
INSTRUCTION BOOK

**OPERATING INSTRUCTIONS
WITH ILLUSTRATED
PARTS LIST**

**TERMALINE® LOAD RESISTOR
MODELS 8792/8793**



Electronic Corporation

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MODELS COVERED IN THIS INSTRUCTION BOOK

8792

8793

8796

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 normal safety regulations. Do not attempt to replace parts or disconnect an RF transmission or any other high voltage line while power is applied. When working with high voltage always have someone present who is capable of rendering aid if necessary. Personnel working with or near high voltage should be familiar with modern methods of resuscitation.

DO NOT SERVICE OR ADJUST ALONE

Operating personnel must at all times observe normal safety regulations. Do not attempt to replace parts or disconnect an RF transmission or any other high voltage line while power is applied. When working with high voltage always have someone present who is capable of rendering aid if necessary. Personnel working with or near high voltage should be familiar with modern methods of resuscitation.

SAFETY EARTH GROUND

An earth uninterruptible 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.

SHOCK HAZARD

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

CHEMICAL HAZARD

Dry cleaning solvents used to clean parts may be potentially dangerous to your health. 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 SYMBOLS

WARNING

Warning: Warning notes call attention to a procedure, which if not correctly performed could result in personal injury.

CAUTION

Caution: Caution notes call attention to a procedure, which if not correctly performed could result in damage to the instrument.

The following safety warnings appear in the text where there is procedures, that if not carefully followed, could be detrimental to operating and maintenance personnel and are repeated here for emphasis.

WARNING

When using dry cleaning solvents, provide adequate ventilation and observe normal safety precautions. Many dry cleaning agents emit toxic fumes that could be harmful to your health, if inhaled. Avoid skin contact with harsh solvents, wear rubber gloves and protective clothing to avoid caustic or acid burns or other detrimental effects caused by absorption, of some solvents, through the skin.

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.

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.

WARNING

Ethylene glycol is a toxic material. Do not take internally. Avoid eye and skin contact. Inhaling the vapors may be irritating to the lungs. See Emergency First Aid Procedures at end of Section I.

The following equipment cautions appear in the text whenever a procedure, if not properly followed, could put the equipment in danger of damage and are 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 resistor element.

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SECTION I. INTRODUCTION

1.1. PURPOSE AND FUNCTION

WARNING

Ethylene glycol is a toxic material. Do not take internally. Avoid eye and skin contact. Inhaling the vapors may be irritating to the lungs. See Emergency First Aid Procedures at end of Section I.

The Models 8792/93 TERMALINE® Load Resistors are designed as compact, low-reflection, and non-radiating terminations for RF transmission lines. Cooled by internal water flow, they generate almost no surface heat, making installation space minimal and convenient. They can safely dissipate up to 80 kilowatts of continuous power when used in a 50 ohm coaxial transmission line system.

The Model 8796 is basically the same as the Model 8792 physically. However, electronically it was designed to be used with a closed coolant system with a 50 percent ethylene glycol and water solution. The power handling capabilities is limited to only 60 kilowatts of RF power.

Each model is designed for use with a standard connector of the types common to 6-1/8 inch coaxial lines, (see Specifications for individual models) and will maintain a VSWR of less than 1.15 to 1.0 from 1000 Hz up to 800 MHz. These loads are 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 Models 8792/93 equipment consists basically of a load resistor unit. 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 8792/93/96 TERMALINE® Load Resistors have the feature of field replacement of the resistive element, described in the Maintenance Section.

When used in conjunction with a Bird Model 4902 or 4905 THRULINE® Wattmeter, these load resistors may be used for direct reading power measurements up to 80 kilowatts.

1.2. EMERGENCY AND FIRST AID PROCEDURES FOR ETHYLENE GLYCOL

EYE CONTACT

Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids open. Get medical attention.

SKIN CONTACT

Flush skin with water. If irritation occurs, get medical attention.

INHALATION

Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention.

INGESTION

Do not give liquids if victim is unconscious or very drowsy. Otherwise, give no more than two glasses of water and induce vomiting by giving 30 cc (2 tablespoons) syrup of Ipecac. If Ipecac is unavailable, give two glasses of water and induce vomiting by touching finger to back of victim's throat. Keep victim's head below hips while vomiting. Get medical attention.

