



MODULOAD[®] RF LOAD RESISTOR
SERIES 8630 AND 8630B

OPERATION MANUAL

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INSTRUCTION BOOK P/N 920-8630S REV. J

MODULOAD[®], ECONOLOAD[®], ECONOLINE[®], AND THRULINE[®] ARE
REGISTERED TRADEMARKS OF BIRD ELECTRONIC CORPORATION

Safety Precautions

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

WARNING
Keep Away From Live Circuits
Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

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




WARNING
Do Not Service Or Adjust Alone
Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

WARNING
Safety Earth Ground
An uninterruptible earth safety ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

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

WARNING
Remove Power
Observe general safety precautions. Do not open the instrument with the power on.

Safety Symbols

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

On page 6.

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.

On pages 9, 11, 15, and 18.

WARNING
Disconnect from RF power sources and the AC line before any disassembly or service.
Electrical shock hazard.

On page 16.

Caution Statements

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

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

On page 4.

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

On page 5.

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.

On page 6.

CAUTION
Operation without sufficient coolant can damage the unit.

On page 7.

CAUTION
Do not run the pump too long, as partially dry operation may damage its mechanism.

On page 7.

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.

On page 8.

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.

On page 8.

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

On page 11.

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

On page 11.

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.

On page 11.

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.

On page 12.

CAUTION
Incorrect hose connections will reverse coolant flow and could destroy the load.

On page 16.

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.

On page 19.

CAUTION

Do not abuse the outside surface of the resistor by firing, sanding, or using any abrasive action.

On page 25.

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.

On page 32.

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.

On page 33.

Safety Statements

USAGE

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

USO

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

BENUTZUNG

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

UTILISATION

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

IMPIEGO

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

SERVICE

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

SERVICIO

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

WARTUNG

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

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

ENTRETIEN

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

ASSISTENZA TECNICA

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

About This Manual

This manual covers the operating and maintenance instructions for the following models:

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		

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

Changes to this Manual

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

Terminology

There are some unique terms used throughout this literature. They are defined here clarify any misunderstanding.

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.

Chapter Layout

Introduction — Describes the features of the RF Load Resistor, lists equipment supplied and optional equipment, and provides power-up instructions.

Installing and Operating Instruction — Describes the features of the Econoload RF Resistor and its process of operation

Performance Specifications — Lists all the limits and specifications of the RF Load Resistor.

Maintenance — Lists routine maintenance tasks as well as troubleshooting for common problems. Specifications and parts information are also included.

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This publication refers to the Moduload RF Load Resistor Series 8630 and 8630B. 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 and 8630B 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 and 8630B 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 and 8630B 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 and 8630B 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 and 8630B Series loads are equipped with standard RF connectors.

- Model 8630 and 8631B — 3-1/8 inch EIA flanged connector.
- Model 8630 and 8635B — 1-5/8 inch EIA flanged connector.
- Model 8630 and 8638B — 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.

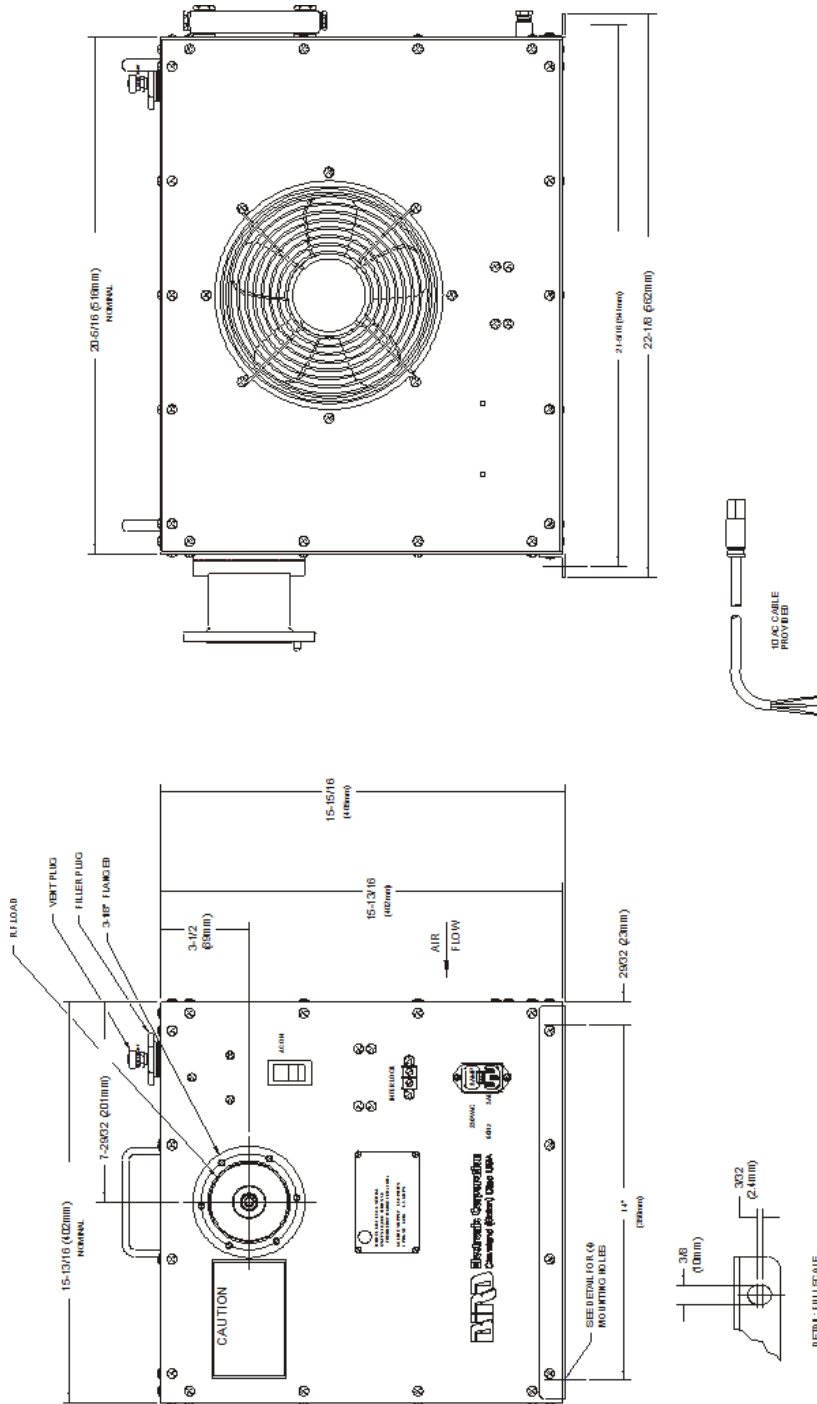
Tools and Test Equipment

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.

Optional Items

Dolly, P/N 6771-011 — For ease in moving the load. Consult Bird Electronic Corporation for more information.

Figure 1 Bird 8630 and 8630B Series Outline Drawing



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 "[Maintenance](#)" on page 13).

