Product User Manual

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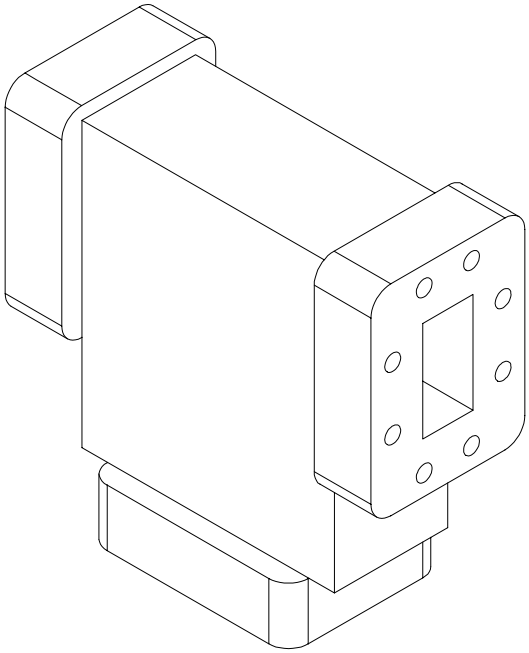
Model GA1108
3-Port Circulator, 5.8 GHz, CPR159



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REVISION HISTORY			
REV.	**DESCRIPTION**	**DATE**	**APPROVAL**
1	PROTOTYPE RELEASE	15JAN04	JFG

WARRANTY

Products manufactured and sold by Gerling Applied Engineering, Inc. ("GAE") are warranted to be free of defects in materials and workmanship under normal use and service for a period of twelve (12) months from the date of original shipment. GAE's obligation under this warranty is limited to repairing or replacing, at GAE's option, all non-consumable component parts. Consumable parts are specifically excluded from this warranty and may include, but are not be limited to, magnetrons, fuses, lamps, seals, o-rings, v-belts, and fluids. All warranty repairs are to be done at GAE's facility or as otherwise authorized by GAE. All shipping charges for warranty repair or replacement are the purchaser's responsibility unless otherwise agreed to by GAE.

This warranty supercedes all other warranties, expressed or implied. No warranty is given covering the product for any particular purpose other than as covered by the applicable product specifications. GAE assumes no liability in any event for incidental or consequential damages, financial losses, penalties or other losses incurred in conjunction with the use of GAE products.

DOCUMENT CONVENTIONS

NOTE: *Means the reader should take note. Notes contain helpful information, suggestions, or references to other sections, chapters, or documents.*

CAUTION: *Means the reader should be careful. You are doing something that might result in equipment damage or loss of data.*

WARNING: *Means danger. A situation exists that could cause bodily injury or death. All personnel must be aware of the hazards involved with high voltage electrical circuitry and high power microwave devices.*

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WARNING

All 3-port circulators manufactured by GAE, Inc. are intended for use with other equipment capable of producing a microwave field that is potentially hazardous to operating personnel. They must never be connected or operated in a manner that allows a field in excess of 10 milliwatts per square centimeter to be generated in an area accessible to operating personnel. Contact GAE, Inc. for technical support prior to installation and/or operation of these units if there is any question or concern about microwave leakage.

All waveguide flange and electrical cable connections throughout the system must be secure prior to operation. Never operate the microwave generator without a properly rated absorbing load attached. To ensure safe operation and prevent microwave leakage, the equipment must be periodically inspected and maintained as required or recommended.

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TABLE OF CONTENTS

EQUIPMENT DESCRIPTION

The model GA1108 3-port circulator is designed for high power industrial heating applications requiring high reliability and rugged construction. These circulators are most often used with dummy loads (such as model GA1221) in an isolator configuration for magnetron protection, but they are also useful in other configurations such as for constant frequency delivery of variable power (see GAE Application Bulletin # 960008).

Construction of the GA1108 is primarily dip brazed aluminum waveguide. Flange adapters are mounted to each port to accommodate the desired flange style. The standard flange style is CPR-F (flat face) while CMR and quick-disconnect ("Q-D") cover flange styles are also available.

