GT-1026A 100 MHz to 26.5 GHz Microwave Power Amplifier

Operation Manual

All technical data and specifications in this publication are subject to change without prior notice and do not represent a commitment on the part of Giga-tronics, Incorporated.

Warranty

Giga-tronics GT-1026A Microwave Power Amplifiers 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.

CONTACT INFORMATION

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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

4650 Norris Canyon Road

San Ramon, California 94583

U.S.A.

Type of Equipment:

Microwave Power Amplifier

Model Series Number:

GT-1026A

Model Numbers:

Not applicable

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

Giga-tronics, Incorporated

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San Ramon, California 94583

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Record of Changes to This Manual

Use the table below to maintain a permanent record of changes to this document. Replacement pages will be issued as a TPCI (Technical Publication Change Instruction).

TPCI Number	TPCI Issue Date	Date Entered	Comments

Table of Contents

List of Figures

List of Tables

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

CAUTION: Indicates a situation which can damage or adversely affect the GT-1026A 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.

1.4 Electrical Safety Precautions

- Any servicing instructions are for use by service-trained personnel only. To avoid personal injury, do not perform any service unless you are qualified to do so.
- For continued protection against fire hazard, replace the AC line fuse only with a fuse of the same current rating and type. Do not use repaired fuses or short circuited fuse holders.

1.5 Important Operating Instructions

- The GT-1026A Amplifier does not include an enable/disable feature to activate and deactivate the amplifier. When connecting or disconnecting the output of the amplifier, ensure that the power switch on the rear of the amplifier is in the OFF position.
- 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

The Giga-tronics GT-1026A Microwave Power Amplifiers are high-performance solid-state microwave power amplifiers. The Giga-tronics GT-1026A provide 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). They feature low noise figure, low harmonics and spurious content, and are highly tolerant to load mismatch.

GT-1026A:

- Frequency Range: 100 MHz to 26.5 GHz, operational to 10 MHz.
- SMA (f) input and output connectors.

2.1.1 Features and Benefits of the GT-1026A Microwave Power Amplifier

- 25 dB nominal gain over the 100 MHz to 26.5 GHz frequency range.
- Ideal for testing in R&D labs, ATE systems, wireless communications applications and defense EW systems.
- Small size allows easily placing the amplifier close to the device under test.

2.2 Controls, Indicators, and Connectors

The following pages describe all of the features shown in Figure 1 and Figure 2 below.

