

TO nnnn-nn-nnn-nn

**Instruction Book
with
Parts List**

**TERMALINE® LOAD RESISTOR
MODEL 8833-300**

**Bird Electronic Corporation
nnnnnn-nn-n-nnnn**

January 1, 1996

© Copyright 1996 by Bird Electronic Corporation
Instruction Book Part Number TO-nnnn-nn-nnn-nn
Termaline® is a registered trademark of
Bird Electronic Corporation
30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794

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.

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.

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.

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.

The following will appear in the text of this publication and are shown here for emphasis.

Warning

Before placing the unit into operation, remove the shipping plug at the top of radiator, near front, substitute with the specially shielded breather plug. Use a 3/4 inch flat wrench for this purpose - do not lose the O-Ring seal. This vent hole must remain open 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. The use of the vent plug also protects the filler opening against intrusion of foreign material while allowing unobstructed venting of the tank. The shipping plug (with O-Ring seal) should be put back in place whenever the unit is to be transported. Be sure to check this plug.

Warning

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

Warning

Provide adequate ventilation and observe normal precautions when using dry cleaning solvents. Many dry cleaning agents emit toxic fumes that may be harmful to your health if inhaled.

Table Of Contents

1.	Introduction	5
	Purpose and Function	5
	Description	5
	RF Input	5
	Coolant	5
	Vent	5
	Items Supplied	5
	Specifications	5
	Component Location	6
	Installation	7
	Mounting	7
	Orientation	7
	Vent	7
	Installing Vent Plug	7
	Thermoswitch	7
	Checking the DC Resistance	8
	Theory of Operation	9
	General	9
	Dielectric Coolant	9
	Radiator	9
	Operating Instructions	10
	Load Resistor Connection	10
	Load Resistor Operation	10
	Maintenance	11
	General	11
	Checking DC Resistance of the Load Resistor	11
	Removing the Load Resistor	11
	Installing the Load Resistor	11
	Preventing Coolant Leakage	12
	Checking Coolant Level	12
	Pressure Vent	12
	RF Input Connector	12

Introduction

1.1 Purpose and Function

The Model 8833-300 Termline Load Resistor is designed as a low reflection and nonradiating termination for coaxial transmission lines. It is a useful aid in the tuning and troubleshooting of transmission equipment within its rating.

1.2 Description

The Model 8833-300 RF Load is fully self-contained. No additional equipment or outside power source is required. Attached to the front and rear panels of the rhombic-shaped radiator are mounting flanges. These flanges act as supports for free standing use in portable applications, or as mounting brackets for optional fixed installation. There are mounting slots provided in the flanges for this purpose, see Section 2 - Installation. Convenient carrying tabs are also provided at each end of the radiator.

1.3 RF Input

The RF input connection is on the lower front face of the unit. The Model 8833-300 is designed for use with coaxial cable using large LC or LT connectors. A female LC connector is installed at the factory, a female N connector is also supplied. Bird Quick-

Change "QC" connectors, and how to change them, are described in Section 5 - Maintenance.

1.4 Coolant

The load unit is filled with a specially selected dielectric coolant chosen for its desirable thermal characteristics and dielectric properties.

1.5 Vent

The coolant inlet, when capped with the vent plug, relieves internal pressure resulting from expansion of heated coolant.

1.6 Items Supplied

Model 8833-300 RF Load Resistor
Female LC Connector (installed)
Female N Connector
Shipping Plug with O-Ring Seal (installed)
Vent Plug with O-Ring Seal (attached by chain)
Coolant (installed)
Interlock Thermoswitch (optional)

1.7 Specifications

Refer to Table-1 for operational specifications.

