INSTRUCTION BOOK

OPERATING INSTRUCTIONS
WITH
PARTS LIST

WATTCHER® MONITOR/ALARM

MODELS

3126A, 3127A, & 3128A

Electronic Corporation
Cleveland (Solon) Ohio USA

Instruction Book Part Number 920-3126/27/28A Revision A

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

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.

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 earth uninterruptible 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 remove RF transmission line while RF power is present.

Chemical Hazard

Dry cleaning solvents used to clean parts may be potentially dangerous. Avoid inhalation of fumes and also prolonged contact with skin.

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

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. See page 24 for specific caution.

3126A/27A/28A 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
Electrical shock hazard. Disconnect from ac power source before servicing.

WARNING
Use dry cleaning solvents only in a well ventilated area away from open flames or sparks. Do not breathe the fumes. Avoid direct skin contact with solvent.

WARNING
Never attempt to connect or disconnect an RF cable while power is on at the RF power source. Radiated RF energy may present a potential health hazard.

3126A/27A/28A Caution Statements

The following equipment cautions appear in the text whenever the equipment is in danger of damage and are repeated here for emphasis.

CAUTION
Be sure voltage selector switch is in the appropriate position before applying ac power. Failure to do so will damage the unit.

CAUTION
Do not attempt to check the microammeters with an ohmmeter. Damage to the movement or pointer will result.

CAUTION
The Wattcher, elements, and line section have been calibrated together. Replacing any component without recalibrating all the components as a unit may affect accuracy.

CAUTION
Do not remove RF center conductor. Placement is critical for proper calibration and obtaining specified accuracy.

About This Manual

This instruction manual covers the Wattcher RF Monitor/Alarm models 3126A, 3127A, and 3128A.

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. Figures and tables are numbered sequentially within each chapter. 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 preventive 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 parts list in Chapter 5.

Changes

Changes to this publication will made as required. To keep your instruction book accurate and up to date, it is recommended that a periodic request of the latest supplement be made. It will be supplied at no cost. When requesting updates, reference your instruction book part number and its revision level listed on the title page.

Reporting Errors

It is our goal to provide our users with the information needed to operate and maintain the Wattcher models listed above. If you should discover any errors in this publication, or if you have suggestions for improving this instruction manual, please send your comments to our factory.

Table of Contents

This publication refers to the Wattcher RF Monitor/Alarm models 3126A, 3127A, and 3128A. The differences between models are listed in the specifications. All models will generally be referred as a Wattcher Unit throughout this manual.