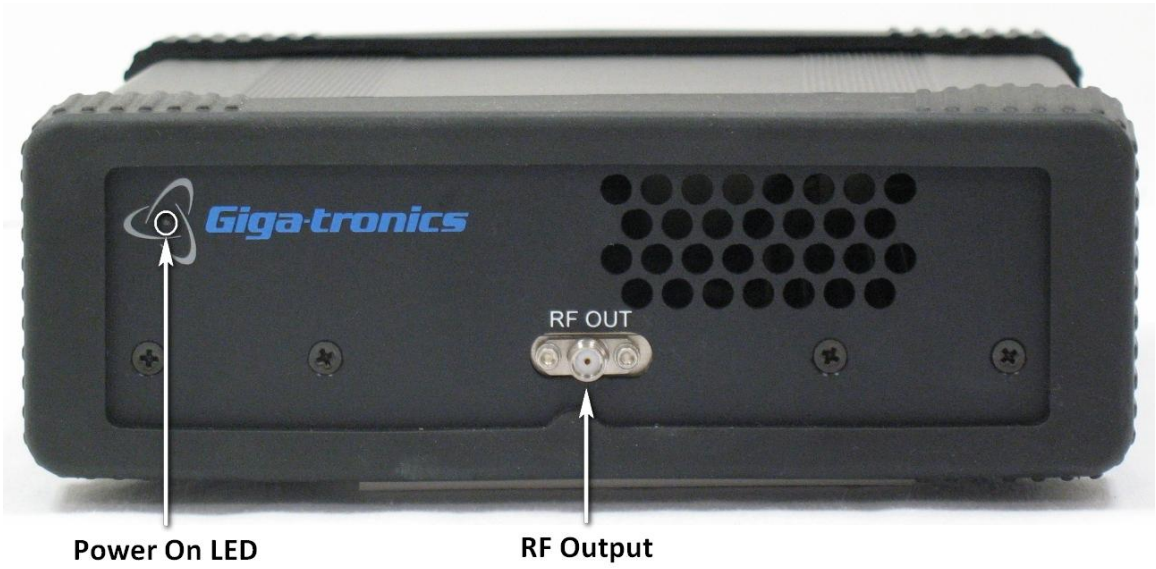

Figure 1: GT-1026A Front Panel

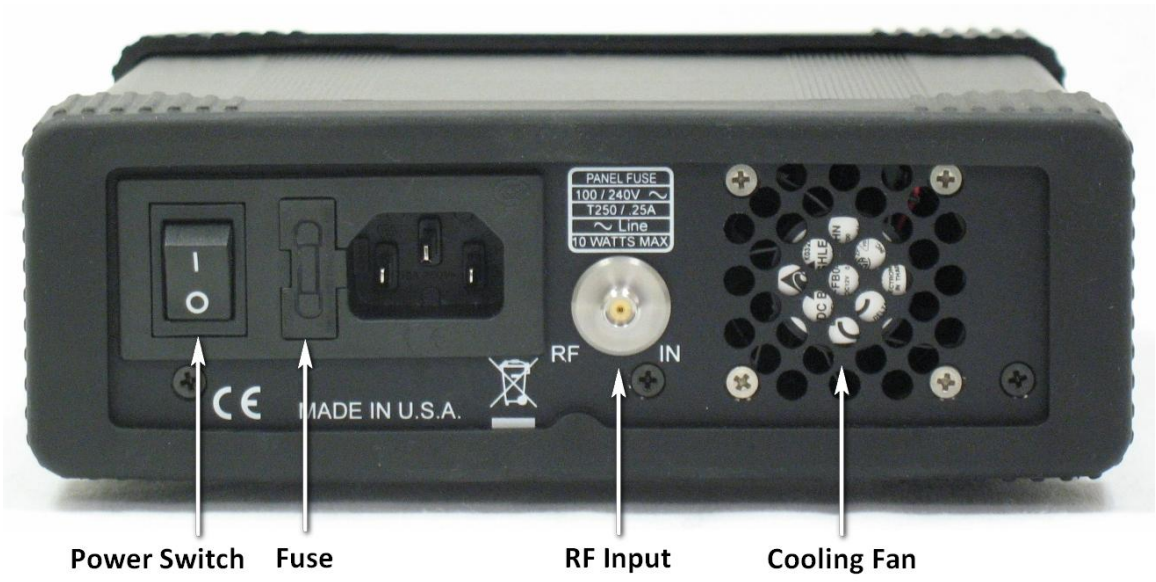

Figure 2: GT-1026A Rear Panel

Controls, Indicators, and Connectors, Continued

The tables below describe the functions of the features shown in Figure 1 and Figure 2 on the previous page.

Table 1: GT-1026A Front Panel Controls, Indicators, and Connections

Name	Function
Power on LED	• Extinguished when AC power is OFF. • Illuminated blue when AC power is ON.
RF OUT (RF output connector)	GT-1026A: SMA (f)

Table 2: GT-1026A Rear Panel Controls, Indicators, and Connections

Name	Function
Power Switch	Switches the unit on and off.
Fuse	Field replaceable fuse.
AC Connector	AC power input.
RF IN (RF Input connector)	GT-1026A: SMA (f)
Fan	Cooling fan for unit (internal)

2.3 Receiving and Inspection

Follow the procedure in Table 3 for receiving and inspecting the GT-1026A.

