CW TWT HIGH POWER WIDE BAND AMPLIFIER

MODEL NUMBER:
TWT8G-200

OPERATING AND MAINTENANCE INSTRUCTIONS

TWT8G-200 MANUAL
MAN-70007, REVISION B, 02-20-2017

SERIAL NUMBER:
1904037401

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SECTION 1.0
INTRODUCTION

Congratulations on the purchase of your new Wide Band Amplifier from PowerMax Innovation, Inc. Your new Wide Band Amplifier incorporates the finest advancements in the state of the art electronics technology available in a compact, portable and versatile package. Your Wide Band Amplifier's quality, performance and trouble free operation depends on you thoroughly reading through this manual and familiarizing yourself with its proper operation and usage.

Your Wide Band Amplifier comes with the following accessories, be sure to check your packaging for the items listed below before disposing of the packaging.

CONTENTS
(For a typical Wide Band Amplifier)

Quantity	Description
1	CW TWT High Power Wide Band Amplifier, Model TWT8G-200
1	Mating Connector, Power Line
1	Operation and Instruction Manual
1	Data Sheets (Included in Manual)

!!ATTENTION!!

MUST Turn ON Amplifier for 4 hours every 30-60 days in RF-ON mode preferably with low-level RF drive to prevent TWT gassing up.

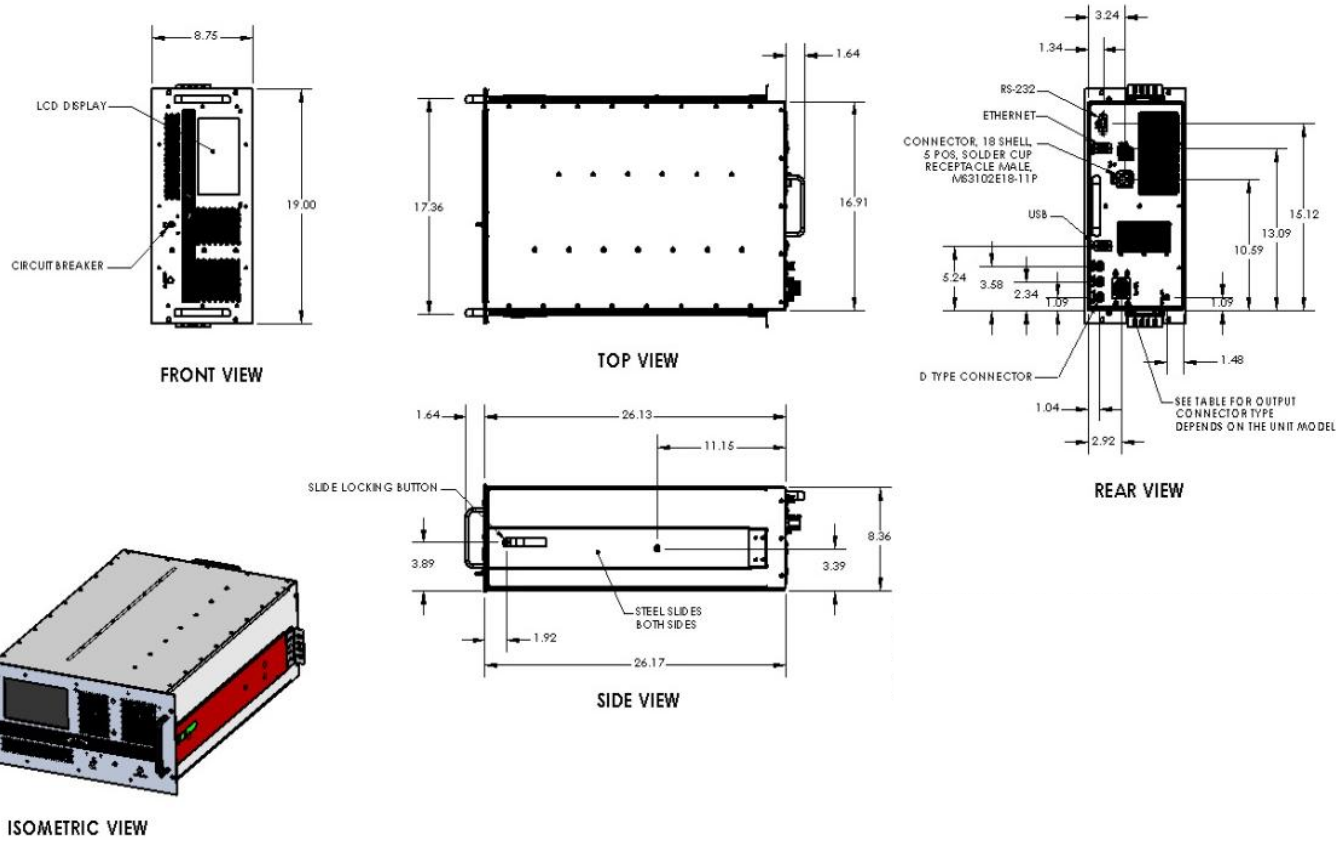

FIGURE 1.0
OUTLINE DRAWING

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SECTION 2.0
GENERAL DESCRIPTION

© The EMC Shop, LLC manufactured CW TWT Wide Band Amplifier is a Bench Top or rack mount amplifier providing a nominal 200 Watts CW of RF power from 2 to 8 GHz, with output power of at least 200 Watts CW. The minimum saturated output power at midband of the operating frequency range is more than 200 Watts CW.

The Amplifier features a touch screen 7", high resolution [800x480] color TFT Display that displays continuous forward and reflected power metering. The display also provides the operator with operating status and self diagnostic fault indications.

The Amplifier incorporates protection circuits that monitors and controls so the amplifier cannot be damaged by any mismatched load.

The Amplifier has an Ethernet interface which allows the amplifier to be remotely controlled through the use of a computer.

To operate the Amplifier, connect a three phase power line (220 Vac line to line) 5 wires to the Power line MS connector on the rear panel as shown below.

Three Phase Connection.

PIN A – PHASE A
PIN B – PHASE B
PIN C – PHASE C
PIN D – NEUTRAL
PIN E – GROUND

SECTION 3.0
TWTA Controller Operation

3.1 Hardware Initialization

The local mode of operation will allow the user to exercise control over the parameters by way of button switches located toward the right of the screen. Pressing a button switch will toggle the switch position and will highlight its function.

