T&C
Power Conversion

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Model AG 0313

13.56 MHz, 300 W
RF POWER SOURCE

OPERATION MANUAL

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AG 0313

13.56 MHz, 300 W RF POWER SOURCE

HIGH RF VOLTAGES 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 ISO 9001 Quality System principals.

Applicable EC Directives: **according to EC EMC Directive 2004/108/CE**
And according to EC Low Voltage Directive 2006/95/CE

Applicable Harmonized Standards: **UL IEC 61010-1 Edition 3.0 2010-6**

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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 specifications.
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:

- All information displayed on the LCD.
- 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:
www.tcpowerconversion.com/about/representatives.html

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	D	Format update to meet EN61010-1 requirements	01/14/05
	E	New package and new PA, controllers.	04/07/2008
	F	New controller, interface and functionality.	08/22/2011
	G	New functions added	03/16/2011
	H	Burst function added	07/02/12

	Name / Title	Signature	Date
Written By	Alexander Sulik/Engineer	*Alexander Sulik*	Jul.02, 2012
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INTRODUCTION

The T&C Power Conversion, Inc. Model AG 0313 13.56 MHz RF Power Source is a totally solid state, air cooled RF power source expressly designed for use in general ultrasonic and gas plasma applications. The RF Power Source utilizes conservatively rated solid state components and automatic power control circuitry to ensure reliable and continuous performance. Completely self-contained, the AG 0313 provides all of the control and monitoring functions needed in a state-of-the-art power generator, which will provide up to 300 W of continuous output into a 50 Ohm load.

The AG 0313 measures forward power, load power, reflected power, and the operating temperature of its power amplifier module. Should any of these parameters exceed a preset limit, the power control circuit will immediately limit the generator's RF power output so that the components always remain within safe operating limits.

The AG 0313 is equipped with a rear panel control interface. The standard T&C Power Conversion, Inc. A/D (see pages 22-24) in conjunction with the "Front Panel Main and SVC" screens, allows to control and monitor the generator through the use of Analog voltage control signals. The A/D Interface provides full control of the generator and allows for automated operation through the use of a computer at this port.

The AG 0313 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 AG 0313 RF Power Source. The unit's completely solid state design substantially reduces DC voltages which eliminates the hazards associated with servicing high-voltage vacuum tube equipment.

The AG 0313 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 AG 0313 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 AG 0313
Appendix	Technical Specifications

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Safety

Chapter 1

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 lighting 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 electrical 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 RF Power Source 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 15 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 N connector will not be exposed. Take care not to interchange the input and output cables.

Chassis Terminal

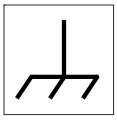
Be sure the chassis is grounded to a reliable earth ground using the grounding stud provided on the rear panel. In addition, be sure the grounding wire remains connected securely between the cover of the chassis and the base of the chassis.

1.1.4 AC INPUT – Alternating current input

Definition: AC Input ratings for operation

100-120 V ac, 50-60 Hz, 7.0 A
200-240 V ac, 50-60 Hz, 3.5 A

Chassis Terminal — For connection of AG 0313 to a proper safety ground



1.1.5 External RF IN (or CEX IN*)

Definition: RF Input (or CEX Input)

The External RF IN (CEX 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.

1.1.7 Miscellaneous Symbols

AC Power Rocker Switch

AC Power Off Symbol

Figure 3

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

The Off symbol on the AC Power Switch identifies the functional configuration of the rocker switch for the user, operator, or service personnel.

AC Power On Symbol

Figure 4

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

The On symbol, next to the AC Power Switch identifies the functional configuration of the rocker switch for the user, operator, or service personnel.

1.1.8 CEX OUT*

Definition: CEX Output

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

* for the models with CEX function

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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 the instructions in this manual or associated test documents.

1.1.9 Name plate

The AG 0313 can be identified by a name plate on its rear side panel that contains the following information.

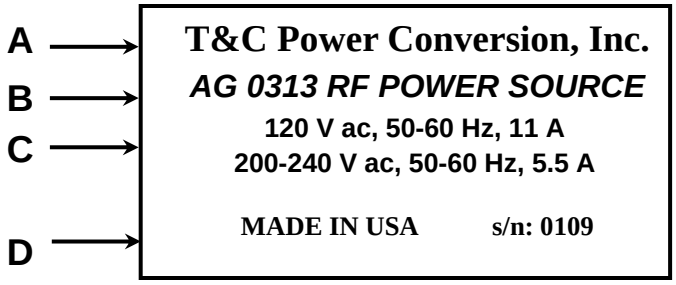

Figure 5 Name plate

A. MANUFACTURER

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

B. MODEL NUMBER / TYPE OF EQUIPMENT

The assembly number which uniquely identifies product configuration is entered on this line. This line holds the description of what the equipment is intended to be used for.

C. PRODUCT RATINGS

This line contains the product's rated voltages and currents.

D. COUNTRY OF ORIGIN & SERIAL NUMBER

This line contains the country of origin as well as a number which is sequentially assigned as the product is manufactured.

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Chapter 2

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 INSTRUMENTS

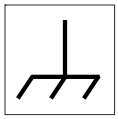
2.2 Installation Requirements

The AG 0313 is designed for bench or system 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" or ~150 mm. min).