Table - 1

Specifications

Power Rating	1000 W continuous duty
RF Input Impedance	50 ohm
Input Connector	Bird "QC" type, female LC normally supplied installed. Female N supplied as an accessory.
Frequency Range	DC - 2.5 GHz
VSWR	
dc-1 GHz	1.10:1.0
1-2.5 GHz	1.25:1.0
Ambient Temperature	-40°C to +45°C (-40°F to +113°F)
Dimensions	21-45/64"L x 7-1/8"W x 17-3/16"H (551 x 181 x 437 mm)
Weight	54 lb 10 oz (24.8 kg)
Finish	Light navy gray (MIL-E-15090C)
Cooling Method	Liquid dielectric and natural air convection

1.8 Component Location

Refer to the following Outline Drawing, Figure- 1, for dimensions and component location.

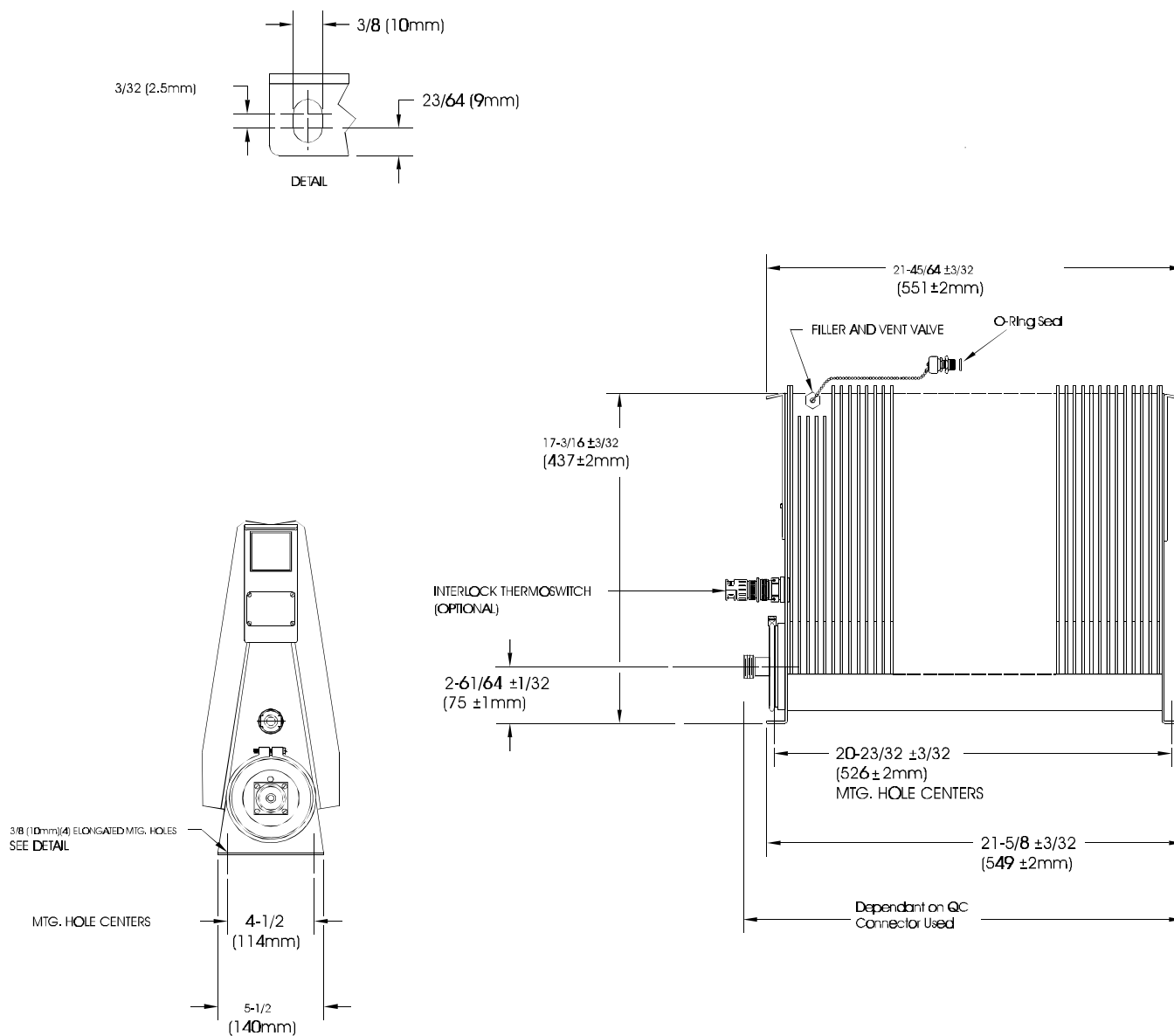
Installation

2.1 Mounting

The Model 8833-300 Load Resistor is equipped for either fixed installations or portable use. The load is

2.

Figure - 1
Outline Drawing



free standing or can be attached to a bench, etc., Refer to Figure-1, Outline Drawing, for location of the two mounting brackets and four mounting holes. Attach the load using four suitable fasteners.

2.2 Orientation

This equipment is designed for operation in an up-right position only, as shown in Figure-1, Outline Drawing. Do not attempt to operate in any other position.

2.3 Vent

The coolant filler inlet is capped with a shipping plug, Figure-2, during transport from the factory. The shipping plug must be removed and replaced with the vent plug, Figure-3, before operation. The vent plug must also remain installed during cooling.

2.4 Installing Vent Plug

Warning
Failure to properly vent the radiator during operation and cooling can result in equipment damage and personal injury.

