



TERMALINE[®] LOAD RESISTOR
SERIES 8890

OPERATION MANUAL

WARNING

**This unit requires the supplied vent plug be installed prior to use.
Operating the unit without the vent plug installed WILL result in equipment damage and may
cause personal injury.**

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

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

CAUTION

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

NOTE

Calls attention to supplemental information.

	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.
	This symbol appears on the equipment and indicates the requirement for separate collection of discarded electrical and electronic equipment in accordance with the European Union Directive 2002/96/EC.

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

**The vent plug must be installed at all times when the unit is in operation or cooling.
Always check to ensure vent plug is installed prior to operation.
Failure to do so WILL result in damage to the equipment and endanger the operator's safety.**

On page 5, 7, 10, 11 and 19.

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 page 8, 10, 12, 13 and 17.

WARNING

Turn off AC power and RF power when attaching the power cable.

On page 9.

WARNING

**Do not touch the load during operation. During operation, load surfaces are extremely hot.
Touching the load during or after operation may cause burns.**

On page 10 and 11.

WARNING

Disconnect the blower assembly from supply voltage before performing any maintenance.

On page 13.

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 page 15, 18, and 20.

WARNING

Do not operate with side panel removed. Doing so could result in personal injury.

On page 15.

Caution Statements

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

CAUTION

This load is designed for operation in a horizontal position only, with the mounting brackets down. Operation in any other orientation will cause insufficient cooling of the unit leading to premature failure.

On page 5.

CAUTION

If installed, connect optional interlock before applying RF power.

On page 7, 10, and 11.

CAUTION

Check the local electrical code for proper AC hookup prior to operation of the unit. Make sure the neutral or return hookup is only used for that purpose.

On page 9.

CAUTION

Make sure the interlock is properly connected when overloaded to prevent damage to the load.

On page 10.

CAUTION

Maximum power is 1,250 W when the blower is not running. If the indicator light should turn off, immediately reduce RF power to less than 1,250 W.

On page 12.

CAUTION

Use only Bird coolant, P/N 5-1070, to prevent damage to the load.

On page 16.

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

NOTE

When used in the rest of the manual, 8890 series refers to all models. 889x-300 refers only to loads without a blower. -315 and -320 refer to loads with attached blowers.

Connector	Model Number		
	Without Blower	Blower, 115 VAC	Blower, 230 VAC
Female LC	8890-300	8890-315	8890-320
3-1/8" EIA Flanged	8891-300	8891-315	8891-320
1-5/8" EIA Flanged	8892-300	8892-315	8892-320
1-5/8" EIA Unflanged	8895-300	8895-315	8895-320
3-1/8" Unflanged, Flush Center, 51.5Ω	8896-300		
3-1/8" Unflanged, Flush Center	8897-300	8897-315	8897-320
3-1/8" Unflanged, Recessed Center	8898-300	8898-315	8898-320
Digital, 3-1/8" EIA Flanged	8891D300		
Digital, 1-5/8" EIA Flanged	8892D300		8892D320
Digital, Female 13-30	8892D13-30		

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.

Chapter Layout

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

Theory of Operation — Describes how the Termaline, Semiconductor, RF Load Resistor works and its functions.

Installation — Describes the how to install the Termaline, Semiconductor, RF Load Resistor.

Operation with Blower — Describes procedures require for operating the load resistor equipped with a blower unit.

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

TABLE OF CONTENTS

Safety Precautions	i
Safety Symbols	ii
Warning Statements	iii
Caution Statements	iv
Safety Statements	v
About This Manual	viii
Changes to this Manual	viii
Chapter Layout	viii
Chapter 1 Introduction	1
Items Supplied	1
Items Required but not Supplied	1
Optional Accessories (889x – 300)	1
Chapter 2 Theory of Operation	3
Load Resistor	3
Coolant	3
Thermal Interlock (Optional 889x – 300)	3
Blower Assembly (Optional 889x – 300)	3
Chapter 3 Installation	4
Unpacking and Inspection	4
Site and Shelter Requirements	4
Tools Required	4
Mounting the Load	5
Vent Plug	5
Thermoswitch	6
Installing the Thermoswitch	6
Installing the Interlock Connection	7
Connecting RF Power	8
Using a “QC” Connector Coupling	8
Using a 13-30 Coupling	8
Using a Swivel Flanged Coupling	8
Using a Unflanged Coupling	9
Using an AC Power Hookup	9
Chapter 4 Operating Instructions, No Blower	10
Normal Operation	10
Operating Under Abnormal Conditions	10
Shutting Down	10
Emergency Shutdown	10
Chapter 5 Operating Instructions, With Blower	11
Blower Controls	11
Normal Operation	11
Operating Under Abnormal Conditions	12
Shutting Down the Load	12
Emergency Shutdown	12

Chapter 6 Maintenance	13
Troubleshooting	13
Routine Maintenance	14
Clean the Load	14
Clean the Blower Assembly	15
Inspect the Load	15
Inspect the Coolant	16
RF Assembly Resistance Test	16
DC Resistance Measurement	17
Repair	18
Replacing the RF Connector	18
Replacing the Fuse	18
Replacing the Indicator Light	19
Replacing the Load Resistor	19
Replacing the Fan	20
Storage and Shipment	21
Storing the Load Resistor	21
Shipping the Load Resistor	21
Customer Service	21
Specifications	22
Replacement Parts	23
Available “QC” Type Connectors	24
Limited Warranty	25

The Bird 8890 series loads are portable, 50 ohm, coaxial RF transmission line terminations, designed for frequency ranges of DC – 2.4 GHz. The 8890 series D loads are designed for use in the UHF (470 – 860 MHz) band, otherwise they are identical to the standard series. These loads provide accurate and dependable low reflection line terminations. Power is dissipated at a level of up to 2500 watts of RF, 5000 watts if the optional blower assembly is used.

