OPERATING INSTRUCTIONS

TERMALINE® LOAD RESISTOR
MODELS 8755 & 8756

Electronic Corporation
Cleveland (Solon) Ohio USA

Instruction Book Part Number 920-5755/56 Revision A

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 throughly 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 make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

Shock Hazard

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

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

Safety Earth Ground

An uninteruptible 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.

Resuscitation

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

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

☞ 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

Never attempt to connect or disconnect an RF cable while power is on at the RF power source. Radiated RF energy is a potential health hazard.

WARNING

The resistor used in this load consists of a resistive film on a special substrate. If the substrate is broken, there will probably be sharp pieces or splinters inside the load housing. Be careful to avoid possible injury.

Caution Statements

The following safety caution appears in the text where the equipment is in danger of damage, and is repeated here for emphasis.

CAUTION

Do not disconnect the water flow switch leads from the control assembly. Any operation of the load without a properly functioning cooling system will cause almost immediate destruction of the resistive element.

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 HACERIO.

WARTUNG

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

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

ENTRENTIEN

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 EFFETTUARRE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

CONNECT INTERLOCK TO TRANSMITTER BEFORE OPERATING.

BRANCHER LE VERROUILLAGE À L'ÉMETTEUR AVANT EMPLOI.

CONECTE EL INTERBLOQUEO AL TRANSMISOR ANTES DE LA OPERACION.

VOR INBETRIEBNAHME VERRIEGELUNG AM SENDER ANSCHLIESSEN.

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

About This Manual

This instruction book covers the models 8755 and 8756 Termaline Coaxial Load 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. At the beginning of each chapter, a general overview describes the contents of that chapter.

Operation

First time operators should read Chapter 1 - Introduction, Chapter 2 - Theory of Operation, and Chapter 3 - Installation, 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 preventative maintenance found in Chapter 5 - Maintenance. If a failure should occur, the troubleshooting section will aid in isolating and repairing the failures.

Parts

For location of major assemblies or parts, refer to the parts list and associated drawings in Chapter 5.

Changes To This Manual

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

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Chapter 1

Introduction

The Model 8755/56 Termaline Load Resistor is designed as a compact, low-reflection, and non-radiating termination for RF transmission lines. Cooled by internal water flow, it generates almost no surface heat, making installation space minimal and convenient. The load can safely dissipate up to 30 kilowatts of continuous power when used in a 50 ohm coaxial transmission line system.

Purpose and Function

Each model uses a 3-1/8 inch connector (refer to the Specifications for individual models) and will maintain a VSWR of less than 1.1 to 1.0 from 1000 Hz up to 900 MHz. This load is intended for use on CW, AM, FM, SSB, and TV modulation envelopes, and within certain limitation on radar or pulse modes. Information on applications involving pulse-type signals should be obtained directly from Bird Electronic Corporation.

The Model 8755 and 8756 equipment consists of:

- Load resistor
- Instruction Manual

Refer to figure 1 for identification of the load.

Optional Equipment

An accessory protective Control System is available as optional equipment. When properly installed, this system protects the load by shutting off the RF power when water flow is too low or interrupted. Discussions of the flow control pertaining to Installation and Maintenance should be ignored when not applicable. The Models 8755 and 8756 Termaline Load Resistor has the feature of field replacement of the resistor, described in Chapter 5, Maintenance.

Direct Power Measurement

When used in conjunction with a Bird Model 4600A or 4805A Thruline Wattmeter, these load resistors may be used for direct reading power measurements up to 30 kilowatts.

Specifications

Power Rating	30,000 Watts
Impedance	50 ohms
Input Connectors	
Model 8755	3-1/8” EIA flanged (50 ohm)
Model 8756	3-1/8” unflanged (50 ohm) flush center conductor
Frequency Range	1000 Hz to 900 MHz
VSWR	1.10 max. 1000 Hz to 900 MHz
Modes	CW, AM, FM, SSB, TV, and certain pulse types
Input Water Temperature Range	5°C to 60°C (41°F to 140°F)
AC Power Required	115 V 50/60 Hz or 230 V 50 Hz (with optional items only)
Minimum Water Flow Rate	7 GPM (26.5 1pm) at 5°C (41°F) 9 GPM (34.0 1pm) at 60°C (140°F)
Water Connections	3/4” standard hose thread
Cooling Water	Potable* Water
Weight	
Model 8755	15 lb 13 oz (7.2 kg)
Model 8756	15 lb 5 oz (6.9 kg)
Dimensions	
Overall Length	19-1/2” (495 mm)
Housing Diameter	3-1/2” (89 mm)
Maximum Diameter (Input Flange)	5-3/16” (132 mm)
Housing Material	Aluminum alloy and brass
Operating Position	Any
Finish	Lusterless Black Enamel

*Potable Water: Standards for potable water have been established by the U.S. Public Health Service at a maximum of 500 ppm of total dissolved solids (ppm - parts per million or 1 mg per liter). Hardness of water (content of calcium and magnesium salts) should be less than 75 ppm. If the quality of the available water supply is doubtful or the mineral content is questionable, use distilled water.

