

**T.O. 33A1-5-514-1**

**OPERATION AND  
MAINTENANCE INSTRUCTIONS  
WITH  
ILLUSTRATED PARTS LIST**

**BIRD**

**Termaline Coaxial  
Load Resistor  
Model 8164-045**

Contract No. F41608-89-C-2888

Bird Electronic Corporation  
30303 Aurora Road  
Cleveland (Solon), Ohio 44139-2794

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**1 September 1990**

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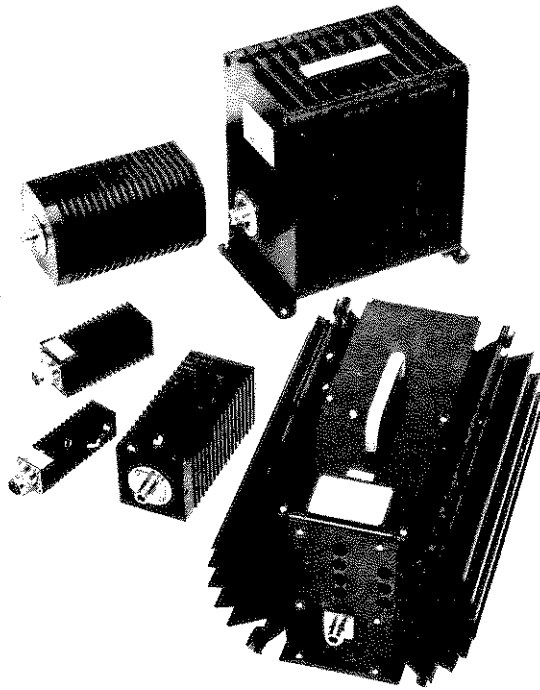
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## MODELS COVERED IN THIS INSTRUCTION BOOK

8080	8164	8173
8085	8166	8431

INSTRUCTION BOOK  
SERIES 8000  
**TERMALINE<sup>®</sup> COAXIAL  
LOAD RESISTOR**

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**BIRD**

**Electronic Corporation**

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

Instruction Book P/N: 920-80005-2

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.

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

```
*****
*                               C A U T I O N                               *
*                               *                                           *
* Do not operate these loads continuously above their *
* maximum power ratings. Load failure will result. *
*****
```

```
*****
*                               W A R N I N G                               *
*                               *                                           *
* Never attempt to disconnect the equipment from the *
* transmission line while RF power is being applied. *
* Leaking RF energy is a potential health hazard. *
*****
```

```
*****
*                               W A R N I N G                               *
*                               *                                           *
* This product contains a resistor substrate made of *
* beryllia oxide. This is a potentially toxic ceramic *
* and may be harmful to your health. Beryllia oxide *
* must be disposed of in accordance with the legal *
* statutes dealing with hazardous material. *
*                               *                                           *
* Do not attempt to repair this unit, but return to *
* BIRD ELECTRONIC CORPORATION. *
*****
```

TABLE OF CONTENTS

	<u>Page</u>
SAFETY PRECAUTIONS .....	i
INTRODUCTION	
Purpose and Function.....	iv
Performance Characteristics and Capabilities.....	iv
Dimensions and Weight.....	iv
Power and Utility Requirements.....	iv
Environmental Requirements.....	v
Items Furnished.....	v
Items Required.....	v
Tools and Test Equipment.....	v
SECTION I - INSTALLATION	
Location.....	1
General.....	1
SECTION II - THEORY OF OPERATION	
General.....	2
SECTION III - OPERATING INSTRUCTIONS	
Use and Function of Controls.....	3
Initial Adjustments.....	3
Start-Up.....	3
Normal Operation.....	3
Operation Under Emergency, Adverse or Abnormal Conditions..	3
Shutdown.....	3
Emergency Shutdown.....	4
SECTION IV - MAINTENANCE	
Troubleshooting.....	5
Cleaning.....	5
Inspection.....	5
Preventive Maintenance.....	6
Repairs.....	6
Calibration.....	6
Disassembly.....	6
Reassembly.....	7
SECTION V - PREPARATION FOR RESHIPMENT	
General.....	8