The 8890 series –300 is the basic load. The –315 and –320 models consist of a load with an installed blower assembly for 115 or 230 VAC lines, respectively.

The load has a coolant chamber surrounded by radiator fins. The front and rear fins form mounting flanges which can be used as supports for freestanding use or as brackets for fixed mounting. A vent plug at the top of the unit relieves internal pressure from coolant expansion. The load's simple and rugged design minimizes maintenance requirements.

Items Supplied

NOTE

The load is pre-filled with coolant at the factory.

- Load Resistor
- Shipping Plug
- Vent Plug
- Instruction Manual

Items Required but not Supplied

- **Coupling Kit:** Connects the load to the RF line

Optional Accessories (889x –300)

NOTE

The blower and control thermoswitch are standard on the –315 and –320 loads.

- **Bird BA-310 Blower Assembly:** Doubles the RF power capacity of the load. Includes control thermoswitch and detachable 3-wire power cable (without male plug for 230 VAC cable)
- **Interlock Thermoswitch:** Automatically shuts off the transmitter to prevent overheating of the load.

Figure 1 Bird 889x Series Outline Drawing - No Blower

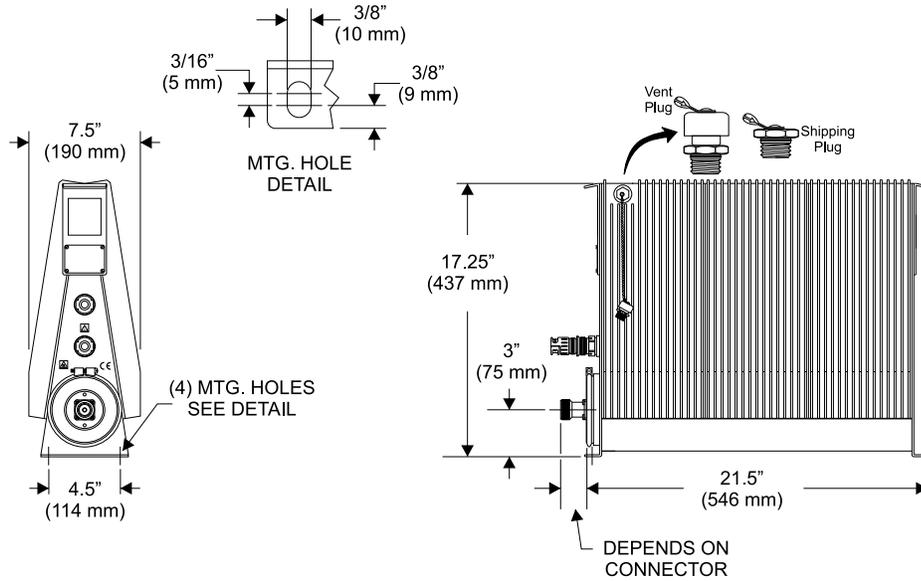
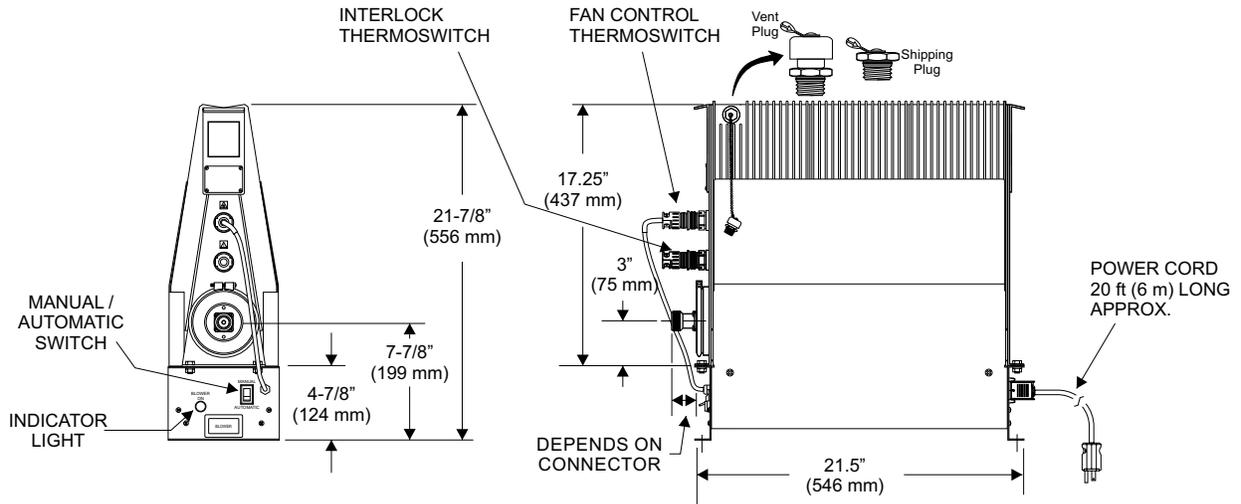


Figure 2 Bird 889x Series Outline Drawing With Blower



Load Resistor

Bird 8890 series loads consist of a thin-film-on-ceramic resistor immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in a special housing. When surrounded by the coolant, this produces a uniform, practically reflectionless line termination over the specified frequencies.

