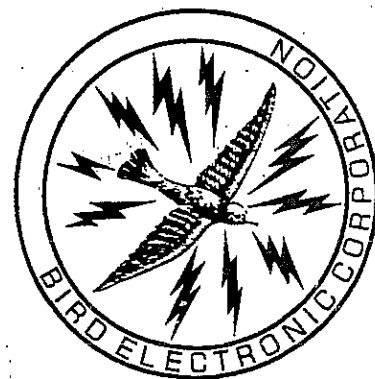




OPERATING INSTRUCTIONS

**TENULINE® ATTENUATOR
MODEL 8327-300**



INSTRUCTION BOOK

OPERATING INSTRUCTIONS

TENULINE® ATTENUATOR
MODEL 8327-300



Bird Electronic Corporation

30303 Aurora Road, Cleveland, Ohio 44139-2794

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.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe normal safety regulations. Do not attempt to replace parts or disconnect an RF transmission or any other high voltage line while power is applied. When working with high voltage always have someone present who is capable of rendering aid if necessary. Personnel working with or near high voltage should be familiar with modern methods of resuscitation.

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.

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.

SHOCK HAZARD

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

CHEMICAL HAZARD

Dry cleaning solvents used to clean parts may be potentially dangerous to your health. Avoid inhalation of fumes and also prolonged contact with skin.

RESUSCITATION

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

SAFETY SYMBOLS

WARNING

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

CAUTION

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

LIMITED WARRANTY

All products manufactured by Seller are warranted to be free from defects in material and workmanship for a period of one (1) year, unless otherwise specified, from date of shipment and to conform to applicable specifications, drawings, blueprints and/or samples. Seller's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by Seller.

If Seller's products are claimed to be defective in material or workmanship or not to conform to specifications, drawings, blueprints and/or samples, Seller shall, upon prompt notice thereof, either examine the products where they are located or issue shipping instructions for return to Seller (transportation-charges prepaid by Buyer). In the event any of our products are proved to be other than as warranted, transportation costs (cheapest way) to and from Seller's plant, will be borne by Seller and reimbursement or credit will be made for amounts so expended by Buyer. Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing within ten (10) days from the date of discovery of the defect.

The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's specifications. In addition, Seller's warranties do not extend to the failure of tubes, transistors, fuses and batteries, or to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to Seller.

The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR SELLER ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.

MODELS COVERED IN THIS INSTRUCTION BOOK

8327-300

The following safety warnings appear in the text where there is procedures, that if not carefully followed, could be detrimental 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. Failure to do this could result in damage to the equipment and endanger the operator's safety. Be sure to check this plug.

WARNING

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

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.

WARNING

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

The following cautions appear in the text whenever a procedure, if not properly followed, could put the equipment in danger of damage 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.

TABLE OF CONTENTS

Section	Paragraph	Page
	Safety Precautions	i
I.	INTRODUCTION	
	1.1 Purpose and Function	1-1
	1.2 Performance Characteristics and Capabilities	1-1
	1.3 Power and Utility Requirements	1-1
	1.4 Connections	1-1
	1.5 List of Items Furnished	1-1
	1.6 List of Items Required	1-1
	1.7 Tools and Test Equipment	1-1
	1.8 Unit Specifications	1-2
II	INSTALLATION	
	2.1 Location	2-1
	2.2 Mounting	2-1
	2.3 Thermoswitch	2-1
III	THEORY OF OPERATION	
	3.1 General	3-1
IV	OPERATING INSTRUCTIONS	
	4.1 General	4-1
	4.2 Connection and Operation	4-1
	4.3 Operation Under Abnormal Conditions	4-1
	4.4 Shutdown	4-1
	4.5 Emergency Shutdown	4-1
V	MAINTENANCE	
	5.1 Troubleshooting	5-1
	5.2 Cleaning	5-1
	5.3 Inspection	5-1
	5.4 Preventive Maintenance	5-1
	5.5 Calibration	5-2
	5.6 Disassembly	5-2
	5.7 Coolant Level	5-2
	5.8 Reassembly	5-3
	5.9 Repairs	5-4
VI	PREPARATION FOR RESHIPMENT	
	6.1 RF Section Assembly	6-1
	6.2 Complete Unit	6-1

