



T&C
Power Conversion

T&C POWER CONVERSION

ULTRA 06-800 MQ

LF AMPLIFIER



OPERATION MANUAL

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ULTRA 06-800 MQ

AMPLIFIER



HIGH RF VOLATAGES MAY BE PRESENT AT THE OUTPUT OF THIS UNIT. All operating personnel should use extreme caution in handling these voltages and be thoroughly familiar with this manual.



DO NOT USE ANY CFC (CHLOROFLUOROCARBON) SOLVENT IN THE MAINTENANCE OF THIS PRODUCT. The no-clean flux used in manufacturing this product may leave a small inert residue, which will not affect the performance of the product. The use of CFC's for cleaning or maintenance may result in partial liquefaction of the no-clean flux residue, which will damage the unit and void the warranty.

This product is manufactured at T&C Power Conversion's Rochester, NY plant, following an ISO 9001 Quality System principals.



Applicable EC Directives: EC Low Voltage Directive 73/23/EEC
EC Electromagnetic Compatibility 89/336/EEC

Applicable Harmonized Standards: EN 61010-1:2001 (2nd Edition), UL 61010-1

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WARRANTY

T&C POWER CONVERSION, INC. warrants to original Purchaser/User for a period of 12 months from the date of delivery each instrument to be free from defects in materials and workmanship.

For a period of 12 months T&C will, at its opinion, adjust, repair, or replace defective parts without charge to the original purchaser, so that the instrument performs according to its specification.

When warranty service is required, the instrument must be returned, transportation prepaid, to the factory.

If, in our opinion, the instrument has been damaged by accident, unreasonable use – inconsistent with user’s manual, improper site preparation or maintenance, or abnormal condition of operation – repairs will be billed at the standard rate to Purchaser.

In these cases, an estimate will be submitted to User before the work is started.

SERVICE AND TECHNICAL ASSISTANCE

For service or repair, contact T&C directly or a local representative with the following information:

- Model and serial number,
- Purchase order number,
- Detailed description of malfunction.

For technical assistance for your particular application contact the factory. The following information will help us provide you with prompt and efficient service:

- Detailed description (e.g. physical damage and/or performance anomalies, quantitative and/or qualitative deviation from specification), including miscellaneous symptoms, dates and times,
- The environment and circumstances under which the issue developed,

Supporting test data and/or records that are available.

Sales & Service Locations

Look for our currently updated Sales and Service Representatives around the world on our website:

<http://www.tcpowerconversion.com/about/representatives.html>

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PRODUCT MANUAL REVISION CONTROL FORM

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Document Number: 9081 0079

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ECO	Rev	Description	Effective Date
	A	First Production Release Custom Product	02/09/09
	B	Specifications changed	07/31/09
	C	dB 25 Pin to dB 15 Pin Interface Change	04/02/10
	D	Section Number Changes	04/07/10

	Name / Title	Signature	Date
Written By	Joe Reminder	<i>Joe Reminder</i>	02/09/09
Checked By	Alexander Sulik	<i>Alexander Sulik</i>	02/18/09
Approved By	Tomasz J. Mokrzan/general manager	<i>Tomasz J. Mokrzan</i>	02/18/09

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INTRODUCTION

The T&C Power Conversion, Inc. Model ULTRA 06-800 MQ class-B power amplifier is a totally solid state, air cooled RF power source expressly designed for use in general ultrasonic and gas plasma applications. The amplifier utilizes conservatively rated solid state components and automatic power control circuitry to ensure reliable and continuous performance. Completely self-contained, the ULTRA 06-800 MQ provides all of the control and monitoring functions needed in a state-of-the-art power amplifier, which will provide up to 450 W continuous output into a 50 Ohm load.

The ULTRA 06-800 MQ measures forward power and reflected power. Should any of these parameters exceed a preset limit, the power control circuit will immediately limit the amplifier's RF power output so that the components always remain within safe operating limits.

The ULTRA 06-800 MQ can accommodate a wide range of AC line voltages automatically. [The unit also has an EMI filtered AC power entry to eliminate conducted line leakage.](#)

Only minimum maintenance is required to guarantee successful operation and endurance of your ULTRA 06-800 MQ amplifier. The unit's completely solid state design substantially reduces DC voltages which eliminates the hazards associated with servicing high-voltage vacuum tube equipment.

The ULTRA 06-800 MQ is classified as ISM (Industrial/Scientific/Medical) type of an equipment.

This manual is divided into three chapters and an appendix. Please refer to the following descriptions to help you locate the information you need.