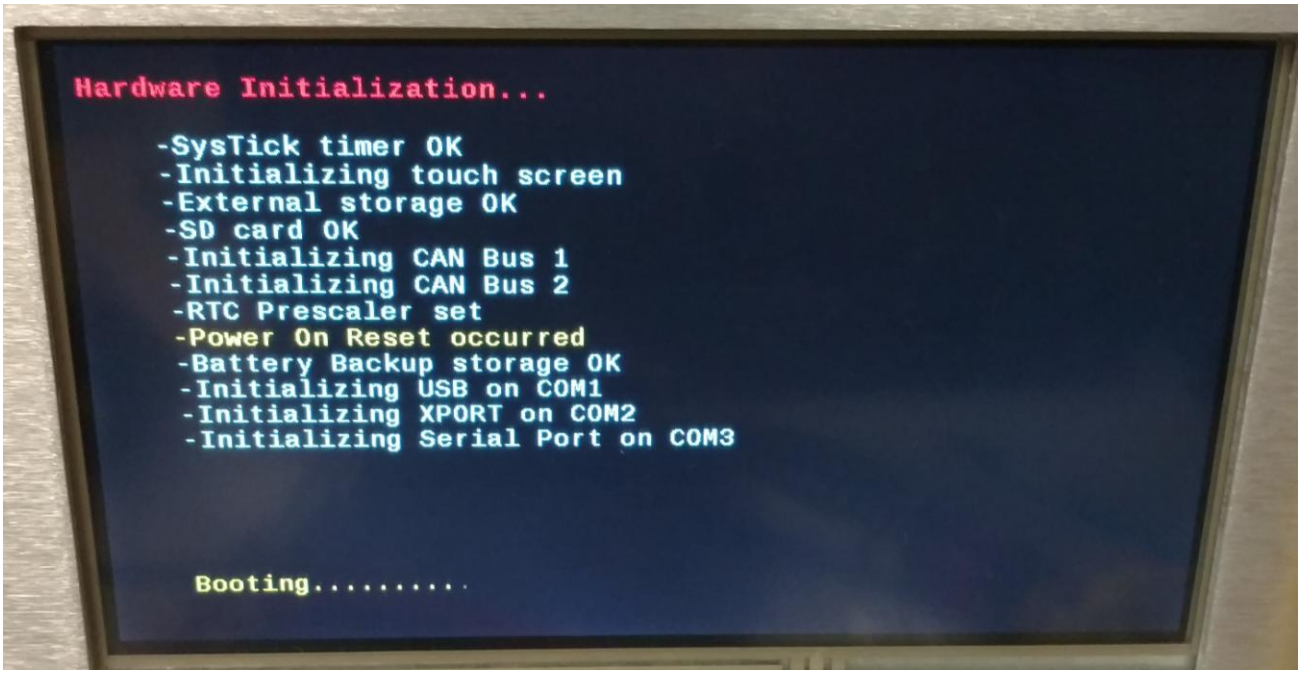

FIGURE 2.0 - Hardware Initialization Screen

Once the power is turned on the controller will boot and display the boot screen as shown above. It will only be displayed for a few seconds follows by the The EMC Shop Logo screen.

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3.2 The EMC Shop Screen

FIGURE 3.0 - The EMC Shop Logo Screen

The The EMC Shop logo screen it is only displayed for a few seconds and is shown in above.

3.3 Information Screen

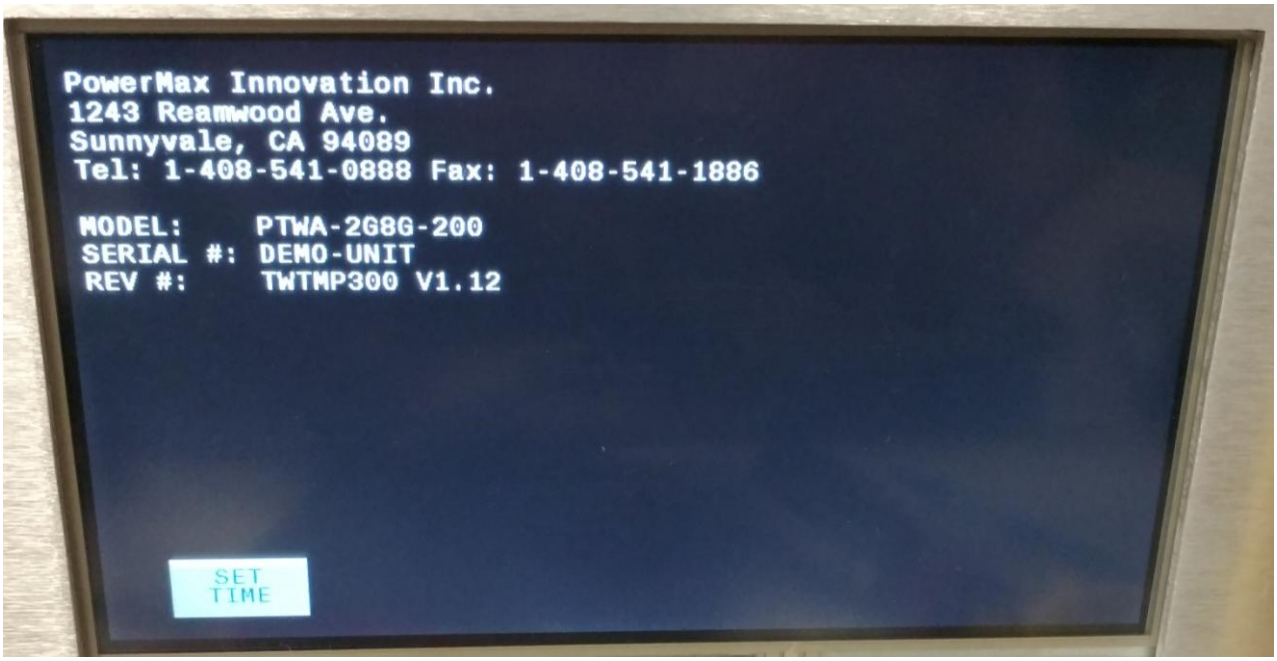

FIGURE 4.0 - System Information and Set Time Button Screen

The Information screen displayed is the set time, Model and version description screen, it will be displayed for a few seconds, should the set time icon be touched the adjust time and date screen will be shown as in Fig. 5.

