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## INSTRUCTION BOOK

# **MODULOAD<sup>®</sup> RF LOAD RESISTOR SERIES 8630**

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Instruction Book P/N 920-8630S Rev. F  
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registered trademarks of Bird Electronic Corporation



## **Safety Precautions**

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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 applied to all phases of operation and maintenance.

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

Operating personnel must at all times observe normal safety regulations. Do not replace components or make adjustments inside the equipment with high voltage 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 personnel 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 uninterruptible earth safety ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

### ***Chemical Hazard***

Dry cleaning solvents for cleaning parts may be potentially dangerous. Avoid inhalation of fumes or prolonged contact with skin.

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



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



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

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

### WARNING

Ethylene glycol is a toxic material. Do not take internally. Avoid eye contact. Inhaling the vapors may be irritating to the lungs.

## Caution Statements

The following equipment cautions appear in the text whenever the equipment is in danger of damage 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**

Before any RF operation of the load is attempted, the transmitter interlock and ac line attachment to the equipment must be made. First attach the transmitter interlock connections to the two binding posts on the front panel and then connect the power cable.

**CAUTION**

The 115 V or 230 Vac line may be connected, but the ac power must not be turned on unless coolant is in the system and filled to the correct level. Damage to the pump will result otherwise.

**CAUTION**

Operation without sufficient coolant can damage the unit.

**CAUTION**

Do not use any sealant, leak-stopping material, or automotive antifreeze in the coolant. Use only distilled water and pure ethylene glycol.

**CAUTION**

Do not attempt to alter the flow switch setting or disturb the coolant pump.

**CAUTION**

Do not operate the load without connecting the interlock. Even momentary application of power to the load while the cooling circulation is off, or possibly functioning improperly, will cause almost immediate destruction of the resistor element.

**CAUTION**

Do not apply more than the rated RF power to the load. Excessive RF power will damage the load resistor.

**CAUTION**

Do not block air flow. Air enters the housing through the circular fan openings and exhausts through the grille opposite.

**CAUTION**

Do not disconnect the line power first. Even a momentary application of RF power to the load while the cooling circulation is off will cause almost immediate destruction of the resistor element.

**CAUTION**

Do not remove any fittings from the water chamber. The elbows could be damaged, and it may be difficult to restore them to their original positions while keeping a water-tight seal. Check the switch for free operation. Flush and clean with mild detergent if necessary, and rinse thoroughly in clear water

**CAUTION**

Before storing the unit, follow the storage instructions in the Storage section of the Maintenance chapter. Failure to follow the instructions may result in damage to the unit.

**CAUTION**

Before shipping the unit, follow the shipping instructions in the Maintenance chapter. Failure to properly prepare the unit for shipping may result in damage to the unit.

### **Safety Statements**



#### **USAGE**

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

#### **USO**

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

#### **BENUTZUNG**

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

#### **UTILISATION**

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

#### **IMPIEGO**

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



#### **SERVICE**

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

#### **SERVICIO**

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

## WARTUNG

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

ZUR VERMEIDUNG GEFÄHRLICHER, ELEKTRISCHER SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

## ENTRETIEN

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

## ASSISTENZA TECNICA

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

## About This Manual

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This instruction book covers the 8630 Series Moduload RF Load Resistors, which specifically covers the models listed below:

8631-115	8631-115-5-N	8635-115-5	8638-115	8638-230-6
8631-230	8631-230-6-N	8635-230-6	8638-230	8638-115-5-N
8631-115-5	8635-115	8635-115-5-N	8638-115-5	8638-230-6-N
8631-230-6	8635-230	8635-230-6-N		

This instruction book is arranged so that essential information on safety is in the front of the book. Reading the Safety Precautions before operating the equipment is strongly advised. The remainder of this instruction book is divided into Chapters and Sections.

### ***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 chapter.

### ***Maintenance***

All personnel should be familiar with preventative maintenance found in Chapter 5 - Maintenance. If a failure should occur, the trouble-shooting section will aid in isolating and repairing the failure. Parts lists and repair instructions are also in this chapter.

### ***Changes To The 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 comment 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.

### ***Naming Conventions***

The following terms will be used throughout this manual to refer to certain components of the Moduload:

**Moduload:** The entire unit.

**Load:** The component which connects to the RF line. It is connected to the HEAT EXCHANGER with two hoses. It contains the RESISTOR.

**Heat Exchanger:** The component containing the pump, blower, coolant reservoir, control panel, and electrical access box. It is connected to the LOAD with two hoses.

**Resistor:** A subcomponent of the LOAD. This is the ceramic resistor which actually absorbs the RF power.

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This publication refers to the Moduload RF Load Resistor Series 8630. The differences between models are listed in the specifications. All models will generally be referred to as a load throughout this manual.

The information in this instruction book pertains to all models except noted differences referred to in the text.

This chapter contains introductory information including items supplied, items required, unpacking, inspecting, and the specifications.

### **Purpose and Function**

The Bird Moduload Loads are self-cooling, low reflection, non-radiating terminations for high power 50 ohm RF transmission lines.

They are for use on CW, AM, FM, SSB, and TV modulation envelopes, and within certain limits on radar or pulse modes. Information for use involving pulse type signals should be obtained directly from Bird Electronic Corporation.

### **Performance Characteristics and Capabilities**

The 8630 series Loads are capable of continuous power dissipation of 10 kW with a voltage standing wave ratio (VSWR) of less than 1.1 to 1.0 from 1 kHz to 1000 MHz. The respective models provide direct connection to 3-1/8 inch and 1-5/8 inch 50 ohm coaxial lines.

The equipment consists of three basic systems: the RF load assembly, the control system, and the heat exchanger system. The load assembly contains the resistor element with its internal water cooling system. The control system includes the electrical circuitry required to prevent damage to the transmitter in case of malfunction of the load, and to protect the RF load should the water flow slow down. The heat exchanger components consist essentially of the pump/motor, the side blower, the coolant collector tank, and a finned cooling coil unit opposite the blower.

When used in conjunction with the appropriate Bird Model Thruline Wattmeter, such as those in the 4600A, 4800A or 4712 series, the Moduload Coaxial Load may be used for direct RF power measurements within the equipment ratings.

### **Dimensions and Weight**

The 8630 Series load is 22-1/8 inches long, exclusive of the connector, 15-13/16 inches wide, and 15-15/16 inches high (562 x 402 x 405 mm).

Its net weight, filled with 100 percent water as coolant, is 113 lb (51.3 kg) and the shipping weight is 125 lb (56.7 kg).

**Power and Utility Requirements**

The 8630 Series loads are offered in four standard forms which differ in the ac input power requirements.

- -115 for 115 V, 60 Hz, 9 Amp, single phase.
- -230 for 230 V, 50 Hz, 4.5 Amp, single phase.
- -115-5 for 115 V, 50 Hz, 9 Amp, single phase.
- -230-6 for 230 V, 60 Hz, 4.5 Amp, single phase.

**Environmental Requirements**

The 8630 Series loads are not intended for use outdoors where they would be exposed to the elements. They should be used indoors in a clean, dry, dust and vibration-free environment. The ambient temperature range is determined by the coolant. For 100 percent water the range is +5°C to +45°C (+41°F to +113°F). For a mixture of 65 percent water and 35 percent ethylene glycol the range is -20°C to +35°C (-4°F to +95°F).

It is important that the room temperature remain within these limits for proper operation of the unit, otherwise a derating of its load value will be necessary. To avoid this derating, it may be necessary to arrange for venting of the air flow from the load to the outside. Consult Bird Electronic Corporation for more details.

**Items Supplied**

The 8630 Series loads are equipped with standard RF connectors.

- Model 8631 — 3-1/8 inch EIA flanged connector.
- Model 8635 — 1-5/8 inch EIA flanged connector.
- Model 8638 — 3-1/8 inch unflanged connector.

They are supplied with a container of ethylene glycol, for making the coolant mixture, when ordered.

**Items Required but not Supplied**

The required items are:

- A mating connector on the coaxial transmission line.
- A conveniently located ac power receptacle to plug in the power cable.
- Distilled water for coolant, or coolant mixture.

<b>Tools and Test Equipment</b>	Only simple tools such as screwdrivers and wrenches are needed for disassembling a Moduload load resistor. A multimeter or an ohmmeter with an accuracy of 1 percent or better at 50 ohms is suggested for checking the DC resistance of the RF load resistor. A basic VOM will suffice for checking the rest of the circuitry.
<b>Optional Items</b>	<p>Dolly, P/N 6771-011 — For ease in moving the load. Consult Bird Electronic Corporation for more information.</p> <p>Ethylene Glycol, P/N 5-1134-3 — A one gallon container of industrial grade ethylene glycol.</p> <p>Resistors, P/N 8731-031 — Field replaceable resistors.</p> <p>Repair and Replacement Kit, P/N 8630-196 — Consists of: Coolant and Container Assy. (8630-197), 50 ohm resistor (8731-031-1), and an instruction sheet (921-8630-196).</p>



The 8730 Series style Econoload Coaxial load resistor installed in this unit is unique in having its water supply primarily directed over the outer, wet film type, resistive coating of the substrate. This eliminates the need for an intermediate heat transfer system, reducing the load size to a minimum. 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 (refer to the Chapter 5 - Maintenance).

### Heat Transfer

The 50 ohm resistor consists of a substrate which has a permanently deposited resistive film, covered by a thin layer of electrically nonconductive material. The heat generated by the absorbed RF power is transferred from the film to the water which flows over it through a restricted chamber surrounding the resistor body. This water, first carried to the front of the load resistor, passes over the entire length of the resistor and discharges through the sealed water chamber at the rear. The composite dielectric characteristics and the distinctive design of these enclosures provide an accurate 50 ohm termination over the specified frequency range of this load - 1 kHz to 1000 MHz.