Chapter	
1	Deals with precautionary details. Please read this if you are unfamiliar with the ULTRA 06-800 MQ or T&C Power Conversion's warranty procedures
2	Explains how to install and power up the system for the first time
3	Describes the operating details of the ULTRA 06-800 MQ
Appendix	Technical Specifications

Safety

1.1 Labels

Labels are provided to alert operating and service personnel to conditions that may cause personal injury or damage to the equipment from misuse or abuse. Please read the labels and understand their meaning.

1.1.1 Important Operating or Maintenance Caution



Definition: Attention, consult accompanying document

The exclamation point within a triangle is to alert the user, operator, or service personnel to the presence of important operating and/or maintenance instructions in the User's Manual.

1.1.2 Shock Hazard Warning



Definition: Caution, risk of electric shock

The lightning bolt within a triangle is to alert the user, operator, or service personnel to the presence of unprotected voltage points within the enclosure of sufficient magnitude to cause dangerous electric shock.

Only authorised service personnel with the schematic diagram and knowledge of the voltages within the equipment shall remove covers or panels bearing this symbol.

1.1.3 CAUTION WARNING

Do not operate this amplifier with the cover removed. Lethal voltages are present beneath the cover. The cover protects against **Electrical Shock** due to AC line voltage, high RF potential in the hundreds of Volts at the output transformer, coupler and output connections. Also the DC supplies produce high voltages in the conversion process and are capable of producing more than 25 Amps of current at nominal output voltage. The cover is an integral part of the air ducting system that keeps components cool. Without the cover in place, insufficient air flows between and around the two DC power supplies causing overheating of the internal components.

Always connect the load to the RF output connector before connecting the RF input to the amplifier. This will ensure that high voltage at the center pin of the output BNC connector will not be exposed. Take care not to interchange the input and output cables.

Be sure the chassis is grounded to a reliable earth ground using the grounding stud provided on the rear panel. In addition, be sure the grounding wire remains connected securely between the cover of the chassis and the base of the chassis.

1.1.4 AC INPUT

Alternating current input

Definition: AC Input ratings for operation

100 to 120 VAC \pm 10%, 50 to 60 Hz 10A

200 to 240 VAC \pm 10%, 50 to 60 Hz, 5 A

1.1.5 EXT RF IN

Definition: RF Input

The EXT RF IN symbol identifies the signal input port for the user, operator, or service personnel.

1.1.6 RF OUT

Definition: RF Output

The RF OUT symbol identifies the signal output port for the user, operator, or service personnel.



CAUTION!

RF Output voltage up to 450 V p-p,

From 20 to 1000 kHz may be present

At this amplifier output!

**Take precaution. Do NOT touch connector
When operating!**

1.1.7 BLANKING

Definition: Blanking

BLANKING is available via the DB15 connector on the rear panel. Pin 14 can be used to identify the TTL Compatible signal input for the user, operator, or service personnel.

NOTE! Not available through BNC connector on this model. Function through Pin 14 of DB15 connector only.

1.1.8 Miscellaneous Symbols

AC Power Toggle Switch



AC Power Off Symbol

Figure 3

Definition: AC Off (power: disconnection from the AC mains)

The Off symbol on the AC Power Switch identifies the functional configuration of the toggle switch (when the switch handle is pointing towards “AC OFF”) for the user, operator, or service personnel.



AC Power On Symbol

Figure 4

Definition: AC On (power: connection to the AC mains)

The On symbol, next to the AC Power Switch identifies the functional configuration of the toggle switch (when the switch handle is pointing towards “AC ON”) for the user, operator, or service personnel.

1.1.9 Service

T&C POWER CONVERSION, INC. is responsible for safety and performance of the equipment only if:



- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by authorised personnel.



- The electrical installation is made in accordance with User’s Manual and the room in which the equipment is installed complies with the environmental requirements,
- The equipment is used strictly in accordance with instructions in this manual or associated test documents.

1.1.10 Name plate

The ULTRA 06-800 MQ can be identified by a name plate on its top right rear panel that contains the following information.

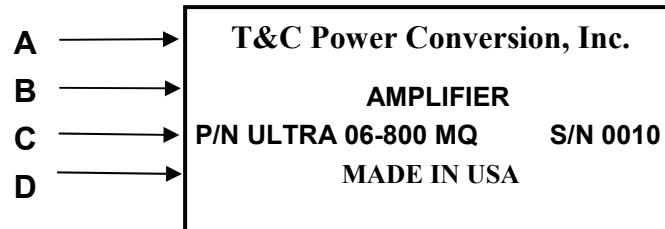


Figure 5 Name plate

A. MANUFACTURER

T&C POWER CONVERSION, INC
110 Halstead Street, Suite #7
Rochester, NY 14610
USA

B. TYPE OF EQUIPMENT

This line holds the description of what the equipment is intended to be used for.

