



TERMALINE® COAXIAL  
LOAD RESISTOR

OPERATION MANUAL

MODEL 8135

©COPYRIGHT 2016 BY BIRD ELECTRONIC CORPORATION  
INSTRUCTION BOOK PART NUMBER 920-8135 REV. D

TERMALINE IS A TRADEMARK OF BIRD ELECTRONIC CORPORATION

# 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. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

## **WARNING**

### **Keep Away From Live Circuits**

Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

## **WARNING**

### **Shock Hazard**

Do not attempt to remove the RF transmission line while RF power is present.

## **WARNING**

### **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.

## **WARNING**

### **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.

## **WARNING**

### **Resuscitation**

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

## **WARNING**

### **Remove Power**

Observe general safety precautions. Do not open the instrument with the power on.

## Safety Symbols

---

### 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.

**Note:** *Calls attention to supplemental information.*

## Warning Statements

---

The following safety warnings appear in the text where there is danger to operating and maintenance personnel, and are repeated here for emphasis.

### WARNING

When power is in the upper range of the load's capacity, the radiator will become hot - care should be used in touching the equipment.

[See page 5.](#)

### WARNING

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

[See page 6.](#)

## Caution Statements

---

The following equipment cautions appear in the text and are repeated here for emphasis.

### CAUTION

Do not operate this equipment continuously above the rated 150 W.

[See page 5.](#)

## **Safety Statements**

---

### **USAGE**

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

### **USO**

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

### **BENUTZUNG**

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

### **UTILISATION**

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

### **IMPIEGO**

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

## **SERVICE**

SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE - TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

## **SERVICIO**

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERLO.

## **WARTUNG**

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES GELTEN NUR FÜR GESCHULTES FACHPERSONAL.

ZUR VERMEIDUNG GEFÄHRLICHE, ELEKTRISCHE SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

## **ENTRETIEN**

L'EMPLOI DES INSTRUCTIONS D'ENTRETIEN DOIT ÊTRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRATIONS D'ENTRETIEN. POUR PRÉVENIR UN CHOC ÉLECTRIQUE DANGEREUX, NE PAS EFFECTUER D'ENTRETIEN SI L'ON N'A PAS ÉTÉ QUALIFIÉ POUR CE FAIRE.

## **ASSISTENZA TECNICA**

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

## About This Manual

---

This manual covers the operating and maintenance instructions for the following models:

8135

## Changes to this Manual

---

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Solon, Ohio factory. This manual may be periodically updated. When inquiring about updates to this manual refer to the part number and revision on the title page.

## Chapter Layout

---

**Introduction** — Describes the features of the load resistor, lists equipment supplied and optional equipment, and provides power-up instructions.

**Theory of Operation** — Describes how the load resistor works.

**Installation** — Describes the power supply and load connection instructions.

**Operating Instructions** — Describes the base level operation instructions.

**Maintenance** — Lists routine maintenance tasks as well as troubleshooting for common problems. Specifications and parts information are also included.

# TABLE OF CONTENTS

<b>Safety Precautions</b> .....	<b>i</b>
Safety Symbols .....	ii
Warning Statements .....	ii
Caution Statements .....	ii
Safety Statements .....	iii
<b>About This Manual</b> .....	<b>v</b>
Changes to this Manual .....	v
Chapter Layout .....	v
<b>Chapter 1 Introduction</b> .....	<b>1</b>
Purpose and Function .....	1
Performance Characteristics and Capabilities .....	1
Dimensions and Weight .....	1
Power and Utility Requirements .....	1
Environmental Requirements .....	1
Items Furnished .....	2
Items Required .....	2
Tools and Test Equipment .....	2
<b>Chapter 2 Theory of Operation</b> .....	<b>3</b>
General .....	3
Dielectric Coolant and Seal .....	3
<b>Chapter 3 Installation</b> .....	<b>4</b>
Location .....	4
Mounting .....	4
<b>Chapter 4 Operating Instructions</b> .....	<b>5</b>
Use and Function of Controls .....	5
Initial Adjustment .....	5
Start Up .....	5