1.3. SPECIFICATIONS FOR MODELS 8792/93/96 TERMALINE® LOAD RESISTOR

Power Rating	
Models 8792/8793	80,000 watts
Model 8796	60,000 watts
RF Input Impedance	50 ohms
Input Connectors	
Model 8792/96	6-1/8" EIA flanged (50 ohm)
Model 8793	6-1/8" unflanged (50 ohm)
Frequency Range	1 kHz to 800 MHz
VSWR	1.15 max. 1000 Hz to 800 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	9 GPM (34 lpm) at 5°C (41°F) 12 GPM (45.4 lpm) at 60°C (140°F)
Water Connections	3/4" standard hose thread
Weight	
Model 8792/96	25 lb (11.3 kg)
Model 8793	24 lb 8 oz (11 kg)
Dimensions	
Overall Length (Model 8792/96)	35 1/8" (892 mm)
(Model 8793)	34 7/8" (886 mm)
Housing Diameter	3 1/2" (89 mm)
Maximum Diameter (Input Flange) 8792	8 1/8" (206.4 mm)
8793	6 1/8" (156 mm)
Housing Material	Aluminum alloy and brass
Operating Position	Any
Finish	Lusterless black enamel
RF Connector & Hose Nipples	Bright Nickel Plate

SECTION II. INSTALLATION

2.1. LOAD RESISTOR CONNECTION

WARNING

When using dry cleaning solvents, provide adequate ventilation and observe normal safety precautions. Many dry cleaning agents emit toxic fumes that could be harmful to your health, if inhaled. Avoid skin contact with harsh solvents, wear rubber gloves and protective clothing to avoid caustic or acid burns or other detrimental effects caused by absorption, of some solvents, through the skin.

The compact design of the Models 8792/93 TERMALINE® Load Resistors enable them to be installed in very small spaces. They require no ventilation and may be placed at any attitude. Do not install them where they 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 (see paragraph 5.2, Maintenance). Use the following procedure for RF attachment.

a. Clean all conductor and insulator surfaces on the transmission line face and, likewise, the RF input connector. Use alcohol, freon, or any acceptable dry cleaning solvent on a cloth or cotton swab stick.

b. 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:

1. Model 8792 - 6-1/8 inch EIA flanged, 50 ohm: Use a 6-1/8 inch EIA coupling kit, Bird P/N 4902-020, which includes 12 3/8-16 x 1-3/4 inch bolt and nut sets, O-Ring, and anchor bullet (center conductor).

2. Model 8793 - 6-1/8 inch unflanged, 50 ohm recessed center conductor. Use Bird coupling kit, P/N 5-1322 (Dialectric Communications P/N 4574-503), consisting

of an outer sleeve two with clamping bands and the center conductor coupling bullet.

c. 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.

2.2. 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 a 90 degree angle 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 2.4 for alternate field installation. To connect to rigid piping, replace the water inlet and outlet hose adapters, Bird P/N 5-065-2, with 1/2 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.

2.3. COOLING WATER QUALITY

Water quality is important. Refer to paragraph 3.3 for an explanation and description. In general, most potable water is satisfactory. This would include purified, filtered, city supply, or soft water.

2.4. 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 1/2 inch NPT Nipple and a 1/2 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.

2.5. 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 8750-115, or on 230 Vac, P/N 8750-230, 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, a 12 \pm 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 BX 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.

2.6. 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:

- a. Make sure the ac and transmitter interlock power are OFF.
- b. Connect an ohmmeter across terminals six and seven (interlock).

- c. Turn the ac power on.
- d. Turn the water supply on and note when the water flow switch operates (audible click).
- e. In not less than 10 seconds (12 \pm 2) the ohmmeter should signify a closed condition across terminals six and seven, indicating operation of the time delay switch.
- f. Water flow from the OUTLET connection of the load must be not less than that given in table 4-1.

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

SECTION III. THEORY OF OPERATION

3.1. GENERAL

This load resistor is unique in that it 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 the attachment in any orientation.

3.2. 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 800 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 Section V - 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:

$$P = 0.263 (T1 - T2) \text{ GPM}$$

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 Fahrenheit degrees the formula is:

$$P = 0.146 (T1 - T2) \text{ GPM}$$

3.3. COOLING WATER FOR MODELS 8792/93

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 coolant 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 8792/93 Load Resistor: filtered, city, or soft water. In general, any potable water is suitable for cooling the load.

