



TERMALINE[®] LOAD RESISTOR
SERIES 825 I

OPERATION MANUAL

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INSTRUCTION BOOK PART NUMBER 920-8251S REV. H

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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.



This symbol indicates that a shock hazard exists if the precautions in the instruction manual are not followed.



The caution symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area.



This symbol indicates that the unit radiates heat and should not be touched while hot.



This symbol indicates that the item must not be discarded but instead managed according to the collection and recycle of waste electrical and electronic equipment (WEEE) as outlined in *Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)*.



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

The vent plug must be used at all times when the unit is operating or cooling. Failure to do so could result in an explosion or severe burns.

See Pages [4](#), [7](#), [10](#), and [11](#)

WARNING

Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

See pages [5](#), [8](#), [9](#), and [10](#)

WARNING

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

See pages [5](#), [7](#), [8](#), and [9](#)

Caution Statements

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

CAUTION

This load is designed for operation in a horizontal position only, with the vent plug up. Do not use in any other manner.

See page [4](#)

CAUTION

The thermostitch has a factory preset temperature adjustment screw. Do not adjust this screw.

See page [5](#)

CAUTION

Make sure the interlock is properly connected when overloaded to prevent damage to the load.

See page [7](#)

CAUTION

Use only Bird coolant, P/N 5-1070, to prevent damage to the load.

See page [9](#)

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 PROIZIONE 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.

CONNECT INTERLOCK TO TRANSMITTER/GENERATOR/AMPLIFIER BEFORE OPERATING.

BRANCHER LE VERROUILLAGE À L'ÉMETTEUR/GÉNÉRATEUR/AMPLIFICATEUR AVANT EMPLOI.

CONECTE EL INTERBLOQUEO AL TRANSMISOR/GENERADOR/AMPLIFICADOR ANTES DE LA OPERACION.

VOR INBETRIEBNAHME VERRIEGELUNG AM SENDER/GENERATOR/VERSTÄRKER ANSCHLIESSEN.

PRIMA DI METTERE IN FUNZIONE L'APPARECCHIO, COLLEGARE IL DISPOSITIVO DI BLOCCO AL TRASMETTITORE/GENERATORE/AMPLIFICATORE.

About This Manual

This instruction book covers the following models:

8251	8251N	8251D	8251D7-16
8251T-230	8251T-300		

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 8251 series load and indicates the capabilities of each model in the series.

Theory of Operation — Includes the details of the loads construction as well as a description of the coolant used and the interlock provided.

Installation — This chapter details installation, from unpacking the unit to proper mounting, and RF connections.

Operating Instructions — Provides safety details necessary to follow during load operation.

Maintenance — This chapter provides troubleshooting and repair information, along with specifications, storage and shipment instructions.

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Bird 8251 Series Loads are portable, general purpose 50 ohm coaxial RF transmission line terminations. They are accurate, dependable, and low reflection, dissipating up to 1000 watts of RF power. See [Figure 1 on page 2](#) for frequency ranges.

The load has a coolant chamber surrounded by radiator fins. A handle is recessed in the radiator fins. The front and rear fins form mounting flanges which can be used as supports for freestanding use or as brackets for fixed mounting. A vent plug at the top of the unit relieves internal pressure from coolant expansion. The load's simple and rugged design minimizes maintenance requirements.

