
INSTRUCTION BOOK

OPERATING INSTRUCTIONS

**THRULINE[®] WATTMETER
MODEL 4308**

BIRD
Electronic Corporation
Cleveland (Solon) Ohio USA

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Instruction Book Part Number 920-4308 Revision C

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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.

Keep Away From Live Circuits

Operating personnel must at all times observe general safety precautions. Do not replace components or make adjustments inside equipment with the high voltage supply turned on. To avoid casualties, always disconnect power.

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.

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.

Shock Hazard

Do not attempt to disconnect an RF transmission line while RF power is present. Radiated RF power is a potential health hazard.

Resuscitation

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

Safety Symbols

WARNING

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

CAUTION

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



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

 Note: Calls attention to supplemental information.

4308 Warning Statement

The following safety warning appears in the text where there is danger to operating and maintenance personnel and is repeated here for emphasis.

WARNING

Leaking RF energy is a potential health hazard. Never attempt to connect or disconnect equipment from the transmission line while RF power is being applied. Severe burns, electrical shock, or death can occur.

4308 Caution Statement

The following equipment caution appears in the text whenever the equipment is in danger of damage and is repeated here for emphasis.

CAUTION

Do not drop the Thruline Wattmeter equipment or submit it to hard blows. The voltmeter circuitry or microammeter, even though it is shock mounted, may be damaged by severe impact.

4308 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 PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.



SERVICE

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

SERVICIO

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

WARTUNG

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

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

ENTRETIEN

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

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE



OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

RF VOLTAGE MAY BE PRESENT IN RF ELEMENT SOCKET - KEEP ELEMENT IN SOCKET DURING OPERATION.

DE LA TENSION H.F. PEUT ÊTRE PRÉSENTE DANS LA PRISE DE L'ÉLÉMENT H.F. - CONSERVER L'ÉLÉMENT DANS LA PRISE LORS DE L'EMPLOI.

HF-SPANNUNG KANN IN DER HF-ELEMENT-BUCHSE ANSTEHEN - ELEMENT WÄHREND DES BETRIEBS EINGESTÖPSELT LASSEN.

PUEDE HABER VOLTAJE RF EN EL ENCHUFE DEL ELEMENTO RF - MANTENGA EL ELEMENTO EN EL ENCHUFE DURANTE LA OPERACION.

IL PORTAELEMENTO RF PUÒ PRESENTARE VOLTAGGIO RF - TENERE L'ELEMENTO NELLA PRESA DURANTE IL FUNZIONAMENTO.

About This Manual

This instruction book covers the model 4308 Thruline Wattmeter.

This instruction book is arranged so that essential information on safety is contained in the front of the book. Reading the Safety Precautions Section before operating the equipment is strongly advised.

The remainder of this instruction book is divided into Chapters and Sections. At the beginning of each chapter a general overview will be given, describing the contents of that chapter.

Operation

First time operators should read Chapter 1 - Introduction, and Chapter 3 - Installation, to get an overview of equipment capabilities and how to install it. An experienced operator can refer to Chapter 4 - Operating Instructions. All instructions necessary to operate the equipment, are contained in this section.

Maintenance

All personnel should be familiar with preventative maintenance found in Chapter 5 - Maintenance. If a failure should occur, the troubleshooting section will aid in isolating and repairing the failure.

Parts

For location of major assemblies or parts refer to the part lists in Chapter 5.

Changes To This Manual

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

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This chapter contains introductory information including product specifications, items supplied, and accessory items.

Purpose and Function

The Model 4308 Thruline Wattmeter is a portable multi-range RF wattmeter. It is a device which requires no external power source or batteries for operation. It is used to measure RF power when inserted into a transmission line of 50 ohms impedance. When operated in this manner, it is used to determine power flow and load mismatch in coaxial transmission lines. It may be used to make measurements of CW, FM, or PM (Plane Modulated) RF Power.

Performance Characteristics and Capabilities

On the front face of the unit, there are four power ranges which are controlled by a selector switch. Each position of the selector switch corresponds to a power range on the read-out meter, refer to the Specifications. There is also a "TRANSIT" position to be used when transporting the unit. This position effectively shunts the delicate meter movement to avoid damage from harsh blows.