TABLE OF CONTENTS [CONT]

Section	Paragraph	Page
VII	STORAGE	
	7.1 General	7-1
VIII	REPLACEMENT PARTS LIST	
	8.1 Model 8327-300	8-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
2-1	Thermoswitch Assembly (P/N 4250-056)	2-2
2-2	Model 8327-300 Dimensional Outline	2-3
8-1	Shipping Plug	8-2
8-2	Shielded Relief Valve Assembly	8-2

SECTION I. INTRODUCTION

1.1. PURPOSE AND FUNCTION

The Model 8327 Attenuator is a low-reflection resistance network for application in the measurement of high power in controlled and known amounts. It is an electrical "T" pad immersed in a dielectric coolant, using principles employed in Bird TERMALINE® RF Load Resistors, which permit the use of large resistive elements at high frequencies while maintaining a low VSWR over a wide frequency range. The attenuator is designed to match the most commonly used 50 ohm transmission line systems.

1.2. PERFORMANCE CHARACTERISTICS AND CAPABILITIES

A system of resistive film-on-ceramic cylindrical resistors immersed in a dielectric coolant constitutes the RF section assembly. The cooling fluid and the tapered input resistor housing provide the proper electrical characteristics for the coaxial line attenuation throughout the internal circuitry. By convection, the fluid carries the heat generated in the various resistor elements to the walls of the coolant housing. This 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 surrounding air.

The unit may be used for isolation of power sources up to 1000 W and for low level monitoring. 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.

1.3. POWER AND UTILITY REQUIREMENTS

The Model 8327-300 TENULINE® Attenuator does not require any external source of power or utilities for cooling purposes. It is a self-contained instrument intended to be fully cooled by natural convection in normal ambient air with a power input of 1000 W. The attenuator unit has a unique rhombic shape with transverse cooling fins evenly spaced along its entire length. The front and rear panels of the unit have mounting flanges. These flanges act as supports for free standing use, or as mounting brackets for optional fixed mounting. Mounting holes are provided for this purpose (see paragraph 2.4).

1.4. CONNECTIONS

The RF input and output connectors are of the Bird "Quick-Change" configuration to permit interchange of connector types. These "QC" connectors are located on the front and back of the unit. See paragraph 5.6 for changing procedure.

1.5. LIST OF ITEMS FURNISHED

The Model 8327-300 is normally supplied with two connectors for its input end, an LC Female and an N Female. An N Female connector is supplied at the output end. The LC input Connector is usually already installed on the attenuator and the N connector is in a bag attached to the unit. These are Quick-Change connectors for convenient and easy interchange with other "AN" type "QC" connectors. Available as optional equipment is an overload thermoswitch, P/N 2450-056, for protection against burnout. As an optional service, the attenuator can be specially calibrated from 500 to 1000 MHz at the time of ordering. This instruction book is the only other item furnished as standard equipment.

1.6. LIST OF ITEMS REQUIRED

The only other items required are two matching connectors on the coaxial transmission line to which the load will be connected.

1.7. TOOLS AND TEST EQUIPMENT

Only simple tools such as screwdrivers will be necessary for disassembly of this equipment. A resistance bridge or an ohmmeter with an accuracy of one percent or better at 50 ohms is useful for checking the resistance values of the RF section assembly.

1.8. Unit Specifications

Model 8327-300 TENU LINE® Attenuator

Impedance	50 ohms nominal
VSWR	
Input, dc-500 MHz	1.1:1.0 maximum
Output, dc-500 MHz	1.15:1.0 maximum
Connectors	
Input	Female LC and N "QC" type
Output	Female N "QC" type
Power Rating	1000 W
Frequency Deviation	DC-500 MHz at ± 0.5 db max.
Attenuation	30 db
Calibration Frequencies	30, 100, 200, 300, 400, & 5000 MHz at ± 0.2 db†
Dimensions	23 15/32"L* x 7 1/8"W x 17 3/16"H (596 x 181 x 437 mm)
Mounting Dimensions	20 23/32" x 4 1/2" rectangle (526.3 x 114.3 mm)
Ambient Temperature	-40°C to +45°C (-40°F to +113°F)
Weight	57 lb (26 kg)
Operating Position	Horizontal only
Finish	Light navy grey baked enamel

†Special calibration to 1000 MHz available at time of order.