Coolant

The load is cooled by natural fluid and air convection currents. The coolant, chosen for its dielectric and thermal characteristics, carries heat from the resistor to the walls of the cooling tank, where radiator fins surrounding the tank transfer the heat to the air.

When the coolant is heated, thermal expansion causes an increase in the internal pressure. The vent plug ([Figure 1](#)) relieves this pressure while protecting the opening from dirt or other contaminants.

Thermal Interlock (Optional 889x – 300)

When installed, a passive, normally closed over-temperature thermoswitch opens above the maximum safe load temperature of 236 °C (457 °F), turning off transmitter power. The interlock will not permit use of the transmitter until the load has reached a safe temperature.

Blower Assembly (Optional 889x – 300)

When installed, the blower assembly provides forced airflow with two blowers. Baffles direct the airflow from the blowers over the radiator fins, doubling the heat transfer efficiency.

Example - A 2.5 kW load will safely dissipate 5 kW. A passive, normally open control thermoswitch closes when the coolant reaches 155 °C (311 °F), turning the fans on.

The baffles interfere with the free flow of normal air currents, causing a 50% reduction in heat transfer efficiency if the forced airflow is stopped. Thus, a 2.5 kW load will have its maximum power dissipation reduced to 1.25 kW.

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 unit should be operated in a dry, dust and vibration free environment.

Do not use outdoors or in areas of condensing humidity.

The ambient temperature range should remain between – 40 to +45 °C (– 40 to +113 °F) for proper operation.

Allow at least 12" (305 mm) of clearance around the unit to permit an unimpeded access of convection air currents for adequate heat dissipation.

Place the unit as close as possible to the transmitting equipment, to permit the shortest possible cable length.

Tools Required

The following tools and supplies will be required to prepare the unit for use:

- Wrenches
- Screwdrivers
- Bolt and nut sets or lag screws for mounting) ($\frac{3}{8}$ "(9.53 mm) max. diameter)

These tools and supplies are required for 889x-300 optional thermostwitch installation:

- 9/16 Hex wrench
- Pipe sealing compound (Loctite 567, or equivalent)
- Soldering Iron and solder
- Torque Wrench

Mounting the Load

CAUTION

This load is designed for operation in a horizontal position only, with the mounting brackets down. Operation in any other orientation will cause insufficient cooling of the unit leading to premature failure.

Bird 8890 series Loads are equipped for either portable use or fixed installation. The mounting brackets on the front and rear faces have four mounting slots arranged in a $4\frac{1}{2}$ " x $20\frac{23}{32}$ " rectangle (114.3 x 526.3 mm). Use a screw with a $\frac{3}{8}$ " (9.53 mm) diameter max.

The following instructions are for mounting the unit to a suitable surface.

1. Place the unit on a flat surface.
2. Insert the bolts through the surface and the mounting slots.
3. Secure the bolts with nuts and lock washers.

Vent Plug

WARNING

**The vent plug must be installed at all times when the unit is in operation or cooling.
Always check to ensure vent plug is installed prior to operation.
Failure to do so WILL result in damage to the equipment and endanger the operator's safety.**

Before placing the attenuator into service, the solid shipping plug, P/N 2450-049, must be removed and replaced by the spring loaded vent plug, P/N 2450-094. The two plugs are linked together by a short length of bead chain.

1. Locate the vent hole for the plug, located at the top left hand side near the front.
See [Figure 1](#) and [Figure 2 on page 2](#).
2. Remove the shipping plug.
3. Verify the O-Ring is installed on the vent plug.
4. Install the vent plug.

Thermoswitch

As an option, the load may be provided with a thermoswitch assembly, P/N 8890-008. The thermoswitch is used as an interlock switch to disable transmitter power if the coolant temperature exceeds a preset temperature, thus preventing possible damage from accidental power overloading from the transmitter or equipment malfunction.

The thermoswitch is normally closed and opens at a maximum safe temperature. Since the thermoswitch is connected in series with the transmitter interlock, it cuts off transmitter power if the coolant temperature exceeds this value.

The assembly consists of:

- Thermoswitch - P/N 8890-005
- Connector - P/N 2450-018

Installing the Thermoswitch

Bird 8890 series Load thermoswitch is normally closed, opening at 155 °C (311 °F), with a rating of 10A at 120VAC and 5A at 230VAC.

NOTE

A control thermoswitch, P/N 2450-085, is used to control the optional blower assembly. It is normally open, closing at 155 °C (311 °F), with a rating of 10A @ 120VAC and 5A @ 230VAC.

1. Remove the vent plug.
2. Verify the O-Ring is installed on the shipping plug.
3. Install the shipping plug.
4. Remove AC power plug from models equipped with a blower.
5. Stand the unit on its back with the RF connector end up.

NOTE

In this position there is no danger of the coolant pouring out through the socket plug hole.

6. Do one of the following:
 - **For Interlock Thermoswitch:**
Remove the socket plug just above the connector assembly with a $\frac{9}{16}$ " hex wrench. See [Figure 1](#) and [Figure 2 on page 2](#).
 - **For Control Thermoswitch:**
Remove the top socket plug with a $\frac{9}{16}$ " hex wrench.

NOTE

Do not contaminate the coolant with pipe sealing compound.

