Safety Precautions

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

WARNING

Keep Away From Live Circuits

Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

WARNING

Shock Hazard

Do not attempt to remove the RF transmission line while RF power is present.

WARNING

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

WARNING

Safety Earth Ground

An uninterruptible earth safety ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

WARNING

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

WARNING

Remove Power

Observe general safety precautions. Do not open the instrument with the power on.

Safety Symbols

WARNING

Warning notes call attention to a procedure, which if not correctly performed, could result in personal injury.

CAUTION

Caution notes call attention to a procedure, which if not correctly performed, could result in damage to the instrument.

Note: *Calls attention to supplemental information.*

Warning Statements

The following safety warnings appear in the text where there is danger to operating and maintenance personnel, and are repeated here for emphasis.

WARNING

The vent plug must be used at all times when the unit is in operation or cooling.
Always check to ensure vent plug is installed prior to operation.
Failure to do this could result in damage to the equipment and endanger the operator's safety.

See page 5 and 8.

WARNING

Do not attempt to operate the equipment without the interlock attached.

See page 6.

WARNING

Never attempt to disconnect the equipment from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard

See page 7, 8, and 10.

WARNING

Using this attenuator in the upper end of its power dissipation range will cause the housing to become hot! Care should be exercised in touching it.

See page 8.

Caution Statements

The following equipment cautions appear in the text and are repeated here for emphasis.

CAUTION

This equipment is designed for operation in a horizontal position only, with mounting brackets down. Do not operate in any other manner.

See page 4 and 8.

CAUTION

RF power rating must always be cut in half when the blower assembly is installed but is not running. Under this condition a 2 kW attenuator will be limited to approximately 1 kW.

See page 8.

Safety Statements

USAGE

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

SERVICE

SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE - TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

SERVICIO

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERIO.

WARTUNG

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES GELTEN NUR FÜR GESCHULTES FACHPERSONAL.

ZUR VERMEIDUNG GEFÄHRLICHE, ELEKTRISCHE SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

ENTRENTIEN

L’EMPLOI DES INSTRUCTIONS D’ENTRETIEN DOIT ÊTRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRATIONS D’ENTRETIEN. POUR PRÉVENIR UN CHOC ÉLECTRIQUE DANGEREUX, NE PAS EFFECTUER D’ENTRETIEN SI L’ON N’A PAS ÉTÉ QUALIFIÉ POUR CE FAIRE.

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL’ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARRE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

CONNECT INTERLOCK TO TRANSMITTER/GENERATOR/AMPLIFIER BEFORE OPERATING.

BRANCHER LE VERROUILLAGE À L'ÉMETTEUR/GÉNÉRATEUR/AMPLIFICATEUR AVANT EMPLOI.

CONECTE EL INTERBLOQUEO AL TRANSMISOR/GENERADOR/AMPLIFICADOR ANTES DE LA OPERACION.

VOR INBETRIEBNAHME VERRIEGELUNG AM SENDER/GENERATOR/VERSTÄRKER ANSCHLIESSEN.

PRIMA DI METTERE IN FUNZIONE L'APPARECCHIO, COLLEGARE IL DISPOSITIVO DI BLOCCO AL TRASMETTITORE/GENERATORE/AMPLIFICATORE.

About This Manual

This manual covers the operating and maintenance instructions for the following models:

8329-300

Changes to this Manual

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Solon, Ohio factory. This manual may be periodically updated. When inquiring about updates to this manual refer to the part number and revision on the title page.

Chapter Layout

Introduction — Describes the features of the 8329 Attenuator, lists equipment supplied and optional equipment.

Theory of Operation — Describes how the 8329 Attenuator functions.

Installation — Describes how to set up the 8329 Attenuator.

Operating Instructions — Describes how to operate the 8329 Attenuator.

Maintenance — Lists routine maintenance tasks as well as troubleshooting for common problems. Specifications and parts information are also included.

Table of Contents

Chapter 1 Introduction

General Description

The Model 8329-300 Attenuator is a low-reflection resistance network for use in reducing RF power in 50 ohm transmission lines by known and controlled amounts.

The Model 8329-300 may be used for isolation of power sources up to 2000 W and for low level monitoring. This attenuator is useful for lowering a high input RF power to a level suitable for feeding into an oscilloscope, frequency counter or similar device. The low power value obtained at the output of the attenuator can easily be read on an oscilloscope or terminated in a small RF load resistor.

It is a self-contained instrument that requires no external source of power (except if blower equipped) or utility service. This attenuator is a passive device that is self-contained and does not need any external source of power or utilities to function. The exception would be the use of the optional BA-300 blower for a higher cooling rate. The BA-300-115 requires 115V at 50/60 Hz and the BA-300-230 requires 230V at 50/60 Hz.