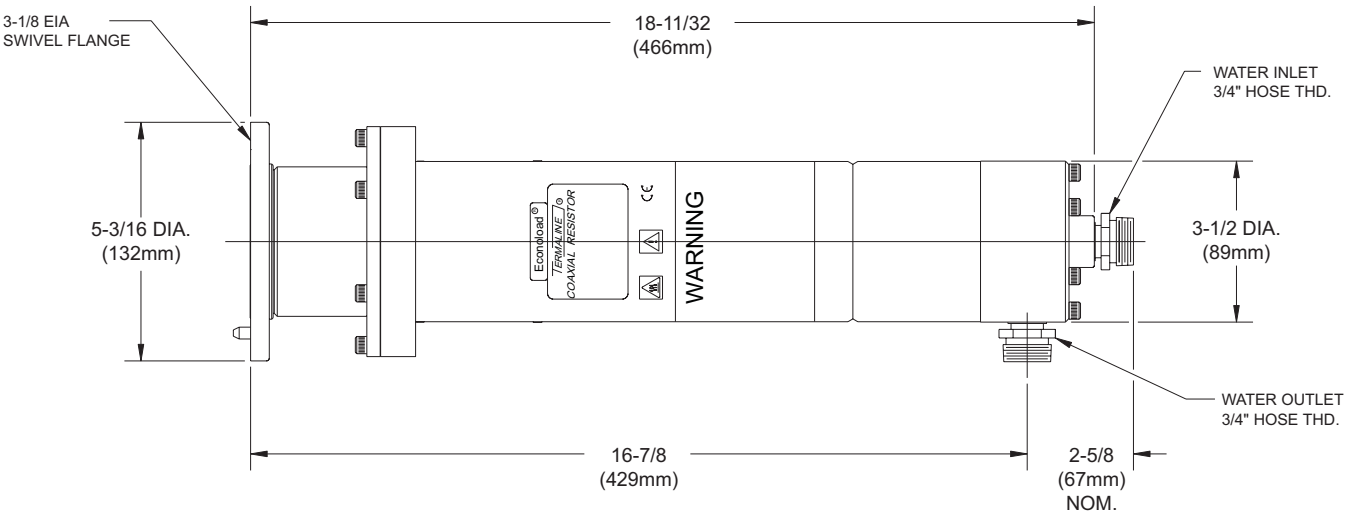


Figure 1
Model 8755 Outline Drawing

Chapter 2

Theory of Operation

General

This load resistor utilizes an external water supply for the direct cooling of the resistor element. By using this technique, the need for an intermediate dielectric fluid to transfer the heat generated in the resistor element has been eliminated, reducing the physical size of the load to a virtual minimum. This simplified system allows the use of the loads in more varied environments, and attachment in any orientation.

Heat Transfer

The 50 ohm resistor consists of a high temperature substrate tube with a deposited resistive film. The heat generated by absorption of RF power is transferred from the heated film to the water flowing over it, through a restricted chamber surrounding the resistor body. This water, first diverted to the front of the load resistor by a special inside tube, passes over the entire length of the resistor and is discharged through the sealed water chamber at the rear. The dielectric characteristics and distinctive design of these enclosures provide a very accurate 50 ohm termination over the specified frequency range of this load (1000 Hz to 900 MHz).

The absence of intermediate cooling fluids considerably simplifies the construction and sealing of this unit. It can be readily disassembled in the field for resistor element replacement (see Chapter 5 - Maintenance).

Because there is practically no heat transfer to the outer housing of the load, the housing remains at a cool ambient temperature even under full power conditions. Virtually all of the power input to the load is transformed into heat which is carried away by the cooling water. Therefore, the differential in output and input temperatures of the water, times the amount of flow, constitutes an accurate gage of the power consumed by the load. The amount of this power dissipation may be calculated from the following formula:

$$P = 0.263 (T1 - T2) GPM$$

Where:
P = Power in kilowatts
T1 = Outlet water temperature in °C
T2 = Inlet water temperature in °C
GPM = Water flow in gallons per minute

In °F the formula is: $P = 0.146 (T1 - T2) GPM$

Where:
P = Power in kilowatts
T1 = Outlet water temperature in °F
T2 = Inlet water temperature in °F
GPM = Water flow in gallons per minute

Cooling Water

The electrical performance of these RF loads is affected by impurities or other chemical additives in the cooling water. The presence of salts in the water definitely makes the device unusable because salts cause a rapid increase in VSWR. Therefore, sea water or silty water should not be used for cooling the loads.

The thermal performance of these loads is also affected by impurities, particularly those impurities that accumulate in the form of scale on the exposed surfaces of the fluid paths of the load assembly. These deposits may result in an increase in the thermal and/or fluid resistance(s) of the load and may in turn cause the load to overheat and fail.

The following types of water are considered safe for the cooling of the Models 8755 & 8756 Load Resistor: filtered, city, or soft water. In general, any potable water is suitable for cooling the load.

Flow Interlock Control Circuit

The interlock control circuit provides instantaneous fail-safe protection of the transmitter and load in the event of even a momentary interruption of the cooling water supply. This protection is necessary because dissipation of the heat generated by the RF power absorption is critically dependent upon maintaining the required minimum water flow rate regardless of inlet water temperature.

The water flow switch, attached to the water inlet of the load, is factory calibrated to open the electrical contacts whenever the water flow drops below six gallons per minute and close when the water flow exceeds this value. When the water flow switch contacts open, the time delay relay switch is deactivated, which in turn opens the interlock switch, causing immediate shutdown of the transmitter or other signal source. The time delay relay also keeps the interlock switch open for a preset interval of 12 ±2 seconds after the minimum flow of six gallons per minute has been re-established. This safeguarding feature assures proper operation of the cooling system before RF power can be applied to the load, preventing damage or burnout of the resistor element.

