
**INSTRUCTION BOOK FOR
TERMALINE® COAXIAL
LOAD RESISTOR**

MODELS

8251

8252

8255

BIRD

Electronic Corporation
Cleveland (Solon) Ohio USA

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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.

- Keep Away From Live Circuits** Operating personnel must at all times observe general safety precautions. Do not replace components or disconnect RF transmission or any other high voltage line while power is applied. To avoid casualties, always remove power.
- 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.
- Shock Hazard** Do not attempt to disconnect an RF transmission line while RF power is present. Radiated RF power is a potential health hazard.
- Chemical Hazard** Dry cleaning solvents used to clean parts may be potentially dangerous. Avoid inhalation of fumes and also prolonged contact with skin.
- Resuscitation** Personnel working with or near high voltages should be familiar with modern methods of resuscitation.
- Safety Earth Ground** An uninterruptible earth 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.

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.

8251/52/55 Warning Statements

The following safety warnings appear in the text and are repeated here for emphasis.

WARNING

The vent plug must be used at all times when the unit is in operation or cooling. Failure to do this could result in damage to the equipment and endanger the operator's safety. Be sure to check this plug.

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

8251/52/55 Caution Statements

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

CAUTION

This equipment is designed for operation in a horizontal position only, with mounting brackets down. Do not operate in any other manner.

CAUTION

Do not operate this equipment over the rated 1000 watts continuously. Damage to the resistive element will result.

CAUTION

The unit is factory filled to the proper level with 1.1 gallons (4.2 liter) of Bird P/N 5-1070. No other coolant should be used.

CAUTION

Do not leave out the O-Ring seal, P/N 5-504 when interchanging the vent and shipping plugs.

About This Manual

This instruction book covers models 8251, 8252 and 8255 Termaline Coaxial Resistors.

This instruction book is arranged so that essential information on safety is contained in the front of the book. Reading the Safety Precautions Section before operating the equipment is strongly advised.

The remainder of this Instruction Book is divided into Chapters and Sections. Figures and tables are numbered sequentially within each chapter.

- Operation** First time operators should read Chapter 1 - Introduction, and Chapter 3 - Preparation for Use, to get an overview of equipment capabilities and how to install it. An experienced operator can refer to Chapter 4 - Operating Instructions. All instructions necessary to operate the equipment, are contained in this section.
- Maintenance** All personnel should be familiar with calibration and repair information found in Chapter 5 - Maintenance. If a failure should occur, the troubleshooting section will aid in isolating and repairing the failure.
- Parts** For location of major assemblies or parts refer to the part lists in Chapter 5.
- Changes** Changes to this publication will be made as required. To keep your instruction book accurate and up to date, it is recommended that a periodic request of the latest revision be made. It will be supplied at no cost. When requesting updates, reference your instruction book part number and its revision level listed on the title page.
- Reporting Errors** It is our goal to provide our users with the information needed to operate and maintain the Models 8251, 8252 and 8255. If you should discover any errors in this publication, or if you have suggestions for improving this instruction book, please send your comments to our factory.

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|---|--|
| Purpose And Function | Models 8251, 8252 and 8255 Termline Coaxial Load Resistors are portable, general purpose 50 ohm coaxial transmission line terminations. These loads provide accurate, dependable, and practically nonreflective line terminations. |
| | These models are rectangular in shape with transverse fins encasing a dielectric coolant cylinder. A retractable handle is recessed in the radiator fins. The front and rear fins are made of heavier gauge material and are bent 90° to form bottom mounting flanges. These flanges are supports for free standing use, or brackets for fixed mounting. Holes are provided in the flanges for fastening the loads down. |
| Applications | Use as a substitute antenna for tuning transmitters under nonradiating conditions or making routine test and adjustments. Use as a substitute for any circuit loading element. Use to measure, with a suitable indicating device, the power output of any coaxially transmitted signal within their rating. |
| Performance Characteristics and Capabilities | Models 8251 and 8252 loads can absorb up to 1000 watts continuously and dissipate it harmlessly as heat over a frequency range of dc to 2400 MHz. They will show a maximum VSWR of 1.10 from dc to 1000 MHz, 1.25 from 1000 to 2000 MHz and, for Model 8251 only, 1.30 from 2000 to 2400 MHz. |
| Power/Utility Requirements | These loads are passive devices that are self-contained and require only the RF input to function. |
| Environmental Requirements | These loads should be operated in a dust and vibration free environment. Allow at least 6 inches (153mm) of clearance around the units to permit adequate heat dissipation. |
| Items Furnished | Load Resistor, Instruction Book, and Input connector, see specifications for type of connectors supplied. |
| Items Required | Matching connector on the coaxial transmission line to which the load will be attached. |
| Tools and Test Equipment | A screwdriver and an adjustable wrench will be necessary for disassembly of this equipment. A resistance bridge or ohmmeter with an accuracy of 1 percent or better at 50 ohms is useful for checking the resistance value of the RF section assembly. |