3.4 Time & Date setup menu

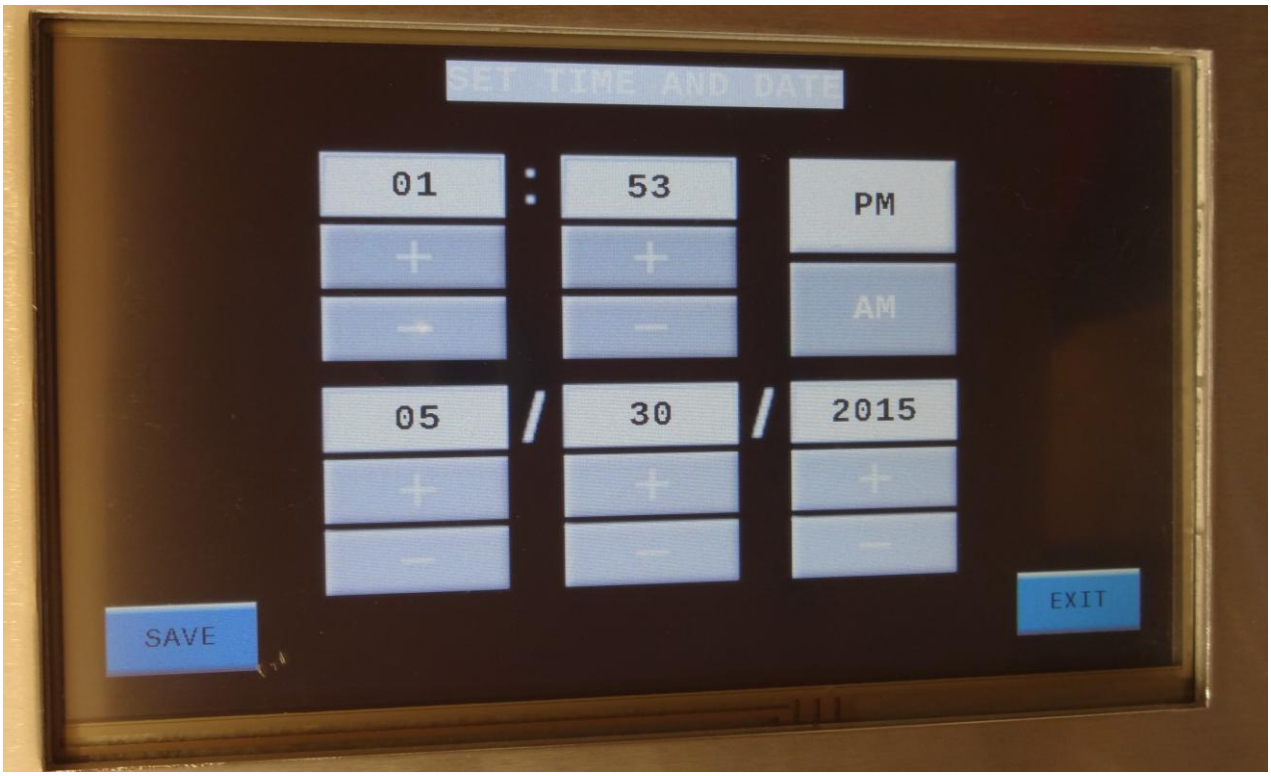

FIGURE 5.0 - Set Time and Date Screen

Figure 5 shows the buttons for adjusting the time and date. Touch the + or – Buttons to adjust the time and date, then save, then exit to return to the main screen.

3.5 Operate Menu, RF-OFF

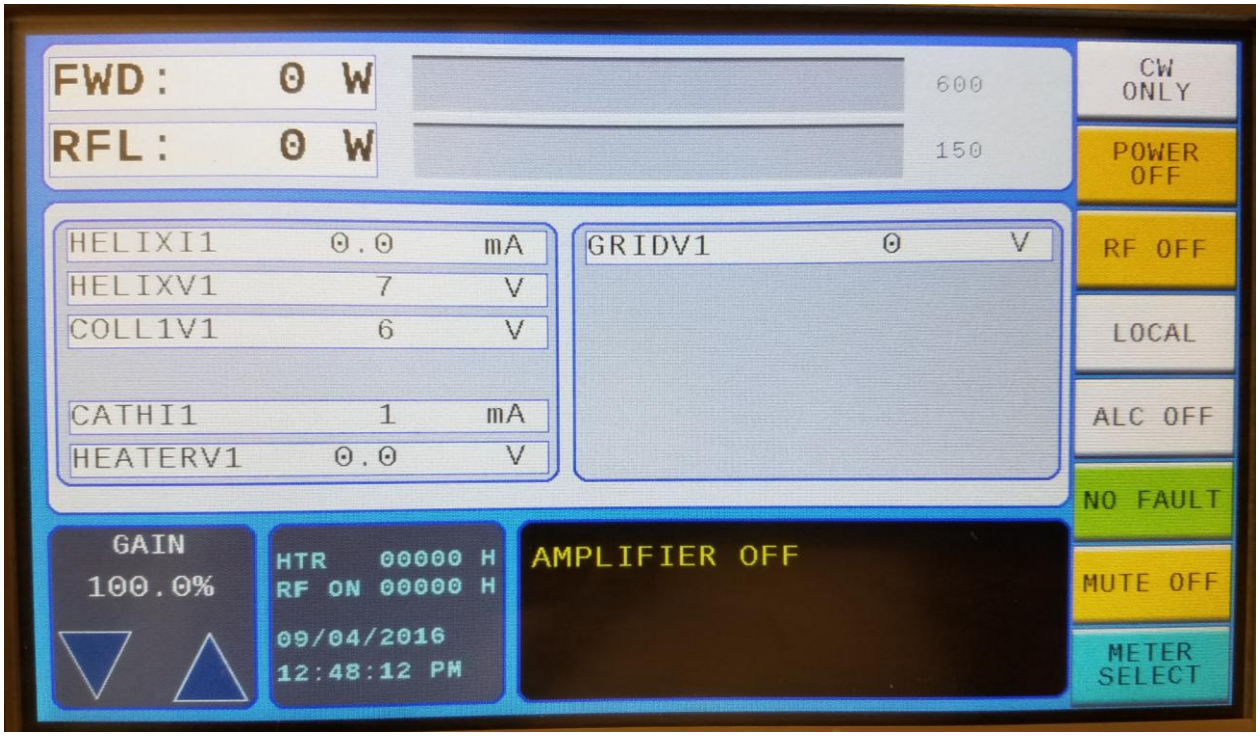

FIGURE 6.0 - OPERATE MENU

The operating menu will come up in POWER_OFF-Mode. The values for Forward Power (FWD), Reflected Power (RFL), and metering should be zero. The Gain will be at 100% at all times unless the Attenuator is being controlled by pressing the Gain buttons Up or Down [only with Attenuator Option].