*Using respective LC & N connectors normally supplied.

SECTION II. INSTALLATION

2.1. LOCATION

CAUTION

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

Allow at least 12 inches (305 mm) of clearance around the unit, to permit an unimpeded access of convection air currents for adequate heat dissipation. Place the attenuator to permit the shortest possible cable length between the unit and the transmitting equipment. Operate the attenuator in a horizontal position only, with the handles and vent plug up.

2.2. MOUNTING

The attenuator may be used for portable operation or for fixed installation; that is, it may stand free or 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 x 15/32 inch elongated 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 114.3 mm). Secure the unit in place with lag screws or nut and bolts sets. The front and rear face plates of the attenuator are also bent over on the top to form convenient carrying handles.

WARNING

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

Before placing the attenuator into service, the solid shipping plug, P/N 2450-049, must be removed and replaced by the spring loaded vent plug, P/N 2450-094. The vent hole for these plugs is located on the

top left hand side near the front. The two plugs are linked together by a short length of bead chain. 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.

2.3. THERMOSWITCH

As an optional item, the attenuator can be provided with a thermoswitch assembly, P/N 2450-056. When installed on the front of the radiator, same end as the RF input, it will prevent possible damage occurring from accidental power overloading from the transmitter or equipment malfunction. Being closed, the thermoswitch opens at a maximum safe temperature. Connected in series with the transmitter interlock, it cuts off transmitter power if the coolant temperature exceeds this value. The assembly consists of a thermoswitch body, P/N 2450-040, with a coupling jack, P/N 2450-018, attached.

If a thermoswitch is to be field installed, proceed as follows:

a. Replace the vent plug with the shipping plug first. Then stand the unit on its back end with the input connector end up. In this position there is no danger of the coolant pouring out through the socket plug hole.

b. Using a 9/16 Allen wrench, carefully remove the socket plug located just above the connector, on the front face of the radiator (see figure 2-2).

c. Replace the plug with the thermoswitch. Use an acceptable pipe sealing compound such as "Locktite with Teflon", or its equivalent, sparingly on only the external threads of the thermoswitch. Do not contaminate the coolant with pipe sealing compound. Observe closely for coolant leaks upon completion.

Connect the thermoswitch as follows: (See figure 2-1.)

a. Unscrew the larger knurled ring-nut (A) at the lower end of the coupling jack assembly. Pull it off from the thermoswitch jack (B).

Unscrew the small knurled cover fitting (C) from the base plug (D) of the connector to release the base.

b. Thread the interlock wires through the clamp (E), with washers (F) inside, and with its threaded fitting in place. Service the interlock wire with short tips, using spaghetti sleeves over the wire ends if needed. Then securely solder the interlock leads to the lugs (G) of the connector base. Note - Be sure that the larger captive clamping nut (A) is in place over the base plug (D) with the knurled end outward towards face.

c. Screw on the cover ring (C) first, then fasten the cable clamp (E) in place, and tighten the two yoke screws (H) on the cable. Push the plug back on to the thermoswitch, and tighten the captive knurled connecting ring. Do not attempt to operate the equipment without the interlock attached.

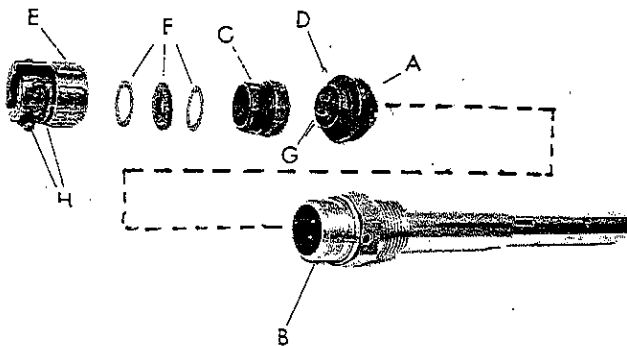


Figure 2-1. Thermoswitch Assembly
(P/N 4250-056)

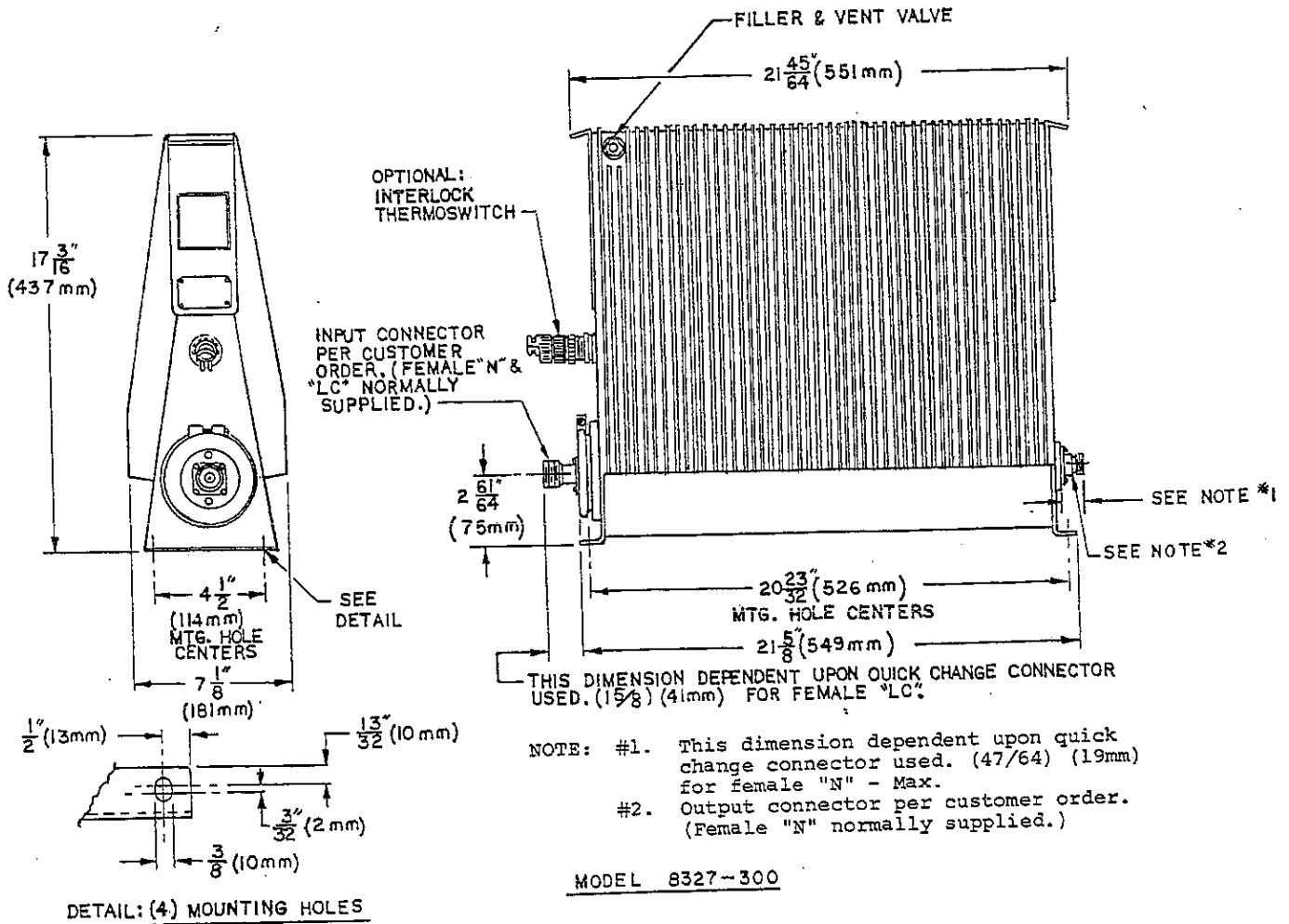


Figure 2-2. Model 8327-300 Dimensional Outline

SECTION III. THEORY OF OPERATION

3.1. GENERAL

The Model 8327-300 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 resistive 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 impedances for the 50 ohm transmission line attenuation.

The input resistor is joined to the "T" leg joint in an exponentially tapered housing to provide a linear reduction in surge impedance directly proportional to the distance along the resistor. The output resistor is enclosed in a housing designed to return to the characteristic impedance of 50 ohms. This arrangement produces a uniform and practically reflectionless 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.

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. Expansion of the coolant, when power is applied to the attenuator, is accomplished by allowing the air, which is compressed by the expanding coolant, to escape through the vent plug located near the top and front face of the unit.

By convection, the coolant carries the heat generated in the various resistor elements to the walls of the coolant housing. This 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.

The Model 8327-300 may be used for isolation of power sources up to 1000 W and for low level monitoring. 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.

SECTION IV. OPERATION INSTRUCTIONS

4.1. GENERAL

The attenuator, being a passive device, has no indicators or operating controls. No initial adjustments are necessary other than to connect the over temperature switch, if so equipped, to the transmitter interlock.

4.2. CONNECTION AND OPERATIONS

WARNING

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

Connect the attenuator input to the transmitter's power output and the output to a suitable load with 50 ohm coaxial (RG-8A/U, RG-9/U, RG-213/U or equal) equipped with plugs which mate with the RF input and output connectors of the attenuator. If the attenuator is to be operated at both maximum power and frequency values, use a Male LC connector with suitable cable (such as RG-218/U or RG-220/U) on the input and Male N connector with appropriate cable or load on the output. These connect to the RF fittings normally supplied.

The front or input end of the attenuator is identified by the four inch (102 mm) diameter die-cast aluminum disc on which the connector is mounted. The rear face of the unit is stenciled OUTPUT above the connector. Caution should be taken not to couple the attenuator backwards to the direction of power flow. Destruction of the output resistor will result.

Before applying any RF power to the attenuator, be certain to check that the breather is in place in the vent hole. See Section I, Installation.

4.3. OPERATION UNDER ABNORMAL CONDITIONS

The Model 8327-300 TENU LINE® Attenuator is not intended or recommended for outdoor use where it may be unprotected and exposed to the elements. It may be subjected to moderate overloads for

limited periods of time without overheating. However, this should be done cautiously, and it is strongly recommended that if such a use is contemplated, the attenuator should be equipped with a thermoswitch, P/N 2450-056. When interlocked with the power line to the source of RF energy, the thermoswitch becomes a fail-safe device to guard the attenuator against the dangers of overheating.

4.4. SHUTDOWN

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.

This attenuator, being a passive device, can not be shut off. The source of RF energy must be cut off instead.

4.5. EMERGENCY SHUTDOWN

Turn off RF power at its source.

SECTION V. MAINTENANCE

5.1. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
Leaking of coolant oil around clamping band or radiator housing	Clamping band not tight	Tighten slightly with a screwdriver.
	Faulty O-Ring (input)	Replace per paragraph 5.7.
	Faulty O-Ring (output)	Replace per paragraph 5.7.
Excessive overheating of the radiator	Transmitter power too high	Reduce transmitter power.
	Faulty RF section assembly	Replace per paragraph 5.7.
	Coolant oil level too low	Add more coolant oil to the radiator per paragraphs 5.6 through 5.7.
High or low DC resistance values per paragraph 5.5	Faulty RF input connector	Replace per paragraph 5.6
	Loose RF input connector	Tighten with a screwdriver.
	Faulty RF section assembly	Replace per paragraph 5.7.

5.2. CLEANING

The outside surface of the attenuator should be wiped free of dust and dirt when necessary. The principle maintenance required by the operator will be to periodically wipe the accumulated dust and lint off the radiator fins. Excessive collection of dust and lint on the cooling fins will interfere with the efficient dissipation of heat. If the Teflon insulator or metallic contact surfaces of the connector should become dirty or grimy, wipe them off with a soft cloth. Use a contact cleaner that is self-drying and leaves no residue to clean the inaccessible internal parts.

5.3. INSPECTION

Periodically inspect under the clamping band,

around the output connector, and the thermoswitch, if the attenuator is so equipped, for signs of possible coolant leakage. See paragraph 5.6 for proper action. Check the connector assembly for tightness. Inspect the cooling fins for accumulation of dust and lint, and the painted metal parts for signs of corrosion. Also, occasionally check the coolant level in the radiator tank.

5.4. PREVENTIVE MAINTENANCE

If there are signs of coolant leakage around the clamping band try tightening it. If the leakage persists it is likely that the O-Ring seal is damaged or deteriorated. Replace it per paragraph 5.6. Similar action should be taken if leakage occurs around the thermoswitch. Remove the thermoswitch



carefully and recoat the threads with sealing compound. Wipe the cooling fins clean of accumulated dust and lint in order to preserve their efficiency in transferring heat to the environment. If any portions of the radiator are corroded or rusted, clean the areas with a fine flint sandpaper, and then touch them up with grey enamel.

5.5. CALIBRATION

Accurate measurement of the dc resistance between the input to ground, output to ground, and input to output will provide a good check of the condition of the attenuator. For these measurements, a resistance bridge or ohmmeter with an accuracy of one percent or better at 50 ohms should be used. Use low resistance leads, preferably a short piece of 50 ohm cable (RG-8A/U or RG-9B/U) attached to Male plugs which match the Female connectors on the attenuator. When the resistance of the equipment is checked at room temperature, the measured readings should be within ± 2 ohms of their nominal resistance values, commonly 93.7 ohms input to output and 50 ohms from either end to ground. It is recommended that for reference purposes, these resistance values should be measured upon receipt of the attenuator and then checked periodically thereafter.

5.6. DISASSEMBLY

There are no special techniques required for the repair or replacement of components in this TENU LINE® Attenuator. A screwdriver and possibly an end wrench are the only tools needed. The following paragraphs outline the component removal procedures.

RF Connector - The connector is a "Quick-Change" design which permits easy interchange with the use of only a screwdriver. This process does not interfere with the essential coaxial continuity of the attenuator RF input, output, or the coolant oil seals. For replacement, proceed as follows:

- a. Remove the four 8-32 x 5/16 round head machine screws from the corners of the RF connector.
- b. Pull the connector straight out of its socket.

Coolant - To examine or replace the dielectric

coolant, the plug on the front of the radiator, or thermoswitch, if so equipped, must be removed. Proceed as follows:

- a. Carefully raise the front of the attenuator until the unit is resting on its back (output connector) end.
- b. Brace the attenuator in this vertical position to avoid tipping it over. Take care not to exert excessive pressure on the attenuator and thereby damage the output connector, while it is in this position.
- c. Remove the thermoswitch, if the attenuator is so equipped. If not, remove the pipe plug (use a 9/16 Allen wrench). Do this carefully to avoid damaging the threads.
- d. Check the coolant level.

5.7. COOLANT LEVEL

The level of the dielectric coolant, P/N 5-030, should remain constant in the unit after prolonged usage under normal operating conditions. As shipped, the coolant is at a factory determined level, and should be about 3-1/4 inches (82.5 mm) below the surface of thermoswitch hole, with the unit in a vertical position. However, loss of up to 10% of the full tank capacity should not impair the operating efficiency of the attenuator. The coolant should be crystal clear and colorless. If not, it is contaminated and should be replaced. Inspect occasionally around the clamping band at the input end for possible coolant leakage. Tighten the clamping screw if necessary, and make certain the O-Ring seal is in good condition; i.e. soft and pliable and free from surface cracks.

To Add Coolant - Add coolant through the pipe plug hole until it reaches the proper level. Do not overfill beyond recommended level (see paragraph 5.7).