- Remove the shipping plug using a 3/4" flat wrench.
- Ensure the o-ring seal stays in place on the shipping plug.
- Ensure the o-ring seal is in place on the vent plug.
- Install vent plug.

2.5 Thermoswitch

thermoswitch assembly, P/N 2450-056, is an available option. When installed in the radiator, it will prevent damage from accidental transmitter power overload or equipment malfunction. Being normally closed, the thermoswitch opens at a maximum safe temperature. Connected in series with the transmitter interlock, it cuts off transmitter power if load temperature exceeds this value. The assembly consists of the thermoswitch body, P/N 2450-040, with coupling jack, P/N 2450-018, attached.

Thermoswitch Installation

- Place the unit on its back, with the connector end up. This position prevents coolant spillage.
- Use a 9/16 allen wrench to remove the socket plug on the front face of the radiator.

Replace the plug with the thermoswitch. Use an acceptable pipe sealing compound sparingly, on the external threads only, of the thermoswitch. Do not contaminate coolant with pipe sealing compound. Observe closely for coolant leaks upon completion.

Connecting the Thermoswitch, see Figure-4

- Unscrew the knurled ring-nut [A] at the lower end of the coupling jack assembly. Pull it off the thermoswitch jack [B].
- Unscrew the small knurled cover fitting [C] from the base plug [D] of the connector to release the base.
- Thread the interlock wires through the clamp [E] (with washers [F] inside) and with its threaded fitting in

Figure - 2
Shipping Plug

A

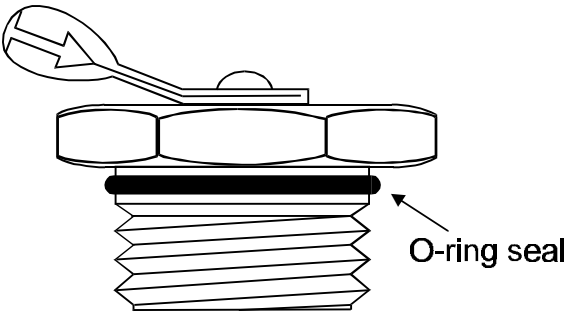
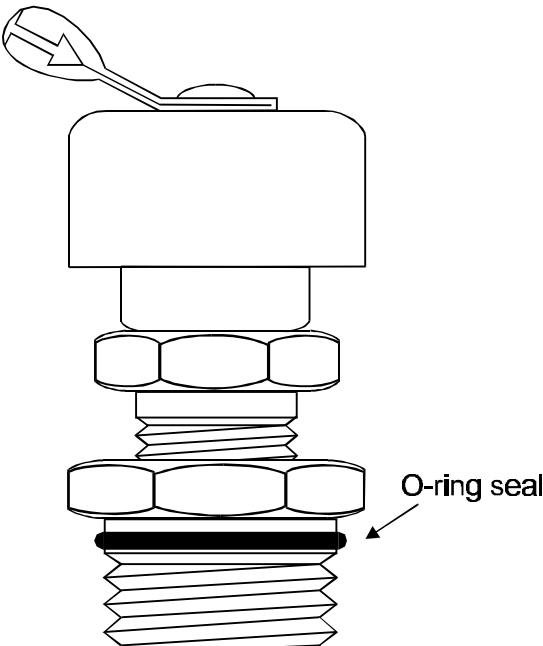