Applications

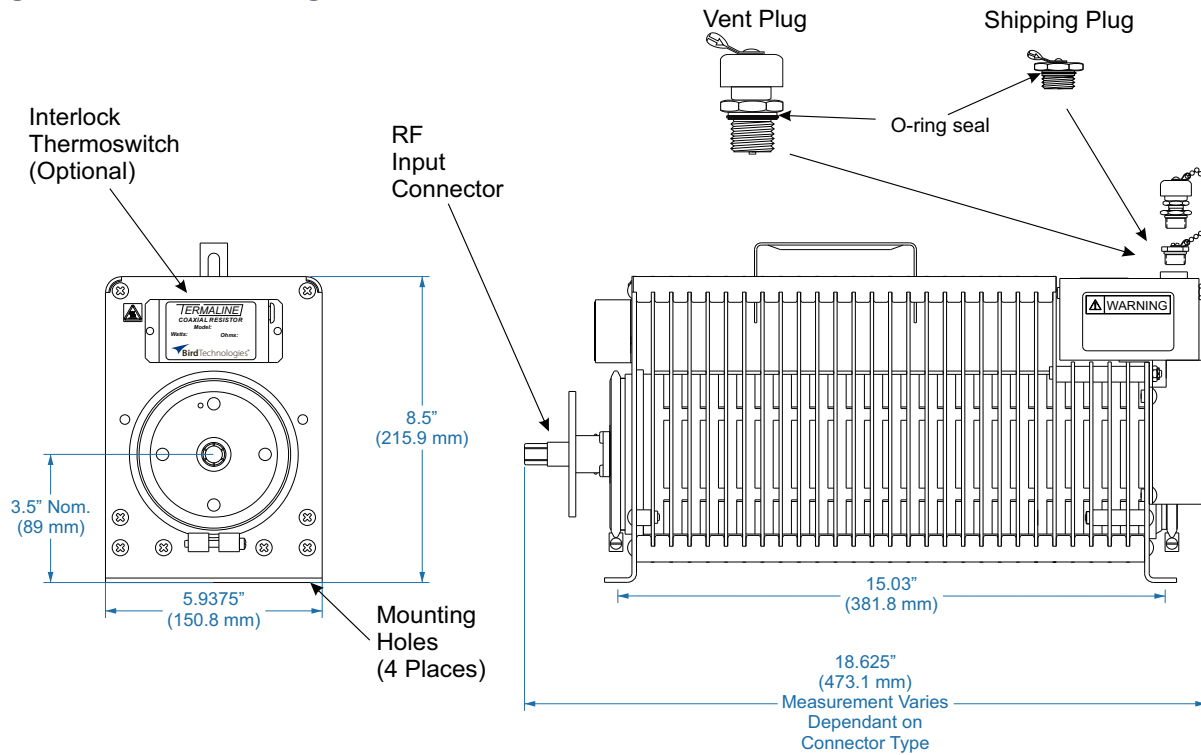
Use an 8251 load:

- As a substitute antenna for tuning transmitters under nonradiation conditions or for making routine tests and adjustments.
- As a substitute for any circuit loading element.
- To measure, with a suitable meter, the power output of coaxially transmitted signals.

Items Supplied

- Load Resistor: Pre-filled with coolant at the factory
- Shipping Plug
- Vent Plug
- Instruction Manual

Figure 1 Outline Drawing



Model	Connector	Frequency Range	Thermoswitch Temperature
8251	Female LC	DC – 2400 MHz	N/A ¹
8251N	Female N	DC – 1000 MHz	N/A ¹
8251D ²	1-5/8" EIA Swivel	470 – 860 MHz	N/A ¹
8251D7-16	7/16 IEC	470 – 860 MHz	N/A ¹
8251T-230 ³	1-5/8" EIA Fixed Flanged	DC – 2000 MHz	230 °F (110 °C)
8251T-300 ³	1-5/8" EIA Fixed Flanged	DC – 2000 MHz	300 °F (149 °C)

- 1 Optional thermoswitch kit (P/N 2450-129) available.
- 2 Requires bullet (P/N 4712-020) – not included
- 3 Bullet included

Load Resistor

Bird 8251 series loads consist of a thin-film-on-ceramic resistor immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in a special housing. When surrounded by the coolant, this produces a uniform, practically reflectionless line termination over the specified frequencies.

Coolant

The load is cooled by natural fluid and air convection currents. The coolant, chosen for its dielectric and thermal characteristics, carries heat from the resistor to the walls of the cooling tank, where radiator fins surrounding the tank transfer the heat to the air.

