

Model 884 TERMALINE

Coaxial Load Resistor

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INSTALLATION - OPERATION

MAINTENANCE

Instruction Sheet
for

INSTALLATION - OPERATION - MAINTENANCE
Bird Model 884
TERMALINE LOAD RESISTOR

GENERAL

This Load Resistor is a general purpose coaxial line termination for use with 50/51.5 ohm radio frequency transmission lines. It has a continuous load capacity of 1000 watts in normal ambient temperatures (up to 45°C) and a frequency range from 0 to about 3300 megacycles per second. Under these conditions the Model 884 therefore provides a very low reflection (non-radiating) line termination. This is useful as a substitute antenna to assist in tuning RF transmitter within its range, and for other routine maintenance or special checks on coaxial transmission equipment. Summary of characteristics:

| | |
|--------------------------|---|
| Characteristic Impedance | 50 ohm nominal |
| Power Input | 1000 watts continuous av. 1200 watts, 1/2 hr only |
| Ambient Temp | 45°C max |
| Frequency Range | DC to 3300 Mc. |
| VSW Ratio | 1.10 to 1.0 max, 0 to 1000 Mc. 1.25 to 1.0 max, 1000 to 3300 Mc. |
| Input Connector | Bird "Coplanar" Type |
| " Adapter | (CS) Type - Coplanar to Female N Connector - see <u>Fittings Section</u> , page 3 |

ELECTRICAL CHARACTERISTICS

The Model 884 is designed to match the most common high frequency transmission media; i.e., 50/51.5 ohm coaxial lines. The impedance, in the VSWR (voltage standing wave ratio) language of such transmission, is quite independent of frequency and almost purely resistive. VSWR values are maintained below 1.1 up to 1000 Mc, and the calibration results of this particular resistor are tabulated on the blue ticket attached to the equipment. In the frequency region 1000 to 3300 Mc, calibration is not normally performed; however, tests on typical units of this equipment show VSWR's to be less than 1.25 in this range. Below 50 Mc, the input impedance of the Dummy Load is very nearly a pure resistance to equal to the DC resistance. The production tolerance on DC resistance is $\pm 3\%$ from the nominal 50 ohms, and the exact value for this particular resistance is inscribed under "RDC" at the bottom of the ticket. Power output measurements are conveniently made by means of the Bird THRULINE Wattmeter attached to the dummy load input - measurements may be made in frequency ranges upwards from 2 mcs.

The Model 884 is useful for the following purposes:

- a. As a substitute antenna.
 - (1) For tuning transmitters - under non-radiating conditions
 - (2) For making routine tests and adjustments.
- b. As a substitute for any circuit loading element.
- c. To measure, with a suitable indicating device, the power output of coaxially transmitted power within its rating.

THEORY OF OPERATION

The Model 884 equipment consists essentially of a carbon film-on-ceramic resistor immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in an exponentially tapered housing. This provides a linear reduction in surge impedance, directly proportional to the distance along the resistor. When surrounded by the dielectric coolant, the characteristic impedance is therefore 50.0 ohms at the front (connector end) and 25.0 ohms half-way down, to compensate for resistance already passed over. It is zero ohms at the rear, where the resistor joins the housing, forming the return conductor of the coaxial circuit. This produces the uniform, practically reflectionless line termination over stated frequencies of the load resistor.

The dielectric oil is chosen for chemical inactivity (to prevent damage to the resistor), high flash point, and its dielectric constant, to which the diameters of the resistor housing are matched. The input connector is constructed with a compressed teflon insulator surrounding the center contact. This connector body, and the resistor housing are both pressed on synthetic rubber O-ring seals, preventing coolant leakage at the front end of the unit. The resistor housing is kept in place by the resultant action of drawing up the radial V-clamp band.

When input power is applied, the resistor generates heat in the adjacent coolant oil. By convection, the heated oil flows thru slotted openings in the coaxial shell to the walls of the fabricated metal tank. The series of radiating fins brazed to the tank transmit the heat of the dielectric oil into the surrounding air.

INSTALLATION

The Termaline Resistor is intended for operation in a horizontal position only. Do not operate in any other manner. It may be placed loose on an appropriate surface, or permanently fastened in a level position by means of its base mounting flanges. The flanges have four 3/8-diam. holes on a 21-1/4" by 5-3/8" base rectangle, for use with screws up to 5/16-inch size. Position the unit for ample air circulation with at least 6 inches of free air space all around the unit.

SPECIAL CAUTION

Do not apply any electrical power (rf load) to the Model 884 Load Resistor until the Vent Plug is removed. This is very essential - - to allow for expansion of the heated dielectric oil. The Vent Plug is screwed directly inside the filler plug at the top and front of the radiator tank. It is painted red on top face and has a 3/4-inch hex head. The plug is unscrewed by use of a 3/4-in. flat wrench. Do not lose the O-ring seal on it. 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 equipment and danger to safety. If the equipment should be moved, replace this plug to prevent oil spillage during transit.

It is possible to manage power loads greater than 1 KW by use of auxiliary ventilation of the equipment. An effective fan or blower placed transverse to the radiator should permit an increase in the input power. The load power may

be doubled by use of the Bird Model BA-88 Blower Unit. This blower is specifically designed for equipment of the Model 88 type - consult with the company.

CONNECTOR ADAPTER - CA-8B

The coaxial input receptacle on the load resistor is a large diameter teflon dielectric female connector. This has 1-1/8x18 screw thread body and is known as a Coplanar Type (CS). It mates directly with the fittings described in the paragraph below. To attach the CA-8B Adapter to Dummy Load, slide back the knurled captive nut, then carefully introduce the center pin into the mating contact on the load receptacle. Push the adapter in squarely, until it bottoms, then bring up the locking nut and turn it to fasten firmly. For best results, the dielectric faces of the connector and adapter should make intimate contact.

FITTINGS

The Model 884 Load Resistor is supplied with Adapter CA-8B which enables the units to be used with RG-213/U or RG-214/U cable attached to UG-21B/U or UG-21D/U male connectors; other fittings could be used directly as follows:

CP-17 - 5 ft. of RG-17/U cable with coplanar connector
on one end and other end plain.

CP-19 - 5 ft. of RG-19/U cable with coplanar connector
on end and other end plain.

(May be obtained from the manufacturer).

OPERATION

Connect the Model 884 to power source under test by means of applicable 50 ohm coaxial power cable. Check that all coaxial power line connections are properly tightened. Avoid use of extraneous adapters and elbows where possible. Proceed according to instructions pertaining to specific equipment involved.

MAINTENANCE

The Model 884 is rugged and simple and should require only nominal routine attention. It is designed to operate for long periods of time if care is taken not to exceed its power handling capabilities.

The outside surface of the instrument should be wiped free of dust and dirt when necessary. Clean the rf input connector with Inhibisol*, or its equivalent, or trichlorethylene, on a cotton swab stick. Take special care to clean the metallic contact surface and the exposed face of the teflon insulator. Provide adequate ventilation and observe other normal precautions when using solvents, particularly carbon tetrachloride.

Accurate measurement of the dc resistance between the inner and outer conductors of the input coupling will provide a good check of the condition of the load resistor. For this instrument, use a Resistance Bridge with an accuracy of one percent or better at 50 ohms, such as Leeds & Northrup Model 5305 Test Set. Use low Resistance leads, preferably a short piece of cable attached to a mating plug to the input connector. When the resistor is checked at room temperature, the measured resistance should be within a range of 48.5 to 51.5 ohms. If the value obtained materially exceeds this allowance, the load resistor may be unsuitable.

* Inhibisol - Non-flammable, non-toxic dry cleaning agent manufactured by the Penetone Co., Tenafly, N.Y.

If the Resistor Housing Assy #811202 should need replacement, proceed as follows: To avoid the possibility of coolant spillage, replace Vent Plug #245006 before proceeding. Place the radiator #245003 and its back end (connector up). Then loosen and remove the screw on the clamping band #24343 at the base of the front cone. Remove clamping band and carefully lift out the Resistor Housing unit in a vertical direction, allowing the oil to drip back into the tank (be sure the radiator unit is properly held). The O-ring #81139 is fitted on the telescoping ring #24316 which will probably remain nested in the cylindrical facing of the radiator tank. Do not re-use the O-ring unless it is in good condition.

When replacing the resistor housing, check that the telescoping ring arrangement is properly set - i.e., with thin section of the step shoulder fitted inside the radiator nosepiece, and the O-Ring #81139 outside on the thick section, pushed snugly against the adjacent face. Before reassembling the equipment, check the coolant level - it should be four inches below the bare edge of the cylindrical flange when the radiator is on end. Replace the Resistor Housing Assy by reversing the procedure described above, and tighten the #10-32 clamping screw securely - making sure that the clamping band is on evenly. Then restore the Load Resistor to a horizontal position, and inspect carefully for oil leakage. Before using equipment, reopen the Vent Plug, and if deemed necessary recheck the coolant level - see Coolant Section below.

COOLANT

The Dummy Load is factory filled to the proper coolant level (with G.E. 10C Transformer Oil) at room temperature. Expansion of the coolant with rise in temperature is taken care of by means of the vent plug previously discussed. The oil level should be about 2-1/4 to 2-1/2 inches below the top face of the filler hole. Reasonable amounts of oil loss will not seriously reduce the capacity of the equipment.

List of Replaceable Parts

| <u>Qty.</u> | <u>Part No.</u> | <u>Description</u> |
|-------------|-----------------|--|
| 1 | 245003 | Radiator |
| 1 | 5131 | O-Ring, Vent Plug |
| 1 | 245049 | Plug, Vent Plug |
| 1 | 245050 | Plug, Filler |
| 1 | 24316 | Ring, Telescoping |
| 1 | 24355 | Band, Clamping and Screw |
| 1 | 81139 | O-Ring, Resistor Hsg. Linear #11-242 |
| 1 | 811202 | Resistor Housing Assy |
| - | 5030 | Type B Coolant, 1.7 Gal. GE 10C Trans. Oil |
| 1 | 811186 | Adapter, Coplanar - CA-8B |

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