Figure - 3
Vent Plug

p
l
a



Note: Be sure that the knurled ring nut [A] is in place over the base plug [D] with the knurled end outward (towards face).

Screw on the cover ring [C].

Fasten the cable clamp [E], and tighten the two yoke screws [H] on the cable.

Push the plug back on the thermoswitch, and tighten captive knurled connecting ring. Do not attempt to operate the equipment without interlock attached.

2.6 Checking the DC Resistance

VSWR and RF Impedance are the true benchmark of a quality dummy load. Checking the dc resistance is simply used to measure a change in the condition of the resistor over a period of time. If the application requires such measurements, follow the steps below to obtain a benchmark value *before* the unit is put into service.

Preparation and Tools Required

Be sure the vent plug is installed, see paragraph 2.4.

Tools: Resistance Bridge or Ohmmeter with accuracy of $\pm 1\%$ @50 ohms.

Temperature of the load is 20° to 25°C (68° to 70°F).

Procedure

Using the resistance bridge or ohmmeter, check the dc resistance of the load before it is put into service, see Figure-5.

Record the value and keep for future use.

Figure - 4
Thermoswitch Assembly

Normally the dc resistance of the load will be a nominal 50 ohms. Stabilization of the resistive film or temperature can cause a change in the dc resistance.

Check the resistance of the load periodically, according to use, and compare this resistance with the original reading. If the values vary more than 2 ohms this could be an indication of a failing resistive element.

3. Theory of Operation

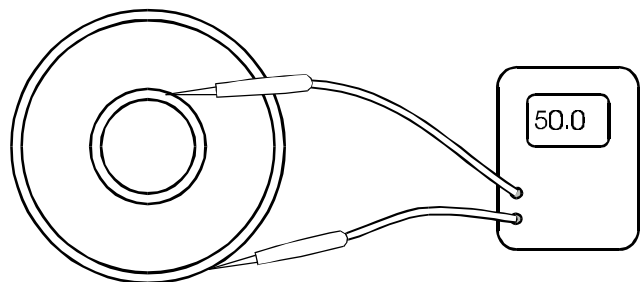
3.1 General

The Model 8833-300 RF Load consists of a film-on-ceramic resistor immersed in a dielectric coolant. The resistor, which is individually selected for its accuracy, is enclosed in an exponentially tapered housing, providing a reduction in surge impedance directly proportional to the distance along the resistor. When the resistor unit is immersed in the dielectric liquid, the characteristic impedance will be 50 ohms at the connector end and graduate to zero ohms at the rear, where the resistor joins the housing forming the return conductor of the coaxial circuit. This produces a uniform, practically reflectionless, line termination over the stated frequencies of the load resistor.

3.2 Dielectric Coolant

The dielectric coolant, a low volatility, high flash point synthetic oil, is chosen for its desirable thermal characteristics and dielectric properties, to which the diameters of the resistor housing are matched. A synthetic rubber o-ring around the outside of the r
e
s

Figure - 5
Checking DC Resistance



istor housing mount furnishes a seal for the radiator opening. A beveled flange retains the o-ring. The o-ring is pressed against the radiator face by the action of drawing up of radial V-band clamp around the enclosing beveled flanges.

