



ECONOLOAD[®] LOAD RESISTOR
SERIES 8730

INCLUDING MODELS 8730A, 8731
8732A, 8738A, AND 8738A110

OPERATION MANUAL

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INSTRUCTION BOOK P/N 920-8730S REV. E

ECONOLOAD AND TERMALINE ARE REGISTERED
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Safety Precautions

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

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

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
Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

On pages 5, 13, 15 and 17.

WARNING
Improper wiring could result in electric shock and death.

On page 5.

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 7 and 14.

WARNING
If the resistor breaks, there may be splinters or sharp pieces inside the load housing. Be careful when repairing to avoid being cut.

On page 18

Caution Statements

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

CAUTION

The load must be fully supported and remain parallel to the transmission line during all steps of installation. Never allow the load to be supported solely by the center conductor or center coupling element (center bullet).

On pages 4, 7, 9, 10

CAUTION

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

On page 5.

CAUTION

If installed, connect optional interlock before applying RF power.

On pages 5, 6 and 12.

CAUTION

Do not contaminate the coolant with pipe sealant.

On page 6.

CAUTION

Never allow the load to be supported solely by the center conductor or center coupling element (center bullet). Damage to the resistor may result.

On pages 8, 9, 10, 14, 15, 16

CAUTION

Do not interrupt coolant supply. Even momentary application of RF power while coolant is not circulating could cause immediate destruction of the load

On page 12.

CAUTION

Do not remove the resistor plug. Any attempt to do so will cause leakage and resistor damage.

On page 18.

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.

CONNECT INTERLOCK TO TRANSMITTER BEFORE OPERATING.

BRANCHER LE VERROUILLAGE À L'ÉMETTEUR AVANT EMPLOI.

CONECTE EL INTERBLOQUEO AL TRANSMISOR ANTES DE LA OPERACION.

VOR INBETRIEBNAHME VERRIEGELUNG AM SENDER ANSCHLIESSEN.

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

About This Manual

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

8730A	8731	8738A
8732A	8738A110	

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

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

Econoload or Load — The entire unit. It contains the RESISTOR.

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 Econoload RF Load, lists equipment supplied and optional equipment, and provides power-up instructions.

Theory of Operation — Describes how the load works on a fundamental level.

Installation — Describes how to install the load or Econoload and its components.

Operating Instructions — Describes the features of the Econoload RF Load and its process of operation.

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

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Bird 8730 Series Econoloads are compact, nonradiating, low reflection terminations for medium power RF lines. They dissipate up to 10 kW with a VSWR of less than 1.1:1 from 1 kHz to 1000 MHz.

Features

- Useable with CW, AM, FM, SSB, and TV modulation, and certain pulse types. Contact Bird for information on using Econoloads with pulsed signals.
- Designed for easy field repair of all components.