Table 3: Receiving and Inspection of the GT-1026A

Step	Action
1.	Before opening the shipping container, inspect it for any signs of damage. **If THERE IS evidence of damage**; record the location and extent of the damage and contact the shipper immediately to report the damage. **If there is NO EVIDENCE of damage**; continue to the next step.
2.	Open the shipping container and inspect the contents for evidence of damage. The contents should include the following: • GT-1026A Microwave Power Amplifier • Operation Manual • AC line cord 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.
End of procedure	

2.4 Prepare the GT-1026A for Use

2.4.1 Cooling

The GT-1026A has an internal cooling fan. The air intake is located on the rear panel of the instrument. When using the GT-1026A, ensure there are no obstructions to the flow of air into or out of the instrument.

2.4.2 AC Power Requirements

AC Power Requirements: See Table 10 on page 11

2.5 Shipping, Repair, and Calibration

2.5.1 Shipping the GT-1026A

If it is necessary to ship the GT-1026A, 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 (350 lbs./sq.in. bursting strength) or a wooden box.
- Wrap the amplifier in heavy paper or plastic before placing it into the shipping container.
- Completely fill the areas on all sides of the amplifier 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

2.5.2 Repairs

The Giga-tronics GT-1026A Microwave Power Amplifier 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 amplifier, 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 is has been determined that you must ship the GT-1026A 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-1026A for shipment as described in the previous section, and enclose all relevant information regarding the problem.
4. Ship the GT-1026A to the address provided by Giga-tronics Customer Service.

2.5.3 Calibration

The GT-1026A Microwave Power Amplifier does not require calibration. There are no adjustments. For more information, contact Giga-tronics.

Chapter 3 Operation

3.1 Operating Safety and Instructions

CAUTION	**DO NOT EXCEED AN INPUT LEVEL OF +20 dBm INTO THE GT-1026A. EXCEEDING THIS LEVEL CAN DAMAGE THE GT-1026A MICROWAVE POWER AMPLIFIER.**

WARNING	**WHEN ENERGIZED, THE GT-1026A IS CAPABLE OF SUPPLYING POWER THAT CAN CAUSE DAMAGE OR INJURY. TAKE THE FOLLOWING PRECAUTIONS TO ENSURE SAFE SETUP AND OPERATION:** • **Verify that all cables, connectors, and equipment connected to the GT-1026A are in good condition.** • **Do not make connections to equipment while the output of any item of equipment is energized.**

Table 4: Operate the GT-1026A

Step	Action
1.	• Verify that the POWER switch on the rear of the unit is OFF. • Plug the included AC line cord into a source of AC power that meets the specifications for power in Table 10 on page 11. • Put the POWER switch on the GT-1026A in the ON position. ***NOTE:*** For best results, let the GT-1026A warm up for one minute after switching the AC power ON.
2.	Verify that the output of the microwave signal source is **NOT** energized before continuing to the next step.
3.	Connect the equipment to the GT-1026A according to your application. ***NOTE:*** Verify all mating connectors are 50 Ohm, and that they are in good condition.
4.	Energize the output of the microwave signal source.
5.	Adjust the output of the microwave signal source until the output from the GT-1026A is at the desired level.
End of Procedure	

Chapter 4 Performance Verification

This chapter is divided into two sections:

- **Specifications:** this section contains all of the operating specifications that define the performance of the GT-1026A.
- **Performance Verification:** this section contains the test procedure that ensures that the GT-1026A meets the specifications.

4.1 Specifications

NOTE: Graphs of some of the GT-1026A characteristics are on page 12.

Table 5: Frequency Range

Model	Specification
GT-1026A	100 MHz to 26.5 GHz, operational to 10 MHz

Table 6: Output Power

Parameter	Specification
100 MHz to 18 GHz	+28 dBm (600 mW) nominal, +26 dBm (400 mW) minimum
18 to 26.5 GHz	+23 dBm (200 mW) nominal, +21 dBm (120 mW) minimum
NOTES: • Output power is specified as minimum saturated power into 50 Ohm load with +5 dBm input, at 23 °C ± 5 °C. • Input power for normal operation should be limited to 0 dBm maximum.	