Normal Operation	5
Operation Under Abnormal Conditions	6
Shutdown Procedures	6
Emergency Shutdown	6
<b>Chapter 5 Maintenance</b>	<b>7</b>
Troubleshooting	7
Cleaning	8
Radiator	8
Inspection	8
Oil Leakage	8
Cleanliness	8
Completeness	8
Preventive Maintenance	8
RF Assembly Test	9
Disassembly	9
RF Input Connector Replacement	9
Diaphragm and Coolant Oil	9
RF Load Resistor Assembly	10
Assembly	10
RF Input Connector	10
Diaphragm and Coolant Oil	10
RF Load Resistor Assembly	10
Storage	10
Customer Service	11
Shipment	11
Specifications	11
Replacement Parts List	12
<b>Limited Warranty</b>	<b>13</b>



## **Purpose and Function**

---

The Bird Model 8135 Termline Load Resistor is a portable, general purpose 50 ohm coaxial transmission line termination. It is a self-contained unit requiring no outside power source or additional equipment. This coaxial load resistor provides an accurate, dependable, and practically non-reflective termination for adjustment, standby, and testing of transmitters under non-radiating conditions.

## **Performance Characteristics and Capabilities**

---

The Model 8135 can absorb up to 150 watts continuously and dissipate it harmlessly as heat over a frequency range of DC to 4000 MHz. It is designed to show low reflectivity throughout this range. The VSWR will be 1.1 to 1.0 maximum from DC to 1000 MHz, 1.2 to 1.0 maximum from 1000 to 2500 MHz and 1.3 to 1.0 maximum from 2000 to 4000 MHz.

## **Dimensions and Weight**

---

The Model 8135 is 8-13/16 inches long, 4 inches wide, and 6-7/16 inches high (224 x 102 x 164 mm). It has a weight of 6 lb (2.7 kg) net and a shipping weight of 8 lb (3.6 kg).

## **Power and Utility Requirements**

---

Being a passive electronic device, the Model 8135 needs no outside source or utility service.

## **Environmental Requirements**

---

The Model 8135 should be used in a dust and vibration-free environment. The ambient temperature range should be kept between -40C and +45C (-40F and +113F) for proper operation. Allow at least 6 inches of clearance around the load to permit an unimpeded access of convection air currents to the load.

## **Items Furnished**

---

The RF input connector, located on the front face of the unit, is a Female N. It is a special “Quick-Change” design permitting rapid and easy interchange with other Bird AN type “QC” connectors. This instruction book is the only other item provided.

## **Items Required**

---

The only other item required is a matching connector on the coaxial transmission line.

## **Tools and Test Equipment**

---

Only simple tools like screwdrivers are needed to disassemble the Model 8135. A resistance bridge or ohmmeter with an accuracy of one percent or better at 50 ohms is useful for checking the resistance value of the RF section assembly.

## General

---

The Model 8135 Termaline Load consists essentially of a cylindrical film type resistor immersed in dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in a special tapered housing which provides a linear reduction in surge impedance directly proportional to the distance along the load resistor. This produces the uniform, practically reflection-less line termination over the stated frequencies of the load.

## Dielectric Coolant and Seal

---

The coolant oil is chosen for its desirable dielectric properties and thermal characteristics. Cooling of the load is accomplished by natural fluid and air convection. The dielectric coolant, 0.1 gallon, carries the electrically generated heat from the resistor to the walls of the cylindrical cooling tank.

The tank is encased in a set of heavy gauge metal radiating fins, which are firmly pressed on the cylinder. The heat from the oil is transferred to the surrounding air by the radiating fins.

A synthetic rubber diaphragm located in the rear dome of the load allows the coolant to expand as the temperature rises.

## Location

---

Free air circulation around the Model 8135 Terminal Load is essential. Keep the load in the clear, and do not place it near heated surfaces. The Model 8135 should have at least a 6 inch clearance on all sides. Keep the space above the unit unobstructed for good air circulation. This load is to be mounted only in a horizontal position to insure that the load resistor will always be immersed in the coolant.

## Mounting

---

The Model 8135 may be fastened to a work or test bench. To do this, remove the four rubber bumpers from the bottom of the radiator. These bumpers are fastened to the corners of the bottom radiator brace by 8-32 studs which are set permanently into the rubber feet. The bumpers unscrew easily by hand. The holes are threaded for 8-32 screws. The fasteners must be placed up through the bench and into the load. These holes are on a 3 x 7 inch rectangle (76 x 178 mm).

## Use and Function of Controls

---

The Model 8135 is a passive electronic device and therefore has no controls to operate.