Heat Transfer

The 50 ohm resistor consists of a substrate which has a permanently deposited resistive film, covered by a thin layer of electrically non-conductive 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 thermostwitch, normally closed at or below +85°C (+185°F) for the 8630 series and at or below +79°C (+174°F) for the 8630B series, 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 and 8630B 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 shipping container for signs of damage.
 - If the shipping container is damaged, do not unpack the unit. Immediately notify the shipping carrier and Bird Technologies.
 - If the shipping container is not damaged, unpack the unit. Save shipping materials for repackaging.

2. Inspect unit for visual signs of damage.

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

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 and 8630B. 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 .

[Figure 2](#) and [Figure 3](#) show 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.

Ingredient	1 Gal. (3.78 L)	5 Gal. (18.9 L)
Distilled Water	5.6 lb (2.54 kg)	28.0 lb (12.7 kg)
Ethylene Glycol	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.

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

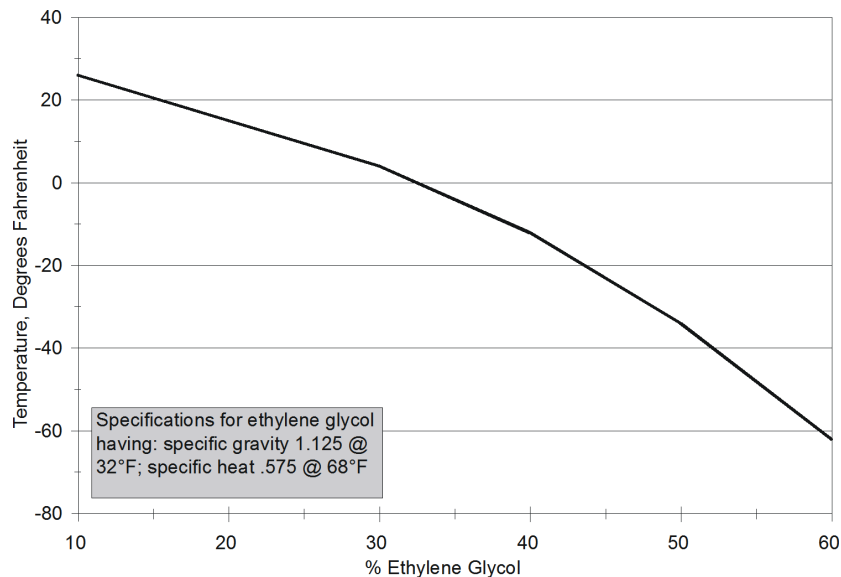
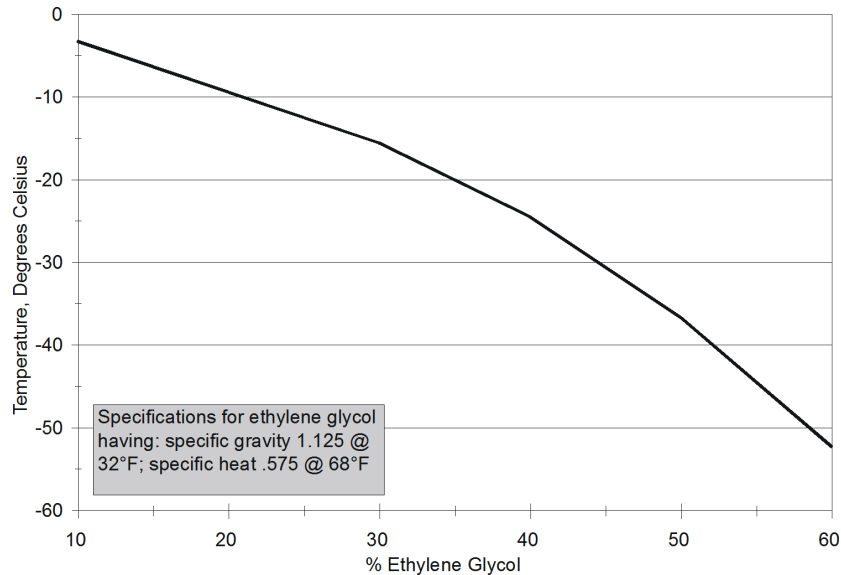


Figure 3 Freezing Point of Ethylene Glycol /Water Mixture °C



Filling Coolant Reservoir

The Bird 8630 and 8630B 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. Ensure the drain plug is in place.
2. Check that the hose connections are correct and properly tightened.
3. Remove the filler cap on top of the unit.
4. Pour approximately 4 pints (2.0 Liters) of coolant in the unit.
5. 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.

CAUTION
Do not run the pump too long, as partially dry operation may damage its mechanism.

Note: A convenient method is to watch the coolant level through the reservoir filler. Stop the pump when the coolant level approaches the bottom of the tank.

6. 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.

Note: 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.

7. Run the unit for about five minutes to remove any trapped air in the system.
8. 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/in². 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 contaminants 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.

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.

Note: Use number 22 AWG (or heavier) wire for interlock connections.

1. Attach solder-less 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 and 8630B Series models the connections are as follows:

Model 8631 and 8631B

Model 8631 and 8631B - 3-1/8" EIA, 50 ohm, swivel flanged. Refer to [Figure 4](#) while following the instructions below.

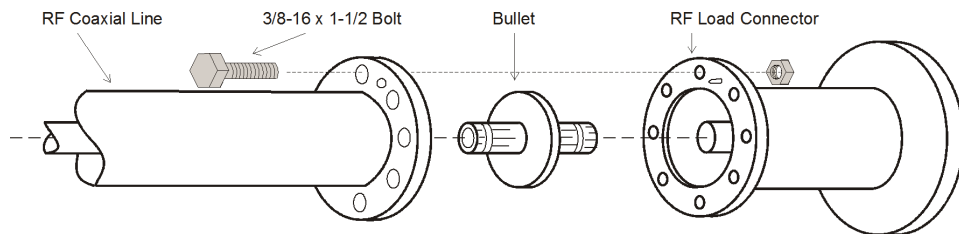
Note: Use 3-1/8" EIA Coupling Kit, Bird P/N 4600-020, which includes six 3/8-16 x 1-1/2" bolt and nut sets, O-Ring, and insulated center bullet.

1. Insert the center bullet
2. Push the bullet into seat insulator in facing.
3. Install the O-Ring in the groove if required.
4. Connect the coaxial input in a straight line.
5. Push in carefully to close.

Note: The swivel flange on the load makes connection independent of a fixed flange on the coaxial input line.

6. Insert bolt sets around the flange connection, and tighten evenly.

Figure 4 Connecting RF Power Model 8631 and 8631B



Model 8635 and 8635B

Model 8635 and 8635B - 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 and 8631B. Refer to the paragraph Connecting RF Power - Model 8631 and 8631B, above.