Continued

TABLE OF CONTENTS

	<u>Page</u>
SECTION VI - STORAGE	
General.....	8
SECTION VII - REPLACEMENT PARTS LIST	
General.....	9
TABLES	
Specifications.....	vi
PARTS LIST	
Model 8164-045 Terminal Coaxial Load Register.....	10

## SERIES 8000 TERMALINE® LOAD RESISTORS

### INTRODUCTION

#### PURPOSE AND FUNCTION

The Series 8000 TERMALINE® Load Resistors are portable, general purpose 50 ohm coaxial transmission line terminations. They are self-contained units, liquid free and air cooled, requiring no outside power source or additional equipment. They provide accurate, dependable, and practically nonreflective terminations for testing and adjusting transmitters under nonradiating conditions. These loads are useful for the following purposes:

- a. As a substitute antenna.
  1. For tuning RF transmitters under nonradiating 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 any coaxially transmitted RF signal within their rating.

#### PERFORMANCE CHARACTERISTICS AND CAPABILITIES

Series 8000 dry loads can absorb their individual maximum rated RF power levels continuously and dissipate them harmlessly as heat over their entire frequency range. Because they are dry, they are attitude insensitive and can therefore, with some restrictions, be used in any position. Consult the Specification Sheet, Page vi, for a listing of their individual power ratings, frequency ranges, and VSWR values.

#### DIMENSIONS AND WEIGHT

Consult the Specification Sheet on Page vi for the size and weight of each load.

#### POWER AND UTILITY REQUIREMENTS

These loads are passive devices that are self-contained and do not require any external source of power or utility to function other than the RF input power.

#### ENVIRONMENTAL REQUIREMENTS

These loads should be operated in a dust and vibration-free environment. The ambient temperature range should remain between -40°C and +45°C (-40°F and +113°F) for proper operation. Allow at least six inches of clearance around the units to permit an unimpeded access of convection air currents for adequate heat dissipation.

#### ITEMS FURNISHED

Series 8000 Loads are normally equipped with a Quick-Change "QC" connector for convenient and easy interchange with other AN type "QC" connectors. Model 8431 has a Small Quick-Change "SQC" connector which is not interchangeable with "QC" types. Consult the Specification Sheet, Page vi, for the connector type normally supplied with each load.

#### ITEMS REQUIRED

The only other item required is a mating connector on the coaxial transmission line to which the load will be connected.

#### TOOLS AND TEST EQUIPMENT

Only a screwdriver will be necessary for changing the "QC" connectors. None of these loads are subject to any further disassembly. An ohmmeter or resistance bridge with an accuracy of 1% or better, at 50 ohms is useful for checking the resistance value of the RF section assembly.



SPECIFICATIONS FOR 8000 SERIES TERMALINE® LOAD RESISTORS

Impedance..... 50 ohms nominal  
 Ambient Temperature..... -40°C to +45°C  
 (-40°F to +113°F)  
 Cooling Method..... Convection air currents  
 Operating Position..... Any ††

MODEL	MAX. VSWR	CONNS.	MAX. WATTS	FREQ. MHZ	SIZE	WT. OZ.
8080	1.1 dc-1000 1.25 1000-3500	N-M†	25	dc-3500	5-9/64"L x 1-1/4"Sq (130.6 x 31.8mm)	9 (255g)
8085	1.1 dc-1000 1.25 1000-3500	N-M†	50	dc-3500	5-9/64"L x 1-3/4"Sq (130.6 x 44.5mm)	15 (425g)
8164	1.1 dc-1000 1.25 1000-2400	N-F†	100	dc-2400	6-63/64"L x 2-3/4"Sq (177.4 x 69.9mm)	48 (1.36kg)
8166	1.1 dc-1000 1.2 1000-2500	N-M†	150	dc-2500	7-31/64"L x 4"Sq (190 x 101.6mm)	96 (2.72kg)
8173	1.1 dc-1000 1.25 1000-2000	N-F†	300	dc-2000	9"L x 9-9/16"H x 5-1/8"W (228.6 x 242.9 x 130.2mm)	100 (2.84kg)
8431	1.1 dc-1000 1.25 1000-2500	N-F*	500/600	dc-2500	13-7/64"L x 7-1/8"H x 9-1/4"W (333 x 181 x 235mm)	206 (5.9kg)