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

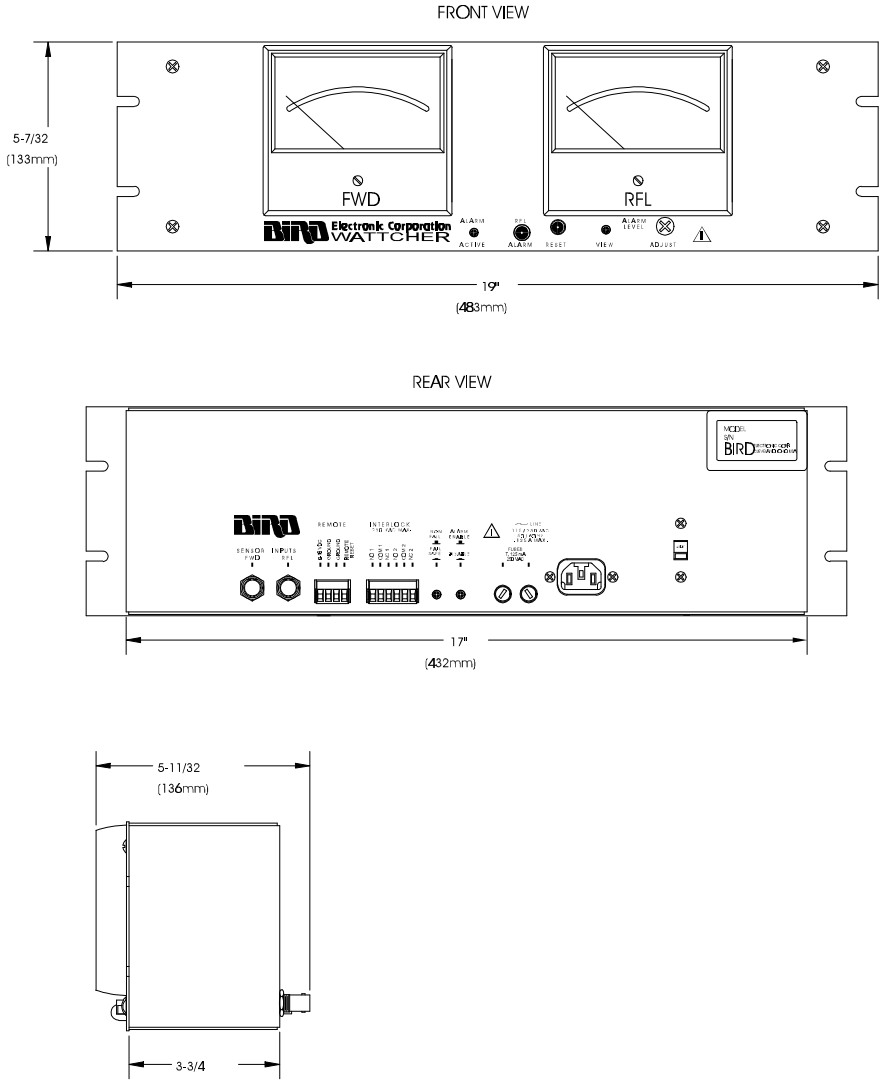
The Bird Wattcher RF Monitor/Alarm—when installed with a dual port Thruline Line Section and two elements—is designed for the protection and monitoring of radio frequency transmission systems. The line section is selected to be compatible with the RF coaxial line used in the transmission system. The elements are selected by the user to cover the desired power levels and frequency ranges.

Purpose and Function

Abnormal loading conditions cause the transmitter to quickly shutdown, a user selectable audible alarm to sound, and an alarm LED to flash.

Remote access is available for resetting audible and visual alarms. Fail-safe or non fail-safe modes are user selectable and the reflected power trip level is adjustable. Operating Instructions in Chapter 4 detail these features.

Figure 1
Outline Drawing



Specifications

Models 3126A and 3127A

Power Range:	100W to 250 kW using Bird plug-in elements
Frequency Range:	2 to 1000 MHz
Accuracy:	±5% of full scale (for elements calibrated with the Wattcher)
Meter Scales:	
3126A:	FWD 15/30/60 kW
3126A:	RFL 1.5/3/6 kW
3127A:	FWD 5/10/25 kW
3127A:	RFL 1/2.5/5 kW

Model 3128A

Power Range:	100mW to 10kW using Bird plug-in elements
Frequency Range:	0.45 to 2700MHz
Accuracy:	±5% of full scale (for elements calibrated with the Wattcher)
Meter Scales:	FWD and RFL 25/50/100W

Common Specifications and Features:

Front Panel Controls:	Reset push button and reflected power limit set (screwdriver adj.)
Rear Panel Controls:	Fail-safe/Non fail-safe mode selector switch, normally open/normally closed alarm contacts (5A @ 230 Vac Resistive), remote reset and dc power connections, audible alarm disable switc
Alarms:	Audible buzzer and visual front panel LED
Alarm Actuation Time:	50ms (typical)
Finish:	Light navy gray powder coat
Nominal Size:	19" X 5-7/32" X 3-3/4" (483 X 133 X 95 mm)
Weight:	5 lb. (2.28kg)
Power:	115/230Vac, 50/60 Hz, 0.125A or 9-16 Vdc, 1A

Items Supplied

Wattcher Monitor/Alarm
115/230 Vac Power Cord
Dc Cable (2)—25’ Standard Other Lengths Optional
Interlock Connector—Six-Terminal, Screw-Clamp Plug Connector
Remote Reset / Auxiliary DC Connector—Four-Terminal Screw-Clamp Plug Connector

Options

Line Sections & Elements

Frequency and power range are governed by the line section and elements selected. Refer to sales catalog for available models.