### Flow Interlock Control Circuit

The interlock control circuit provides instantaneous fail-safe protection of the transmitter and Moduload in the event of even momentary interruption of the coolant supply. This protection is necessary because dissipation of the heat generated by the RF power is critically dependent on a required minimum water flow of 2.5 gallons (9.5 liters) per minute at all times, regardless of the coolant temperature.

#### CAUTION

Do not attempt to alter the flow switch setting or disturb the coolant pump.

The water flow switch, installed directly on the coolant input line to the load resistor, is a “normally open” type; i.e. its electrical contacts open when deactivated. Closed during equipment operation, the switch is adjusted to open when the coolant flow drops below the minimum. When the water flow switch contacts open, the time delay switch is deactivated, which at once opens the interlock switch, causing immediate transmitter shutdown. Also, the centrifugal impeller of the pump is carefully selected for the necessary flow rate.

The proper operation of this equipment depends on these conditions being maintained.

The time delay relay keeps the interlock switch open for a predetermined interval (set at about 2 seconds, nominal), to allow the minimum flow of 2.5 gallons per minute to be established. This safeguard feature ensures proper operation of the cooling system before RF power is applied to the load, preventing resistor damage or burnout. As an additional safeguard, an over temperature thermoswitch, normally closed at +85°C (+185°F) or lower, is wired in series with the flow switch for protection from overheating due to overloading of the load.

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

### CAUTION

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

The 8630 series load is to be installed, and operated, in a horizontal position. The unit is shipped horizontal, and normally stands on its attached base brackets.

#### Unpacking and Inspection

1. Carefully inspect the shipping container for signs of damage. If damage is noticed, do not unpack the unit. Immediately notify the shipping carrier and Bird Electronic Corporation.
2. If the container is not damaged, unpack the unit. Save the packing materials in case the unit should need to be shipped again.
3. Inspect all of the components for visible signs of damage. Immediately notify the shipping carrier and Bird Electronic Corporation of equipment damage or missing parts.

#### Site and Shelter Requirements

The load may be operated anywhere that adequate ac line power and ventilation are available, and ambient temperatures do not exceed those given in the specifications.

☞ Note: 10 kW being equivalent to 34,000 Btu/h (8568 kilogram- calories/hr), a sufficient quantity of air must be provided. Allow room for unobstructed air intake on the side facing the fan grille, and a clearance of two or three feet beyond the grille outlet opposite.

#### Mounting

For installation of the equipment, mounting angle brackets are attached to the front, and back edges of the enclosure. They may be removed by unscrewing the four 8-32 Phillip Truss head screws holding each bracket. These brackets have two slots each on the 14" x 21-15/16" (356 x 557 mm) centers to accommodate four 1/4" screws that may be used for mounting the unit.

### Coolant

Before shipment, the Moduload is drained of coolant to avoid possible damage in transit from freezing. The system must be refilled with coolant before it can be put into operation. The unit operates with 10

pints (4.74 liter) of coolant. The coolant must be either; distilled water or a mixture of distilled water and ethylene glycol.

**WARNING**

Ethylene glycol is toxic. Do not take internally. Avoid contact with eyes, skin, and clothing. Avoid breathing vapor. Wash thoroughly after handling.

**CAUTION**

Use only distilled water or the supplied ethylene glycol as coolant. Do not use tap water, automotive antifreeze, sealants, or leak stopping material. Use of these materials will damage the instrument and void all warranties.

Distilled water is the primary coolant for the Bird 8630. Ethylene glycol should be added to prevent bacterial growth and freezing; 10% – 35% ethylene glycol is recommended. Using at least 10% will prevent bacteria growth and 35% will protect against freezing to – 20°C.

Figures 3 and 4 shows the coolant's freezing point for a given percentage of ethylene glycol in the mix. The following example shows the weights to make a 65% distilled water to 35% ethylene glycol mixture in 1 and 5 gallon quantities.

<b>Ingredient</b>	<b>1 Gal. (3.78 L)</b>	<b>5 Gal. (18.9 L)</b>
<b>Distilled Water</b>	5.6 lb (2.54 kg)	28.0 lb (12.7 kg)
<b>Ethylene Glycol</b>	3.0 lb (1.39 kg)	15.2 lb (6.9 kg)

The load's electrical and thermal performance is impaired by impurities or additives in the coolant. Impurities which accumulate as scale on the resistor surface are especially damaging. Only use distilled water or a mixture of distilled water and ethylene glycol as coolant. To ensure proper mixing add the water first, then the ethylene glycol.

**Filling Coolant Reservoir**

The Bird 8630 has a coolant capacity of about 10 pints (4.74 liter). To fill the coolant, follow these steps:

**CAUTION**

Operation without sufficient coolant can damage the unit.

1. Make sure the drain plug is in place. Check that the hose connections are correct and properly tightened.
2. Remove the filler cap on top of the unit.

3. Pour approximately 4 pints (2.0 Liters) of coolant in the unit.
4. Turn on the motor, for only a few seconds, to pull the liquid into the system and draw the coolant level down to the bottom of the tank. Do not run the pump too long, as partially dry operation may damage its mechanism.
- 🔧 Note: A convent method is to watch the coolant level through the reservoir filler. Stop the pump when the coolant level approaches the bottom of the tank.
5. Repeat filling in the above manner twice more, with about 3 pints (1.5 liters) each time, or until the fluid remains steady at the proper level. The unit should be full to a level of about 2-7/8 inches (73 mm) below the top face of the filler tube opening, or to the high mark on the gauge. Add coolant if necessary to bring to the required level.
6. Run the unit for about five minutes to remove any trapped air in the system.
7. Recheck the fluid level before applying RF power.

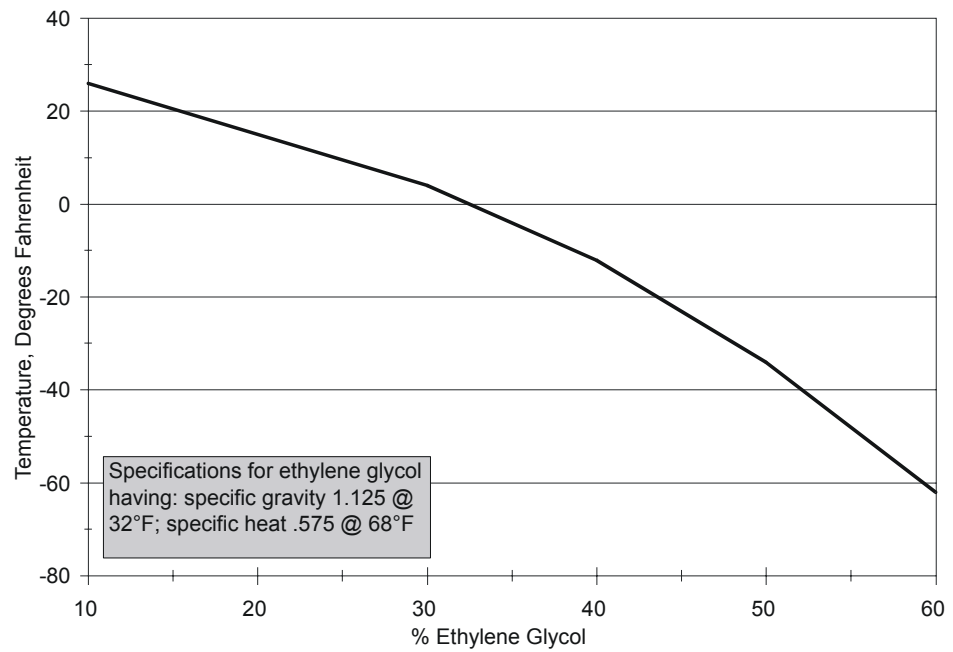
🔧 Note: The filler plug is equipped with a breather vent to relieve internal pressure caused by the heated coolant. It is normally closed, but is set to open at 2 lb/in<sup>2</sup>. The electrical performance of the load is affected by impurities or other chemical additives in the cooling liquid. Therefore, the cooling liquid should be distilled water, with pure industrial grade ethylene glycol added if required, and should be kept clean at all times.

Introducing contaminates from unsuitable coolant liquids could coat the cooling system components, particularly the resistor surface. This would unfavorably affect the thermal performance and VSWR of the load. When this is suspected always check the VSWR. General scale accumulation is not likely unless the load resistor is used outside the unit, with an improper water supply. If the coolant system has been contaminated, flush it out according to the instructions in the Maintenance Chapter.

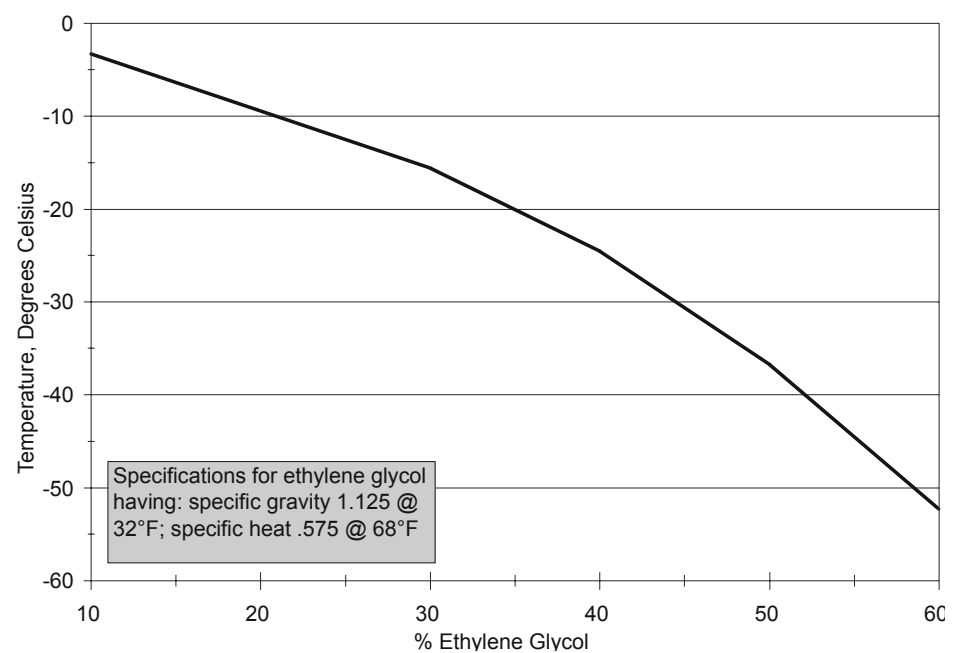
**Blower Fan** The fan is wired direct to the ac line input and will always operate along with the pump when the ac line power is turned on.