When the coolant is heated, thermal expansion causes an increase in the internal pressure. An expansion tank on the upper rear of the load allows for coolant expansion due to the rise in temperature, and is equipped with a vent plug (see [Figure 1 on page 2](#)) to relieve this pressure while protecting the opening from dirt or other contaminants.

Thermal Interlock

Loads can be supplied with an optional passive overtemperature thermoswitch. Normally closed, it opens at either 230 or 300 °C (110 or 149 °F), depending on the model, turning off transmitter power. The interlock system will not permit use of the transmitter until the load has reached a safe temperature.

This chapter provides information for on-site requirements, unpacking, inspection, and preparing the load for use.

Unpacking and Inspection

1. Carefully inspect shipping container for signs of damage.
2. Do one of the following:
 - If the shipping container is damaged, do not unpack the unit. Immediately notify the shipping carrier and Bird Electronic Corporation.
 - If the shipping container is not damaged, unpack the unit. Save shipping materials for repackaging.
3. Inspect unit for visual signs of damage.

Note: *If there is damage, immediately notify the shipping carrier and Bird Electronic Corporation.*

Setup

Note: *Before first using the load, get a resistance baseline for future maintenance. Refer to "[DC Resistance](#)" on page 9 for details.*

1. Remove the shipping plug from the load. Refer to [Figure 1 on page 2](#) for location of the plugs.
2. Verify the o-ring seal is in place on the vent plug, then install in the load.

WARNING

The vent plug must be used at all times when the unit is operating or cooling. Failure to do so could result in an explosion or severe burns.

Mounting

Place the load in a dry, dust and vibration free environment. Do not use outdoors or in areas of condensing humidity. For operation above 300 W, allow at least 6" (15 cm) of clearance on all sides of the load.

CAUTION

This load is designed for operation in a horizontal position only, with the vent plug up. Do not use in any other manner.

The load is equipped for either portable use or fixed installation. The mounting brackets on the front and rear faces have four mounting slots arranged in a 5 $\frac{1}{8}$ " x 15" rectangle (130 x 381 mm). Use a screw with a $\frac{1}{4}$ " (6.4 mm) diameter max.

Installing Thermoswitch

Bird 8251T loads are identical to the 8251 except for a factory-installed interlock thermoswitch. It is normally closed, opening at either 230 or 300 °F (110 or 149 °C), depending on the model. The terminals are rated for 10A @ 120 Vac and 5A @ 240 Vac.

WARNING

Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

CAUTION

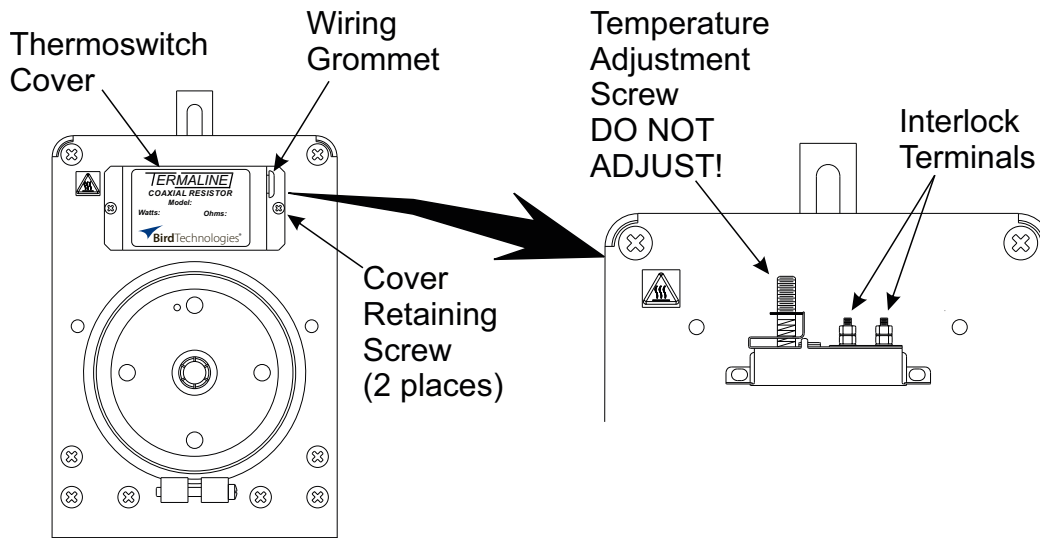
The thermoswitch has a factory preset temperature adjustment screw. Do not adjust this screw.

