

GT-1000B Microwave Power Amplifier



Operation Manual



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Warranty

Giga-tronics GT-1000B Series instruments are warranted against defective materials and workmanship for one year from date of shipment. Giga-tronics will at its option repair or replace products that are proven defective during the warranty period. This warranty DOES NOT cover damage resulting from improper use, nor workmanship other than Giga-tronics service. There is no implied warranty of fitness for a particular purpose, nor is Giga-tronics liable for any consequential damages. Specification and price change privileges are reserved by Giga-tronics.

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Regulatory Compliance Information

This product complies with the essential requirements of the following applicable European Directives, and carries the CE mark accordingly.

89/336/EEC and 73/23/EEC

EMC Directive and Low Voltage Directive

EN61010-1 (1993)

Electrical Safety

EN61326-1 (1997)

EMC – Emissions and Immunity

Manufacturer's Name:

Giga-tronics, Incorporated

Manufacturer's Address

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U.S.A.

Type of Equipment:

Microwave Power Amplifier

Model Series Number

GT-1000B

Model Numbers:

Not applicable

Declaration of Conformity on file. Contact Giga-tronics at the following;

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Table of Contents

CHAPTER 1 SAFETY AND MANUAL CONVENTIONS	1
1.1 Personal Safety Alert	1
1.2 Equipment Safety Alert.....	1
1.3 Notes.....	1
1.4 Before Applying Power	1
1.5 Electrical Safety Precautions	2
1.6 Important Operating Precautions	2
CHAPTER 2 INTRODUCTION.....	3
2.1 Overview.....	3
2.1.1 Features and Benefits of the GT-1000B Microwave Power Amplifier	3
2.3 Controls, Indicators, and Connectors	4
2.3.1 GT-1000B Front Panel Description	5
2.3.2 GT-1000B Rear Panel Description	6
2.3.3 Replace the Fuse	7
2.4 Receiving and Inspection	8
2.5 Prepare the GT-1000B for Use.....	9
2.5.1 Cooling.....	9
2.5.2 AC Power Requirements	9
2.6 Shipping, Repair, and Calibration	10
2.6.1 Shipping the GT-1000B.....	10
2.6.2 Repairs.....	10
2.6.3 Calibration	10
CHAPTER 3 OPERATE THE GT-1000B	11
3.1 Operating Safety and Instructions.....	11
3.2 Operator’s Maintenance	12
3.2.1 Equipment and Materials	12
APPENDIX A OPTIONS	13

List of Tables

Table 1: GT-1000B Front Panel Indicators and Connections.....	5
Table 2: GT-1000B Rear Panel Controls, Indicators, and Connections.....	6
Table 3: Replace the GT-1000B Line Fuse	7
Table 4: Receiving and Inspection of the GT-1000B.....	8
Table 5: GT-1000B AC Power Specifications.....	9
Table 6: Operate the GT-1000B.....	11
Table 7: Cleaning the GT-1000B	12
Table 8: GT-1000B Options.....	13

Chapter 1 Safety and Manual Conventions

This manual contains conventions regarding safety and equipment usage as described below.

1.1 Personal Safety Alert



WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

1.2 Equipment Safety Alert



CAUTION: Indicates a situation which can damage or adversely affect the GT-1000B or associated equipment.

1.3 Notes

Notes are denoted and used as follows:

NOTE: Highlights or amplifies an essential operating or maintenance procedure, practice, condition or statement.

Review this manual to become familiar with the instrument safety markings and instructions before operation. This product is a Safety Class I instrument (provided with a protective earth terminal).

1.4 Before Applying Power

Verify that the product is set to match the available line voltage and the correct fuse is installed. See Table 13 on page **Error! Bookmark not defined..**

1.5 Electrical Safety Precautions



- An uninterruptible safety earth ground must be provided from the main power source to the GT-1000B.
- Any interruption of the protective ground conductor (internal or external to the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury.
- Grounding a single conductor of a two conductor outlet is insufficient protection. Additionally, verify that a common ground exists between the unit under test, any additional test equipment, and this instrument prior to energizing any unit.
- Whenever it is likely that the protection has been impaired, the instrument must be removed from service and secured against unintended operation.
- If this instrument is to be energized via an autotransformer (for voltage reduction), ensure that the common terminal is connected to neutral.
- Servicing instructions are for use by service-trained personnel only. To avoid personal injury, do not perform any service unless qualified to do so.
- Adjustments described in the manual are performed with the unit energized and protective covers removed. Energy available, at many points, may cause personal injury.