The radiator has rhombic shaped cooling fins spaced evenly along its length for the most efficient cooling. Relying only on ambient air currents, this Tenuline Attenuator will safely absorb, and dissipate harmlessly as heat, up to 2000 watts of input power. When equipped with an optional blower, Model BA-300, the increased air flow will allow a doubling of the rated load capacity to 4000 watts. Over the frequency range of DC to 500 MHz, the power output will be reduced by 30dB (99.9%) ±0.5dB. Up to 500 MHz, the input VSWR will not exceed 1.1 and the output VSWR 1.15. See Figure 1 on page 2.

Items Supplied

The following items are supplied with the Model 8329-300.

- LC Female connector - input end
- N Female connector - output end
- Instruction Manual

Items Required

The following items are required to put the Model 8329-300 into service.

- Multimeter
- Screwdrivers
- Matching connectors on the coaxial transmission line.

Optional Items

The following items are available as optional equipment.

- Overload thermoswitch, P/N 8329-028, for protection against burnout.
- Quick-Change (QC) connectors for convenient and easy interchange with other “AN” type QC connectors. Refer to the list in the Maintenance Chapter.

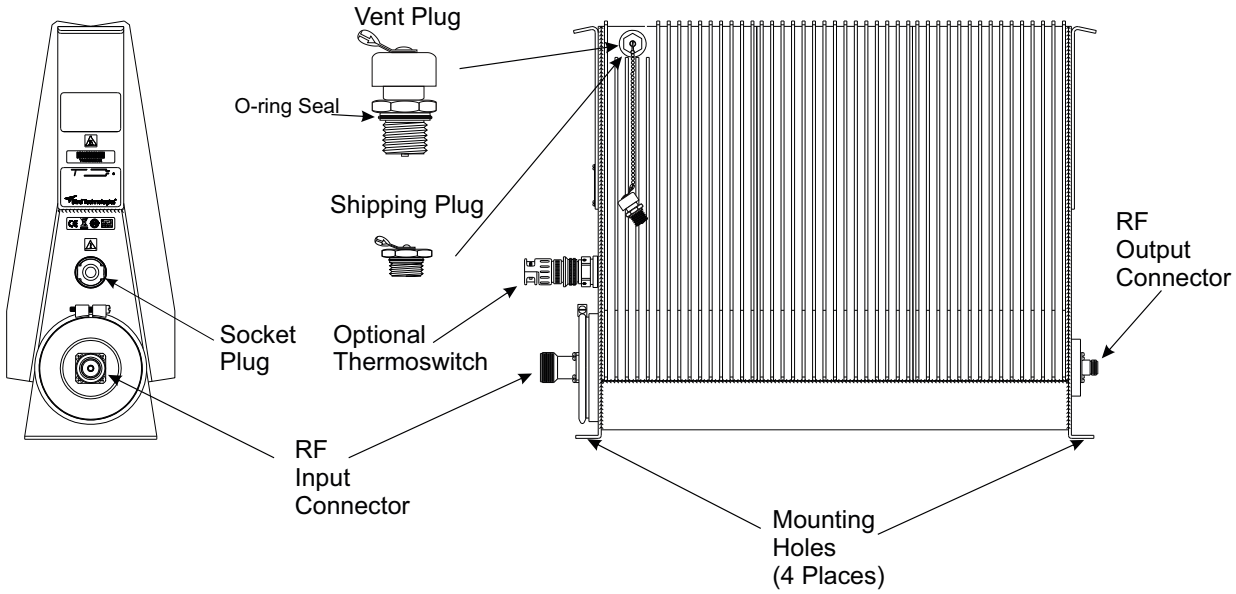
RF Connectors

The 8329-300 Attenuators are equipped with a Bird Quick-Change (QC) connectors.

LC Female connector for the input and a female N type connector for the output are normally supplied but they may be conveniently and easily interchanged with other Bird QC connectors. See "“QC” Type Connectors" on page 15 for a list of available connectors. See "Replace RF Connector" on page 11 for replacement instructions.

> **Note:** *At the full power and frequency capability of this model, refer to* "Specifications" on page 14*, only type LC, LT (Female or Male) or 7/8" EIA (air line) connectors will be adequate on the input line.*

Figure 1 Model 8329-300 Outline Drawing



Chapter 2 Theory of Operation

Attenuator Construction

The Model 8329-300 Attenuator is a symmetrical “T” pad, with the power distribution on the legs being different. Therefore, the value of the resistance on each leg is different according to the power it is to absorb. On the input resistor element, a proportionately larger resistor is of course required for its much greater power dissipation. A “T” configuration is used to provide equal input and output impedance’s for the 50 ohm transmission line attenuation.

The input resistor is joined by the “T” leg joint in an exponentially tapered housing to provide a linear reduction in surge impedance of 50 ohms. This arrangement produces a uniform and practically reflection-less attenuation characteristic over the stated frequencies of the attenuator.