1. Unscrew the cover screws and remove the thermoswitch cover.
2. Thread the interlock wires through the grommet on the side of the cover.
3. Wrap the interlock wires around the terminals and clamp them in place with the terminal nuts.

Note: Do not apply more than 10 in. lb. (1.1 N-m) of torque to the terminal nuts.

4. Replace the cover.
5. Check the requirements of the transmitter interlock and make connections as required.

Figure 2 Thermoswitch



Connecting RF Power

Note: After installing the load, the RF transmission line can be attached using standard coaxial line coupling kits.

WARNING

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

Using a “QC” Connector Coupling

Use a 50 ohm coaxial cable such as RG-218/U or -220/U (-17A or -19A), appropriate for the frequency and power level of operation.

Note: Use a cable connector which will mate with the one on the load.

Using a 13-30 Coupling

Use 50 ohm coaxial cable such as RG-8A/U, RG-9U, RG-213/U, or equivalent with a male 13-30 plug.

Using a Swivel Flanged Coupling

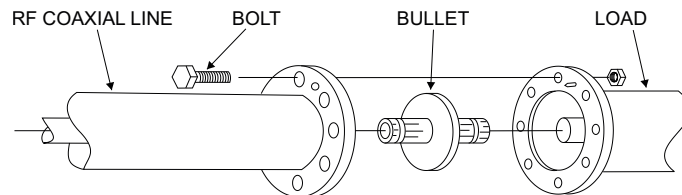
1. Insert the center bullet.
2. Push it in until it is fully seated.
3. Connect the coaxial input in a straight line
4. Push, carefully, on the center conductor to close.

Note: The swivel flange on the load makes connection independent of the orientation of the fixed flange on the coaxial input outer conductor.

5. Insert the bolt sets and tighten evenly all around to transmission line manufacturer’s recommended torque.

Note: Use all of the bolts.

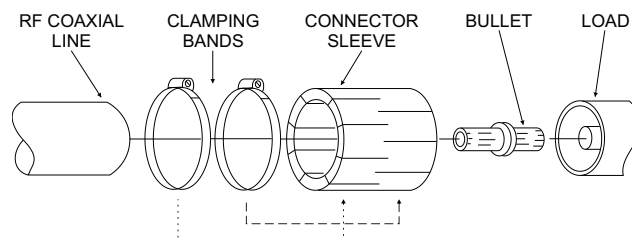
Figure 3 Swivel Flanged Coupling



Using a Unflanged Coupling

1. Insert the center bullet
2. Push until it sets the midpoint nibs.
3. Position the outer sleeve, with clamping bands, over the input connector.
4. Set the transmission line snugly against the coupling stops.
5. Position the clamping bands evenly about 3/4” from the ends of the sleeve.
6. Tighten the clamping bands.

Figure 4 Unflanged Coupling



After the transmitter has been connected to the load, proceed according to the transmitter manufacturer’s instructions. When reconnecting the antenna, it may be necessary to slightly readjust the transmitter due to differences in VSWR between the load and the antenna system.

WARNING

The vent plug must be used at all times when the unit is operating or cooling. Failure to do so could result in an explosion or severe burns.

Normal Operation

Bird 8251 series loads have no indicators or operating controls. They require no special operating procedures or surveillance when their performance limits are not exceeded. Follow the instructions for the specific transmitter equipment.

Operating Under Abnormal Conditions

The load can be moderately overloaded for short periods.

