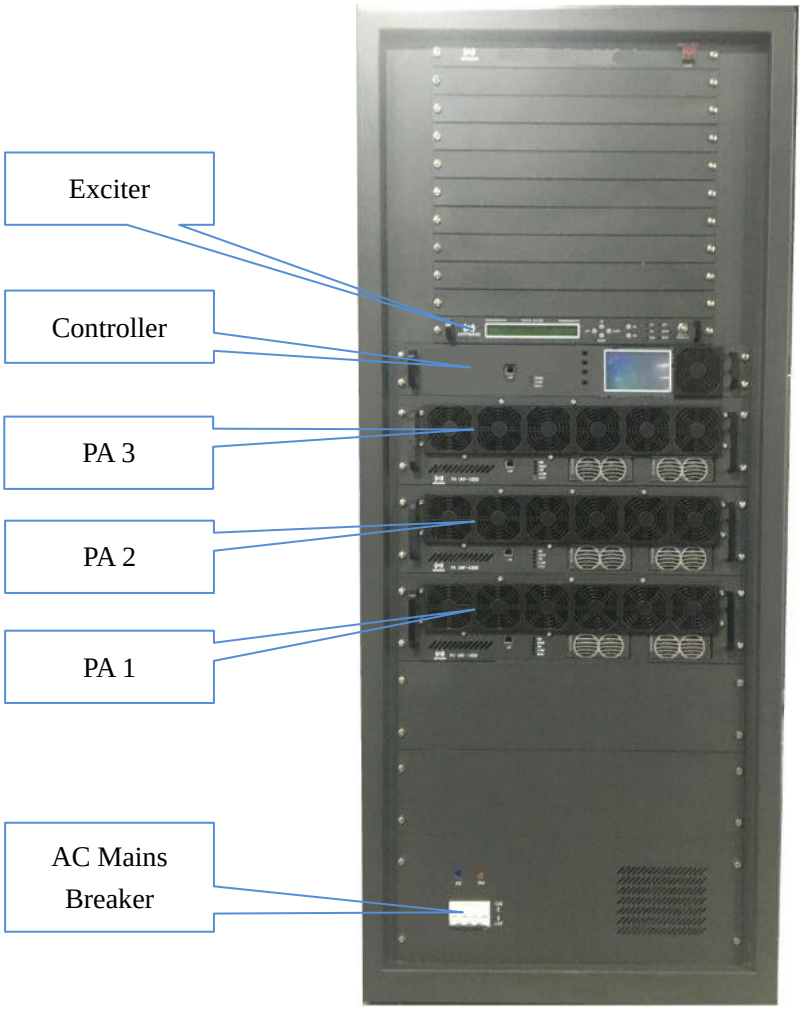


The 2-PA MHPTV system Cabinet dimensions are shown below.

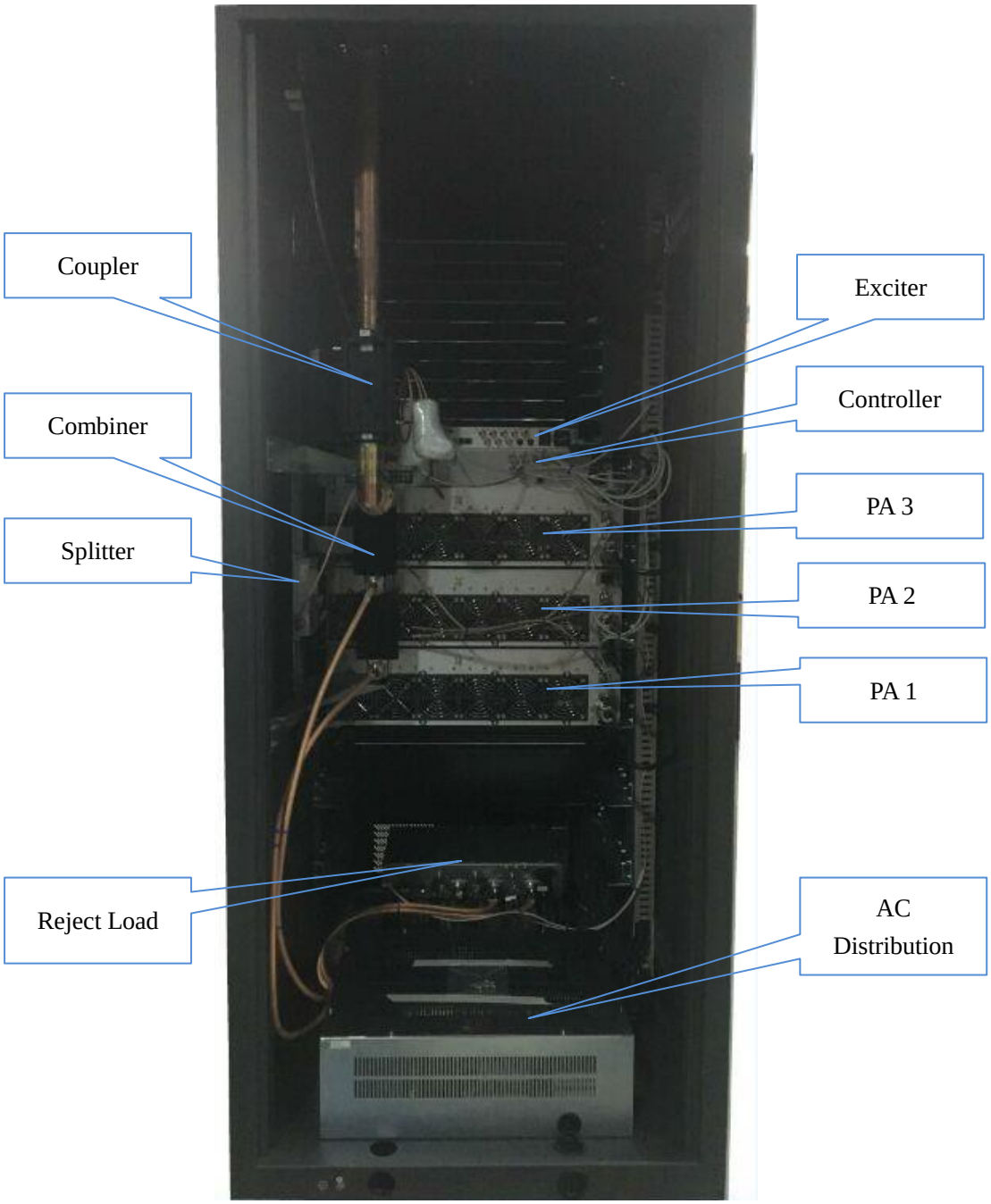


1.2.4 3-PA TX

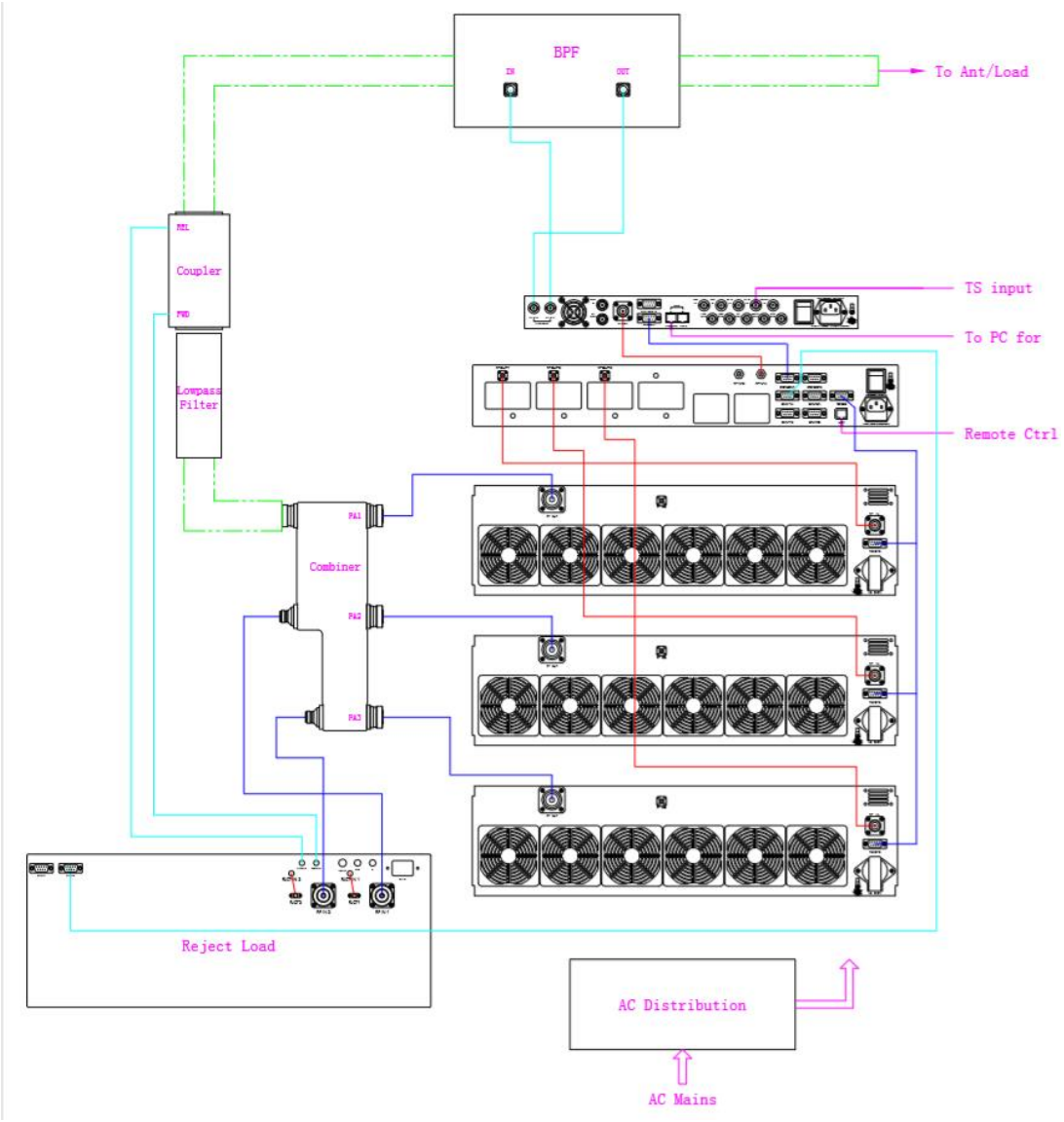
The Anywave 3-PA MHPTV Transmitter comes in single and dual exciter configurations. Photos of a single exciter system are shown below. The main subsystems (as seen from the front) include one or two Exciter(s), one Controller (with a touchscreen LCD, and built-in preamp), three PA-8D-C-FA power amplifiers (8-power transistors per PA), one AC Mains Breaker, one Low Pass Filter–installed external to the cabinet, and a channel mask Band Pass Filter (BPF) – optional –installed on the floor next to the cabinet rack (by default).



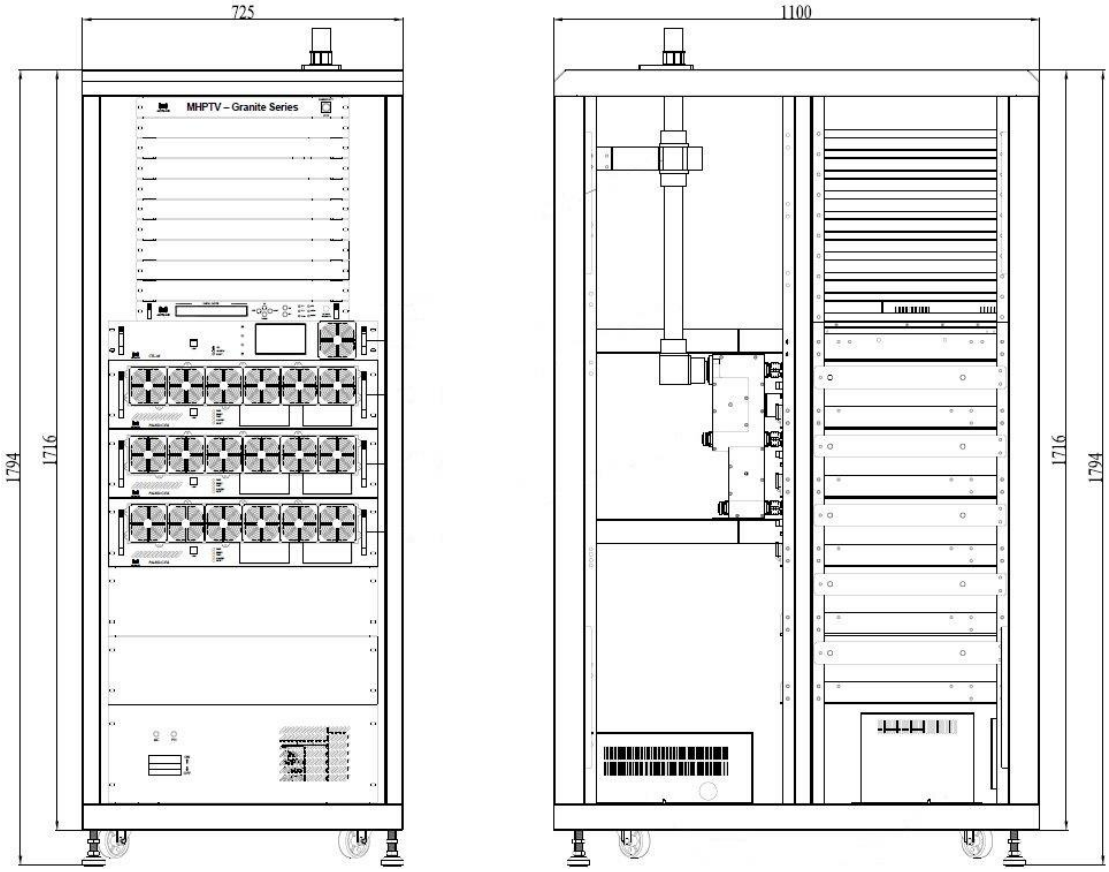
From the rear view of the TX cabinet, several other main components can be seen which include one AC Distribution System, one 3-way Splitter and Combiner, one 2-port Directional coupler, and one Reject Load.