General Specifications

Frequency	5.8 GHz nominal
Input Power	700W continuous max. (fwd and rev)
Waveguide	WR159
Input Flange	CPR159F (UG1731/U)
Input VSWR	1.1 max. (Port 1)
Insertion Loss	0.15 dB max. (Port 1 to Port 2)
Isolation	20 dB min. (Port 2 to Port 1)
Construction	Aluminum
Finish	Chemical conversion coating

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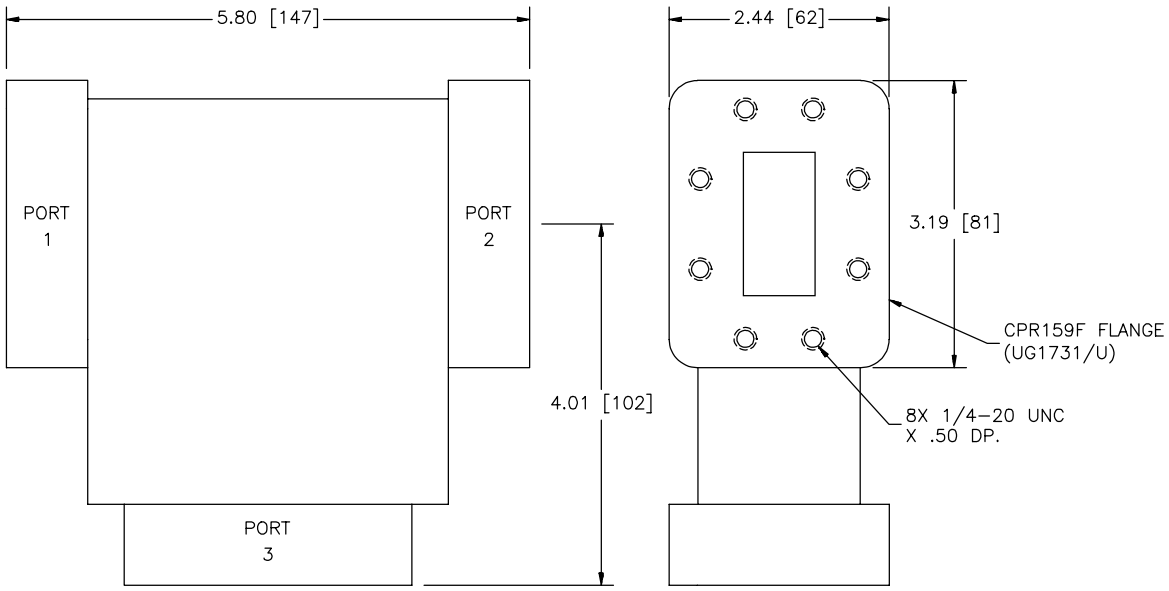
Outline Drawing



INSTALLATION

Preliminary Inspection

Upon arrival at the installation site the GA1108 3-port circulator should be thoroughly inspected for damage or wear caused during shipping. Any visible damage to the packaging material or the circulator itself should be noted and reported immediately to the shipping company in accordance with standard claims procedures. The following components are included:

a) GA1108 3-port circulator

b) Product User Manual (this document)

Waveguide Configuration

The GA1108 3-port circulator can be connected to and used with any common waveguide component having a compatible flange (see below). The mounting position can be either horizontal or vertical, but the orientation with respect to the microwave generator depends on the intended function.

The most common function of a 3-port circulator is that of an isolator for protection of a magnetron from the damaging effects of reverse power. This configuration requires a separate dummy load (such as GAE model GA1221) connected to port 3. Port 1 is then connected to the microwave generator and port 2 is oriented towards the process load. Figure 1 below illustrates the circulator used in a typical isolator configuration.