**DC Resistance** Before the unit is put into operation, check the DC resistance. Refer to the Maintenance chapter for complete details and instructions.

*Figure 2*  
*Freezing Point of*  
*Ethylene Glycol /*  
*Water Mixture °F*



*Figure 3*  
*Freezing Point of*  
*Ethylene Glycol /*  
*Water Mixture °C*



**Interlock Connections**

A terminal strip provides connection to the transmitter's internal safety interlock circuitry. An active interlock state occurs as a result of either high coolant temperature or no coolant flow. It will also be active for about 2 seconds after power up.

Interlock connections are made to the terminal strip on the front of the unit.

1. Use number 22 AWG (or heavier) wire for interlock connections. Attach solderless ring terminals to the wire ends to ensure safe operation, and to ease installation.
2. Connect the interlock wires to the interlock terminal strip as required for the transmitter in use.

**AC Line Attachment****CAUTION**

Before any RF operation of the load is attempted, the transmitter interlock and ac line attachment to the equipment must be made.

First attach the transmitter interlock connections to the two binding posts on the front panel and then connect the power cable.

**CAUTION**

The 115 V or 230 Vac line may be connected, but the ac power must not be turned on unless coolant is in the system and filled to the correct level. Damage to the pump will result otherwise.

Before applying ac power to the unit, make sure:

- Coolant is in the system.
- Coolant is filled to the correct level.
- The green wire at the supply end is fastened to ground.

The ac power supply may be either 115 or 230 V depending on the unit requirements. AC line power is supplied to the 3-wire ac panel module socket by means of the 10 foot cable and matching socket that is furnished with the equipment. The third wire in the cable, coded green, is the ground. For proper protection, if a 3-wire type plug and outlet is not used, fasten the green wire at the supply end to a satisfactory ground.

## Connecting RF Power

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

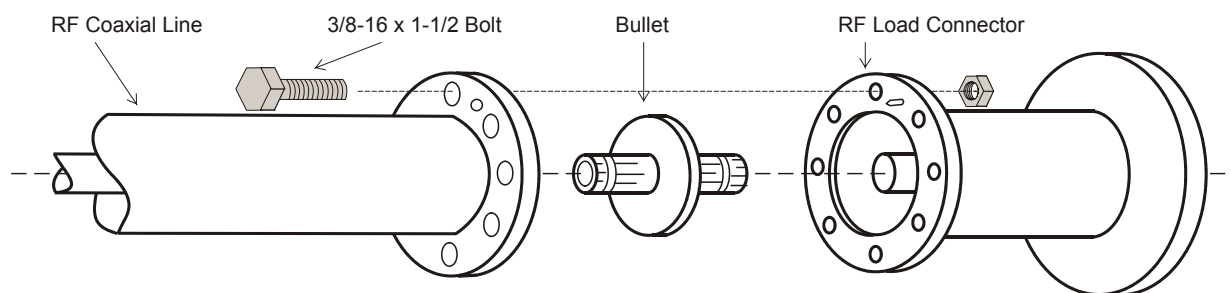
### WARNING

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

Connect the coaxial RF transmission line to the unit. For the respective 8630 Series models the connections are as follows:

- Model 8631** Model 8631 - 3-1/8" EIA, 50 ohm, swivel flanged. Refer to Figure 4 while following the instructions below.
1. Use 3-1/8" EIA Coupling Kit, Bird P/N 4600-020, which includes six 3/8-16 x 1-1/2" bolt and nut sets, O-Ring, and insulated center bullet.
  2. Insert the center bullet, push into seat insulator in facing, and install the O-Ring in the groove if required.
  3. Connect the coaxial input in a straight line, push in carefully to close. The swivel flange on the load makes connection independent of a fixed flange on the coaxial input line.
  4. Insert bolt sets around the flange connection, and tighten evenly.

Figure 4  
Connecting RF  
Power Model 8631

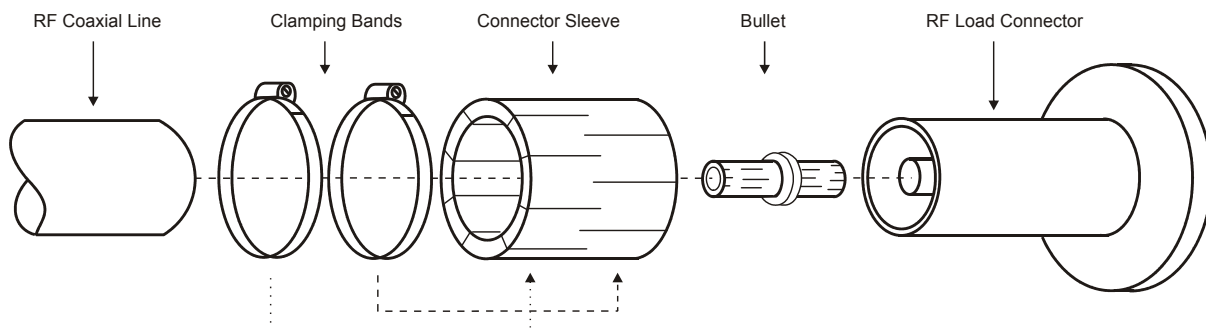


- Model 8635** Model 8635 - 1-5/8" EIA Coupling Kit, Bird P/N 4712-020, which includes four 5/16-18 x 1-1/2" large bolt and nut sets, O-Ring, and anchor bullet. The assembly procedure is the same as for Model 8631. Refer to the paragraph Connecting RF Power - Model 8631, above.

**Model 8638** Model 8638 - 3-1/8" unflanged, 50 ohm impedance. Refer to Figure 5 while following the instructions below.

1. Use the Bird Coupling Kit P/N 5-726, consisting of two clamping bands, an outer sleeve, and the center conductor coupling bullet.
2. Insert the center bullet, and bottom it on the midpoint nibs.
3. Position the outer sleeve, with clamps, over the input connector.
4. Introduce the transmission line and seat snugly against the coupling stops.
5. Position clamp bands evenly about 1-3/4" apart, and tighten.

*Figure 5*  
*Connecting RF*  
*Power Model 8638*



**Preliminary  
Equipment Check**

Check the RF load for acceptable electrical condition. Refer to the Maintenance Chapter for the procedure to determine load impedance. Below is the test equipment needed, and the critical parameters.

Equipment Needed: Digital Multimeter

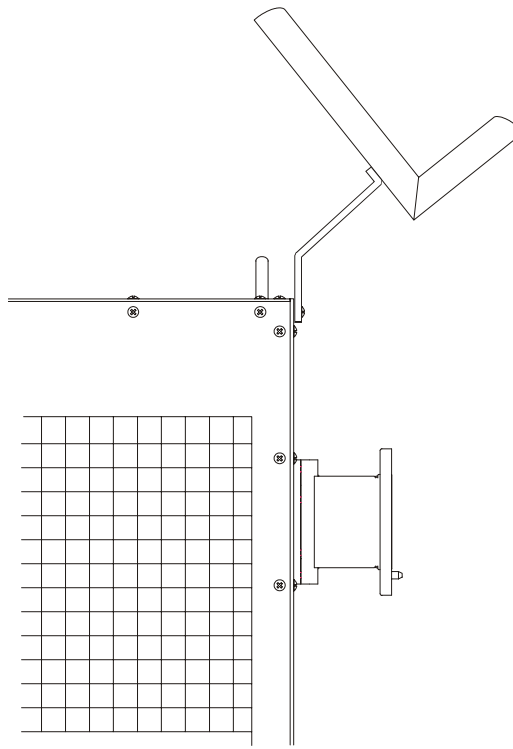
Accuracy: 1 percent at 50 ohms,  $\pm 1$  digit

**Meter Rack**

The Meter Rack is used to hold the meter at the correct angle, for the best possible viewing. Assemble and install as instructed below:

1. Assemble the kit using #6-32 x 1/4 screws, (supplied).
2. Remove the 2 screws from the panel at a desired mounting location.
3. Mount the assembled Meter Rack using #8-32 x 3/8 phillips truss (supplied). Refer to Figure 6.

*Figure 6*  
*Meter Rack*  
*Assembly*



## Chapter 4

## Operating Instructions



### CAUTION

Do not operate the load without proper coolant levels. Operation without sufficient coolant can damage the unit.

### Use and Function of Controls

The Series 8630 loads have no operating controls, other than the ON/OFF switch; therefore, they do not require an operator in attendance. They are equipped with two indicators. One is a pilot light in the ON/OFF switch, to warn that the ac power is being applied. The other is the coolant level gauge, referred to in Chapter 3 - Installation.

### Initial Adjustments and Control Settings

There are no adjustments or settings required beyond confirming that the cooling system contains an adequate level of coolant for proper operation. Refer to Chapter 3 - Installation.

### Equipment Startup

### 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.

### CAUTION

Do not apply more than the rated RF power to the load. Excessive RF power will damage the load resistor.

### CAUTION

Do not block air flow. Air enters the housing through the circular fan openings and exhausts through the grille opposite.

### CAUTION

Do not operate the load without connecting the interlock. Even momentary application of power to the load while the cooling circulation is off, or possibly functioning improperly, will cause almost immediate destruction of the resistor element.

1. Make sure coolant level is adequate, and verify fan operation.
2. Turn interlock supply on.
3. Turn on 115 V or 230 Vac power.
4. Apply RF power to the load.

## Normal Shutdown

### CAUTION

Do not disconnect the line power first. Even a momentary application of RF power to the load while the cooling circulation is off will cause almost immediate destruction of the resistor element.