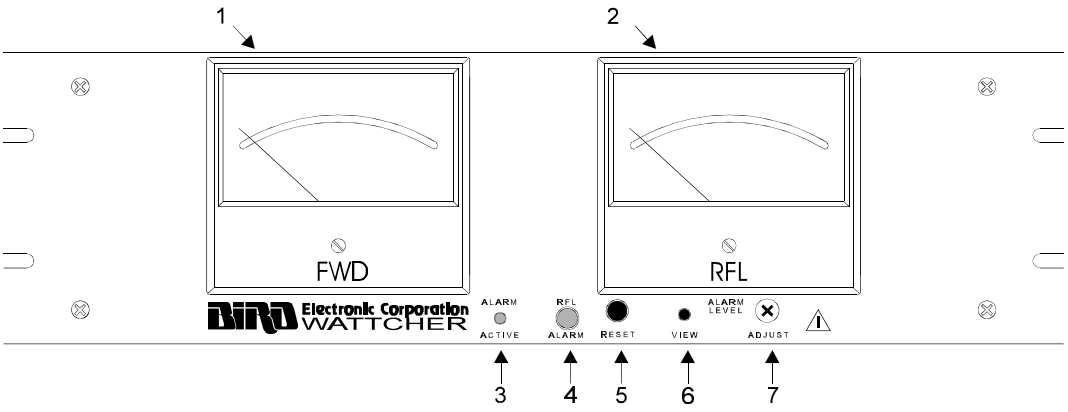
Cable Assemblies

DC Cable Assemblies are available for remote rigid line installation. The assemblies are various length of RG-58/U cable with a dc plug, P/N 7500-076 on one end and a BNC(m) connector installed on the opposite end. Refer to the cable section of the parts list for cable lengths and part numbers.

Functional Description

Enclosure The Wattcher RF Monitor/Alarm is enclosed in an aluminum housing intended for a standard 19" rack mount.