3.6 TURNING-ON THE AMPLIFIER

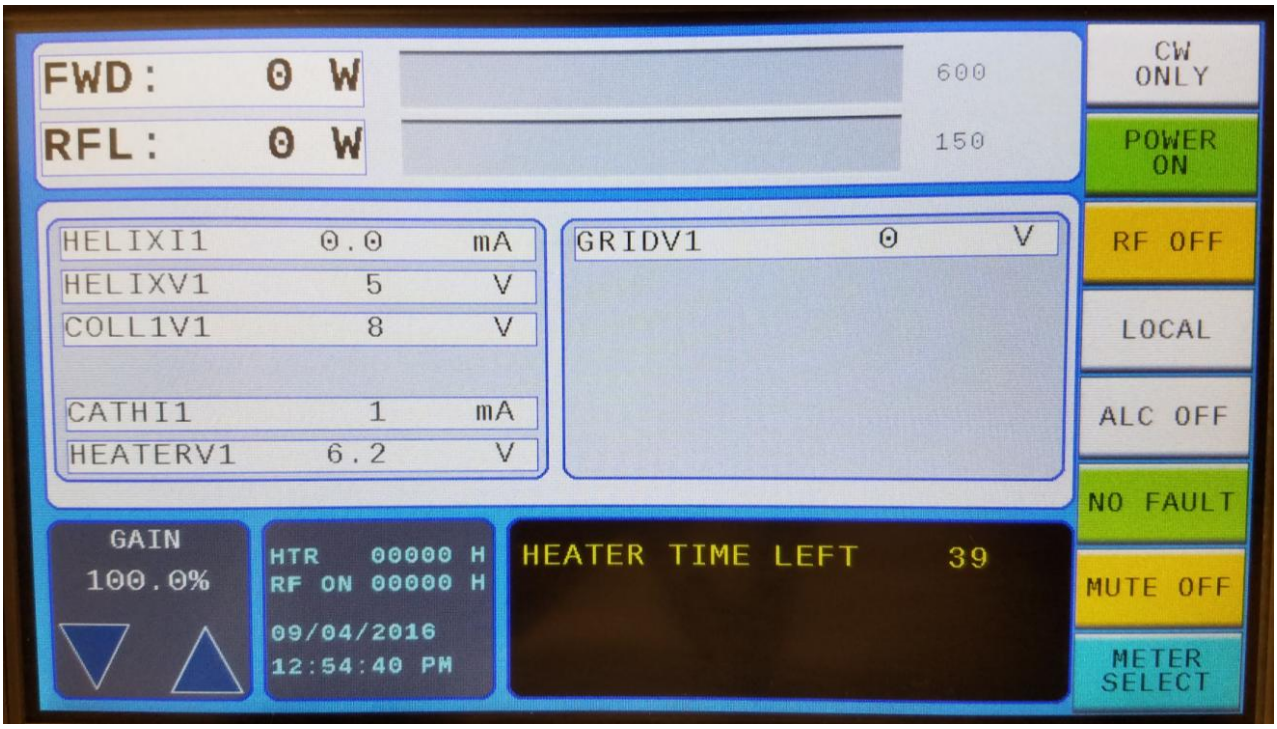

FIGURE 7.0 – TURNING ON THE AMPLIFIER

1. Touch the POWER OFF Button which will change to POWER ON. The unit will display "HEATER Time left" and start the countdown starting with the required time for the applicable TWT incorporated in the amplifier. In this mode the Heater supply will be energized.
2. After the time out, the amplifier will revert to STANDBY mode

3.6.1 Standby Mode

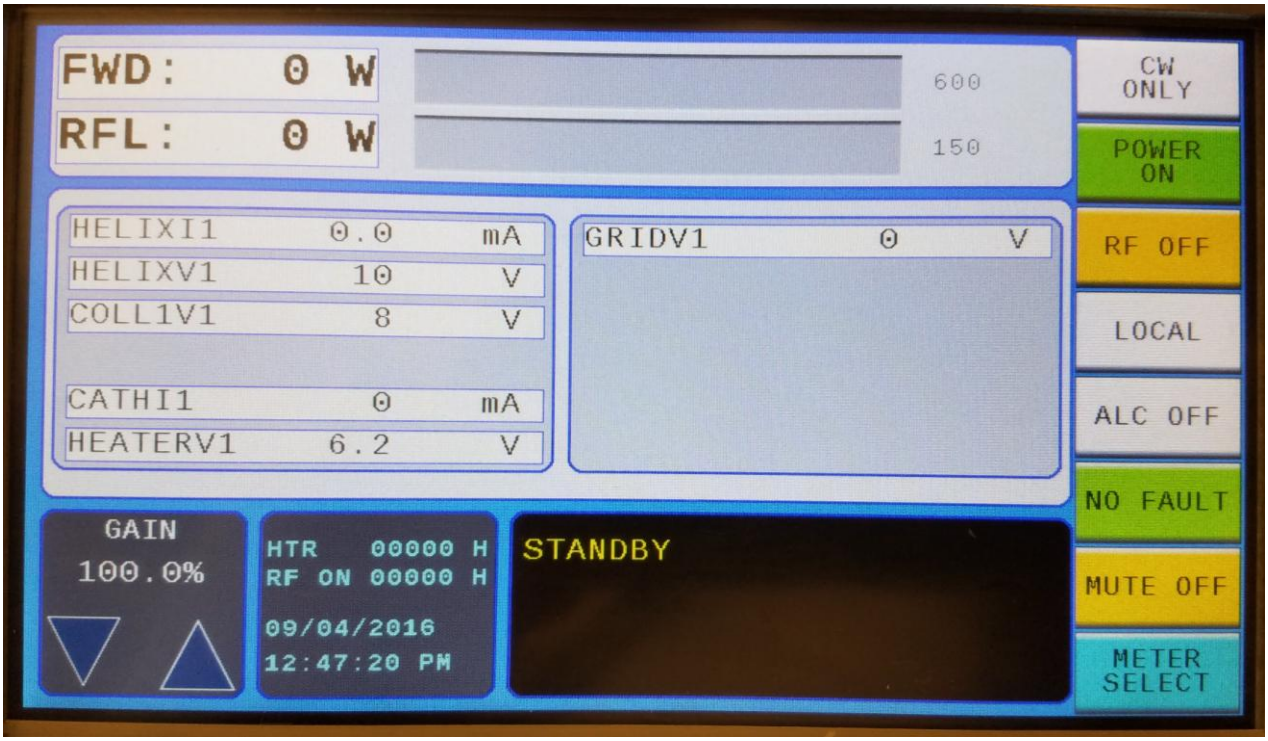

FIGURE 8.0 – STANDBY MODE (Typical)

At this mode the TWT is fully warmed up, all High Voltages are OFF and only are being applied when the amplifier goes to RF-ON mode [also known as Cathode turned on].
Some TWTs have a single Collector element, therefore only COLL1V will be display.