Table 7: Gain Flatness

Range	Specifications
100 MHz to 26.5 GHz	± 3 dB nominal, ± 3.5 dB maximum
NOTES: • Nominal gain is 25 dB, minimum gain > 20 dB. • Gain flatness is specified as maximum variation with -5 dBm input and 50 Ohm load.	

Table 8: Input and Output VSWR

Connector	**Frequency Range** (100 MHz to 26.5 GHz)
Input, 50 Ohms	2.0:1 typical
Output, 50 Ohms	2.0:1 typical

Table 9: Additional Specifications

Parameter	**Specification**
Stability	Unconditionally Stable
Maximum Load VSWR	3:1
Maximum Input Power (RF)	+20 dBm
Third Order Intercept	+32 dBm nominal, referenced to output
Harmonic Distortion	< -30 dBc nominal
Spurious	< -60 dBc nominal
Reverse Isolation	> 50 dB
Noise Figure	< 6 dB nominal, < 8 dB maximum
* NOTE: Harmonics measured at +10 dBm output power. Spurious measured at -5 dBm input power level	

Table 10: General Specifications

Parameter	Specification
Operating Temperature	0 °C to +50 °C
Storage Temperature	-20 °C to +75 °C
Cooling	Forced air
Dimensions	2.5 inches H x 6.8 inches D x 7.0 inches W (64 mm H x 173 mm D x 178 mm W)
Weight	4.5 lbs (2 kg)
RF Connectors	SMA (f)
Power Supply	
AC line input	100 to 240 VAC, 47 to 440 Hz, Single Phase
Line Power	25 VA maximum

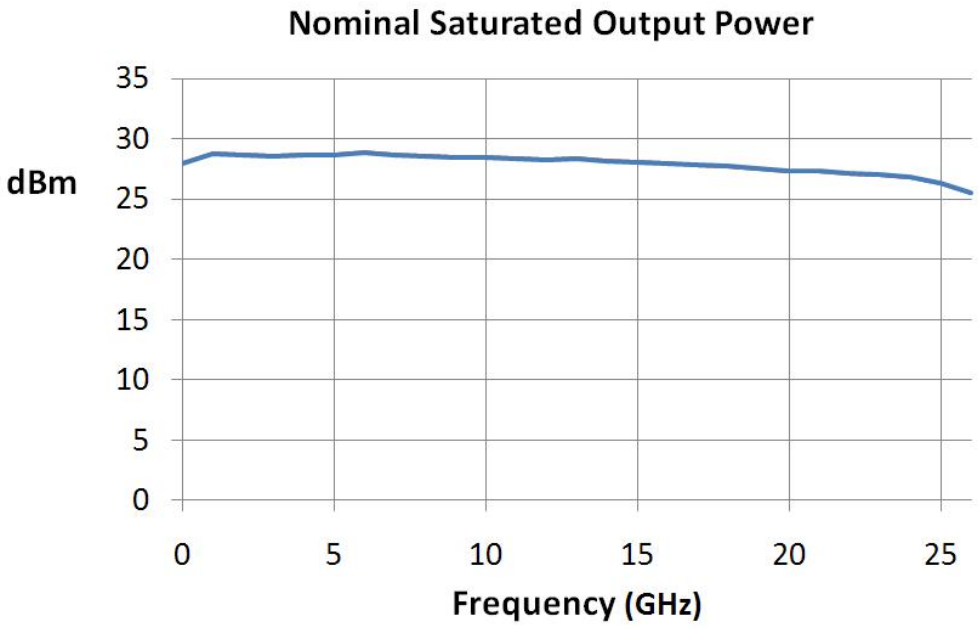

Figure 3: Saturated Output Power (nominal)