The diagram below shows the overall system interconnect between the various modules in the 3-PA MHPTV system.

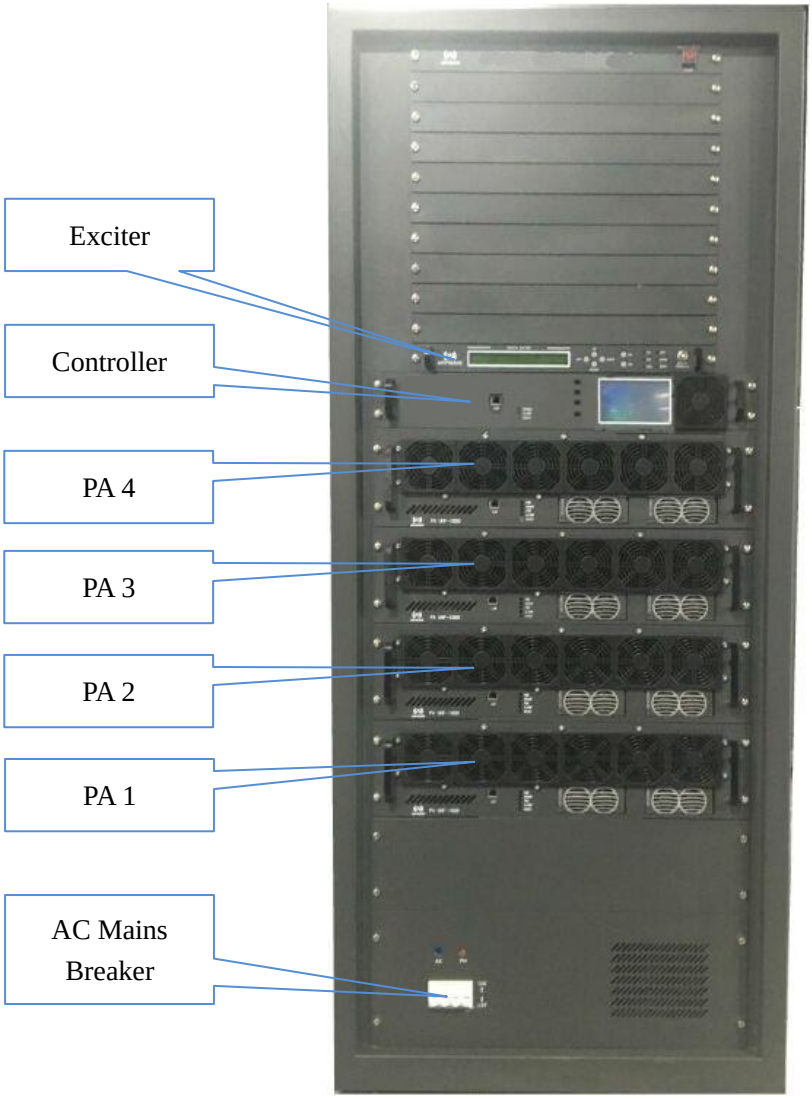


The 3-PA MHPTV system Cabinet dimensions are shown below.

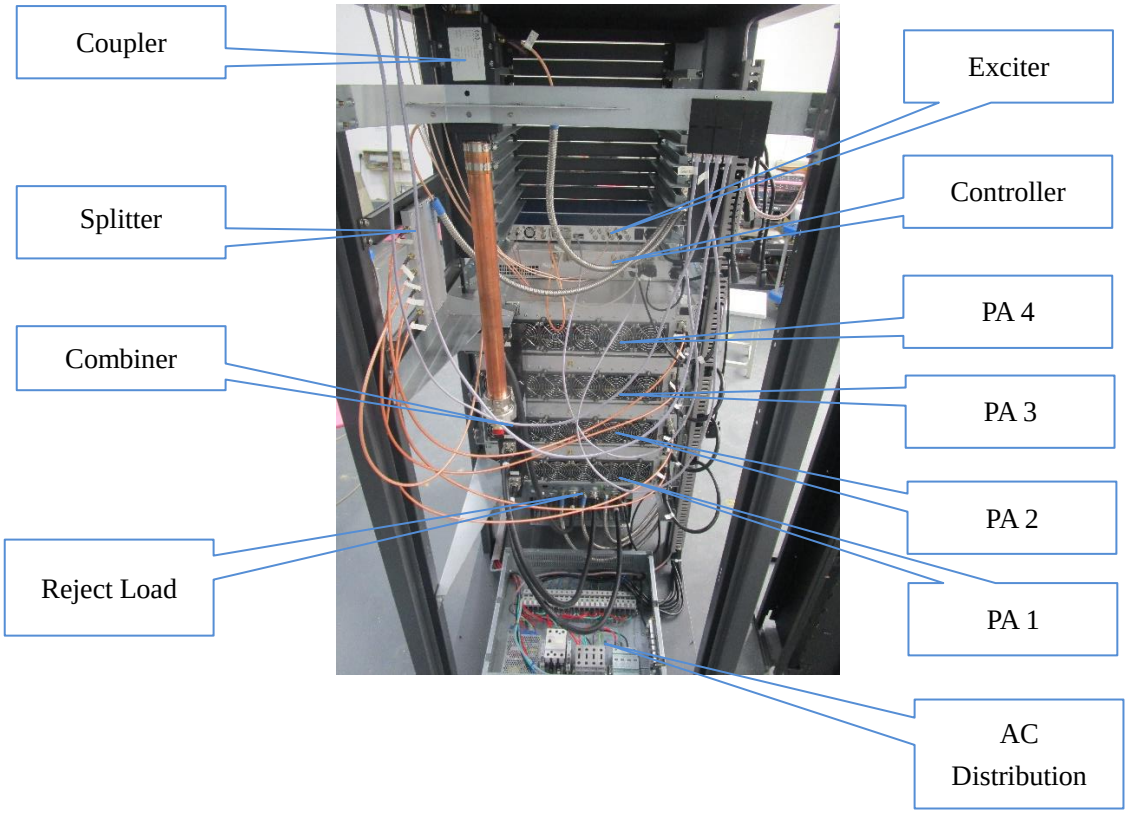


1.2.5 4-PA TX

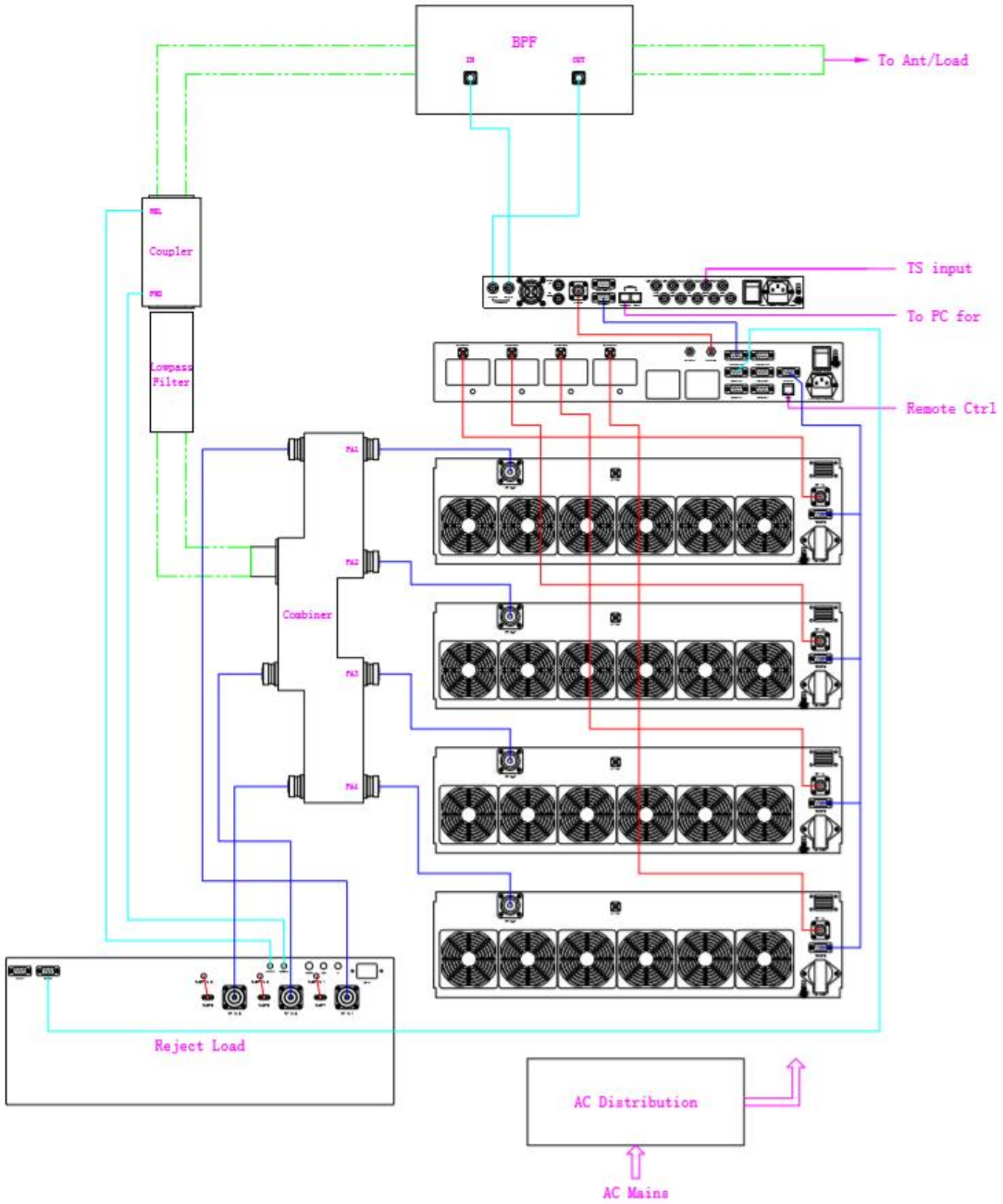
The Anywave 4-PA MHPTV Transmitter comes in single and dual exciter configurations. Photos of a single exciter system are shown below. The main subsystems (as seen from the front) include one or two Exciter(s), one Controller (with a touchscreen LCD, and built-in preamp), four PA-8D-C-FA power amplifiers (8-power transistors per PA), one AC Mains Breaker, one Low Pass Filter –installed external to the cabinet, and one channel mask Band Pass Filter (BPF) – optional –installed on the floor next to the cabinet rack (by default).



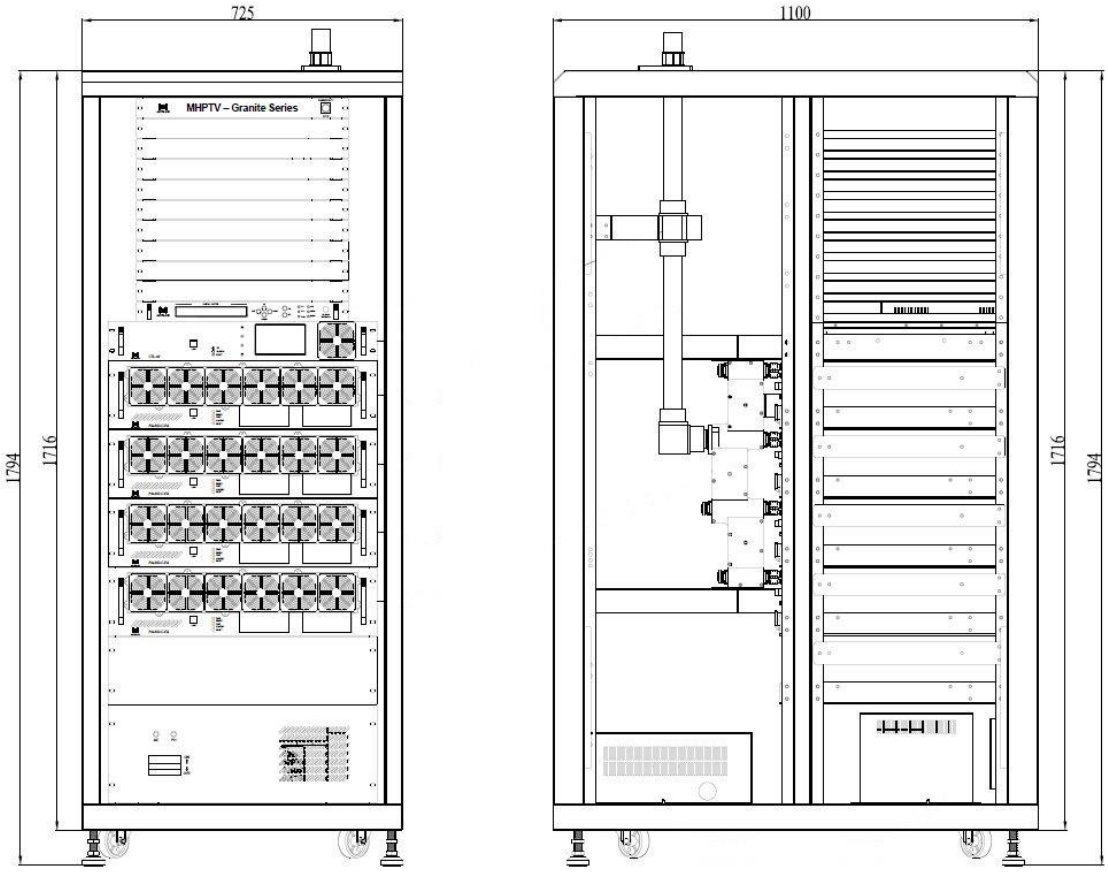
From the rear view of the TX cabinet, several other main components can be seen which include one AC Distribution System, one Combiner, one 2-port Directional coupler, and one Reject Load.