## Initial Adjustment

---

No adjustments or setting are required.

## Start Up

---

Connect the Model 8135 Termline Load to the transmitting equipment under test with 50 ohm coaxial cable such as RG213/U or equal, and a Male N type plug (UG-21E/U or equal) which mates 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 readjust the transmitter due to possible differences in VSWR.

## Normal Operation

---

Being a passive device, the Model 8135 will function without an operator in attendance provided its stated performance limits are not exceeded.

**WARNING**

When power is in the upper range of the load's capacity, the radiator will become hot - care should be used in touching the equipment.

**CAUTION**

Do not operate this equipment continuously above the rated 150 W.

## **Operation Under Abnormal Conditions**

---

The Model 8135 can be subjected to moderate overloads for short periods of time, providing a sufficient amount of time is allowed between intervals for adequate cooling. An example would be 250 watts for a maximum of 5 minutes, allowing at least a 20 minute interval for cooling between power applications.

## **Shutdown Procedures**

---

There is no way to turn off the Model 8135; power must be shut off at the RF source instead.

## **Emergency Shutdown**

---

Power must be shut off from the RF source as in the above procedure.

**WARNING**

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

**Troubleshooting**

---

For corrections requiring repair or replacement of components, refer to the appropriate section for your specific model.

PROBLEM	POSSIBLE CAUSE	REMEDY
Leakage of coolant oil around clamping band or radiator housing.	Clamping bands not tight.	Tighten slightly with screwdriver.
	Faulty O-Ring (front).	Replace. See " <a href="#">RF Load Resistor Assembly</a> " on <a href="#">page 10</a>
	Faulty diaphragm (rear).	Replace. See " <a href="#">Diaphragm and Coolant Oil</a> " on <a href="#">page 9</a>
Overheating of the radiator.	Transmitter power too high.	Reduce transmitter power.
	Coolant oil level too low.	Add more coolant oil to the radiator. See " <a href="#">Diaphragm and Coolant Oil</a> " on <a href="#">page 9</a>
	Faulty RF section assembly.	Replace. See " <a href="#">RF Load Resistor Assembly</a> " on <a href="#">page 10</a>
High and low DC resistance values per " <a href="#">RF Assembly Test</a> " on <a href="#">page 9</a>	Faulty RF input connector.	Replace. See " <a href="#">RF Input Connector Replacement</a> " on <a href="#">page 9</a>
	Loose RF input connector.	Tighten with a screwdriver.

## **Cleaning**

---

### **Radiator**

---

The principle maintenance required by the operator will be the cleaning of the radiator fins. Keep the radiator of the Model 8135 Termaline Load clean and free of dust. Wipe away the accumulated dust and grime with a soft clean cloth. If the insulator or metallic contact surfaces of the RF input connector should become dirty or grimy, clean carefully with a soft clean cloth. Use self-drying, spray or aerosol contact cleaner that leaves no residue on the inaccessible portions of the connector.

### **Inspection**

---

Periodic Inspection - with the rugged and simple construction of the Model 8135 Termaline Load, periodic inspection will be necessary at only about six month intervals. Inspection should include the items listed below:

#### **Oil Leakage**

---

Check for coolant oil seepage around the radiator tank, and particularly at the front and back around the underside of the clamping bands. See paragraph 5.1, Troubleshooting, if leakage is observed. Check tightness of the clamping bands, both front and back.

#### **Cleanliness**

---

Check for cleanliness of the radiator fins and the RF connector. Proceed as in paragraph Cleaning.

#### **Completeness**

---

Inspect the Model 8135 Termaline Load for completeness and general condition of the equipment.

### **Preventive Maintenance**

---

Most of the preventive maintenance procedures are covered in the previous paragraph 5.5, Inspection. If any portions of the radiator are corroded or rusted, clean the area carefully with a fine flint sandpaper, and touch up the grey enamel.



## RF Assembly Test

---

DC Resistance - Check the condition of the load resistor 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 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.

## Disassembly

---

There are no special techniques required for the repair or replacement of components in the Model 8135 Terminal Load. A screwdriver is the only tool needed. The paragraphs below outline component removal.

### RF Input Connector Replacement

---

The input connector is a patented "Quick-Change" 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 or the coolant oil seal. For replacement, proceed as follows:

1. Remove the four 8-32 x 5/16 inch round head machine screws from the corners of the RF connector.
2. Pull the connector straight out of its socket.