The meter, line section, and related circuitry of the instrument are contained in a rugged aluminum housing. This housing is equipped with a carrying strap, four rubber bumper feet on the bottom, and four rubber bumper feet on the back. These bumper feet allow the unit to be used in a standing (vertical) or flat (horizontal) position.

Specifications

Impedance:	50 ohms nominal
Full Scale Power Range:	1.5, 5, 15, 50 Watts
Insertion VSWR: Female "TNC" Connector Female "UHF" Connector	1.05 max. from 440-512 MHz 1.07 max. from 512 to 960 MHz 1.08 max. from 440-512 MHz 1.12 max. from 512 to 960 MHz
Insertion Loss: With Female "UHF" Connectors	0.1 dB max. 440 to 512 MHz 0.13 dB 512 to 960 MHz 0.1 dB 440-512 MHz 0.15 dB 512-960 MHz
Accuracy:	440-960 MHz \pm 5% Full Scale
Weight, Nominal:	3 lb.. (1.36 kg)
Dimensions, Nominal: Without Connectors: With Female "TNC" Connectors:	3-29/32" L x 4" W x 6-7/8" H (99 mm x 102 mm x 175 mm) 3-29/32" L x 5" W x 6-7/8" H (99 mm x 127 mm x 175 mm)
Connectors:	Bird Quick Change "QC" type, Female TNC normally supplied.
Finish:	Grey Powder Coat
Meets European EMC Standards: EN55011 and EN50082-1, which are in accordance with council directives 89/336/EEC and 92/31/EEC. Meets European Safety Standard EN 61010-1, Which is in accordance with council directive 73/23/EEC and 93/68/EEC.	

Accessory Item

Case — Model CC-1, Vinyl case holds Wattmeter and accessories.

Travelling Wave Viewpoint

The operation of the Model 4308 wattmeter is based on the travelling wave concept of RF transmission. As RF power is applied to a transmission line, there is a forward wave travelling from the transmitter to the load and a reflected wave travelling from the load back to the transmitter. The closer the line termination, or load, is matched to the line impedance, the smaller the reflected wave will be. To determine the number of watts dissipated in the load, it is necessary to determine both the power of the forward wave and the power of the reflected wave. The difference between the two will indicate effective power dissipation.

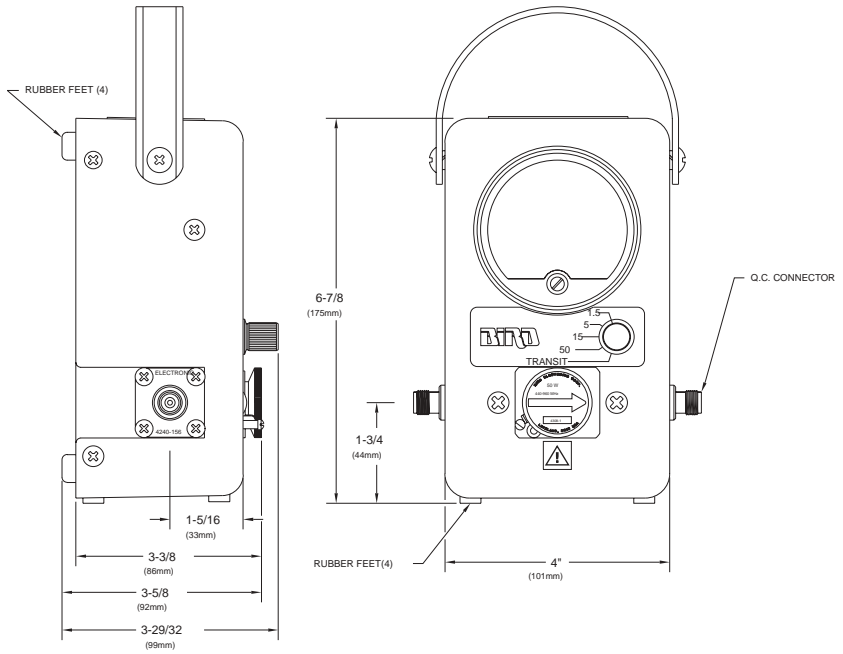
Travelling Wave vs Standing Wave

The interference between the forward and reflected waves, produces a standing wave in a coaxial system. In the standing wave concept, VSWR (voltage standing wave ratio) is a widely used tool. There is a simple relationship between forward power, reflected power, and VSWR.