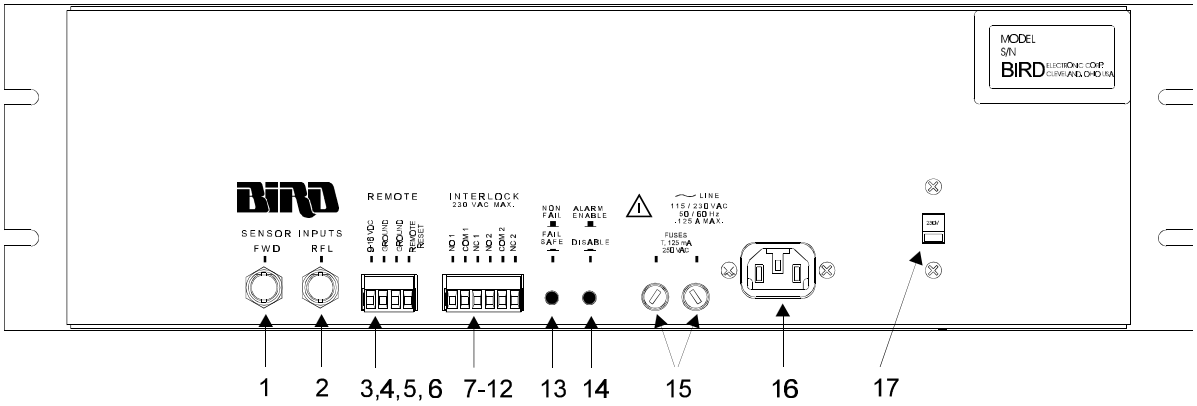
Figure 2
Front Panel



Front Panel

1	**Forward Power Meter**	Analog Meter Indicating forward power.
2	**Reflected Meter**	Analog Meter indicating reflected power.
3	**Alarm Active LED**	Green LED, when illuminated the alarm is active, power is on.
4	**RFL Alarm LED**	Red LED, flashes when the reflected power trip level has been exceeded for more than 50ms.
5	**Reset Push-button**	Resets the Wattcher to normal operation after the error condition is corrected.
6	**View Push-button**	Allows for viewing the reflected power trip level during adjustment.
7	**Adjust**	Potentiometer providing for adjustment of reflected power trip level.

Figure 3
Back Panel



Rear Panel

1	**Forward Sensor Input Connector**	Input connector for forward power sensor cable from port A of line section.
2	**Reflected Sensor Input Connector**	Input connector for reflected power sensor cable from port B of line section.
3	**9-16 Vdc**	Auxiliary positive (+) dc power connection.
4	**Ground**	Auxiliary negative (-) power connection.
5	**Ground**	Remote reset ground connection.
6	**Remote Reset**	Remote reset connection.
7	**NO1**	Normally open connection for interlock one.
8	**COM1**	Common Connection for interlock one.
9	**NC1**	Normally closed connection for interlock one.
10	**NO2**	Normally open connection for interlock two.
11	**COM2**	Common Connection for interlock two.
12	**NC2**	Normally closed connection for interlock two.
13	**Non Fail / Fail Safe**	Select switch for non fail-safe or fail-safe mode.
14	**Alarm**	Alarm enable/disable switch.
15	**Fuse**	Fuse receptacles for 0.125A, 250v fuses.
16	**AC Receptacle**	Provides a means of supplying AC line power to Wattcher.
17	**Line Voltage Selector Switch**	Determines line voltage operation.

General

The forward power meter acts as a continuous monitor of forward power output. This provides a reference against the reflected power value enabling determination of power ratios and VSWR.

Alarm Condition

An alarm condition occurs as the result of the reflected power being greater than the reflected power set point for longer than 50ms. If enabled, an audible alarm will sound.

An alarm condition will also activate the interlock. An active interlock will cause the normally open terminals to close and the normally closed terminals to open.