Load Resistor Connection

The compact design of the Models 8755/56 Termaline Load Resistor enables it to be installed in very small spaces. It requires no ventilation and may be placed at any attitude. Do not install it where the load may be subjected to severe vibration or to physical shock.

The load is ready for connection as received from the factory. It is useful to first check the 50 ohm input resistance of the load and record this data before attachment (Chapter 5 - Maintenance). Use the following procedure for RF attachment.

1. Clean all conductor and insulator surfaces on the transmission line face and, likewise, the RF input connector. Use a dry cleaning solvent that does not leave a residue on the connector.

2. Attach the load resistor to the RF line, but do not tighten the bolt and nut sets. Use connector kits for respective models as follows:

   A. Models 8755 - 3-1/8 inch EIA flanged, 50 ohm: Use a 3-1/8 inch EIA coupling kit (Bird P/N 4600-020) which includes six 3/8-16 x 1-1/2 inch bolt and nut sets, O-Ring, and anchor bullet (center conductor).

   B. Models 8756 - 3-1/8 inch unflanged, 50 ohm flush center conductor. Use Bird coupling kit P/N 5-726 (RCA MI-27791K-4A) consisting of an outer sleeve with two clamping bands and the center conductor coupling bullet.

3. Rotate the load so that the warning label shows and the outlet water tube is placed to the best advantage. Now tighten the RF connection by securing the clamps or bolt sets firmly and evenly.

☞ NOTE: Do not disturb the socket head cap screws that join the connector section to the main housing.

Water Line Attachment

The RF Load comes supplied with standard 3/4 inch hose fittings for attaching the water supply and drain lines. The water INLET, at the back on center and water OUTLET, adjacent at 90° to the inlet, mate with 3/4 inch water hose connectors. If the unit is supplied with the optional control system, the water flow switch is installed on the water inlet line. See paragraph Flow Switch (Optional) for alternate field installation. To connect to a rigid piping connection, replace the water inlet and outlet hose adapters, Bird P/N 5-065-2, with ½ inch male pipe or pipe fittings. Take special care when connecting the water lines. The inside of the load is designed so that the water flows properly in only one direction - from the inlet to the outlet. The water flow must be kept in the proper direction - opposite flow will cause resistor failure when power is applied.

Cooling Water Quality

Water quality is important. Refer to Chapter 2, Cooling Water for an explanation and description. In general, any potable water is satisfactory. This would include purified, filtered, city supply, or soft water.

Flow Switch (Optional)

The ports of the flow switch are 3/4 inch NPT Female. The direction of flow is marked on the casting of the flow tube and on the operating head. Observe carefully- opposite connection will restrict the water flow and cause load failure. The flow switch may be connected to the inlet or the outlet side of the load, preferably as close to the load as possible. Just be certain the flow through the switch is in the correct direction. Connect with a ½ inch NPT Nipple and a ½ to 3/4 inch bushing, Bird P/N 5-489-1 and

5-490-1, or connect by hose or pipes. In either case, the flow switch should not be over 20 feet from the load. Alternatively, attach hose to switch with a 3/4 inch hose nipple, Bird P/N 5-903.

Do not connect flow switch leads at this time. First turn on the water flow and check the system for leaks and proper operation.

Control Box (Optional Item)

The wiring center and remaining elements of the control system are contained in the control box. This includes a terminal strip and three BX cable clamps for the input connections, a pilot lamp, and a delay timer. Only wiring material is needed for connecting the flow switch to the control box. The control unit operates on 115 Vac, P/N 8750-101-1, or on 230 Vac, P/N 8750-101-2, depending on the unit ordered to suit requirements.

The pilot lamp on top of the box is a safe operation indicator; it lights only when ac power is on and an adequate water supply is flowing. After the pilot lamp lights up, a 12 ±2 second time delay allows sufficient time for the water flow to stabilize before closing the transmitter interlock.

The control box is mounted by means of four 1/4 inch holes on a 5 x 5 inch square in the back. Locate the box for the best view of the pilot light and for easy attachment of the B'S cable and wiring. Connect the leads for each voltage as shown on the wiring schematic inside the control box.

☞ NOTE - These connections are critical - wire carefully.

Pre-Operational Checkout

Before attempting to operate the RF load, whether under test or actual operating conditions, TEST the complete water system and INTERLOCK CONTROL as follows:

1. Make sure the ac and transmitter interlock power are OFF.
2. Connect an ohmmeter across terminals six and seven (interlock).
3. Turn the ac power on.
4. Turn the water supply on and note when the water flow switch operates (audible click).
5. In not less than 10 seconds (12 ±2) the ohmmeter should signify a closed condition across terminals six and seven, indicating operation of the time delay switch.
6. Water flow from the OUTLET connection of the load must be not less than that given for the respective models in Table 1 - Requisite Flow Rates, Chapter 4.

☞ NOTE - As a precautionary measure, it is recommended that the pre-operational checkout be performed each time the load is put into service.

Chapter 4

Operation

General

CAUTION

DO NOT disconnect the water flow switch leads from the control assembly. Any operation of the load without a properly functioning cooling system will cause almost immediate destruction of the resistor element.