C. MODEL NUMBER

The assembly number which uniquely identifies product configuration is entered and a number which is sequentially assigned as the product is manufactured.

D. S/N

This line contains the country in which the product is manufactured.

System Installation



Note: Chapter 2 is for "Authorized Personnel" only, qualified in electrical installation

2.1 Initial Installation

2.1.1 Mechanical Inspection

If damage to the shipping carton is evident, request the carrier's agent be present when the unit is unpacked. Check for equipment damage and inspect the cabinet and panels for dents and scratches.

2.1.2 Claim for Damage

Please notify T&C Power Conversion, Inc. directly or your authorized T&C representative if the product is mechanically damaged or fails to meet specifications upon receipt. Retain the shipping carton and packing material for the carrier's inspection as well as for subsequent use to return the unit should this become necessary.

2.1.3 Packaging for Reshipment

Contact Your T&C sales and support office to coordinate the return of the unit. Whenever possible, the original shipping carton and packing material should be used for reshipment. If the original packing material is not available, package the item in a suitable substitute that meets industry standards of safe packaging standards. Use a strong shipping container. If a cardboard carton is used, it should be at least 200 lbs. tested material.

Use shock-absorbing material around all sides of the instrument to provide a firm cushion and to prevent movement inside the container wall on each side. Protect the front panel by means of cardboard spacers inserted between the front panel and the shipping carton. Make sure that the instrument cannot move in the container during shipping. Seal the carton with a acceptable industry grade of shipping tape and mark the container:

FRAGILE DELICATE INSTRUMENT

2.2 Installation Requirements

The ULTRA 06-800 MQ is designed for bench or rack mount operation. To guarantee the best performance, make sure there is adequate clearance for the entrance of cooling air to the front of the unit as well as for the exhaust out the back of the unit. (6"min.)

The ULTRA 06-800 MQ is set for operation with a single phase, 50 to 60 Hz AC Line of 100-120 VAC, 200 to 240VAC. Unit does not require any special internal adjustments if operated within the specified voltage range.

Please check the following items before applying AC power to the ULTRA 06-800 MQ:

- *Check Unit for any physical damage that could affect safety.*
- *Ensure the AC power cord is an IEC type with a 15 Amp or greater rating with a proper safety ground connection.*
- *Ensure the AC power cord is plugged into a properly grounded outlet..*
- *Connect ULTRA 06-800 MQ chassis to a proper safety ground. (Use Grounding Stud on rear panel) A green insulated 14-gauge wire or heavier less than 50 feet in length is recommended.*



2.3 Cooling and Ventilation

The ULTRA 06-800 MQ is protected against damage caused by lack of air flow. If inadequate air flow causes the temperature to rise over the temperature threshold, the amplifier senses and triggers an OVERHEAT fault, and RF power is automatically shut off. RF power will be restored automatically after the temperature falls below the threshold.

For proper ventilation, adequate clearance of at least 6 inches (~150 mm) should be provided for the cool air intake on the front panel of the amplifier. The ports located on the rear panel of the unit, should have at least 6 inches (~150 mm) of clearance and also be free from obstruction. To reduce potential overheating, do not allow exhausted warm air from the back to re-circulate to the front of the unit.

Maximum Ambient Temperature: 40°C

2.4 Power Line Voltage

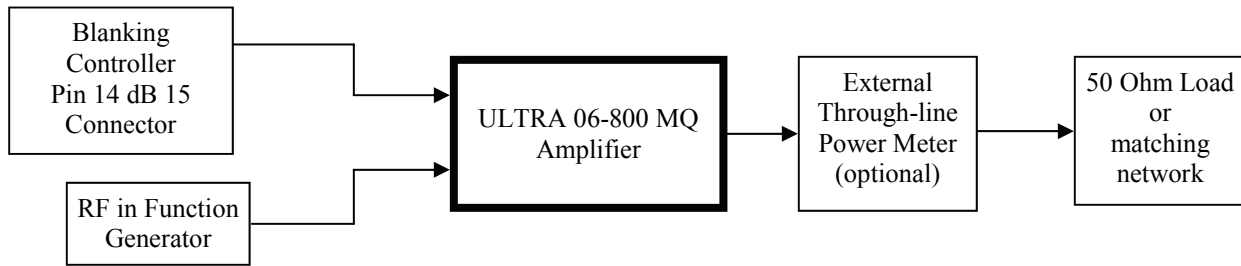
The ULTRA 06-800 MQ is designed for operation from a single-phase, 3-wire with electrical network with the following parameters:

100 to 120 VAC, $\pm 10\%$

200 to 240 VAC, $\pm 10\%$

50-60 Hz

2.5 System Interconnection



(For operation information refer to Chapter 3)

2.6 Initial Turn-On Procedure

The following procedure outlines a simple test to check for proper operation of the ULTRA 06-800 MQ amplifier. It is assumed that the amplifier is already connected to an appropriate AC power source, and a suitable 50 Ohm dummy load or matching network (as indicated in the diagram above).