† "QC" Connector  
 \* "SQC" Connector  
 †† See Text

## SECTION I - INSTALLATION

### 1.1 LOCATION

1-2. Allow at least six inches of clearance around these units to permit an unimpeded access of convection air currents for adequate heat dissipation. Place the loads to permit the shortest possible cable length between the units and the transmitting equipment.

### 1-3. GENERAL

1-4. These loads may be used for portable operation or fixed installation. The Models 8080, 8085, and 8164 are, in general, light enough to be attached directly to the mating RF connector of another device such as a Bird THRULINE® Wattmeter or simply set on the workbench like the Models 8166, 8173, and 8431. Attach the load resistor as close as possible to the transmitter's output and use only suitable connectors. Try to connect direct to minimize cable length and avoid the use of adaptors as much as possible. The Model 8166, because of its weight, has a provision for special mounting. The housing has four tapped mounting holes on one side. They are 1/2 inch (13mm) deep for 8-32 screws and arranged in a 6-3/8 inch x 1-3/4 inch (162 x 44.4mm) rectangle. The Model 8431, mounted horizontally, will dissipate up to 500W, mounted vertically, up to 600W. Model 8173 should be operated only in a horizontal position.

## SECTION II - THEORY OF OPERATION

### 2-1. GENERAL

2-2. The resistive element in these dry TERMALINE® Loads is individually selected for its accuracy, and enclosed in a heat sink housing. The housing is specially contoured inside to provide the load with its unusually low reflection characteristics throughout its entire frequency range. The housings for the 25, 50, 100, and 150 watt models are deeply slotted and painted black with a lusterless finish to improve their heat dissipation. Models 8173 and 8431 are fabricated with sheet metal fins to more efficiently meet their higher heat dissipation requirements.

SECTION III - OPERATING INSTRUCTIONS

3-1. USE AND FUNCTION OF CONTROLS

3-2. These loads, being passive devices, have no indicators or operating controls.

3-3. INITIAL ADJUSTMENTS

3-4. No initial adjustments are required other than to connect the load to the RF source by means of a coaxial cable equipped with a suitable matching connector plug.

3-5. START-UP

3-6. Connect these loads to the transmitting equipment under test with 50 ohm coaxial cable where necessary (RG-8A/U, RG-9/U, RG-213/U or equal) equipped with a suitable plug which mates with the RF input connector of the load. After the load has been connected to the transmitter, proceed according to the transmitter manufacturer's instructions. When reconnecting the antenna, it may be necessary to slightly readjust the transmitter due to possible differences in VSWR between the load and the antenna system.

3-7. NORMAL OPERATION

```
*****
*                               *
*           C A U T I O N       *
*                               *
* Do not operate these loads continuously above their *
* maximum wattage ratings. Load failure will result. *
*                               *
*****
```

3-8. Having no indicators or operating controls, these loads require no special operating procedures or surveillance when the stated performance limits are not exceeded.

3-9. OPERATION UNDER EMERGENCY, ADVERSE OR ABNORMAL CONDITIONS

3-10. These units will sustain an input moderately greater than their maximum rated power for short periods of time. Such loading must be spaced at reasonable intervals to allow sufficient time for cooling to a safe temperature. Apply the excessive power for a few minutes at most and allow at least a half hour for adequate cooling before reapplying power. Because of the excessive heat generated by overloading, touch the load with caution to avoid painful burns.