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.

The Models 8755/56 Termaline Load Resistors do not have any operating controls. Therefore, the presence of operating personnel is not required when in use. Proper operation of the equipment is assured if the instructions contained in Chapter 3, Installation are followed exactly.

Do not apply more than the rated RF power to the load. The water flow rates and inlet water temperature, +5°C to 60°C (+41°F to +140°F), must be as specified in the following table.

Table 1 Requisite Flow Rates

Power	Min. Flow		Temperature	
Kilowatts	(GPM)	(LPM)	(°C)	(°F)
20	6	22.7	5	41
	8	30.3	60	140
30	7	26.5	5	41
	9	34.0	60	140

In actuality, an adequate and uninterrupted flow of water is more critical than the actual water temperature.

Operation As A Load Resistor

1. Turn on the ac power (if the load is equipped with an interlock system).
2. Turn on the water supply.
3. Check for proper interlock operation.
4. Check that all coaxial power line connections are properly tightened.
5. Apply RF power to the load and proceed according to instructions pertaining to the specific transmitting equipment.

Operation As An RF Wattmeter

The RF load can be combined with a Bird Rigid Line Series Thruline Wattmeter to form an absorption-type wattmeter by inserting the wattmeter line section just ahead of the RF load. Installation and operation of the wattmeter is covered in the Thruline Wattmeter Instruction Book.

☞ NOTE - Select a wattmeter type appropriate to the input connector of the load resistor. Consult the Bird Catalog or contact the Company.

Basic operation is as follows:

1. Carry through the same functions as stated in paragraph Operation as a Load Resistor.
2. Rotate the element in the line section element socket to monitor incident or reflected power. Measurement is taken in the direction indicated by the arrow on the element.

Shutdown Procedure

1. Turn off the RF power to the load.
2. Wait at least one minute to allow the resistor substrate time to cool.
3. Turn the interlock and ac power off.
4. Turn off the water supply — *always* do this last.

Chapter 5

Maintenance

General

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

The Models 8755/56 Termaline Load Resistors are rugged and simple, requiring only nominal and routine attention. The load is designed to operate satisfactorily for long periods of time if care is taken not to exceed its power handling capabilities.

Troubleshooting

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

Table 2 Troubleshooting

Problem	Possible Cause	Correction
Coolant oil leak around clamping band or radiator	Clamping bands not tight	Tighten slightly with screwdriver
	Faulty O-Ring (front)	Replace O-Ring
	Faulty diaphragm	Replace diaphragm
Overheating of the radiator	Transmitter power too high	Reduce transmitter power
	Coolant oil level too low	Add more coolant oil to radiator
	Accumulation of dirt on cooling fins	Clean cooling fins
	Faulty RF section assembly, check dc resistance	Replace if needed
High or low dc resistance values	Loose or faulty RF connector	Tighten or replace as needed
	Faulty RF section assembly	Replace if needed

Cleaning

Outside Surface

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 leaves no residue to clean the hard to reach internal portions.

☞ NOTE - Always handle the load with care to prevent subjecting it to unnecessary shock or impact.

Inspection

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

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

Preventative 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.

RF Load Resistor

Preparation:

- Tools: Common hand tools
- Ohmmeter with an accuracy of ± 1% at 50 ohms.
- Use low resistance leads, preferably a short piece of 50 ohm coaxial cable fitted with alligator clips.
- Temperature of the load between 20°C to 25°C (68°F to 77°F)

Accurate measurement of the dc resistance between the inner and outer conductors of the RF input connector will provide a good check of the condition of the load resistor. Checking the dc resistance is simply used to measure a change in the condition of the resistor over time. The tracking of the dc resistance must start *before* the resistor is first put into service. Perform the following steps and record the value for future comparison. Check and record the resistance of the load periodically according to use.

> 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.

Checking the DC Resistance

Measure the dc resistance.

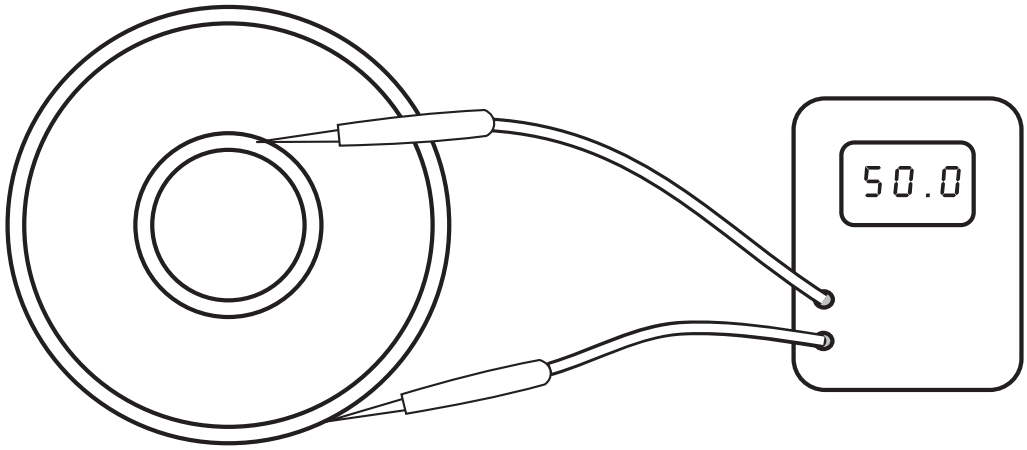
1. Turn off the RF power and interlock circuitry before any electrical disconnections are made.
2. Disconnect the RF coaxial line.
3. Connect the multimeter test leads across the center and outer conductor of the load resistor. Refer to figure 2 for placement of the leads.
4. Record the value of the resistance *before* the load is put into service. Compare subsequent values with the latest reading. If the values vary more than 2 ohms this could be an indication of a failing resistive element.