Turn ON the main AC switch from the back panel.

1. The Green AC ON LED should come on, as well as the fans.
2. Apply signal -6dBm , 850 kHz to the RF input of the amplifier and observe the power with External Through-line Power Meter (100W \pm 20W—depends on the temperature).
3. Apply TTL high voltage to the BLANKING pin 14 on DB15 connector.
The output power should be 0W.
4. This concludes the test. The unit operates properly and ready for use.

Note:

- Forward power can be monitored on pin 3 of DB15 Connector.
- Reverse (Reflected) power can be monitored on pin 5 of DB15 Connector.
- Power Load power can be monitored on pin 11 of DB15 Connector.

$$\text{LOAD} = (\text{FWD} - \text{REV}) [\text{W}]$$

- Scale for all power monitoring 1Vdc=100W.

Operation

Chapter 3

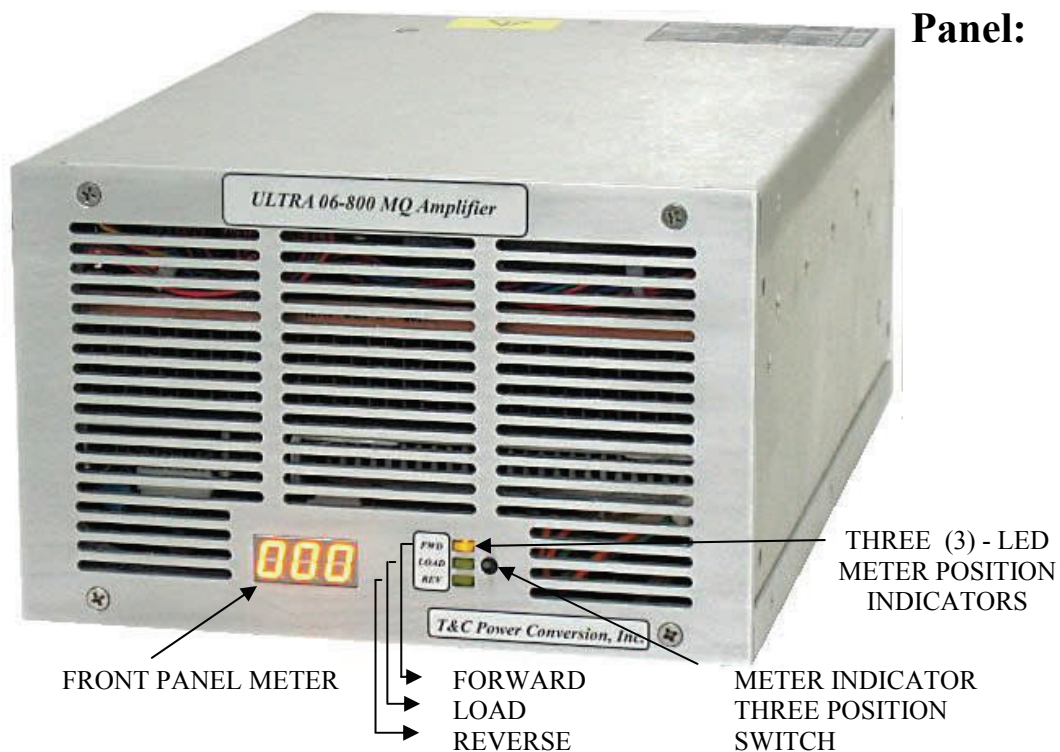
The ULTRA 06-800 MQ is a rack mounted laboratory amplifier with simple to use features. On the bottom center of the rear panel is the AC line power ON / OFF switch. This heavy-duty double pole switch connects and disconnects the hot (AC) and neutral power line connections. The amplifier is shipped from the factory capable of 100-120 VAC, 200 - 240 VAC, 50-60 Hz operation.

The amplifier has “BNC” coaxial connectors on the rear panel for easy connection of the Ext RF signal source, RF Output to the load, and for blanking (optional). The user must make sure that connecting cables to the output are also a 50-Ohm type to keep the output power from being reflected back to the amplifier due to cable impedance mismatch. High quality RF cable for connection to the load is highly recommended.

Forward and Reversed RF power is continuously measured so the power will not exceed set forward and reverse limits.