3-11. SHUTDOWN

3-12. These loads, being passive devices, have no operating controls to be turned off. Their source of RF power must be turned off instead.

3-13. EMERGENCY SHUTDOWN

```
*****  
*                               *  
*           W A R N I N G       *  
*                               *  
* Never attempt to disconnect the equipment from the *  
* transmission line while RF power is being applied. *  
* Leaking RF energy is a potential health hazard.    *  
*****
```

3-14. Turn off the RF power at its source.

SECTION IV - MAINTENANCE

4-1. TROUBLE SHOOTING:

<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
Excessive Overheating	Transmitter power too high	Reduce transmitter power.
	Faulty RF resistor	Return to factory for repair.
High or Low DC Resistance Values Per Paragraph 4-12	Faulty RF input "QC" connector	Replace.
	Loose "QC" connector	Tighten with screwdriver.
	Faulty RF resistor	Return to factory for repair.

4-2. CLEANING

4-3. The outside surface of these loads 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 of the radiator fins. Excessive collection of dust and lint on the cooling fins will interfere with 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 non residue-forming to clean the hard to reach internal portions.

4-4. INSPECTION

4-5. With the rugged and simple construction of the loads, periodic inspection will be necessary at only about six-month intervals. Inspection should include the items listed below:

- a. Cleanliness - Keep the housing and connector free of grime (see Paragraph 4-3).
- b. Inspect the load for completeness and general condition of the equipment.
- c. A Troubleshooting Chart, see Paragraph 4-1, lists the commonly encountered problems, their possible causes and remedies. Use this chart as a guide when analyzing symptoms.

4-6. PREVENTIVE MAINTENANCE

4-7. Due to the basic simplicity of construction, the major requirement for preventive maintenance is to keep the equipment clean, particularly the radiator fins. It is important to maintain the heat transfer efficiency of the cooling fins.

4-8. REPAIRS

```
*****
*                               *
*           W A R N I N G       *
*                               *
* This product contains a resistor substrate made of *
* beryllia oxide. This is a potentially toxic ceramic *
* and may be harmful to your health. Beryllia oxide *
* must be disposed of in accordance with the legal *
* statutes dealing with hazardous material. *
*                               *
* Do not attempt to repair this unit, but return to *
* BIRD ELECTRONIC CORPORATION. *
*                               *
*****
```

4-9. Due to the unitized nature of the construction, these loads are not field repairable other than replacement of the "QC" connector.

4-10. Repairs beyond what is covered in this instruction book will require return of the equipment to Bird Electronic Corporation for service. Please consult the factory.

4-11. CALIBRATION

4-12. 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 1% or better at 50 ohms for this purpose. The measured resistance should be a nominal 50 ohms. It should not deviate by more than ±2 ohm from this value.

4-13. DISASSEMBLY

4-14. Except for the "QC" connector, "SQC" on Model 8431, there is no disassembly possible with these loads. To change the connector use the following procedure.

4-15. RF Connector - The connector is a "QC" design which permits easy interchange with the use of only a screwdriver. This process does not interfere with the essential coaxial continuity of the load resistor RF input. For replacement, proceed as follows:

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

4-16. REASSEMBLY

4-17. RF Connector - To install a new connector, reverse the procedures in Paragraph 4-13, Disassembly. Be sure that the projecting center pin on the connector is carefully engaged and properly seated with the mating socket of the load resistor input.



SECTION V - PREPARATION FOR RESHIPMENT

5-1. GENERAL

5-2. Wrap the RF connector with padding and tape securely in place. Pack and brace the load in a suitable shipping container; a corrugated paper box should suffice.

SECTION VI - STORAGE

6-1. GENERAL

6-2. No special preparations for storage are necessary other than to cover the equipment to keep out dust and dirt. Store these units in a dry and dust-free environment where the ambient temperature will remain within the -40°C to +45°C (-40°F to +113°F) working range of the loads.