7. Use an acceptable pipe sealing compound sparingly on *only* the external threads of the thermoswitch.
8. Install the thermoswitch in place of the plug. Torque to 40 +/-2 ft-lbs.
9. Lower the attenuator back onto its feet.
10. Check the unit for coolant leaks.

WARNING

The vent plug must be used at all times when the unit is in operation or cooling.

Always check to ensure vent plug is installed prior to operation.

Failure to do so WILL result in damage to the equipment and endanger the operator's safety.

11. Remove the shipping plug.
12. Verify the O-Ring is installed on the vent plug.
13. Install the vent plug.

Installing the Interlock Connection

CAUTION

If installed, connect optional interlock before applying RF power.

1. Unscrew the large knurled ring-nut (A) at the lower end of the coupling jack assembly.
2. Pull the large knurled nut off the thermoswitch jack (B). See [Figure 3 on page 7](#).
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 with its threaded fitting in place.
5. Service the control switch wire with short tips and put spaghetti sleeves over the wire ends if necessary.
6. Securely solder the control switch leads to the lugs (G) of the connector base.

NOTE

The ring-nut (A) must be in place over the base plug (D) with the knurled end facing out.

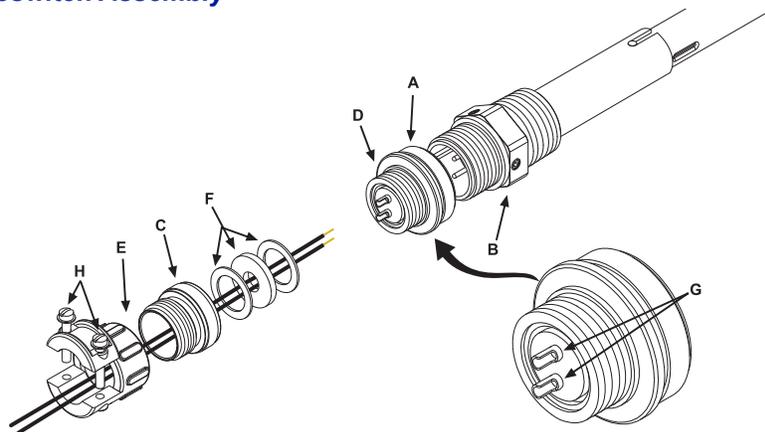
7. Screw on the cover ring (C).
8. Fasten the cable clamp (E) in place.
9. Tighten both yoke screws (H).
10. Push the plug back on the thermoswitch.
11. Tighten the nut (A).

NOTE

Do not attempt to operate the equipment without the interlock attached.

12. Connect the Thermoswitch wiring to the transmitter's interlock.

Figure 3 Thermoswitch Assembly



Connecting RF Power

Before first using the load, perform the following steps.

1. Wipe all connectors and insulator surfaces on the transmission line face with a clean soft cloth.
2. Check the RF input connector for signs of wear, damage, or dirt.
3. Clean the connector if necessary. Use a self-drying, non-residue forming contact cleaner on the interior portions of the connector.
4. Check the input resistance of the load. Refer to "[RF Assembly Resistance Test](#)" on page 16 for details.
5. 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.

Using a "QC" Connector Coupling

Use a 50 ohm coaxial cable such as RG-218/U or -220/U (-17A or -19A), appropriate for the frequency and power level of operation.

NOTE

Use a cable connector which will mate with the one on the load.

Using a 13-30 Coupling

Use 50 ohm coaxial cable such as RG-8A/U, RG-9U, RG-213/U, or equivalent with a male 13-30 plug.

Using a Swivel Flanged Coupling

1. Insert the center bullet. See [Figure 4 on page 8](#).
2. Push it in until it is fully seated.
3. Connect the coaxial input in a straight line
4. Push, carefully, on the center conductor to close.

NOTE

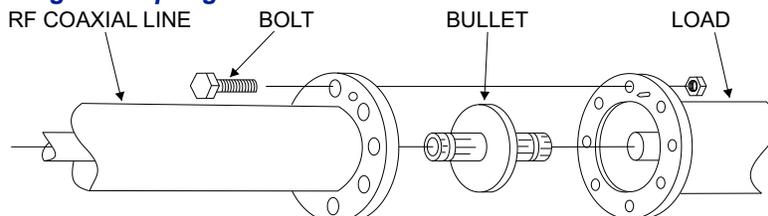
The swivel flange on the load makes connection independent of the orientation of the fixed flange on the coaxial input outer conductor.

5. Insert the bolt sets and tighten evenly all around to transmission line manufacturer's recommended torque.

NOTE

Use all of the bolts.

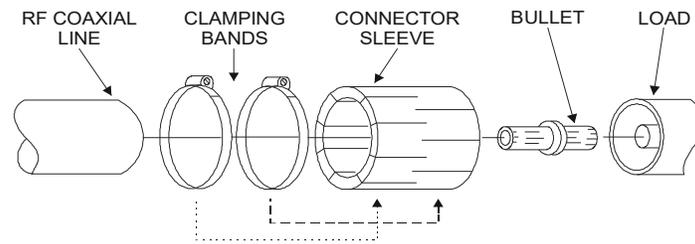
Figure 4 Swivel Flanged Coupling



Using a Unflanged Coupling

1. Insert the center bullet, see [Figure 5](#).
2. Push until it sets the midpoint nibs.
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.
6. Tighten the clamping bands.

Figure 5 Unflanged Coupling



Using an AC Power Hookup

WARNING

Turn off AC power and RF power when attaching the power cable.