A wide area of ventilating holes serve as the air intake for cooling the amplifier. **The air intake must be kept clear of obstructions**, as should the fan outflow at the rear of the unit. Allow a minimum of 6” clearance around all sides of the chassis. The fan’s speed is proportional to the temperature rise of the internal heat sink. There is also a high temperature cut out switch that shuts down the amplifier if the heat sink gets too hot. This can happen; for example, if the intake airflow is obstructed.

3.1 Front



Rear Panel:

3.2 RF Input: The isolated base BNC connector for RF input is located at the top left of the rear panel and labeled EXT RF IN. Apply signal from the RF or Function Generator using 50 Ohm type cable. Input drive should be within specification.

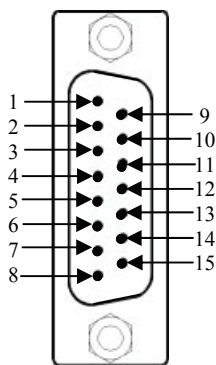
3.3 Blanking: This function is available through Pin 14 on DB15 Remote connector. No connection on this port or a Low TTL level to the shield will enable the RF Output. The normal open condition allows normal operation. The High TTL level will disable output. Typical T off time < 3 μs, T on time < 5 μs. Great for BURST. Please contact the factory for special applications and uses.

3.4 RF Output: The BNC connector labeled for RF output is located at the top right of the rear panel and labeled RF OUT. Connect the load to RF OUT using a high quality 50 Ohm type cable.

3.5 Remote Operation: These additional features are provided by use of the Remote Control:

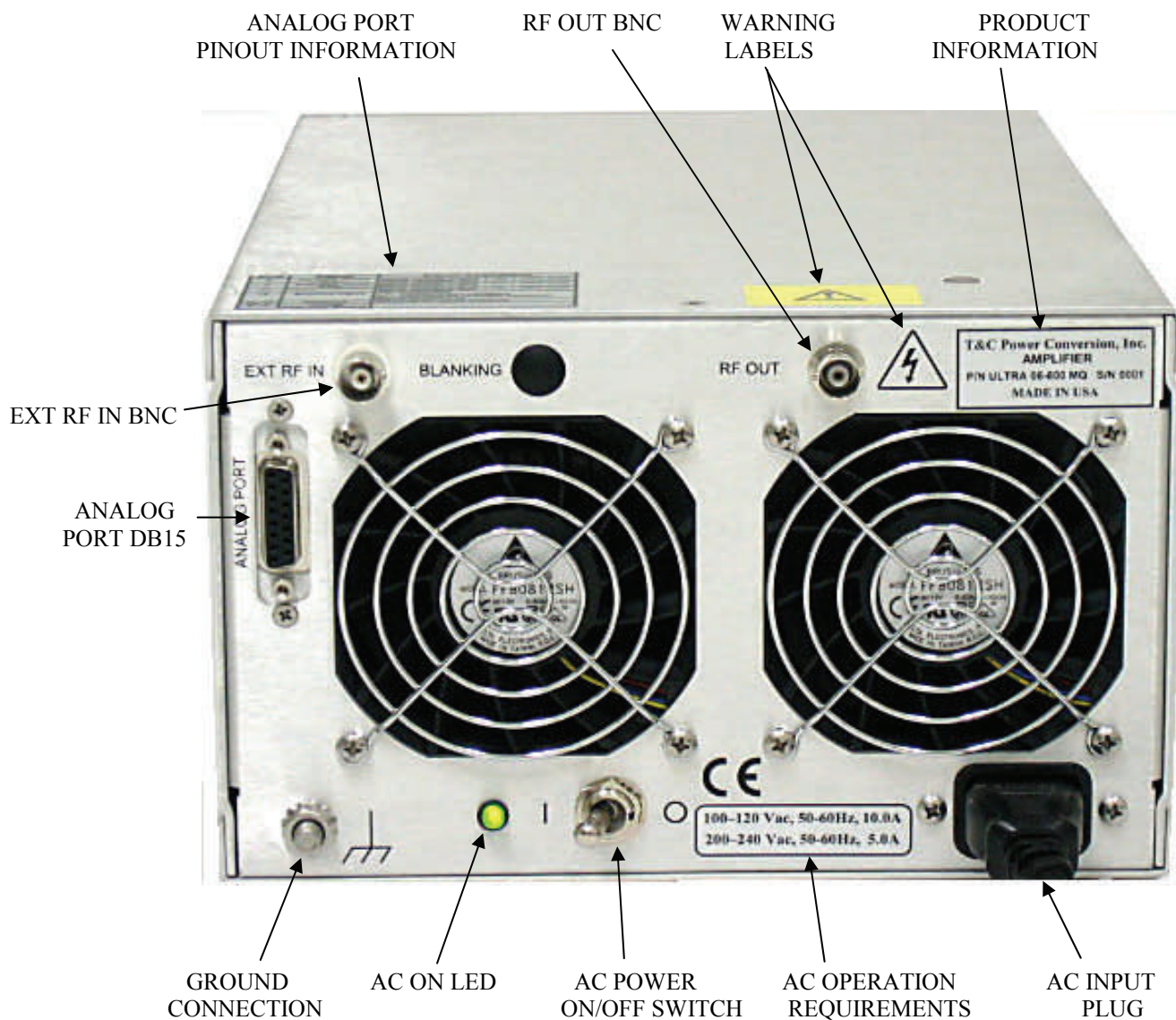
- Power Leveling within +/- 0.5 dB. From 550 kHz to 950 kHz min. **NOTE!** Not available on this model. Optional!
- Remote power level adjustment and control. **NOTE!** Not available on this model. Optional!
- Remote access to forward (FWD), load (LOAD = FWD -REV) and reverse (REV) power level information.