$$VSWR = \frac{1 + \sqrt{\frac{W_r}{W_f}}}{1 - \sqrt{\frac{W_r}{W_f}}}$$

Where W_f = forward power; and W_r = reflected

Figure 1
Model 4308 Outline Drawing



Power

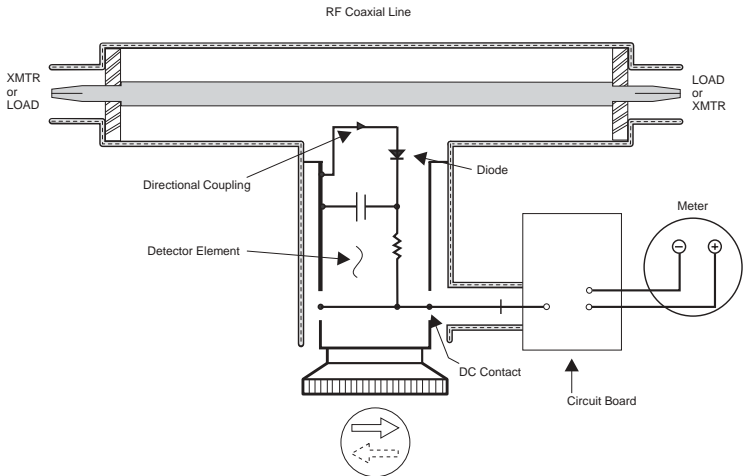
Since there is a definite relationship between the standing wave ratio and the forward-reflected power ratio, the forward and reflected powers may be read from the Thruline Wattmeter and converted to VSWR. The charts are furnished in this Instruction Book.

Coupling Circuit

The coupling circuit which samples the travelling waves is in the Plug-In Element. The circuitry of the element and its relationship to the other components of the Thruline Wattmeter are illustrated in the schematic diagram, see figure 2.

Energy will be produced in the coupling circuit of the element by both mutual inductance and capacitance from the two travelling RF waves in the line section. The inductive

Figure
2
Schematic
Diagram



currents will flow according to the direction of the travelling waves producing them, whereas the capacitive portion of these currents is independent of the direction. Therefore, in either position of the Plug-In Element, the coupling currents produced from the waves of one direction will add in phase, and those produced from waves of the opposite direction will accordingly subtract in phase. The additive direction is indicated by the arrow.

The electrical values of the element circuits are carefully balanced and designed so that the inductive current produced from the reverse wave will cancel its portion of the capacitive current almost completely. The result is a directivity greater than 25 dB, which means that the element is highly insensitive (i.e. produces little or no signal) from the reverse direction wave. By being so highly directional, the Detector element is sensitive at either one of its settings, but to only one of the two travelling waves. Thruline Wattmeter measurements are also independent of their position along the standing waves.

Portability

CAUTION

Do not drop the Thruline Wattmeter equipment or submit it to hard blows. The voltmeter circuitry or microammeter, even though it is shock mounted, may be damaged by severe impact.

The Model 4308 is a portable instrument, and the housing is not designed for fixed mounting. A strap is provided for carrying purposes. To protect the meter movement during periods of transit, put the range switch in the “TRANSIT” position. This effectively shunts the meter movement and dampens the pointer action.


Connections

WARNING

Leaking RF energy is a potential health hazard. Never attempt to connect or disconnect equipment from the transmission line while RF power is being applied. Severe burns, electrical shock, or death can occur.

Install the wattmeter in the 50 ohm transmission line as follows:

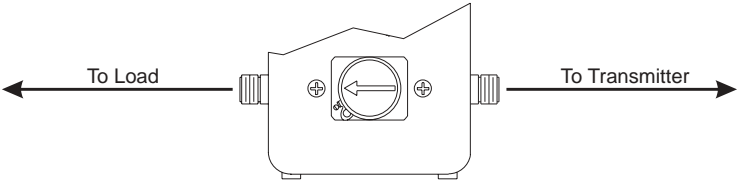
1. Attach the transmission line to the connectors on either side of the wattmeter housing. It makes no difference which sides the RF power source and the load are connected.