The diagram below shows the overall system interconnect between the various modules in the 4-PA MHPTV system.

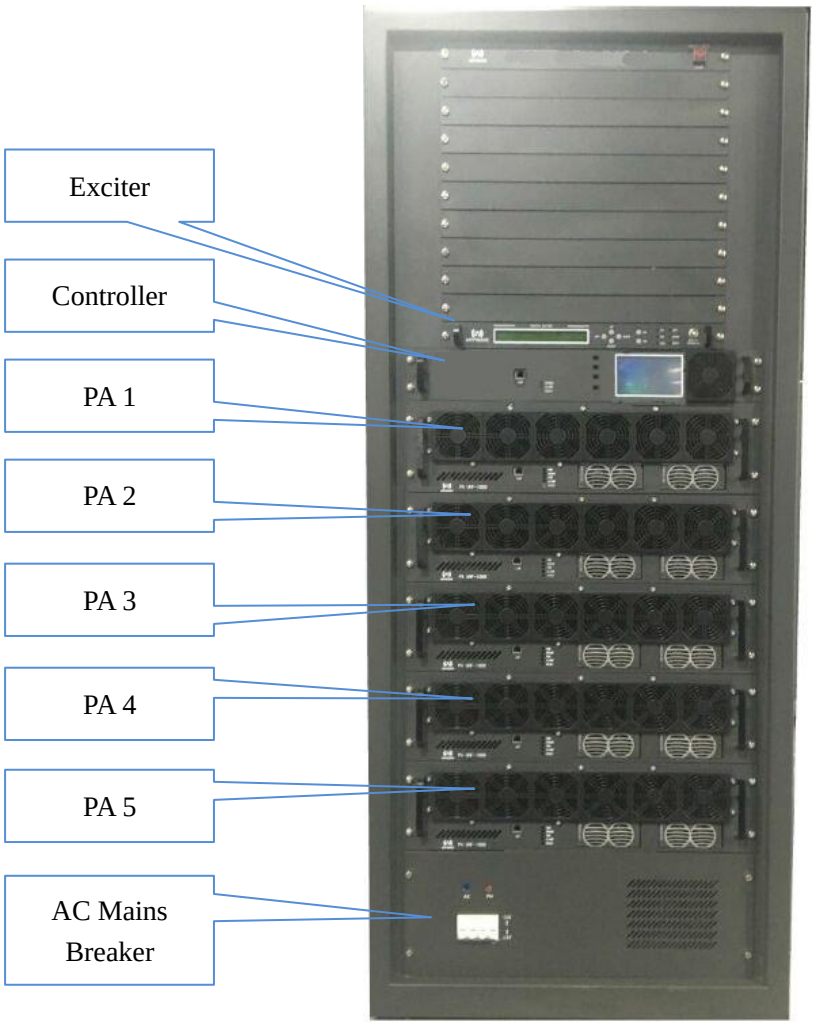


The 4-PA MHPTV system Cabinet dimensions are shown below.

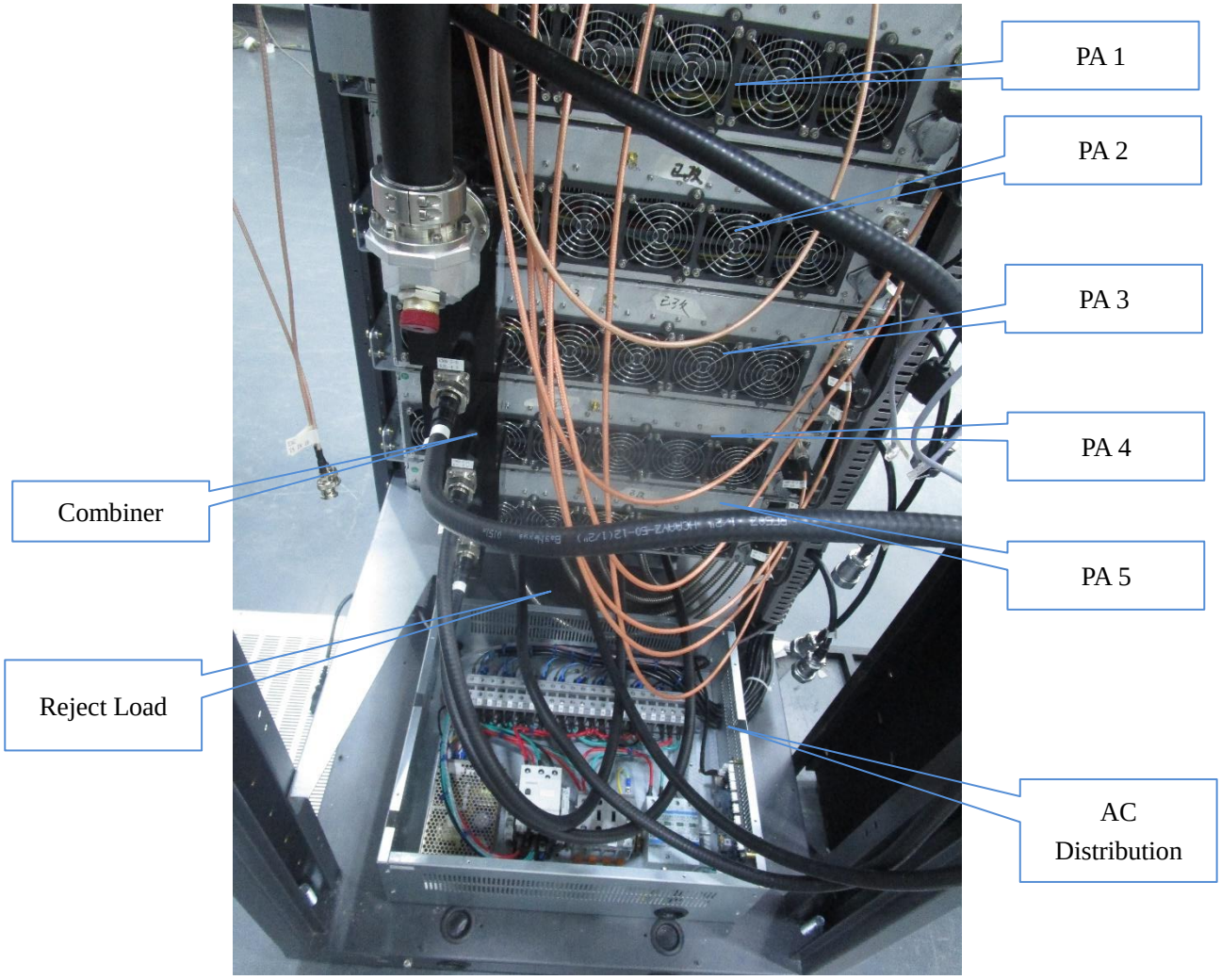


1.2.6 5-PA TX

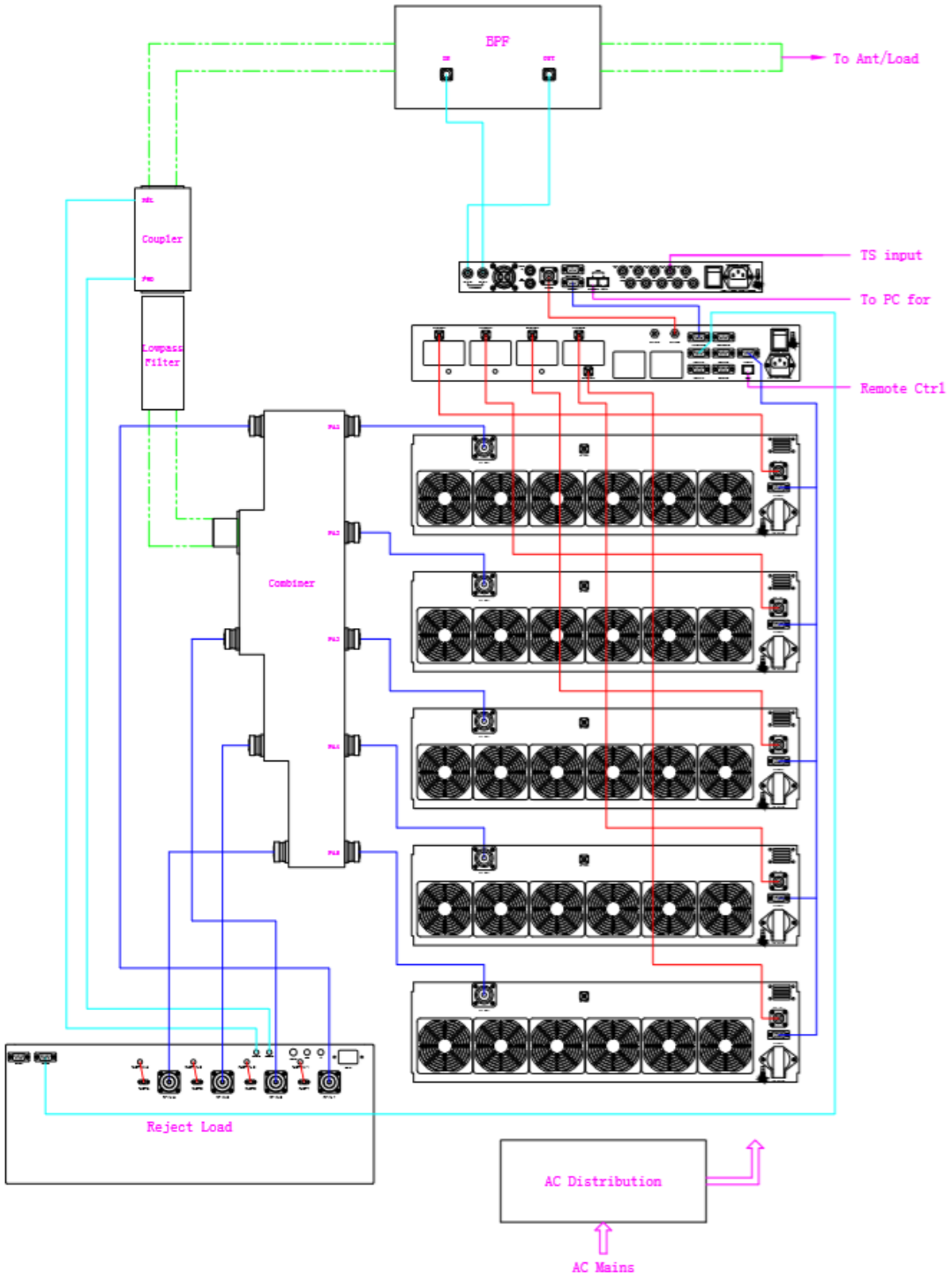
The Anywave 5-PA MHPTV Transmitter comes in single and dual exciter configurations. Photos of a single exciter system are shown below. The main subsystems (as seen from the front) include one or two Exciter(s), one Controller (with a touchscreen LCD, built-in preamp), five PA-8D-C-FA power amplifiers (8-power transistors per PA), one AC Mains Breaker, one Low Pass Filter –installed external to the cabinet, and one channel mask Band Pass Filter (BPF) – optional – installed on the floor next to the cabinet rack (by default).