Specifications

| | |
|----------------------------|--|
| Impedance | 50 ohms nominal |
| VSWR | |
| Models 8251/52 | 1.1 max. dc-1000 MHz 1.25 max. 1000-2000 MHz |
| Model 8251 | 1.3 max. 2000-2400 MHz |
| Model 8255 | 1.25 to 1.0 max. |
| Connectors | |
| Model 8251 | Female LC "QC" type normally supplied |
| Model 8252 | 3 $\frac{1}{8}$ " EIA swivel flange |
| Model 8255 | 7 $\frac{1}{8}$ " EIA flanged "QC" type |
| Power Range | |
| Models 8251/52 | 1000 watts continuous |
| Model 8255 | 0-825 watts continuous |
| Frequency Range | |
| Model 8251 | dc-2400 MHz |
| Model 8252 | dc-2000 MHz |
| Model 8255 | 1250-1350 MHz |
| Ambient Temperature | |
| Models 8251/52 | -40°C to +45°C (-40°F to +113°F) |
| Model 8255 | -40°C to +50°C (-40°F to +122°F) |
| Cooling Method | Oil dielectric and convection currents |
| Dimensions | |
| Model 8251 | 17 $\frac{29}{32}$ "L x 5 $\frac{15}{16}$ "W x 8 $\frac{1}{2}$ "H (455 x 151 x 216mm) |
| Model 8252 | 19 $\frac{33}{64}$ "L x 5 $\frac{15}{16}$ "W x 8 $\frac{1}{2}$ "H (496 x 151 x 216mm) |
| Model 8255 | 18 $\frac{5}{8}$ "L x 5 $\frac{15}{16}$ "W x 8 $\frac{1}{2}$ "H (473 x 151 x 216mm) |
| Weight | |
| Net | 25 lb 8 oz.. (11.6 kg) |
| Shipping | 30 lb (13.6 kg) |
| Operating Position | Horizontal only - vent plug up |
| Finish | |
| Models 8251/52 | Light navy gray baked enamel (MIL-E-15090C) |
| Model 8255 | Semi-gloss black enamel per Federal Standard 595 (TT-E-529) |

General

These loads consist essentially of a carbon film resistor on a ceramic substrate immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in a special 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 ohms at the front (connector) end, 25 ohms at the mid-point (to compensate for the resistance already passed over), and zero ohms at the rear where the resistor joins the housing, forming the return conductor of the coaxial circuit. This produces a uniform, practically reflectionless line termination over the stated frequencies of the load resistor.

Cooling

The dielectric coolant was chosen for its desirable dielectric and thermal characteristics. Cooling of the load is accomplished by natural fluid and air convection currents. The 1.1 gallons (4.2 liters) of dielectric coolant carries the electrically generated heat from the resistor to the walls of the cylindrical cooling tank. This tank is encased in a set of radiating fins, constructed from heavy gauge aluminum alloy, and firmly pressed onto the cylinder. The heat from the dielectric oil is transferred to the surrounding air by the fins.

Expansion of the coolant, caused by the rise in its temperature, is allowed for by the use of an expansion tank located on the upper rear of the load. The expansion tank is equipped with a spring loaded vent valve for relief of the internal pressure.

CAUTION

This equipment is designed for operation in a horizontal position only, with mounting brackets down. Do not operate in any other manner.

The Models 8251, 8252 and 8255 may be used for portable operation and stand free, or they may be secured to a bench top or other flat surface for a fixed installation. Mount the load with four screws of up to 1/4 inch diameter. Fasten them through the four 9/32 inch holes in the mounting brackets that are arranged in a 5-1/8 inch x 15 inch (130.2 x 381 mm) rectangle.