The AG 0313 is set for operation with a single phase, 50—60 Hz AC Line of 120 or 200 - 240 V. The power supply switches automatically to the line voltage applied to the unit. 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 AG 0313:

- *Check Unit for any physical damage that could affect safety.*
- *Ensure the AC power cord is an IEC type with a 13 Amp or greater rating with a proper safety ground connection.*
- *The unit should be connected to an AC outlet that is easily accessible.*
- *Ensure the AC power cord is plugged into a properly grounded outlet..*
- *Connect AG 0313 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 AG 0313 is protected against damage caused by lack of air flow. If inadequate air flow causes the temperature to rise over the OVERHEAT threshold, the RF Power Source senses an OVERHEAT fault, and RF power is automatically shut off. RF power will be restored automatically after the temperature falls below 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/generator. 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 AG 0313 is designed for operation from a single-phase, 3-wire electrical network with the following parameters:

100-120 V ac, 50-60 Hz
or
200-240 V ac, 50-60 Hz

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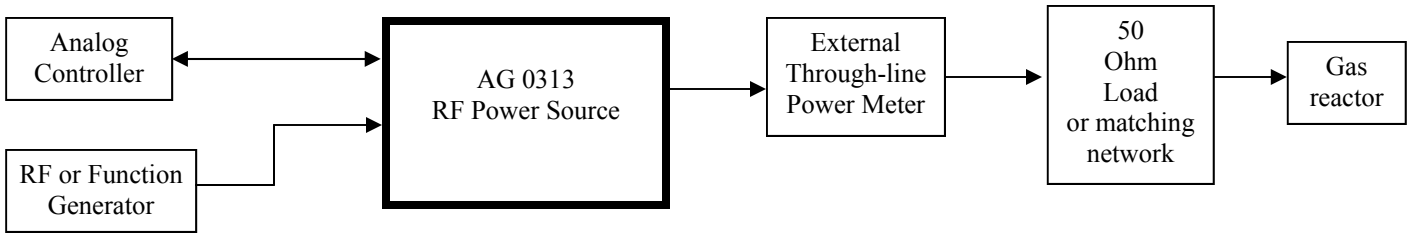
2.5 System Interconnection



(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 AG 0313 13.56 MHz RF Power Source. It is assumed that the RF Power Source is already connected to an appropriate AC power line, and a suitable 50 Ohm dummy load or matching network (as indicated in the diagram above).

Verify the AC Safety Interlock is Enabled (Pin 10 and 23 electrically shorted together for the units with requested safety interlock, see page 24).

Turn ON the main AC switch on the front panel.

1. The screen should flash the name of the manufacturer, firmware version before displaying the power parameters.
2. Verify that the status LEDs are as shown below. Each button below the display contains two functions. Active function is indicated by a lit LED.

3. Run the test. With 50 Ohm RF load connected, activate the RF Output ☼ON function and increase the SET FP (Requested FP Power) to 100W using Editor knob. The ACT FP (Forward Power) reading should be (100+/-1)W and the ACT RP (Reverse Power) should be 0W. Next increase the SET FP to 320W. The FP reading should now read approximately 300W and note the status of FWR LIMIT LED: it should be on. Decrease SET FP to 0W.
4. Disconnect the 50 Ohm RF Load from the output, increase the RP to 75W. Forward Power and Reverse Power readings should equal 70W. Note the status of the REV LIMIT LED: it should be on. When reducing below 110W, the REV LIMIT LED will be off.
5. Reduce SET FP to zero, and reconnect load.
6. This concludes the test. The unit is operating properly and ready for use.

Operation

Chapter 3

3.1 Introduction

The AG *0313* is a bench top or rack mount RF Power Supply with practical features. On the left end of the front panel is the **AC line** power ON / OFF switch. This switch activates heavy-duty double pole relay that connects and disconnects the hot and neutral power line connections. The amplifier is shipped from the factory internally wired for 100 - 120 V ac or 200 - 240 V ac. with PFC. The power supply switches automatically to the line voltage applied to the unit.

The green indicator LED AC ON shows that AC power is connected to the unit, the power switch is on and the DC power is available to the controllers. The user must make sure that connecting cables to the RF output are also the 50-Ohm type, to keep the output power from being reflected back to the amplifier due to cable impedance mismatch.

A wide area of ventilating slots serve as the air intake for ventilating the generator. Operation of the generator necessitates removal of the heat generated by the amplifying devices. ***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 heatsink gets too hot. This could happen; for example, if the intake airflow is obstructed or the ambient air temperature is too great.

There are three (3) ways to control the unit:

a) using the Front Panel's under screen buttons and Editor knob along with the screen MAIN and Service SVC selection menus. In that case, Front Panel MAIN menu selection LOC/REM field is set to LOC.

b) using the Analog and Digital Interface, A/D INTERFACE Port. For that, Front Panel MAIN menu, LOC/ REM field is set to REM.

c) using GUI. Computer with installed program must be connected to the unit via USB port.