 Note: Use of a short length of 50 ohm cable fitted with the appropriate mating connectors may be useful when inserting the wattmeter in the transmission line.

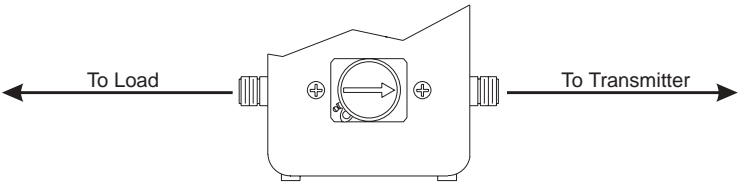
- 2. Rotate the element so that the arrow points in the direction of power flow.

If coaxial cables other than 50 ohm impedance are used, a mismatch will occur which may cause serious inaccuracies in the readings.

*Figure
3
Element
Direction*



Forward Power Measurement



Reflected Power Measurement

Chapter 4

Operating Instructions

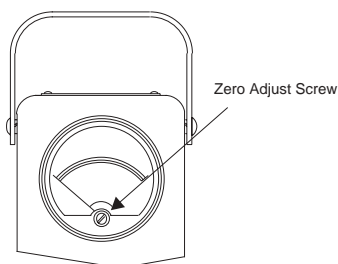
A description of the features of the Thruline Wattmeter have been discussed in the previous sections. Read and become familiar with the following instructions before operating the Model 4308. As mentioned, no batteries or external power sources are required to operate the meter. A small but sufficient amount of power is obtained from the transmission line into which the unit is connected.

Zero Adjust

Before applying any RF power, check to see that the meter pointer is set at zero. If adjustment is required, it will be necessary to zero adjust the meter under power off conditions. Refer to figure 4.

Turn the zero-adjust screw on the bezel of the meter, using a small screwdriver, clockwise or counterclockwise as necessary. Turn until the pointer exactly aligns with the zero of the meter scale.

Figure 4
Zero Adjust



Range Switch and Power Measurement

The range switch should be placed at the highest power setting, (i.e., 50 Watts). This is especially true when the amount of power being applied is unknown. After the RF power is applied the range switch may be switched down so that a power indication is given in the upper one-third of the scale.

The Model 4308 is supplied with a special broadband 50 W element with a frequency range of 440-960 MHz. This element is capable of operating at lower power levels and up to 50 watts equally as well. At lower power levels, the range switch should be turned to a lower setting for better resolution. Do not select a range lower than necessary or damage to the meter may result.

Forward power (i.e., the forward direction of power flow) is indicated when the element's arrow is pointing towards the load. Reflected power can be indicated by rotating the element in the line section so that the arrow points in the direction of the reflected power flow, i.e., towards the source of power. Refer to figure 4. When the reflected power is decisively lower, switching the range switch to a lower level, if possible, will give better resolution.

Where appreciable power is reflected, as with an antenna, it is necessary to subtract the reflected from the forward power to get load power. Power delivered to, and dissipated in a load is given by:

$$W_l = \text{Watts into load} = W_f - W_r$$

This correction is negligible (less than one percent) if the load is such as to have a VSWR of 1.2 or less. Good load resistors, such as Bird Termaline Load Resistors, will produce a negligible or unreadable reflected power.

VSWR Calculations

After obtaining the forward and reverse power, the VSWR may be found by calculation, as described in Theory of Operations - Chapter 2 , or by using the VSWR Nomographs in figures 5 and 6 to simplify finding VSWR. Simply apply the obtained forward and reflected power readings to the chart, following the cross lines to their intersection and taking the VSWR from the nearest sloping line.