1. Turn RF power to the load off.
2. Wait five minutes, allowing pump and blower to return coolant to ambient room temperature.
3. Turn ac power off.

☞ Note: Stopping the pump automatically opens the interlock connection.

## Emergency Shutdown

With the use of interlock capability, the Load will automatically turn off the transmitter's RF power if an emergency arises.

If an emergency arises that is not a fault of the unit, always turn off the source of RF power first, and then the ac power to the Load.

## Performance Notes

The electrical performance of the Series 8630 RF loads is affected by impurities or other chemical additives in the cooling liquid. Therefore, the cooling liquid should be the coolant supplied with the unit, or distilled water. Do not use any additives.

Thermal performance is affected by impurities, particularly those which accumulate in the form of scale on the surface of the ceramic tube and any other water passages. This results in an increase of thermal resistance of the load, and in turn, may cause the load to overheat and fail.

## Chapter 5

## Maintenance

This chapter covers cleaning, inspection, trouble-shooting, and specifications for the 8630 Series Moduload RF Load Resistors.

### Troubleshooting

The table below provides troubleshooting information for problems which may occur during normal operation. Locate the problem, review the possible causes, and perform the action listed. This manual cannot list all malfunctions that may occur, or their corrective actions. If a problem is not listed or is not corrected by the listed actions, notify a qualified service center.

PROBLEM	POSSIBLE CAUSE	CORRECTION
Transmitter won't come on or shuts off repeatedly	Insufficient coolant flow	Check coolant gauge
		Check for blockage in circulatory system
		Check for coolant leaks
	Defective flow switch	Check flow switch
	Defective pump	Check pump
	Overheating	Check for sufficient coolant
	Defective thermost switch	Check thermost switch
		Check for excessive room temperature
		Check fans for jamming and grilles for blockage
Excessive reflected power	Damaged resistor	Check resistance value of RF section
	Contaminated coolant	Drain, flush and refill coolant system
	Insufficient coolant	Check for coolant leaks and add more coolant
Coolant Leaking	Loose connections	Check and tighten all connections
	Worn or cracked tubing	Replace defective tubing
New or unusual noises	Fans	Check for loose fan blades
	Pump	Check pump for signs of initial failure
	Circulatory system	Check for any sign of coolant leakage

## Cleaning

The most important cleaning task is to remove accumulations of dust, lint, and grime that could interfere with proper air circulation and therefore efficient heat transfer. The heat exchanger surfaces, particularly on the inside, should be checked periodically for possible collection of dust and lint. When cleaning is necessary, follow these instructions.

1. Remove and retain the 18 screws from the edges of the top panel, and the top panel.
2. Clean off dust and lint, if any, with a radiator brush or stiff bristle brush. A vacuum can be used to clean the coils if necessary.
3. Check under the ribs of the exhaust grille (at the side) for dust collection. If there is a buildup, remove the grille and clean under the ribs.
4. Replace top panel and screws.

Heavy coatings of lint on any surfaces of the heat exchanger unit can impair the efficiency of the Moduload unit. Keep the surfaces of the heat exchanger clean.

### **Radiator Surface**

The radiator surface, particularly on the inside, should be checked periodically for possible collection of dust and lint. A heavy lint coating on the inside surface of the radiator can impair the cooling efficiency of the unit. Follow the instructions below for cleaning.

1. Remove the 18 screws from the edges of the top panel and remove the panel.
2. Clean off any collected dust and lint with a radiator brush or any stiff bristle brush.
3. Replace the top panel.

### **Connector and Outside**

The outside surface of the unit should also be wiped free of dust and dirt at regular intervals. Use a soft, clean cloth dampened with mild detergent. Check the condition of the RF coaxial connector. If needed, clean the RF input connector using a selfdrying contact cleaner that leaves no residue on the inaccessible portions.

## General Maintenance

### Measure Load DC Resistance

#### Preparation:

- Tools: Common hand tools
- Ohmmeter with an accuracy of  $\pm 1\%$  at 50 ohms.
- Temperature of the load between 20°C to 25°C (68°F to 77°F)

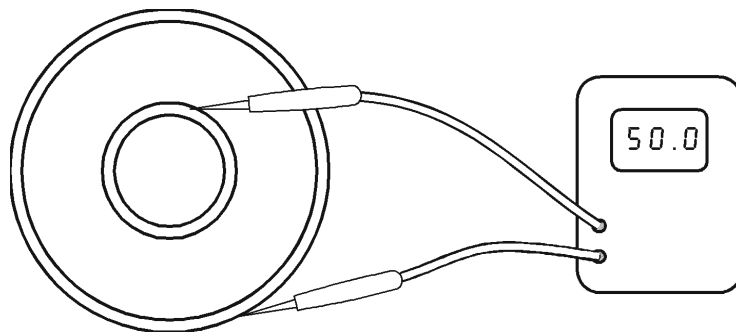
Accurate measurement of the DC resistance between the inner and outer conductors of the RF input connector will provide a good check of the condition of the load resistor. Checking the DC resistance is simply used to measure a change in the condition of the resistor over time. The tracking of the DC 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 an RF cable while power is on at the RF power source. Radiated RF energy is a potential health hazard.

1. Turn off RF power and interlock circuitry before any electrical disconnection.s are made.
2. Disconnect RF coaxial line.
3. Connect the multimeter test leads across the center and outer conductor of the load resistor. Refer to Figure 7.
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.

Figure 7  
Meter Lead  
Placement



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

**Water Flow Switch** The water flow switch should be inspected periodically for accumulated scale and cleaned, if necessary, to permit free movement of the sliding valve. This needs to be done after three to six months of operation, depending on the amount of use. This should be done by removing only the wired sensor plug using the following steps:

1. Drain the unit of its coolant.
2. Unscrew, counterclockwise, the 1-1/2 inch collar that holds the sensor plug in the flow switch body.
3. Carefully pull the sensor plug out of the body, do not lose the spring and sliding valve on the sensor plug stem.
4. Reverse the above steps to assemble.

The component is nonrepairable and must be replaced if its performance is faulty. Operation can be checked by monitoring the interlock circuits while starting or stopping the pump/motor with the RF power off.

**Routine Service Checks** When the equipment is in use inspect the coolant level at regular intervals. Normally check once or twice a week, more often if it is used continuously or under high ambient temperatures. The coolant level should remain at the upper gauge mark on the back panel, whether the unit is running or not. For test measurement and addition of liquid if required, Refer to the Coolant paragraph in chapter 3. Use only distilled water and industrially pure ethylene glycol. Do not use automotive antifreeze or deionized water.

**Flushing the System** Whenever maintenance work has been performed, including resistor repair, or there is a reason to suspect that contamination has been introduced or dislodged into the coolant, the system should be thoroughly flushed. Do this by:

1. Run the load with coolant but without RF power applied for a period of three to five minutes.
2. Drain the circulating system as completely as possible.
3. Fill the unit with fresh, clean, distilled water.
4. Repeat the sequence as required until the drained liquid is clear.
5. Fill the unit with distilled water and/or approved ethylene glycol mixture per the Coolant paragraph.

## Repair

The series 8631/35/38 loads are designed for independent, long term, trouble-free operation. Regular mechanical maintenance procedures, other than routine checks and cleaning care described previously, are not required. In the case of malfunction of the unit or replacement of a major component, resistor repair excepted, the entire load may be returned to the factory. This applies especially to any unit still under the one year warranty. Consult the factory.

⚠ Note: Do not tamper with operational settings or perform other unauthorized maintenance work during the first year. It could be cause to void the warranty.

Field repair of the load resistor may be performed as described in the Internal Repair of the Load Resistor paragraph. Other replacement instructions that might be needed are given in this section.

If in performing the DC resistance check a significant change in resistance is noted, or if for any reason the resistive element should fail, the element should be replaced. Inexpensive replacement resistors are available. Installation is described below.

### RF Load Resistor Unit Removal

Resistor repair in the load may be done without removing the water connections; follow procedures in the Internal Repair of the Load Resistor paragraph. They contain full dismounting and resistor change procedures. The full load assembly may be removed from the case as in the following procedure. Then follow the Internal Repair of the Load Resistor section.

⚠ Note: Notice the angular position of all elbows and associated parts as they must be returned to relatively the same position when reassembled.

#### 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.

1. Turn off RF power and interlock circuitry before any electrical disconnections are made.
2. Disconnect the RF coaxial line.  
Models 8631 and 8635 — flanged, loosen and remove the 3/8-16 bolt and nut sets that secure the flanges. Refer to Figure 4.  
Model 8638 — unflanged, loosen one clamping band on the load side of the connector sleeve. Refer to Figure 5.

3. Separate the transmission coaxial air line from the load connector. Make sure the center conductor bullet remains in the transmission line.

To remove the load resistor unit take off the top panel by removing the 18 screws around its perimeter. Lift off the top panel assembly by the handles. Continue following these instructions:

1. Remove, and retain the drain plug located near the bottom of the rear panel of the unit and allow the coolant to drain.


 Note: Do not replace the drain plug with any substitute plug, use the plug removed.

2. Unscrew the hose clamps on the hoses leading to the input elbow of the flow switch and the output elbow on the water chamber. Use an ordinary screwdriver.

3. Remove the hoses.

4. Loosen the hex collar on the flow switch assembly and remove the collar and sensor from the flow switch body. The output elbow on the side of the water chamber can now be removed by unscrewing counterclockwise.

5. Remove the six 1/4-20 x 5/8 hex head bolts (on the inside of the front panel) securing the load to the front panel.

 Note: When the six bolts securing the load to the front panel are removed the outer conductor assembly will be disconnected. Hold this assembly to keep it from falling and being damaged.