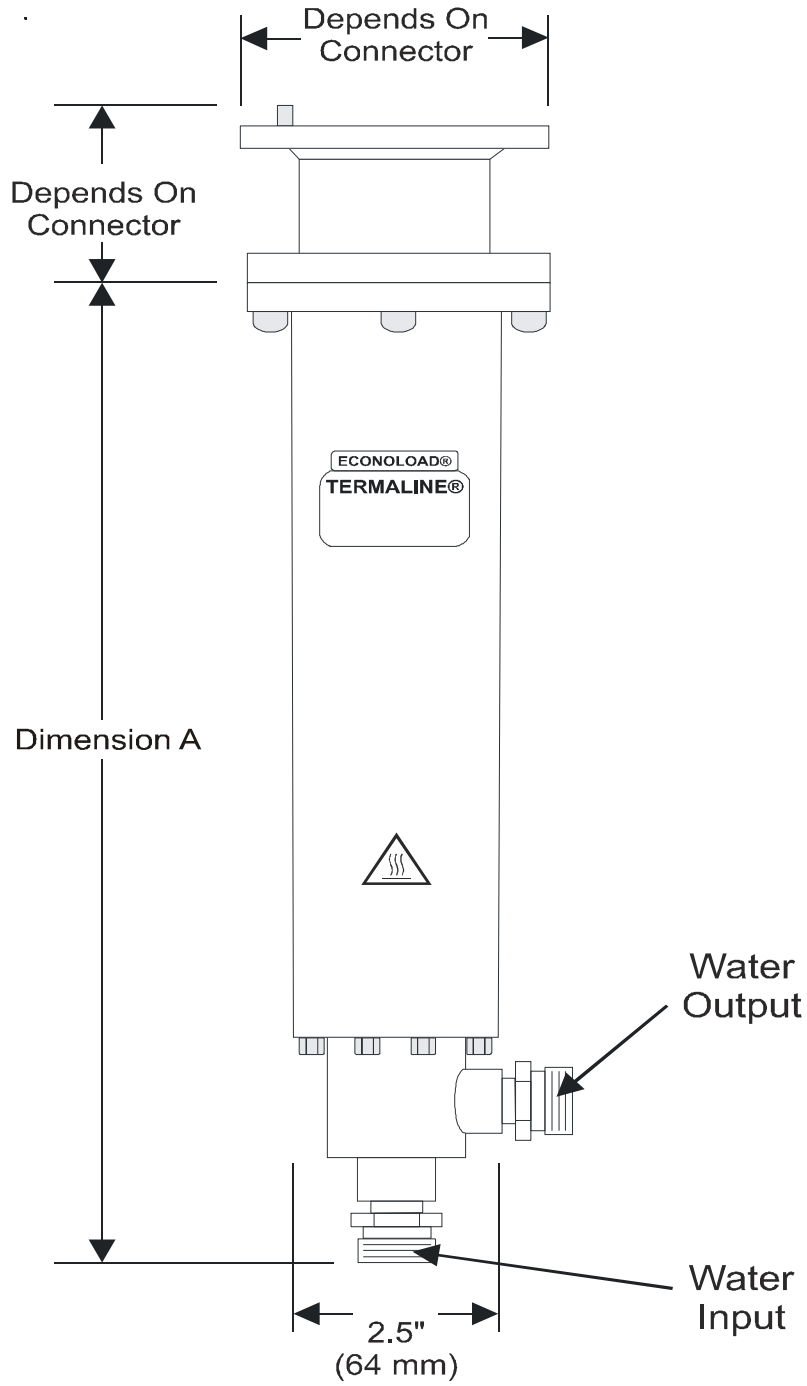
Items Supplied

- Load, Water-cooled
- Instruction Manual

Optional Items

- Control system with red pilot light that turns on when the load is working properly. Also has flow switch and 12 second time delay interlock to ensure steady coolant flow before RF power is applied.

Figure 1 8730 Series Econoload Outline Drawing



Model	Dimension A
8731	12"
8730A, 8732A, & 8738A	13"
8738A110	13-3/8"

Resistor

Bird 8730 Series Econoloads consist of a thin-film-on-ceramic resistor immersed in externally-supplied coolant. The coolant flows directly over the resistor instead of using an intermediate heat transfer system, reducing the load size to a minimum. After passing over the entire length of the resistor, the coolant leaves the load and can either be discarded or cooled in a heat exchanger and reused.

Coolant

The load's electrical and thermal performance is reduced by impurities or chemical additives in the coolant, especially ones which are deposited as scale on the resistor. This may cause the load to overheat and fail. Salt water will have a similar effect and should not be used. For recommended coolant, refer to ["Coolant" on page 5](#) and to ["Specifications" on page 20](#).

Optional Flow Interlock

A minimum coolant flow of four gallons per minute is required at all times to dissipate the heat from RF power. When the flow rate drops below this point, the flow switch opens causing immediate transmitter shutdown. The flow switch is a "normally open" type, and is closed during normal operation.

After flow is restored, a time delay switch keeps the interlock open for an additional 12 seconds. This ensures proper operation of the cooling system before applying RF power, preventing resistor burnout.

Optional Thermal Interlock (8732A Only)

The 8732A can be supplied with an optional passive overtemperature thermoswitch. Normally closed, it opens at a preset temperature, turning off transmitter power. The temperature setting is preset at the factory for either 72 or 79 °C (162 or 175 °F). The interlock system will not permit use of the transmitter until the load has reached a safe temperature.

Calorimetry

Almost all the RF power in the load is transferred to the coolant as heat. There is no heat transfer to the outer housing of the load, leaving it at ambient temperature even at full power. The flow rate, and the difference between the input and output coolant temperatures, can be used to calculate the power dissipated in the load with the following formula:

$$P = k \times (T_{out} - T_{in}) \times F$$

where

P = Power in kilowatts

k = 0.263 for temperature in °C, 0.146 for temp. in °F

T_{out} = Water temperature at the output of the load

T_{in} = Water temperature at the input to the load.

F = Water flow rate in gallons per minute

This chapter provides information on site requirements, unpacking, inspection, and preparing the Bird 8730 Series Econoload for use.

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.*

DC Resistance

Before first using the load, get a resistance baseline for future maintenance. Refer to "[RF Assembly Resistance Test](#)" on page 14 for instructions.

Placement

- Do not use outdoors or in areas of condensing humidity.
- Ventilation or buffer space is not required. The Econoload may be placed in very small spaces.

CAUTION

The load must be fully supported and remain parallel to the transmission line during all steps of installation. Never allow the load to be supported solely by the center conductor or center coupling element (center bullet).

Note: *it is recommend that additional mechanical support is used to support the load in addition to the RF swivel flange. The load must have additional mechanical support if an unflanged connection or 7-16 jack(8732A only) is used*

- The load may be mounted in any position. Rotate the load so that the warning label is visible and the water connections are easily accessible.
- Access to a coolant supply or pump is required. Make sure the coolant supply can meet the required flow rate.
- To use the optional interlock, AC power is required.

Coolant

For operation at 1kHz or lower, use only distilled water as the coolant. For operation above 1kHz use distilled or potable water. Refer to the specifications for the definition of potable water. If the water quality is doubtful, use distilled water.

Hoses

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

The Econoload is supplied with standard 3/4" hose fittings. For rigid piping, replace the hose adapters with 1/2" male pipe fittings. If the optional flow switch is installed, it is attached to the water INPUT.

Note: with the exception of Model 8738A110, which is equipped with 1/2" barbed hose fittings

- The Econoload's water INPUT is located in the center of the back of the load. Connect the coolant supply to the load's INPUT. Secure with hose clamps.
- The Econoload's water OUTPUT is on the rear side of the load, at a 90° angle to the INPUT. Connect the coolant drain to the load's OUTPUT. Secure with hose clamps.

Interlock (Optional)

WARNING
Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

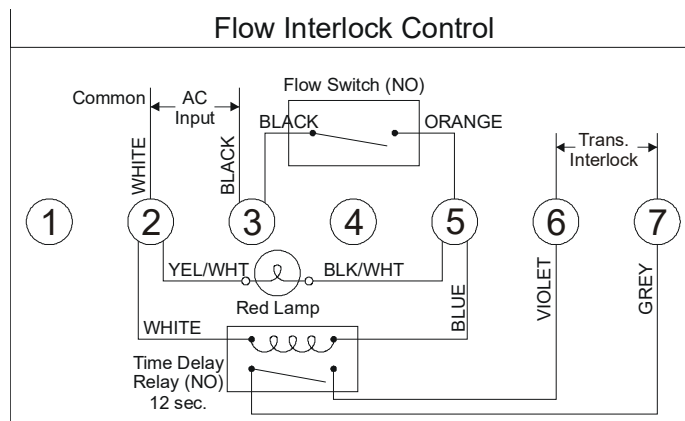
WARNING
Improper wiring could result in electric shock and death.

CAUTION
If installed, connect optional interlock before applying RF power.

The interlock control box has four 1/4" mounting holes in a 5" x 5" (127 x 127 mm) square. Mount it where the safety light will be clearly visible. Wire the control box as follows (refer to [Figure 2](#)):

- Connect the flow switch leads to terminals 3 and 5.
- Connect the transmitter interlock to terminals 6 and 7.
- Connect the ac power source to terminals 2 and 3, making sure that ac common is connected to terminal 2.

Figure 2 Interlock Connections



Thermoswitch (8732A Only) (Optional)

Installing the Thermoswitch

CAUTION

If installed, connect optional interlock before applying RF power.

Note: *The 8732A, only, can be equipped with an optional interlock thermoswitch, P/N 2450-095-x.*

1. Stand the unit with the water connectors up to prevent spills.
2. Remove the water outlet connector.
3. Replace the connector with the thermoswitch.
4. Sparingly apply pipe sealing compound to the external threads, only, of the thermoswitch.

CAUTION

Do not contaminate the coolant with pipe sealant.

5. Check for coolant leaks upon completion.

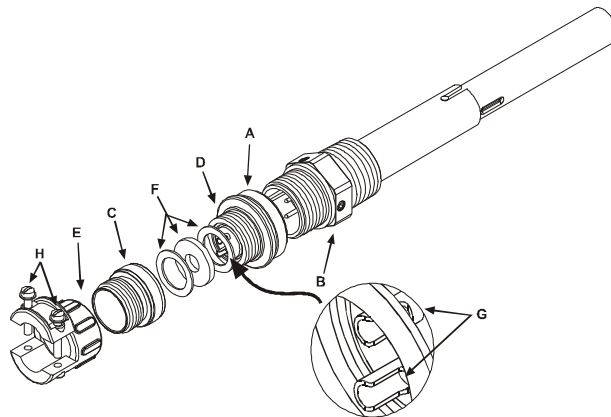
Connecting the Thermoswitch to the Interlock

1. Unscrew the large knurled ring-nut [A] at the lower end of the coupling jack assembly.
2. Pull it off the thermoswitch jack [B].
3. Unscrew the small knurled cover fitting from the base plug [D] of the connector to release the base.
4. Thread the control switch wires through the clamp [E] with the washers [F] inside and its threaded fitting in place.
5. Use short tips on the wires and put spaghetti sleeves over the ends if necessary.
6. Solder the switch leads to the lugs [G] of the connector base.

Note: *The ring-nut [A] must be in place over the base plug [G] with the knurled end facing out.*

7. Screw on the cover ring, then fasten the cable clamp [E] in place and tighten both yoke screws [H].
8. Put the plug back on the thermoswitch and tighten the nut [A].

Figure 3 Thermoswitch Assembly



Connecting the RF Power

The Econoload can be attached to the RF transmission line using standard coaxial line coupling kits.

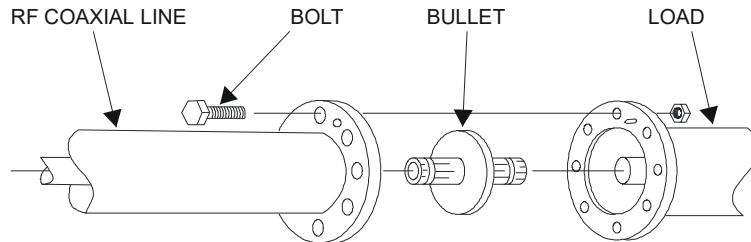
WARNING
Never attempt to connect or disconnect RF equipment from the transmission line while RF power is being applied.
Leaking RF energy is a potential health hazard.

Using a Swivel Flanged Coupling

Note: The center bullet (coupling element) and transmission line must be in dimensional tolerance as specified by IEC339-2, "General purpose rigid coaxial transmission lines and their associated flange connectors, Second edition, Part 2" 339 IEC 50-40-3 or 339 IEC 50-80-3.

To couple the swivel flange with a flanged RF transmission line, use an appropriate coupling kit. Refer to [Figure 4](#) while following the instructions below.

Figure 4 Swivel Flanged Coupling



CAUTION
The load must be fully supported and remain parallel to the transmission line during all steps of installation. Never allow the load to be supported solely by the center conductor or center coupling element (center bullet).

Note: It is recommended that additional mechanical support be provided for the load if a swivel flange connection is used.

1. Install support for the load, the load must be fully supported and remain parallel to the transmission line.

Note: ● Extreme care must be taken to ensure the center bullet is inserted parallel to the loads' center conductor.

- Under no circumstances, should the center bullet be twisted or rocked during insertion.
- Under no circumstance should tools be used to insert the center bullet.
- If difficulty is encountered, stop and inspect the center bullet for damage or out-of-tolerance dimensions.

2. Insert the center bullet and push it in until it is fully seated.

- Note:**
- Extreme care must be taken to ensure the load is inserted parallel to the RF transmission line.
 - Under no circumstances, should the load be twisted or rocked during insertion.
 - Under no circumstance should tools be used to attach the load to the transmission line.
 - If difficulty is encountered, stop and inspect the transmission line or center bullet for damage or out-of-tolerance dimensions.
3. Connect the coaxial input in a straight line and push carefully on the center conductor to close.

CAUTION

Never allow the load to be supported solely by the center conductor or center coupling element (center bullet). Damage to the resistor may result.

- Note:**
- The swivel flange on the load makes connection independent of the orientation of the fixed flange on the coaxial input outer conductor.
 - The load must be fully supported and remain parallel to the transmission line during all steps of the installation.
4. Insert the bolt sets and tighten evenly all around to transmission line manufacturer's recommended torque.
- Note:** *Use all of the bolts.*

Repositioning

Following installation, if the load must be moved for any reason, follow the guidance below:

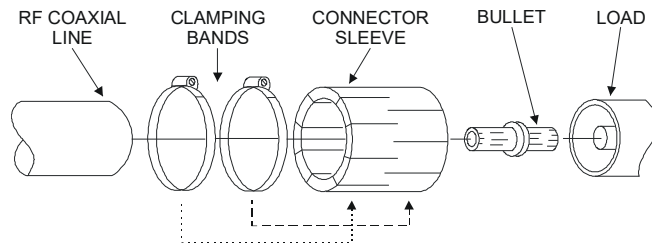
- Never twist/rotate the load if the orientation must be changed (example: the orientation of the coolant connection needs to be adjusted). The load must be removed, repositioned then re-installed per steps [3](#) & [4](#).
- The load must be fully supported and remain parallel to the transmission line during all steps of repositioning.
- Never allow the load to be supported by the center conductor or center coupling element (center bullet).
- Under no circumstances, should the load be twisted or rocked during removal or re-installation.

Using an Unflanged Coupling

Note: The center bullet (coupling element) and transmission line must be in dimensional tolerance as specified by IEC339-2, "General purpose rigid coaxial transmission lines and their associated flange connectors, Second edition, Part 2" 339 IEC 50-40-3 or 339 IEC 50-80-3.

To couple the unflanged connector with an unflanged RF line, use an appropriate coupling kit. Refer to [Figure 5](#) while following the instructions below:

Figure 5 Unflanged Coupling



CAUTION

The load must be fully supported and remain parallel to the transmission line during all steps of installation. Never allow the load to be supported solely by the outer connector sleeve only.

Note: The load must have additional mechanical support if an unflanged coupling is used. The load must not be supported solely by the outer connector sleeve only.

1. Install support for the load, the load must be fully supported and remain parallel to the transmission line.

Note:

- Extreme care must be taken to ensure the center bullet is inserted parallel to the loads' center conductor.

- Under no circumstances, should the center bullet be twisted or rocked during insertion.
- Under no circumstance should tools be used to insert the center bullet.
- If difficulty is encountered, stop and inspect the center bullet for damage or out-of-tolerance dimensions.

2. Insert the center bullet and maintain at least 1/8" (3mm) gap between the midpoint nibs and the center conductor.

Note:

- Extreme care must be taken to ensure the load is inserted parallel to the RF transmission line.

- Under no circumstances, should the load be twisted or rocked during insertion.
- Under no circumstance should tools be used to attach the load to the transmission line.
- If difficulty is encountered, stop and inspect the transmission line or center bullet for damage or out-of-tolerance dimensions.

3. Position the outer sleeve, with clamping bands, over the input connector.
4. Set the transmission line snugly against the coupling stops.
5. Position the clamping bands evenly about 3/4" from the ends of the sleeve.

CAUTION

Never allow the load to be supported solely by the center conductor, center coupling element (center bullet) or connector sleeve. Damage to the resistor may result.

Note: The load must be fully supported and remain parallel to the transmission line during all steps of the installation.

- Tighten the clamping bands.