Figure 5
VSWR Conversion Nomograph

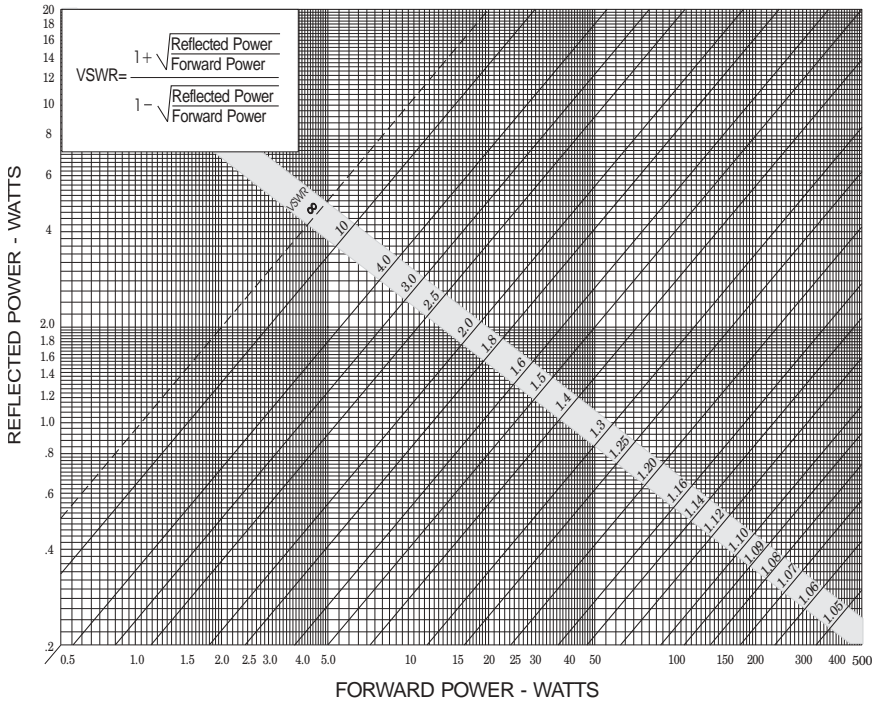
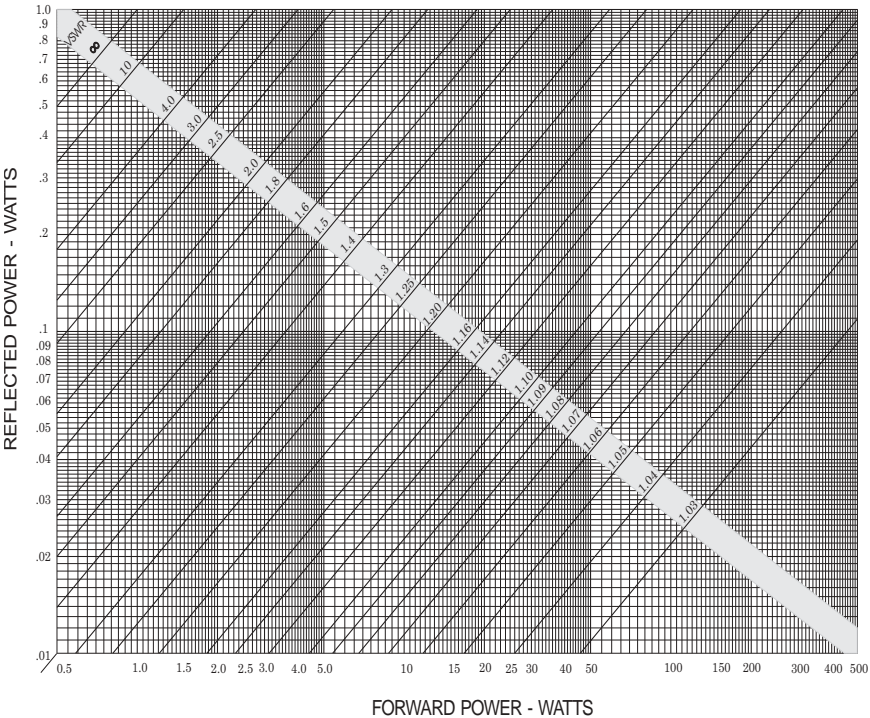


Figure 6
VSWR Conversion Nomograph



This chapter includes cleaning, inspection, troubleshooting, and performance information.

Troubleshooting

Use the following table to aid in isolating problems, their possible cause, and corrections.