3.4. FLOW INTERLOCK CONTROL CIRCUIT

The interlock control circuit provides instantaneous fail-safe protection of the transmitter and load in the event of even 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 nine 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 nine gallons per minute has been reestablished. 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 resistive element.

The control assembly also includes a large, torpedo-lens pilot light set on top of the box. As normally mounted, this red pilot lamp should be freely visible from nearly all front angles in the operating vicinity of the load unit control assembly. After proper installation, as described in Section I, this pilot lamp will serve as a visible indication that the RF load is ready to receive power if it is lit, or of trouble in the cooling water supply system if it is not lit.

SECTION IV. OPERATION INSTRUCTIONS

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

The Models 8792/93 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 Section II - 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 table 4-1.

4.2. OPERATION AS A LOAD RESISTOR

- a. Turn on the ac power (if the load is equipped with an interlock system).
- b. Turn on the water supply.
- c. Check for proper interlock operation.

d. Check that all coaxial power line connections are properly tightened.

e. Apply RF power to the load and proceed according to instructions pertaining to the specific transmitting equipment.

4.3. 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:

- a. Carry through the same functions as in paragraph 4.2, a - e.
- b. 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.

4.4. SHUTDOWN PROCEDURE

- a. Turn off the RF power to the load.
- b. Wait at least one minute to allow the resistor substrate time to cool.
- c. Turn the interlock and ac power off.
- d. Turn off the water supply; always do this last.

Table 4-1. Requisite Flow Rates

POWER KILOWATTS	MIN. FLOW (GPM) (LPM)	@	WATER TEMP (°C) (°F)	
80 MAX	9 34		5 41	MIN
	INCREASE TO		TEMP RISE	
	12 45.4		60 140	MAX

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

SECTION V. MAINTENANCE

5.1. GENERAL

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.

WARNING

When using dry cleaning solvents, provide adequate ventilation and observe normal safety precautions. Many dry cleaning agents emit toxic fumes that could be harmful to your health, if inhaled. Avoid skin contact with harsh solvents, wear rubber gloves and protective clothing to avoid caustic or acid burns or other detrimental effects caused by absorption, of some solvents, through the skin.

The Models 8792/93 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.

The outside surface of the unit should be wiped free of dust and dirt at regular intervals. Disconnect the load from the transmission line and clean the RF input connector, both metallic and insulator surfaces, with freon, alcohol, or any acceptable dry cleaning solvent on a cloth or a cotton swab stick.

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

5.2. RF ASSEMBLY TEST

DC Resistance - Check the condition of these load resistors by accurate measurement of the dc resistance between the inner and outer conductors of the RF input connector. Use a resistance bridge or ohmmeter with an accuracy of one percent or better at 50 ohms for this purpose. The measured resistance should be a nominal 50 ohms. For greater accuracy, the resistance of the load should be carefully checked prior to use at ambient room

temperature. This resistance value should be recorded and used as a reference. Subsequent resistance measurements should not deviate more than two percent from this value.

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

5.3. 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 in paragraph 5.2, 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:

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.

5.4. RESISTOR REMOVAL

NOTE - Item numbers enclosed in brackets [] in the text are indicated on figures 5-1, 5-2, and 5-3.

a. 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 [2] on the load and disconnect the unit from the RF transmission line.

b. Set the load on end with RF Connector down. The water chamber is removed by unscrewing it in a counterclockwise direction. A strap wrench and a 3/8 to 1/2 inch rod are useful to overcome the initial tension of the water chamber item [1]. The rod is inserted in the water output hose nipple fitting item [2] for leverage.

c. The water inlet tube [4] will usually come out with the water chamber. If not, it can easily be pulled straight off.

d. Remove the resistor cap assembly [7]. Usually, it can be lifted off with your fingers. Occasionally, however, O-Ring tension may cause a restriction and the resistor cap will require gentle prying under the lip with a flat blade or screwdriver.

e. When the resistor cap [7] is removed, the resistor end will be exposed. Withdraw the load resistor [13] straight up and out. Occasionally, the load resistor will come out with the ground cap assembly, due to O-Ring tension.

f. At this point, the load resistor may be replaced and you may reverse the process and proceed to final assembly if ---

1. The spring fingers on the input resistor fitting [22] are snug and offer some resistance when the resistor [13] is inserted into the load body and ---

2. The load resistor has not been fractured or badly burnt in operation. Inspect the resistor thoroughly.

However, if either of these conditions are not as stated, further disassembly will be required. Proceed with step g.