For continued protection against fire hazard, replace the line fuse only with a 250V fuse of the same current rating and type. Do not use repaired fuses or short circuited fuse holders.

1.6 Important Operating Precautions

CAUTION

- The GT-1000B Amplifier does include an enable/disable feature to activate and deactivate the amplifier. When connecting or disconnecting the output of the amplifier, ensure that either the Remote REF Off signal is applied or that the power switch of the amplifier is in the OFF position.
- The amplifier is capable of power output levels greater than 15 Watts. Devices connected to the output of the amplifier must be rated to handle 25 Watts or higher. Exceeding the rated output power of a device will result in permanent damage.
- When connecting the amplifier to a transmitting device, observe all safety procedures to ensure that the amplifier isn't interfering with other systems in the area. High power microwaves can adversely affect power sensitive instruments in the area of transmission.
- Exercise precautions to avoid exposure to radiated microwave energy at all times.

Chapter 2 Introduction

2.1 Overview

This chapter describes the controls, inputs/outputs, indicators, and basic function of the GT-1000B.

2.1.1 Features and Benefits of the GT-1000B Microwave Power Amplifier

- The standard GT-1000B typically provides 10 Watts 2 to 8 GHz, and 5 Watts up to 20 GHz. The GT-1000B Option 06 typically provides 7 Watts 100 MHz to 8 GHz and 5 watts up to 18 GHz.
- The standard GT-1000B typically provides 40 dB of gain over the 2 to 20 GHz range. The GT-1000B Option 06 typically provides 35 dB of gain over the 100 MHz to 18 GHz range.
- Incorporates the CAP Wireless patented Spatium™ spatial combining architecture solid-state amplifier. The Spatium™ technology amplifier is based on a solid state parallel MMIC design with exceptionally wide bandwidth and high power. The unique circuit topology is highly reliable, with performance that excels where extremes of bandwidth and power are demanded.
- Provides excellent pulse fidelity
- Low intermodulation distortion
- High linearity and superior gain flatness without the warm-up time, drift or aging issues of traveling wave tube amplifiers (TWTA).
- Low noise figure
- Low harmonics and spurious content
- Highly tolerant to load mismatch.

2.3 Controls, Indicators, and Connectors

The following pages describe all of the features shown in Figure 1, Figure 2 and Figure 3 below:



Figure 1: GT-1000B Front Panel

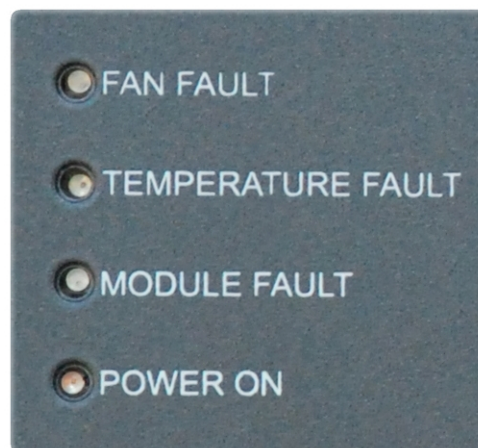


Figure 2: Front Panel Indicators



Figure 3: GT-1000B Rear Panel

2.3.1 GT-1000B Front Panel Description

Table 1 describes the parts and functions of items on the front panel. Refer to Figure 1 on the previous page for the location of the items on the front Panel.

Table 1: GT-1000B Front Panel Indicators and Connections

GT-1000B Front Panel Indicators and Connections	
Name	Function
Power On/Off button	Switches the AC power on and off.
RF Output	<ul style="list-style-type: none"> SMA (f) connector Option 02: Type-N (f) connector
RF Input (Option 04 Only)	
Indicators	
FAN FAULT ¹	Illuminated indicates the exhaust fan has stopped rotating. The POWER ON LED remains illuminated, and the amplifier is fully functional until a TEMPERATURE FAULT occurs.
TEMPERATURE FAULT ¹	When illuminated, indicates the internal heat sink temperature exceeds 75 °C. All amplifier functions are disabled, the POWER ON indicator extinguishes, and any other fault indicators are disabled. The amplifier remains non-functional with the TEMPERATURE FAULT indicator illuminated until the heat sink temperature drops to less than 50 °C, at which point, the amplifier will automatically restart.
MODULE FAULT ¹	When illuminated, the MODULE FAULT LED indicates that one or more amplification modules in the final stage of the power amplifier are malfunctioning. The POWER ON indicator remains illuminated, and the amplifier remains functional at reduced capability and performance.
POWER ON	When illuminated, indicates AC power is applied and unit is ready to function
¹ If any fault occurs, switch off the instrument's power at the front panel before investigating the cause of the failure.	