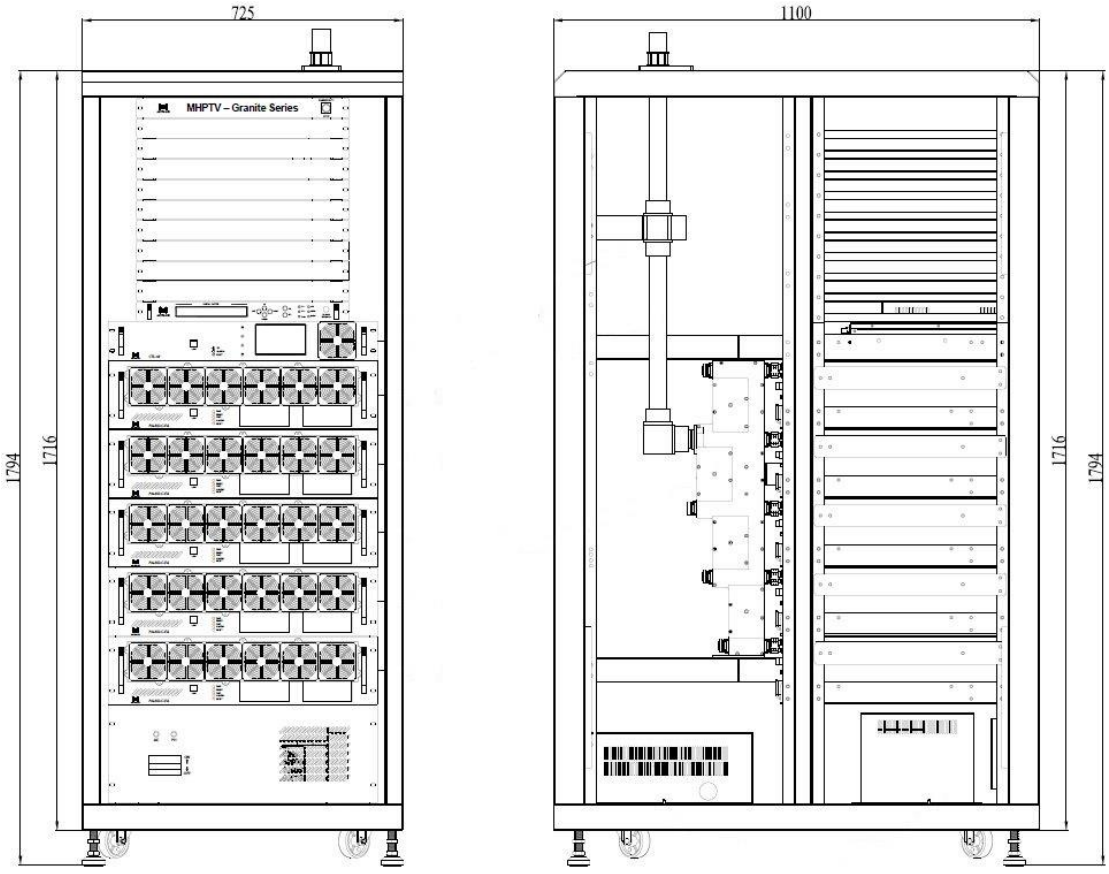
From the rear view of the TX cabinet, several other main components can be seen which include one AC Distribution System, one Combiner, one 2-port Directional coupler, and one Reject Load.



The diagram below shows the overall system interconnect between the various modules in the 5-PA MHPTV system.

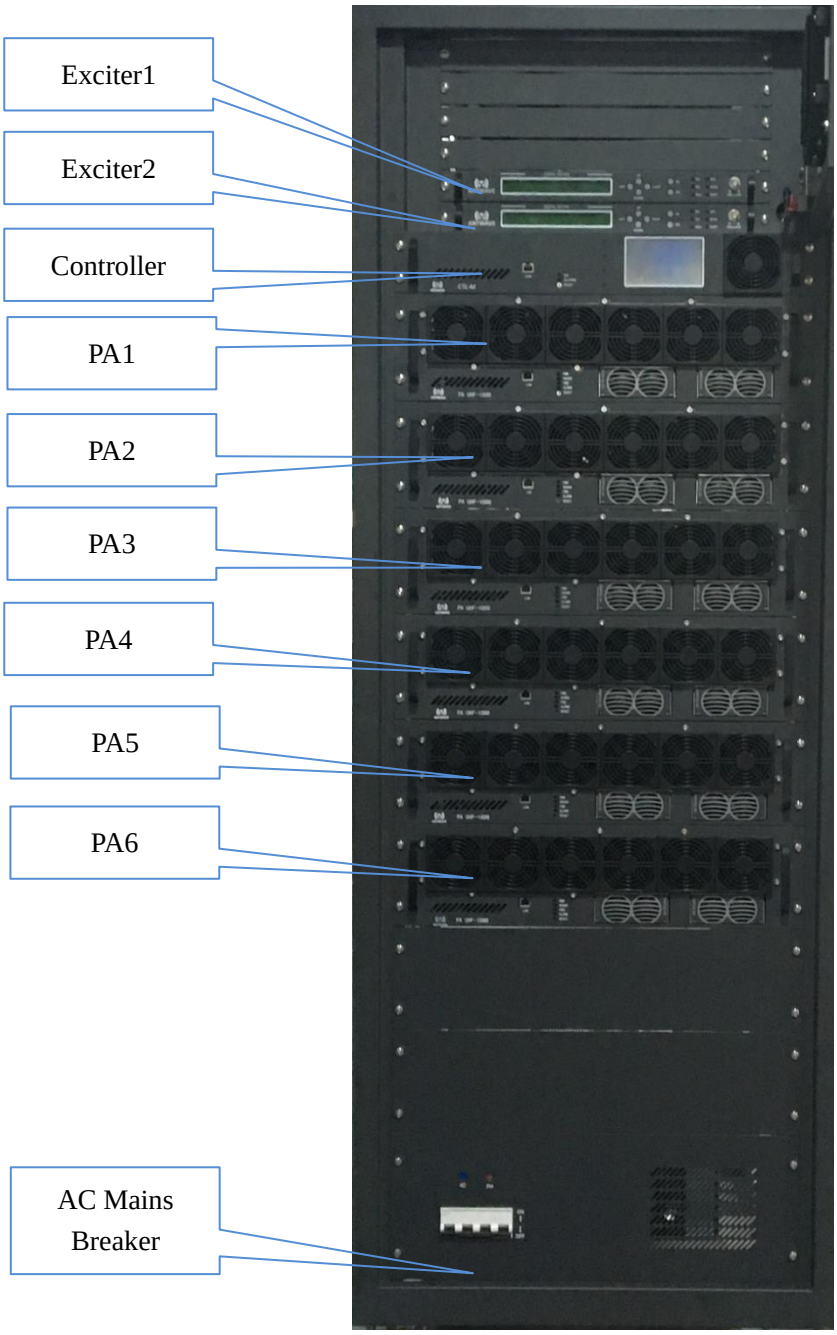


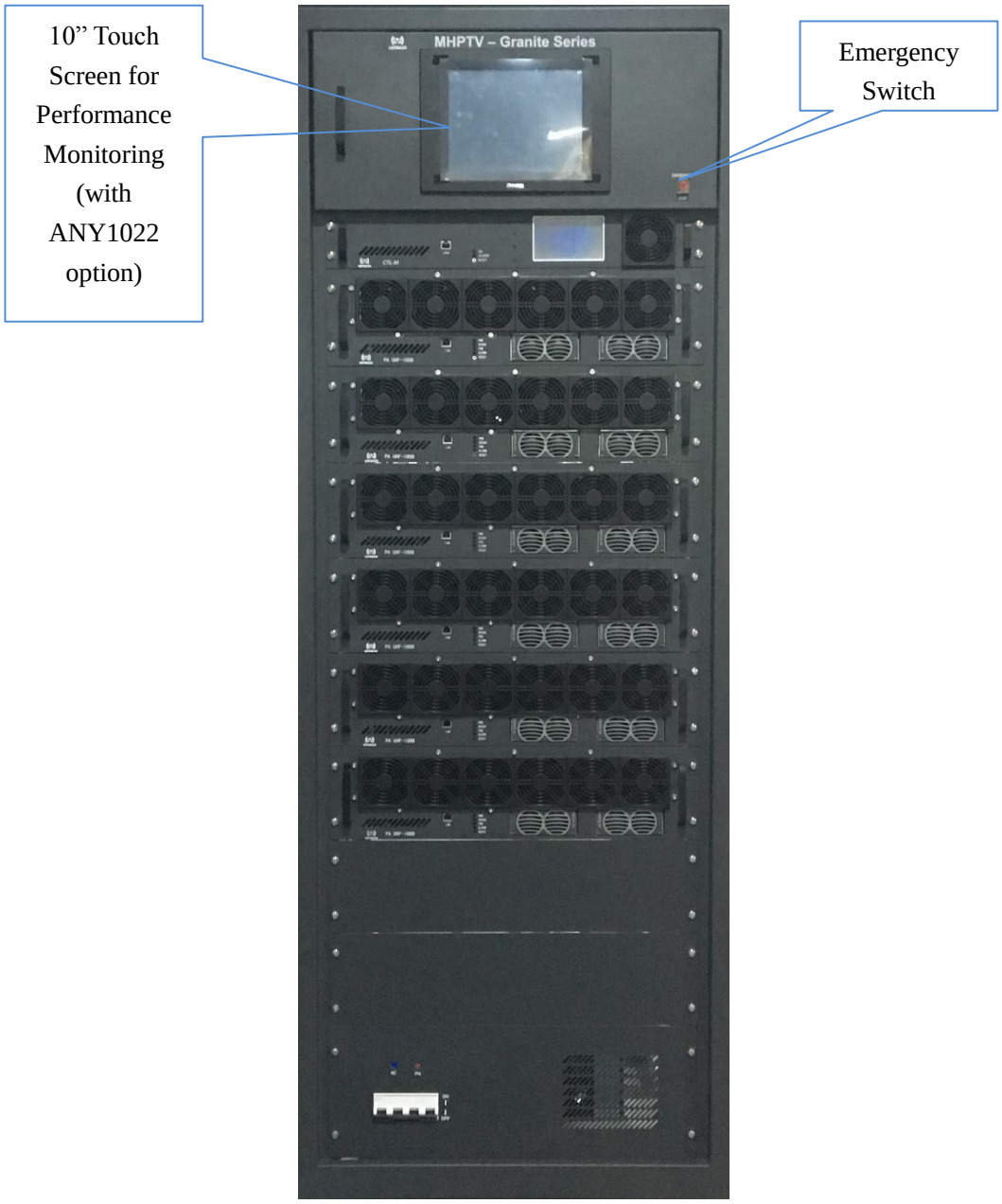
The 5-PA MHPTV system Cabinet dimensions are shown below.



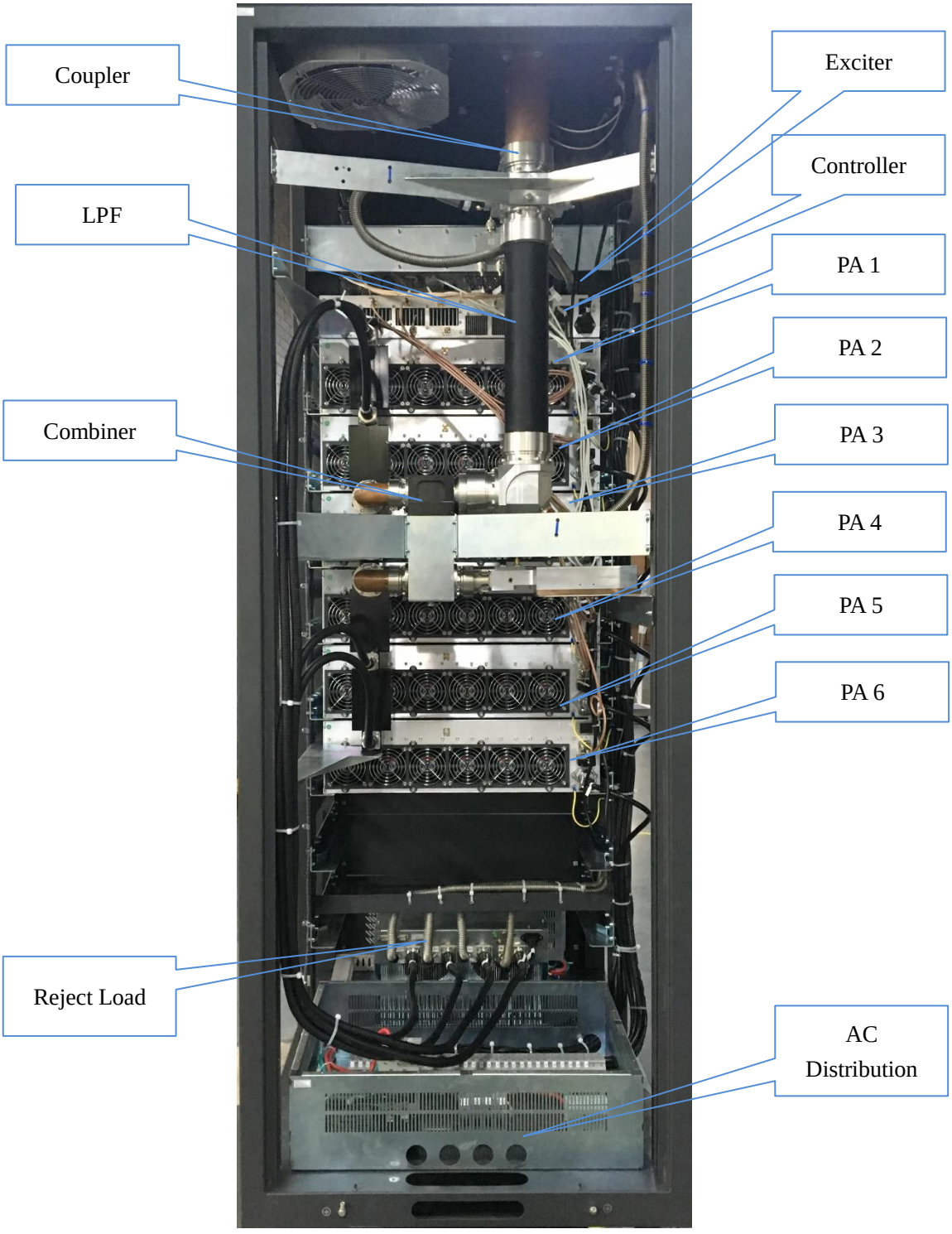
1.2.7 6-PA TX

The Anywave 6-PA MHPTV Transmitter comes in single and dual exciter configurations. Photos of a single exciter system are shown below. The main subsystems (as seen from the front) include one or two Exciter(s), one ANY1022 with 10” touch screen display(option), one Controller (with a touchscreen LCD, built-in preamp), six PA-8D-C-FA power amplifiers (8-power transistors per PA), one AC Mains Breaker, and one channel mask Band Pass Filter (BPF) – optional –installed on the floor next to the cabinet rack (by default).