CAUTION

Check the local electrical code for proper AC hookup prior to operation of the unit. Make sure the neutral or return hookup is only used for that purpose.

AC power is only required if the blower assembly is installed. The AC power supply required is 115/230 V, depending on the blower, @ 50/60 Hz, 1 ϕ . The blower is equipped with an IEC 320 "cold" (65 °C) AC inlet.

WARNING

The vent plug must be installed at all times when the unit is in operation or cooling.
Always check to ensure vent plug is installed prior to operation.
Failure to do this could result in damage to the equipment and endanger the operator's safety.

WARNING

Do not touch the load during operation. During operation, load surfaces are extremely hot.
Touching the load during or after operation may cause burns.

CAUTION

If installed, connect optional interlock before applying RF power.

Normal Operation

Bird 8890 series– 300 loads have no indicators or operating controls. They require no special operating procedures or surveillance when their performance limits are not exceeded. Follow the instructions for the specific transmitter equipment.

Operating Under Abnormal Conditions

The load can be moderately overloaded for short periods.

CAUTION

Make sure the interlock is properly connected when overloaded to prevent damage to the load.

Shutting Down

These loads are passive devices, so have no way of being turned off. Turn off RF power at the source.

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.

Emergency Shutdown

Turn off RF power at the source.

NOTE

If the interlock thermoswitch is properly connected, RF power will be automatically turned off when the coolant temperature reaches an unsafe level.

WARNING

The vent plug must be installed at all times when the unit is in operation or cooling.
Always check to ensure vent plug is installed prior to operation.
Failure to do this could result in damage to the equipment and endanger the operator's safety.

WARNING

Do not touch the load during operation. During operation, load surfaces are extremely hot.
Touching the load during or after operation may cause burns.

CAUTION

If installed, connect optional interlock before applying RF power.

Blower Controls

Bird 8890 series –315 and –320 Loads are equipped with a control switch and indicator light on the front of the blower assembly. The switch is labeled MANUAL/AUTOMATIC.

- When the switch is set to MANUAL, the fans run continuously.
- When set to AUTOMATIC, the fans turn on when the coolant reaches a preset temperature.

NOTE

The indicator light, labeled BLOWER ON, turns on whenever the unit is connected to AC power.

Normal Operation

1. Ensure the indicator light is on.
2. Set the switch to MANUAL for a few moments.
3. Ensure the fans are working properly.
4. Set the switch back to AUTOMATIC.
5. Apply RF power.

Operating Under Abnormal Conditions

The load can be subjected to higher power levels for short intervals. If this is likely, make sure the interlock is properly connected to prevent damage to the load.

NOTE

A properly connected interlock will prevent overload.

CAUTION

Maximum power is 1,250 W when the blower is not running. If the indicator light should turn off, immediately reduce RF power to less than 1,250 W.

If the indicator light turns off or the fans stop unexpectedly, do one of the following:

- Immediately turn off RF power.
- Reduce the RF power to less than 1,250 W.

NOTE

Refer to ["Troubleshooting"](#) on page 13 to correct the problem.

Shutting Down the Load

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.

1. Turn off RF power at the source.
2. Wait approximately 15 minutes, or for the fans to stop running.

NOTE

This will allow the load to cool without causing heat stress.

3. Turn off the blower.

Emergency Shutdown

Turn off RF power at the source.

NOTE

If the interlock thermoswitch is properly connected, RF power will be automatically turned off when the coolant temperature reaches an unsafe level.

This chapter covers cleaning, inspection, trouble-shooting, and specifications for the Bird 8890 series Loads.

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 blower assembly from supply voltage before performing any maintenance.

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
No air flow from blowers; "BLOWER ON" light off.	Unplugged power cable.	Connect the power cable.
	No AC power.	Make sure AC power is properly connected and turned on.
	Fuse burnout.	Replace fuse after correcting the burnout cause. See "Replacing the Fuse" on page 18.
No air flow from blowers; "BLOWER ON" light on.	Fan obstructed by bent grill.	Straighten the grill.
	Fan motors overheated.	Clean the grill and fan blades. See "Clean the Load" on page 14.
	Fan motors burnt out.	Replace the fan motors (See "Replacing the Fan" on page 20.)
Air flow from blowers; "BLOWER ON" light off.	Lamp burnout.	Replace lamp. See "Replacing the Indicator Light" on page 19.
Leaking coolant.	Loose clamping band.	Tighten the clamping band.
	Defective or improperly installed O-ring.	Replace the O-ring. See "Replacing the Load Resistor" on page 19.
High or low DC resistance.	Loose RF input connector.	Tighten connector.
	Faulty RF input connector.	Model 8890: Replace connector. See "Replacing the RF Connector" on page 18. All other models: Return the unit for service.
	Faulty resistor.	Replace the resistor. See "Replacing the Load Resistor" on page 19.
Overheating radiator.	RF power too high.	Lower RF power. See "Specifications" on page 22 for maximum RF power.
	Coolant level too low.	Check the coolant level. Add coolant if necessary. See "Inspect the Coolant" on page 16.
	Coolant degraded.	Replace the coolant. See "Inspect the Coolant" on page 16.
	Faulty control thermostwitch (blower only).	Replace control thermostwitch. See "Installing the Thermostwitch" on page 6.
	Faulty resistor.	Replace the resistor. See "Replacing the Load Resistor" on page 19.

Routine Maintenance

Figure 6 shows the location of components which may be referred to in this section.