3.6 Rear Panel Analog and Digital Communication Port, DB-15 Connector Pin Out Diagram:



Pin#	Signal	Signal Description
3	Forward Power Meter	Linear voltage output, 1 Vdc = 100W scale Signal Direction: OUT
5	Reflected Power Meter	Linear voltage output, 1 Vdc = 100W scale Signal Direction: OUT
11	Power Load Meter	Linear voltage output, 1 Vdc = 100W scale Signal Direction: OUT
14	Blanking Signal	TTL Compatible Lo— uninterrupted operation Hi— interrupts RF at output connector Note: nothing connected—no RF at output Signal Direction: IN
12, 13	Reserved	Reserved for safety interlock
6, 15	Analog Reference Ground	

3.7 Rear Panel:



ULTRA 06-800 MQ Specifications

Class Of Operation

Class B

Frequency Of Operation

550 kHz to 950 kHz

RF Power Output

50 Ohm load:
Up to 400W

Any load:

Up to 250W, continuous operation.

Gain

55 dB @ 350W / 0.85 MHz set point
±0.75 dB 550 kHz to 950 kHz

RF Input Drive

- 15 dBm to 0 dBm typical range,
Up to + 3 dBm max.

Input Drive Source

Signal or function generator, analog
computer input capable of up to 2
Vp-p @ 50 Ohm

Input and Output Impedance

50 Ohm
(Optimized for 50 Ohm !)

Input VSWR

2:1 max

Output VSWR

3:1 max

Output VSWR Protection

80 W max reflected power limit

Harmonic Level

350W, 750kHz—950 kHz:
Better than -35 dBc for 3-rd harmonic,
any other better than -28dBc.
350W, 550kHz—750 kHz:
Better than -25 dBc for 3-rd harmonic,
any other better than -17dBc.

Spurious Output

- 50 dBc equivalent noise level
generated by internal circuits

Output Blanking / Pulsing

ULTRA 06-800 MQ (Pin 14, DB15)
amplifier offers blanking of the output
signal for minimum noise RF
spectrum.

"T off" time < 3 μ s,
"T on" time < 5 μ s

TTL High - RF Output Blanked,
TTL Low - RF Output present, nor-
mal operation.

RF Connectors

BNC Female: Back Panel

Third Order Intercept

+57 dBm

AC Input Current (RMS)

RF Out max 450W:
100-120 V ac, 50-60 Hz, 10 A
120 V ac, 8.2 A
200-240 V ac, 50-60 Hz, 5 A
230 V ac, 4.5 A

Panels

Front: LED display, display switch,
LED, air intake. Marking: company
name, product number.

Back: air exhaust. Hardware location
for RF IN, RF OUT, Analog DB15,
AC Input connectors, AC Switch and
Indicator, Fan Guard, Safety Ground
Stud. Markings: safety labels, GND
and AC Line Table, Serial Number
and Remote Control Label.

AC Power Connection

IEC Standard Power Entry followed
RFI filter.

Filter range 0.1 to 30 MHz mini-
mum

Cooling

Forced air, temperature controlled.

Dimensions

H135mm x W211mm x L368mm
+/- 2 mm

H 5.25" x W 8.3" x L 13.5"
+/- 0.1"

Weight

12.7 kg (28 lbs.)

Mounting

1/2 Rack Mount Unit.