Repositioning

Following installation, if the load must be moved for any reason, follow the guidance below:

- Never twist/rotate the load if the orientation must be changed (example: the orientation of the coolant connection needs to be adjusted). The load must be removed, repositioned then re-installed per steps 4 through 6 of installation.
- The load must be fully supported and remain parallel to the transmission line during all steps of repositioning.
- Never allow the load to be supported by the center conductor, center coupling element (center bullet), or connector sleeve.
- Under no circumstances, should the load be twisted or rocked during removal or re-installation.

Using a Slotted Connector Sleeve (for Model 8738A110)

Note: The center bullet (coupling element) and transmission line must be in dimensional tolerance as specified by IEC339-2, "General purpose rigid coaxial transmission lines and their associated flange connectors, Second edition, Part 2" 339 IEC 50-40-3 or 339 IEC 50-80-3.

To couple the slotted connector, use an appropriate coupling kit.

CAUTION

The load must be fully supported and remain parallel to the transmission line during all steps of installation. Never allow the load to be supported solely by the outer connector sleeve only.

Note: The load must have additional mechanical support if an unflanged coupling is used. The load must not be supported solely by the outer connector sleeve only.

- Install support for the load, the load must be fully supported and remain parallel to the transmission line.

Note:

- Extreme care must be taken to ensure the center bullet is inserted parallel to the load's center conductor.

- Under no circumstances, should the center bullet be twisted or rocked during insertion.
- Under no circumstance should tools be used to insert the center bullet.
- If difficulty is encountered, stop and inspect the center bullet for damage or out-of-tolerance dimensions.

- Insert the center bullet and maintain at least 1/8" (3mm) gap between the midpoint nibs and the center conductor.

Note:

- Extreme care must be taken to ensure the load is inserted parallel to the RF transmission line.

- Under no circumstances, should the load be twisted or rocked during insertion.
- Under no circumstance should tools be used to attach the load to the transmission line.
- If difficulty is encountered, stop and inspect the transmission line or center bullet for damage or out-of-tolerance dimensions.

- Position a clamping band over the input connector.
- Slide the slotted outer conductor of the load input over the unflanged transmission line until it is seated.

CAUTION

Never allow the load to be supported solely by the center conductor, center coupling element (center bullet) or connector sleeve. Damage to the resistor may result.

Note: *The load must be fully supported and remain parallel to the transmission line during all steps of the installation.*

5. Tighten the clamping band.

Repositioning

Following installation, if the load must be moved for any reason, follow the guidance below:

- Never twist/rotate the load if the orientation must be changed (example: the orientation of the coolant connection needs to be adjusted). The load must be removed, repositioned then re-installed per steps [4](#) through [6](#) of installation.
- The load must be fully supported and remain parallel to the transmission line during all steps of repositioning.
- Never allow the load to be supported by the center conductor, center coupling element (center bullet), or connector sleeve.
- Under no circumstances, should the load be twisted or rocked during removal or re-installation.

Operation without Interlock

Normal Operation

CAUTION

Do not interrupt coolant supply. Even momentary application of RF power while coolant is not circulating could cause immediate destruction of the load.

1. Turn on the coolant supply.

Note: *Minimum flow rate is 4 gal/min (15 L/min) at 5 °C (40 °F). The minimum flow increases linearly up to 6 gal/min (23 L/min) at 60 °C (140 °F).*

2. Wait for the coolant flow to stabilize.
3. Apply RF power.

Shutdown

1. Turn off RF power at the source.
2. Wait at least five minutes for the Econoload to cool.
3. Turn off the water supply. *Always* do this last.

Emergency Shutdown

Turn off RF power at the source.

Operation with the Optional Interlock

CAUTION

If installed, connect optional interlock before applying RF power.

1. Turn on AC power to the interlock control box.
2. Turn on the coolant supply.
3. Listen for the flow switch to close (it will click when it closes).
4. Wait about 12 seconds.

Note: *The time delay switch should close and the red light on the control box should turn ON.*

5. Apply RF power.

Shutdown

1. Turn off RF power at the source.
2. Wait at least five minutes for the Econoload to cool.
3. Turn off ac power to the interlock control box.
4. Turn off the water supply. *Always* do this last.

Emergency Shutdown

Turn off RF power at the source.

Troubleshooting

The table below contains troubleshooting information for problems which can occur during normal operation. 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 turn on or shuts off repeatedly	Overheating	Increase water flow Lower the ambient temperature
	Insufficient water flow	Check the coolant circulation system
Excessive reflected power	DC resistance of the load has changed	Check DC resistance (" RF Assembly Resistance Test " on page 14)
	Contaminated water	Check the resistor for scaling. Replace if necessary. Check that the water meets the standards listed in the specifications. Use distilled water if necessary.

Maintenance

WARNING

Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

Cleaning

The outside surface of the unit should be wiped free of dust and dirt when necessary. Clean the RF connector, both metallic and insulating surfaces, with a dry, non-residue forming solvent.

If the optional water flow switch is installed, periodically remove it from the load and clean off any dirt or scale which might prevent the switch from functioning.

Inspection

Routinely inspect the following components:

- **Load**
Check the center and outer conductors for visible damage or excessive wear
- **Hoses**
Check for cracks or deterioration. Make sure the hoses are securely fastened to the load.

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.