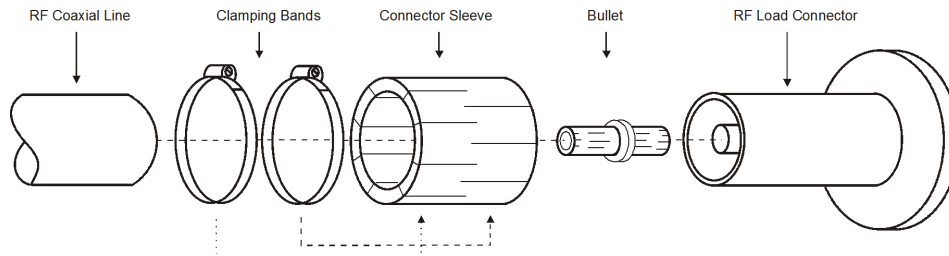
Model 8638 and 8638B

Model 8638 and 8638B - 3-1/8" unflanged, 50 ohm impedance. Refer to [Figure 5 on page 10](#) 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 and 8638B



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

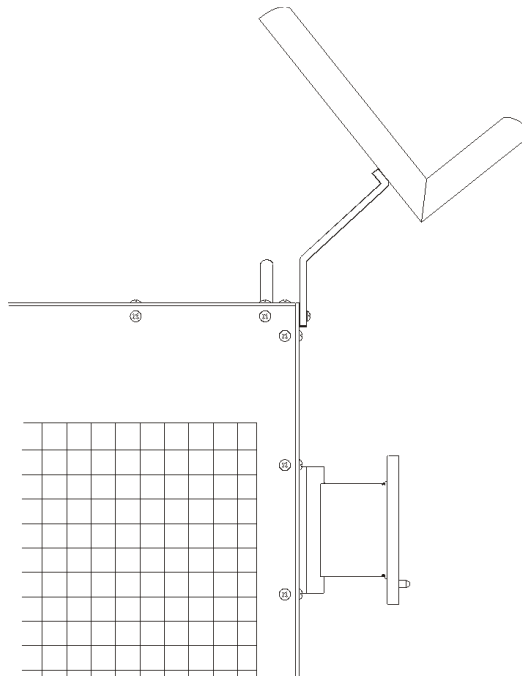
Accuracy: 1 percent at 50 ohms, ± 1 digit

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 head screws (supplied). Refer to [Figure 6](#).

Figure 6 Meter Rack Assembly



**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 and 8630B loads have no operating controls, other than the ON/OFF switch; therefore, they do not require an operator in attendance. The 8630 series is 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 "[Installation](#)" on page 5. The 8630B series is equipped with one indicator which is the coolant level gauge, referred to in "[Installation](#)" on page 5.

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 "[Installation](#)" on page 5.

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 of 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 and 8630B 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.

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 thermostwitch	Check thermostwitch
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.

Note: *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 self-drying contact cleaner that leaves no residue on the inaccessible portions.

General Maintenance

RF Assembly Resistance Test

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

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 resistance over time. Tracking the DC resistance should start *before* the unit is first put into service. Perform the following steps and record the value for future comparison. Resistance measurements should be taken periodically according to use.

Preparation:

- Tools: Common hand tools.
- Ohmmeter with an accuracy of $\pm 1\%$ at 50 ohms (or use a resistance bridge).
- Use low resistance leads, preferably a short piece of 50 ohm coaxial cable fitted with an appropriate connector or alligator clips.
- Temperature of the load should be stabilized between 20°C to 25°C (68°F to 77°F).

DC Resistance Measurement

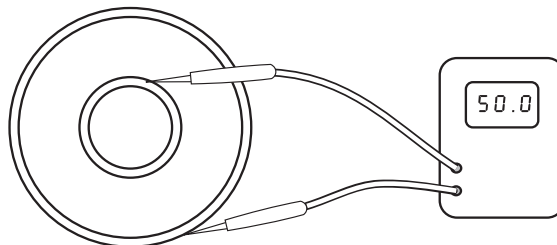
WARNING

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.

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

1. Turn off RF power and interlock circuitry before making any disconnections.
2. Disconnect the RF coaxial line.
3. Connect the multimeter test leads across the center and outer conductor of the load resistor. See [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 *Measuring DC Resistance*



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

Note: Do not lose the spring and sliding valve on the sensor plug stem.

4. Reverse the above steps to assemble.

Note: The component is non-repairable 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.

Note: If the unit is to remain fully or partially drained for two weeks or more, [see "Storage" on page 32](#).

WARNING

Disconnect from RF power sources and the AC line before any disassembly or service.
Electrical shock hazard.

CAUTION

Incorrect hose connections will reverse coolant flow and could destroy the load.

Normal Coolant Flush

As scheduled maintenance or If the coolant is contaminated, old and needs to be replaced, the system should be thoroughly flushed.

1. Drain the circulating system as completely as possible.
2. Fill the unit with fresh, clean, distilled water.
3. Run the load with coolant but without RF power applied for a period of five minutes.
4. Drain and discard the water.
5. Repeat the Steps 2 - 4 until the drained liquid is clear.
6. Fill the unit with distilled water and/or approved ethylene glycol mixture per ["Coolant" on page 6](#).

Coolant Flush after Load Replacement

Prior to installing a repaired load or a new load the cooling system needs to be flushed to remove any debris or containments that may remain when a damaged load is removed.

1. Open the drain plug.
2. Drain and discard the coolant.
3. Close drain plug.
4. Connect a suitable hose from the outlet of the pump to a drain or container to hold the discarded coolant.
5. Connect a second hose from the inlet of the heat exchanger to a source of clean potable water.
6. Open the fill cap.
7. Turn on water source and allow the tank to fill.
8. Replace the fill cap.
9. Leave the water source on and allow the system to flush for 1 to 3 minutes.
10. Turn the water source off.
11. Reverse the position of the hoses.
12. Flush the system with the water flowing in the opposite direction for 1 to 3 minutes.
13. Repeat steps 9 - 12 until there are no signs of debris or contaminants in the water being discharged.
14. Remove the hoses.
15. Reinstall the load.
16. Fill the unit with distilled water and/or approved ethylene glycol mixture per "[Coolant](#)" on page 6.

Repair

The series 8630 and 8631B, 8635 and 8635B, 8638 and 8638B 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 / 8631B and 8635 / 8635B** — Flanged, loosen and remove the 3/8-16 bolt and nut sets that secure the flanges. Refer to [Figure 4](#).
 - **Model 8638 and 8638B** — 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.
4. Take off the top panel by removing the 18 screws around its perimeter. Lift off the top panel assembly by the handles.
5. 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.

6. 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.
7. Remove the hoses.
8. Do one of the following:
 - **On the 8630** - Loosen the hex collar on the flow switch assembly and remove the collar and sensor from the flow switch body.
 - **On the 8630B** - Disconnect the flow switch wires at their in-line connectors. The output elbow on the side of the water chamber can now be removed by unscrewing counterclockwise.
9. 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.

10. Temporarily reattach the outer conductor to the load body. Use two or three of the 1/4-20 bolts (finger tight) for this purpose.
11. Tip up the unit at the back enough to unscrew the flow switch counterclockwise.

Note: The input elbow on the water chamber can be taken off after the load is removed through the front panel.

Note: 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.

12. Replace the load resistor by reversing this 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. Do one of the following:
 - **On the 8630** - Release the fan panel by removing the 18 pan head screws surrounding it.

Note: *When free, it should not be necessary to detach the terminal block connections to the fan; lay the panel to the side.*
 - On the 8630B:
 - a. Disconnect the two flow switch connectors, the two quick-connects from the thermostwitch, the orange wire from the front panel terminal block, and the red wire from the time delay relay.
 - b. Disconnect the fan power cable connector.

Note: *Be sure to note the location of each wire for reassembly. The fan panel may now be removed by removing the 18 pan head screws that attach it to the unit.*
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.

Note: *Make note of, or mark, all wire connections before detaching.*
5. Detach the 3-wire cable from the 3-lug terminal block on the inside of the front panel.

Note: *For reference, the color codes of the motor supply wires generally match the twist-lock (8630) or the power (8630B) input wires, with the green going to the blue (8630) or the green/yellow (8630B) ground wire from the socket (8630) or the power entry module (8630B). Refer to [Figure 8](#).*
6. Release the hose clamp nearest the pump on the input hose.
7. Loosen the hose from the 90° input elbow at the center of the helical pump head. In the same manner.
8. Loosen the output hose from the straight-up fitting on the pumps helical outlet.
9. 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
10. Remove the two 3/8-16 nuts from the base studs holding the motor feet using a 9/16" hex socket extension wrench or a small flat-end wrench.
11. Lift the motor slightly to clear the studs, then carefully inch the pump assembly forward while detaching the hoses.

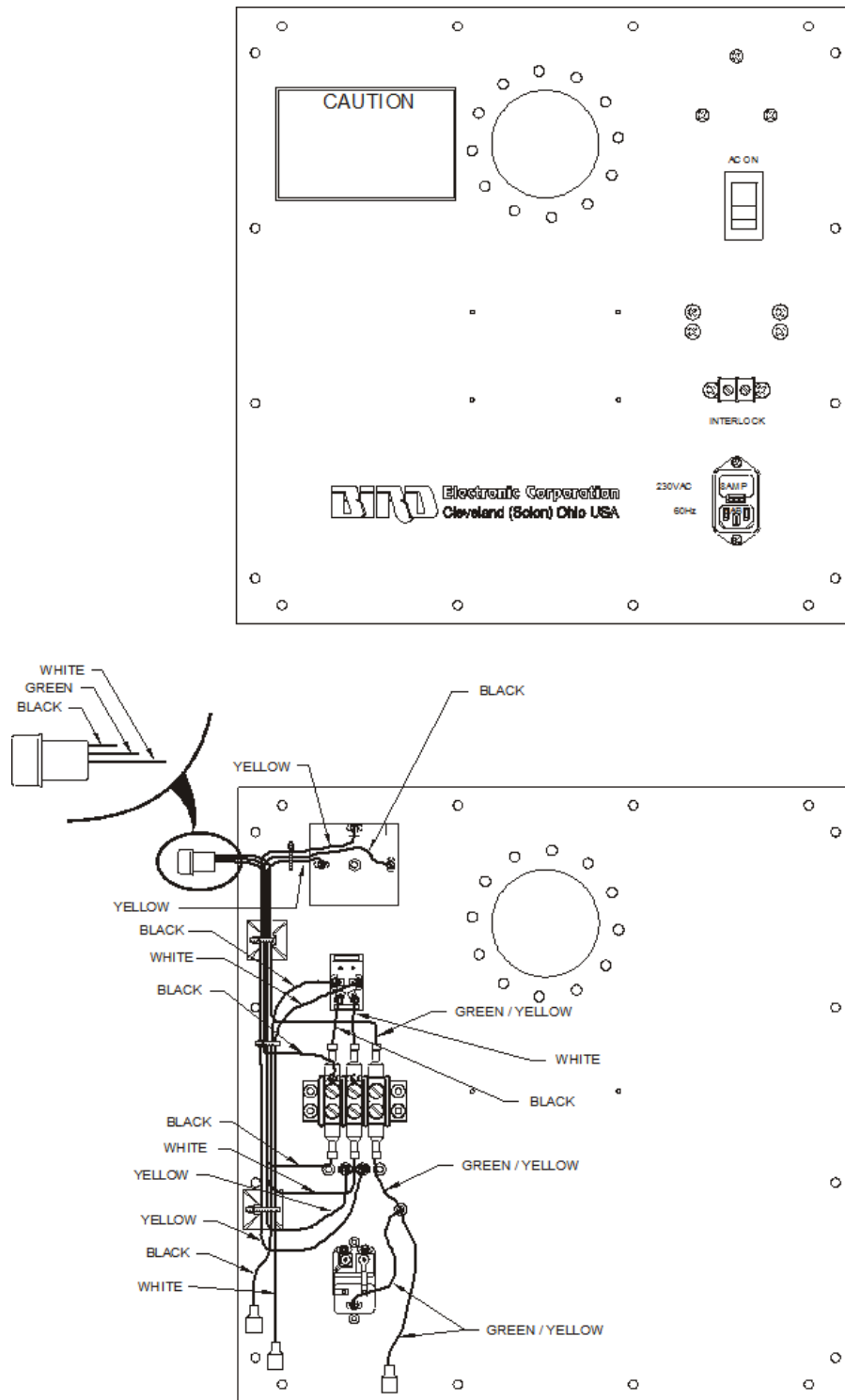
Note: *The freed assembly may be lifted from the equipment out the open side. Remove the wires, if needed, but make note of the connections for assembly.*

Note: *Record the positions of the fittings. Observe the slight downward tilt of the 90° input elbow.*
12. Twist off, counterclockwise, the whole input and output fittings parts. Remove the small drain elbow also.
13. Store the detached parts with the disassembled unit and return the pump/motor unit to the factory for replacement.
14. Replace the pump/motor and assemble the unit by reversing the disassembly procedure above.
15. 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. Remove the top cover and drain the unit of coolant,
2. Loosen the clamp bands on the hose connections going to the load water chamber output and the flow switch input.
3. Remove the hoses and move them out of the way.

Note: *Series 8630 only:*

- a. Remove the 18, 8-32 x 1/4" head mounting screws in the perimeter of the pan panel assembly.
- b. Pull the panel out sufficiently towards the rear of the unit to gain access.

Note: *Usually connection wires will not have to be disconnected.*

4. Disconnect the wires that lead to the flow switch.

Note: *On the 8630 series 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.*

5. Do one of the following:

- **On the 8630 series**, unscrew the input elbow to the flow switch, counterclockwise.

Note: *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*

- **On the 8630B series**, unscrew the input elbow to the flow switch (counterclockwise).

Note: *If the fan interferes when removing the elbow, loosen the set screw on the water chamber then rotate the water chamber until the elbow is free from interference.*

6. The flow switch is now free for repair or replacement.
7. Replace the flow switch and assemble the unit by reversing this procedure.

Note: *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 non-adjustable and is set for a 2 second delay. The relay contacts can be used to interrupt the transmitter circuit in the event of inadequate coolant flow or over temperature. The relay is located on the upper left inside of the front panel.

The relay is not serviceable. To remove the relay perform the following steps.

For 8630 Series

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. Install the new cartridge by putting the center nib into the hole provided.
4. Rotate until the key way is engaged, and push in.

For 8630B Series

1. Remove the wires from the relay contacts. Note the color and location of each wire for use in reassembly.
2. Remove the screw, nut, and washers that secure the relay to the panel then remove the relay.

Replace Fuse

Preparation:

- Observe general safety precautions.
 - Tools needed: Common hand tools
 - 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. Replace with the same type and rating fuse. i.e., 15 Amp for the 115V unit and 8 Amp for the 230V unit.

Series	115V	230V
8630	15 amp	10 amp
8630B	15 amp	8 amp

5. Return the drawer to the receptacle.
6. 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 1](#).

Repair Preparation

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 by unscrewing the 18, 8-32 x 1/4" mounting screws.
3. Remove the coolant filler plug.
4. Lift the lid off by its handles.
5. Remove the 8-32 x 1/8" socket set screw on the circumference of the water chamber assembly near the load housing seam with a 5/64" hex wrench.
6. Unscrew the six 1/4-20 x 5/8" flange mounting screws from the inside of the front panel with a 7/16" end-wrench.

Note: Take the screws out to release the exterior flanges.
7. Turn the housing counterclockwise while firmly holding the water chamber and flow switch at the back by using either a leather strap type pipe wrench, or twisting the housing flange on the outside of the front panel.

Note: A little extra torque will break the initial screw compression, and the housing should screw off easily.
8. Unscrew the housing until the threads are disengaged and pull it out of the front panel.
9. Temporarily reattach the outer conductor assembly to the load housing to prevent displacement of the center conductor assembly.

Note: Use two 1/4 -20 mounting screws placed through diametrically opposite flange holes, fastened finger tight.

The Load Resistor is ready to be repaired.

Resistor Removal

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

1. Unscrew the wired sensor plug of the flow switch, with a 1-1/2 end-wrench.

Note: *The water chamber complex, of the load resistor assembly, and flow switch, with the attached adapters, may be dismantled, but it is not required or recommended. Do not disconnect the wiring. See "[RF Load Resistor Unit Removal](#)" on page 18.*

Note: *The O-Ring inlet seal in the water chamber may be removed and replaced if necessary.*

2. Remove the retainer sleeve and O-Ring sleeve backup. The inner flow tube may also be removed.
3. Grasp the resistor ground cap and remove it by pulling with a slight rocking motion. This will expose the end of the resistor.
4. The resistor should still be nested inside the resistor fitting.

Note: *If the spacer ring is displaced, it will have to be repositioned.*

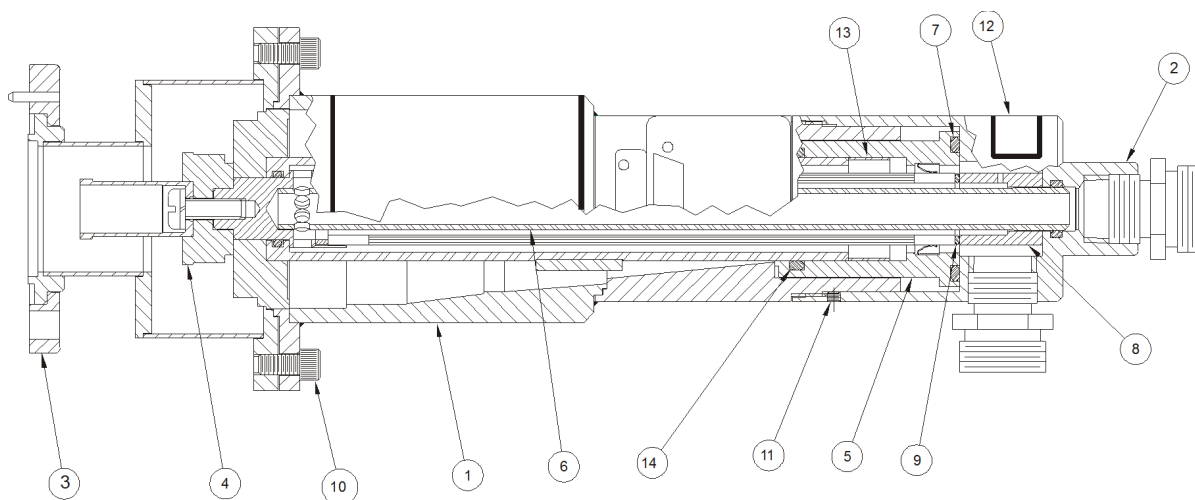
5. Ensure the spacer ring is bottomed.

Inspection

Inspect the resistor and visible internal parts for damage.

Note: 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 / Assy
2	Chamber, Water / Assy
3	Conductor, Outer / Assy
4	Conductor, Center / Assy
5	Cap, Resistor / Assy
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

CAUTION

Do not abuse the outside surface of the resistor by firing, sanding, or using any abrasive action.

Note: *Take particular care of the outside surface of the resistor. Treat this surface gently, wiping with a soft cloth.*

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.
3. Push the resistor into the fitting until it bottoms on the spacer ring.
4. Ensure the spacer ring is in the proper place.

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

5. Do one of the following:
 - 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.
6. Place the resistor ground cap on the exposed end of the resistor, and press it into place.
7. Slide the O-Ring down the inner flow tube until it rests on the end of the resistor.
8. 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.
9. Ensure 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.*

10. Place the resistor housing through the front panel opening, and into the water chamber.
11. Turn the housing, gently, clockwise to thread it on, eventually bottoming it in its original position.
12. Reverse the procedure for the RF Load Dismounting, to restore the original condition.

Note: *Do not replace the top panel until after this section is completed.*

13. 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](#).

Note: *If the resistance check passes perform the next steps:*

14. Fill the unit with coolant.
15. Perform the flush out procedures of the RF Load Dismounting section.
16. 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

Note: *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 and 8635B), 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 lock washer 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.

Note: *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.

Note: *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.

Note: *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.

Note: *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 lock washer.

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

1. Remove the 3/8-16 hex nut, and the 3/8" split lock washer with a 9/16 socket or nut driver while holding the center conductor stationary.
Note: For Models 8731 and 8738, remove the center conductor and the insulator.
2. Remove the resistor fitting by pushing the exposed threaded end of the fitting into the outer flow tube.
Note: The resistor fitting and any broken pieces of resistor will fall from the opposite end of the outer flow tube.
3. 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.**Note:** If any of the internal parts are damaged, they must be replaced to ensure proper electrical and/or thermal performance of the load.
4. Insert the replacement resistor into the resistor fitting.
Note: 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.
5. Reassemble the input center conductor assembly by first replacing the outer flow tube seal O-Ring, if necessary.
6. Insert the resistor fitting in position in the outer flow tube.
7. Replace insulator and center conductor for Models 8731 and 8738. Tighten in place with the 3/8-16 hex nut and 3/8" split lock washer.

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.
Note: For Models 8730, 8731 or 8738, remount the outer conductor assembly 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.
2. Continue with the Resistor Replacement Instructions, given earlier in this chapter.
Note: 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

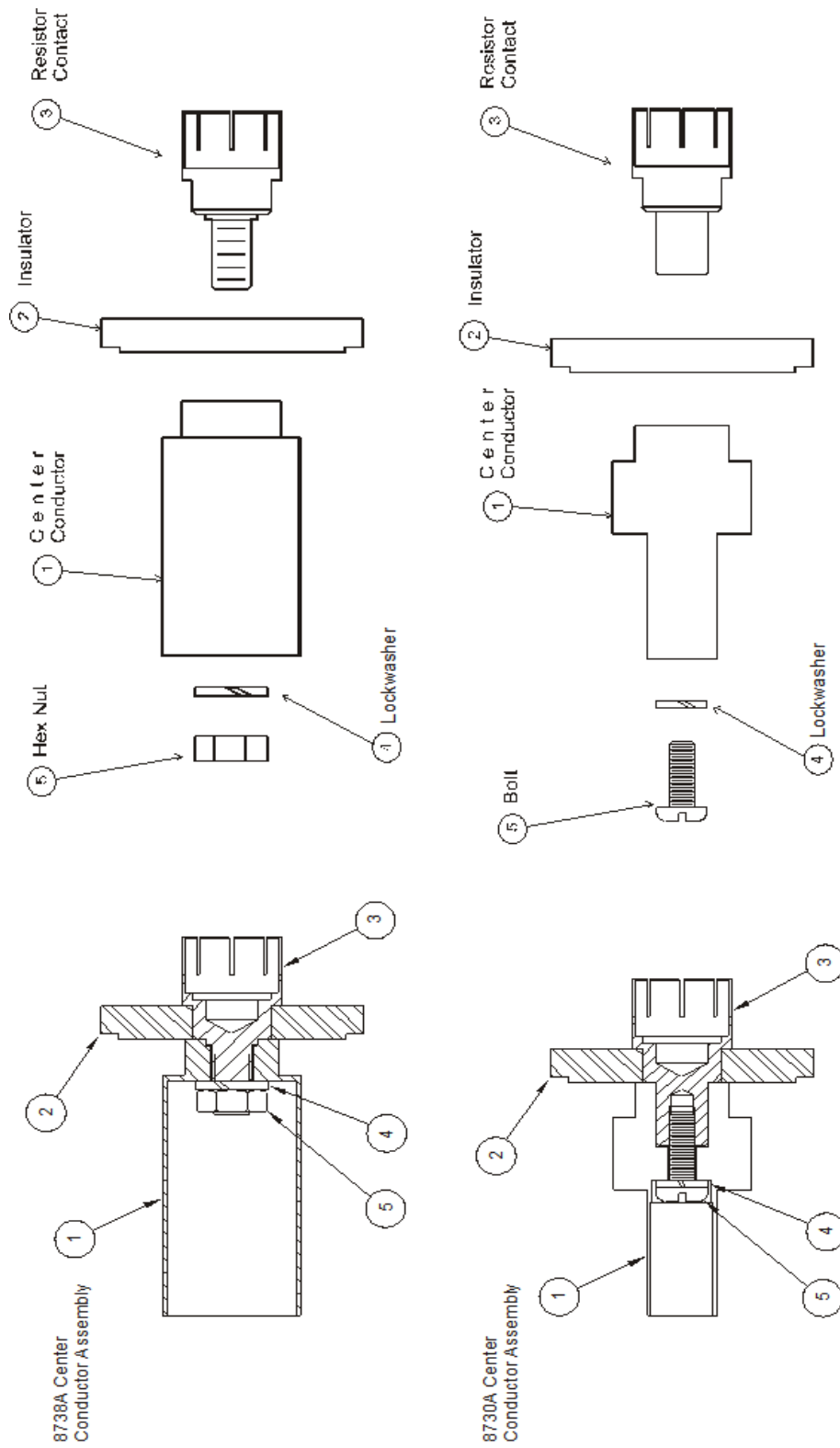


Figure 11 Schematic Diagram, 8630, 10 kW Moduload, 115 V 50/60 Hz Supply

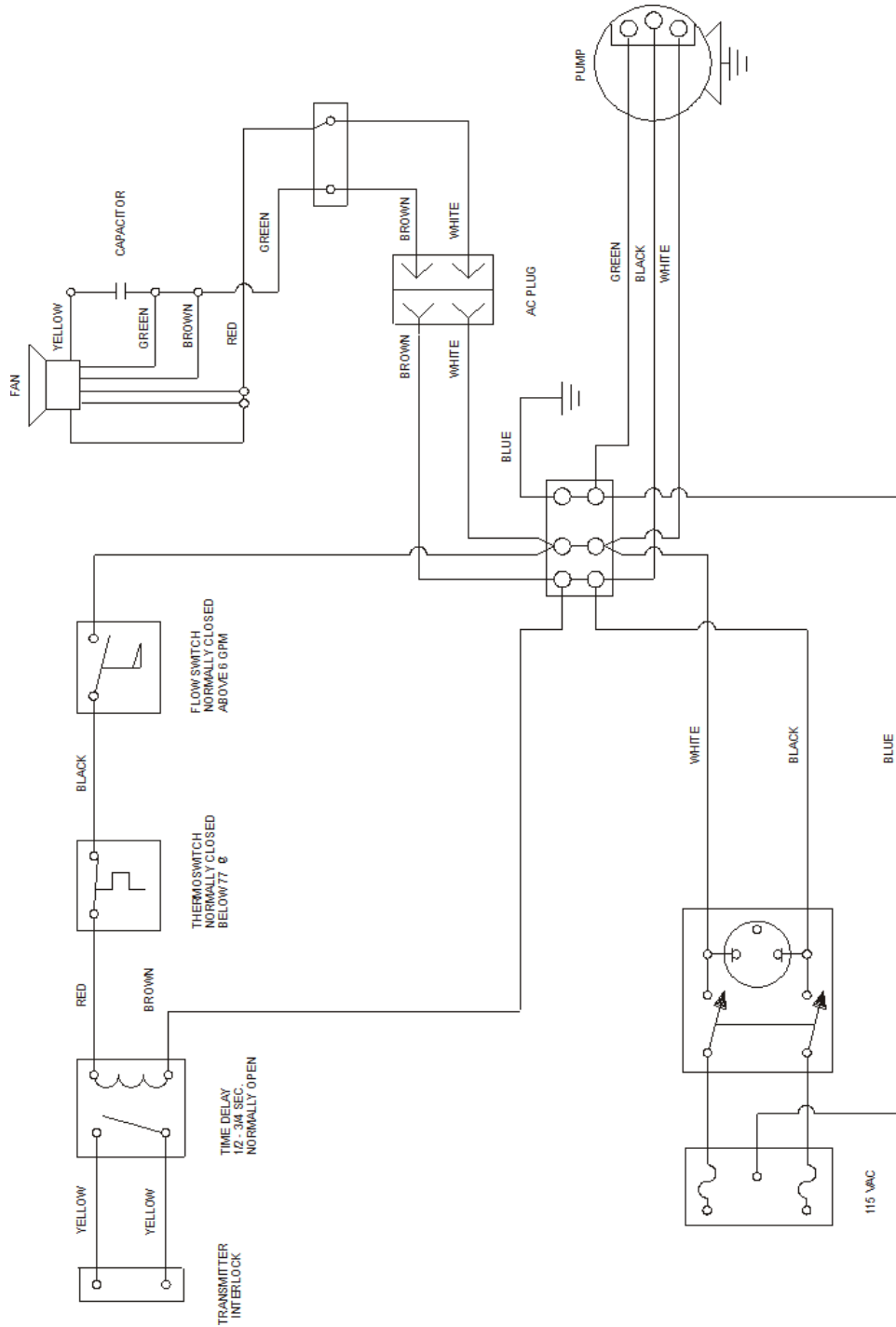


Figure 12 Schematic Diagram, 8630, 10 kW Moduload, 230 V, 50/60 Hz Supply

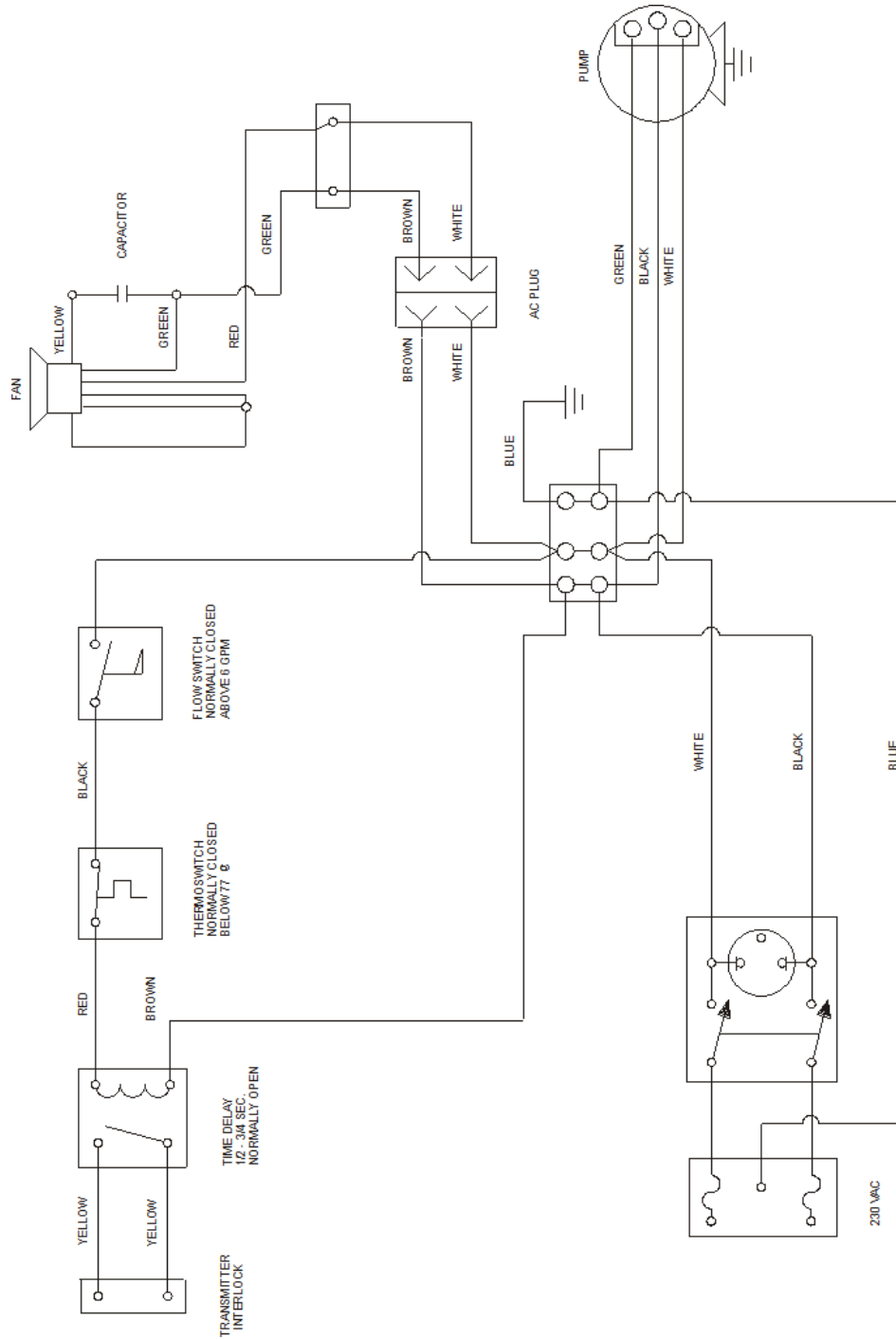
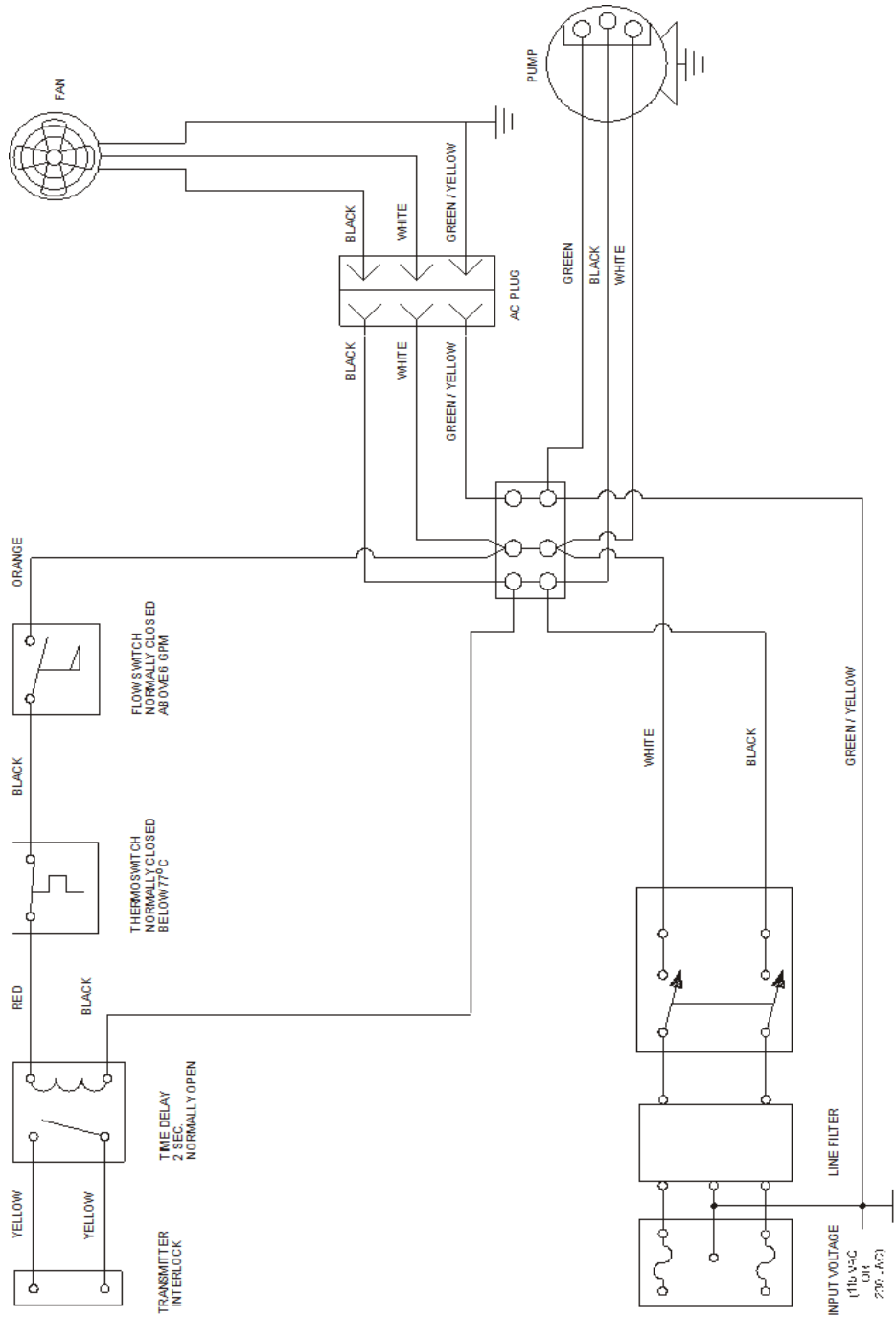


Figure 13 Schematic Diagram, 8630B, 10 kW Moduload, 115 V and 230 V, 50/60 Hz Supply



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

1. Flush the system as described in the manual:
 - Minimum of one time.
 - Minimum of five times if the coolant has had any ethylene glycol added.
2. Remove the drain plug and allow the fluid to drain from the system with the unit in a level position.
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.
9. 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:
 - Minimum of one time.
 - Minimum of five times if the coolant has had any ethylene glycol added.
2. Remove the drain plug and allow the fluid to drain from the system with the unit in a level position.
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.
9. Reinstall drain plug and expansion tank cap.

Note: *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 shock absorbing 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 the unit needs to be returned for any reason, request an Return Material Authorization (RMA) through the Bird Technologies website. All instruments returned must be shipped prepaid and to the attention of the RMA number.

Bird Service Center

30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794
Fax: (440) 248-5426
E-mail: bsc@birdrf.com

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

<http://www.birdrf.com>

Specifications

Frequency Range	1 kHz to 1000 MHz
Power Rating	10 kW Maximum
Impedance, Nominal	50 ohms
VSWR	1.1 to 1.0
Modes	CW, AM, FM, SSB, & TV
Connectors Model 8631 and 8631B ¹ Model 8635 and 8635B ¹ Model 8638 and 8638B ¹	3-1/8" EIA flanged 1-5/8" EIA flanged 3-1/8" Unflanged
AC Power	115 VAC @ 9 Amps, 50/60 Hz 230 VAC @ 4.5 Amps, 50/60 Hz
Interlock Contact Ratings, Solid State Relay 125 VAC 230 VAC +28 VDC 125 VAC Max switching voltage	10 A, resistive 5 A, resistive 5 A, resistive 1/4 hp 250 VAC
Interlock Contact Ratings, Mechanical Relay	10 amps resistive at 30 VDC, 120 / 240 VAC
Ambient Temperature With 100% distilled water as coolant With 35% ethylene glycol as coolant	+5°C to +45°C (+41°F to +95°F) -20°C to +35°C (-4°F to +95°F)
Operating Position	Horizontal only
Dimensions, Nominal	22-1/8" L x 15-13/16" W x 15-15/16" H (562 x 402 x 405 mm)
Weight, Nominal	113 lb with distilled water (51.3 kg) 103 lb without water (46.7 kg)
Finish	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 8630B Series Moduload RF Load

Description	Qty	Part Number
RF Load Resistor Model 8631 and 8631B Model 8635 and 8635B Model 8638 and 8638B	1	8731-101 8730A051 8738-101
Power Switch (illuminated) 115V 230V	1	5-1842-1 5-1842-2
Power Switch (not illuminated)	1	5A2384
AC Power Receptacle	1	5-1844
Fuse Drawer 115V 123V	1	5-1845 5A2310
Fuse 115V Model 15amp, 3AB Time-Delay Type MDA 15 230V Model 8amp, 3AB Time-Delay 230V Model 8amp, 5 mm x 20 mm Time-Delay 8A	2	5-1828-36 5A2257-25 5A2257-25
Power Cord 115 V 230 V	1	5-1836 5-1837
Fan Guard Model 8630 Model 8630B	6	5-1923 5A2789-2
Fan Motor Assembly Model 8630, 115V Model 8630, 230V Model 8630B, 115V Model 8630B, 230V	1	8630-644-1 8630-644-2 5A2770-1 5A2770-2
Fan Starting Capacitor (model 8630 only)	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 Model 8630 Model 8630B	1	8630-108 8630B108
Time Delay Relay Model 8630, 115V Model 8630, 230V Model 8630B (115V and 230V) <i>After 7/1/13:</i> 863XB-115 863XB-230	1	5-1627 5-1625 5A2787-1 5A2787-115 5A2787-230
Relay Socket (model 8630 only)	1	8640-561
Over Temperature Thermoswitch Model 8630 Model 8630B	1	8630-013 5A2788-1

Description	Qty	Part Number
Coolant Tank Assembly Model 8630 Model 8630B	1	8630-102 8630-089
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	8630B-099
Coolant Gauge Body	1	5-1200
Pump Inlet Fitting Assembly	1	8650-081
Relay Retaining Clamp (model 8630 only)	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 Model 8630 Model 8630B	1	5-768-2 5A1840-2
Interlock Terminal Strip Cover (model 8630B only)	1	5A1840-2-C
Line Filter (ac input) (model 8630B only)	1	5A2792-1

**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 and 8630B Series Loads

Note: RF Load Assembly Parts for Moduload Models 8731-101, 8738-101, and 8730A051

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

Note: Front Connector Parts are Assigned Per Model Type Below:

Model 8635B 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" Button Head Machine Screw	1	1121-1217-00
1/4" Split Lock washer	1	Standard

Model 8631B 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 Lock washer	1	Standard
Outer Conductor Assembly	1	8731-004

Model 8638B 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 Lock washer	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

Optional Items

Description	Qty	Part Number
Ethylene glycol	1 gal	5-1134-3
Repair and Replacement Kit, P/N Consists of: Coolant and Container Assy. (8630-197), 50 ohm resistor (8731-031-1), and instruction sheet (921-8630-196).	1	8630-196

LIMITED WARRANTY

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

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

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

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