Location For operation above 300 watts allow at least 6 inches (153 mm) of clearance on each side. Operate these loads in a horizontal position only, with the handle on top.

Shipping and Vent Plugs

WARNING

The vent plug must be used at all times when the unit is in operation or cooling. Failure to do this could result in damage to the equipment and endanger the operator's safety. Be sure to check this plug.

It is very important to replace the shipping plug, P/N 2450-049, with the supplied vent plug, P/N 2450-094, before applying any RF power to these loads. Don't forget to use the O-Ring seal, P/N 5-504. The shipping and vent plugs are connected with a short length of bead chain to prevent the mislaying or loss of the unused plug.

Figure 3-1
Shipping Plug,
Remove and re-
place with vent
plug when load is
in operation.

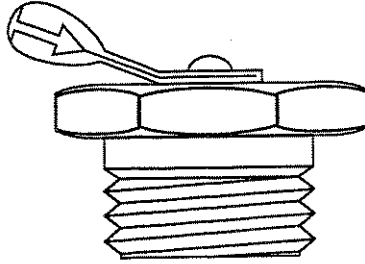
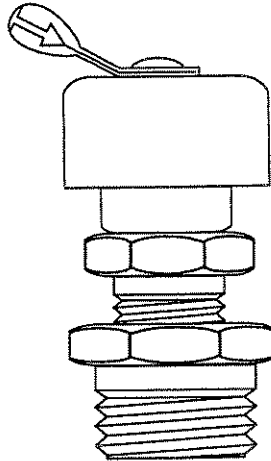


Figure 3-2
Shielded Vent Plug,
Must be installed
in place of ship-
ping plug before
load is operational.



Start-up

Model 8251 Connect the load to the transmitting equipment under test with 50 ohm coaxial cable (RG-8A/U, RG-9/U, RG-213/U or equal) and a Male LC type plug. The Male LC 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.

Model 8252 The 3-1/8 inch EIA flange connector is fastened to the transmission line by six 3/8-16 by 1-1/2 inch stainless steel screw and nut assemblies. The center conductors must be joined with a bullet for 50 ohm 3-1/8 inch coaxial lines. Bird P/N 4600-020 Bullet Kit includes six screw and nut sets, O-Ring and center conductor bullet. Be sure to seat the bullet carefully so that half of the thickness of the insulator is nested in the counterbore of each connector flange. Place the load resistor so that it will align with the coaxial input line and push in carefully on the center contact. Tighten the flange nuts evenly all around (finger tight) and then finish tightening evenly with wrenches. The swivel flange on the Model 8252 makes the load resistor connector independent of the orientation of a fixed mating flange on the input line. Avoid the use of adapters and elbows whenever possible. Due to the difference in the VSWR between the dummy load and the transmitter's antenna, the transmitter may require readjustment when reconnected to the original antenna.

Normal Operation

| |
|---|
| <p>CAUTION</p> <p>Do not operate this equipment over the rated 1000 watts continuously. Damage to the resistive element will result.</p> |
|---|

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.

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 1000 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 1200 watts for a maximum of five minutes with an interval of at least 30 minutes between each power application.

Shutdown

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

Emergency Shutdown

WARNING

Never attempt to disconnect 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.

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

Service Center **U.S.A. Sales and Manufacturing Service Group**
Bird Electronic Corporation
30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794
Phone: (216)248-1200 Cable: BIRDELEC
Fax: (216)248-5426 Telex: 706898 Bird Elec UD

Sales Offices **European Sales Office**
Bird Electronic Ltd.
Unit 1 Shannon Business Centre
Town Centre Shannon
County Clare, Ireland
Phone: 353 61 360583 or 353 61 360577
Fax: 353 61 360585

Pan Asian Sales Office
Bird Electronic Ltd.
3A Unit 6 Tyrwhitt Road
Singapore 0820
Phone: 65 299 2537
Fax: 65 299 8509