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

☞ NOTE - It is recommended that this resistance check be performed each time the load is to be used.

Figure 2

DC Resistance Lead Placement



Replacement Procedure for Resistive Element

This series of water-cooled loads is designed to be quickly and easily repaired in the field. If in performing the dc resistance check described previously. A significant change in resistance is noted, or if for any reason the resistive element should fail, inexpensive replacement resistors are available. They can be installed in the load, using the following procedures:

Resistor Removal

☞ NOTE - Item numbers enclosed in brackets [ ] in the text are so indicated on figures 3 and 4.

1. Be sure the water flow has been turned off before any disconnection. If the load is not already removed from the system, disconnect the water hoses at the hose fittings [5] on the load and disconnect the unit from the RF transmission line.

2. Set the load on end, with the water connections up. Using a 3/16 Allen wrench, unscrew the six 1/4-20 x 2-1/2 inch socket head cap screws [6] holding the water chamber [3] to the main load housing. When all screws are loose, pull the water chamber assembly (with screws) straight off. It may be necessary to rock the chamber gently while carefully pulling it off.

3. The inner flow tube [9] will usually come out with the water chamber assembly, being held to it by the compression of the inner O-Ring [4] (water input) seal. This is normal, and if the resistor body is unbroken, there will be no need to remove the inner flow tube from the water chamber assembly. The ground cap assembly [10] is fitted tightly within the water chamber and should normally remain with it. If the inner flow tube has stayed in the resistor section, simply grasp the resistor stop sleeve [7] on the flow tube and pull out the assembly. NOTE - This includes the cushioning O-Ring [8] which fits loosely below the stop sleeve - be careful not to lose it by letting it fall off. Also, if the brass stop sleeve [7] is removed at all, notice that it has a small escape hole at the side and an access counterbore leading to it. In reassembly, be sure this counterbore is facing toward the O-Ring and the resistor [1]. This is essential for internal water venting.

☞ Note: The water outlet holes and also the small shoulder at the base of the inner flow tube. At reassembly, this must fit into a mating recess in the input fitting at the bottom.

4. If the resistor [1] is intact, it may be easily pulled straight out of the load housing, and is ready for replacement. The outer flow tube is captive, and will not come out of the housing at this stage.

Figure 3

Resistor Removal (Exploded View)