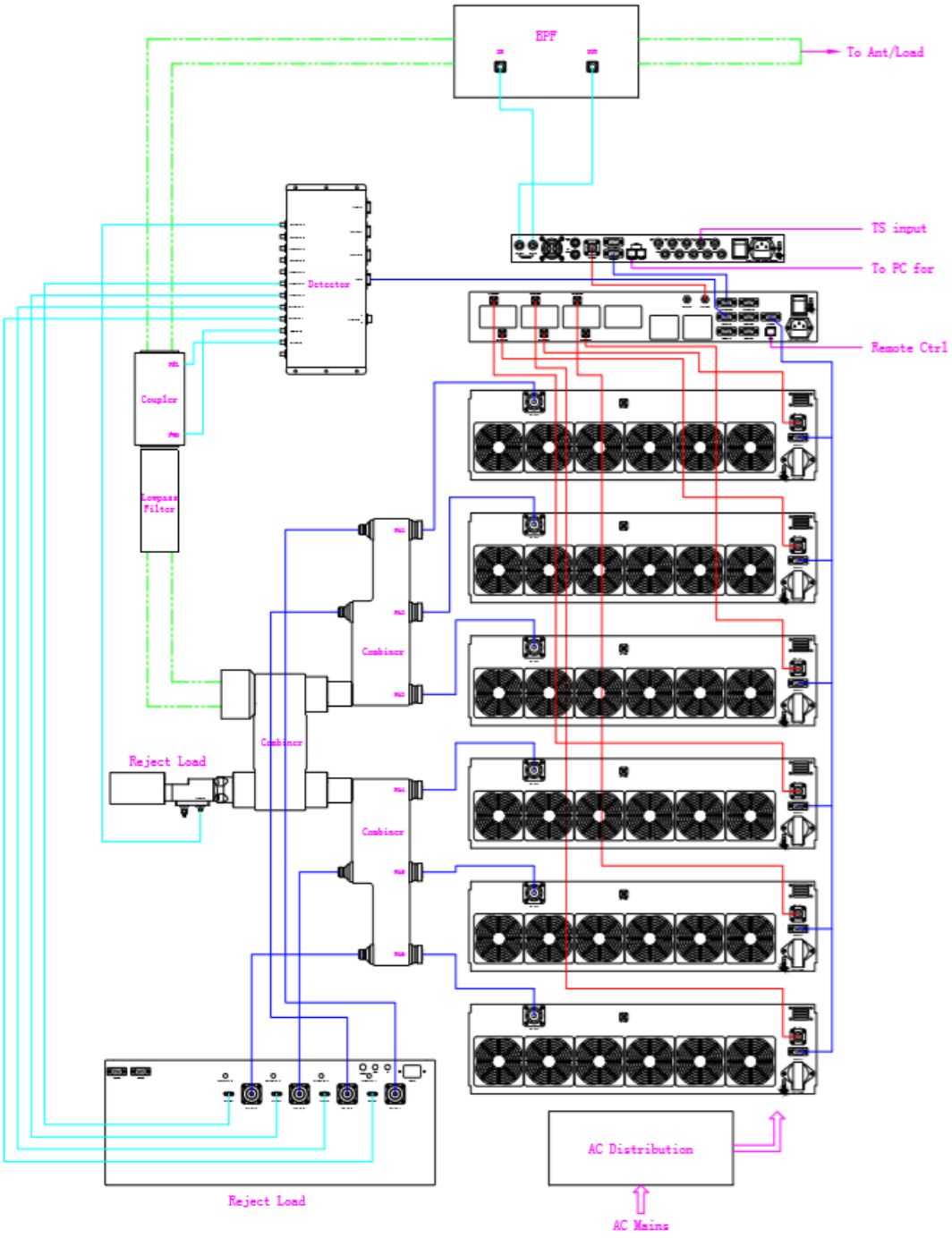



10” Touch Screen for Performance Monitoring (with ANY1022 option)
MHPTV – Granite Series
Emergency Switch

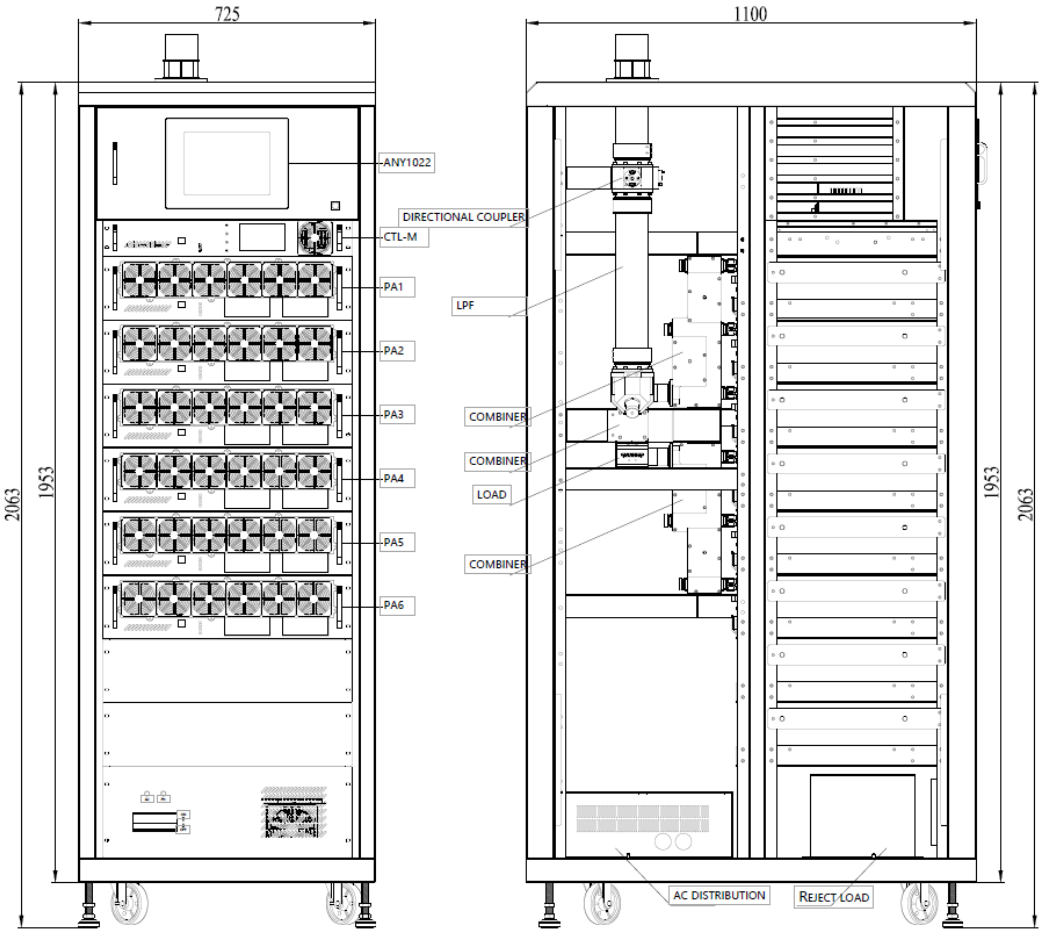
From the rear view of the TX cabinet, several other main components can be seen which include one AC Distribution System, one Combiner, one 2-port Directional coupler, one Low Pass Filter, and one Reject Load.



The diagram below shows the overall system interconnect between the various modules in the 6-PA MHPTV system.

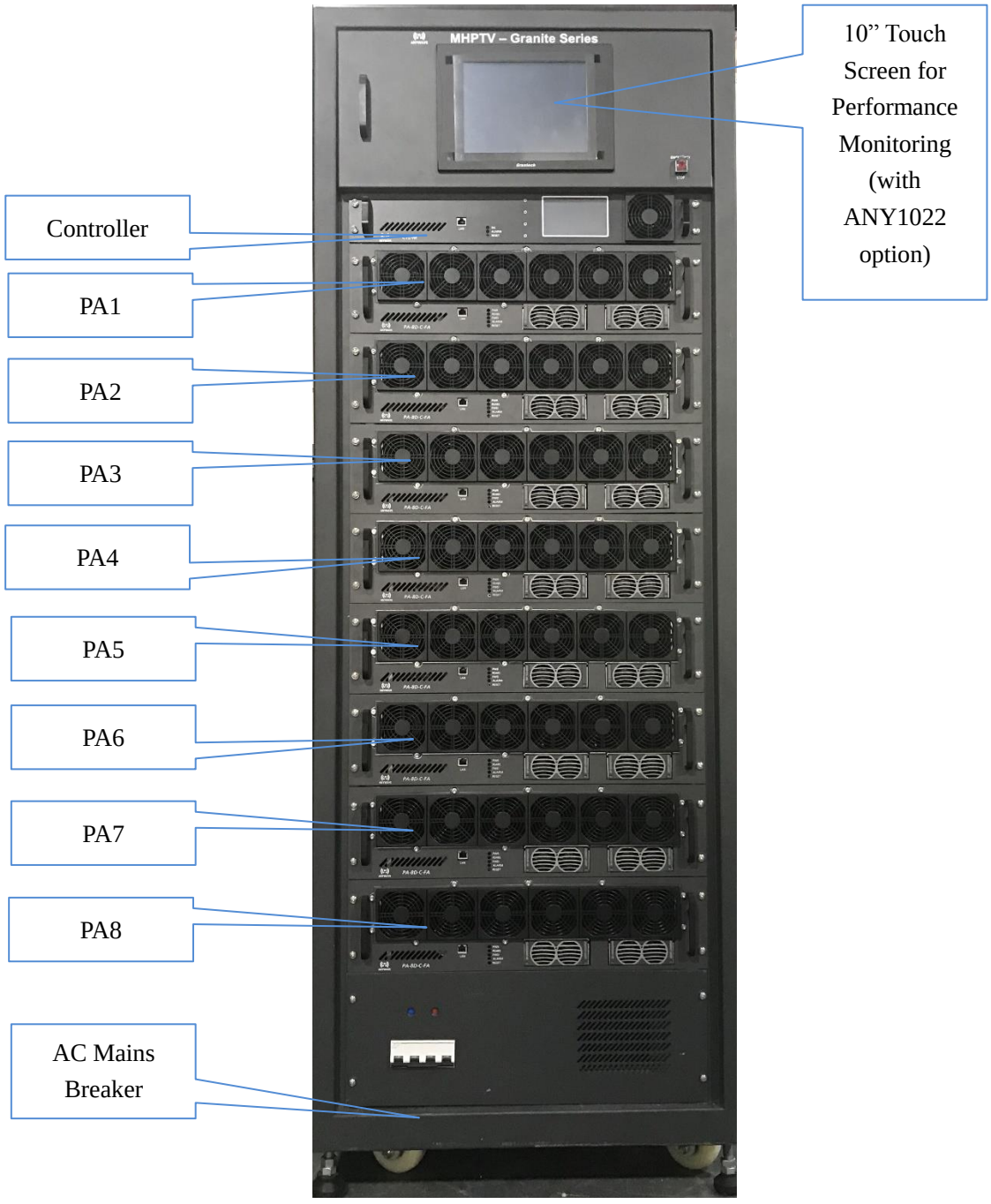


The 6-PA MHPTV system Cabinet dimensions are shown below.