Troubleshooting

| Problem | Possible Cause | Correction |
|---|---|--------------------------------------|
| Coolant oil leak around clamping band or radiator housing | Clamping bands not tight | Tighten slightly with screwdriver |
| | Faulty O-ring (front) | Replace O-ring |
| | Faulty O-ring (rear) | Replace O-ring |
| Overheating of the radiator | Transmitter power too high | Reduce transmitter power |
| | Coolant oil level too low | Add more coolant oil to the radiator |
| | Accumulation of dirt on cooling fins | Clean cooling fins |
| | Faulty RF section assembly, check Rdc | Replace if needed |
| High or low dc resistance values | Loose RF connector | Tighten as needed |
| | Faulty RF connector Models 8251/55 Model 8252 | Replace Return to factory |
| | Faulty RF section assembly | Replace if needed |

Cleaning

The outside surface of these loads should be wiped free of dust and dirt when necessary. The principal maintenance required by the operator will be to periodically wipe off the accumulated dust and lint from the radiator fins. Excessive collection of dust and lint on the cooling fins will interfere with the 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 leaves no residue to clean the inaccessible internal parts.

If there are areas of the radiator that has become corroded or rusted, clean the areas with a fine flint sandpaper, and touch-up with gray enamel.

Inspection

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:

1. Oil Leakage - Check for coolant oil leaking around the radiator tank, particularly at the front and back around the underside of the clamping band. If leakage is observed, see Troubleshooting, and check tightness of the front and rear clamping bands.
2. Inspect the load for completeness and general condition of the equipment.

Preventive Maintenance

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. Also, occasionally check the coolant level in the radiator tank.

CAUTION

The unit is factory filled to the proper level with 1.1 gallons (4.2 liter) of Bird P/N 5-1070. No other coolant should be used.

To check the coolant level remove the vent plug from the socket on the top surface of the expansion tank. Unscrew the plug with a 3/4 wrench. The coolant level at room temperature should not be more than 1/8 inch above the bottom surface of the expansion tank. Check this by carefully lifting the front end of the load and noting the presence of coolant on the bottom surface. The coolant quantity should be sufficient to fill the radiator cylinder. The inner housing, for the resistor element, is specially shaped to match the dielectric properties of the recommended coolant.

RF Assembly Test

The electrical condition of the load resistor itself may be ascertained generally from its dc resistance at room temperature. It must be remembered that VSWR and RF impedance are the prime requisites of a good dummy load. however, occasionally checking the dc resistance will offer an indication of a failing load.

Normally the dc resistance of the load will be a nominal 50 ohms. Stabilization of the resistive film or temperature can cause a change in the dc resistance. always check the load when its temperature is between 20 and 25 degrees Celsius. check and record the dc resistance value of the load before it is put into service. Use a resistance bridge or an ohmmeter with an accuracy of one percent or better at 50 ohms for this purpose.

If the load is used frequently, daily to weekly, it would be wise to check the dc resistance on a monthly schedule. If however, the load is used more infrequently you may want to set up a six month to yearly schedule accordingly. If there is no change or even a slight change in dc resistance there is no cause for alarm, however, if there is a drastic change greater than two ohms, this could be an indication of a failing load.

These tests are by no means a dire necessity to the operation of the load but merely guidelines for the users information and advisement.

Disassembly

There are no special techniques required for the repair or replacement of components in these Termaline Load Resistors. A screwdriver and a small wrench are the only tools needed for the 8251. An adjustable wrench will also be required for Model 8252 connector bolts. The paragraphs below outline component removal.

RF Connector This section applies to the Models 8251 and 8255. (The Model 8252 has a 3-1/8 inch EIA flanged connector and must be returned to the factory for connector replacement.) The connector on Models 8251 and 8255 are "Quick-Change" design that 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 pan head machine screws from the corners of the RF connector flange.
2. Pull the connector straight out of its socket.

Rear Seal and Coolant

Before any disassembly of the rear of the load, if the coolant has not already been drained from the tank, stand the radiator on end with the connector pointed down.

1. Unscrew the four 10-32 truss head screws at the corners of the guard cover, P/N 2430-078, and remove the guard cover.
2. Unscrew the tube nut from tank nozzle, using a small wrench if necessary, and pull the nozzle free.
3. Loosen the clamp screw with a screwdriver from the bottom of the V-band, same type as at front, and remove the V-band clamp.
4. The rear cover which includes the attached escape tube with captive nut, P/N 2430-088, and the diaphragm seal, P/N 2430-089, may now be removed.
5. Inspect the diaphragm seal and replace it if it is not soft and pliable or shows signs of surface cracks.
6. Replace the coolant if it is contaminated, i.e., is not a clear light yellow color.