Cleaning

Problem	Possible Cause	Correction
No meter indication	No RF power applied to unit.	Check RF source and check cables.
	“Arrow” on Plug-In Element pointed in the wrong direction.	Reposition element
	No pick-up from dc contact finger	Adjust contact finger
	Open or short circuit in dc circuit.	Check switch connections, circuit board, and meter leads.
	Meter burned out or damaged	Replace or return wattmeter to the factory for meter replacement and recalibration

Problem	Possible Cause	Correction
Intermittent or Inconsistent Meter Readings	Faulty transmission line or antenna	Inspect line
	Sticky or defective meter	Replace or return wattmeter to the factory for meter replacement and calibration
	Dirty dc contact on element	Clean contact
High VSWR or Reflected power	Bad load or poor connectors	Replace load, antenna or connectors.
	Shorted or open transmission line	Service or replace line


Care and cleanliness is a main factor in maintenance. If any of the contacts or line connectors become dirty, they should be cleaned with a dry cleaning solvent that does not leave a residue.

It is important to keep these areas clean:

- ♦ All contact surfaces and especially the exposed faces of the Teflon insulators.
- ♦ The meter face and the housing, clean with a soft cloth dampened with a mild detergent solution.

Repair and Replacement

Although the Model 4308 is designed to for long term, trouble free operation. In the case of malfunction of the unit, the repair or replacement procedures in this section should be followed.

 **Note:** Do not perform unauthorized maintenance work during the first year. It could be cause to void the warranty.

Line Section or Element Coupling Circuit

If a problem should occur in the line section or element coupling circuit, it is advised that the unit be returned to Bird Electronic Corporation for repair and recalibration.

Meter Housing

For access to the inside of the meter housing, the back cover must be taken off. To do this:

1. Remove the four screws located near the back at the top and bottom of the sides.
2. Pull the cover straight off.

Line Section and Circuit Board

1. Loosen the nuts on the meter terminals using a 5/16 inch wrench.
2. Remove the connecting wires on the meter terminals.
3. Remove the range switch knob. Use a 1/16 inch hex wrench to loosen the set screw.
4. Remove the two 10-32 Phillips head screws located on the front of the meter housing on either side of the detector element. Support the line section while removing the 10-32 screws. The line section with the attached circuit board will fall straight out the back.
5. Detach the circuit board by removing the two screws that secure it to the line section.

Be careful not to distort the spring finger of the dc contact that protrudes into the line section. Also be careful not to lose either; the Teflon insulator on the spring contact finger or the small spacers on the circuit board mounting screws. It is important that the operating position of this part be properly maintained for correct contact with the dc contact on the element body. Also take special care not to disturb the setting of the potentiometers on the circuit board. These potentiometers are for calibration purposes and the accuracy of the unit will be altered if the setting of these potentiometers is changed.

These parts are not subject to further disassembly and must be replaced in their entirety if defective. The circuit board is only replaceable at the factory.

6. Reassemble the unit by reversing the above procedures.

Connector Replacement

The Model 4308 is normally supplied with two Female TNC Bird Quick-Change Connectors. Other “QC” connectors are available. These connectors may be obtained from Bird Electronic Corporation. Refer to the Available Connector List.

These “QC” connectors are quickly changed by:


1. Remove the four 8-32 round head machine screws from the corners of the connector flange.
2. Pull the connector straight out.
3. Install connectors by reversing the above procedure. Making sure the center contact pin aligns properly with the socket.

Element Removal

1. Remove the screw and sleeve on the lower left corner of the element port flange.
2. Grasp the knurled part of the element knob in your fingers and gently pull up while turning slightly in a clockwise direction. The element will easily pull right out.

Element Installation

When reassembling the element in the line section, be sure the retaining clip on the front face of the line section is repositioned. It must be on the shoulder of the element, *before* replacing the retaining clip, stop-sleeve, and screw.

 Note: If a defective element must be replaced, the unit must be returned to the factory for element replacement and recalibration.

Meter Replacement

To replace the meter in the unit follow these steps:

1. Disconnect the meter leads from the terminals on the back of the meter.
2. Remove the screws securing the meter in place. The screws are located on each side of the housing.
3. Pull the meter, with the shock mount assembly, straight out of the unit.
4. Reinstall the meter, be sure the bumper feet, shock mount strip, and shock mount ring are in place on the meter.
5. Position the mounting ring on the meter so that the side mounting holes are parallel to the meter lugs.
6. Place the wattmeter housing on a flat surface with its front face down.
7. Position the meter with the shock ring in place and press down on the shock ring, manipulating it until its side holes are aligned with those in the housing and the fastening screws can be inserted.
8. Insert the fastening screws into the housing and shock ring.
9. Be sure the meter is correctly positioned and tighten the fastening screws.