6. Temporarily reattach the outer conductor to the load body. Use two or three of the 1/4-20 bolts (finger tight) for this purpose.
7. Tip up the the unit at the back enough to unscrew the flow switch counterclockwise. The input elbow on the water chamber can be taken off after the load is removed through the front panel.
8. If the load resistor is to be returned to the factory for repair, store components with the Moduload unit until further use. Consult the factory. If the unit is to be field repaired, proceed with resistor replacement instructions as described in the Internal Repair of the Load Resistor section.
9. Replace the load resistor by reversal of the above procedure. Be sure to replace the coolant, per the coolant section. Check for leaks, especially at the restored connections.

**Pump/Motor  
Removal**

For removal of the pump motor, it should not be necessary to remove the load resistor. Drain the unit of coolant by unscrewing the drain

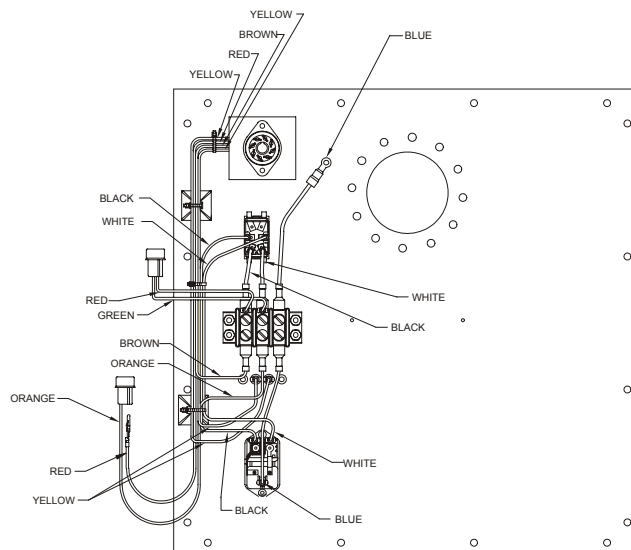
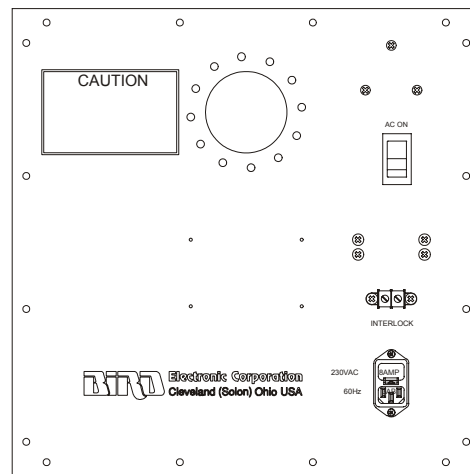
plug on the lower rear panel, then remove the fan panel and rear panel as follows:

1. Release the fan panel by removing the 18 pan head screws surrounding it. When free, it should not be necessary to detach the terminal block connections to the fan; lay the panel to the side.
2. Detach the back panel by, using a crescent or 7/8" hex socket wrench, removing the two large hexagonal bolts that fasten the coolant level gauge to the back panel.
3. Pull the coolant gauge off the panel.
4. Remove the 16, 8/32 screws, to free the panel.
5. Make note of, or mark, all wire connections before detaching.
6. Detach the 3-wire cable from the 3-lug terminal block on the inside of the front panel. For reference, the color codes of the motor supply wires generally match the twistlock input wires, with the green ground wire going to the blue ground wire from the socket. Refer to Figure 8.
7. Release the hose clamp nearest the pump on the input hose and carefully loosen the hose from the 90° input elbow at the center of the helical pump head. In the same manner, loosen the output hose from the straight-up fitting on the pumps helical outlet.
8. Reach under the input elbow with a screwdriver and loosen the clamp band on the drain tube at the base of the volute. Free the tube completely from the fitting
9. Use a 9/16" hex socket extension wrench or a small flat-end wrench, to remove the two 3/8-16 nuts from the base studs holding the motor feet. Lift the motor slightly to clear the studs, then carefully inch the pump assembly forward while detaching the hoses. The freed assembly may be lifted from the equipment out the open side. Remove the wires, if needed, but make note of the connections for assembly.
10. Note the positions of the fittings. Observe the slight downward tilt of the 90° input elbow. Twist off, counterclockwise, the whole input and output fittings parts. Remove the small drain elbow also. Store the detached parts with the disassembled unit and return the pump/motor unit to the factory for replacement.
11. Replace the pump/motor and assemble the unit by reversing the disassembly procedure above. Refill the unit with coolant per the instructions in the Coolant section.

### CAUTION

Do not remove any fittings from the water chamber. The elbows could be damaged, and may be difficult to restore them to their original positions while keeping a water-tight seal. Check the switch for free operation. Flush and clean with mild detergent if necessary, and rinse thoroughly in clear water.

*Figure 8*  
*Wiring Diagram*



**Water Flow Switch**

To replace the safety control water flow switch, begin with the same process as described in the RF Resistor Load Disassembly section. Remove the flow switch carefully or damage to the connections and fittings may result.

1. With the top cover removed, and the unit drained of coolant, loosen the clamp bands on the hose connections going to the load water chamber output and the flow switch input. Remove the hoses and move them out of the way.
2. Remove the 18, 8-32 x 1/4" Phillips head screws in the perimeter of the pan panel assembly. Pull this panel out sufficiently towards the rear of the unit to gain access. Usually connection wires will not have to be disconnected.
3. Disconnect the wires that lead to the flow switch. One wire is connected to the thermoswitch located under the coolant reservoir tank. The other wire is disconnected at a connector in the wire harness.
4. Unscrew the input elbow to the flow switch, counterclockwise. The flow switch can be easily unscrewed counterclockwise, depending on the orientation of the output elbow on the load's water chamber. This elbow may have to be turned or possibly removed to allow the flow switch to swing freely when being unscrewed.
5. The flow switch is now free for repair or replacement.
6. Replace the flow switch and assemble the unit by reversing the disassembly directions given above. When replacing the flow switch on threaded fittings, coat only the external threads sparingly with an acceptable pipe sealant compound. Coating only the external threads reduces the chances of contaminating the coolant.

**Time Delay Relay**

The time delay relay is an integral component, factory set for the operation of an approximate 2 second delay, isolating the circuit relay. The relay is situated on the upper left inside of the front panel, mounted in an octal socket.

The relay cartridge cannot be disassembled or repaired in the field. A faulty unit should be replaced as follows:

1. Loosen the 8-32 pan head screw at the top of the relay clamp, to release the retaining prongs of the clamp.
2. Pull the delay relay cartridge straight out of the socket.
3. To install the new cartridge, put the center nib into the hole provided. Rotate until the key way is engaged, and push in.

## **Replace Fuse**

### **Preparation:**

- Observe general safety precautions.
  - Tools needed: Common hand tools; fuse puller
  - Disconnect ac power main.
1. Remove the fuse drawer from the ac receptacle.
  2. Lift up on the tab that secures the drawer with the flat blade of a screwdriver.
  3. Pull the drawer straight out.
  4. Use a fuse puller or a flat blade screwdriver to remove the fuse.
  5. Replace with the same type and rating fuse. i.e., 15 Amp for the 115V unit and 10 Amp for the 230V unit.
  6. Return the drawer to the receptacle.
  7. Reconnect the ac power main and check the unit for proper operation.

## **Load Resistor Internal Repair**

The entire load resistor unit need not be removed from the Moduload unit as a piece. It is simpler to disassemble it in place by the following procedure. While following these instructions refer to Figure 9.

1. Drain coolant from the equipment by unscrewing the drain plug from the lower back face of the equipment.
2. Remove the top panel of the unit. Unscrew the 18, 8-32 x 1/4" phillips head screws and remove the coolant filler plug. Lift the lid off by its handles.
3. Use a 5/64" hex wrench to remove the 8-32 x 1/8" socket set screw on the circumference of the water chamber assembly near the load housing seam.
4. Use a 7/16" end-wrench to unscrew the six 1/4-20 x 5/8" flange mounting screws from the inside of the front panel. Take the screws out to release the exterior flanges.
5. Use a leather strap type pipe wrench, or by twisting the housing flange on the outside of the front panel, turn the housing counterclockwise while firmly holding the water chamber and flow switch at the back. A little extra torque will break the initial screw compression, and the housing should screw off easily. Unscrew the housing until the threads are disengaged and pull it out of the front panel.

6. Temporarily reattach the outer conductor assembly to the load housing to prevent displacement of the center conductor assembly. Use two 1/4 -20 mounting screws placed through diametrically opposite flange holes, fastened finger tight.
7. The Load Resistor is ready to be repaired.

**Resistor Removal**

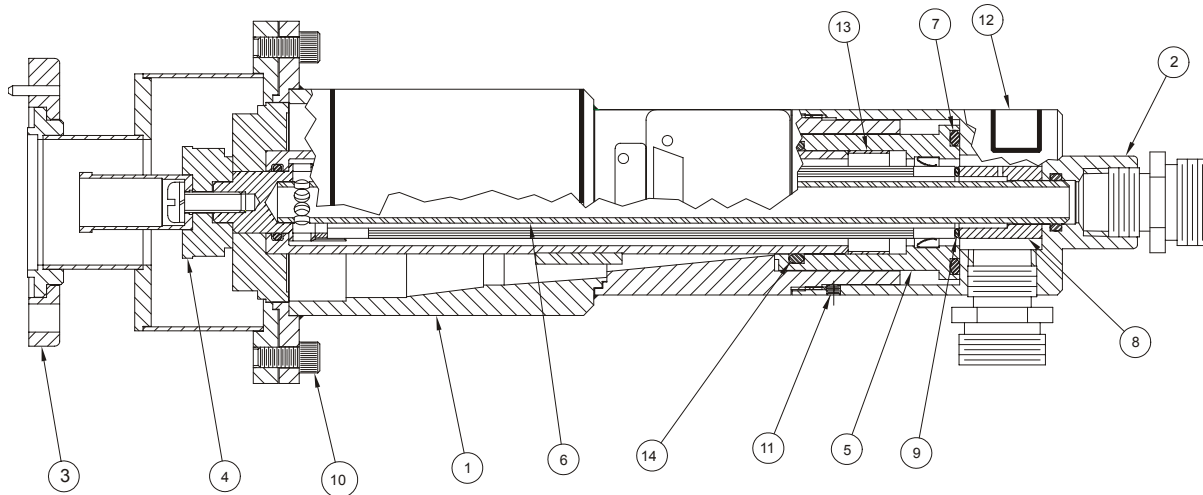
The removal of the resistor is to be done with the unit in a vertical position, connector end down.