The expansion tank is vented through the breather plug, P/N 2450-094. The unit unscrews from a socket on top of the tank, but is not itself subject to disassembly. The shipping plug is sealed by compression of an O-Ring, P/N 5-504, which should be included when replacing the breather plug.

**RF Load
Resistor
Assembly**

CAUTION

Do not leave out the O-Ring seal, P/N 5-504 when interchanging the vent and shipping plugs.

1. Replace the vent plug, P/N 2450-094, with the shipping plug, P/N 2450-049, in the fill hole of the expansion tank to prevent coolant loss.
2. Stand the unit on its back end, i.e., vertically with the RF connector up. Brace the unit in this position to prevent it from tipping over.
3. Loosen the 10-32 x 1-1/2 inch screw on the clamping band until the band is free and then remove the band.
4. Grasp the RF connector and slowly lift the load resistor assembly out of the radiator tank to allow the excess coolant to drip back in.
5. Before replacing the load assembly (Model 8251, P/N 8890-050; Model 8252, P/N 8891-050) check the O-Ring seal to be sure it is properly placed and is in good condition. It should be free of twists and positioned evenly around the beveled flange of the resistor housing. Furthermore, it should still be soft and pliable and not hard or showing signs of surface cracks.

**Radiator
Handle**

The radiator handle slides on and is held in place by the two retaining studs that are riveted to the fins. It may be removed or replaced as follows:

1. With a large screwdriver, the blade covered with a rag, or with a suitable wooden stick, gently pry apart the fins next to each stud just enough to clear the handle thickness.
2. With the fins pried apart sufficiently, slide each leg of the handle off its respective stud.

Assembly

- RF Connector** To install a new connector, reverse the disassembly procedure. 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.
- Diaphragm and Coolant Oil** To reassemble, reverse the disassembly procedure.
- RF Load Resistor Assembly** To reassemble, reverse the disassembly procedure.
- Radiator Handle** To reassemble, reverse the disassembly procedure.

Preparation for Shipment

It is not necessary to remove the coolant to ship these loads. Simply replace the vent plug with the shipping plug attached to the bead chain. Be sure the O-Ring seal is mounted on the plug to avoid leakage.

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).

Storage

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.

Replacement Parts List

| Qty. Req'd. | Description | Part Number |
|-------------------------|-------------------------------------|-------------|
| 1 | RF Section Assembly | |
| | Model 8251/8255 | 8890-050 |
| | Model 8252 | 8891-050 |
| 1 | Radiator Assembly | |
| | Model 8251 | 2430-123 |
| | Model 8252 | 2430-146 |
| | Model 8255 | 2430-153 |
| 1 | Diaphragm Cover Guard | |
| | Model 8251 | 2430-078 |
| | Model 8252 | 2430-078-1 |
| | Model 8255 | 2430-078-2 |
| 1.1 gals (4.1 liter) | Coolant Oil - Dielectric | |
| | 1 pint container | 5-1070-1 |
| | 1 gallon container | 5-1070-2 |
| | 5 gallon container | 5-1070-3 |
| 1 | "QC" Connector for Models 8251/8255 | *See Below |
| 1 | Diaphragm Seal | 2430-089 |
| 1 | Diaphragm Cover | 2430-088 |
| 2 | Clamp Band Assembly | 2430-055 |
| 1 | RF Section O-Ring Seal | 5-230 |
| 1 | Radiator Handle | 2430-028 |
| 1 | Vent plug | 2450-094 |
| 1 | Shipping Plug | 2450-049 |
| 1 | Chain Assembly | 8180-094 |
| 2 | Vent and Shipping Plug O-Ring | 5-504 |
| 1 | Expansion Tank, part of Radiator | 2430-080 |

***Available QC Type Connectors**

| | | | |
|---------------------|----------|-------------------|----------|
| N-Female | 4240-062 | LT-Female | 4240-018 |
| N-Male | 4340-063 | LT-Male | 4240-012 |
| HN-Female | 4240-268 | C-Female | 4240-100 |
| HN-Male | 4240-278 | C-Male | 4240-110 |
| LC-Female | 4240-031 | 7/8" EIA Air Line | 4240-002 |
| LC-Male | 4240-025 | | |
| UHF-Female (SO-239) | 4240-050 | | |
| UHF-Male (PL-259) | 4240-179 | | |