## MODEL 8164-045 TERMALINE LOAD RESISTOR

### PARTS LIST

#### GENERAL

This section contains an illustrated list of all replacement parts for the Model 8164-045 Termaline Coaxial Load Resistor. The parts are grouped into one major assembly.

#### PARTS LIST

Figure 1 is a parts illustration of the Coaxial Load Resistor. Along with the illustration is a parts list containing all of the replaceable components of the Coaxial Load Resistor. If a part is found to be defective, and is not contained in this list, it is not available for replacement and the assembly to which it belongs must be replaced. The parts list is broken down into the following column structure:

- a. INDEX NO. The numbers in this column identify the location of parts within an illustration. For example, the INDEX NO. 1-3 describes item 3 located within Figure 1.
- b. DESCRIPTION. The full name and descriptive data needed to identify and order replacement parts are contained within this column. The descriptions are indented to indicate relationship to the next higher assembly.
- c. CAGE CODE. Parts manufacturers are identified in this column by their Commercial and Government Entity (CAGE) codes. Bird Electronic Corporation (70998) is the only producer of replacement parts for the Load Resistor.
- d. MFG PART NO. The original manufacturer's part number is contained in this column.
- e. QTY. This column indicates the quantity of each part used in the assembly but not necessarily the total quantity used in the unit.

#### QUICK CHANGE CONNECTORS

The RF input connector can easily be changed to mate with most common connector types. The following is a list of all of the "quick change" connectors manufactured by Bird Electronic Corp. for use with the 8164-045 Coaxial Load Resistor:

N-Female	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	4240-031	UHF-Female	4240-050
LC-Male	4240-025	UHF-Male	4240-179
	7/8" EIA Air Line		4240-002

\*\*\*\*\*  
 WARNING  
 \*\*\*\*\*

The resistor (Item No. 2) contains beryllium oxide as a major ingredient.

The following precautions should be observed:

1. Avoid breathing dust from these parts.
  2. Avoid in any way allowing the ceramic from entering into the body. Be especially careful when handling small or sharp edged broken pieces.
  3. Avoid coming in contact with the body where cuts or minor abrasions are present.
  4. Wash hands after handling this material and before eating or smoking.
  5. Great care should be taken when disposing of this material. All remains of the resistor should be carefully wrapped or placed in a separate container and disposed of according to the laws governing disposal of hazardous material in your locale.
- \*\*\*\*\*

LEGEND FIGURE 1

INDEX NO.	DESCRIPTION 1 2 3 4 5 6 7	CAGE CODE	MFG.	QTY
			PART NO.	
1-	LOAD RESISTOR, Coaxial, . . . . .	70998	8164-046	REF
	Model 8164-045, Assembly			
-1	HOUSING, Load resistor . . . . .	70998	8164-042	1
-2	RESISTOR . . . . .	70998	8160-010	1
-3	CLAMP, Resistor . . . . .	70998	8160-008	1
-4	SCREW, Clamp, resistor . . . . .	70998	8160-011	1
-5	PLUG . . . . .	70998	8164-003	1
-6	CONNECTOR, Male N, assembly . . . .	70998	4240-063	1
-7	SCREW, Machine, pan head, . . . . .		COML	4
	#6-32 x 1/4 inch lg.			
-8	NAMEPLATE, Model 8164-045, metal	70998	8164-051	1
-9	SCREW, Set, cone point, . . . . .		COML	4
	#10-32 x 3/16 inch lg. stl. pk.			
-10	EMBLEM, Bird . . . . .	70998	4600-012	1
-11	LABEL, Caution . . . . .	70998	8080-014	1
-12	LABEL, Warning . . . . .	70998	8164-049	1
-13	ROD, Support . . . . .	70998	8164-048	1
-14	RING, Mounting . . . . .	70998	8160-006	1
-15	INSULATOR, Teflon . . . . .	70998	8160-009	1
-16	FITTING, Resistor . . . . .	70998	8160-007	1