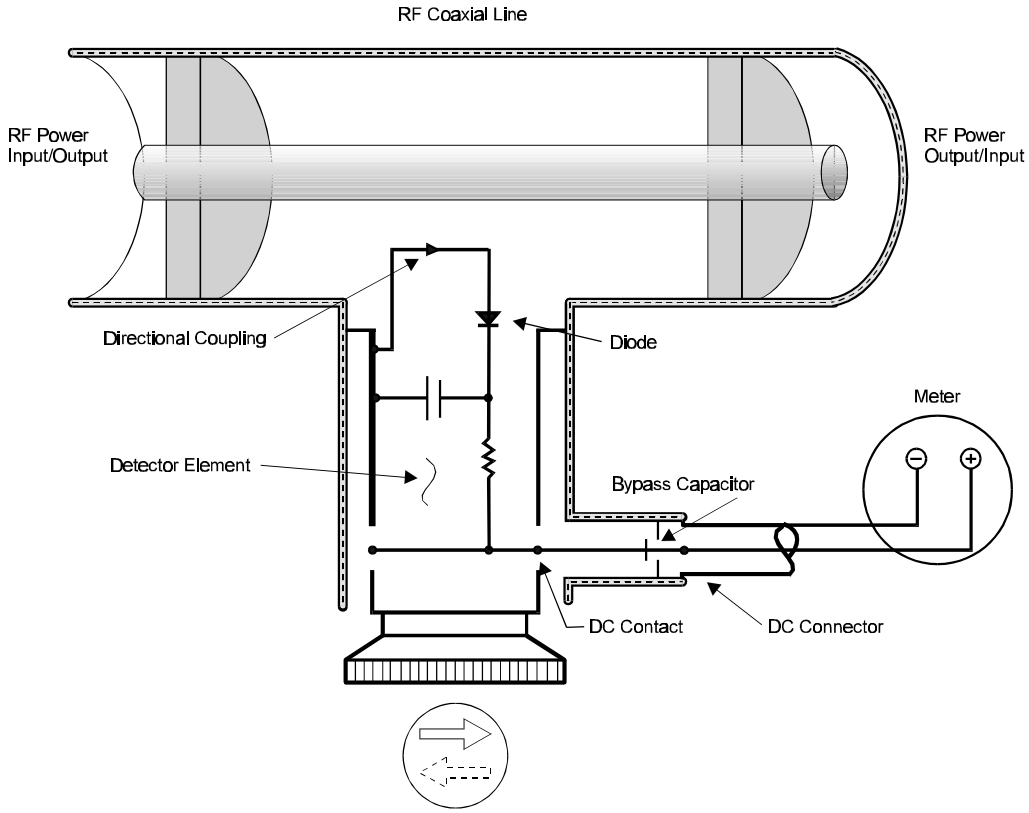
Fail-Safe/Non Fail-Safe

In the fail-safe mode an alarm condition will also occur if the Wattcher is not powered. The non fail-safe mode requires power for an alarm condition.

Element

The function of the element is to detect (sense) the forward or reflected RF power in the line section at any given time. The direction in which the "arrow" on the element cap is oriented indicates the direction in which it is sensing the RF power flow in the system.

Figure 4
Element Schematic



Traveling Wave Viewpoint

The best way to visualize the Thruline Wattmeter idea is from the Traveling Wave viewpoint on transmission lines, which illustrates that the voltages, currents, standing waves, etc., on any uniform line section are the resultants of two traveling waves, forward and reflected.

Coupling Circuit

The coupling circuit which samples the traveling waves is in the Plug-In Element. Energy will be produced in the coupling circuit of the element by both mutual inductance and capacitance from the traveling RF waves of the line section. Of course, the inductive currents will flow according to the direction of the traveling waves producing them.

The capacitive portion of these currents is naturally independent of the direction of the traveling waves. Therefore, it is apparent that the inductive portion of the current produced from the waves of one direction will add in phase to the capacitive portion of the current, and those of the opposite direction will subtract in phase. The additive direction is the forward or *arrow* direction of the element.

The forward wave travels and its power flows from the source to the load. It has an RF voltage E_f and current I_f in phase, with $E_f / I_f = Z_o$.

The reflected wave originates by reflection at the load, travels, and its power flows from the load back to the source. It has an RF voltage E_r and current I_r in phase, with $E_r / I_r = Z_o$.

Note that each component wave is mathematically simple and is completely described by a single figure for power, for instance:

$$W_f = \text{Watts Forward} = E_f^2 / Z_o = I_f^2 Z_o = E_f I_f$$

$$W_r = \text{Watts Reflected} = E_r^2 / Z_o = I_r^2 Z_o = E_r I_r$$

Z_o is the characteristic impedance of the uniform line, and simplifies matters by being a pure resistance, usually 50 ohms for useful lines. The main RF line circuit of the Thruline Wattmeter is a short piece of uniform air line section, whose Z_o is 50 ohms, in which accurate measurements may be made.

The electrical values of the element circuits are carefully balanced and so designed that the inductive current produced from the reverse direction wave will cancel its portion of the capacitive current almost completely. The result is a directivity always higher than 25 dB, which means that the element is highly insensitive (nulled) to the reverse direction wave. By being highly directional, the Thruline Wattmeter is sensitive at either one of its settings, but to only one of the two traveling waves which produce standing waves by interference. Thruline Wattmeter measurements are also independent of their position along the standing waves.

Element Socket

An accurately positioned socket for inserting a radio frequency coupling device, called a Thruline Plug-In Element, is mounted on the outer conductor. The socket is precision bored to hold the rotatable element in its calibrated position, with a spring-loaded clasp to keep the element firmly seated. The machined step on the top face of the socket engages a stop-pin on the element. Rotary movement of the element is thereby restricted to 180 degrees and is stopped on the axial center line.