CAUTION

Make sure the interlock is properly connected when overloaded to prevent damage to the load.

Shutting Down

Note: *These loads are passive devices, so have no way of being turned off. Turn off RF power at the source.*

WARNING

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

Emergency Shutdown

Turn off RF power at the source.

Note: *If the interlock thermoswitch is properly connected, RF power will be automatically turned off when the coolant temperature reaches an unsafe level*

This chapter covers cleaning, inspection, troubleshooting, and specifications for the Bird 8251 series loads.

Troubleshooting

The table below contains troubleshooting information for problems which can occur during normal operation. This manual cannot list all malfunctions that may occur, or their corrective actions. If a problem is not listed or is not corrected by the listed actions, notify a qualified service center.

Problem	Possible Cause	Correction
Leaking coolant	Loose clamping band	Tighten the clamping band
	Defective or improperly installed front O-ring	Replace the O-ring (See “Load Resistor” on page 11.)
	Defective or improperly installed rear O-ring	Replace the O-ring (See “Rear Seal” on page 10.)
High or low DC resistance	Loose RF input connector	Tighten connector
	Faulty RF input connector	Models with “QC” type connectors: Replace connector (See “RF Connector” on page 10.)
		All other models: Return the unit for service
Faulty resistor	Replace the resistor (See “Load Resistor” on page 11.)	
Overheating radiator	RF power too high	Lower RF power (See “Specifications” on page 13. for maximum RF power)
	Coolant level too low	Check the coolant level. Add coolant if necessary (See “Coolant” on page 9.)
	Coolant degraded	Replace the coolant (See “Coolant” on page 9.)
	Faulty resistor	Replace the resistor (See “Load Resistor” on page 11.)

Maintenance

WARNING

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

WARNING

Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

Cleaning

The outside surface of the instrument should be wiped free of dust and dirt when necessary. Excessive dust on the cooling fins will interfere with heat dissipation. Clean the RF connector, both metallic and insulating surfaces, with a dry, non-residue forming solvent.

Inspection

Inspect the unit every six months. Check for coolant leakage around the clamping band and the thermoswitch. Also check for corrosion.

DC Resistance

Measuring the DC resistance between the inner and outer conductors of the RF connector shows changes in the load over time, a good check of the load resistor's condition. Under normal operating conditions, the resistor should provide at least 5,000 hours of operation before requiring any additional service. DC resistance tracking must start before the load is put into service, and should be measured annually.

Perform the following steps and record the value for future comparison. Make sure that you have an ohmmeter with an accuracy of $\pm 1\%$ at 50 ohms and that the load temperature is between 20 and 25 °C (68 to 77 °F) before starting.

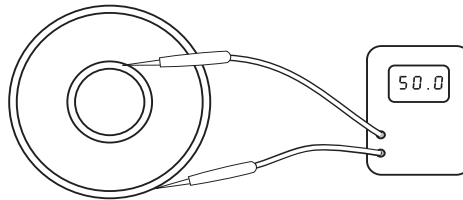
WARNING

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

1. Turn off the RF power and interlock circuitry.
2. Disconnect the RF line.
3. Connect the multimeter test leads to the center and outer conductor of the load resistor.
4. Compare the measured value with the previous measurement and with the baseline resistance, measured when the load was put into service.

Note: *If the new value differs from either of these by more than 1 ohm this could indicate a failing resistor.*

Figure 5 Measuring Resistance



Coolant

Coolant lifetime will vary greatly depending on operating conditions. For heavy use (full RF power for long times, high ambient temperature), check the coolant every 500 hours. If the load has only had light duty (fraction of full power, low ambient temperature), then coolant inspection may only be necessary every 2,000 hours.

Note: *Correct any coolant leakage before inspection.*

WARNING

Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

CAUTION

Use only Bird coolant, P/N 5-1070, to prevent damage to the load.

1. Remove the load resistor (Refer to "Load Resistor" on page 18).

CAUTION

Use only Bird coolant, P/N 5-1070, to prevent damage to the load.