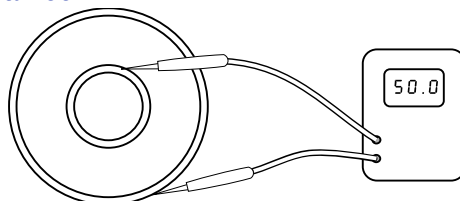
CAUTION

Never allow the load to be supported solely by the center conductor, center coupling element (center bullet) or connector sleeve. Damage to the resistor may result.
Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.

- Note:**
- Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.
 - Under no circumstances, should the load be twisted or rocked during removal.
 - Under no circumstance should tools be used to remove the load from the transmission line.
 - Never allow the load to be supported by the center conductor or center coupling element (center bullet).

2. Disconnect the RF coaxial line. Refer to "[Connecting the RF Power](#)" on page 7.
3. Connect the multimeter test leads across the center and outer conductor of the load resistor. See [Figure 6](#).
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 6 *Measuring DC Resistance*



Repair

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

Disconnect the unit from all power sources before servicing.
The unit may be energized from multiple sources.
The potential for electric shock exists.

Replacing the Flow Switch

1. Turn off the RF power and interlock circuitry.

CAUTION

Never allow the load to be supported solely by the center conductor, center coupling element (center bullet) or connector sleeve. Damage to the resistor may result.
Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.

- Note:**
- Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.
 - Under no circumstances, should the load be twisted or rocked during removal.
 - Under no circumstance should tools be used to remove the load from the transmission line.
 - Never allow the load to be supported by the center conductor or center coupling element (center bullet).
2. Disconnect the RF line and AC line.
 3. Disconnect the water flow switch leads at the control box.
 4. Remove the defective switch and replace it.
 5. Connect the flow switch leads to terminals 3 and 5.
 6. Turn on the interlock ac power.
 7. Turn on the coolant system.
 8. Make sure the flow switch functions properly.

Replacing the Time Delay Switch

1. Turn off the RF power and interlock circuitry.

CAUTION

Never allow the load to be supported solely by the center conductor, center coupling element (center bullet) or connector sleeve. Damage to the resistor may result. Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.

- Note:**
- Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.
 - Under no circumstances, should the load be twisted or rocked during removal.
 - Under no circumstance should tools be used to remove the load from the transmission line.
 - Never allow the load to be supported by the center conductor or center coupling element (center bullet).
2. Disconnect the RF line and AC line.
 3. Open the control box door by turning the slotted screw 1/4 turn.
 4. Loosen the screw at the top of the relay clamp.
 5. Press the clamp legs in slightly to release the relay.
 6. Pull the relay cartridge straight out of its socket.
 7. Insert the new relay cartridge and rotate it to align the opening in the cartridge with the center post nub in the socket.
 8. Make sure that the clamping prongs fit into their matching slots.
 9. Tighten the clamp screw to secure it.
 10. Turn on the interlock ac power.
 11. Turn on the coolant system.
 12. Make sure the time delay switch functions properly.

Replacing the Safety Light

1. Turn off the RF power and interlock circuitry.

CAUTION

Never allow the load to be supported solely by the center conductor, center coupling element (center bullet) or connector sleeve. Damage to the resistor may result. Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.

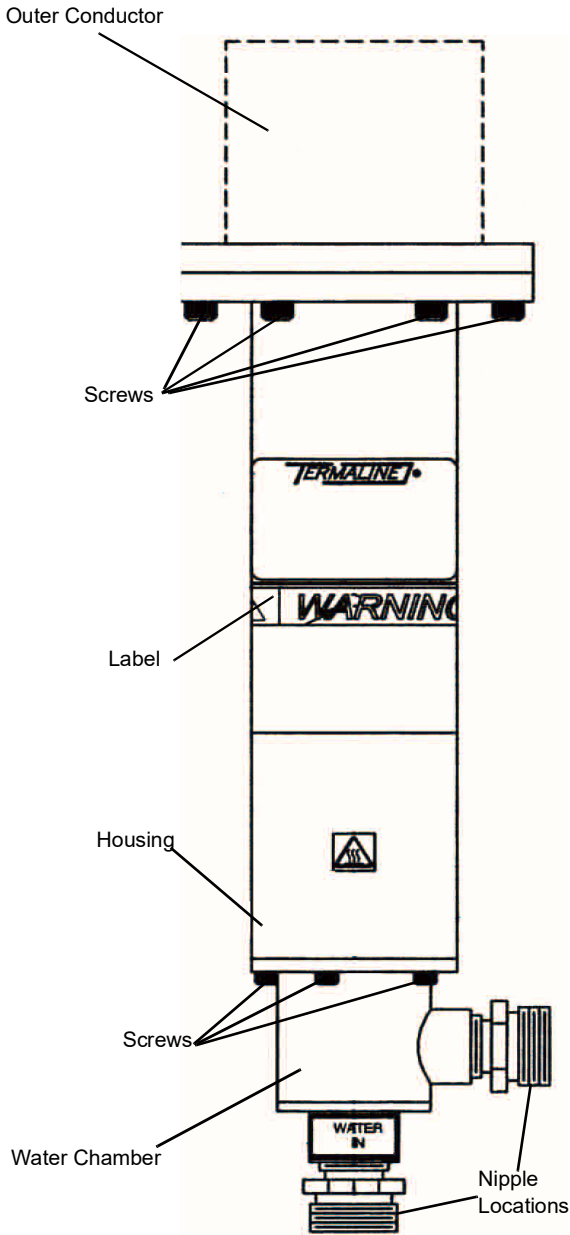
- Note:**
- Extreme care must be taken to ensure the load is removed parallel to the RF transmission line.
 - Under no circumstances, should the load be twisted or rocked during removal.
 - Under no circumstance should tools be used to remove the load from the transmission line.
 - Never allow the load to be supported by the center conductor or center coupling element (center bullet).
2. Disconnect the RF line and AC line.
 3. Unscrew the lens cover at the top of the control box to expose the bulb.
 4. Gently push down on the bulb and twist counterclockwise to remove the old bulb.
 5. Reverse these steps to install the new bulb.

Servicing the Resistor

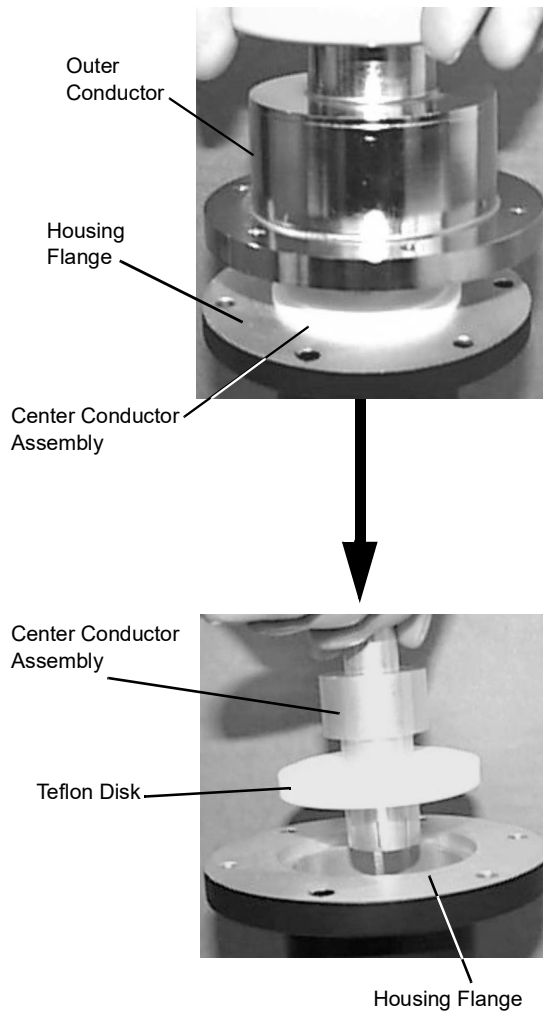
The load is designed to be quickly and easily repaired in the field. If a significant change in the DC resistance is noted or if the resistor should fail, inexpensive replacement resistors are available.

WARNING
Disconnect the unit from all power sources before servicing. The unit may be energized from multiple sources. The potential for electric shock exists.

Figure 7 Load Exploded View - Model 8730



DETAIL - Center Conductor Assembly



Removing the Resistor

Numbers in brackets [] refer to the labeled parts in [Figure 7](#). Parts may appear slightly different than what is shown for some models.

1. Disconnect the load from the RF line and the interlock control box, remove the water hoses, and drain off any water still in the load.
2. Turn the load on end with the hose fittings up.
3. Remove the screws from the back of the water chamber assembly. These secure the water chamber assembly to the load housing [0].

Note: *The 8731 has only one screw, on the side of the water chamber assembly. Also, the water chamber is threaded, and screws into place. Turn the water chamber counterclockwise until the threads disengage before pulling the assembly out.*

4. Pull the water chamber assembly out.

Note: *It may be necessary to rock the chamber gently while pulling.*

Note: *If the resistor is intact then the entire resistor assembly [2] may be pulled straight out of the load housing.*

Inspection

When the resistor has been successfully removed, inspect it carefully to insure that it has not been fractured. In most cases, even in the event of complete resistor burnout the resistor will remain intact.

Examine the inside of the load housing and water chamber for damage to internal parts, especially the resistor O-Ring seal and the resistor contact strip. If the O-Ring has cracks or if the contact strip has missing fingers, replace them. If the resistor did fracture, thoroughly rinse all parts under clear running water and dry before any assembly.

Replacing the Resistor

WARNING

If the resistor breaks, there may be splinters or sharp pieces inside the load housing. Be careful when repairing to avoid being cut.

CAUTION

Do not remove the resistor plug. Any attempt to do so will cause leakage and resistor damage.

1. Insert the plugged end of the new resistor into the resistor fitting of the center conductor assembly [8] to test its tightness.
2. The resistor should be snug but should not have to be forced into the fitting.

Note: *If the resistor is too loose, press the fitting fingers together slightly and try the resistor again. Continue closing the ends of the resistor fitting until a snug fit is obtained.*
3. Bottom the resistor in the fitting.
4. Put the resistor and center conductor in the load housing [0].
5. Screw the flow tube [7] into the water chamber assembly. Make sure it is screwed in completely to avoid damaging the resistor.
6. Put the water chamber [3] back into the load, gently rocking and twisting the chamber to achieve a flat seat on the outer housing. Line up the holes with the holes in the load.
7. Tighten the water chamber screws [4].
8. Check the dc resistance between the inner and outer conductors; it should be about 50 ohms. Record this measurement as the new baseline reading.
9. Connect the load to the coolant supply and cycle the coolant for five minutes. Check for leaks.

Replacing the Conductor

1. Remove the screws [9] from the RF connector.
2. Remove the outer conductor assembly [12].

Note: *NOTE: To only replace the outer conductor, install it now and screw it into place.*

3. Remove the center conductor assembly [11] by pulling it carefully out of the load housing [0].
4. Make sure the resistor [1] and inner flow tube [9] do not come out with the center conductor.
5. Insert the new center conductor assembly into the load housing.
6. Make sure the resistor fitting makes a snug fit with the resistor.
7. Replace the outer conductor and screw it into place.

Storage and Shipment

Storing the Load Resistor

- Cover Bird 8730 Loads before storing to keep out dust and dirt.
- It is not necessary to install the shipping plug.
- Store in a dry, dust-free environment where the ambient temperature will remain between –40 and +45 °C (–40 to +113 °F).

Shipping the Load Resistor

1. Drain any remaining coolant from the load.
2. Wrap the load in a generous amount of padding for protection during transfer.
3. Pack and brace the load in a sturdy wooden crate for shipment.

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 a 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			
8730A		DC - 1000 MHz	
8731		1 kHz - 1000 MHz	
8732A		DC - 45 MHz	
8738A		1 kHz - 1000 MHz	
Power Rating			
All models except 8732A		10 kW average	
8732A		Depends on flow rate. See table below.	
Max at (8732A)	Power Min Flow 60° C (140° F)	Thermoswitch P/N	Thermoswitch Open Temp
10 kW	6 gal. / min. (23 L / min.)	N/A	N/A
8 kW	4 gal. / min. (15 L / min.)	2450-095-1	72° C
4 kW	1.1 gal. / min (4 L / min.)	2450-095-3	79° C
5 kW contin. 10 kW pulse	2.6 gal. / min. (10 L / min.)	2450-095-3	79° C
Mode		CW, AM, FM, SSB, TV and certain pulse types	
Impedance		50 ohms nominal	
VSWR		1.10 max.	
Connectors			
8730A	1-5/8" EIA Flanged	8732A	7/16 Jack, IEC Type 169-4
8731	3-1/8" EIA Flanged	8738A	3-1/8" Unflanged
		8738A110	Unflanged with integrated, slotted outer conductor adapter
Operating Position		Any	
Coolant		For operation at 1kHz or lower, use only distilled water as the coolant. For operation at greater than 1kHz use distilled or potable water. ¹	
Coolant Connections		3/4" standard hose thread 1/2" barbed hose fitting (model 8738A110)	
Temperature Range		5 to 60 °C (41 to 140°F)	
Flow Rate, Min		4 gal./min (15.2 L/min) @ 5 °C (41 °F) 6 gal./min (22.7 L/min) @ 60 °C (140 °F)	
Flow Rate, Max.		12 gal./min (45.4 L/min)	
Dimensions, Nominal		2.5" diameter x 12" long (64 x 305 mm) 2.5" diameter x 13-3/8" long (64 x 340 mm) - Model 8738A110	
Weight, Nominal		8 lb. (3.6 kg)	

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

Replacement Parts

Bird 8730A, 8732A, and 8738A

Description	Qty	Part No.
Resistor Assembly	1	8738A072
Water Chamber Assembly	1	8738A052
Hose Connector	2	5-065-2
Housing, Rear	1	8738A071
Housing, Front	1	8738A054
Socket Head Cap Screw, 8-32 x 3/4"	5	1118-1208-00
Socket Set Screw, 10-32 x 1/4" Cone pt.	1	1129-0400-25
Socket Head Cap Screw, 1/4-20 x 3/4"	6	1121-1208-00
Center Conductor Assembly		
8732A	1	8732A053
8730A		8730A053
8738A		8738A056
Outer Conductor Assembly		
8732A	1	8732A052
8730A		8730A052
8738A		8738A053
7/16 Jack, IEC Type 169-4 (8732A only)	1	4240-344

Bird 8731

Description	Qty	Part No.
Water Chamber Assembly	1	8731-003
Center Conductor Assembly (includes resistor)	1	8731-005
Outer Conductor Assembly	1	8731-004

Bird 8738A110

Description	Qty	Part No.
Hose Connector	2	5A2857-1
Center Conductor Assembly	1	8738A113
Outer Conductor Assembly	1	8738A112

Interlock (Optional)

Description	Qty	Part No.
Flow Switch	1	5-898-6
Interlock Control Assembly, 115 Vac	1	8750-101-1
Interlock Control Assembly Components		
Relay Clamp	1	8630-193
Time Delay Relay, 115 Vac	1	5-1664
Indicator Light, 115 Vac	1	5-970-1
Thermoswitch (8732A Only)		
Opens at 79 °C	1	2450-095-3
Opens at 72 °C		2450-095-1

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.

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.