The measuring socket has a hole bored through the wall through which an insulated phosphor bronze contact finger projects. The Plug-In Element has terminals on diametrically opposite sides of its body, so that pickup can be made from either side. A small silvered button tip can contact the element only in the precise forward and reflected measuring positions, against the end stops. A specially designed jack mounted on the side of the socket mates with the plug on the dc cable furnished with the read-out meter. The dc jack assembly has a built-in filter capacitor shunted across the meter circuit. This more fully protects meter readings against the adverse effects of any stray RF energy generated in the Plug-In Element. The line section is bright silver plated over practically all of its metal parts.

Matching

CAUTION

The Wattcher, elements and line section have been calibrated together. Replacing any component without recalibrating all the components as a unit may affect accuracy.

The scale on the read-out meter reads full scale for the power rating stamped on the cap of the Plug-In Element. The Wattcher, the Plug-In Element, and the Thruline Section are all stamped with matching serial numbers. The equipment is supplied as a matched and calibrated set and the parts, particularly the elements, should not be interchanged with any other like equipment. Such an interchange of the measuring elements could produce readings with an error greater than the stated 5 percent of full scale accuracy.

Load Power

Power delivered to and dissipated in a load is given by:

$$W_L = \text{Load in Watts} = W_f - W_r$$

Where appreciable power is reflected, as with an antenna, it is necessary to subtract the reflected power from the forward power to get the effective power. This correction is negligible, less than 1 percent, if the loading device has a VSWR of 1.2 to 1 or less.

VSWR scales, and their attendant controls for setting the reference point, have been intentionally omitted from the Thruline Wattmeter for two reasons.

a. Why make something similar to a hypothetical dc volt ohmmeter with control potentiometers for the voltmeter multipliers? Even more complications arise when diodes at RF are involved.

b. Experience using the Thruline Wattmeter on operating problems, such as transmitter tune-up, antenna matching etc., shows that the power ratio ϕ is no mean competitor, in practical usefulness, to the standing wave ratio ρ = VSWR.

A trial is suggested for a few days - forget VSWR and try thinking in terms of $\phi = W_r / W_f$ when the Thruline Wattmeter is used. It will be noted that even without bothering to calculate the ratio exactly the two meter readings, W_r and W_f, give an automatic mental impression which pictures the situation. Thus, in an antenna matching problem the main objective usually is to minimize W_r, and anything done experimentally to this end is noted directly when the Thruline Element is turned to the reflected position. Furthermore, the ratio of readings, even if only mentally evaluated, is a reliable guide to the significance of the remaining reflected power.

ρ vs. ϕ and its Significance

Since there are definite simple relationships between standing wave ratio ρ and the reflected/forward power ratio ϕ indicated by the Thruline Wattmeter, the latter may be conveniently used to measure VSWR.

$$\rho = \frac{1 + \sqrt{\phi}}{1 - \sqrt{\phi}} \quad \text{and} \quad \phi = \left[\frac{\rho - 1}{\rho + 1}\right]^2 \qquad \text{where } \rho = \text{VSWR} \quad \text{and } \phi = \frac{W_r}{W_f}$$

Note that around ϕ = 10 percent, below which W_r will <u>appear</u> insignificant and may be hard to read, you are close to the commonly accepted lower limit ρ = 2. Trying to adjust to an even lower value of ϕ, in order to improve antenna match still further, becomes less and less worthwhile in many systems. Experimentally by using the Thruline Wattmeter it can be readily shown that reducing ϕ below 10 percent produces little in the way of increased W_L. TV transmitter antenna lines and VHF omnirange transmitters are among those systems that require much lower levels of reflected power but for reasons other than simple power transmission. A very small level of reflected power, e.g., ϕ = .06 percent, corresponds to ρ = 1.05. With just a single element suitable for measuring W_f, <u>detection</u> of reflected power is possible down to about ϕ = 1 percent (ρ = 1.2), providing W_f approaches full scale. However, <u>measurement</u> is possible only down to about ϕ = 5 percent (ρ = 1.5).