### Diaphragm and Coolant Oil

---

Remove the diaphragm to replace or examine the coolant oil. Replacement of the diaphragm and coolant oil are outlined in the following steps:

1. Stand the load vertically, with the back end up.
2. Loosen the clamp screw until clamping band is released.
3. Remove the diaphragm cover and lift diaphragm from back end of radiator tank. If the diaphragm is no longer pliable or shows signs of surface cracks, replace it.
4. The coolant oil level should be about one inch below the top of the radiator cylinder. If the oil appears to be contaminated, replace it.

## RF Load Resistor Assembly

---

To replace the load resistor assembly, proceed as follows:

1. Stand load vertically, connector end up.
2. Loosen clamp screw until clamping band is released.
3. Lift load resistor assembly straight up out of the cylinder, allowing the coolant to drip back into cylinder.
4. Inspect the O-Ring seal which is located just inside the mounting flange of the resistor assembly.

**Note:** *DO NOT reuse the O-Ring if it is no longer pliable or shows signs of surface cracks.*

## Assembly

---

### RF Input Connector

---

Reverse the procedure in the RF Input Connector Replacement paragraph to install a new connector. Be sure that the projecting center contact pin on the connector is carefully engaged and properly seated with the mating socket of the load resistor input.

### Diaphragm and Coolant Oil

---

To reassemble, reverse the procedure in the Diaphragm and Coolant oil paragraph.

### RF Load Resistor Assembly

---

To replace the load assembly, reverse the procedure in the RF Load Resistor Assembly paragraph.

## Storage

---

No special preparations for storage are necessary other than covering the load to keep it dust free. Store in a dry and dust-free environment. Keeping the ambient temperature within the -40C to +45C (-40F to +113F) working range is preferable.

## Customer Service

Any maintenance or service procedure beyond the scope of those in this chapter should be referred to a qualified service center.

If the unit needs to be returned for any reason, request an Return Material Authorization (RMA) through the Bird Technologies website. All instruments returned must be shipped prepaid and to the attention of the RMA number.

### Bird Service Center

30303 Aurora Road  
Cleveland (Solon), Ohio 44139-2794  
Fax: (440) 248-5426  
E-mail: [bsc@birdrf.com](mailto:bsc@birdrf.com)

For the location of the Sales Office nearest you, visit our Web site at:

<http://www.birdrf.com>

## Shipment

Wrap the RF connector with padding and tape it securely. Pack and brace the Model 8135 in a suitable shipping container. A corrugated paper box should suffice. It is not necessary to remove the dielectric coolant before shipping.

## Specifications

Impedance	50 ohms nominal
VSWR	1.1:1.0 maximum DC-1000 MHz 1.2:1.0 maximum 1000-2500 MHz 1.3:1.0 maximum 2500-4000 MHz
Connectors	Female N "QC" type (normally supplied)
Power Range	150 W continuous
Frequency Range	DC-4000 MHz
Dimensions	8-13/16"L x 4"W x 6-7/16"H (224 x 102 x 164 mm)
Ambient Temperature	-40C to +45C (-40F to +113F)
Cooling Method	Dielectric liquid & air convection
Weight, Nominal	6 lb (2.7 kg)
Operating Position	Horizontal only
Finish	Grey Powder Coat Paint

## Replacement Parts List

Item	Qty.	Description	Part Number
1	1	RF load resistor assembly	8130-015
2	1	Radiator	2400-025
3	1	O-Ring seal	5-229
4	2	Clamping band assembly	7500-254
5	1	Diaphragm	2400-015
6	1	Diaphragm cap	2400-050
7	1	Connector	*See Below
8	0.5 gallon (1.9 liters)	Coolant Oil	5-030-2 (1/2 gallon container)

<b>*Available QC Type Connectors</b>	
N-Female	4240-062
N-Male	4240-063
HN-Female	4240-268
HN-Male	4240-278
LC-Female	4240-031
LC-Male	4240-025
LT-Female	4240-018
LT-Male	4240-012
C-Female	4240-100
C-Male	4240-110
UHF-Female (SO-239)	4240-050
UHF-Male (PL-259)	4240-179
7/8" EIA Air Line	4240-002

# 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. Routine (regularly required) calibration is not covered under this limited warranty. 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.