Environmental conditions

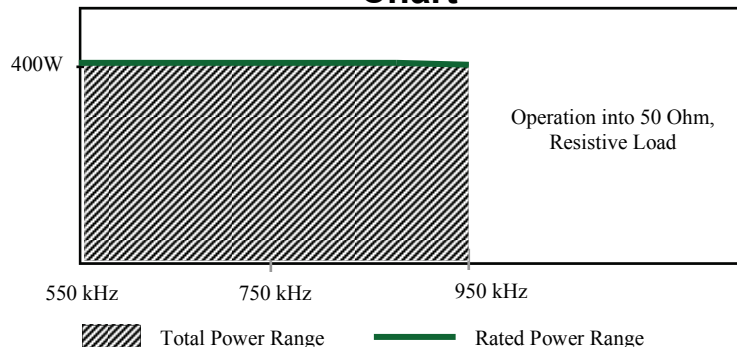
Temp.: 0° to 40° C ambient

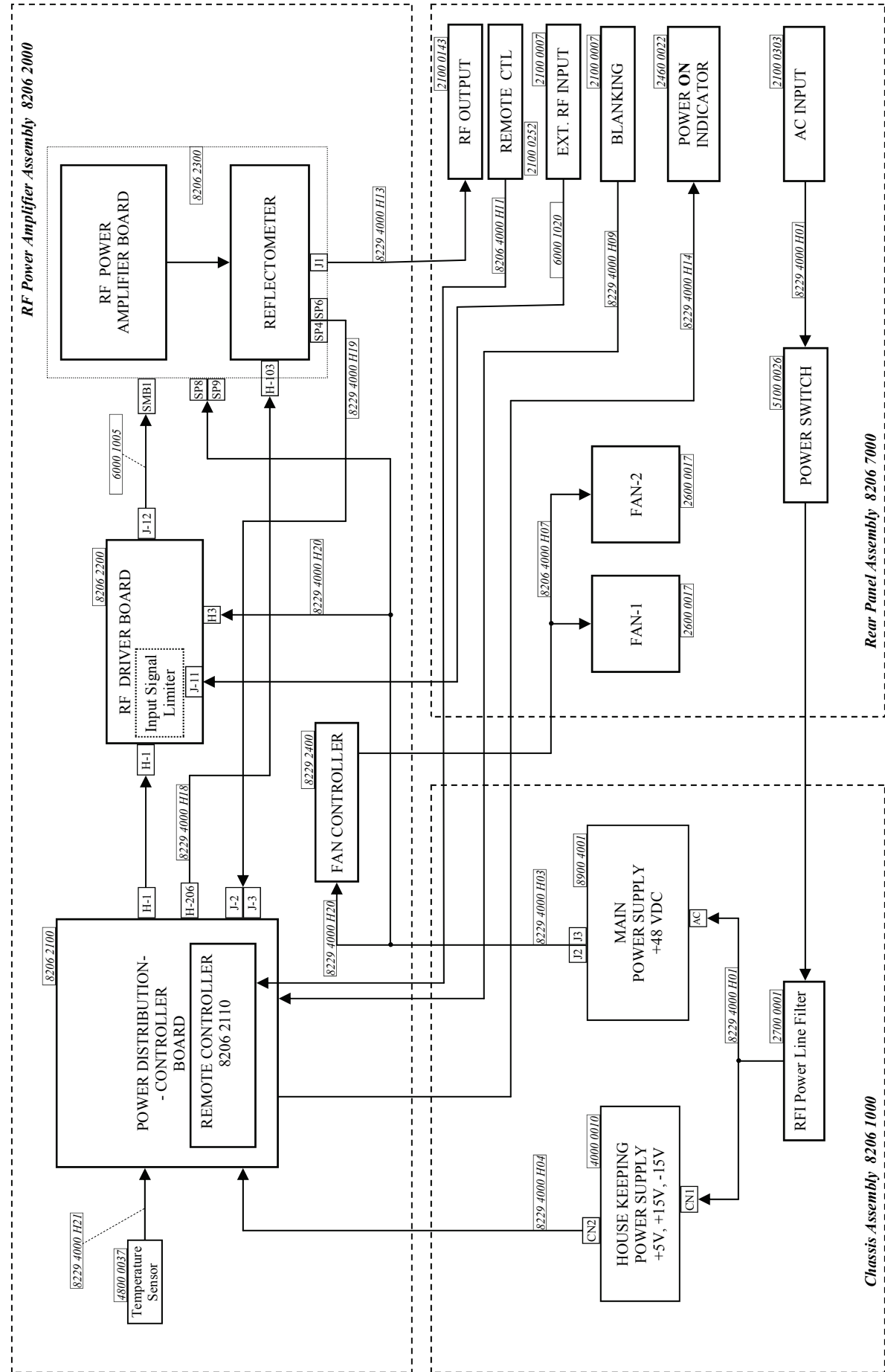
Humidity: 80%

Equipment intended for ISM applica-
tions in laboratory and light industrial
environment.