Figure 6 Maintenance and Repair Locations, Without Blower

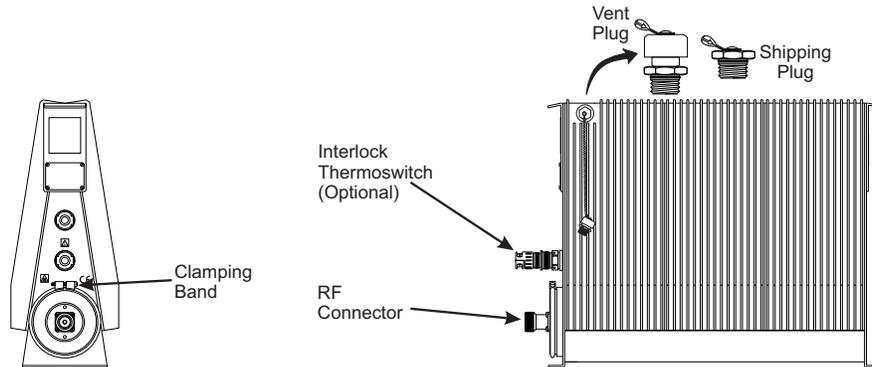
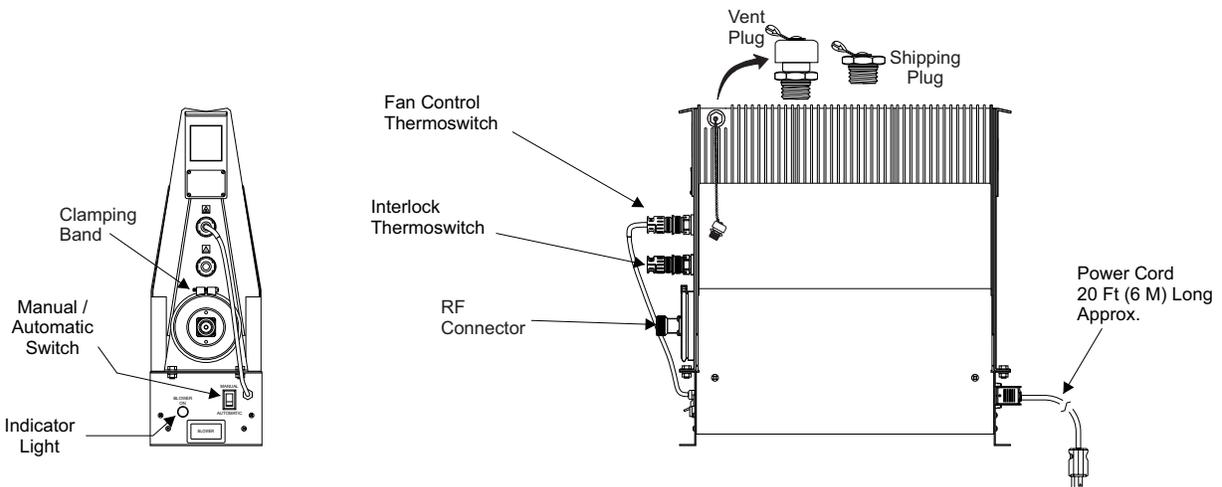


Figure 7 Maintenance and Repair Locations, With Blower



Clean the Load

- The outside surface of the instrument should be wiped free of dust and dirt when necessary.
- Clean the cooling fins.

NOTE

Excessive dust on the cooling fins will interfere with heat dissipation.

- Clean the RF connector, both metallic and insulating surfaces, with a dry, non-residue forming solvent.

Clean the Blower Assembly

- The intake grills, fans, and inside of the baffles should be wiped free of dust and dirt when necessary.

NOTE

Excessive dust will interfere with heat dissipation.

When the blower assembly is installed, it will be necessary to partially disassemble the blower to clean the load's radiator fins.

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**

Do not operate with side panel removed. Doing so could result in personal injury.

1. Unscrew both 10-32 truss head screws that secure one of the side baffles and remove it.
2. Clean the load.
3. Secure the side baffle with the 10-32 truss head screws.
4. Repeat Steps 1-3 for the other side baffle.

Inspect the Load

- Inspect the unit every six months.
 - a. Check for coolant leakage around the clamping band.
 - b. Check for coolant leakage around the thermostick.
 - c. Check for corrosion.

Inspect the Coolant

Coolant lifetime will vary greatly depending on the operating temperature.

- **Heavy Use (full RF power for long times, high ambient temperature, 50 Hz AC supply):**
Inspect the coolant every 500 hours.
- **Light Use (fraction of full power, low ambient temperature, 60 Hz AC supply):**
Inspect coolant every 2,000 hours.

NOTE

Correct any coolant leakage before inspection. See ["Troubleshooting"](#) on page 13.

WARNING

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

To inspect the coolant:

1. Remove the load resistor (See ["Replacing the Load Resistor"](#) on page 19).

CAUTION

Use only Bird coolant, P/N 5-1070, to prevent damage to the load.

- The coolant should be clear, with a faint yellow tinge, and have a slightly sweet smell.
 - If coolant is black with a burnt or acrid smell, drain it and add about 2.9 gal (11 L) of coolant.
2. With the load still on end, the coolant level should be $4\frac{3}{4}$ to 5 inches (125 mm) below the top surface of the resistor assembly mounting ring, at ambient temperature.
 3. Add coolant if necessary.
 4. Install the load resistor (See ["Replacing the Load Resistor"](#) on page 19).