2.3.2 GT-1000B Rear Panel Description

Table 2 describes the parts and functions of items on the rear panel. Refer to Figure 3 on page 5 for the location of the items on the rear panel.

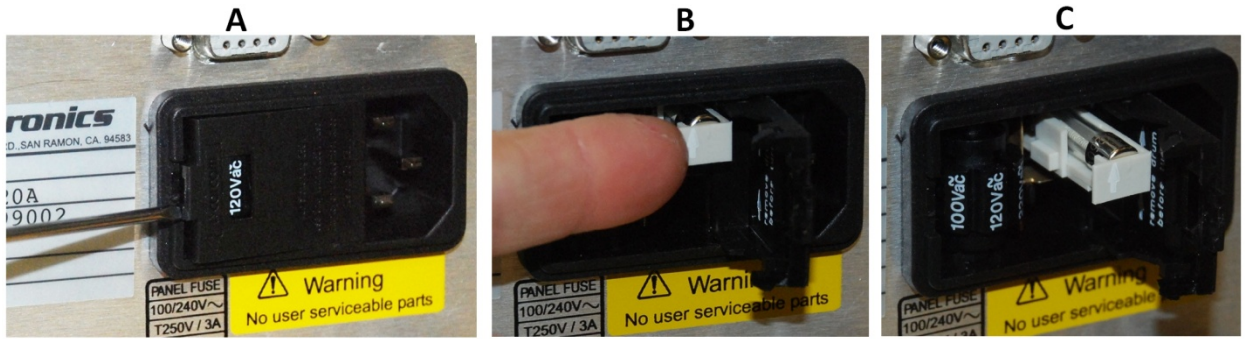
Table 2: GT-1000B Rear Panel Controls, Indicators, and Connections

GT-1000B Rear Panel Controls, Indicators, and Connections	
Name	Function
RF In (the RF input is located on the front panel in Option 04)	<ul style="list-style-type: none"> SMA (f) connector Option 02: Type-N (f) connectors
Detector out (Option 01 only)	<p>The output connector for the internal coupler/detector. This output can be used for external ALC and power monitoring.</p> <p>BNC (f) connector, nominal -1 Volt DC output at 10 Watts RF out, and nominally -250 mV at 1 Watt RF out, into high impedance.</p>
Remote RF Off Input	<p>Input connector of amplifier enable/disable remote control.</p> <p>BNC (f) connector, open circuit = amplifier enabled (RF On), short circuit to ground = amplifier disabled (RF Off). Open circuit voltage is nominally +5 V. Short circuit current is less than 10 mA.</p>
AC Input and fuse	<p>Provides the AC power input and over-current protection for the amplifier. For fuse specifications at the AC voltage to be used for the GT-1000B, see Table 13 on page Error! Bookmark not defined..</p> <p>NOTE: Instructions for replacing the fuse are located on page 7.</p>
Serial number label	<p>Provides important information about the GT-1000 microwave power amplifier. A full description of the information on the serial number label is provided below.</p>
Serial Number Label Description	
Descriptor	Type of Information
Code	This is a two-digit manufacturing code
Model	This identifies the model. This line is usually "GT-1000B."
Serial	This is a seven-digit serial number, and provides a unique identifier for each GT-1000B.
Options	<p>When options have been included in the GT-1000B, one or more two-digit numbers are listed on this line of the label. For more information about options, see Appendix A on page Error! Bookmark not defined..</p>
Config	Contains important unique configuration information.

2.3.3 Replace the Fuse

Follow the procedure in Table 3 below to replace the fuse.