3.6.2 RF-ON Mode

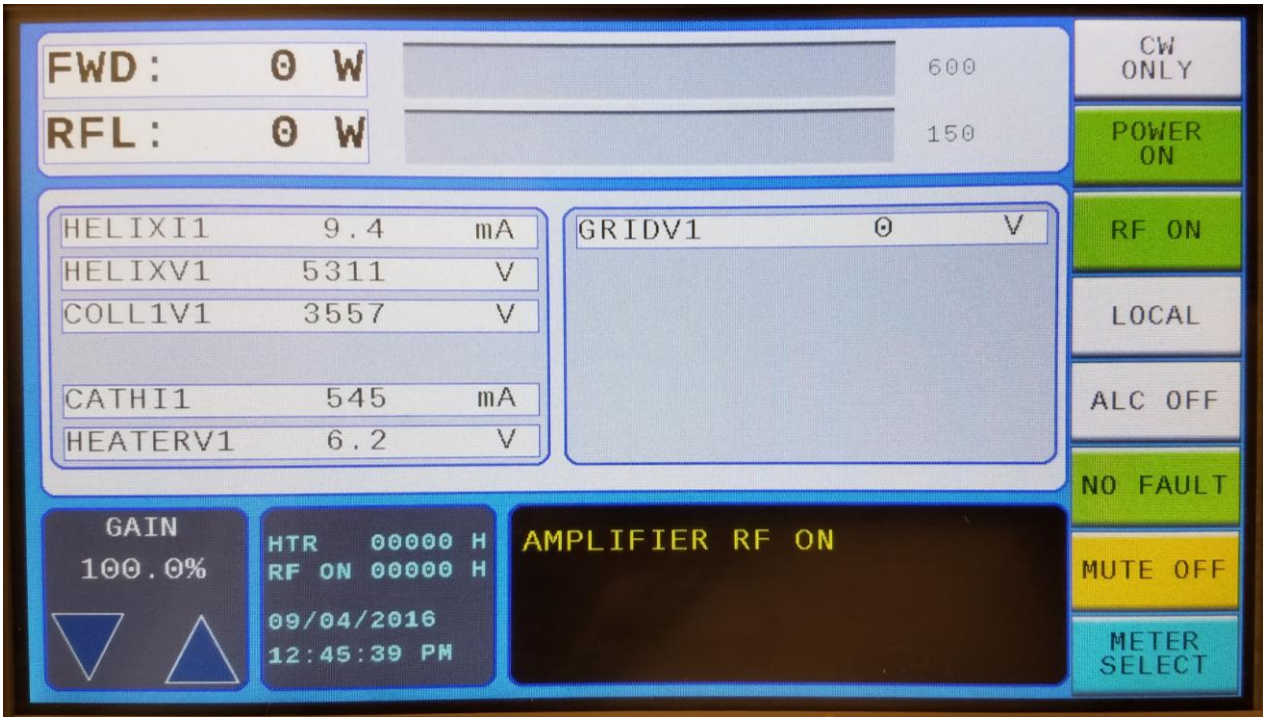

FIGURE 9.0 – RF-ON MODE

1. Place the unit in RF ON mode. In this mode the TWT will be turned ON.
2. The display will show the Helix and Collector currents as per TWT operating data sheet (enclosed in the manual).
3. Grid voltage will be displayed only with TWTs having Grid element.
4. Some TWTs have a single Collector element, therefore only COLL1V will be display.

SECTION 4.0
GENERAL INFORMATION

4.1 SCOPE OF THIS MANUAL

This manual is intended to inform a qualified transmitter operator or technician of the normal operating and maintenance procedures for the TWT Amplifier. It is not intended to be a course of instruction for unqualified personnel.

4.2 OPERATION OVERVIEW

The Amplifier is designed to amplify a low level microwave signal and supply a high power CW output. The Amplifier system function is accomplished primarily through the use of a Traveling Wave Tube (TWT), control circuitry and HV power supplies, which can be controlled either locally or remotely. The major subassemblies are mounted on separated decks. The left deck houses the HV Power supply & control circuitry. The right deck houses the TWT and all the RF components.

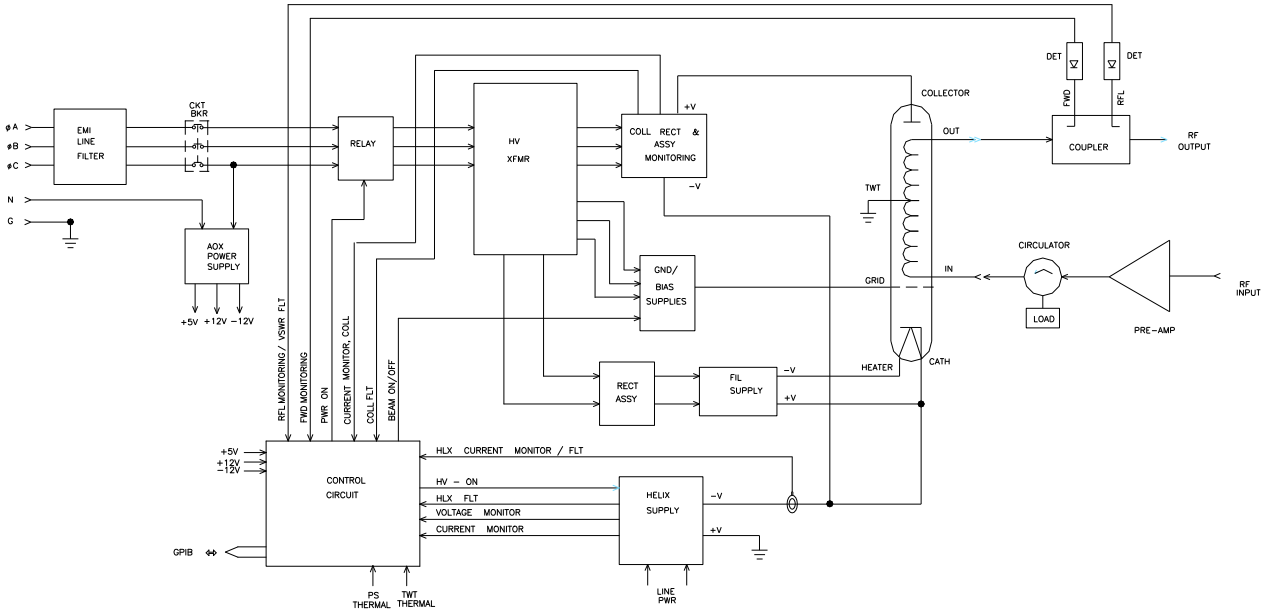

FIGURE 10.0 - SYSTEM BLOCK DIAGRAM

4.4 GENERAL SPECIFICATIONS

The specifications listed below represent the minimum performance characteristics at the time of delivery.

SPECIFICATIONS

Frequency	2-8GHz
Output Power	200W CW min. 250W CW Typical in midband
Input Drive	≤ 0dBm
Gain @ Rated power	54.0 dB
Input Impedance	50 Ohms nominal
Output Impedance	50 Ohms nominal
Spurious	-50dBc max.
Harmonics	2-3GHz: 0 to -4dBc; 3-6GHz: -4 to -8dBc; 6-8GHz: -8 to -15dBc
Noise Factor	35dBm
Prime Power	220Vac, 50/60Hz, 3 Phase, 5 wires
Power Consumption	3KVA max.

4.5 Functional Description

The required voltages and currents to operate the TWT are provided by the Helix, Collector and Heater supplies. The Helix supply provides the negative high voltage potential between TWT Cathode and ground. The Collector supply provides the high voltage potential between the TWT Cathode and Collector. The Heater supply provides the Heater voltage and floats at high voltage Cathode potential. The primary control circuitry and the service power supplies (+5V, +/- 12V, + 48V [Fans]) are energize when the main circuit breaker is turned ON. Upon pressing the AMP ON switch, the Heater & Bias supplies are energize and a three minutes warm up time is initiated. At the completion of the three minutes time out the HV supplies applied to the TWT then the Amplifier goes to STBY mode if no faults were detected . Upon pressing the RF ON switch the Grid voltage is applied to the TWT Grid with Positive voltage which turns the Beam ON.

4.6 PROTECTION CIRCUITS

The TWT Amplifier is designed with a variety of protection circuits to provide safeguards for the amplifier should any adverse electrical conditions occur or if the amplifier is accidentally experiencing operator deviation of the design application. Listed below are the safeguards.

4.6.1 Over Heat Protection

The TWT a critical component of this Amplifier is mounted to a heat sink which in turn, air cooled by high efficiency blower. Should an overheating condition occur, either through component failure or by a restricted air flow, the Amplifier contains heat sensors that will shut down the system should an overheating condition occur. As a result, the air inlet and outlet openings should be free of obstructions for proper cooling of the amplifier. Operation is restored by the Reset button when the amplifier cools to normal temperature levels.