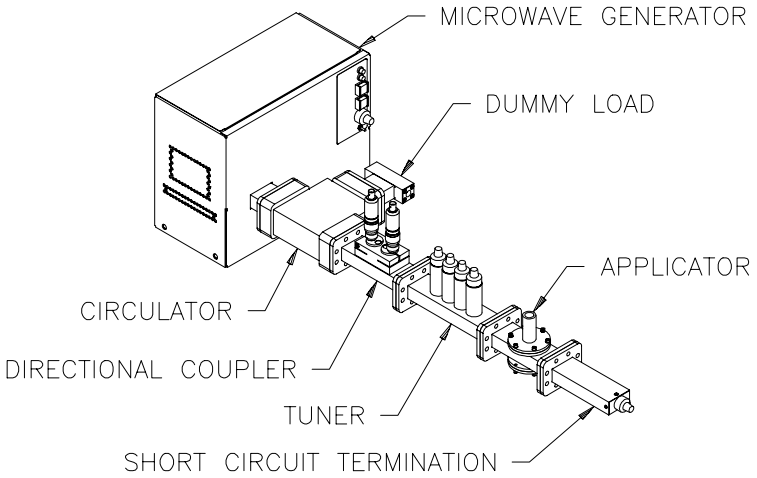


Figure 1. Typical isolator waveguide configuration.

CAUTION: *Because the 3-port circulator relies on a magnetic field for operation, care must be taken to avoid placing the device near other sources of strong magnetic fields. For similar reasons,*

the 3-port circulator should be located at least 4 inches from other metal objects that respond to magnetic fields (i.e. ferrous steel).

Flange Connections

All three flanges of the 3-port circulator must be properly connected to another waveguide component. Bolts must be installed at all flange bolt holes on both flanges and securely tightened prior to operation.

Microwave Leakage – Regulatory limits for microwave leakage relate to standards for human safety and interference with other electronic devices. Standards for human safety as adopted by OSHA, the International Electrotechnical Commission (IEC) and other regulatory agencies limit leakage to 5 mW/cm^2 measured at 5 cm from the leakage source under normal operating conditions, and 10 mW/cm^2 at 5 cm from the source under abnormal operating conditions. The U.S. Federal Communications Commission (FCC) has established regulations limiting the emission of energy at frequencies outside the ISM bands. All GAE waveguide components meets these requirements when properly connected to another waveguide component.

OPERATION

Basic Operation

Once installed, the GA1108 3-port circulator will operate without any need for operator involvement. No adjustments or settings are available or necessary.

CAUTION: *Care must be taken to avoid operating the microwave generator at power levels exceeding the rating of the 3-port circulator. Excessive power levels can cause damage to the ferrite disks and/or magnets.*

Performance Considerations

Ideally, all of the power entering the 3-port circulator (typically through port 1) will exit through only one of the other two ports (typically port 2). In practice, however, a small amount of power is absorbed by the circulator and/or reflected back to the source, and a small amount of power exits the other output port (port 3). Thus, the following parameters are commonly used to measure the performance of a circulator:

Isolation – A measure of the minimum attenuation of power between the input port and the *unintended* output port.

Insertion Loss – A measure of the maximum attenuation of power as it passes through the device.

Input VSWR – A measure of maximum reflection (VSWR) at the input port due to incident power only (assumes no reverse power leaving the same port).

Note that these parameters are often measured and specified by the manufacturer at low power operation. Because of the thermal effects due to power absorption, the actual performance can vary from the manufacturer's specifications when the device is operated at high power or in the presence of high VSWR.

It is also important to note that performance is dependent on the phase relationships between forward and reverse power at any one port. Performance specifications are typically given for the worst case phase relationships.

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MAINTENANCE

The GA1108 3-port circulator is designed to be maintenance free and does not require any user maintenance under normal operating conditions. No calibration is necessary.

Although the GA1108 3-port circulator is a very rugged and stable device, it can be subject to damage due to excessive power levels or mishandling. If damage occurs, the circulator should be returned to GAE for repair. Contact GAE for information on repair services.

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