Model 8246 TERMALINE

Coaxial Load Resistor

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INSTALLATION - OPERATION

MAINTENANCE

TERMALINE
Coaxial Load Resistor
Model 8246

I GENERAL DESCRIPTION

The Model 8246 TERMALINE Load Resistor is designed as a low-reflection, non-radiating termination for coaxial rf transmission lines, to assist in tuning and trouble-shooting of transmitting equipment within its rating. The basic specifications of this equipment are as follows:

Characteristic Impedance	50 ohms, nominal
Power Input	5 KW, continuous
Frequency Range	DC to 1000 mcs.
VSWR	No more than 1.1
Input Connector	Any BEC Quick-Change Connector
Weight	55 pounds (approx.)
Cooling	Tap Water, 2 gpm
Mounting	Vertical

The Model 8246 consists of a load resistance, a dielectric coolant, and a cooling coil, housed in a cylindrical steel tank. The load resistance consists of a tapered rf line section using a special film resistor as its center conductor to give an almost reflectionless termination. RF power is converted to heat in the resistor and transferred to the dielectric coolant. The heat is then carried away by the water cooling system.

The unit is designed to accept any of a series of special quick-change connectors. These connectors are available in most of the standard AN types as shown in the Replacement Parts List. The "QC" connectors are easily interchanged, using only a screwdriver.

The Model 8246 is especially useful for the following purposes:

a. As a substitute antenna for tuning transmitters under non-radiating conditions of making routine tests and adjustments.
b. As a substitute for any circuit loading element.
c. In conjuction with a BEC Model 43 THRULINE Wattmeter to form an absorption-type wattmeter.
d. As an accurate rf resistance, substantially independent of frequency and line length.

It is primarily designed for operation in a fixed position, wall or bulkhead mounted. However, due to its manageable weight (55 lbs.) and compact design, it can be easily moved for reinstallation at another location, if desired.

II THEORY OF OPERATION

1. INTRODUCTION.

There is very little lumped-constant, conventional circuitry in this instrument. Circuit elements are of distributed constant type, machined and fabricated, as in microwave components.

2. LOAD RESISTOR.

The load resistor forms the terminating part of the center conductor of a tapered transmission line section. The exponential taper of the outer conductor provides a reduction in surge impedance proportional to the distance along the resistor. Thus impedance at the high end is 50 ohms. Halfway down, impedance is 25 ohms to compensate for resistance already passed over. At the upper end, the housing joins the terminal of the load resistor, providing the return conductor for the coaxial circuit. A teflon seal at the lower end acts as a mechanical support for the center conductor and provides a seal against leakage of the dielectric coolant.

3. COOLING SYSTEM.

a. HEAT TRANSMISSION - The dielectric coolant is specially chosen for its chemical inactivity (to prevent damage to the resistor) and its low dielectric constant, to which the diameters of the resistor housing are matched. The cooling coil, a helix of finned copper tubing, is immersed in the dielectric coolant. When the rf power is applied, heat is generated in the coolant surrounding the resistor. The heat of the coolant generates a thermal convection upward from the central resistor and downward from the cooling tubes coiled in the upper end of the tank. This heat is carried away by water flowing through the finned tubing.

b. ELECTRICAL SIGNIFICANCE OF COOLANT - The unit must be filled with the proper coolant (approx. 2.5 gals GE 10C oil) to cover the top of the resistor housing. If not, the rf impedance and the power calibration of the equipment will be impaired, and the load resistor will be damaged under rf power. The dielectric constant of the coolant is an important factor in determining the input impedance. Careful attention has been given to obtaining a design which is leak-proof under service conditions. In order to get both high quality rf connectors and a leak-proof design, teflon insulators compressed as gaskets for the rf connections and "O" rings of synthetic high temperature resistant rubber are used.

4. OVER-TEMPERATURE PROTECTION.

a. The unit is equipped with an over-temperature thermoswitch. This switch is normally closed type which opens (to disable the transmitter) when the temperature exceeds 100°C.

III INSTALLATION

1. MOUNTING.

The RF Load must be installed vertically, with the water connections up. The unit should be located so that a short transmission line can be connected with a minimum of bending. Four 7/16" dia. mounting holes are arranged in a 19-7/8" x 6" rectangle.

2. WATER COOLING.

Connect the water supply and drain plumbing to the unions provided, with a suitable valve in the supply side (supply line has vent plug). The water supply can be tap water. Ordinary pressure variations are unimportant, as the water is used only to carry heat away from the unit.

3. THERMOSWITCH.

Remove holding screws from the base of the thermoswitch cover and lift cover. Connect the thermoswitch terminals to the transmitter interlock circuit. The thermoswitch can be left connected while the transmitter is on the air.

4. DIELECTRIC COOLANT.

CAUTION: BEFORE APPLYING POWER, BE SURE TO REMOVE VENT PLUG, which is located in the water supply line. Then remove the filler plug from the top surface of the housing, and check the level of the dielectric coolant. The surface of the coolant should be between 1-1/2 and 2 inches below the top of the filler hole. After checking the level of the coolant in the tank, restore filler plug to the hole. DO NOT OPERATE WITH COOLANT LEVEL LOWER THAN TWO INCHES FROM TOP.

IV OPERATION

Connect the transmission line to the Model 8246 Load. Be certain that all RF fittings are secure to prevent damage from RF arcs and flashovers. Ues minimum of adapters, etc. It is most desirable to have load connector mate directly with cable plug.

Turn on water supply. WATER SUPPLY OF TWO GALLONS PER MINUTE. (minimum) MUST BE FLOWING at all times when the unit is in use. Continue flow of water for at least two minutes after cutting off RF power.

Turn on radio frequency power and proceed with desired tests or adjustments.

V MAINTENANCE

1. INTRODUCTION.

a. The circuit simplicity and essentially mechanical design of the Model 8246 result in a minimum of maintenance, since all electrical circuits are sealed and rigidly mounted.

b. Generally, the unit will require only the routine wiping and cleaning coupled with reasonable care in handling. Preventive and corrective maintenance are grouped together in this section.

2. GENERAL MAINTENANCE.

a. Dust off the unit when necessary, removing any deposits of dirt or grime. Especially important - keep the jacks and plugs clean.

b. Protect the power input jack by keeping it plugged or covered when not in use. If the connector contacts or faces should become dirty or grimy, wipe carefully with a dry solvent on a cotton swab stick. Inhibisol* or its equivalent is recommended, or trichlorethylene. If carbon tetrachloride must be used, take very careful precautions to avoid excessive skin contact or any inhalation of the fumes.

c. Dropping is the most likely source of damage to the equipment. Observe normal care in handling of the load resistor unit. Be sure that the interlock thermoswitch is connected (per Section III, Installation) and be sure that adequate water supply is flowing whenever rf load power is applied. Even though the heat exchanger is supplied with over temperature protection, care should be taken not to overload resistor with excess power for even short periods of time.

3. REPAIR AND REPLACEMENT.

Note: The rugged and self-contained nature of the equipment should ensure very little maintenance due to parts failure. If difficulty should occur, particularly in electrical functioning, it is generally advisable to return the rf section and the meter to the factory for repair and recalibration. Specified accuracy of the unit is then assured, and the qualifications of a new instrument are maintained. Following on the next page are the significant electrical components of the Model 8246 which may be serviced as described:

* A non-toxic, non-flammable dry cleaning agent manufactured by Pentone Company, Tenafly, New Jersey.

a. The Resistor-Voltmeter unit - RF Section Bird part #824602.

1) This is an integral component, not subject to further disassembly by field maintenance, except for change of the QC input connector. An idea of the electrical condition of the load resistor proper may be determined from its dc resistance. An accurate resistance bridge, such as Leeds & Northrop Model 5305 Test Set, good to 1% or better at 50 ohms, is required. Low resistance leads (preferably a short length of coaxial cable with a suitable plug), attached to the input jack should be used. A change of more than one ohm from the value of the resistance stamped on the nameplate will cause wattmeter readings beyond specified tolerance.

2) To remove the RF Section from the cooling unit, first replace the vent plug (with its O-ring seal) in its socket at the side of the water inlet pipe. Tighten vent plug to seal, and make sure the filler plug on top plate of the coolant tank is also tight. Reverse the load unit to place it in a vertical position with the connector end up, disconnecting water hoses if necessary. Unscrew the clamping screw on the V-band clamp on the top of the face of the coolant tank, and release the V-band. Pull the resistor-voltmeter ass'y (RF section) straight up and out from the coolant tank. Allow sufficient time for coolant drainage before removing the unit from top of the tank.

3) In replacing the RF Section with another, it should be noted that even within allowed dc tolerance of the load resistor, a change in this resistance will produce a corresponding apparent change in the wattmeter reading.

4) To reassemble, reverse procedure in above paragraphs. This oil seal (O-ring #81139) for RF Section should be completely clean, placed against the beveled flange all around and free of twists. Use a new O-ring seal if possible. Tighten the clamp band securely, and then upend the unit vertically. After a short time, check carefully for possible oil leakage.

b. Other portions of the equipment might be replaced for purely mechanical reasons. Handling this should be relatively easy for anyone accustomed to mechanical assemblies.

c. Dielectric coolant level will remain constant unless spilled. When upright, make certain that the 10C oil coolant (at room temperature) fully covers the top coils of the cooling unit, i.e. between 1-1/2 to 2 in. below the top plate surface as measured thru the filler hole. The coolant will not circulate if its level is below this. Additional coolant is available from the factory (GE 10C Oil, Bird part #5030).

Note: The vent plug and filler plug must be closed to prevent loss of coolant when the unit is to be moved or shipped.

4. CONNECTORS - QC

The input connector of the Model 8246 may be readily changed to other AN Standard Types. Alternate available types are listed in Section VI, and may be procured from Bird Electronic Corporation. To change connectors, simply unscrew the four #8-32 round head screws on the square base flange, and pull connector straight out. To attach connector, reverse procedure, being certain to properly engage center pin in contact hole, keeping alignment true; fasten flange securely.

VI REPLACEABLE PARTS LIST

REQ.	DRAWING NUMBER	DESCRIPTION
1	824109	Assy, Barrel
(1)	82476	Assy, Cooler Unit
1	82450	. Assy, Top Plate & Cooling Coils
1	75040	. Plug, Vent
1	81141	. O-Ring, Vent Plug
1	824100	. Assy, Thermoswitch
1	82418	. Cover, Thermoswitch
1	82445	. Plug, Filler
1	81159	. O-Ring, Filler Plug
1	82475	. Seal, Upper Plate
2	Std.	. 1/2" Brass Ground Joint Pipe Union
1	Std.	. BX Cable Clamp, #12 x 12 SP-5300 G'Bar
1	82462	Band Clamping
1	824602	Assy, RF Section
1	24343	Band, Clamping
-	5030	2-1/2 Gal. GE 10C Oil

AVAILABLE QUICK CHANGE CONNECTOR TYPES

Special Note - The alternative connectors listed below should not be used beyond the power and frequency limitations applicable to respective types.

N - Female	424062	LC - Female	424031
N - Male	424063	LC - Male	424025
HN - Female	424073	LT - Female	424018
HN - Male	424049	LT - Male	424012
C - Female	424100	UHF - Female (SO-239)	424050
C - Male	424110		
7/8" EIA Air Line	424002		

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