Designed and tested to meet
EN / UL 61010-1:2001
Self Certified

**ULTRA 06-800 MQ Performance
Chart**



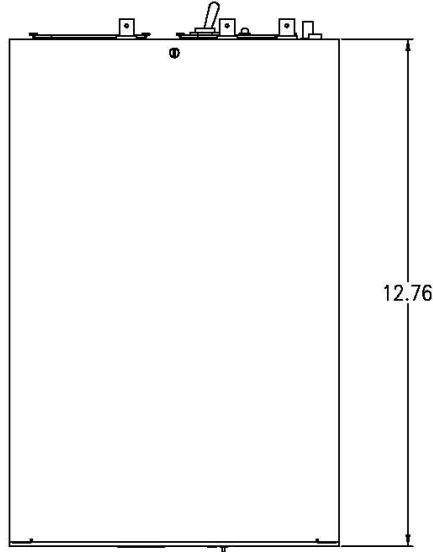


ULTRA 06-800 MQ FUNCTIONAL BLOCK DIAGRAM		T&C Power Conversion, Inc. 110 Halstead Street Rochester, NY, 14610 USA	
		DRAWN ARTUR ZURKOWSKI CHECKED ALEX SULIK APPROVED TOMASZ MOKRZAN	10.23.2006
		REV. A	SHEET 1 OF 1
		DOCUMENT # 9000 0098 02	

TOP VIEW

SIDE VIEW

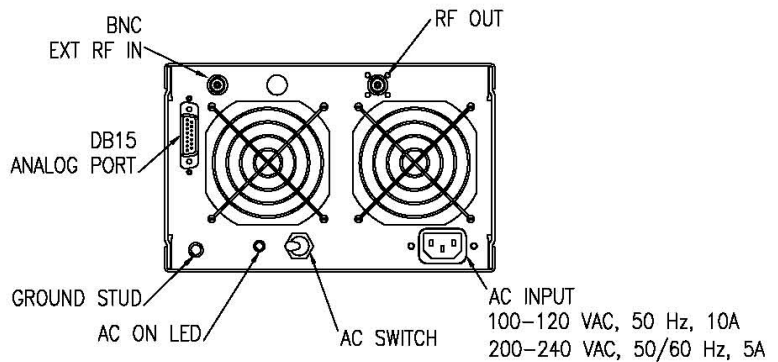
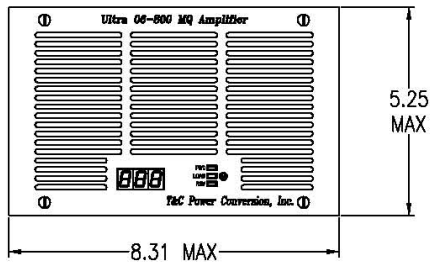
MIN 6" [150] CLEARANCE FOR PROPER AIR EXHAUST



MIN 6" [150] CLEARANCE FOR PROPER AIR INTAKE

FRONT PANEL

BACK PANEL

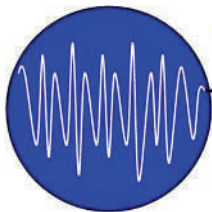


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MOUNTING AND OUTLINE
06-800 MQ

T&C Power Conversion, Inc.
110 Halstead Street, Suite 7, Rochester, NY 14610

APPROVALS	DATE	SIZE Δ		DWG. NO.	REV.
DRAWN RMS	11/22/10	9100 0220 92		A	
CHECKED		SCALE	NONE	SHEET	1 OF 1
ISSUED					



T&C Power Conversion, Inc.

110 Halstead Street
Rochester, New York 14610 USA
e-mail: sales@TCPowerConversion.com

Phone: 1 585 482 5551
Fax: 1 585 482 8487

EC Declaration of Conformity
according to 98/37/EC
according to EC EMC Directive 89/336/EEC
And according to EC Low Voltage Directive 73/23/EEC

We, *T&C Power Conversion, Inc.*

of *110 Halstead Street, # 7*
Rochester, NY 14610, USA

herewith declare, that the following product complies with the appropriate basic safety and health requirements of the EC Directive based on its design and type, as brought into circulation by us. In case of alteration of the product, not agreed upon by us, this declaration will lose its validity.

Product Description: RF Amplifier

Model Number: Ultra 06-800 MQ

Applicable EC Directive(s): 73/23/EEC - The Low Voltage Directive
and its amending directives

89/336/EEC - The Electromagnetic Compatibility Directive
and its amending directives

Applicable Harmonized Standards: EN 61010-1:2001 (2nd Edition)
EN 61326-1: 1997 + A1:1998 +A2:2001 +A3:2003

Authorized Signature: Tomasz Mokrzan **Date:** 02/10/09

Name: Tomasz Mokrzan

Title of Signatory: General Manager

CE 09