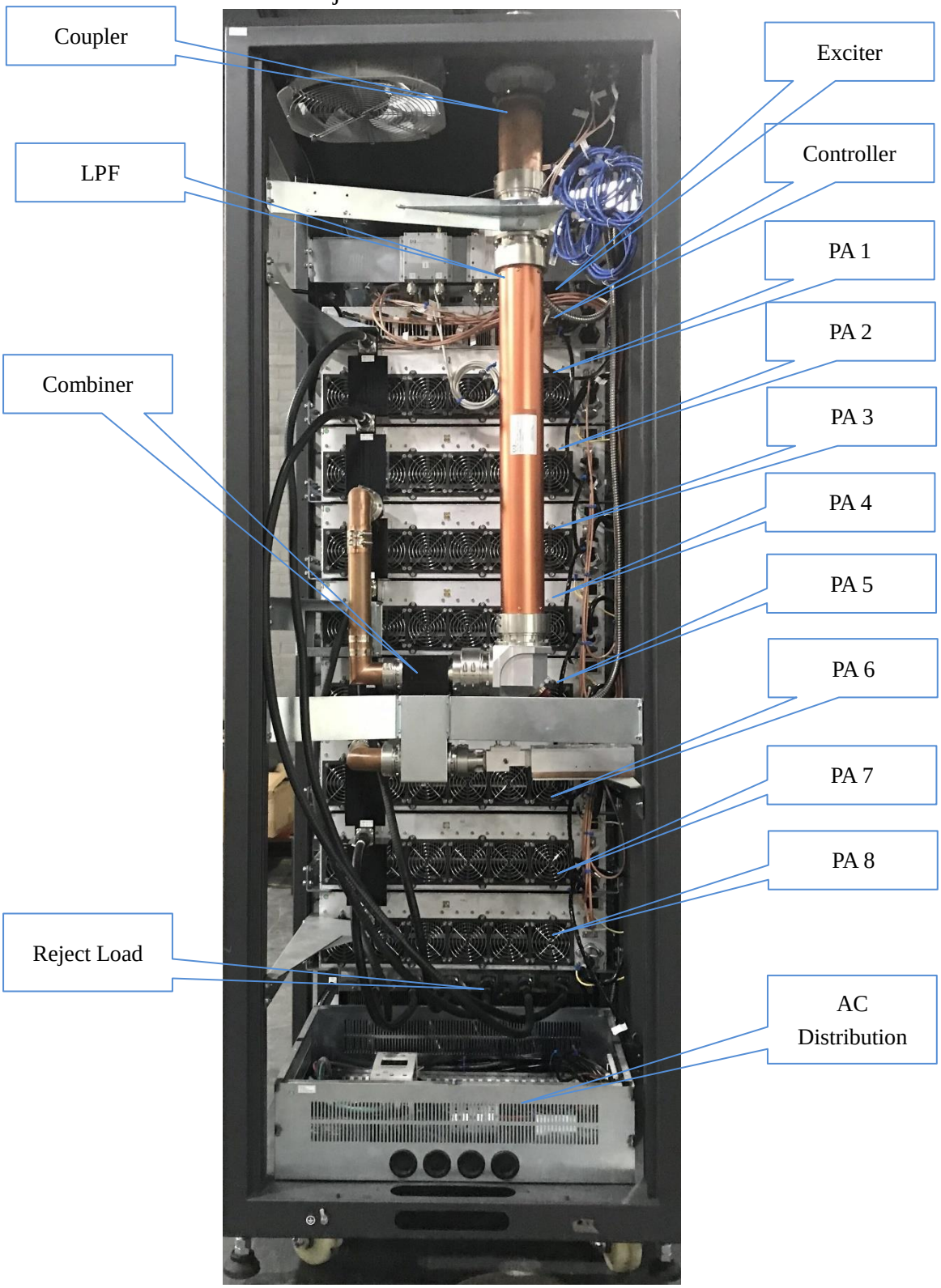


1.2.8 8-PA TX

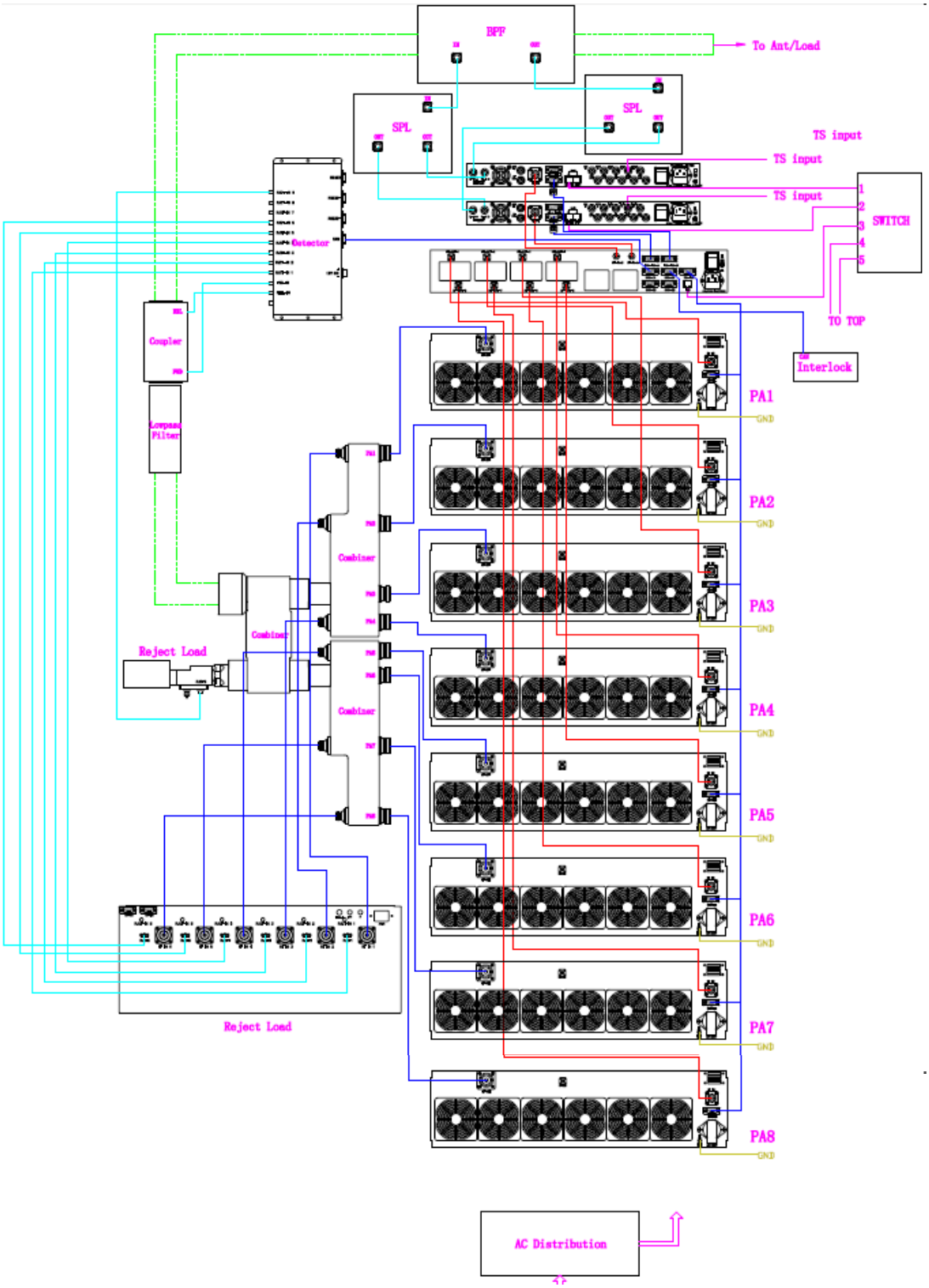
The Anywave 8-PA MHPTV Transmitter comes in single and dual exciter configurations. Photos of a single exciter system are shown below. The main subsystems (as seen from the front) include one or two Exciter(s), one ANY1022 with 10” touch screen display(option), one Controller (with a touchscreen LCD, built-in preamp), eight PA-8D-C-FA power amplifiers (8-power transistors per PA), one AC Mains Breaker, and one channel mask Band Pass Filter (BPF) – optional –installed on the floor next to the cabinet rack (by default).



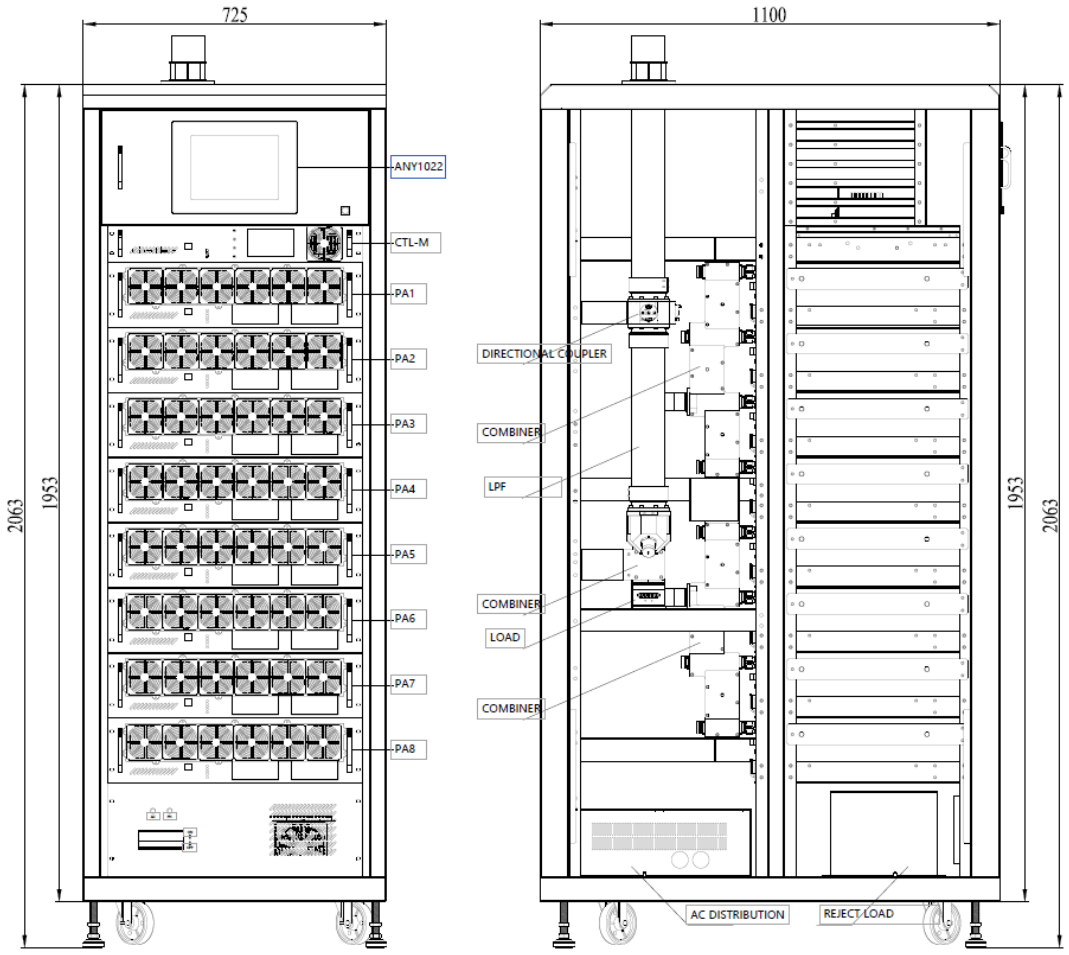
From the rear view of the TX cabinet, several other main components can be seen which include one AC Distribution System, Combiners, one 2-port Directional coupler, one Low Pass Filter and one Reject Load.



The diagram below shows the overall system interconnect between the various modules in the 8-PA MHPTV system.



The 8-PA MHPTV system Cabinet dimensions are shown below.



1.3 TX Specifications

- RF Output
  - Connector: 1 5/8” (1, 2, 3, 4 or 5 PA), 3 1/8” (6 or 8 PA), 50 Ω
  - Frequency: 470~610 MHz, in steps of 1 Hz
  - Rated Power (after BPF): 1.1, 2.2, 3.3, 4.4, 5.5, 6.6, 8.8 kW (rms) (ATSC)
  - Level Stability: < ±0.2 dB
  - MER: > 35 dB
  - Amplitude Flatness: < ±0.5 dB
  - Shoulder Level: < - 50 dB (after correction)
  - Return Loss: > 16 dB
- Environment
  - Operation Temperature: 0 ℃~ +40 ℃
  - Operation Humidity: < 95 % (non-condensing)
  - Atmospheric Pressure: 86 kPa ~ 106 kPa
- Power Supply
  - Voltage: 240 VAC 1-phase, 208VAC 3-phase
  - Frequency: 50/60 Hz

Note

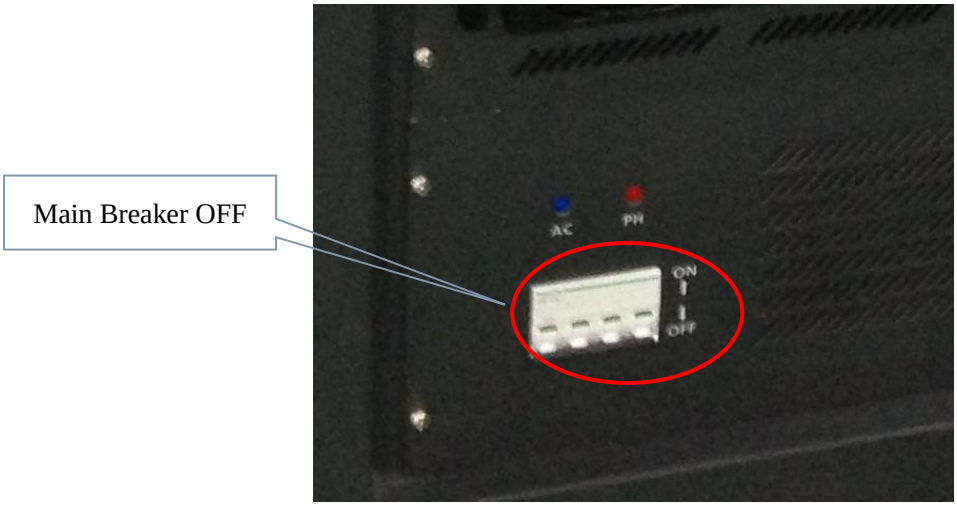
1. The electrical interface characteristics are measured under normal conditions. Values may vary.
2. Operating in abnormal conditions may result in damage to the equipment. Long operating hours in severe environments may reduce the reliability of the entire system, which may cause permanent damage to equipment. Make sure all electrical interface characteristics and environmental parameters are within the defined range listed above before operating this equipment.

1.4 AC Power Requirements

Please review the safety WARNINGS on page 4 of this manual before proceeding with any electrical work.

A licensed Electrician is required to properly and safely connect the AC mains power cable from your station's electrical panel to the terminal block located inside the TX AC Mains Distribution compartment in compliance with local electrical and building codes. Please note: a power cable is not provided with the Transmitter system and should be obtained via your local Electrician.

Be sure the Main Breaker on the lower left front of the TX is turned OFF before performing any electrical work on the TX (as shown below).