1. The water chamber complex, of the load resistor assembly, and flow switch, with the attached adapters, may be dismounted, but it is not required or recommended. Do this only by unscrewing the wired sensor plug of the flow switch, with a 1-1/2 end-wrench. Do not disconnect the wiring. Follow the instructions provided earlier in this chapter for the entire load removal.
2. The O-Ring inlet seal in the water chamber may be removed and replaced if necessary.
3. Remove the retainer sleeve and O-Ring sleeve backup. The inner flow tube may be removed.
4. Grasp the resistor ground cap and remove it by pulling with a slight rocking motion. This will expose the end of the resistor.
5. The resistor should still be nested inside the resistor fitting. If the spacer ring is displaced, it will have to be repositioned.
6. Ensure the spacer ring is bottomed.

**Inspection**

Inspect the resistor and visible internal parts for damage. In most cases, even in the event of a resistor failure, the resistor substrate will remain intact. If so, continue the procedure in this section. Use the special procedure for the replacement of fractured resistors or damaged internal parts, as the condition of the resistor or internal parts require.

Figure 9  
Econoload - Cut away view




1. Housing / Ass'y
2. Chamber, Water / Ass'y
3. Conductor, Outer / Ass'y
4. Conductor, Center / Ass'y
5. Cap, Resistor / Ass'y
6. Tube, Flow, Inner
7. O-Ring
8. Contact, Sleeve
9. O-Ring
10. Cap Screw St. Stl.
11. Set Screw St. Park
12. Label, Water Chamber
13. Insulator, Sleeve
14. O-Ring


### Resistor Replacement

Take particular care of the outside surface of the resistor. Treat this surface gently, wiping with a soft cloth. Do not abuse it by firing, sanding, or using any abrasive action.

1. Insert the new resistor into the load housing until it reaches the resistor fitting.
2. Carefully rotate and rock the resistor until it starts to enter its way into the resistor fitting. Push the resistor into the fitting until it bottoms on the spacer ring. Ensure the spacer ring is in the

proper place. If the resistor seems to be loose, refer to the procedure for the replacement of fractured resistors or damaged internal parts below for instructions on how to tighten the resistor fitting.

3. If damaged, replace the inner flow tube. If undamaged, place the original flow tube 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 resistor fitting.
  4. Place the resistor ground cap on the exposed end of the resistor, and press it into place. Slide the O-Ring down the inner flow tube until it rests on the end of the resistor.
  5. Slide the retainer sleeve down the inner flow tube until it rests on the O-Ring, ensuring that the end of the retainer sleeve with the larger inside diameter goes on first.
  6. Check the O-Ring inlet seal to see that it is properly seated in its groove in the inside of the water chamber subassembly.
-  Note: Normally, the water chamber will not have been dismantled. Be sure the screws are removed from the flange connecting the outer conductor assembly.
7. Place the resistor housing through the front panel opening, and into the water chamber. Gently turn the housing clockwise to thread it on, eventually bottoming it in its original position.
  8. Reverse the procedure of the RF Load Dismounting paragraph, to restore the original condition. Do not replace the top panel until after this section is completed.
  9. Check the DC resistance between the outer and inner conductors; it should be approximately 50 ohms. Refer to the Measure DC Resistance section, and Figure 7.
  10. If the resistance check passes, fill the unit with coolant, performing the flush out procedures of the RF Load Dismounting section, and check for leaks.

 Note: After the completion of this or any of the resistor repair procedures, perform a 10 kW test on the ac line power. Perform this test with the Moduload unit in operation for at least one-half hour, and check the DC resistance before RF load use.

## Replacement of Fractured Resistor or Damaged Internal Parts

**Resistor Removal**      The load should already be disassembled to the point of the Resistor Removal section, step 5.

1. Turn the load on end, with the RF input connector up, to allow debris, if present, to fall out of the load housing.
2. Loosen and remove the 1/4-20 x 5/8 inch hex head screws from the flanged end of the load housing assembly as shown in Figure 9.
3. Remove the outer conductor assembly.
4. Remove the input center conductor assembly by pulling it out of the load housing assembly.

**Input Center  
Conductor  
Assembly**

Refer to Figure 10 while following the instructions below.

Model 8730A, (used in the Model 8635), 1-5/8 inch EIA flanged input connector only.

1. Remove the 1/4-20 x 3/4 inch pan head machine screw and 1/4 inch split lockwasher by unscrewing the screw while holding the center conductor stationary.
2. Remove the center conductor, the center conductor adapter, and the insulator from the rest of the assembly.
3. Remove the resistor fitting by pushing the exposed end of the fitting into the outer flow tube. The resistor fitting and any broken pieces of resistor will fall from the opposite end of the outer flow tube.
4. Inspect all O-Ring seals, metal and internal parts for damage. The metal parts may be discolored or oxidized and may be cleaned by rubbing them with fine abrasive cloth or silver cleaner. The Teflon parts can be cleaned with detergent and water. If any of the internal parts are damaged, they must be replaced to ensure proper electrical and/or thermal performance of the load.
5. Insert the replacement resistor into the resistor fitting. If the fitting is loose press the slotted finger contacts of the fitting together slightly and try the resistor again. Continue this procedure until a snug fit is obtained.
6. Reassemble the center conductor assembly by first replacing the outer flow tube seal O-Ring. If needed, insert the resistor and resistor fitting in position in the outer flow tube.
7. Replace Insulator center conductor adapter, and center conductor. Tighten in place with 1/4-20 x 3/4 Inch pan head machine screw and 1/4 inch split lockwasher.

Model 8731-101 Load (used in Model 8631), 3-1/8 inch EIA flanged and Model 8738-101 Load (used in Model 8638), 3-1/8 inch unflanged input connector.

1. Loosen and remove the 3/8-16 hex nut, and the 3/8" split lockwasher with a 9/16 socket or nut driver while holding the center conductor stationary.
2. Remove the center conductor and the insulator, for Models 8731 and 8738.
3. Remove the resistor fitting by pushing the exposed threaded end of the fitting into the outer flow tube. The resistor fitting and any broken pieces of resistor will fall from the opposite end of the outer flow tube.
4. Inspect all internal parts and O-Ring seals for damage. The metal parts may be discolored or oxidized and may be cleaned by rubbing them with fine abrasive cloth or silvercleaner. The Teflon parts can be cleaned with detergent and water. If any of the internal parts are damaged, they must be replaced to ensure proper electrical and/or thermal performance of the load.
5. Insert the replacement resistor into the resistor fitting. If the fitting is loose press the slotted finger contacts together slightly and try the resistor again. Continue this procedure until a snug fit is obtained.
6. Reassemble the input center conductor assembly by first replacing the outer flow tube seal O-Ring, if necessary.
7. Insert the resistor fitting in position in the outer flow tube.
8. Replace insulator and center conductor for Models 8731 and 8738. Tighten in place with the 3/8-16 hex nut and 3/8" split lockwasher.

**Final Assembly**

1. Replace the input center conductor assembly by lowering it into the flanged end of the load housing assembly, and pressing it into place.
2. Remount the outer conductor assembly, for Models 8730, 8731 or 8738, by placing the flange with the threaded holes against the flange of the housing assembly. Tighten the six 1/4-20 x 5/8" hex head cap screws securely.
3. Continue with the Resistor Replacement Instructions, given earlier in this chapter.