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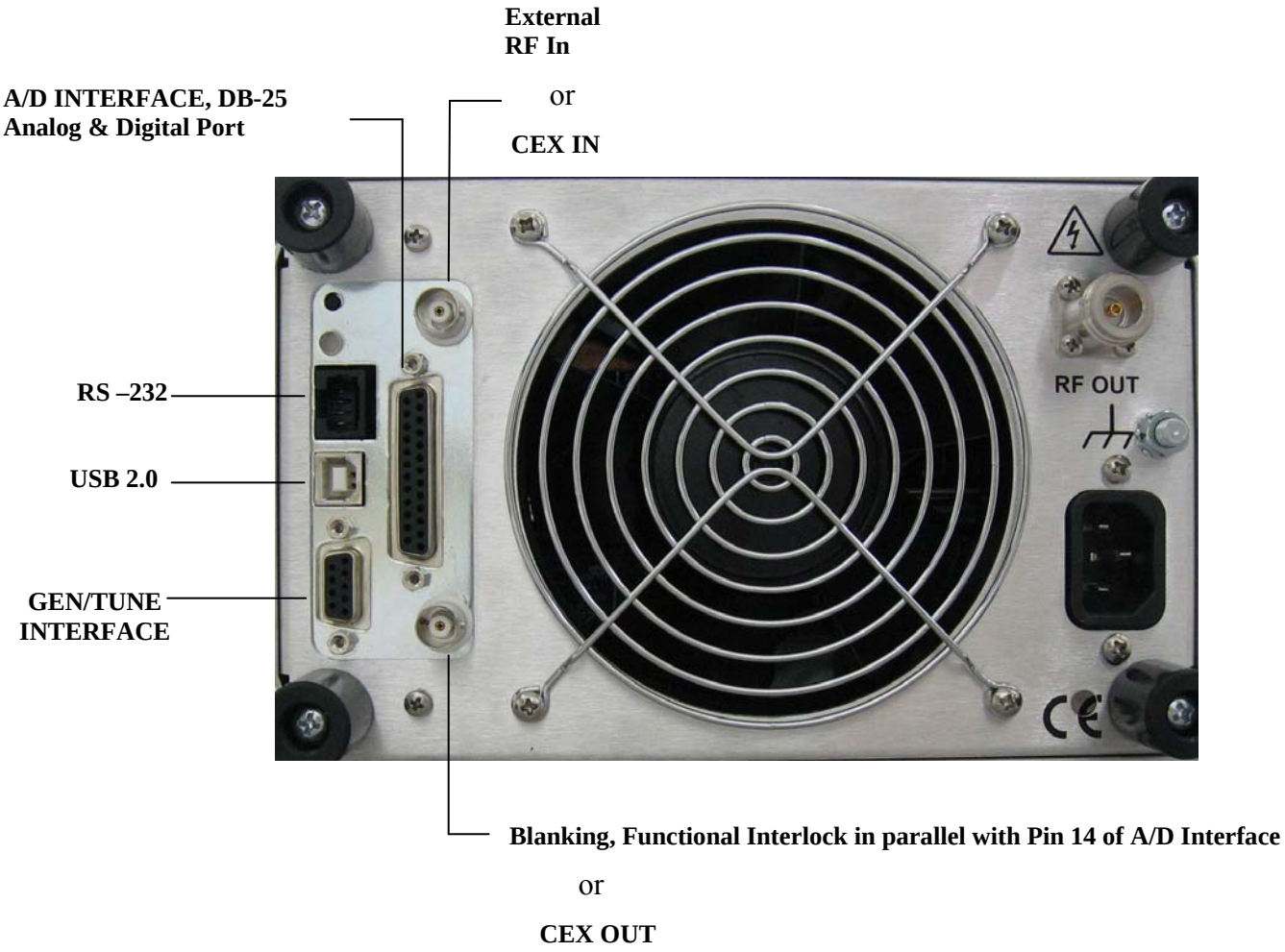
3.2 GUI Operation:

Graphic User Interface operation is available on this model for operation via USB port.

For proper operation of the GUI close communication and than turn of the unit.

The digital communication port has RS 232 connection for generator programming only.



3.3 Rear Panel Control Interface, A/D INTERFACE:

Description: These additional features are provided by use of the Remote Control on A/D INTERFACE, DB-25 connector:

- *Power level adjustment and control.*
- *Access to forward, load, and reverse power level information.*
- *Status flags indicating power on, thermal limit, reverse power limit.*

Operation: The user must make an electrical connection between pins 10 and 23 to enable the AC Safety Interlock. To enable operation (RF ON Switch), a control signal TTL Hi must be applied to pin 8 of the rear panel connection. To control the unit's RF power level, pin 5 must be provided with a DC voltage proportional to the RF power level desired. Refer to the table of panel connector pin descriptions on page 23 of this manual.

The rear panel connector's socket pins are numbered 1 to 13 reading from bottom to top across the top row. Returning to the bottom, the bottom row is 14 to 25.

Blanking (Functional Interlock): The connector also has a blanking input on Pin 14 intended as Functional Interlock. TTL Hi level on Pin 14 in relation to Pin 18, 19, 21 (Analog Ground) will interrupt the RF Output. The normal open condition allows normal operation. Pulsing can be accomplished by maintaining a positive TTL level on Pin 14 and pulsing it to ground and back to positive. The RF Output will then pulse in relationship to that DC pulse. Please contact the factory for special applications and uses.
NOTE: Central pin of BNC connector for BLANKING on the rear panel has the same function as to the pin 14.
NOTE: Pin 14 must never go negative in relation to Pin 18, 19, 21.