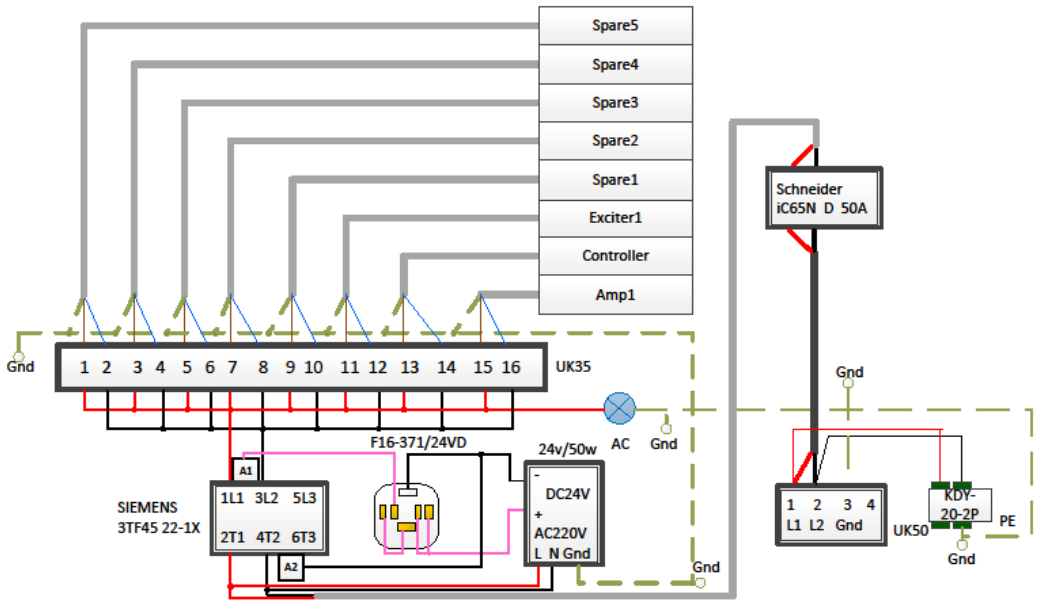
The MHPTV TX AC distribution compartment may be wired for 240VAC single-phase (3-wire, L1, L2, GND) or 208VAC three-phase (4-wire, L1, L2, L3, GND) power to be sourced from a proper breaker sized according to the charts below. Also, please note the recommended cable gauge to make the connection between the TX AC Mains Distribution terminal block and the circuit breaker installed in the facility electrical panel. Please note: this cable is not provided with your Transmitter equipment and should be obtained from your local Electrician.

Important: The transmitter cabinet MUST be properly bonded to the building lightning protective ground and have a good RF ground. This is typically done with a 2” to 4” copper strap that is connected to the cabinet ground, found at the bottom rear of the TX cabinet, making sure all equipment inside the rack is tied to this ground. Any damage caused by not having proper grounding may void your warranty.

MHPTV – (Granite) Doherty AC Power Requirements

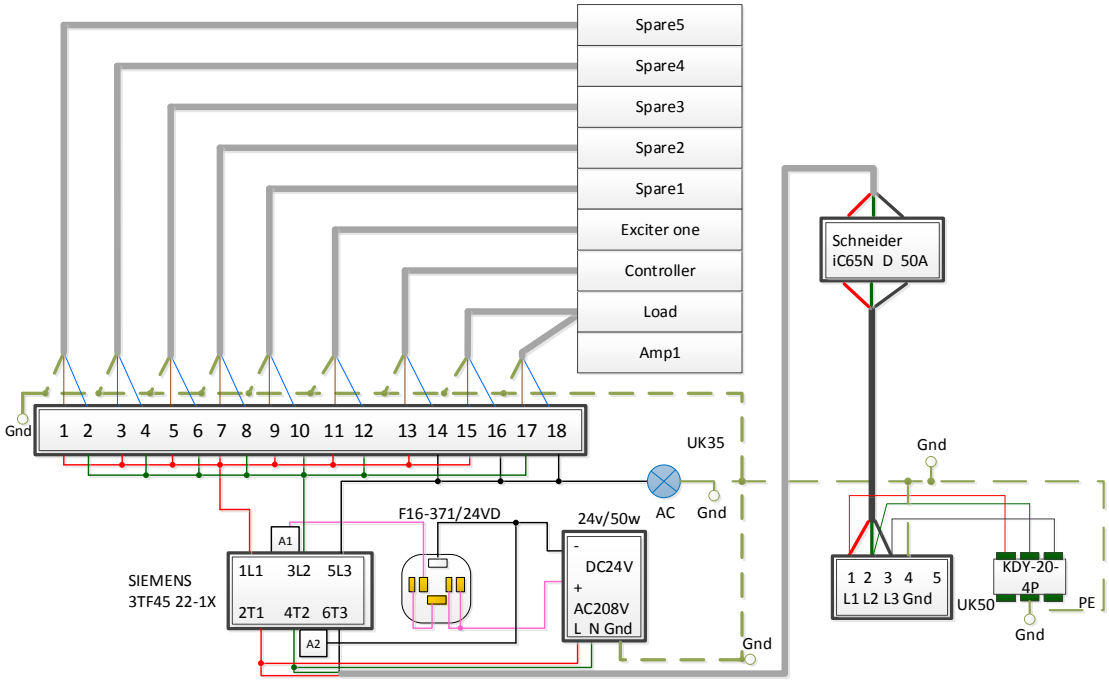
MHPTV- (Granite) Doherty (888E) -AC Power Requirements, Dimensions, and Weights			
After BPF(W)	**240VAC** **Single-phase (L1, L2, GND)**	**208VAC** **Three-phase (L1, L2, L3, GND)** **Delta**	**Net Weight (lbs.)** **Dimensions (mm)**
1100(ATSC), 1PA	3110W consumption	3110W consumption	Weight: 400 lbs.
	20A, 2pole breaker, gauge 12 wire	15A, 3pole breaker, gauge 14 wire	1358H x 850D x 725W (mm)
	13.0A/phase-current draw	8.7A/phase-current draw	
2200(ATSC), 2PA	6220W consumption	6220W consumption	Weight: 520 lbs.
	40A, 2pole breaker, gauge 8 wire	30A, 3pole breaker, gauge 10 wire	1358H x 850D x 725W (mm)
	25.9A/phase-current draw	17.3A/phase-current draw	
3300(ATSC), 3PA	9330W consumption	9330W consumption	Weight: 700 lbs.
	50A, 2pole breaker, gauge 6 wire	40A, 3pole breaker, gauge 8 wire	1794H x 1100D x 725W (mm)
	38.9A/phase-current draw	26.0A/phase-current draw	
4400(ATSC), 4PA	N/A	12440W consumption	Weight: 810 lbs.
	N/A	50A, 3pole breaker, gauge 6 wire	1794H x 1100D x 725W (mm)
	N/A	34.6A/phase-current draw	
5500(ATSC), 5PA	N/A	15560W consumption	Weight: 920 lbs.
	N/A	60A, 3pole breaker, gauge 6 wire	1794H x 1100D x 725W (mm)
	N/A	43.2A/phase-current draw	
6600(ATSC), 6PA	N/A	18670W consumption	Weight: 1060 lbs.
	N/A	70A, 3pole breaker, gauge 4 wire	2063H x 1100D x 725W (mm)
	N/A	51.9A/phase-current draw	
8800(ATSC), 8PA	N/A	24890W consumption	Weight: 1280 lbs.
	N/A	100A, 3pole breaker, gauge 2 wire	2063H x 1100D x 725W (mm)
	N/A	69.2A/phase-current draw	

1-PA 240VAC, Single-Phase AC Distribution Wiring



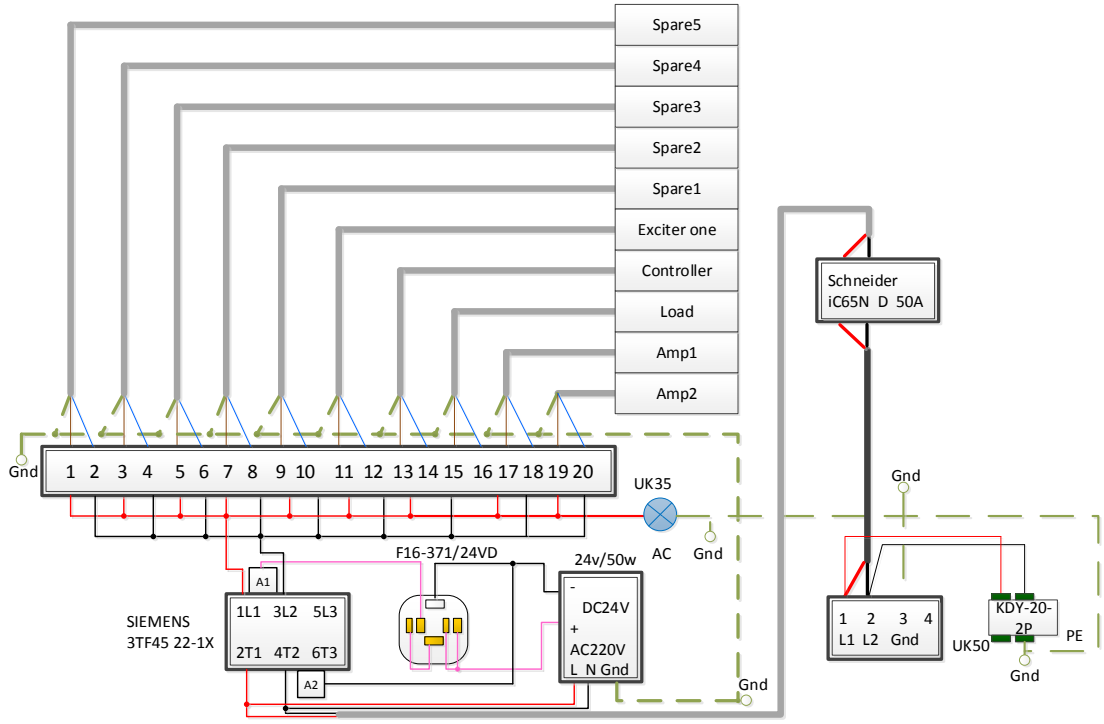
Properly connect the three wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other two connections as L1 and L2.

1-PA 208VAC, Three-Phase AC Distribution Wiring



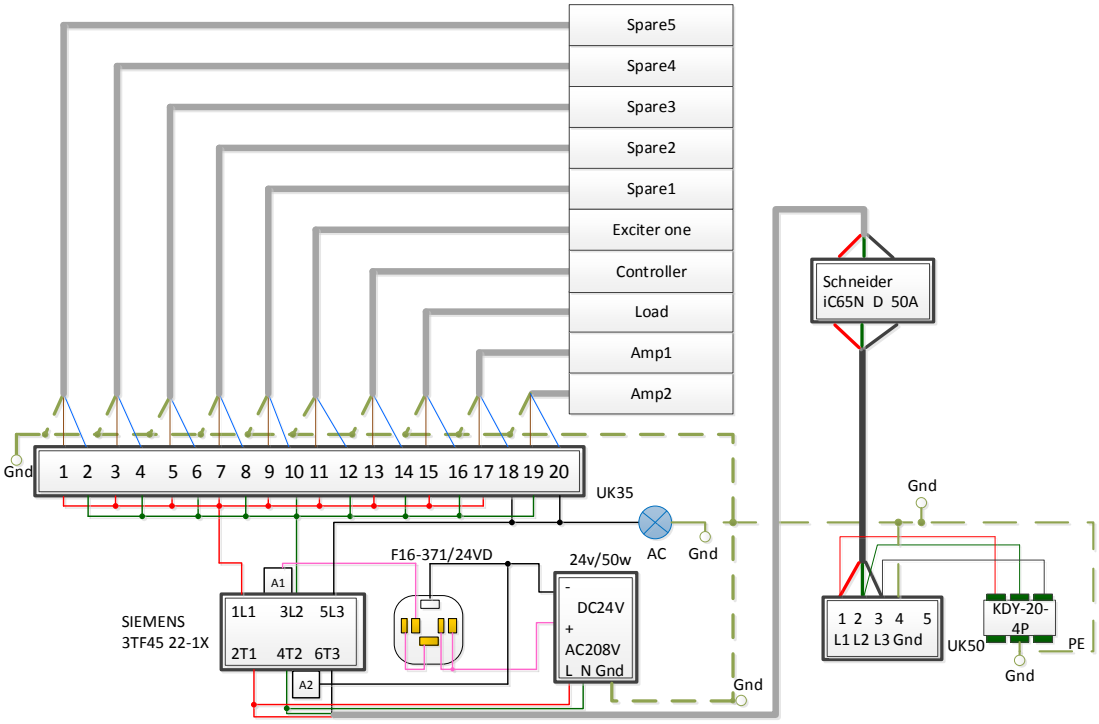
Properly connect the four wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other three connections as L1, L2, and L3.