3.3 Radiator

When input power is applied, the resistor generates heat which is absorbed by the surrounding dielectric coolant. By convection, the heated oil flows through holes in the coaxial shell to the walls of the radiator tank. This radiator is a fabricated single-unit construction, and is carefully designed of heat-sink sections on a unique vertical rhombic form. This provides a very high efficiency of heat transfer from the dielectric coolant into the surrounding air.

4. Operating Instructions

4.1 Load Resistor Connection

Warning

Provide adequate ventilation and observe normal precautions when using dry cleaning solvents. Many dry cleaning agents emit toxic fumes that may be harmful to your health if inhaled.

Clean all conductors and insulator surfaces on the transmission line face and check the RF input connector. Use an aerosol type contact cleaner or any dry cleaning solvent on a cotton swab stick, if necessary.

Attach the Model 8833-300 Load Resistor to the RF line with a 50 ohm coaxial cable such as RG-218/U or RG-220/U (-17A or 19A) with a suitable plug attached. Check that all coaxial power line connections are properly tightened. Avoid the use of adapters and elbows whenever possible.

4.2 Load Resistor Operation

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

Proceed according to the instructions pertaining to the specific transmitting equipment. There are no operating controls or adjustments for the Model 8833-300 Termaline Load Resistor.

Due to the difference in VSWR between the dummy load and the transmitter's antenna, readjustment of the transmitter may be required when returning to the original antenna.

5. Maintenance

5.1 General

The Model 8833-300 RF Load Resistor is very rugged and simple requiring little routine attention. The load will operate for a long period of time if its power handling capabilities are not exceeded.

Warning

Provide adequate ventilation and observe normal precautions when using dry cleaning solvents. Many dry cleaning agents emit toxic fumes that may be harmful to your health if inhaled.

The outside surface of the unit should be wiped free of dust and dirt when necessary. Clean the RF input connector with an aerosol type contact cleaner or dry cleaning solvent on a cotton swab stick. Take special care to clean the metallic contact surface and the exposed faces of the teflon insulator.

5.2 Checking the DC Resistance

VSWR and RF Impedance are the true benchmark of a quality dummy load. Checking the dc resistance is simply used to measure a change in the condition of the resistor over a period of time. If the application requires such measurements, follow the steps below to obtain a benchmark value *before* the unit is put into service, then periodically according to use.

Preparation and Tools Required

Be sure the vent plug is installed, see paragraph 2.4.

Tools: Resistance Bridge or Ohmmeter with accuracy of $\pm 1\%$ @50 ohms.

Temperature of the load is 20° to 25°C (68° to 70°F).

Procedure

Using the resistance bridge or ohmmeter, check the dc resistance of the load before it is put into service, see Figure-6.

Compare the value to benchmark value obtained during installation.

Normally the dc resistance of the load will be a nominal 50 ohms. Stabilization of the resistive film or temperature can cause a change in the dc resistance.

If the values vary more than 2 ohms this could be an indication of a failing resistive element.

5.3 Removing the Load Resistor

The load resistor assembly is not field serviceable. In the event of a failure, the load resistor assembly—complete—must be replaced.

Place the unit on its back, with the connector end up. This position prevents coolant spillage.

Remove the clamping band by loosening the 10-32 x 1-1/2 inch screw on the clamping band.

Slowly lift the load resistor assembly out of the tank allowing the coolant to drip back into the tank.

Check that the o-ring seal is in good condition, free of twists, and positioned evenly all around the beveled flange of the resistor housing. If the condition is

questionable, or coolant has leaked around a securely-tightened clamping band, install a new o-ring seal.

5.4 Installing the Load Resistor

Reverse the procedure described in paragraph 5.3.1—Removing the Load Resistor.

Tighten the clamping band securely, ensure the band is fully seated, retighten the clamping band screw.

band for coolant leakage. If leakage is observed:

Tighten the clamping screw if required. If the coolant continues to leak, proceed to step (b).

Replace the resistor housing o-ring seal. Follow instructions for removing and installing the load resistor in paragraphs 5.3 through 5.4.

5.6 Checking Coolant Level

The dielectric coolant level should remain constant under normal operating conditions, but should be checked periodically.

Place the unit on its back, with the connector end up.

Note: The unit is filled at the factory—to the level described in step (c)—with 2.9 gallons (11 liters) of specially selected dielectric fluid. Do not use any other coolant.

Add amount of coolant, p/n 5-030, required to bring coolant up to the level described in step (c).

Install the load resistor following instructions starting in paragraph 5.4.

5.7 Pressure Vent

When the coolant oil is heated, thermal expansion will cause an increase in internal pressure. The vent plug—when properly installed in the coolant inlet of the radiator tank—provides a vent to relieve this pressure and prevents dirt and other contaminants from entering the radiator.

Ensure the vent plug is in place and free from obstruction during operation and cooling.

5.8 RF Input Connector

The input connector on the Model 8833-300 is a Bird Quick-Change or “QC” connector. As the name implies, changing the connectors is easy and quick.

Remove the load resistor following instructions starting in paragraph 5.3.

At room temperature the coolant level should be 4-3/4 inches (121 mm) below the top surface of the load resistor assembly mounting ring.

Connectors can be changed without disturbing the coolant seal or interfering with coaxial continuity of the load resistor input.

Replacing the RF Input Connector

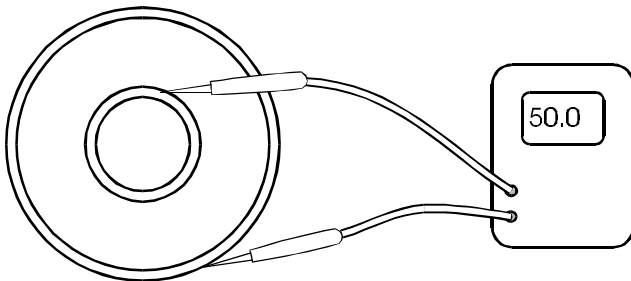
Remove the four 8-32 x 5/16 inch round head machine screws from the corners of the RF connector flange.

Pull the connector straight out.

Reverse the above procedure to install new connector, making certain that the projecting center contact pin of the “QC” connector is carefully engaged and properly aligned with the mating socket of the load resistor.

The “QC” connector may be replaced with other standard AN type connectors if obtained from Bird Electronic Corporation. At the full power and frequency capability of this model, only type LC or LT (Female or Male) or 7/8 inch EIA (air line) connectors will be adequate. For any other connector type, input power must be limited to the specifications of the selected type.

Figure - 6
Checking DC Resistance



5.9 Replacement Parts List

ItemQuantityDescriptionPart Number

11RF Load Resistor 8205-002

21 Resistor Housing O-Ring Seal, (included in item 1) 8110-039

31Clamping Band Assembly (2430-043 & Screw) 2430-055

42Shipping / Vent Plug O-Ring Seal 5-504

51Vent Plug 2450-094

61Shipping plug 2450-049

71Over Temperature Thermoswitch Assembly 2450-056

81Thermoswitch Body (included in item 7) 2450-040

91 Thermoswitch Jack (included in item 7) 2450-018

102.9 gal.

(11 liter) Dielectric Coolant 5-030

111Radiator Assembly 2450-301

5.10 "QC" Type Connectors

N-Female*4240-062LT-Female4240-018

N-Male4240-063LT-Male4240-012

HN-Female4240-268C-Female4240-100

HN-Male4240-278C-Male4240-110

LC-Female*4240-031UHF-Female (SO-239) 4240-050

BNC-Female4240-125UHF-Male (PL-259) 4240-179

BNC-Male4240-1327/8" EIA Air Line 4240-002

*Normally supplied