g. Remove the ground section housing [9] by grasping it firmly in your hand and unscrewing it from the third housing section [11].

h. The third housing section is removed by unscrewing the six 1/4-20 x 1 inch socket head cap screw on the flange.

i. There is no advantage in separating the front and second housing sections. These are removed as an entire unit by removing the six 1/4-20 x 1 inch socket head cap screws on the flange of the front housing [19]. The flow tube [21] may become dislodged and stay with the front resistor fitting [22] when the front housing [19] is removed. If this should happen, just pull it loose from the resistor fitting and push it back into the front housing

section.

j. The resistor fitting [22], insulator [24], and center conductor assembly are now exposed and may be taken out for inspection. The entire input center conductor assembly can be taken apart by removing the 3/8-16 x 3/4 inch hex head machine screw [27] in the input center conductor [26].

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.

5.5. INSPECTION

If the load 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. If, however, the load resistor had been fractured rinse all the load internal parts thoroughly under clear running water to remove any remaining pieces or splinters that may be lodged there. Next, examine all other internal parts for any apparent damage.

5.6. REASSEMBLY

Reassembly is accomplished by simply reversing the procedure of paragraph 5.4. When replacing the resistor [13] in the resistor fitting [22], be sure it is a very snug fit and requires a moderate force to push the resistor into the fitting. This fit must not be loose and yet not excessively tight.

If the resistor is loose in the fitting [22], 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 even, fit is obtained. Then bottom the resistor in the fitting. With the resistor in place in the fitting [22], install this assembly upright in the RF outer conductor [28] or [31]. Replace the front housing [19] and continue with reassembly.

5.7. RF CONNECTOR REPLACEMENT

The RF Coaxial connector consists of the inner conductor [26 or 30] and the outer conductor [28 or 31] respectively. It is disassembled by first removing the six 1/4-20 x 1 inch socket head cap screws [20] from the flange of the front housing assembly [19]. The outer conductor will come off exposing the center conductor and insulator. Grasp the center conductor assembly and gently pull it off the front housing. Usually the resistor [13] and flow tube [21] will remain in place in the housing when the center conductor assembly is removed. There is the occasion, however, when one or both of these parts will come out with the center conductor assembly. This is not a problem and they can be separated from the front center conductor assembly and resealed in the housing without consequence.

The center conductor assembly can be disassembled further by removing the 3/8-16 x 3/4 inch screw and lockwasher set [27] located inside the center conductor. Use a 5/8 inch socket wrench set with an extension for the screw. Hold the resistor fitting [22] by inserting a 5/32 inch rod, or equivalent, through the holes in the fitting. Do not use any pliers or wrenches on the resistor fitting [22] as damage to its surface may result.

Reassemble the RF Connector by reversal of the above procedure. When replacing the center conductor assembly, gently manipulate the assembly until it is thoroughly seated in place.

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 paragraph 5.8, 5.9, and 5.10 only when applicable.

5.8. 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:

- a. Make certain the RF power, ac line power, and the transmitter interlock supply are turned off.

- b. Disconnect the leads at the water flow switch.
- c. Remove the defective switch from the plumbing and install the new unit.
- d. Reconnect the flow switch leads.
- e. Perform the pre-operational checkout per paragraph 2.6.

5.9. 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 simply be replaced using the following procedure:

- a. Be sure RF power, ac line power, and the transmitter interlock supply are off.
- b. Open the door of the control box by turning the slotted screwhead one-quarter turn.
- c. 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.
- d. Pull the delay relay cartridge straight out of the socket.
- e. 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.
- f. 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 clockwise until snug.
- g. Close the control box door and reconnect interlocks and the ac power line by reversing the procedure in paragraph 5.9, a and b.
- h. Perform the pre-operational checkout per paragraph 2.6.

5.10. **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 Section VII.