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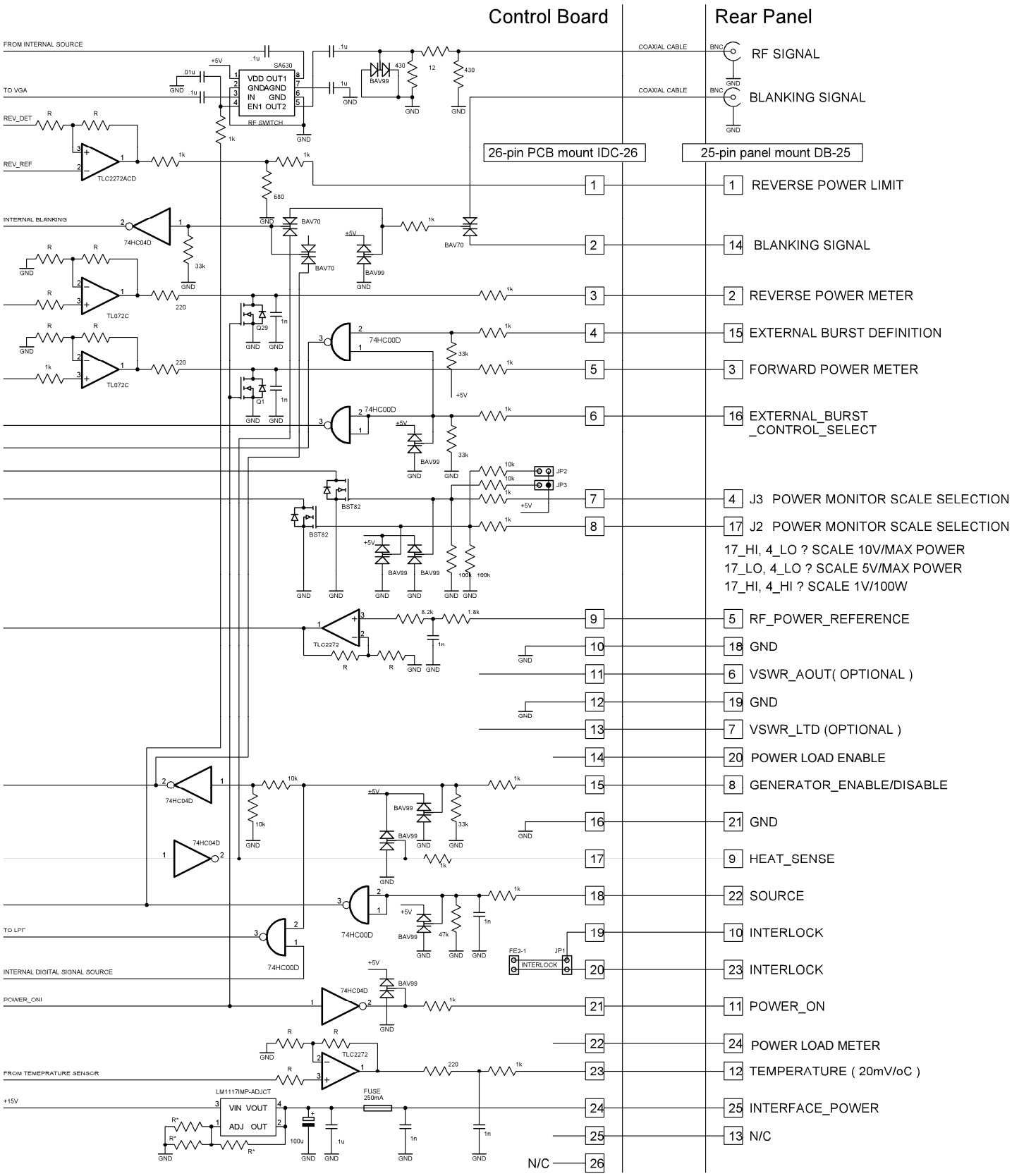

25 - pin Analog Remote Interface Schematic

Analog Communication Port DB-25 Connection:

Pin #	Name of Signal	Signal Description
1	REV LIMIT - This output indicates that output power level was automatically reduced under load mismatch conditions.	TTL Compatible Hi = RF Out Limit, Lo = Normal operating condition at low VSWR. Signal Direction: **OUT**
2	REVERSE POWER	Refer to Front Panel Service Screen SVC for scale settings. 5V default scale. Signal Direction: **OUT** **NOTE:** Available from SVC 5V or 10V=nominal power [W].
3	FORWARD POWER	Refer to Front Panel Service Screen SVC for scale settings. 5V default scale. Signal Direction: **OUT** **NOTE:** Available from SVC 5V or 10V=nominal power [W].
4, 17	N/A	
5	RF PWR REF	Refer to Front Panel Service Screen SVC for scale settings. 5V default scale. Signal Direction: **IN** Part of AGC in default setting. **NOTE:** Available from SVC 5V or 10V=nominal power [W].
8	GENERATOR ENABLE / DISABLE **(RF ON/OFF)**	TTL Compatible; Hi = RF Output on, Lo = RF Output off, Signal Direction: **IN** **NOTE!** By default unit operates in AGC Mode.
9	HEAT SENSE - This output indicates that the unit has become too hot.	TTL Compatible; Hi = Fault/Amp disable, Lo = amplifier enabled Signal Direction: **OUT**
10, 23	INTERLOCK 1, (Safety Interlock, disconnects AC Power Line from Main Power Supply)	CONNECTED: RF Power Source enabled (ready for RF OUT) OPEN: unit disabled (no RF OUT will generated) Signal Direction: **IN** NOTE: optional on special request. Default setting - disable by jumper on internal board, Enabled by removing jumper. Please contact factory for that option
11	POWER ON: DC power applied to control circuit; indirect meaning AC is ON.	TTL Compatible Hi = Power ON, Lo = Power OFF Signal Direction: **OUT**
12	TEMPERATURE MONITORING	20 mV/C Signal Direction: **OUT**
14	INTERLOCK 2, (Functional Interlock, by electronic means, disconnects RF Drive from Power Converter)	TTL Compatible Hi = interrupts RF at output connector, Lo = uninterrupted operation. Signal Direction: **IN**
15	EXTERNAL BURST - Defines Pulse Time and Width input.	TTL compatible input: Hi - Burst RF Output Lo - Burst RF Off
16	EXTERNAL BURST CONTROL SELECT	TTL compatible input: Hi - RF External Burst Ready Lo - No Signal or Burst Off **NOTE!** Amplitude of the output is defined by % settings on the front panel.
20	N/A	
18, 19, 21	ANALOG GROUND (BLANKING AND BURST RETURN)	Reference for other signals
22	N/A	
24	POWER LOAD METER	Refer to Front Panel Service Screen SVC for scale settings. 5V default scale. Signal Direction: **OUT** **NOTE:** Available from SVC 5V or 10V=nominal power [W].
25	INTERFACE POWER	12 V dc (250 mA, overload protected) Other levels of 5V and 10 V available! Please contact factory. Signal Direction: **OUT**