2-PA 240VAC, Single-Phase AC Distribution Wiring



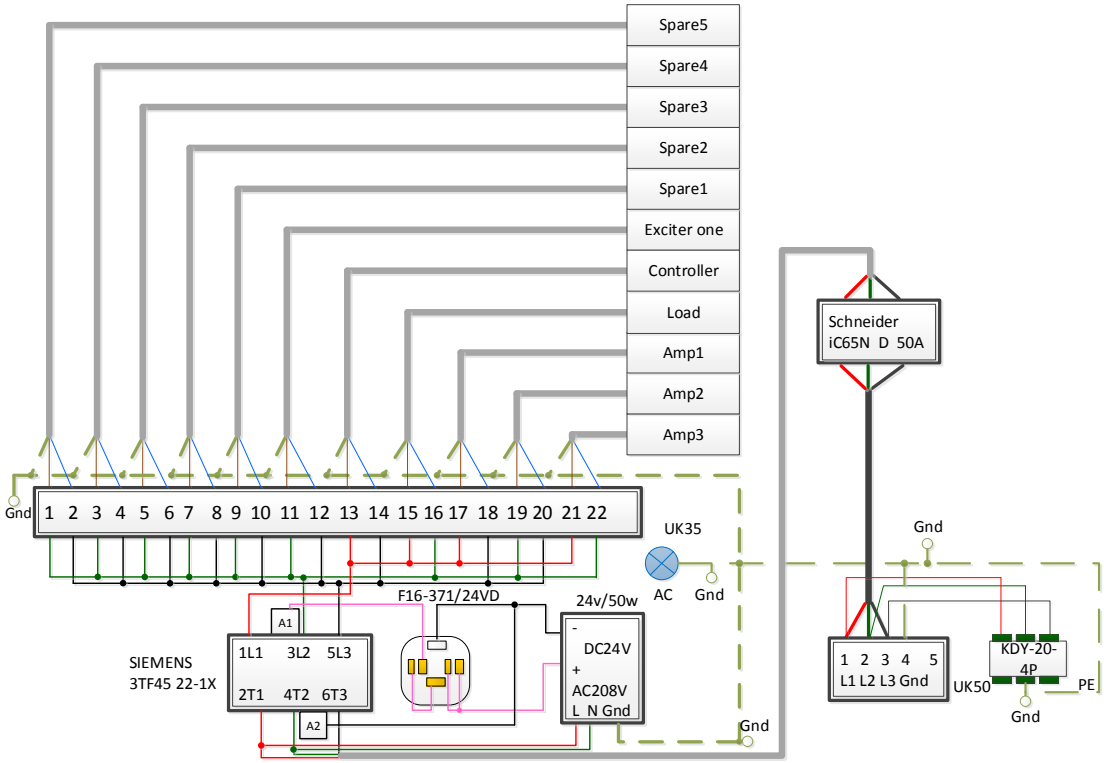
Properly connect the three wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other two connections as L1 and L2.

2-PA 208VAC, Three-Phase AC Distribution Wiring



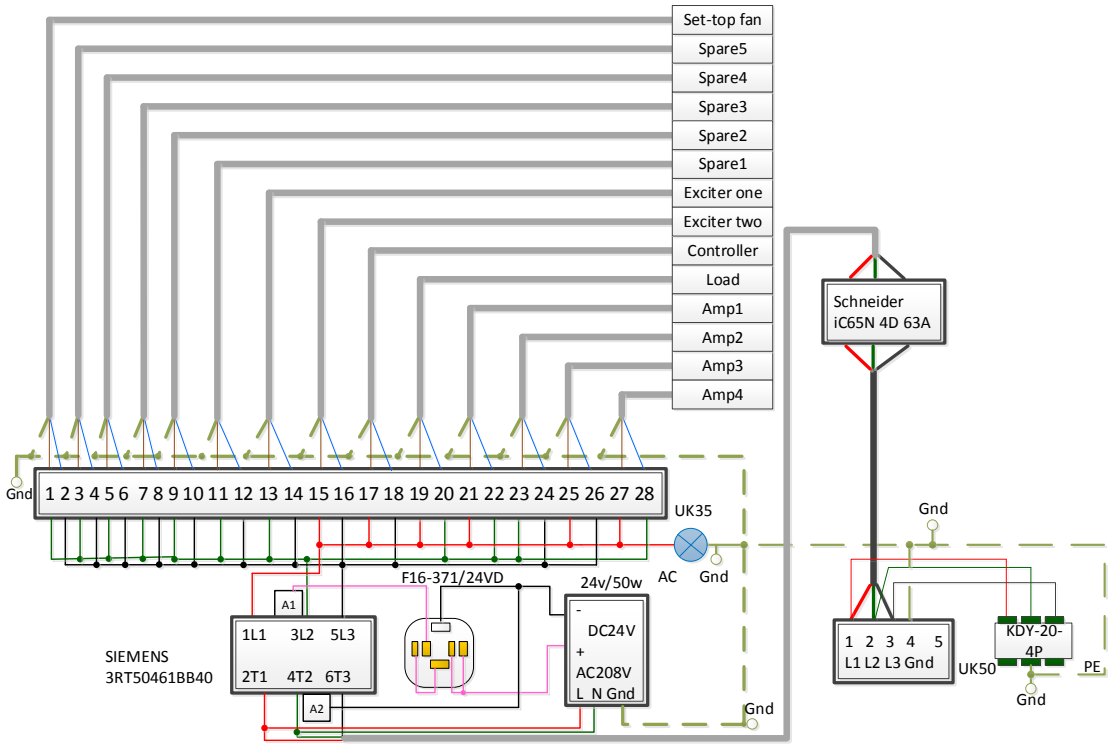
Properly connect the four wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other three connections as L1, L2, and L3.

3-PA 208VAC, Three-Phase AC Distribution Wiring



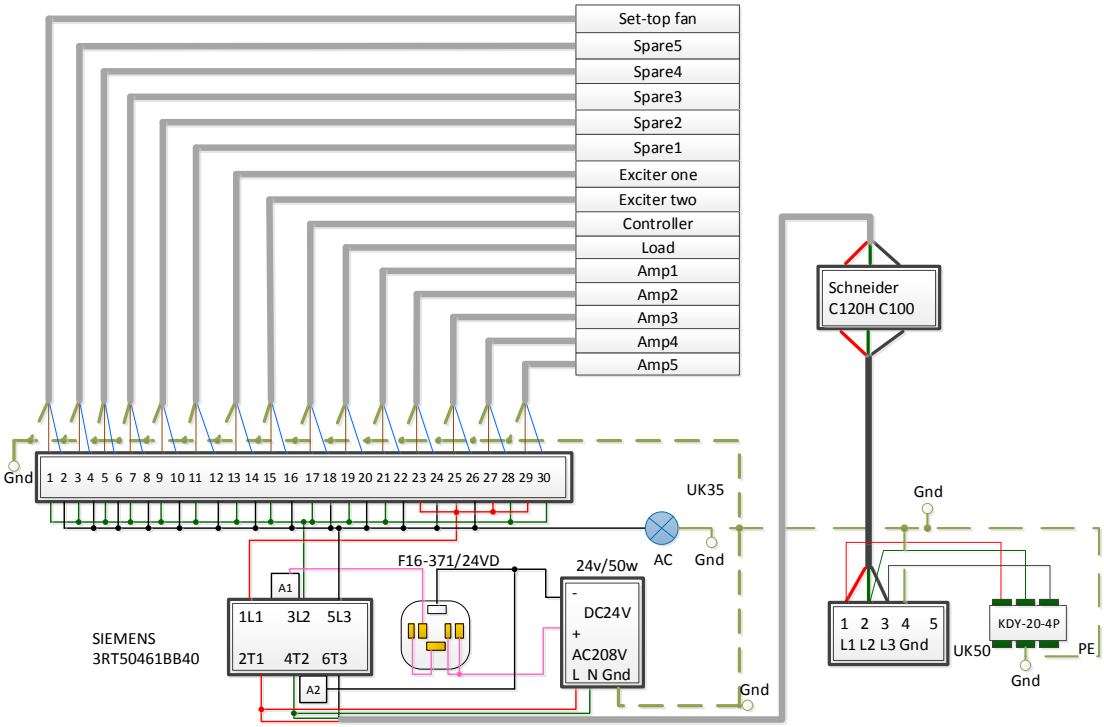
Properly connect the four wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other three connections as L1, L2, and L3.

4-PA 208VAC, Three-Phase AC Distribution Wiring



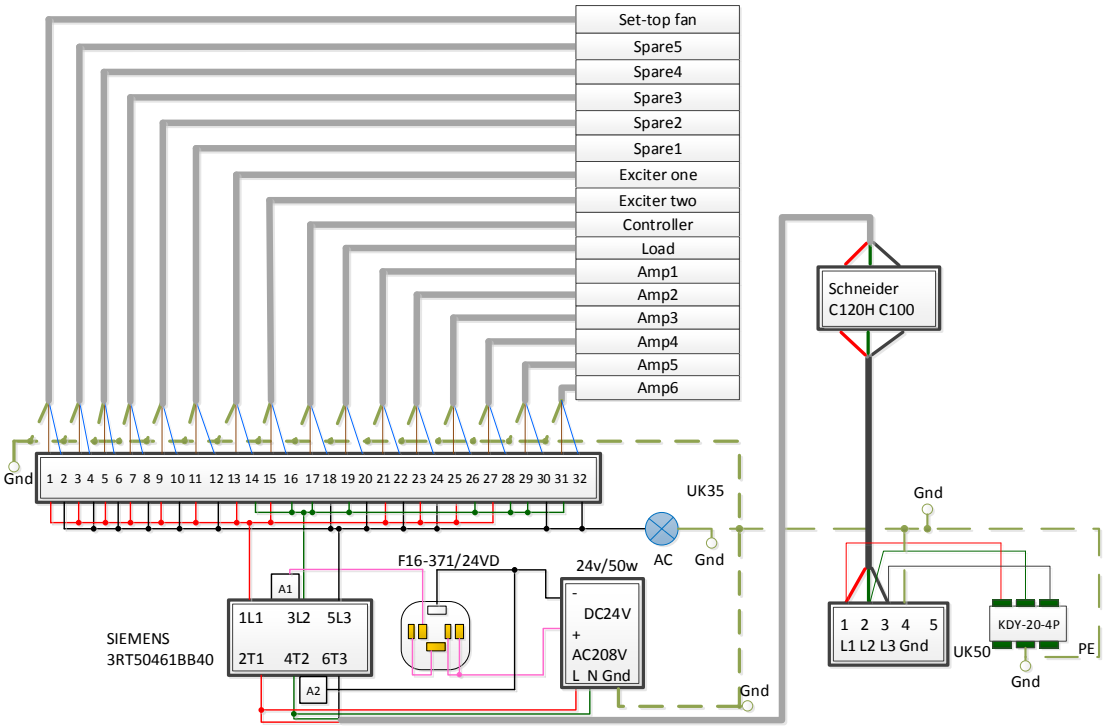
Properly connect the four wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other three connections as L1, L2, and L3.

5-PA 208VAC, Three-Phase AC Distribution Wiring



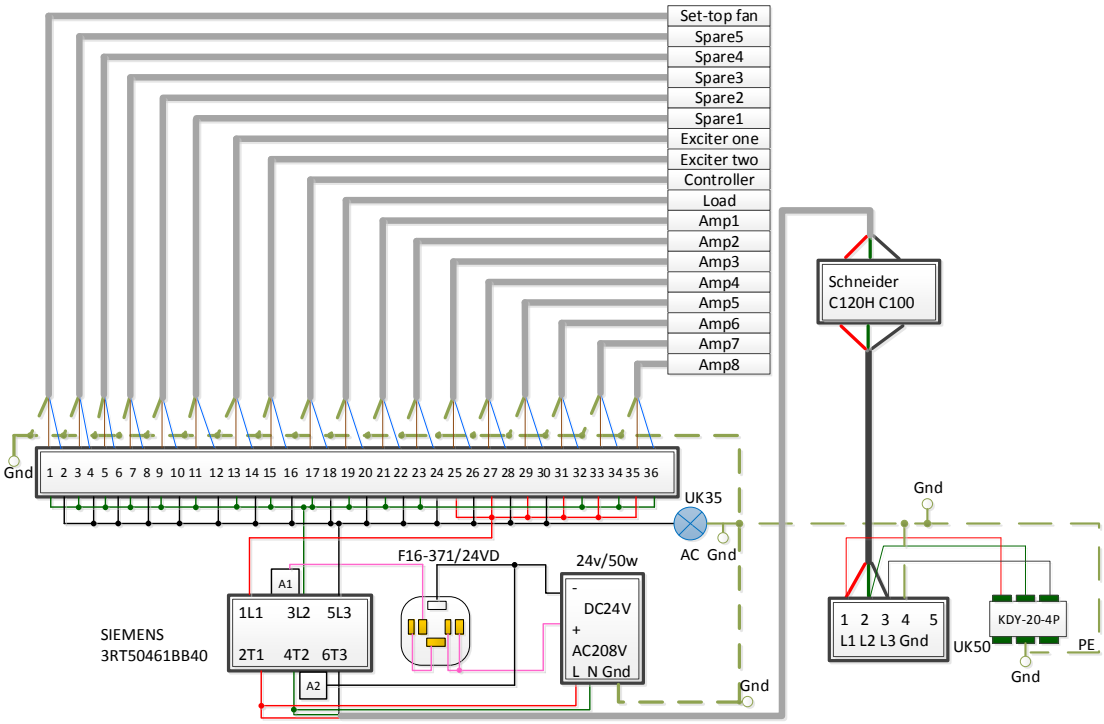
Properly connect the four wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other three connections as L1, L2, and L3.

6-PA 208VAC, Three-Phase AC Distribution Wiring



Properly connect the four wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other three connections as L1, L2, and L3.

8-PA 208VAC, Three-Phase AC Distribution Wiring



Properly connect the four wires to the terminal block as shown in the above diagram, taking care to notice which terminal is connected to the chassis Ground in your system. Be sure to connect the GND terminal properly and other three connections as L1, L2, and L3.

1.5 RF System Connections

If you purchased an Anywave BPF, Anywave will install the BPF either on top of the TX cabinet (as shown below) or standing on the floor, according to the transmitter and the BPF's dimension, unless it is specified with order. If it is installed on top of the TX cabinet, four metal stand-offs "feet" with mounting hardware are supplied with the BPF to allow it to be fastened and secured to four holes located in the top panel of the cabinet. Please reference Section 3 "Installation/Initial Turn-On" for step-by-step instructions on setting up and connecting your RF System components.

BPF on top of the TX cabinet: