
INSTRUCTION BOOK

**TERMALINE® COAXIAL
LOAD RESISTOR
MODEL 82A**



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.

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

HIGH VOLTAGE is used in the operation of this equipment. DEATH ON CONTACT may result if personnel fail to observe safety precautions. Learn the areas containing high voltages in each part of the equipment. Be careful not to contact high voltage connections when installing or operating this equipment.

CHEMICAL HAZARD

Solvents used to clean parts are potentially dangerous. Avoid inhalation of fumes and also prolonged skin contact.

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.

The following 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 there for emphasis.

WARNING

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

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 any RF equipment from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard.

The following equipment cautions appear in the text whenever a procedure, if not properly followed, could put the equipment in danger of damage and are repeated there for emphasis.

CAUTION

This equipment is designed for operation in a horizontal position only, with mounting brackets down. Do operate in any other manner.

CAUTION

Do not operate these loads continuously above their maximum power range. Load failure will result.

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SECTION I. INTRODUCTION

1.1. GENERAL

The Bird TERMALINE® Model 82A is a general purpose coaxial load resistor to be used in conjunction with transmitters which have an RF output up to 500 W, over a wide frequency range of dc to 3500 MHz. This coaxial load resistor is designed to match commonly used 50 ohm coaxial transmission lines. The impedance is quite independent of frequency, and is almost a pure resistance. On the production unit, the voltage standing wave ratio (VSWR) values are maintained below 1.1 to 1.0 up to 1000 MHz.

Below 50 MHz, the input impedance of the TERMALINE® is very nearly a pure resistance equal to the dc resistance value. The production tolerance on the dc resistance is ± 5 percent from the nominal 50 ohms.

Any Model 82A Load Resistor may be made to operate as a termination type wattmeter with the insertion of a Bird Model 43 THRULINE® Wattmeter series with the load. This will permit measurement of forward power within the usual capabilities of the TERMALINE® and THRULINE® Wattmeter.

1.2 UNIT SPECIFICATIONS

MODEL 82A TERMALINE® COAXIAL LOAD RESISTOR

Impedance	50 ohms nominal
VSWR	1.15:1, DC - 1000 MHz 1.30:1, 1000 - 3500 MHz
Connectors	Bird "QC" Type Female N (normally supplied)
Power Range	500 W continuous
Frequency Range	DC - 3500 MHz
Dimensions	9-9/16"L x 5-15/16"W x 8-15/32"H (497 x 151 x 215 mm) length with F - N connector
Ambient Temperature	-40°C to +45°C (-40°F to +113°F)
Weight	21 lb (9.5 kg)
Finish	Light navy grey baked enamel (MIL-E-15090)

SECTION II. INSTALLATION

2.1. GENERAL

CAUTION

This equipment is designed for operation in a horizontal position only, with mounting brackets down. Do operate in any other manner.

The Model 82A Load Resistor should be operated in a horizontal position only. The unit may be used free-standing on any convenient flat surface. The radiator has flanged feet at both ends, with 9/32 diameter mounting holes at each corner. The holes are arranged in a 12-9/16 x 5-1/8 rectangle (319 x 130.2 mm). If it is desired to fasten the load by means of its base mounting flanges, use suitable 1/4 inch machine screws with nuts, or No. 12 wood screws, keeping the major axis of the load horizontal. Do not tilt upward at the connector end. Be sure that there is ample provision for air circulation of at least six inches of free space around and above the unit.

2.2. CONNECTOR - QC

The Model 82A is supplied with a Bird "QC" type input connector. The Model 82A is normally equipped with a Female N connector to mate with UG21D/U or similar type Male N connector on RG8A/U or RG-98/U cable. The input connector may be readily changed to other AN Standard Types. Alternate available types are listed in Section VI, and may be procured from Bird Electronic Corp.

To change connectors, simply unscrew the four 8-32 round head screws on the square base flange, and pull connector straight out. (Do not remove the second set of 10-32 Fillister head machine screws.) To attach connector, reverse the procedure making certain to properly engage the center pin in the contact hole, keeping alignment true; then fasten flange securely. Special Note - The alternative connectors listed in Section VI - Replacement Parts List should not be used beyond the power and frequency limitations applicable to respective types.

2.3. COOLANT

The Model 82A is factory filled with dielectric coolant at room temperature. With a rise in temperature, expansion of the coolant and the resultant pressure is controlled by means of a synthetic rubber diaphragm (not visible) in the rear dome of the unit. Breather holes are apparent in the dome. Do not probe inside with any pointed instrument.

SECTION III. THEORY OF OPERATION

3.1. GENERAL

This equipment consists of a film-on-ceramic-substrate resistor enclosed in a specially tapered housing and immersed in a dielectric coolant. The resistor, particularly selected for its uniform resistive film accuracy, along with this taper, provide a reduction in surge impedance directly proportional to the distance along the resistor. When surrounded by the dielectric coolant, the characteristics impedance is therefor 50 ohms at the front, and zero ohms at the rear - where the resistor is joined to the housing, forming the return conductor of the coaxial circuit. This produces a uniform proactively relectionless line termination over the stated frequencies of the load resistor.

3.2. COOLANT QUALITIES

The dielectric coolant of the load resistor is chosen for its desirable dielectric and thermal properties to which the diameters of the resistor housing are matched. An insulator supports the axial resistor, while introducing only a very slight interruption to the requisite coaxial line impedance. The insulator seals the nosepiece against coolant seepage by the use of precise dimensional compression and a radially compressed peripheral O-Ring of synthetic rubber.

Another synthetic rubber O-Ring placed over a projecting rim of the coolant cylinder furnishes a seal for the radiator opening. A beveled flange retains the O-Ring. This flange, with the O-Ring captive, is pressed against the radiator face by a force which results from drawing up the radial V-Band clamp around corresponding beveled flanges of the radiator and resistor housing.

When input power is applied, the load resistor generates heat in the adjacent dielectric coolant. By convection, the heated liquid flows through slotted openings in the coaxial resistor housing to the walls of the radiator tank. The set of radiating fins (pressed on the tank) transmit the heat of the dielectric liquid into the surrounding air.

SECTION IV. OPERATING INSTRUCTIONS

4.1. USE AND FUNCTION OF CONTROLS

These loads, being passive devices, have no indicators or operating controls.

4.2. INITIAL ADJUSTMENTS

There are no initial adjustments required other than to attach the loads to their RF source by means of a coaxial transmission line equipped with a suitable matching connector.

4.3. START-UP

Connect the load to the transmitting equipment under test with 50 ohm coaxial cable, RG-8A/U or RG-9U, equipped with a Male N type plug. The Male N plug will mate with the RF input connector of the load. After the transmitter has been connected to the load, proceed according to the transmitter manufacturer's instructions. When reconnecting the antenna, it may become necessary to slightly readjust the transmitter due to possible differences in VSWR between the load and the antenna system.

4.4. NORMAL OPERATION

CAUTION

Do not operate these loads continuously above their maximum power range. Load failure will result.

Having no indicators or operating controls, these loads require no special operating procedures or surveillance when the stated performance limits are not exceeded.

Proceed according to the instructions pertaining to the specific transmitting equipment.

4.5. OPERATION UNDER ABNORMAL CONDITIONS

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.

These units will sustain an input moderately greater than 500 watts for short periods of time. Such loading must be spaced at reasonable intervals to allow sufficient time for cooling to a safe temperature. They can, for instance, sustain an input of up to 600 watts for a maximum of five minutes with an interval of at least 30 minutes between each power application.

4.6. **SHUTDOWN**

These loads, being passive devices, have no way of being turned off. Their source of RF power must be turned off instead.

4.7. **EMERGENCY SHUTDOWN**

WARNING

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

Turn off RF power at its source.

SECTION V. MAINTENANCE

5.1. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
Leakage of Coolant Oil around clamping band or radiator	Clamping band not tight	Tighten slightly with a screwdriver.
	Faulty O-Ring	Replace per paragraph 5.4.
Excessive overheating of the radiator	Transmitter power too high	Reduce transmitter power.
	Faulty RF section assembly	Replace per paragraph 5.4.
	Coolant oil level too low	Add more coolant oil to the radiator per paragraph 5.5.
High or Low dc Resistance values per paragraph 5.3	Faulty RF input connector	Replace per paragraph 2.2.
	Loose RF input "QC" connector	Tighten with a screwdriver.
	Faulty RF section assembly	Replace per paragraph 5.4.

5.2. CLEANING

WARNING

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

This equipment is rugged and simple, and should require only nominal routine care. Keep the radiator dusted off and the electrical parts free of dirt. If any of the connector faces or contacts should become dirty or grimy, wipe carefully with a dry solvent on a cotton swab stick. A nonresidue forming aerosol type cleaner is also useful.

5.3. RF ASSEMBLY TEST

DC Resistance - Check the condition of these load resistors by accurate measurement of the dc resistance between the inner and outer conductors of the RF input connector. Use a resistance bridge or ohmmeter with an accuracy of one percent or better at 50 ohms for this purpose. The measured resistance should be a nominal 50 ohms. For greater accuracy, the resistance of the load should be carefully checked prior to use at ambient room temperature. This resistance value should be recorded and used as a reference. Subsequent resistance measurements should not deviate more than two percent from this value.

5.4. DISASSEMBLY

If the resistor housing assembly should need replacement, proceed as follows:

- a. Turn the unit upside down so that the mounting flanges are facing up. Lift the front of the unit (connector end) up at about a 25° angle, so that the drain plug surface is on a horizontal plane.
- b. Using a 3/16 Allen wrench, remove the drain plug and drain off about 8 oz. of dielectric coolant. Use a clean container and store coolant for future use.
- c. Stand the radiator vertically with connector end up and secure in this position.
- d. Loosen and unscrew the 10-32 machine screw on the front V-clamp around the outer flange of the cone and remove the band. The load resistor unit is now free and may be withdrawn by lifting straight up and out of the radiator assembly. Allow excess coolant, on resistor housing assembly, to drip back into the radiator tank with remaining coolant.

With the exception of the circumferential O-Ring No. 8110-039 (and the filler plug and seal), this unit is not subject to further disassembly. Replace a defective resistor housing in its entirety. Units may be returned to the factory for repair; consult with company before shipping. Do not reuse the O-Ring unless it is in good condition. Before replacing the resistor housing, check that the O-ring is placed on the projecting lip of the radiator cylinder, and against flat outer face of the beveled radiator flange.

5.5. REASSEMBLY

Replace the resistor housing assembly by reversing the procedure described above. Position housing so that the filler plug faces the bottom of the radiator and tighten the 10-32 clamping screw securely - making sure that the V-band clamp is on evenly. After replacing resistor unit, return coolant, previously drained off, through filler hole to entirely fill the coolant compartment (see step b. of disassembly procedure). Restore filler plug, P/N 7500-040, with O-Ring seal, P/N 8110-041. Return the load resistor to a horizontal position, inspecting carefully for coolant leakage at both ends of the tank and the filler hole.

SECTION VI. REPLACEMENT PARTS LIST

6.1. MODEL 82A

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	Radiator housing assembly	8110-202-1
2	1	Diaphragm, rubber	2430-015
3	1	Cap, diaphragm	2430-148
4	2	Clamping band assembly (including screw)	2430-055
5	1	O-Ring, front cone seal	8110-039
6	1	O-Ring, filler plug	8110-041
7	1	Filler plug	7500-040
8	.85 gallon (3.2 liter)	Dielectric coolant	5-030-3 (1 gallon container)
9	1	"QC" female N connector	(See below)
10	1	Radiator handle	4230-028

Available QC Type Connectors

N-Female*	4240-062	BNC Male	4240-132
N-Male	4240-063	LT-Female	4240-018
HN-Female	4240-268	LT-Male	4240-112
HN-Male	4240-278	C-Female	4240-100
LC-Female	4240-031	C-Male	4240-110
LC-Male	4240-025	UHF-Female (SO239)	4240-050
BNC Female	4240-125	UHF-Male (PL259)	4240-179

7/8" EIA Air Line 4240-002

* Normally Supplied

82A TERMALINE® Coaxial Load Resistor

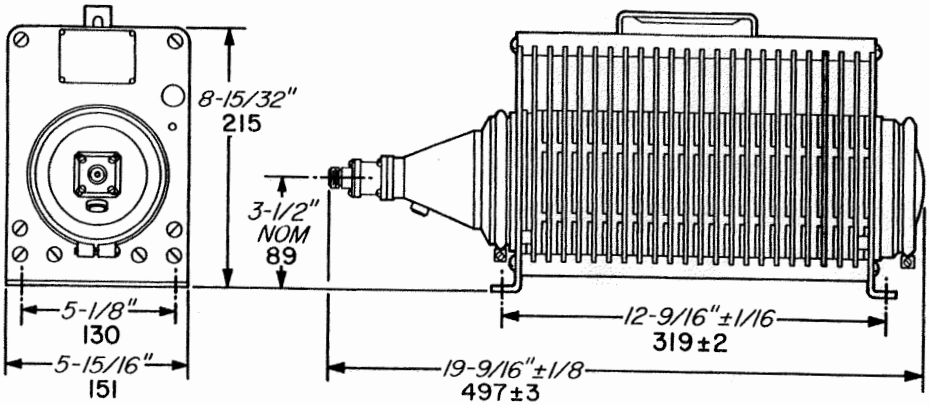


Figure 6-1. Outline Drawing