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3.4 Front Panel Controls and Display:

Front Panel Display with no connection to
AIT 600 Automatic Impedance Tuner.

Front Panel Display with connection to
AIT 600 Automatic Impedance Tuner.

3.4.1 Front Panel Display:

The Front display is designed and offers two independent screens “Main Screen” and “Service Screen”. Upon AC turn-on, the display will automatically display the “Main Screen”. To change the screen to the “Service Screen” the operator must turn the Editor Knob until the “MAIN” field is highlighted, then push the Editor Knob in until the “MAIN” flashes and rotate the knob to select either “Main” or “Service” screens. Push the Editor Knob in to chose the desired field.

3.4.2 Front Panel Control Switches:

A.) **RF OUTPUT:** Selection of RF Power On or OFF
B.) **TUNER:** Selection of either Load Capacitor positions or Tune Capacitor positions.
C.) **LEVELING:** Selection of FP (Forward Power) or LP (Load Power) Display Setup Controls
D.) **SOURCE:** Selection of Internal Oscillator Drive or External Drive Source.

3.4.3 EDITOR knob:

It is used to select the desired power level the unit will deliver to the load. The knob has OK button, it is used for scrolling between the fields on “Main” and “SVC” screens and new values.
By pressing the Knob activates the chosen field.

3.4.4 EDIT POWER:

FWD: Set desired Forward Power when adjusting the EDITOR knob.
LOAD: Set desired Load Power when adjusting the EDITOR knob. Load power is the power which is delivered to the load and it equals to the difference between Forward Power and Reverse Power.

3.4.5 SOURCE:

INT: Unit is set for operation from the internal oscillator. The frequency of operation is 13.56 MHz.
EXT: Unit is set for operation from external signal generator. Connect the signal generator to the External RF In connector. Use specifications to set the desired frequency of operation and the power level from the signal generator. **NOTE: In order to select source, the RF OUT must be in OFF.**

3.4.6 Main Display Screen and Switch Panel Operation:

When the unit is first turned on, the "Main Screen" will appear on the display and the switch controls will be illuminated as follows:

A.) **RF OUT** will be illuminate in the OFF position
B.) **TUNER** positions are OFF
C.) **LEVELING** will illuminated in the Forward Power "FP" position
D.) **SOURCE** will be illuminated in the Internal "INT" position

3.4.7 Main Screen Forward Power Setup (Displayed with AIT 600 Tuner Connection):

Upon turn-on of the AC power, the "Main Screen" will appear as illustrated above with a highlighted area in the RF Power "Watts" section. To setup the operating parameters within this section, the operator must follow the following procedure.

A.) The field is flashing and ready to accept new values.
B.) At this time the operator must adjust the "EDITOR KNOB" clockwise or counter clockwise to select the desired level of RF Power.
C.) When the desired level is obtained, push the "EDITOR KNOB" in to lock the Forward Power Level into the RF Generator's microprocessor.
D.) To begin the process, push the "RF OUT" switch to the "ON" position to turn on the RF Power.

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3.4.8 Main Screen Tuner MODE Setup Positions (Displayed with AIT 600 Tuner Connection):

If the Tuner is detected on the back panel of GEN/TUNE Interface, Pin 1=+7.5V, the screen will be as presented below. For manual control of Tuner's Capacitors positions, select Tuner "M TUNE" mode. NOTE! "M TUNE" -Manual Control Tuner Settings, "ATUNE" -Automatic Tuner Operation.
In "M TUNE" mode, TUNER option of the switch will became active and LOAD or TUNE selection available by toggling the membrane switch. Position of the selected capacitor in scale of 0 to 100% can be set then by rotating EDITOR.
By selecting ATUNE, Automatic Tuner Operation, TUNER manual settings option will be disabled.