4.6.2 Power Supply Faults

The Power Supply Fault circuit monitors the Helix and Collectors power supplies and produces a fault indication should any voltage level deviate from normal operating parameters. Each power supply voltage output is monitored and displayed. Should any power supply voltage deviate from the design parameters, the Fault Indication on the front panel Display of the Amplifier will display the related fault.

4.6.3 Mismatch Protection

The Amplifier is designed to operate with a tuned 50 Ohm load and should any mismatching of the 50 Ohm occur, the Reverse Power, also called Reflective Power, will increase producing a high VSWR. The Amplifier microprocessor monitors the Reverse Power levels by utilizing a Dual Directional Coupler. When the Reflected Power exceeds 25% the Amplifier Output Power it will go to STBY and the High VSWR message will be indicate on the LCD display. The Reverse Power is also displayed on the LCD Display for operator monitoring for any mismatched load.

4.7 STATUS INDICATORS, CONTROLS AND CONNECTORS

The Amplifier has various controls and status indicators which are identified below and can be visually located on Figure 1.0, Illustration and Figure 3.0, Rear Panel Illustration. A narrative description for the function and purpose of each control and status indicator is provided within paragraphs 4.7.1 and 4.7.2.

RF AMPLIFIER

Front Panel	Rear Panel
Power ON/OFF Ckt Bkr	AC PWR MS Power Connector
Local/Remote Touch switch	RJ45 Ethernet Connector
POWER ON/OFF Touch switch	RS232 Connector
RF ON/OFF Touch switch	RF Input N, Female
Fault/Reset Touch switch	RF Output type 7/16, Female
	FWD Sample Port N, Female
TFT Status Display	RFL Sample Port N, Female [Optional]

	Connector Type	Location	Comments/Notes
Input Connector	N/Female	Rear	
Output Connector	7/16-Female	Rear	
FWD Sample Port	N/Female	Rear	-50dBc ±1dB
RFL Sample Port	N/Female	Rear	-50dBc ±1dB [optional]
Remote	RS232, RJ-45	Rear	RS232, Ethernet
AC Connector	MS3102E18-11P	Rear	220Vac, 3 Phase, 5 wires, 3KVA max.

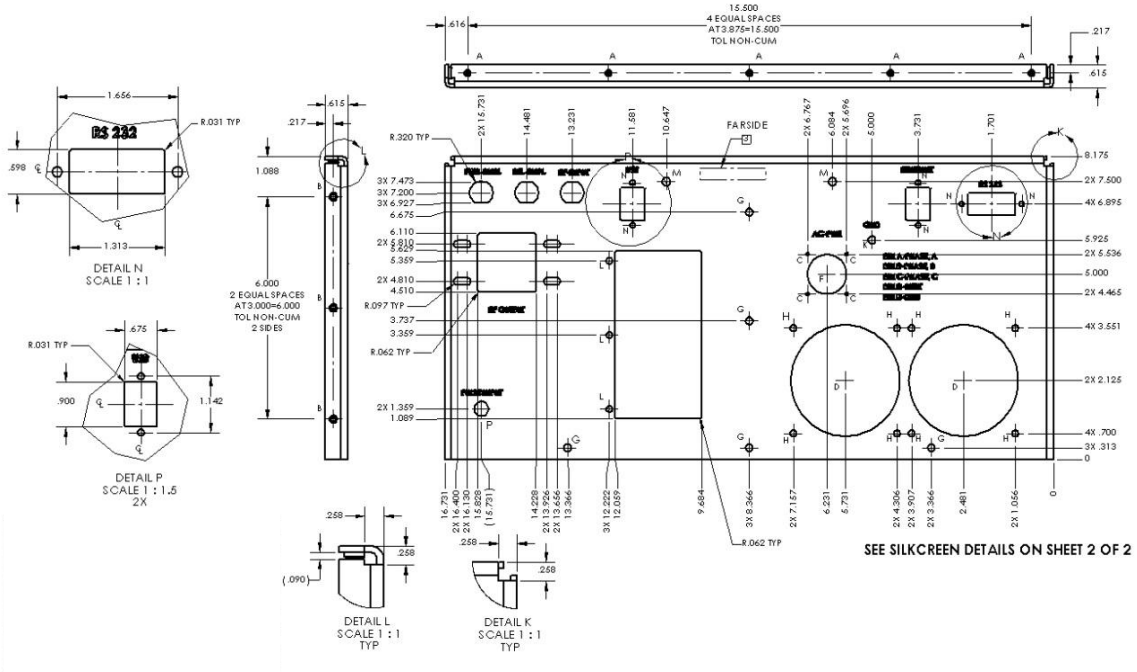

FIGURE 11.0 - REAR PANEL ILLUSTRATION

4.7.1 FRONT PANEL STATUS INDICATORS

INDICATOR	FUNCTION
Fault	The Fault will be indicated when the any of the Power Supplies deviate from the design parameters. The Amplifier will revert to RF OFF mode when either a Thermal condition occurs outside design parameters. Should an excessive temperature condition occur while monitoring the TWT temperature of the Heat sink temperature the Amplifier will revert to RF OFF mode. The TFT Display will indicate which fault had occurred.
Heater/RFON Hours	Elapsed time Indication on the TFT display, presents Heater hours of the amplifier or RF-ON hours with BEAM ON.
Remote	The Remote will be indicated when the amplifier is in the remote control mode of operation via the computer.

4.7.2 CONTROLS

CONTROL	FUNCTION
AC Power Breaker	Circuit Breaker to turn On/Off main prime power to the Amplifier.
Local	The Local switch is a touch switch. When depressed, the amplifier is restored to the local control from the Remote mode of control.
POWER OFF / ON	Switch, when set to POWER ON mode it will apply Heater Voltage to the TWT and after the warm-up time will apply the high voltages required to operate the tube , when set to POWER OFF it turn all supplies OFF.
RF OFF / RF ON	Switch, when set to RF ON mode it will apply the Positive voltage to the TWT-Grid via the Modulator to turn Beam ON, when set to RF OFF it turns TWT Beam OFF.
RESET	Switch, when pressed resets Faults.

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4.8 DATA SHEETS

Provided with each Amplifier are specific Test Data Sheets measured from the amplifier using a calibrated 50 Ohm Pad to assist the operator in maximizing the performance of the Wide Band Amplifier.

The accuracy of the Metering is ± 1 dB (nominal) so to provide the operator with the ability to maximize the performance of the wide band amplifier.
The Test Data Sheets are located within Appendix A

SECTION 5.0
PRINCIPLES OF OPERATION

5.1 PROPER USAGE AND WARNINGS

5.1.1 Controlling Power Output

With a nominal 50 ohm resistive load and an input signal appropriate to produce a power output within the limitations specified above, the amplifier may be placed in operation. To interrupt the output, simply interrupt the input signal. The amplifier may be run indefinitely at rated output. Output power is usually measured with a power meter and suitable power Termination.

5.1.2 Input Signal Levels

The Amplifier is designed to operate with less than a 0 dBm (1.0 mW) input signal.
It is not advisable to over drive any amplifier and depend on protection circuits to maintain proper gain control. The EMC Shop makes available with each shipped amplifier specific data and curves so the operator will know the proper input signal levels to more efficiently operate the amplifier refer to Paragraph 4.7 herein.