Measurement and Monitoring of Transmitter Power

Little more need be said about this in view of the preceding load power discussion. The Thruline Wattmeter is useful for the continuous monitoring of transmitter output and is also helpful for the continuous monitoring of reflected power, for instance in checking intermittent antenna or line faults.

Like diode devices in general, the Thruline meter indicates the carrier component on amplitude modulation, with very little response to side band components added by modulation.

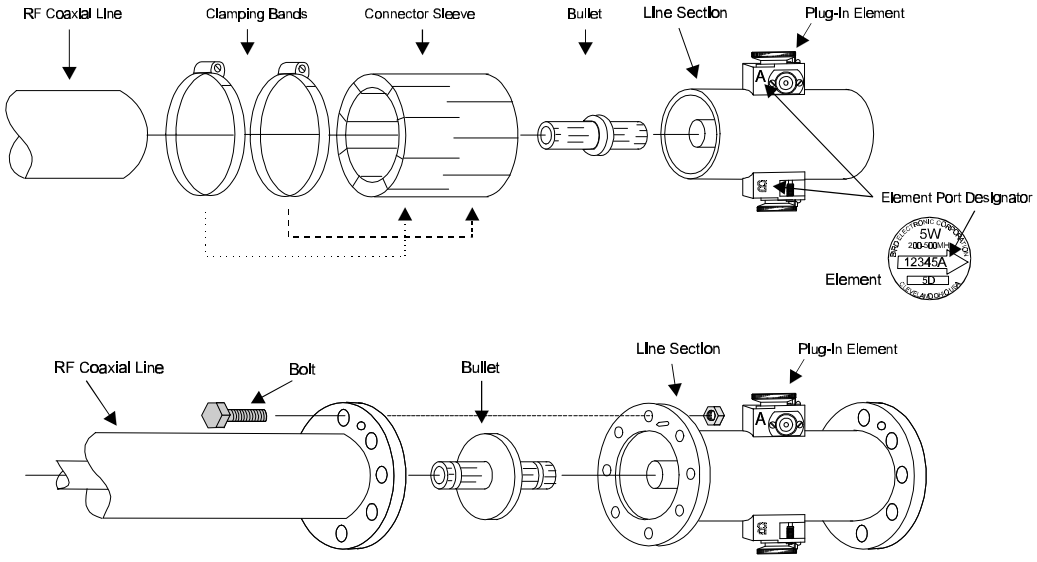
Items Required

Wattcher RF Monitor Alarm
Thruline Line Section (ordered separately, p/n depends on transmission line type)
Elements (ordered separately, p/n depends on Wattcher model, power level and frequency ranges)
Coupling Kit (ordered separately, p/n depends on transmission line type)
2 DC Cables - Length as required

General The Wattcher Unit model and serial numbers are located on the back panel. Before proceeding with the installation record these numbers in the space provided on the last page of this manual. The model and serials numbers will be required when obtaining information from the Factory or Bird's customer service department.

Line Section A coupling kit is required for connecting the line section to the transmission line. The coupling kit will be similar to one of the coupling kits shown below. Review the following and refer to the diagram to install the line section.

Figure 5
Coupling Connections



1. Locate the line section so that element sockets are oriented for easy access.
2. Be sure center conductor anchor bullets have been positioned with insulators properly seated in the counterbores.
3. For flanged connectors, tighten evenly around flange to obtain a firm uniform contact.
4. For unflanged connectors, bullets should firmly seated in the center conductor. The ends of the line section should be butted snugly against the ends of the transmission line.
5. Position clamp bands approximately 3/4" from ends of sleeve and tighten securely.
6. The coaxial line should be continuous with no bends or offsets in its axial line.