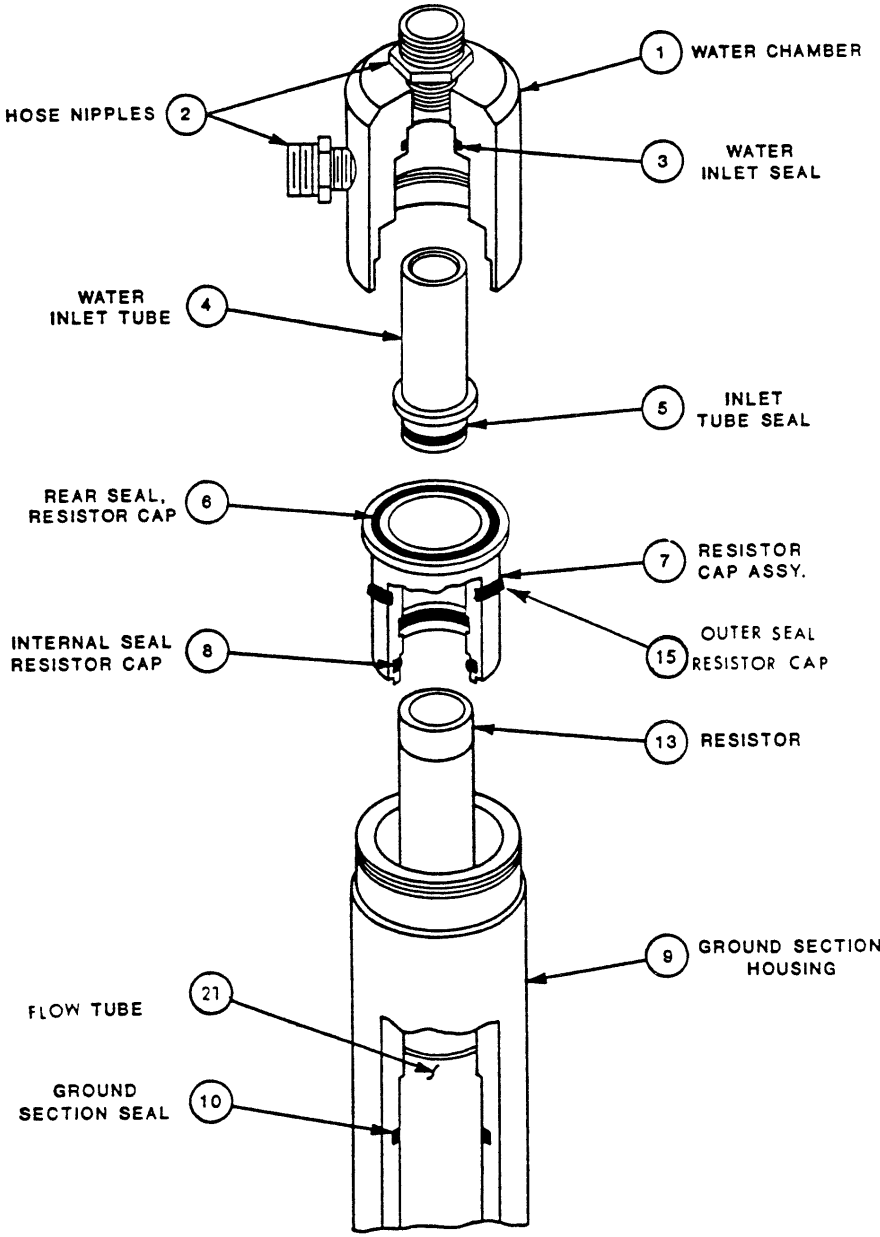


Figure 5-1. Resistor Removal (Exploded View)