This system of carbon-film-on-ceramic cylindrical resistors immersed in a dielectric coolant constitutes the RF section assembly. The cooling liquid and the tapered input resistor housing provide the proper electrical characteristics of the coaxial line termination.

Cooling

The dielectric coolant is carefully chosen for its desirable dielectric properties, to which the diameters of the resistors and housings are matched, and for its high thermal stability characteristics.

Coolant Expansion

When power is applied to the attenuator, the coolant expands, as the air in the coolant housing is compressed it is allowed to escape through the vent plug located near the top and front face of the unit.

Heat Dissipation

Heat Dissipation is accomplished by convection, the coolant carries the heat generated in the various resistor elements to the walls of the coolant housing. The housing is encased in a set of radiating fins which are attached to its outer surface. These radiating fin surfaces dissipate the heat of the coolant into the surrounding air.

Chapter 3 Installation

Unpacking and Inspection

1. Carefully inspect shipping container for signs of damage.
   - If the shipping container is damaged, do not unpack the unit. Immediately notify the shipping carrier and Bird Technologies.
   - If the shipping container is not damaged, unpack the unit. Save shipping materials for repackaging.
2. Inspect unit for visual signs of damage.

   Note: *If there is damage, immediately notify the shipping carrier and Bird Technologies.*

Site and Shelter Requirements

The Model 8329-300 Attenuator should be operated in a dry, dust, and vibration free environment.

The ambient temperature range should remain between -40°C and +45°C (-40°F and +113°F) for proper operation.

Allow at least 12" (300mm) of clearance around the unit, 6" (150mm) if it is equipped with a blower, to permit unimpeded access of convection air currents for adequate heat dissipation.

Place the attenuator as close as possible to the transmitting equipment, to permit the shortest possible cable length.

Tools Required

The following tools and supplies will be required to prepare the unit for use.

- Wrenches
- Standard screwdrivers
- 9/16 Hex wrench (for thermoswitch installation)
- Pipe sealing compound (for thermoswitch installation)
- Soldering Iron and solder (for thermoswitch installation)
- Bolt and nut sets or lag screws (for mounting)

Mounting

CAUTION
This equipment is designed for operation in a horizontal position only, with mounting brackets down. Do not operate in any other manner!

The attenuator may stand free, may be secured to a bench, or any convenient flat surface. The front and rear face plates are made of heavier gauge material bent outward 90° at the bottom to form mounting flanges. At each corner of these flanges is a 3/8 inch hole for use with suitable fasteners up to 3/8 inch. The holes are arranged in a 20-23/32 inch x 4-1/2 inch rectangle (526.3 x 114.3mm). The front and rear face plates of the attenuator are also bent over on the top to form convenient carrying handles.

1. Place the unit on a flat surface.
2. Insert the fasteners, up to 3/8 inch, through the bench and the holes.
3. Secure the bolts with nuts and lock washers.

Vent Plug

> WARNING
> The vent plug must be used at all times when the unit is in operation or cooling.
> Always check to ensure vent plug is installed prior to operation.
> Failure to do this could result in damage to the equipment and endanger the operator's safety.

Before placing the attenuator into service, the solid shipping plug must be removed and replaced by the spring loaded vent plug. The two plugs are linked together by a short length of bead chain.

1. Locate the vent hole for the plug, located at the top left hand side near the front.
   See Figure 1 on page 2.
2. Remove the shipping plug.
3. Verify the O-Ring is installed on the vent plug.
4. Install the vent plug
5. Retain the shipping plug for use in transporting the attenuator.
   The shipping plug should be placed back in the vent hole whenever the attenuator is to be shipped. Take care not to lose the O-Ring seal.

The Thermoswitch

As an optional item, the attenuator can be provided with a thermoswitch assembly (P/N 8329-028). When the thermoswitch is installed, it prevents possible damage from accidental power overloading from the transmitter or equipment malfunction.

The thermoswitch is normally closed and opens at a maximum safe temperature of +200°C (+392°F). Since the thermoswitch is connected in series with the transmitter interlock, it cuts off the transmitter power if the coolant temperature exceeds this value. The assembly consists of:

- Thermoswitch body - P/N 8329-027
- Coupling Jack - P/N 2450-018

Thermoswitch Installation

> WARNING
> The vent plug must be used at all times when the unit is in operation or cooling.
> Always check to ensure vent plug is installed prior to operation.
> Failure to do this could result in damage to the equipment and endanger the operator's safety.

1. Replace the vent plug with the shipping plug.
2. Stand the unit on its front, supporting it so that the connector is not damaged.

   Note: *In this position there is no danger of the coolant pouring out through the socket plug hole.*
3. Remove the socket plug just above the connector assembly, using a $^{9}/_{16}$" hex wrench.
4. Replace the plug with the thermoswitch. Use an acceptable pipe sealing compound sparingly on *only* the external threads of the thermoswitch.

   Note: Do not contaminate the coolant with pipe sealant.
5. Check for coolant leaks upon completion.