5.2.1.1 Preamplifier

The Preamplifier provides the proper drive levels to the TWT to obtain the proper Output Power
The preamplifier is powered from a low voltage power supply that is independent of the main power supplies.

5.2.1.2 Power Amplifier

The Power amplifier consists of the combined high power Traveling Wave Tube as the main amplification stage. It is powered by Heater, Grid, Helix and Collector high voltage power supplies.

SECTION 6.0
REMOTE INTERFACE FOR MEDIUM POWER AMPLIFIERS

6.1 INTRODUCTION

The EMC Shop Amplifiers can be operated remotely from a computer having RS-232 or ETHERNET interfaces. These interfaces will allow the amplifier to be remotely controlled by sending commands to the amplifier. Additionally, the amplifier status and forward and reverse power readings may be read over the remote.

6.2 RS-232 INTERFACE

RS-232 is a standard which defines the communication between DTE, data terminal equipment to DCE, data communication equipment. The EMC Shop Amplifiers have a RS-232, serial interface. All amplifier functions can be controlled by coded messages sent over the interface bus via the 9-pin D-type socket connector on the rear panel of the unit.

1.3.1 RS-232 Wiring

Connect the serial port of the amplifier to a computer using a null modem cable or a standard serial cable with a null modem adapter.

Pin #s	Signal Name	Remote Terminal I/O
2	TXD	Output to remote terminal
3	RXD	Input from remote terminal
5	Signal GND	Signal reference

Note: Use the NULL Modem between Computer and Amplifier for RS-232 Interface.

The RS-232 Serial Communication Settings:

Baud Rate:	9600 Baud.
Data Bits:	8
Parity:	None
Stop bits:	1
Flow control:	None

6.3 ETHERNET INTERFACE

The Amplifiers have an Ethernet Interface. All amplifier functions can be controlled by coded messages sent over the interface bus via RJ-45 connector on the rear panel of the unit.

1.3.1 Description

The Ethernet Interface allows the Amplifier to communicate with and participate in a Local Area Network using RJ-45 cable.

The **Internet protocol suite** (commonly **TCP/IP**) is the set of communications protocols that implement the protocol stack on which the Internet and most commercial networks run. It is named for two of the most important protocols in it: the Transmission Control Protocol (TCP) and the Internet Protocol (IP), which were also the first two networking protocols defined. Today's IP networking represents a synthesis of two.

TCP/IP uses four numbers to address a computer. Each computer must have a unique four numbers address. The numbers are always between 0 and 255. Addresses are normally written as four numbers separated by a period like this: **192.168.1.50**.

The Ethernet interface is a cable bus which runs over copper or fiber. The copper interfaces use either a coaxial cable or differential twisted pairs. The Ethernet network is defined by IEEE 802.3 standard. Descriptions for each of the physical lines are provided below.

Ethernet Bus 10/100BaseT Pin-Out

Name	Pin	Cable Color	Pin	Name
TX+	1	White/Orange	1	TX+
TX-	2	Orange	2	TX-
RX+	3	White/Green	3	RX+
	4	Blue	4	
	5	White/Blue	5	
RX-	6	Green	6	RX-
	7	White/Brown	7	
	8	Brown	8	

1.3.2 Ethernet Wiring

Connect the RJ-45 port of the amplifier to a computer cable on 100BaseT UTP Cat5 cable.

The EMC Shop uses Lantronix XPort device as an interface to the remote Ethernet. Using a driver provided by Lantronix which is available on http://www.lantronix.com/device-networking/utilities-tools/device-installer.html and download DeviceInstaller from there. An IP Address can be read by using DeviceInstaller only when the amplifier and PC are placed in network (on DHCP Server).

6.4 REMOTE COMMAND FORMAT

The EMC Shop Amplifiers remote commands are a string of ASCII characters with the following format:

Command Code	End Of String Characters

The
Command Code is a three to nine characters command code which the system interprets to determine the type of action to take. See Remote commands below.

NOTES:

1. ALL COMMANDS AND REQUESTS MUST CONSIST ENTIRELY OF UPPER CASE ALPHANUMERIC CHARACTERS.

2. ALL VALUES DISPLAYED DO NOT SHOW THE ZEROS TO THE LEFT OF THE NUMBER VALUE.

1.4.1 Remote/Local Control

When the amplifier receives a command over the remote interface, it is required to enter REMOTE command first to switch into REMOTE operation, entering the LOCAL command or touching the LOCAL button on the front panel returns the unit to normal manual local operation In this option all status commands can be read while the amplifier is into local mode and they should not switch the amplifier into remote mode. An additional LOCAL command is applied to put amp in local mode if it was set for remote operation.

6.5 REMOTE COMMANDS

COMMANDS FOR TWTA AMPLIFIER

Command Code	Amplifier Function	Amplifier Response	Description
AMP-OFF	Go to AMP-OFF Mode	**AMP-OFF**	Brings the amplifier to POWER-OFF from POWER-ON mode
AMP-ON	Go to AMP-ON Mode	**AMP-ON**	Brings the amplifier to POWER-OFF to POWER-ON mode
RF-OFF	Go to RF-OFF Mode	**RF-OFF**	Brings the amplifier to RF-OFF from RF-ON mode
RF-ON	Go to RF-ON Mode	**RF-ON**	Brings the amplifier to RF-ON from RF-OFF mode
RESET	Fault Reset	**FAULT**	Resets the amplifier if it is in a fault

SYSTEM STATUS RESPONSES FOR AMP

Command Code	Amplifier Response	Description
STATUS	**POWER-OFF**	Amplifier Initialization or rebooting
	POWER-ON	Amplifier POWER-ON mode
	RF-OFF	Amplifier RF-OFF mode
	RF-ON	Amplifier RF-ON mode
	FAULT	The Amplifier has a Fault
	WARNING	The Amplifier has a warning
STATUSALL	**"Model, Warning, Amp status"**	Multistate status string
WARNING	Returns warning message	
FAULT	Returns Detailed Message	
	THERMAL FAULT	High Temperature Fault
	HIGH VSWR FAULT	When VSWR is greater then set value
	HELIX CURRENT FAULT	When Helix current exceed the allowable limit
	HELIX VOLTAGE FAULT	When Helix voltage is out of range
	FILAMENT FAULT	When Filament current is low
	SUM FAULT	HV Power supply faults
	LOW AIRFLOW FAULT	When airflow is low
	NO FAULTS	No fault condition