To replace all of the coolant use the following procedures:

- a. Remove the rear (output) connector per paragraph 5.6.
- b. Replace the vent plug with the shipping plug.

c. Carefully raise the unit by its front handle and foot until it is tipped up on its back.

d. Position the load on the bench top so that the entire rear connector assembly, minus the connector, projects over the edge of the bench. Brace it vertically in this position so that it will not topple over.

e. Place a clean container for liquid on a stool or a box perhaps, just under the rear connector assembly to receive the oil. The volume of oil is 2.9 gallons (11 liter), so the container must be at least a three gallon size, and preferably five gallons.

f. Remove the V-band clamp from around the front (input) connector assembly by loosening the 10-32 holding screw sufficiently to slip the band off.

g. Carefully work the RF section assembly loose and lift it straight out of the radiator tank. There will be some initial resistance as the O-Ring seal around the rear connector assembly comes loose from the housing. As the RF section comes out of the rear connector assembly, the coolant will start to pour into the container. Work the RF section loose slowly, so that the coolant doesn't splash coming out. Let the coolant drip for a few minutes to get as much as possible out. Note - As the RF section is raised out of the radiator tank some coolant will be trapped in the rear end cylinder. Turn the section over carefully to empty this out.

NOTE - An alternate, but much slower, method of draining the radiator would be to siphon the coolant out of the thermoswitch hole.

RF Load Resistor Assembly - To replace the load resistor assembly use the same procedure as in paragraph 5.7 and then inspect the O-Ring seals. Do not reuse the O-Rings if they are no longer soft and pliable or shows signs of surface cracks. The RF section is not field repairable and further disassembly should not be attempted. Return the entire RF assembly to the factory for repair or replacement.

Thermoswitch - To remove or replace the thermoswitch use the procedures in paragraph 2.3.

5.8. REASSEMBLY

RF Connector - To install a new connector, reverse the procedures in paragraph 5.6. Be sure the projecting center pin on the connector is properly engaged and seated in the mating socket, then push it in firmly.

Coolant - After adding coolant, if needed, reverse the procedure given in paragraphs 5.6 through 5.7. Screw the pipe plug or thermoswitch back in place carefully to avoid stripping the aluminum threads of the plug hole. The pipe plug or thermoswitch threads should be coated sparingly with "Loctite with Teflon" or similar pipe sealant. Do not contaminate the coolant and alter its dielectric properties.

To replace the coolant use the following procedures:

a. After completing the steps in paragraph 5.7, discard contaminated coolant collected in the container.

b. Replace the RF section assembly making sure it is smoothly and firmly seated in the rear connector assembly.

c. Replace the V-band on the front connector plate assembly and tighten the screw.

d. Follow the procedures in paragraphs 5.6 through 5.7 to add enough new coolant to bring it to the level indicated in paragraph 5.7.

e. Replace the pipe plug or thermoswitch carefully to avoid damaging the threads (see paragraph 5.8).

f. Lower the attenuator back onto its feet.

g. Check all seals for signs of leaks.

RF Section Assembly - Use the procedures in paragraph 5.8. If the coolant in the container is not contaminated, it may be reused in the radiator tank with additional new coolant as required.

Thermoswitch - Use the procedures in paragraph 2.3.

5.9. REPAIRS

Repairs beyond what are covered in this instruction book will require return of the equipment to Bird Electronic Corporation for service. Please consult the factory.

SECTION VI. PREPARATION FOR RESHIPMENT

6.1. RF SECTION ASSEMBLY

Wrap the RF section assembly with sufficient padding to avoid damage in shipping and tape securely. Place the wrapped RF section in a cardboard carton and pad or brace it to prevent shifting.

6.2. COMPLETE UNIT

If the entire unit is to be shipped, first remove the vent plug and replace it with the shipping plug. The unit may be shipped with its dielectric coolant; however, do not ship the unit with its dielectric coolant if the unit has developed a coolant leak. Drain the coolant first. Place the attenuator in a wooden crate or other substantial shipping container, and pack or brace it securely to prevent damage in shipping.