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. The resistor should provide at least 5,000 hours of operation before requiring any additional service. DC resistance should be measured annually.

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.

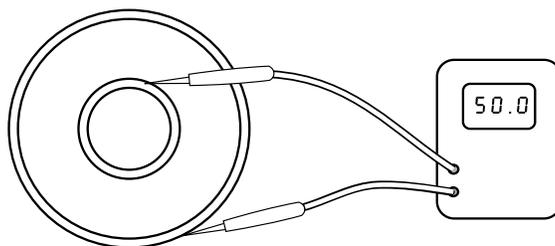
Leaking RF energy is a potential health hazard.

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 8](#).
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 1 ohms this could be an indication of a failing resistive element.

Figure 8 *Measuring DC Resistance*



Repair

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 RF Connector

ONLY the Model 8890 has a special Bird “QC” connector which allows easy changing of the RF connector. This does not disturb the coolant seal or affect the electrical continuity of the load. To change the connector, proceed as follows:

1. Remove the four screws at the corners of the RF connector.
2. Pull the connector straight out.
3. Push the new connector in. Make sure that the center pin on the connector is properly seated in the mating socket on the load.
4. Replace the screws.

NOTE

If not using the LC connector normally supplied, the frequency and power must be limited to the capabilities of the connector.

Replacing the Fuse

WARNING

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

NOTE

Correct the fuse burnout cause. Common causes include stuck or blocked fans or a short circuit in the motor or blower wiring. See "[Troubleshooting](#)" on page 13.

NOTE

The fuse is located in the AC module on the back of the blower.

1. Press the locking tab on the fuse drawer.
2. Remove the drawer.
3. Replace the fuse.
See "[Specifications](#)" on page 22 for fuse type and current rating.
4. Push the drawer into the AC module until it locks into place.

NOTE

If the fans still do not run or if the fuse burns out again, return the blower assembly to the factory.

Replacing the Indicator Light

1. Remove the four 8-32 pan head screws from the front and back of the base frame.
2. Pull the fan guard straight off the bottom.
3. Remove the quick disconnects on the light.
4. Unscrew the retaining sleeve.
5. Remove the light unit.
6. Remove the lens while pressing both locking tabs.
7. Release the lamp by pressing the housing's center slot with a small screwdriver.
8. Push the new lamp into the housing until it snaps into place.
9. Replace the lens.
10. Put the light unit back in place.
11. Secure the fan guard with the 8-32 pan head screws.

Replacing the Load Resistor

1. Remove the vent plug.
2. Verify the O-Ring is installed on the shipping plug.
3. Install the shipping plug.
4. Remove AC power plug from models equipped with a blower.
5. Stand the unit on its back with the connector end up.

NOTE

In this position there is no danger of the coolant pouring out through the socket plug hole.

6. Unscrew and remove the clamping band.
7. Lift the load resistor assembly out of the tank.
8. Allow any coolant to drip back into the tank.
9. Check the O-Ring.

NOTE

It should be free of twists and positioned evenly around the flange of the resistor housing. If the O-ring shows signs of deterioration (e.g. is no longer pliable or has surface cracks) replace it.

10. Inspect the coolant, see "[Inspect the Coolant](#)" on page 16.
11. Install the entire load resistor assembly.

NOTE

The load resistor assembly cannot be disassembled any further.

12. Put the clamping band in place and tighten it.
13. Lower the unit back onto its feet.
14. Check all seals for signs of leaks.

WARNING

The vent plug must be installed at all times when the unit is in operation or cooling.

Always check to ensure vent plug is installed prior to operation.

Failure to do this could result in damage to the equipment and endanger the operator's safety.

15. Remove the shipping plug.

16. Verify the O-Ring is installed on the vent plug.
17. Install the vent plug.

Replacing the Fan

WARNING

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

1. Remove the four 8-32 pan head screws from the front and back of the base frame.
2. Pull the fan guard straight off the bottom.
3. Carefully unsolder the color coded connecting wires.

NOTE

Note the connections for resoldering.

4. Remove the four fan mounting screws.
5. Remove the defective fan.

NOTE

Be careful not to lose the lipped retaining washers.

6. Insert the replacement fan with the fan blade assembly facing down, towards the fan guard grill.
7. Insert the mounting screws and retaining washers into the mounting holes.
8. Turn the washers so that the lipped portion fits over the rim of the fan frame.
9. Tighten the screws.

NOTE

If the fan replaced is the one closest to the power socket, reattach the green ground wire to the closest mounting screw.

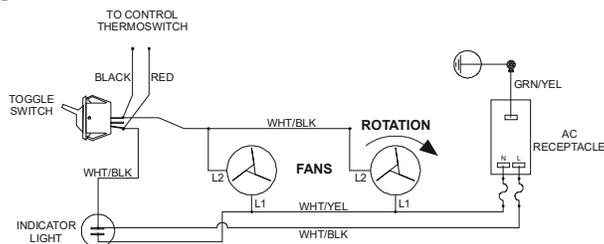
10. Solder the connecting wires to the solder lugs on the motor unit according to the color coding.
11. Replace the fan guard and screws.

NOTE

Before reattaching the blower assembly to the load, check the fans for free and unimpeded movement of the blades.

12. Connect the unit to AC power.
13. Set the switch to MANUAL.
14. Ensure that the fans work properly.
15. Set the switch back to AUTOMATIC.