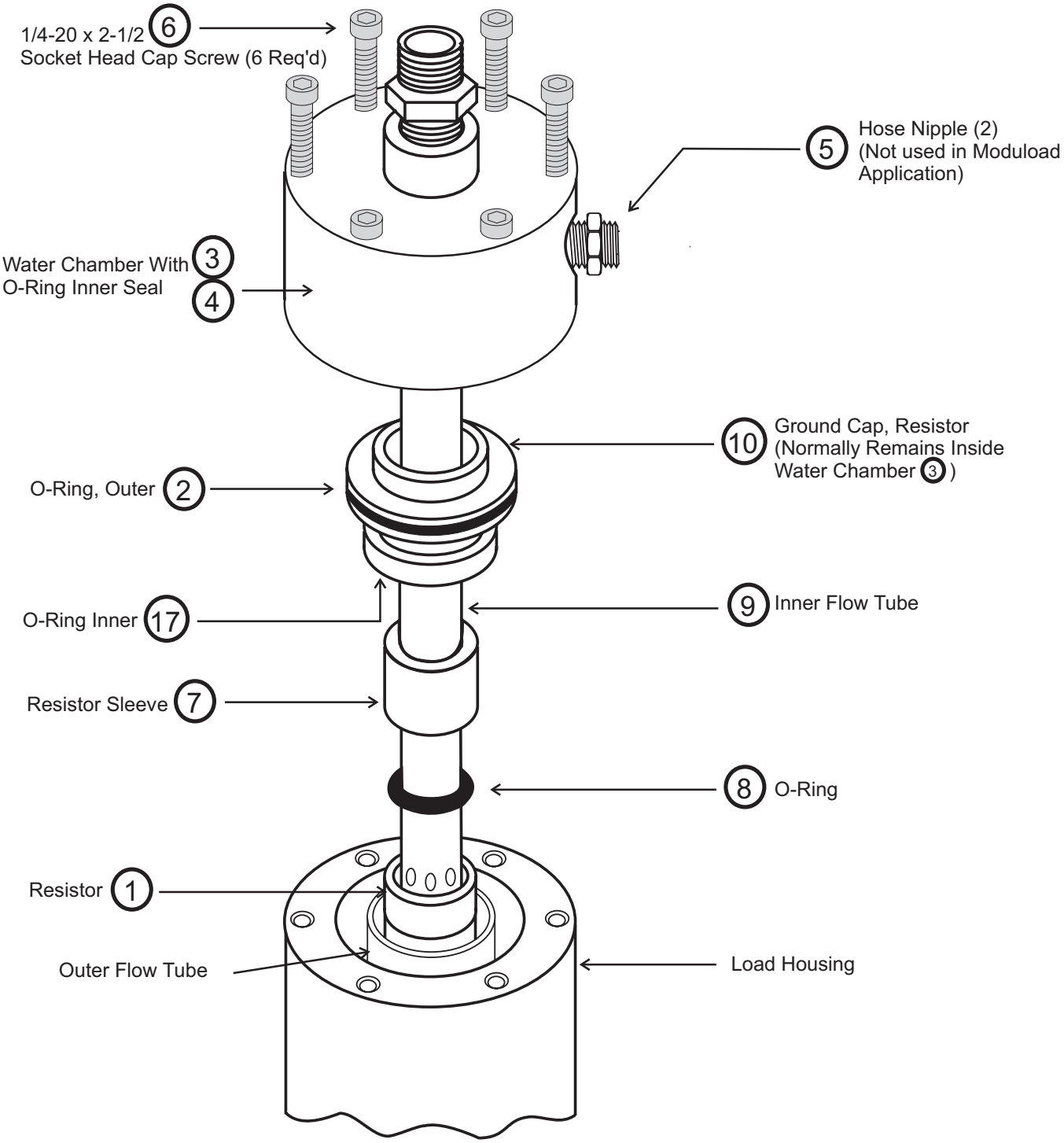
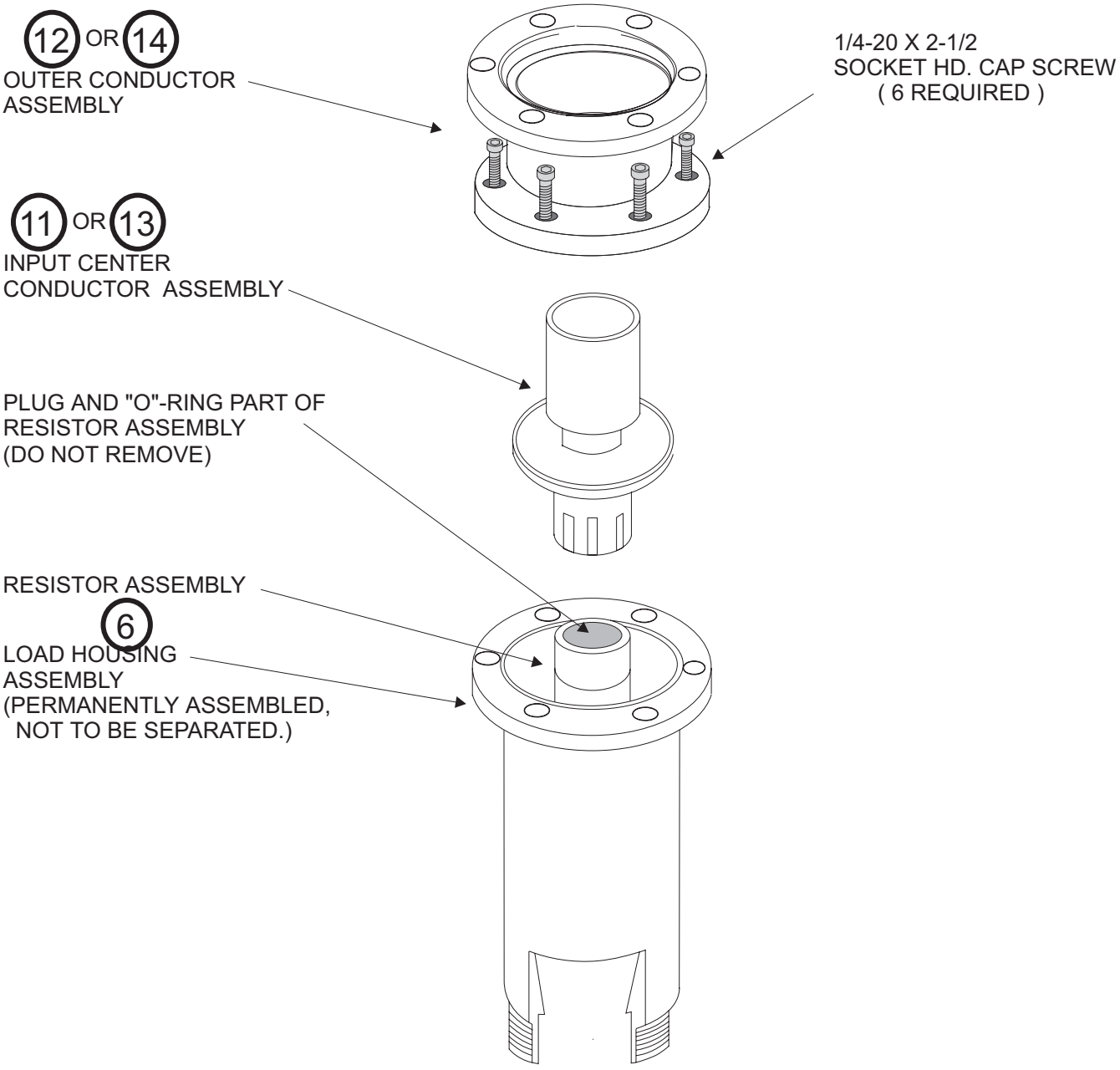


Figure 4

RF Input Assembly (Exploded View)



Inspection

At this point, if the resistor has been successfully removed intact, inspect it carefully to be sure that it is not fractured. In the majority of cases, even in the event of resistor burnout, the resistor substrate will remain intact. Next, examine the inside of the load housing assembly for any apparent damage to the internal parts. If no damage is found, proceed with resistor replacement. If, however, the resistor is broken, other internal parts appear to be damaged, or if they do not fit together properly, continue with Replacement Procedure for Fractured Resistors.