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

Figure 10  
Center Conductor Assemblies

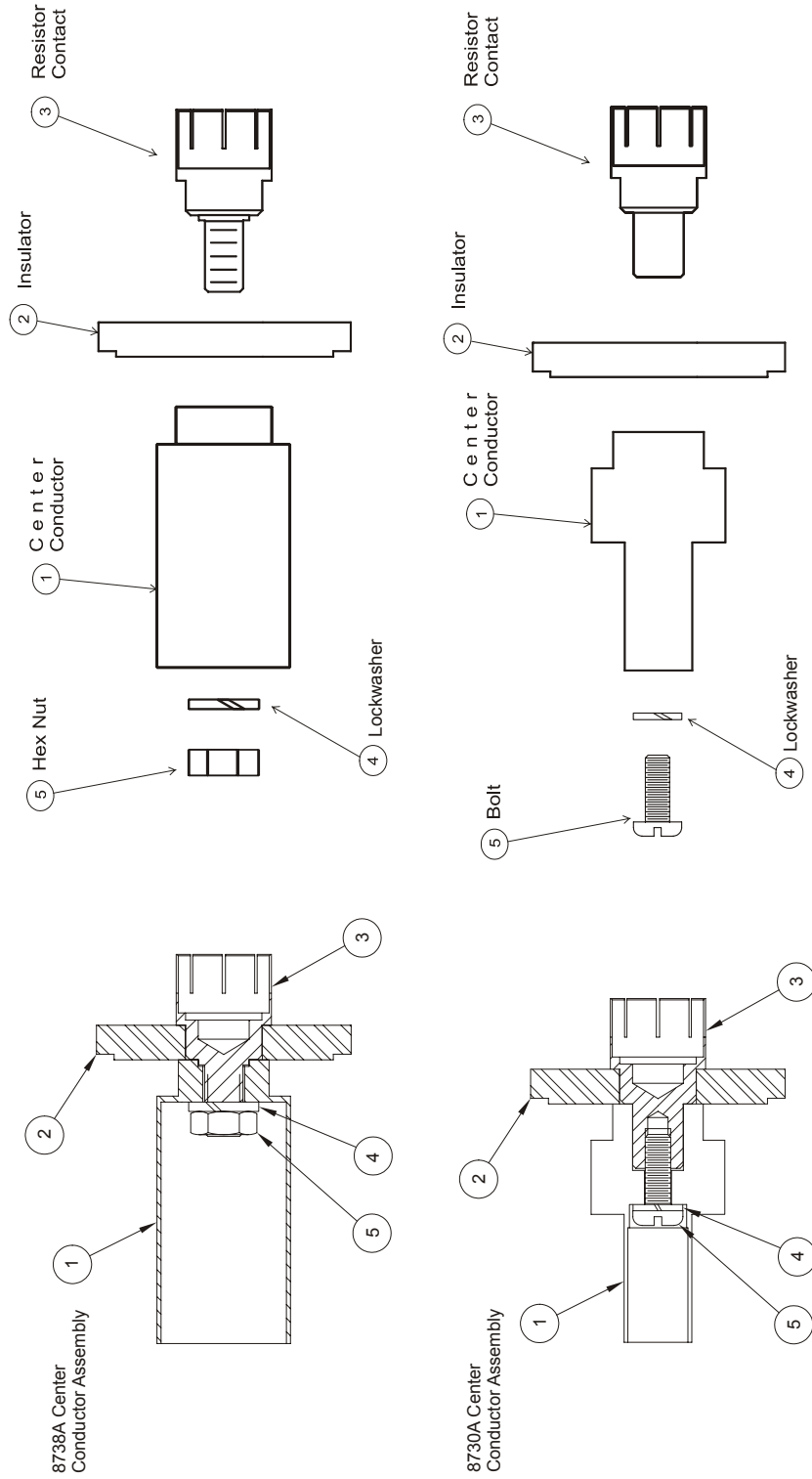


Figure 11  
Schematic Diagram, 10 kW Moduload, 115 V, 50/60 Hz Supply

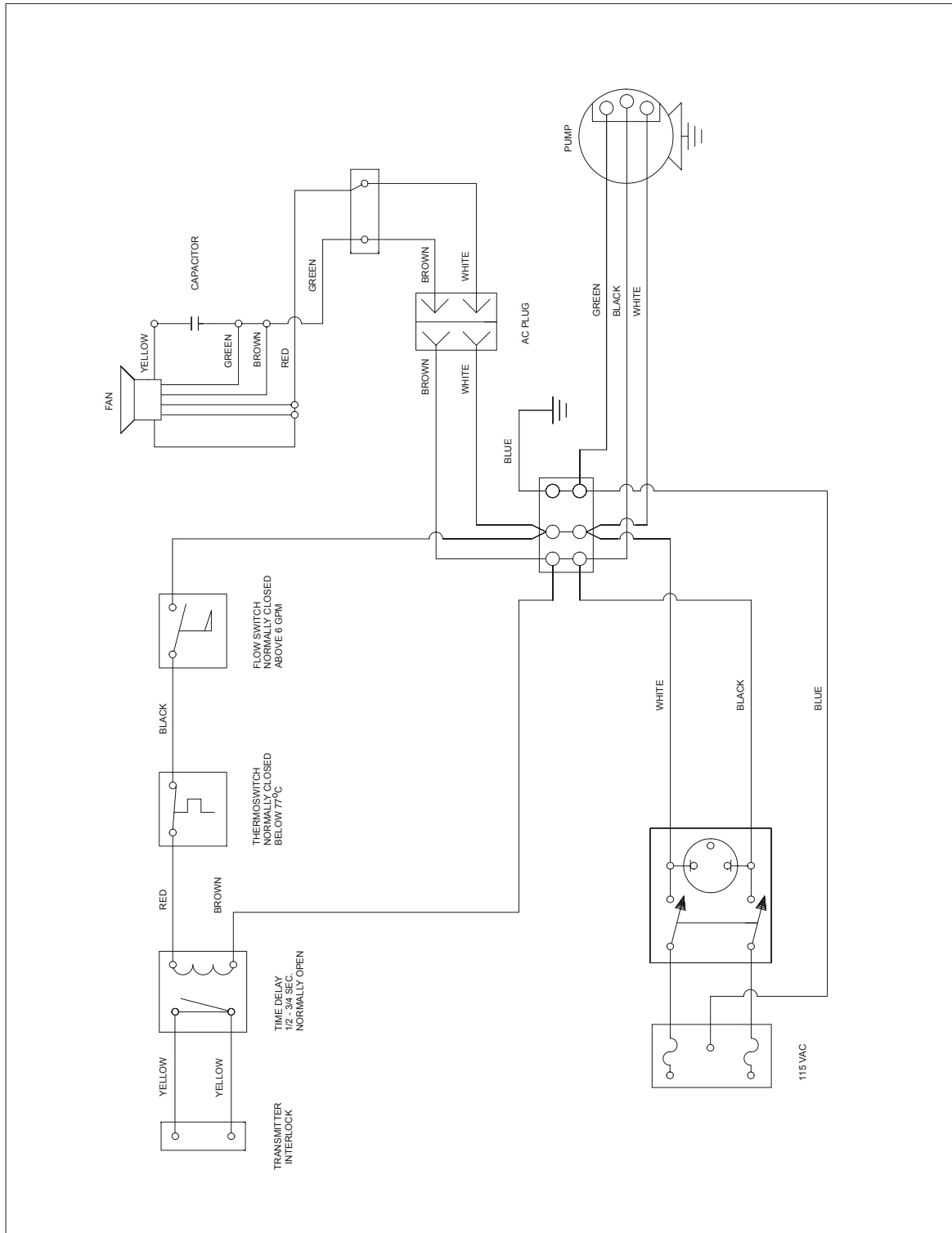
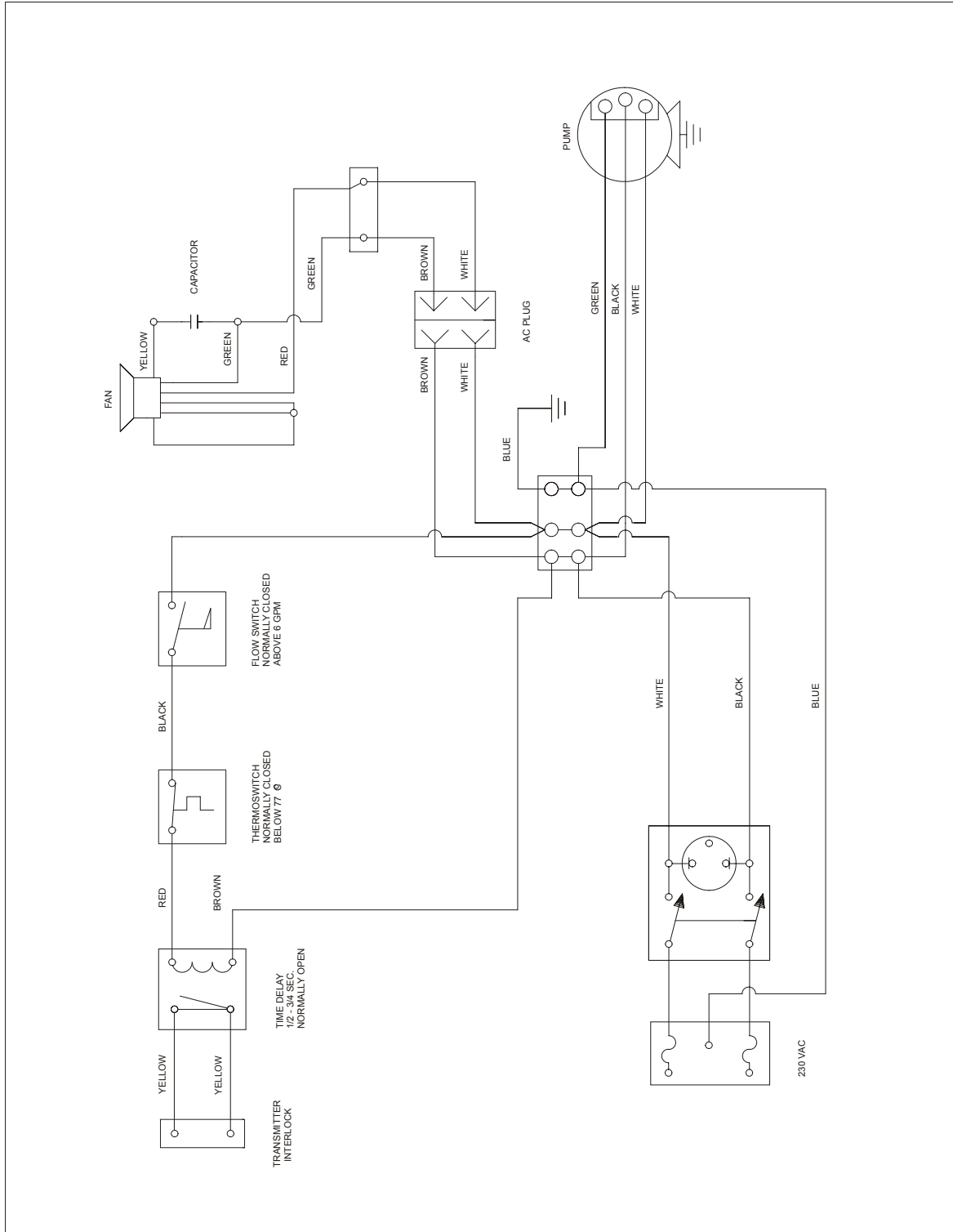


Figure 12  
Schematic Diagram, 10 kW Moduload, 230 V, 50/60 Hz Supply



## Storage and Shipment

### Storage

#### CAUTION

Before storing the unit, follow the storage instructions in the Storage section of the Maintenance chapter. Failure to follow the instructions may result in damage to the unit.

If the unit is to be stored it should be stored filled with coolant if possible. If storing the unit filled is not possible, drain the unit following the drainage instructions below.

### Drainage

If the unit is to be stored partly drained or fully drained for two weeks or longer, follow the drainage instructions below.