Calibration Checks

If a calibration check of the Model 4308 is necessary, set-up the Model 4308 Wattmeter in series with a standard wattmeter of a known accuracy.

For example, a Bird Model 43 Thruline Wattmeter could be used. Refer to figure 7 for a sample set-up. Follow the guidelines outlined below.

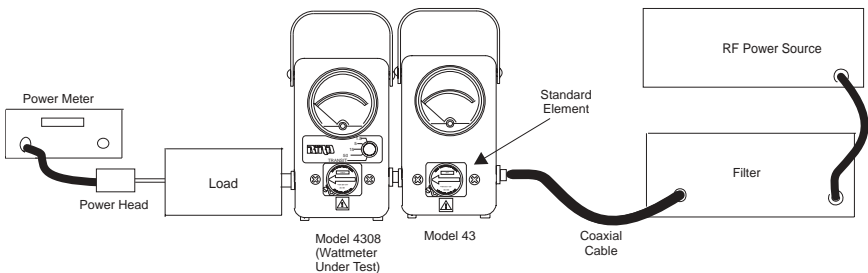
- ♦ Use a suitable low pass filter between the wattmeters and the RF power source.
- ♦ Terminate the set-up in a suitable 50 ohm load, similar to the Bird Model 8201.

- ♦ Make all connections as short as possible to avoid mismatches and additional insertion losses.
- ♦ Make all calibration checks on each range at the upper one-third of the scales.
- ♦ If the unit is found to be outside the stated accuracy, the unit must be returned to the factory for recalibration.

Customer Service

Any maintenance or service procedure beyond scope of those provided in this section should be referred to a qualified service center. Bird Electronic Corporation maintains complete repair and calibration facilities at the following address:

*Figure 7
Calibration Check Set-up*



Sales / Repair Facilities

U.S.A. Sales and Manufacturing

Bird Electronic Corporation

30303 Aurora Road Cleveland (Solon), Ohio 44139-2794

Phone: (440) 248-1200 Fax: (440) 248-5426

Sales Facilities

European Sales Office

Bird Electronic Corporation

Berkhamsted House

121 High Street

Berkhamsted Hertfordshire

HP4 2DJ England

Phone: 44 1 442 870097 Fax: 44 1 442 870148

Pan Asian Sales Office

Bird Electronic Ltd.

3A Unit 6 Tyrwhitt Road

Singapore 0820

Phone: 65 299 2537 Fax: 65 299 8509

Replacement Parts List

Item	Qty.	Description	Part Number
1	1	Micrometer Meter	2120-017
2	1	Housing Assembly	4410-003
3	1	Cover Assembly	4210-005-1
4	1	Line Section Assembly	4308-003
5	1	Carrying Strap	8580-003
6	1	RF Connectors	*See table
7	3	Meter Bumper Feet	4220-098
8	1	Range Switch Knob	5-1852
9	1	Range Switch Label	4308-006
10	1	Cushion Strip, Shock Mount	5-1066
11	4	Rubber Feet	5-1388
12	1	Meter Shock Mount Ring	4220-087

***Available “QC” Type Connectors**

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

Limited Warranty

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

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

The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's specifications. 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.

DECLARATION OF CONFORMITY

Manufacturer: Bird Electronic Corporation
30303 Aurora Road
Cleveland, Ohio 44139-2794

Product: Thruline Wattmeter
Models: 4308

The undersigned hereby declares, on behalf of Bird Electronic Corporation of Cleveland, Ohio, that the above-referenced product, to which this declaration relates, is in conformity with the provisions of the following standards;

- EN 55011:1991 - Emissions (Class B)
- IEC 801-2:1984, Part 3 - EMF Immunity
- IEC 801-4:1988, Part 4 - Fast Transient/Burst Immunity

These standards are in accordance with EMC Directive (89/336/EEC).

- European Standard EN 61010-1:1993 - Part 1: General Requirements

This standard is in accordance with Low Voltage Directive (73/23/EEC), 1973

The technical documentation file required by this directive is maintained at the corporate headquarters of Bird Electronic Corporation, 30303 Aurora Road, Cleveland, Ohio 44139.



Bob Gardiner
Director of Quality
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