"A" (Automatic) Tuner Mode

The operator has the ability to select between Automatic Tuner operation or Manual Tuner operation. This feature gives the operator the ability to set the capacitor at known positions within it's range. Within the "Main Screen" as illustrated above with the highlighted area in the "TUNE" section over the "A" (Automatic Mode), the operator can select between Automatic or Manual operation. To setup the operating parameters within this section, the operator must perform the following procedure to select the mode of operation.

A.) Push in the "EDITOR KNOB" located on the right side of the display and the "A" (Automatic) will begin to flash indicating that it is ready to adjust the section to the desired Tuner operational parameter "A" (Automatic) or "M" (Manual) operation.
B.) At this time the operator must adjust the "EDITOR KNOB" clockwise or counter clockwise to select the desired operation.
C.) When the desired selection is obtained, push the "EDITOR KNOB" in to lock your selection.
D.) In the "A" Automatic mode and to begin the RF process, push the "RF OUT" switch to the "ON" position to turn on the RF Power. If the mode selected is "M" Manual mode, continue to the next section below.

Quick Access and Exit to "M" Tune can is available by holding TUNER switch for ~ 1.5 seconds. The "A" Tune switches to "M" Tune and either "L" or "T" will be blinking to indicate the field is ready for adjustment. Quick will change between Load and Tune capacitors. Holding the membrane switch will take you back to previous function.

3.4.9 Main Screen Manual Tuner Setup Position:

To adjust the Load Position in "Manual" tune mode, Rotate the editor Knob until the highlighted area is over the "L" (LOAD) position and push in on the Editor Knob until the "L" flashes. Then rotate the Editor Knob until the highlighted area is over the Load value percentage. Once the Load value section is flashing, adjust the Editor Knob to the desired capacitor setting and press the Editor Knob to lock in your percentage required. You will notice the Tuner switch panel Load light will be illuminated when in the Load position.

3.4.10 Tuner Presets Screen Local Operation (Displayed with AIT 600 Connected):

The operator has the option to "Preset" Tuner positions by pushing and holding the Editor Knob in for 1.5 seconds from any screen. This automatically switches the cursor into a new screen "P Tune" and will high-light "STO" (store) or "REC" (recall). Using the Editor Knob the operator can scroll to "STO" or "REC" by rotating it clockwise or counter clockwise to the selected field and using the Editor Knob push in to OK your selection. After your selection is made the highlighted area will move into the number field. Using the Editor Knob, identify the desired tuner capacitor position with your selected two digit number such as 01, 02, 03 up to 10 positions and "STO" your selection by pushing in the Editor Knob to store your selection. To "REC" (recall) your selection, simply highlight the number field in the "REC" field and select your number by rotating the Editor Knob to the desired number you want to recall. Using the Editor Knob push in the knob to OK your selection. The program will automatically switch the tuner position to the recalled positions. After your selection, the program will return to the prior menu before your "Preset Tune" request.

If the operation in "P TUNE" was to RECall positions, after sending motors into these positions, controller will switch tuner function into "A TUNE", auto tuning, being ready for operation.

If the operator desires to leave the "P TUNE" screen before making any selection, push EDITOR KNOB for ~1.5s and the program will automatically return to the menu position before entering "P TUNE" screen.

NOTE! If your cursor is located in the "P TUNE" screen, the operator can only scroll within the "P TUNE" screen. The primary function of the "P TUNE" screen is to “STO” or “REC” inputs performed by the operator.

3.4.11 Main Screen Local Operation (Displayed with AIT 600 Tuner Connected):

The operator has the option to select either “LOC” (Local Panel Control) or “REM” (Remote Panel Control). To control the unit from the front panel the unit must be in “LOC” Control. To set the unit in “LOC” Control, rotate the Editor Knob so that the highlighted area is over the “LOC” section. Push in the Editor Knob until the “LOC” starts flashing. Rotate the editor Knob until the highlighted area is over the selected field and push in the Editor Knob to lock in your desired selection.

3.4.12 Main Screen Remote Operation (Displayed with AIT 600 Connected):

The operator has the option to select either "LOC" (Local Panel Control) or "REM" (Remote Panel Control).
To operate in the Remote position the operator must adjust the Editor Knob clockwise or counter clockwise until the "REM" field is highlighted. Push in the Editor Knob to lock your selection and operate the unit in Remote function.
Remote operation can only be selected with the "RF OUT" switch in the off position.

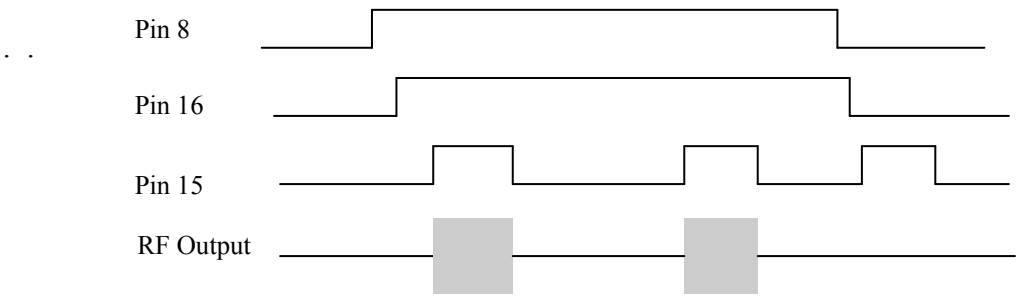
3.4.13 Main Screen Remote Operation for Burst operation:

or

The BURST operation is controlled via A/D Interface.
Pin 8: TTL HI activates RF ON output.
Pin 16: TTL HI activates BURST Mode.
Pin 15: TTL HI/LO will define your train of pulses.