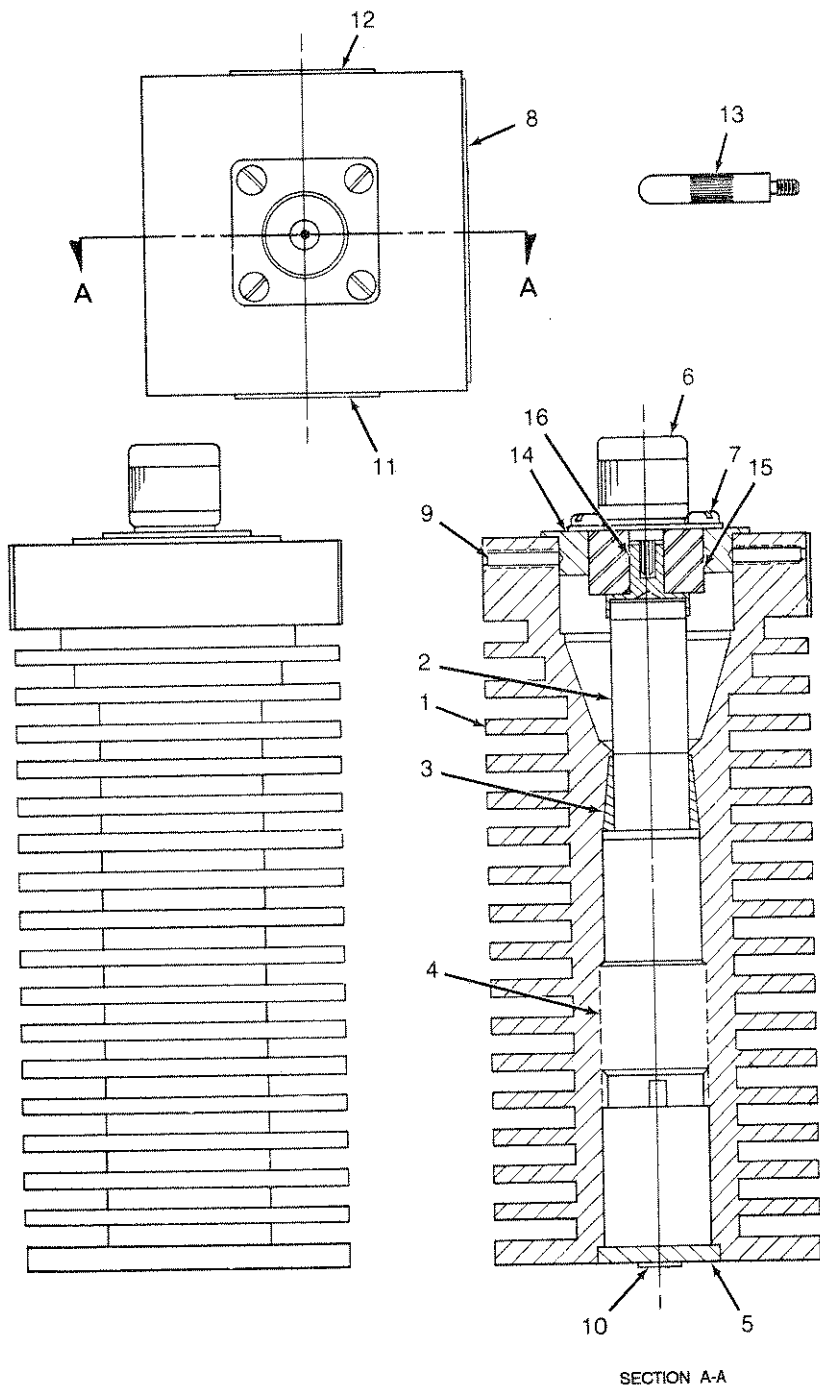


Figure 1. Model 8164-045 Terminal Load Resistor

# NOTES