1. Flush the system as described in the manual five times if the coolant has had any ethylene glycol added. Otherwise, flush the system a minimum of one time per the manual.
2. With the unit in a level position, remove the drain plug and allow the fluid to drain from the system.
3. Tip the unit approximately 10 degrees from vertical, once each side, to move more fluid out the drain opening.
4. Attach a fitting to the top of the expansion tank and plumb clean, dry, filtered air regulated to 20 psi.
5. Allow air to purge the Moduload until relative humidity of output is <20%.
6. Plumb a source of clean, dry nitrogen gas to the expansion tank fitting with a regulator set to 5-9 psi.
7. Allow nitrogen to purge the Moduload until relative humidity of output is <15%.
8. Disconnect nitrogen supply and fittings from the Moduload. Reinstall drain plug and expansion tank cap.

### Shipment

#### CAUTION

Before shipping the unit, follow the shipping instructions in the Maintenance chapter. Failure to properly prepare the unit for shipping may result in damage to the unit.

If the unit is to be shipped, prepare the unit for shipping using the drainage procedure below.

1. Flush the system as described in the manual five times if the coolant has had any ethylene glycol added. Otherwise, flush the system a minimum of one time per the manual.
2. With the unit in a level position, remove the drain plug and allow the fluid to drain from the system.
3. Tip the unit approximately 10 degrees from vertical, once each side, to move more fluid out the drain opening.
4. Attach a fitting to the top of the expansion tank and plumb clean, dry, filtered air regulated to 20 psi.
5. Allow air to purge the Moduload until relative humidity of output is <20%.
6. Plumb a source of clean, dry nitrogen gas to the expansion tank fitting with a regulator set to 5-9 psi.
7. Allow nitrogen to purge the Moduload until relative humidity of output is <15%.
8. Disconnect nitrogen supply and fittings from the Moduload. Reinstall drain plug and expansion tank cap.

When shipping the Moduload, use the original shipping package if possible. If the original package is not available, use a heavy duty corrugated box with shockabsorbing material around all sides of the unit to provide firm cushioning, and to prevent movement in the container. The container should be properly sealed.

## Customer Service

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

If you need to return the unit for any reason, contact the Bird Service Center for a return authorization. All instruments returned must be shipped prepaid and to the attention of Bird Service Center.

### **Bird Service Center**

30303 Aurora Road  
Cleveland (Solon), OH 44139-2794  
Phone: (440) 519-2298  
Fax: (440) 519-2326  
E-mail: [bsc@bird-technologies.com](mailto:bsc@bird-technologies.com)

For the location of the Sales Office nearest you, give us a call or visit our Web site at: <http://www.bird-electronic.com>

## Specifications

<b>Frequency Range</b>	1 kHz to 1000 MHz
<b>Power Rating</b>	10 kW Maximum
<b>Impedance, Nominal</b>	50 ohms
<b>VSWR</b>	1.1 to 1.0
<b>Modes</b>	CW, AM, FM, SSB, & TV
<b>Connectors</b>	
Model 8631 <sup>1</sup>	3-1/8" EIA flanged
Model 8635 <sup>1</sup>	1-5/8" EIA flanged
Model 8638 <sup>1</sup>	3-1/8" Unflanged
<b>AC Power</b>	
	115 VAC @ 9 Amps, 50/60 Hz
	230 VAC @ 4.5 Amps, 50/60 Hz
<b>Ambient Temperature</b>	
With 100% distilled water as coolant	+5°C to +45°C (+41°F to +95°F)
With 35% ethylene glycol as coolant	-20°C to +35°C (-4°F to +95°F)
<b>Operating Position</b>	Horizontal only
<b>Dimensions, Nominal</b>	22-1/8" L x 15-13/16" W x 15-15/16" H (562 x 402 x 405 mm)
<b>Weight, Nominal</b>	113 lb with distilled water (51.3 kg) 103 lb without water (46.7 kg)
<b>Finish</b>	Grey Powder Coat

- 1 Suffix - 115 added for 115 V, 60 Hz, 9 Amp, single phase  
 Suffix - 230 added for 230 V, 50 Hz, 4.5 Amp, single phase  
 Suffix - 115-5 added for 115 V, 50 Hz, 9 Amp, single phase  
 Suffix - 230-6 added for 230 V, 60 Hz, 4.5 Amp, single phase

## Replacement Parts

### Model 8630 Series Moduload RF Load

DESCRIPTION	QTY	PART NUMBER
RF Load Resistor Model 8631 Model 8635 Model 8638	1	8731-101 8730A051 8738-101
Power Switch (illuminated) - 115V - 230V	1	5-1842-1 5-1842-2
AC Power Receptacle	1	5-1844
Fuse 115V Model 15amp 3AB Time-Delay MDA 15 230V Model 8amp 3AB Time-Delay MDA 8	2	5-1828-36 5-1828-33
Power Cord 115 V 230 V	1	5-1836 5-1837
Fan Guard	6	5-1923
Fan Motor Assembly 115V 230V	1	8630-644-1 8630-644-2
Fan Starting Capacitor	1	5-873-2
Pump/Motor Unit 115 / 230VAC, 60 Hz. 115 / 230VAC, 50 Hz.	1	5-1053-1 5-1053-2
Flow Switch Assembly	1	8630-108
Time Delay Relay: 115V Model 230V Model	1	5-1627 5-1625
Relay Socket	1	8640-651
Over Temperature Thermoswitch	1	8630-013
Coolant Tank Assembly	1	8630-102
Filler Plug	1	8630-038
Silicone Rubber Hose, 5/8" diameter	1	**8630-065
Filler Plug Seal (O-Ring)	1	5-814
Carrying Handle (kit)	2	5-375
Silicone Rubber Hose, 3/4" diameter	1	**8640-064
Drain Plug	1	8640-036
Drain Plug Seal (O-Ring)	1	5-428
Hose Clamp, 5/8"	8	5-681
Hose Clamp, Diamond 3/4"	2	5-742
Breather Vent	1	5-1350
Drain Body Assembly	1	8630-099

Coolant Gauge Body	1	5-1200
Pump Inlet Fitting Assembly	1	8650-081
Relay Retaining Clamp	1	8630-193
Load, Outlet - elbow	1	8630-175
Pump Outlet Tube Assembly	1	8630-176
Flow Switch Inlet Fitting (elbow)	1	8630-033
Flow Switch to Load Fitting (elbow)	1	8630-178
Interlock Terminal Strip	1	5-768-2

\*\*Measure hose length when ordering.

For All -N Models

DESCRIPTION	QTY	PART NUMBER
Fan Panel Assembly: 115V 230V	1	8630-172-3 8630-172-4
Fan, Service Assembly: 115V 230V	1	8630-644-3 8630-644-4
Fan Propeller	1	5A2457

**Model 8630 Series** Models 8731-101, 8738-101, and 8730A051 Load Resistors for the Moduload Loads

DESCRIPTION	QTY	PART NUMBER
Resistor	1	8731-031
Resistor Ground Cap Rear Seal O-Ring	1	5-176
Water Chamber Subassembly	1	8731-025
Inlet Seal O-Ring	1	5-430
Retainer Sleeve	1	8731-023
Sleeve Backup O-Ring	1	5-1142
Inner Flow Tube	1	8731-022
Resistor Ground Cap	1	8731-007
Housing Assembly	1	8731-002
Resistor Ground Cap Internal Seal O-Ring	1	5-187
8-32 x 1/8" Cup Point Socket Set Screw	1	1128-0201-25
Outer Flow Tube	1	1128-0201-25
Outer Flow Tube Seal O-Ring	1	5-099
Insulator	1	8731-018

Front Connector Parts are Assigned Per Model Type Below:

Model 8635 Load — 8730A051 - 1-5/8" EIA Flanged Connector - 50 ohms

DESCRIPTION	QTY	PART NUMBER
Center Conductor Assembly	1	8730-003
Resistor Fitting	1	8730-008
Center Conductor Adapter	1	8730-009
Center Conductor	1	8730-010
Outer Conductor Assembly	1	8730-002
1/4-20 x 3/4" Pan Head Machine Screw	1	8730-002
1/4" Split Lockwasher	1	Standard

Model 8631 Load — 8731-101 - 3-1/8" EIA Flanged Connector - 50 ohms

DESCRIPTION	QTY	PART NUMBER
Center Conductor Assembly	1	8731-005
Resistor Fitting	1	8731-017
Center Conductor	1	8731-015
3/8-16" Hex Nut	1	Standard
3/8" Split Lockwasher	1	Standard
Outer Conductor Assembly	1	8731-004

Model 8638 Load — 8738-101 - 3-1/8" Unflanged Connector - 50 ohms

DESCRIPTION	QTY	PART NUMBER
Center Conductor Assembly	1	8738-003
Resistor Fitting	1	8731-017
Center Conductor 3/8-16" Hex Nut	1	Standard
3/8" Split Lockwasher	1	Standard
Center Conductor	1	8738-005
Outer Conductor Assembly	1	8738-002

For all Models

DESCRIPTION	QTY	PART NUMBER
Resistor Spacer Ring	1	8731-008
1/4-20 x 5/8" Hex Head Cap Screw	6	1121-1008-00

## **Limited Warranty**

All products manufactured by Seller are warranted to be free from defects in material and workmanship for a period of one (1) year, unless otherwise specified, from date of shipment and to conform to applicable specifications, drawings, blueprints and/or samples. Seller's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by Seller.

If Seller's products are claimed to be defective in material or workmanship or not to conform to specifications, drawings, blueprints and/or samples, Seller shall, upon prompt notice thereof, either examine the products where they are located or issue shipping instructions for return to Seller (transportation-charges prepaid by Buyer). In the event any of our products are proved to be other than as warranted, transportation costs (cheapest way) to and from Seller's plant, will be borne by Seller and reimbursement or credit will be made for amounts so expended by Buyer. Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing within ten (10) days from the date of discovery of the defect.

The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's specifications. Routine (regularly required) calibration is not covered under this limited warranty. In addition, Seller's warranties do not extend to the failure of tubes, transistors, fuses and batteries, or to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to Seller.

The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR SELLER ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.