Figure 9 Schematic Diagram



Storage and Shipment

Storing the Load Resistor

1. Cover Bird 8890 Loads before storing to keep out dust and dirt.

NOTE

When storing the load it is not necessary to install the shipping plug.

2. 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

The unit may be shipped with its dielectric coolant; however, do not ship the unit with its dielectric coolant if the unit has developed a leak. Drain the coolant first.

1. Remove the vent plug.
2. Verify the O-Ring is installed on the shipping plug.
3. Install the shipping plug.
4. Wrap the vent plug with padding and tape it to the side of the load for protection.

NOTE

With the shipping plug installed, it is not necessary to empty out the coolant.

5. Wrap the connector in padding.
6. Pack and brace the load in a sturdy wooden crate for shipment.

NOTE

All instruments returned for service must be shipped prepaid and to the attention of the Customer Service Group. See [Customer Service](#).

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 8891D300, 8892D300, 8892D13-30, 8892D320 All other models	470 – 860 MHz DC – 2.4 GHz
Power Rating¹ Peak Power for Pulse Width² 1 μ s 10 μ s 100 μ s 1000 μ s 5000 μ s	2500 W continuous duty 150 kW 115 kW 80 kW 54 kW 22 kW
Impedance 8896 All other models	51.5 ohms 50 ohms
VSWR 8891D300, 8892D300, 8892D13-30, 8892D320 All other models ³	1.065 DC – 1 GHz 1.1 1 – 2 GHz 1.25 2 – 2.4 GHz 1.3
Connectors 8890 8891, 8891D300 8892, 8892D300, 8892D320 8892D13-30 8895 8896 8897 8898	Female LC 3-1/8" EIA flanged 1-5/8" EIA flanged Female 13-30 1-5/8" EIA unflanged 3-1/8" unflanged (flush center) 3-1/8" unflanged (flush center) 3-1/8" unflanged (recessed center)
AC Power –315 –320	115 V \pm 10% @ 50/60 Hz \pm 3% 230 V \pm 10% @ 50/60 Hz \pm 3%
AC Line Power Rating	460 W max IEC (5 x 20 mm) Type T
Fuse Rating 115 Vac 230 Vac	1 A 500 mA
Thermoswitch Interlock Fan Control	Normally closed. Opens at 236 °C (457 °F) Normally open. Closes at 155 °C (311 °F)
Thermoswitch Rating 115 Vac 230 Vac	10 A 5 A
Ambient Temperature	–40 to +45 °C (–40 to +113 °F)
Altitude⁴	1520 m (5000 ft.)
Humidity	95% noncondensing max
Cooling method	Oil dielectric and convection currents
Dimensions Without blower With blower	21.75" L x 7.5" W x 17.25" H (551 x 190 x 437 mm) 21.75" L x 7.5" W x 21.875" H (551 x 190 x 556 mm)
Weight, Nominal	59 lb. (27 kg)

Finish	Grey Powder Coat
--------	------------------

- 1 Power rating with blower installed and operating: 5000 W
Power rating with blower installed and *NOT* operating: 1250 W
- 2 Set the duty factor so that the average power rating of the load is not exceeded.
- 3 For models 8890-300, -315, and -320 VSWR Measured using a female N connector
- 4 Derate RF power by 2.5% for every 305m (1,000 ft.) above 1,520m (5,000 ft.).

Replacement Parts

Description	Qty	Part Number
RF load resistor	1	
8890		8890A050
8891		8891-050
8891D300		8891-071
8892, 8892D300		8892-015
8892D13-30		8862-017
8895		8895-015
8897		8897-003
8898		8898-006
Resistor O-Ring	1	5-230
Clamping band assembly	1	2430-055
Plug	1	
Vent		2450-094
Shipping		2450-049
Overtemp thermosthwitch	1	8890-008
Thermosthwitch body	1	8890-005
Thermosthwitch jack	1	2450-018
Control thermosthwitch ¹	1	2450-085
Thermosthwitch body	1	2450-086
Thermosthwitch jack	1	2450-018
Coolant, 2.9 gal (11 liters)	1	5-1070
Radiator assembly	1	2450-313
Access plug 3/4"-14 hex socket	1	5020-103
Blower assembly, BA-300²	1	
115 VAC		BA-300-115
230 VAC		BA-300-230
Blower assembly, BA-310¹	1	
115 VAC		BA-310-115
230 VAC		BA-310-230

- 1 Optional on the -300, standard on the -315 and -320
- 2 Optional on the -300

Available “QC” Type Connectors

Connector	Part Number
BNC-Female	4240-125
BNC-Male	4240-132
C-Female	4240-100
C-Male	4240-110
HN-Female	4240-268
HN-Male	4240-278
LC-Female ¹	4240-031
LC-Male	4240-025
Open Term.# 10-32 Nut	4240-080
LT-Female	4240-018
LT-Male	4240-012
N-Female	4240-062
N-Male	4240-063
SC-Female	4240-090
SMA-Female	4240-336
SMA-Male	4240-334
7/16 Jack, IEC Type 169-4	4240-344
7/16 Plug, IEC Type 169-4	4240-363
Mini UHF-Female	4240-346
UHF-Female	4240-050
UHF-Male	4240-179
1-5/8" EIA Fixed	4240-096
1-5/8" EIA Swivel	4240-208
7/8" EIA	4240-002
TNC-Female	4240-156
TNC-Male	4240-160

1 Normally supplied on the 8890

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.