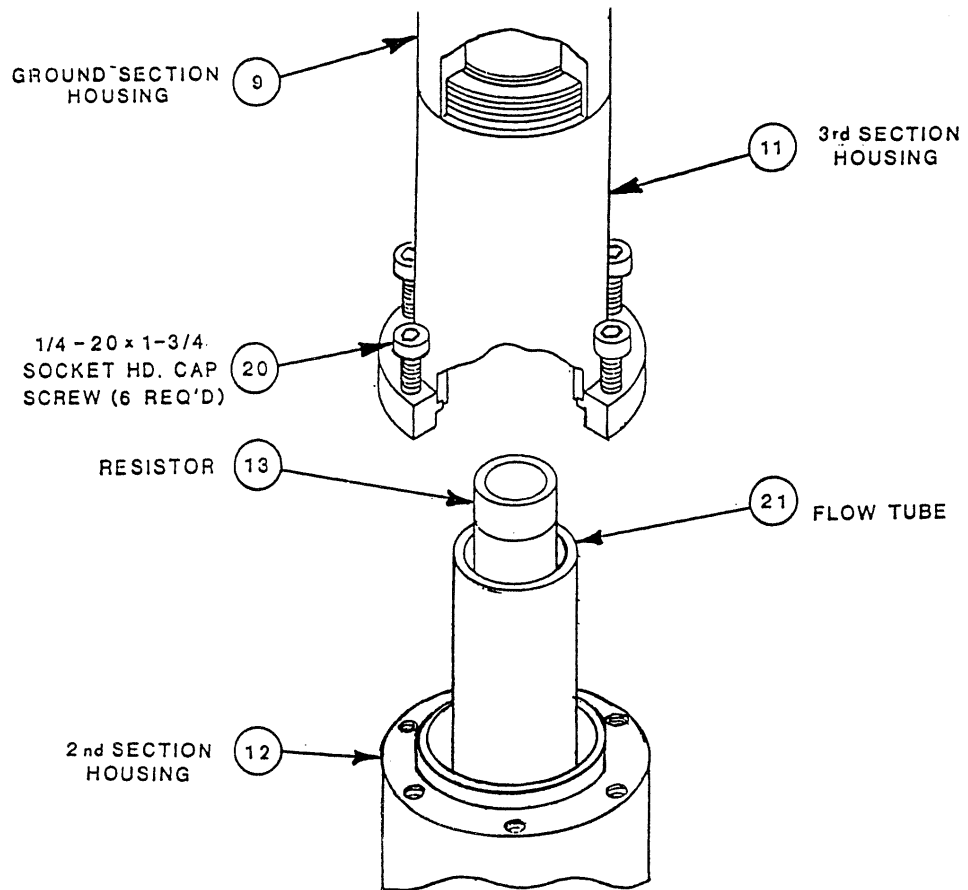


Figure 5-2. RF Load Midsection

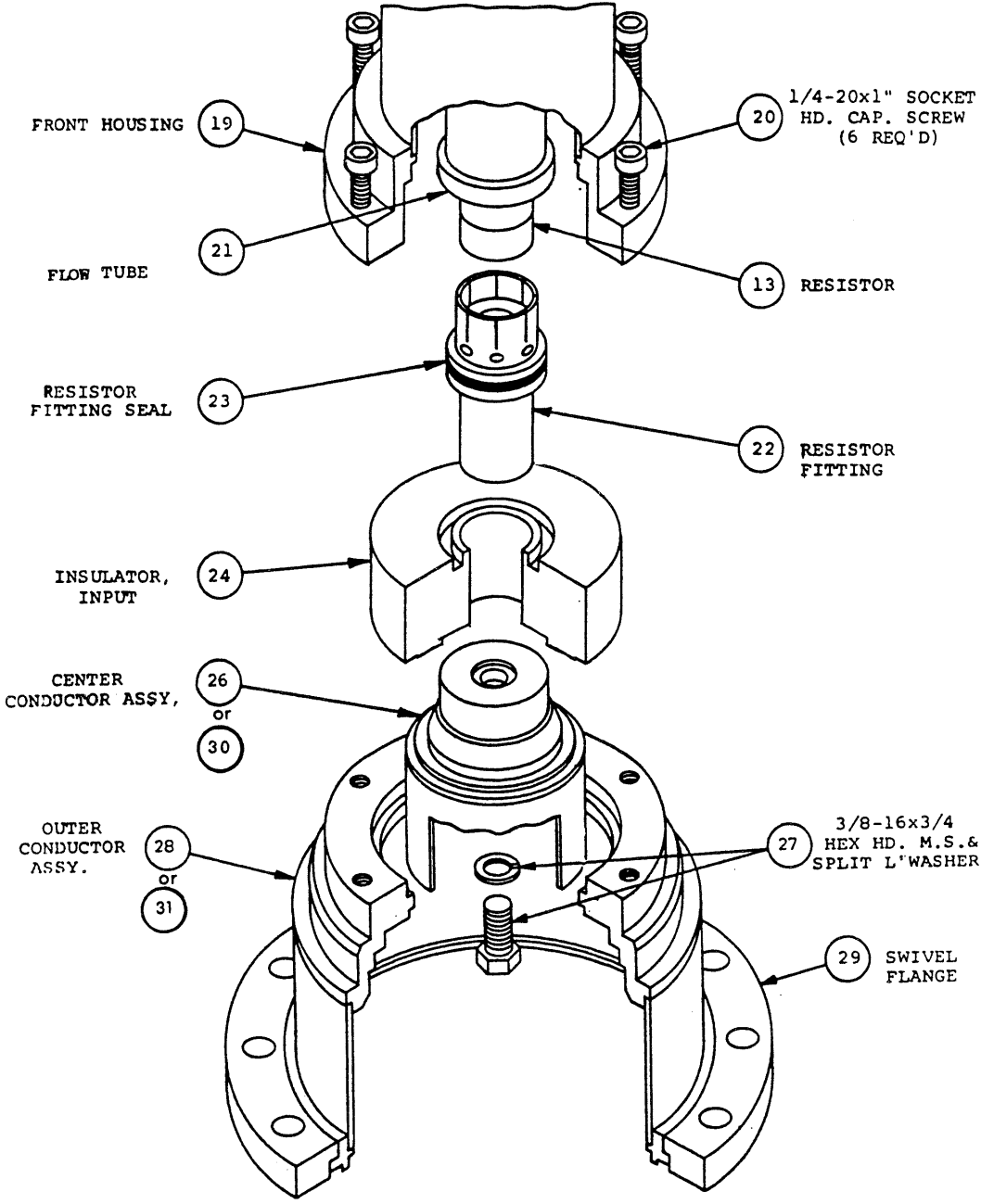


Figure 5-3. RF Input Assembly (Exploded View)

SECTION VI. STORAGE & SHIPPING

6.1. STORAGE

If the model 8792/93 is to be stored for any length of time, be sure it is completely drained of all water and the input and output water ports plugged with plastic caps. Cover the unit to avoid the intrusion of dust and dirt, and store at room ambient temperature. Avoid storing at temperatures below freezing (0 Celsius) or extreme temperatures above 70°C (158°F).

6.2. PREPARATION FOR SHIPMENT

If the unit is to be returned to the factory or shipped to another destination, be sure it has been purged of all coolant and the coolant ports plugged as above for storage. Pad the RF Connector to protect it from damage and if it is a flanged unit, fasten the flange securely to keep it from moving. Put the unit in a sturdy wooden crate, pad and brace it securely. If feasible, it is best to save the original shipping container.

SECTION VII. REPLACEMENT PARTS LIST

7.1. Models 8792, 8793

ITEM	QUANTITY	DESCRIPTION	PART NUMBER
	(1)	Water chamber assembly	8790-005
1	1	Water chamber	8790-031
2	2	Hose nipple	5-065-2
3	1	Internal O-Ring seal	5-1250
4	1	Water inlet tube	8790-032
5	1	Water inlet seal O-Ring	5-1340
6	1	Resistor cap rear seal O-Ring	5-1128