Table 3: Replace the GT-1000B Line Fuse

Replace the GT-1000B Line Fuse	
Step	Action
1.	Use the power switch on the front of the GT-1000B to switch the power OFF.
2.	On the rear of the GT-1000B, disconnect the AC line cord. The fuse compartment is located next to the AC line cord socket.
3.	<p>Remove the fuse as follows (see Figure below):</p> <ul style="list-style-type: none"> A) Use a small flat-blade screwdriver to pry open the fuse compartment. B) Pull out the white fuse holder. C) You can now remove the fuse from the fuse holder. <div style="text-align: center;">  </div> <p style="text-align: center;">Figure 4: GT-1000B Fuse Holder</p>
4.	<p>Replace the fuse with a new fuse (see Table 13 on page Error! Bookmark not defined. for selecting the fuse type).</p> <ul style="list-style-type: none"> • Push the fuse holder in, and close the fuse compartment door.
5.	<p>Plug the AC line cord into the rear of the GT-1000B and return the instrument to operation.</p> <p>NOTE: If the GT-1000B continues to blow fuses, contact your local Giga-tronics sales representative or the Giga-tronics factory for help to resolve the problem. See the contact information on the inside of the front cover of this manual (page ii).</p>
End of Procedure	

2.4 Receiving and Inspection

Follow the procedure in Table 4 for receiving and inspecting the GT-1000B.

Table 4: Receiving and Inspection of the GT-1000B

Receiving and Inspection of the GT-1000B	
Step	Action
1.	<p>Before opening the shipping container, inspect it for any signs of damage.</p> <p>If THERE IS evidence of damage; record the location and extent of the damage and contact the shipper immediately to report the damage.</p> <p>If there is NO EVIDENCE of damage; continue to the next step.</p>
2.	<p>Open the shipping container and inspect the contents for evidence of damage. The contents should include any external, loose options and accessories, and the following:</p> <ul style="list-style-type: none"> • Operation Manual • AC line cord <p>If any of the contents are damaged or missing, contact Giga-tronics immediately. Refer to the Contact Information on the inside of the front cover of this manual.</p>
End of procedure	


2.5 Prepare the GT-1000B for Use


2.5.1 Cooling

The GT-1000B has an internal cooling fan. The air exhaust is located on the rear panel of the instrument. When using the GT-1000B, ensure there are no obstructions to the flow of air into the instrument. Clean the fan filter regularly, to prevent it becoming clogged and disrupting the air flow.

2.5.2 AC Power Requirements

Fuse Specifications: see Table 13 on page **Error! Bookmark not defined.**

	<p style="text-align: center;">PROTECTIVE EARTH GROUND</p> <p>This is a Safety Class 1 product (it includes a protective earth terminal). An uninterruptible safety earth ground must be provided from the main AC power source to the GT-1000B's AC input connector. Observe the following:</p> <ul style="list-style-type: none"> • If it is possible that the safety earth ground has been impaired, make the GT-1000B inoperative and secure it against unintended operation. • If the GT-1000B will be powered through an autotransformer, verify that the autotransformer's common terminal is connected to the neutral connector (the grounded side of the Mains supply).
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	<p style="text-align: center;">MATCH FUSE TO INPUT AC VOLTAGE</p> <p>Before applying AC power to the GT-1000B, check that the fuse in the rear of the instrument (see Replace the Fuse on page 7) has a voltage rating that matches the AC voltage.</p>
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AC Line Cord: All GT-1000B microwave synthesizers are supplied with a 6-foot, three-wire power cord with three-terminal polarized plug with a safety ground. If a different power cord is used, it must not exceed 3 meters (9 feet) in order to meet safety requirements.

Table 5 below describes the AC power requirements for the GT-1000B.

Table 5: GT-1000B AC Power Specifications

GT-1000B AC Power Specifications	
Parameter	Specification
AC line voltage/frequency	85 to 264 Volts/47 to 63 Hz NOTE: The GT-1000B automatically adjusts to operate at any voltage within the voltage range above. No adjustment is necessary.
AC line power	450 VA maximum

2.6 Shipping, Repair, and Calibration

2.6.1 Shipping the GT-1000B

If it is necessary to ship the GT-1000B, observe the following:

- Use the best packaging materials available. If possible, reuse the original shipping container.
- If the original shipping container is not available, use a strong carton (350lbs./sq.in. bursting strength) or a wooden box.
- Wrap the instrument in heavy paper or plastic before placing it into the shipping container.
- Completely fill the areas on all sides of the instrument with packaging material. Take extra precaution to protect the front and rear panels.
- Seal the package with strong tape or metal bands. Mark the outside of the package clearly, and in bold type, as follows:

FRAGILE — DELICATE INSTRUMENT

2.6.2 Repairs

The Giga-tronics GT-1000B microwave synthesizer is a robust instrument that has been designed and built for years of trouble-free service. However, if you experience problems with the instrument, do the following:

1. Contact your local Giga-tronics sales office, or the factory, and be prepared to provide the model, serial number, and any included options of your instrument, and a description of the problem. To contact the factory directly, use the following information:

Contacting Giga-tronics Customer Service	
Email	repairs@gigatronics.com
Telephone (within the United States)	800.726.4442
Telephone	925.328.4702
Fax	925.328.4702

2. If it has been determined that you must ship the GT-1000B to the factory or a service center for repair, you will be issued a **Return Materials Authorization (RMA)** number. Use the RMA number in all correspondence regarding the repair.
3. Pack the GT-1000B for shipment as described in the previous section, and enclose all relevant information regarding the problem.
4. Ship the GT-1000B to the address provided by Giga-tronics Customer Service.

2.6.3 Calibration

The GT-1000B is not a calibrated instrument. No specific calibration is required. For more information, contact Giga-tronics.

Chapter 3 Operate the GT-1000B

3.1 Operating Safety and Instructions

This section describes how to operate the GT-1000B Microwave Power Amplifier. Equipment and personal safety information is also provided.

CAUTION	DO NOT EXCEED AN INPUT LEVEL OF +17 dBm INTO THE GT-1000B. EXCEEDING THIS LEVEL CAN DAMAGE THE GT-1000B MICROWAVE POWER AMPLIFIER.
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 WARNING	<p>WHEN ENERGIZED, THE GT-1000B IS CAPABLE OF SUPPLYING POWER THAT CAN CAUSE DAMAGE OR INJURY. TAKE THE FOLLOWING PRECAUTIONS TO ENSURE SAFE SETUP AND OPERATION:</p> <ul style="list-style-type: none"> • Verify that all cables, connectors, and equipment connected to the GT-1000B are in good condition. • Do not make connections to equipment while the output of any item of equipment is energized.
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Table 6: Operate the GT-1000B

Operate the GT-1000B	
Step	Action
1.	Verify that the output of the signal source driving the amplifier is NOT energized before continuing to the next step.
2.	Connect the equipment to the GT-1000B according to your application. NOTE: Verify all mating connectors are 50 Ohm, and that they are in good condition.
3.	Apply AC power to the GT-1000B by turning the front panel power switch ON. Observe that the POWER ON indicator on the front panel illuminates (see Figure 1 on page 4)
4.	Verify that the output level of the signal source is set below +17 dBm.
5.	Energize the output of the signal source.
6.	NOTE: The GT-1000B has a Remote RF Off input. This input may be used to enable or disable the RF output. Open circuit = RF On. Short circuit to ground = RF Off.
7.	NOTE: Do not exceed the safe limits of the output power from the GT-1000B into the load. The load should be rated for at least 30 Watts CW.
End of Procedure	

3.2 Operator's Maintenance

The only operator's maintenance that the GT-1000B requires is regular cleaning of the air exhaust screen and interior of the instrument. Both are important in order to maintain cooling airflow through the GT-1000B.

3.2.1 Equipment and Materials

- Phillips screwdriver, small
- Vacuum cleaner

Table 7: Cleaning the GT-1000B

Cleaning the GT-1000B	
Step	Action
1.	Use the front panel power switch to de-energize the GT-1000B.
2.	Disconnect the AC power cord from the rear of the GT-1000B.
3.	Use a small Phillips screwdriver to remove the screws that secure both upper and lower covers of the GT-1000B. Remove both covers.
4.	Use a vacuum cleaner to remove dust from the interior and from the screen in the air exhaust port on the rear of the instrument. NOTE: Do not bump the vacuum nozzle against any of the components inside the GT-1000B during this procedure.
5.	Replace both covers onto the GT-1000B.
6.	Ensure that the GT-1000B operates correctly.
End of Procedure	

Appendix A Options

This section describes the options that are available for the GT-1000B.

Table 8: GT-1000B Options

GT-1000B Options	
Option Number	Description
01	Add internal coupler/detector for ext. ALC and power monitoring
02	Type-N (f) input and output connectors ¹
04	Both input and output connectors on front panel ¹
06	Add 100 MHz to 18 GHz Frequency Range
46	Rack Slide Kit (HP style rack only)
¹ Special connector configurations available on request. Contact your local representative.	

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