POWER AND METERING - STATUS RESPONSES FOR AMP

Command Code	Amplifier Function	Amplifier Response	Description
FWDPWR	Forward Power	**'FWD POWER: XXXXX W'**	Returns Forward Power Value in Watts
RFLPWR	Reflected Power	**'RFL POWER: XXXXX W'**	Returns Reflected Power Value in Watts
HELIXV-1	Helix Voltage	**'HELIXV PS1: XXXXX V'**	Returns Helix Supply Value in Volts
HELIXI-1	Helix Current	**'HELIXI PS1: XXX.X mA'**	Returns Helix Supply Current in milliamps
COLL1V-1	Collector 1 Voltage	**'COLL1V PS1: XXXXX V'**	Returns Collector 1 Supply Value in Volts
COLL2V-1	Collector 2 Voltage	**'COLL2V PS1: XXXXX V'**	Returns Collector 2 Supply Value in Volts
CATHI-1	Cathode Current	**'CATHI PS1: XXXX.X mA'**	Returns Cathode current in milliamps
HEATERV-1	Heater Voltage	**'HEATERV PS1: XXX.X V'**	Returns Heater supply value in Volts
TEMP-AMB	Ambient Temperature	**'AMBIENT TEMP: XXXXX C'**	Returns Ambient temp value
HEATERH	Filament Hours	**'HTR HRS: XXXXX'**	Returns Total Hours
RF-ONH	Beam hours	**'RF ON HOURS: XXXXX'**	Returns Operation Hours Value,
MODEL	Model number	**'XXXXXXXXXXXXXXXX'**	Returns Model number of the unit
SN	Serial number	**'XXXXXXXXXXXXXXXX'**	Returns Serial number of the unit
***IDN?**	System ID	**'EMC,XXXXXXXXXXXXXXXX ,XXXXXXXXXXXXXXXX,XXX XXXXXX'**	Returns ASCII response comprising of four data fields in the format <Manufacturer>, <Model>(16 Characters), <Serial Number>(16 Characters), <Firmware Version>(9 Characters)
***RST**	Reset Amplifier CPU		Reset Command, Sets the Amplifier to the factory default power up state (reboots MPU)

6.6 REMOTE EXAMPLE CODE

RS-232 or Ethernet, Example using Hyper-terminal

1. Connect serial port of amplifier to computer using a null modem cable or a standard serial cable with a null modem adapter.
2. Use a program such as Hyper-terminal to communicate with the amplifier. (To find Hyper-terminal go to Start → Programs → Accessories → Communications → Hyper Terminal, and click on Hyper terminal.

   To setup Hyper terminal follow the directions below.
   When Hyper terminal runs a setup dialog box will open:

   For RS-232:

   2.1 Enter a name and choose an icon. Click OK.
   2.2 In the Connect Using box select your Comm. port (Ex. "Direct to Com1" or "Com1") for RS-232 or TCP/IP for Ethernet remote. Click OK.
   2.3 In Bits per Second select "9600".
   2.4 In Data Bits select "8".
   2.5 In Parity Select "None".
   2.6 In Stop bits select "1".
   2.7 In Flow control select "None"
   2.8 Click OK.

   For Ethernet:

   2.1 Enter a name and choose an icon. Click OK.
   2.2 In the Connect Using box select TCP/IP for Ethernet remote. Click OK.
   2.3 Enter an **IP Address** in Host Address box and **10001** in Port Number box. Click OK.

3. If you use Hyper-terminal steps 2.1 to 2.8 will set up Com1 to communicate at 9600 baud, 8 bits, and no parity with 1 stop bit and steps 2.1 to 2.3 will set up Ethernet to communicate at 57600 baud.
4. Turn amplifier line power ON.
5. To place the amplifier in remote operation type in a valid command such as "STATUS" and then hit the "Enter" key. The amplifier will then go into remote operation and the status will be displayed on the computer.

SECTION 7.0
MAINTENANCE AND SERVICING

7.1 PERIODIC MAINTENANCE

The only periodic maintenance required on the CW TWT amplifier system is insuring that the cooling vents are not obstructed in such a manner that the air flow is restricted. Periodic cleaning of the vents may be required depending on the degree of dust in the atmosphere.

7.2. SERVICING THE AMPLIFIER

Servicing of the amplifier by the operator is not recommended. Most of the internal circuitry requires special and unique test instruments to trouble shoot, align and calibrate the circuits. Should servicing be required, refer to Paragraph 7.3.

7.2.1 TROUBLESHOOTING

PROBLEM	*CAUSE*	*SOLUTION*	*COMMENTS*
TFT display blank	No service voltages	Check line power. Check service voltages, +12VDC, -12Vdc, 5VDC	Connect AC line to specified Prime power source. Refer to S/N tag on unit
Amp will not go to Operate mode	High VSWR	Check RF output termination connection.	When operating any RF amplifier proper termination must be connected to the RF output connector.
Power supply fault	Any of the high voltage power supplies are malfunction	Disconnect TWT leads and Check high voltages on HV terminal block when the amplifier is powered ON	Danger High Voltages of up to 12KV present
Thermal fault	Over-heating	Make sure airflow is adequate and ambient temperature within the limit.	

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7.3 EQUIPMENT RETURN PROCEDURE

Should such an event arise that the Amplifier requires repair or calibration, it is recommended that the reader follows the Equipment Return Procedure so the equipment can be repaired or calibrated and returned in an efficient and timely manner.

7.3.1 Request a RMA Number

Contact the The EMC Shop Service Department either in writing or by calling 408-541.0888 and request a Return Material Authorization (RMA) Number. The RMA Number is the method The EMC Shop uses to prepare its' services for returned material in transit and acts as a tracking document for the returned material through the repair or calibration process. The RMA also documents the customers' specific instructions or reason related to the return of the material.

7.3.2 Return All Accessories

In the interest of saving time and expediting the repair or calibration process, return all the associated accessories described in Section 1.0 when returning the equipment for repair or calibration. In many cases, a faulty accessory could give an illusion that the equipment itself has failed. For this reason it is important to return the all the accessories with the equipment. It is also the EMC Shop's policy to verify performance of all associated accessories of Section 1.0 before returning the equipment to service.

7.3.3 Packaging The Equipment

When returning equipment to the manufacturer, always wrap each accessory separately and provide sufficient protective material around each item to prevent damage from handling and shipping conditions.

7.3.4 Reference The RMA Number

As detailed in Paragraph 7.3.1, always reference the EMC Shop assigned RMA Number on your Packing List and Purchase Order and also when any inquiries are made.

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SECTION 8.0
WARRANTY INFORMATION

© The EMC Shop, LLC warrants each product of its manufacture to be free from any defect in material and workmanship for a period of (1) One year from the date of shipment. All warranty returns, however, must first be authorized by our factory office representative. Refer to the Service Section for information on how to return items for warranty repair.

Warranty liability shall be limited to repair or replacement of, or part thereof, which proves to be defective after inspection by the EMC Shop. This warranty shall not apply to any the EMC Shop product that has been disassembled, modified, physically or electrically damaged or any product that has been subjected to conditions exceeding the applicable specifications or ratings.

The EMC Shop shall not be liable for any direct or consequential injury, loss, or damage incurred through the use, or the inability to use any the EMC Shop product.

The EMC Shop reserves the right to make changes to any the EMC Shop product without incurring any obligation to make the same changes to previously purchased units.

This warranty is the full extent of obligation and liability assumed by the EMC Shop with respect to any and all The EMC Shop products. The EMC Shop neither makes, nor authorizes any person to make any other guarantee or warranty concerning the EMC Shop products.