Select REM on the main screen. Apply High TTL to the Pin 16 of A/D Interface on the back of the unit**.** The field used for setting the power on the front panel changes from [W] to a [%] scale. Nominal power level will correspond to 100%. Note: the scale is not linear. It is recommended that BURST operation will be first normalized for complete understanding of operation and amplitude settings related to [%] scale in your particular pulse scheme. The generator measuring system averages power samples of its output and only within some [ms] BURST will be close to real power displayed in FP and LOAD fields. Make a note of it! Rotate the editor knob until the "Set Forward Power" field is highlighted and press the knob to activate selection. The field will flash and is ready to accept new values [%]. Set the desired amplitude of the RF output following results of the system normalization. A/D Interface Pin 15 defines the BURST train. Applying High TTL to that pin will enable the RF output. Applying Low TTL will disable the RF output. See Burst diagram below.

Burst diagram



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3.4.14 Service Screen Operation (Displayed with AIT 600 Connected):

"SVC" Service Screen →

To enter the "SVC" Service screen the operator must adjust the Editor Knob clockwise or counter clockwise until the "MAIN" field is highlighted. Push in the Editor Knob until the "MAIN" is flashing and then adjust the Editor Knob clockwise or counter clockwise to select the "SVC" field. Push in the Editor Knob to lock in your selection and operate in the Service Screen. Note; remote operation can only be selected with the "RF OUT" switch in the off position.

3.4.15 Service Screen Selections:

Available selections in the "SVC" (Service Screen) are as follows:

1.) Forward Power Limit (WATTS)
2.) DCV Limit
3.) Meter Scale
    A.) 5 Volts = 300 Watts
    B.) 10 Volts = 300 Watts
4.) Ramp ON (Option "Y" (YES) or "N" (NO)
5.) Start Process with _____ number Watts
6.) Adjust Ramp Speed in seconds

Ramp Operation:

With selection of Ramp "Y", start/ wattage and step wattage /per seconds, return to "MAIN" SCREEN. To define your max and min RF OUT Levels with set "FP". The AG 0613 will immediately follow new set "FP" with the speed of W/S defined in "SVC" screen.
Upon AC Power cycling the unit will remember set parameters in service screen **"EXCEPT" RAMP - ALWAYS WILL BE "N".**

Note: When operating in the "SVC" service mode the front panel membrane switches are not operable.

To change the operational setting in the "SVC" service screen, adjust the Editor Knob until the highlight area is over the field desired and push in the Editor Knob until the position starts flashing. By adjust the Editor Knob clockwise or counter clockwise, set the value within the position and push in the Editor Knob to lock in your settings. When the operator is finished making his changes, scroll back to the "SVC" service position and push the Editor Knob so that "SVC" flashes. Using the Editor Knob, adjust the knob clockwise or counter clockwise until the "MAIN" screen appears and push the Editor Knob to return the the "MAIN" screen.

3.5 CEX IN Connector

Isolated base BNC female connector is used for common exciter input (CEX IN). The signal level should be in the range from 3Vp-p to 8Vp-p at 13.56MHz. The signal is necessary for operation in Slave mode.

3.6 CEX OUT Connector

Isolated base BNC female connector is used for common exciter output (CEX OUT). The signal level is in the range from 3Vp-p to 8Vp-p at 13.56MHz.

Master mode

In Master mode the signal from internal source is present at CEX OUT connector all times regardless of interlock state or RF Output state.
The unit works in Master mode when the internal source is chosen via GUI, Front Panel, or Analog Port (pin22). Refer to page 20 (operation manual) for the ways and the priorities of control.
The unit works in Master mode when the external source is chosen via GUI (unit controlled via GUI, switch Signal Source in INTERNAL position), Front Panel (unit controlled via Front panel, with button SOURCE/ESC select INT), or Analog Port (unit controlled via Analog Port, signal Generator Enable/ Disable (pin8) is TTL Hi and signal Source (pin22) is TTL Lo).

Slave mode

In order to operate the unit in Slave mode choose the desirable way to control the unit: GUI, Front Panel, or Analog Port. Refer to page 20 (operation manual) for the ways and the priorities of control.
The unit works in Slave mode when the external source is chosen via GUI (unit controlled via GUI, switch Signal Source in EXTERNAL position), Front Panel (unit controlled via Front panel, with button SOURCE/ESC select EXT), or Analog Port (unit controlled via Analog Port, signal Generator Enable/ Disable (pin8) is TTL Hi and signal Source (pin22) is TTL Hi).
When the unit operates in Slave mode the signal from external RF source is present on that connector.

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AG 0313 Specifications

Class Of Operation
Class B

Frequency Of Operation
13.56 MHz

Frequency Stability
0.005% or better

RF Power Output
300 Watts nominal into 50 Ohms

EXT RF Input Drive for AGC
Recommended +0 to +3 dBm for the best operation

Input Drive Source for EXT RF IN
Signal or function generator, analog computer input capable of up to 2 Vp -p @ 50 Ohm

CEX Input*
3Vp-p to 8Vp-p at 13.56 MHz

CEX Output*
3Vp-p to 8Vp-p at 13.56 MHz

Internal RF Source
Crystal oscillator at 13.56 MHz

Input and Output Impedance
50 Ohm

IN / OUT VSWR
1.2:1 max - input
3:1 max - output

Output VSWR Protection
70 Watts max reflected power limit. Automatic, limits typically within 0.1 ms after reverse power reaches 70 Watts or power amplifier current preset limit.