SECTION VII. PREPARATION FOR RESHIPMENT

7.1. GENERAL

No special preparations for storage are necessary other than to cover the equipment to keep out dust and dirt. Store the unit in a dry and dust-free environment where the ambient temperature will remain within the -40°C to $+45^{\circ}\text{C}$ (-40°F to $+113^{\circ}\text{F}$) operational range of the load.

SECTION VIII. REPLACEMENT PARTS LIST

8.1. Model 8327-300

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
1	1	RF section assembly	8327-302
2	1	Radiator assembly	8329-307
3	2.9 gallons (11 liters)	Dielectric coolant	5-030-3 (1 Gallon Container)
4	3	"QC" connector	*See Below
5	1	Clamp band assembly (includes screws)	2430-055
6	1	Input O-Ring seal	8110-039
7	1	Output O-Ring seal	5-176
8	1	Vent relief valve	2450-094
9	1	Shipping plug	2450-049
10	2	Vent and shipping plug O-Ring	5-504
11	1	Chain assembly	8180-094
12	1	Thermoswitch plug	5020-103
13	1	Thermoswitch & connector assembly	2450-056
		accessory item consisting of:	
	1	Connector assembly	2450-018
	1	Thermoswitch assembly	2450-040

*Available QC Type Connectors

†N-Female(input/output)	4240-062	LT-Female	4240-018
N-Male	4240-063	LT-Male	4240-012
HN-Female	4240-268	C-Female	4240-100
HN-Male	4240-278	C-Male	4240-110
†LC-Female (input)	4240-031	UHF-Female (SO-239)	4240-050
LC-Male	4240-025	UHF-Male (PL-259)	4240-179

7/8" EIA Air Line 4240-002

†Normally supplied

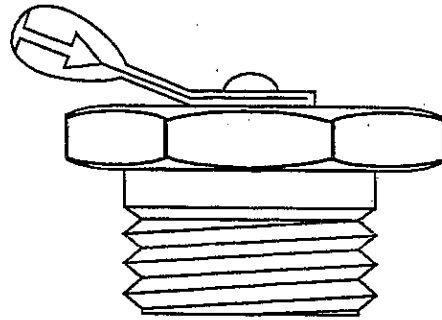


Figure 8-1. Shipping Plug - Remove and replace with vent plug when attenuator is in operation

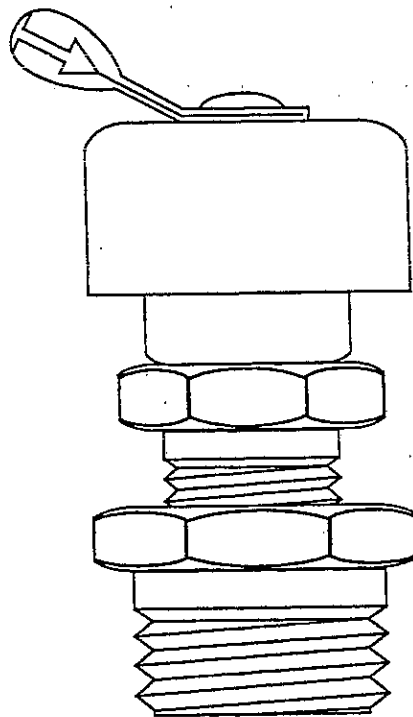


Figure 8-2. Shielded Relief Valve Assembly - Must be installed in place of shipping plug when attenuator is in operation

**QUALITY INSTRUMENTS
FOR RF POWER MEASUREMENTS**

From 2 to 2300 MHz and from 25 milliwatts
to 250 kilowatts in 50 ohm coaxial line systems

TERMALINE®

**ABSORPTION
WATTMETERS**

LOAD RESISTORS

CALORIMETERS

THRULINE®

**DIRECTIONAL
MONITORING
WATTMETERS**

TENULINE®

ATTENUATORS

COAXWITCH®

**SELECTOR
SWITCHES**

COAXIAL RF FILTERS

SENTRILINE®

FILTER-COUPERS

BIRD

ELECTRONIC CORPORATION
30303 Aurora Road Cleveland, (Solon) Ohio 44139-2794