2. Inspect the coolant.
 - The coolant should be clear, with a faint yellow tinge, and have a slightly sweet smell. If it is black with a burnt or acrid smell, drain it and add about 0.75 gal (2.84 L) of coolant.
 - With the load still on end, the coolant level should be $4\frac{3}{4}$ to 5 inches (125 mm) below the top surface of the resistor assembly mounting ring, at ambient temperature.
3. Add coolant if necessary

Repair

WARNING

Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

WARNING

The vent plug must be used at all times when the unit is operating or cooling. Failure to do so could result in an explosion or severe burns.

RF Connector

The Bird 8251 and 8251N have a special Bird “QC” connector which allows easy changing of the RF connector. This does not disturb the coolant seal or affect the electrical continuity of the load. To change the connector, proceed as follows:

1. Remove the four screws at the corners of the RF connector.
2. Pull the connector straight out.
3. Push the new connector in.
4. Ensure that the center pin on the connector is properly seated in the mating socket on the load.
5. Replace the screws.

Note: *If not using the connector normally supplied, frequency and power must be limited to the capabilities of the connector.*

Rear Seal

If the coolant has not been drained from the load, stand the unit on end with the RF connector down before disassembly.

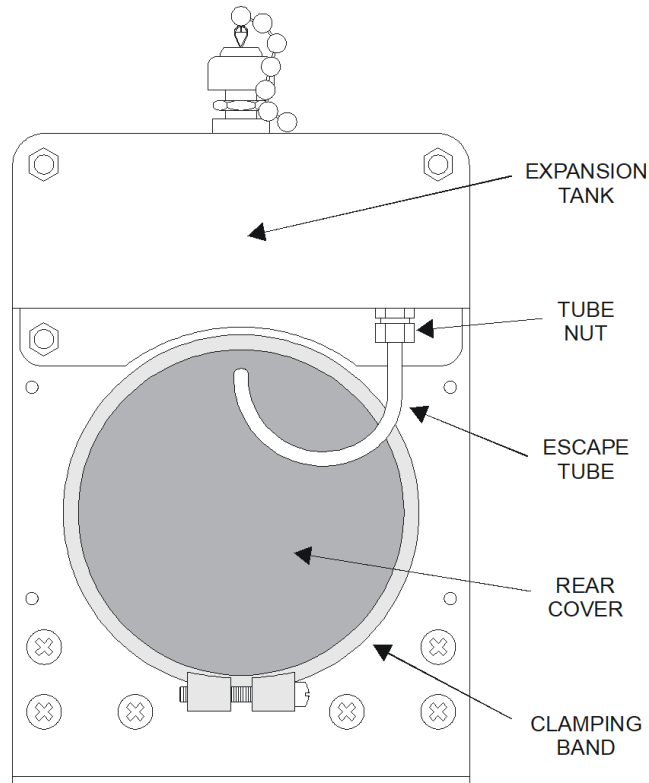
WARNING

Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

1. Unscrew the four screws at the corners of the guard cover.
2. Unscrew the tube nut from the tank nozzle, using a small wrench if necessary, and pull the nozzle free.
3. Unscrew and remove the clamping band.
4. Remove the rear cover, including the attached escape tube and the diaphragm seal.
5. Inspect the diaphragm seal and replace it if it is not pliable or has surface cracks.

- To reassemble, reverse these steps.

Figure 6 Rear Seal



WARNING

The vent plug must be used at all times when the unit is operating or cooling. Failure to do so could result in an explosion or severe burns.

Load Resistor

- Remove the vent plug.
- Install the shipping plug.
- Stand the unit on its back, with the RF connector up.
- Brace the unit to prevent it from tipping over.
- Unscrew and remove the clamping band.
- Lift the load resistor assembly out of the tank and allow any coolant to drip back into the tank.