Resistor Replacement

1. Examine the inside of the load housing assembly for any apparent damage to the internal parts.

2. Insert the new resistor [1] into the load housing until it reaches its fitting. Push in the resistor until it bottoms snugly. If the resistor seems to be loose, refer to the procedure for the replacement of fractured resistors for instructions on how to tighten the resistor fitting.

3. Place the inner flow tube [9] inside the resistor and lower it until it reaches the resistor fitting. Gently work and twist the inner flow tube until it seats in the bottom of the input resistor fitting. (This operation may also be done if the inner flow tube is still in position in the water chamber).

4. Make sure that the O-Ring [8] cushion is placed on the inner flow tube next to the resistor and the backup resistor sleeve [7] is right behind it. Watch the orientation of the sleeve per the Resistor Removal section, step 3 . (There is no need to disturb the resistor cap assembly [10] in the water chamber for this procedure).

5. Replace the water chamber [3], gently rocking and twisting the chamber to achieve the proper flat seat on the outer housing.

☞ NOTE - If the water chamber [3] does not seem to fit properly, refer back to Resistor Removal, step 3, to see that the inner flow tube is properly in place.

6. Then tighten the six 1/4-20 x 2-1/2 inch socket head cap screws [6]. Check the dc resistance between the inner and outer conductors; it should be approximately 50 ohms (refer to the RF Load Resistor paragraph). Then connect the load to a water source and check for leaks. If none appear, the load is ready for service.

WARNING

The resistor used in this load consists of a resistive film on a special substrate. If the substrate is broken, there will probably be sharp pieces or splinters inside the load housing. Caution should be exercised to avoid possible injury.

Replacement Procedure for Fractured Resistors

Resistor Removal

1. The load should already be disassembled to the point of Resistor Removal, step 4. Turn the load on end, with the RF input connector up to allow any loose pieces of resistor to fall out of the load housing.

2. Using a 3/16 inch hex wrench, loosen and remove the six 1/4-20 x 1-1/2 inch socket head cap screws [16] from the flanged end of the load housing (figure 4). The outer conductor assembly [12] or [14] may now be easily removed.

3. Next remove the input center conductor assembly [11] or [13] (figure 4), by pulling it out of the load housing, and then carefully remove any remaining pieces of the resistor. Normally, at this disassembly, the outer flow tube will remain with the load housing. Restore it to this position after inspection and cleaning if it should come out. Inspect the inside of the load housing for any apparent damage.

4. Also, if it is in place in the water chamber, pull out the inner flow tube. Inspect carefully for broken pieces. Then grasp the projecting hub of the resistor cap assembly [10] firmly with your fingers and pull straight off with a strong even force.

5. Thoroughly wash all the inside portions of the three assemblies under clear running water; i.e., input section, load housing, and water chamber. Reinstall the resistor cap assembly in the water chamber at this time, pushing in firmly to bottom.

Resistor Replacement

1. Insert replacement resistor [1] into the resistor fitting of the input center conductor assembly to test its tightness. The resistor should not have to be forced into the fitting, but it should be quite snug.

2. If the resistor is loose in the fitting, press the slotted finger contacts of the fitting together slightly and try the resistor again. Continue closing the ends of the resistor fitting until a snug fit is obtained. Then bottom the resistor in the fitting.

3. With the resistor still in place in the resistor fitting, insert the resistor and the input center conductor assembly into the load housing (figure 4), reversing procedure Resistor Removal, step 3. Then reinstall the outer conductor assembly and the six 1/4-20 x 1-1/2 inch socket head cap screws [16], and tighten.

4. Stand the load on end with the RF input connector down, and place the inner flow tube inside the resistor and lower it until it reaches the resistor fitting. Gently move and twist the inner flow tube until it seats in the bottom of the resistor fitting.

5. Continue same procedure as given in Resistor Removal, step 3.

Front Connector Assembly

This portion of the load unit consists of the inner conductor [11] or [13] and the outer conductor [12] or [14], respectively. They may be released by removing the six screws [16] at the front of the housing flange, Replacement for Fractured Resistor, Resistor Removal, step 2. When the inner conductor has been pulled out, the O-Ring [15] seal (to the outer water flow tube) may be changed. Do not attempt further disassembly of this part. Return to the factory for repair, if necessary; consult the company.

☞ NOTE - Procurement and use of the accessory protective control system (comprising the water flow switch and control box) is optional. Consider the instructions and replaceable parts described in Front Connector Assembly, Water Flow Switch and Time Delay only when applicable.

Water Flow Switch

The water flow switch should be checked and cleaned of any accumulated dirt or scale that might impede free movement of the control gate in the switch. This should be done after several months use, or sooner if indicated by erratic operation. This component is not repairable and if found defective, it must be replaced. For replacement, proceed as follows:

1. Make certain the RF power, ac line power, and the transmitter interlock supply are turned off.
2. Disconnect the leads at the water flow switch.
3. Remove the defective switch from the plumbing and install the new unit.
4. Reconnect the flow switch leads.
5. Perform the pre-operational checkout in Chapter 1.