7	(1)	Resistor cap assembly	8792-003
	1	Resistor cap subassembly	8792-004
8	1	Internal resistor cap seal O-Ring	5-1251
9	1	Housing ground section	8792-007
10	1	Ground section seal O-Ring	5-1128
11	1	Third housing section	8792-002
12	1	Second housing section	8792-006
13	1	Resistor element Model 8792 & 8793	8792-010-1
14	1	Cone point socket hd. set screw (front and second sect.) 10-32 x 1/4 inch	standard
15	1	Outer resistor cap seal O-Ring	5-1128
16*	1	Time delay control assembly 115 VAC	8750-115
		Time delay control assembly 230 VAC	8750-230
17*	1	Flow switch	5-898-7
18*	1	Flow switch bushing	5-490-1A
19	1	Front section housing assembly	8792-005
20	12	1/4-20 x 1 inch socket head Cap screws	standard
21	1	Flow tube	8792-009
22	1	Resistor fitting	8790-016
23	1	Resistor fitting seal O-Ring	5-1127
24	1	Input insulator	8790-015
25		Insulator ring (omitted these units)	
26	1	Center conductor assembly (Model 8792)	8790-009
27	1	3/8-16 x 3/4 inch hex head s/s Screw & lockwasher set	standard
28	1	Outer conductor assembly (Model 8792)	8790-006
29	1	Swivel flange	4802-014
30	1	Center conductor (8793)	8791-005
31	1	Outer conductor (8793)	8791-004
32*	1	Hose nipple	5-903
33*	1	Pipe nipple	5-489-1A
34*	1	Indicator light assembly	8750-106
35*	1	Incandescent lamp 115 V	5-970-1
		230 V	5-970-2
36*	1	Time Delay relay 115 VAC	5-1664
		230 VAC	5-1665
37*	1	Relay clamp	8630-193

* For optional items only.