Note: *The O-Ring should be free of twists and positioned evenly around the flange of the resistor housing. If the O-ring shows signs of deterioration (e.g. is no longer pliable or has surface cracks) replace it.*

- Replace the entire load resistor assembly.

Note: *It cannot be further disassembled.*

- Put the clamping band in place and tighten it.
- Remove the shipping plug. Install the vent plug.

Storage and Shipment

Storing the Load Resistor

- Cover the Load before storing to keep out dust and dirt.
- It is not necessary to install the shipping plug.
- Store in a dry, dust-free environment where the ambient temperature will remain between -40 and $+45$ °C (-40 to $+113$ °F).

Shipping the Load Resistor

1. Remove the vent plug.
2. Install the shipping plug.
3. Wrap the vent plug with padding and tape it to the side of the load for protection.

Note: *With the shipping plug installed, it is not necessary to empty out the coolant.*

4. Wrap the connector in padding.
5. Pack and brace the load in a sturdy wooden crate for shipment.

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

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

<http://www.birdrf.com>

Specifications

Frequency Range	
8251	DC – 2400 MHz
8251T	DC – 2000 MHz
8251N	DC – 1000 MHz
8251D, 8251D7-16	470 – 860 MHz
Power Rating	1000 Watts continuous duty
Impedance, Nominal	50 ohms
Operating Position	Horizontal only – vent plug up
VSWR	
8251N	1.10
8251D, 8251D7-16	1.065
8251 ¹	1.10, DC – 1000 MHz 1.20, 1000 – 2000 MHz 1.30, 2000 – 2400 MHz
8251T	1.10, DC – 800 MHz 1.20, 800 – 1000 MHz 1.30, 1000 – 2000 MHz
Connectors	
8251	“QC” Type, Female LC
8251D	1-5/8” EIA Swivel Flanged
8251D7-16	7/16 Jack, IEC
8251N	“QC” Type”, Female N
8251T	“QC” Type”, 1-5/8 EIA Fixed Flanged
Thermoswitch Temperature	
8251T-230	110 °C (230 °F)
8251T-300	149 °C (300 °F)
Ambient Temperature	-40 to +45 °C (-40 to +133 °F)
Cooling Method	Oil dielectric and convection currents
Dimensions	18”L x 6”W x 8.5” H (455 x 151 x 216 mm)
Weight, Nominal	25 lb. 8 oz. (11.6 kg)
Finish	Gray Powder Coat

1 VSWR Measured using a female N connector.

Replacement Parts

Description	Qty	Part Number
RF Load Resistor: 8251D 8251D7-16 All other models	1	8892-015 8890A050 8890A050
Resistor O-Ring	1	5-230
Clamping Band Assembly	1	2430-055
Plug Vent Shipping	1	2450-094 2450-049
Thermoswitch Kit 149 °C (300 °F) 110 °C (230 °F)	1	2450-129-1 2450-129-2
Coolant, 0.75 gal (2.84 L)	1	5-1070-2
Optional Bullet, 8251D Only	1	4712-020

Available “QC” Type Connectors

Connector	Part Number
BNC-Female	4240-125
BNC-Male	4240-132
C-Female	4240-100
C-Male	4240-110
HN-Female	4240-268
HN-Male	4240-278
LC-Female ¹	4240-031
LC-Male	4240-025
Open Term. # 10-32 Nut	4240-080
LT-Female	4240-018
LT-Male	4240-012
N-Female ²	4240-062
N-Male	4240-063
SC-Female	4240-090
SMA-Female	4240-336
SMA-Male	4240-334
7/16 Jack, IEC Type 169-4	4240-344
7/16 Plug, IEC Type 169-4	4240-363
Mini UHF-Female	4240-346
UHF-Female	4240-050
UHF-Male	4240-179
1-5/8" EIA Fixed	4240-096
1-5/8" EIA Swivel	4240-208
7/8" EIA	4240-002
TNC-Female	4240-156
TNC-Male	4240-160

1 Normally supplied on the 8251

2 Normally supplied on the 8251N

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 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.