Time Delay Relay

The relay cartridge, P/N 5-1664 or 5-1665, in the control box cannot be disassembled or repaired in the field. A faulty unit should be replaced using the following procedure:

1. Be sure RF power, ac line power, and the transmitter interlock supply are off.
2. Open the door of the control box by turning the slotted screw head one-quarter turn.
3. Loosen the 8-32 pan head screw at the top of the relay clamp, P/N 8630-193, then press its legs in slightly to release the retaining prongs of clamp.
4. Pull the delay relay cartridge straight out of the socket.
5. To replace the relay, reverse the procedure above. The socket is an ordinary octal type. When inserting the relay, rotate the cartridge carefully to align the center post nub in the socket.
6. The prongs of the clamp should match the side slots in the socket holder. Fit the clamp into the slots and turn the head of the screw until snug.
7. Close the control box door and reconnect interlocks and the ac power line by reversing the procedure in the Time Delay Relay paragraph, stes 1 and 2.
8. Perform the pre-operational checkout in Chapter 1.

Pilot Light

The pilot light lamp, P/N 5-970-1 or -2, may be reached simply by unscrewing the lens of the indicator light, P/N 8750-106, on the topside of the control box. The bulb is a bayonet type and is easily removed by pushing down gently, and slightly twisting counterclockwise. Reverse this procedure to install a new lamp.

A list of replaceable parts is included in Chapter 5, Maintenance.

Repairs

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.

Customer Service

Any maintenance or service procedure beyond scope of those provided in this section should be referred to a qualified service center. Bird Electronic Corporation maintains complete repair and calibration facilities at the following addresses:

Service Group

U.S.A. Sales and Manufacturing
Bird Electronic Corporation
30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794
Phone: (440) 248-1200
Fax: (440) 248-5426

Sales Offices
For the location of the sales office nearest you, give us a call or visit our Web site at:

http://www.bird-electronic.com

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 +40°C (-40°F to +113°F) working range of the loads.

Shipment

Wrap and secure the RF connector with tape to keep out foreign material during shipment. Pack and brace the load in a shipping container; a corrugated paper box should suffice.

Replacement Parts List

Models 8755/56

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	Resistor	8755-027-3
2	1	Water chamber seal O-Ring	8410-009
	(1)	Water chamber assembly (includes items 3,4, and 5)	8755-008
3	1	Water chamber	8755-014
4	1	Inlet seal O-Ring	5-099
5	2	Hose nipple	5-065-2
6	1	1/4-20 x 2-1/2" stainless steel socket head cap screw	1121-2608-00
7	1	Resistor sleeve	8755-026
8	1	Sleeve backup O-Ring	8110-059
9	1	Inner flow tube	8755-025
10	1	Resistor ground cap	8755-005

Front Connector Parts — assigned per Model type

Model 8755 - 3-1/8" EIA connector - 50 ohms

11	1	Center conductor input assembly	8755-007
12	1	Outer conductor assembly	8755-004

Model 8756 - 3-1/8" Unflanged connector flush center conductor - 50 ohms

13	1	Center conductor input assembly	8756-003
14	-	Outer conductor assembly	8756-002

Both Models

15	1	Center conductor assembly O-Ring	5-1127
16	6	1/4-20 x 1-1/2" stainless steel socket head cap screw	1121-1808-00
	1	Inner resistor cap seal O-Ring	5-567

Optional Equipment

Control and Water Flow Parts - not shown on Figures

1	Water flow switch	5-898-2
1	Control assembly - 115 V	8750-101-1
	Control assembly - 230 V	8750-101-2
1	Relay retaining clamp	8630-193
1	Time delay relay - 115 V	5-1664
	Time delay relay - 230 V	5-1665
1	Indicator light	8750-106
1	Incandescent lamp - 115 V	5-970-1
	Incandescent lamp - 230V	5-970-2

Note - These items are part of the Control Assembly

1	Pipe nipple (flow switch)	5-489-1
1	Hex bushing (flow switch)	5-490-1

Accessory Connector Kits

Model 8755 Coupling Kit - 3-1/8" EIA Connector		4600-020
1	Anchor bullet	4600-021
1	O-Ring	4600-022
1	Mounting hardware	4600-023
Model 8756 Coupling Kit - 3-1/8" Unflanged Connector Flush - 50 ohms		5-726

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. 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.

DECLARATION OF CONFORMITY

Manufacturer: Bird Electronic Corporation
30303 Aurora Road
Cleveland, Ohio 44139-2794

Product: TERMALINE RF COAXIAL LOAD RESISTOR
Models: 8755 8756

The undersigned hereby declares, on behalf of Bird Electronic Corporation of Cleveland, Ohio, that the above-referenced product, to which this declaration relates, is in conformity with the provisions of the following standards;

1. European Standard EN 61010-1:1993 - Safety, Group II.

This standard is in accordance with Council Directive 73/23/EEC and 93/68/EEC.

The technical documentation file required by this directive is maintained at the corporate headquarters of Bird Electronic Corporation, 30303 Aurora Road, Cleveland, Ohio.

Ken DeVore
QA/Metrology Manager
Bird Electronic Corporation