Harmonic Level @ 300 W
Better then - 50 dBc

Spurious Output
50 dBc

RF Output Stability
Unconditionally stable up to 10:1 VSWR, any angle, any load.

Output Blanking
T&C amplifiers and generators offer blanking of the output signal for minimum noise RF spectrum

Dynamic Power Range
1 to 300 W, settings within +/- 2W

Output Settings & Control (Communications)
SubD 25 Analog and Digital I/O .Rear Panel

NOTE! Check which scale is selected from the front panel SVC screen for your unit.
Available scales:
5 V=nominal power (factory setting)
10 V=nominal power

Digital Communication Port:
RS-232 - for programming only!
USB 2.0

RF Power Margin
(Open Loop Max Power/Rated Power)-1)*100
+10 % - defined by AC/DC power supply settings,
+50 % - RF section capacity

RF Connectors
INPUT BNC Female
OUTPUT N Female
BLANKING BNC Female
Rear Panel

AC Power Connection
IEC Standard Power Entry followed by RFI filter.
Filter range 0.1 to 30 MHz min.

AC Circuit Protection
Internally fused on the main DC Power Supply, 15 A.

AC Input Current (RMS)
100-120 V ac, 50-60 Hz, 7.0 A
200-240 V ac, 50-60 Hz, 3.5 A

Cooling
Forced air, temperature controlled, heatsink temperature monitored for equipment safety at 70C limit.

Dimensions
L 442 mm x W 210 mm x H 142 mm
(17.4" x 8.25" x 5.6")

Weight
9.0 kg, 20 lbs.

Case
Front Panel: Plastic Overlay Coated Steel.
Aluminum Covers and Chassis.
Chassis designed to meet EMI RFI shielding requirements

Mounting
Half Rack, 3U high.

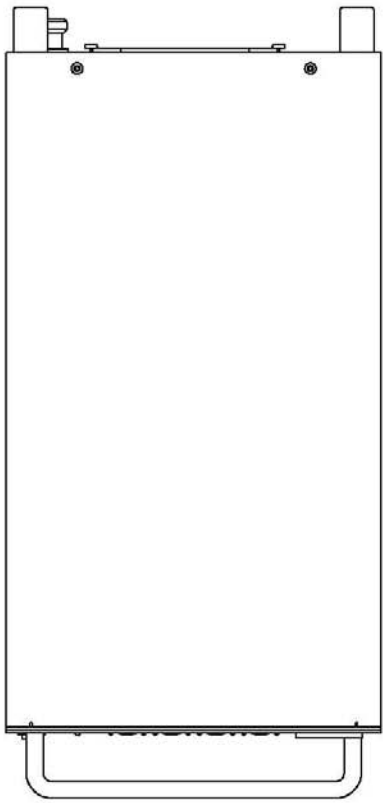
Optional: Rack Mount Kit, Adapter Kit, Coupling Screws.

Environmental conditions
Temp.: 0° to 40° C ambient
Humidity: 80%

Equipment intended for ISM applications in laboratory and light industrial environment.

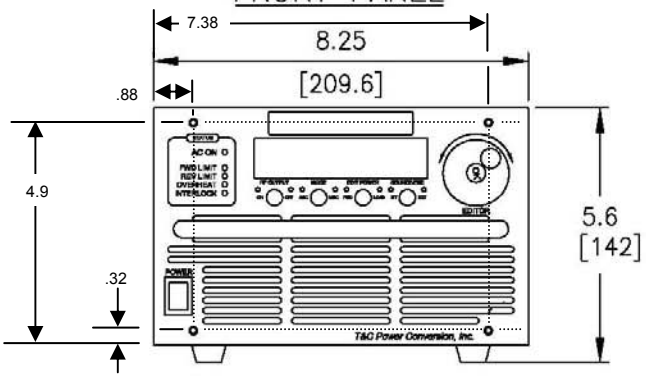
* for the models with CEX function

MIN 6" CLEARANCE FOR AIR EXHAUST

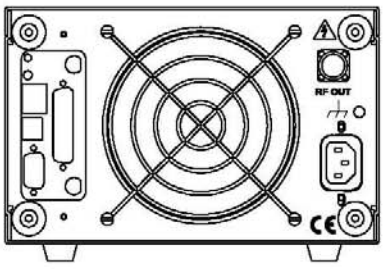


MIN 6" CLEARANCE FOR AIR INTAKE

FRONT PANEL



BACK PANEL



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110 Halstead Street, Suite 7, Rochester, NY 14610

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EC Declaration of Conformity

according to EC EMC Directive 2004/108/CE and according to EC Low Voltage Directive 2006/95/CE

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 Power Source**

Model Number: **0313, 0313 D-Com, AG 0313**

Applicable EC Directive(s): **2006/95/CE - The Low Voltage Directive and its amending directives**

2004/108/CE - The Electromagnetic Compatibility Directive and its amending directives

Applicable Harmonized Standards: **UL IEC 61010-1 Edition 3.0 2010-6**

Authorized Signature: *Tomasz Mokrzan* **Date:** 03/29/13

Name: **Tomasz Mokrzan**

Title of Signatory: **General Manager**

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