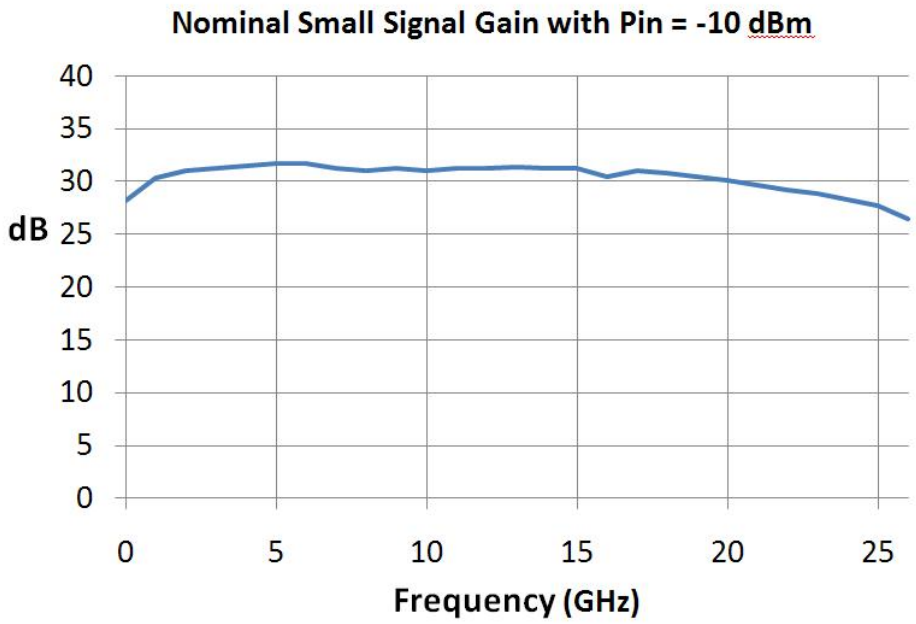

Figure 4: Small Signal Gain (nominal)

4.2 Performance Verification

This section describes how to test the GT-1026A to verify that it meets Giga-tronics specifications.

The overall operation of the GT-1026A Microwave Power Amplifier is checked using a broadband signal source, power sensor, and a power meter.

The test setup is shown in Figure 5. The procedure starts on the next page.

Equipment and Material

- Signal source: Giga-tronics 2526B 26.5 GHz Microwave Signal Generator or equivalent
- Power meter: Giga-tronics 8650A or 8650B Power Meter or equivalent
- Power sensor: Giga-tronics 80323A, 26.5 GHz, 1 Watt, SMA or equivalent
- Test cable: SMA (m), 26.5 GHz test cable

Figure 5: GT-1026A Performance Verification Setup

Note: Connect test cable between 2526B RF Output and GT-1026A DUT RF Input.

Performance Verification, Continued

Table 11: GT-1026A Performance Verification Procedure

Step	Action
1.	Connect equipment as shown in Figure 5.
2.	Keep equipment powered off until all connections are made.
3.	Always start with signal generator RF Off.
4.	Turn equipment on (with RF Off) and allow to warm up for 30 minutes.
5.	Set signal generator to the first test frequency and RF power level at -20 dBm.
6.	Set power meter to first test frequency.
7.	Turn on signal generator RF output and increase RF power level to +5 dBm.
8.	Measure power output from DUT on power meter and record the value in Table 12.
9.	Set signal generator to the next test frequency
10.	Set power meter to next test frequency.
11.	Measure power output from DUT on power meter and record the value.
12.	Repeat steps 9 thru 11 for all remaining test frequencies.
13.	Verify measured power exceeds minimum power specification.
End of Procedure	

Performance Verification, Continued

Table 12: Performance Verification Measurements

Frequency (GHz)	Minimum Power Output (dBm)	Measured Power Output (dBm)
0.1	26	
1	26	
2	26	
3	26	
4	26	
5	26	
6	26	
7	26	
8	26	
9	26	
10	26	
11	26	
12	26	
13	26	
14	26	
15	26	
16	26	
17	26	
18	21	
19	21	
20	21	
21	21	
22	21	
23	21	
24	21	
25	21	
26	21	
Serial Number		

Appendix A Options

This section describes the options that are available for the GT-1026A.

Table 13: GT-1026A Options

Option Number	Description
46	Add Rack Mount Kit