Wattcher RF Monitor/Alarm

The Wattcher is designed to mount in an EIA standard 19" relay rack. Wire lengths are not critical, the unit may be installed where convenient for monitoring and operation.

The following connections and switch settings should be made before installation. Refer to the operations chapter for descriptions of various modes.

1. Auxiliary dc
2. Remote reset
3. Interlock
4. Alarm enable/disable mode selected
5. Fail-safe / non fail-safe mode selected
6. Forward and reflected power sensor cables
   Forward power sensor cable from port A of the line section
   Reflected power sensor cable from port B of the line section
7. AC line voltage selector switch is in the appropriate position. Voltage visible in the switch window is selected voltage.

> Caution
> Be sure voltage selector switch is in the appropriate position before applying ac power. Failure to do so will damage the unit.

8. AC power cable connected

Elements

The element port designator is stamped on the line section ports and after the serial numbers on the elements. Be sure to match these designators to achieve stated accuracy. Refer to figure 5.

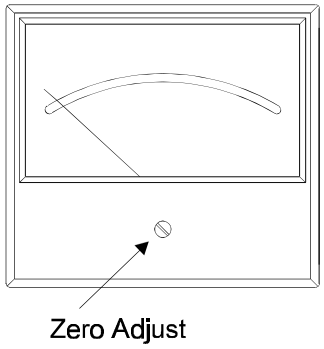
General

This section contains information about the various operating modes and features of the Wattcher RF Monitor/Alarm.

Zero Adjust

The two panel meters should be checked for zero set under no power conditions. With no power applied the meter pointers should set exactly on zero. If adjustment is required, turn the adjustment screw until the pointer is set at zero.

Figure 6
Zero Adjust



Alarm Enable/Disable

The audible alarm will be enabled when the push-button is not depressed, and disabled when it is depressed.

Fail-Safe / Non Fail-Safe Mode

Non fail-safe mode is selected when the push-button is not depressed, and fail-safe is selected when it is depressed.

Non fail-safe mode—An interlock active condition is caused *only* by exceeding reflected power trip value. Fail-safe mode—An interlock active condition can be caused by exceeding reflected power trip value *or* if the Wattcher Unit is not operating.

Adjusting Reflected Power Trip Level

Ensure that the plug-in elements in the line section of transmission line are properly positioned and directed. Make sure that the fail-safe/non fail-safe switch is in the desired mode.

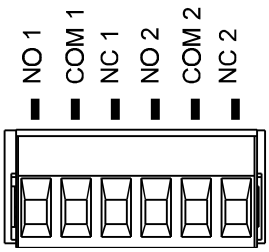
While depressing the view push-button, rotate alarm level adjust screw until the pointer indicates the desired trip level.

Connecting the Interlock

There are two sets of interlocks provided. Wire the interlocks based on transmitter requirements. During an alarm condition the interlocks become active. An active interlock—in the non-fail safe mode—causes the normally closed terminals to open and the normally open terminals to close. Connection to the interlocks is achieved through a six-terminal Screw-Clamp plug connector.

Note: The opposite is true for fail safe mode.

Figure 7
Interlock Connector



Using Remote Reset & Auxiliary DC

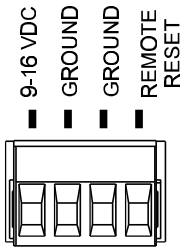
Remote reset can be used to wire a reset switch in a convenient location. Actuating the switch will reset the alarm condition after the error has been corrected.

The reset input can be jumpered to ground so that the alarm will clear automatically when the reflected power drops below the set point.

Auxiliary dc, (9-16 Vdc @ 1A), can be used to power the Wattcher Unit.

Connection to these features is achieved through a four-terminal Screw-Clamp plug connector.

Figure 8 Remote Reset Auxiliary DC Connector



Meter Scales

Both the forward and reflected meter faces have triple-range scales. The full scale value shown on the element cap determines the power scale to be read.

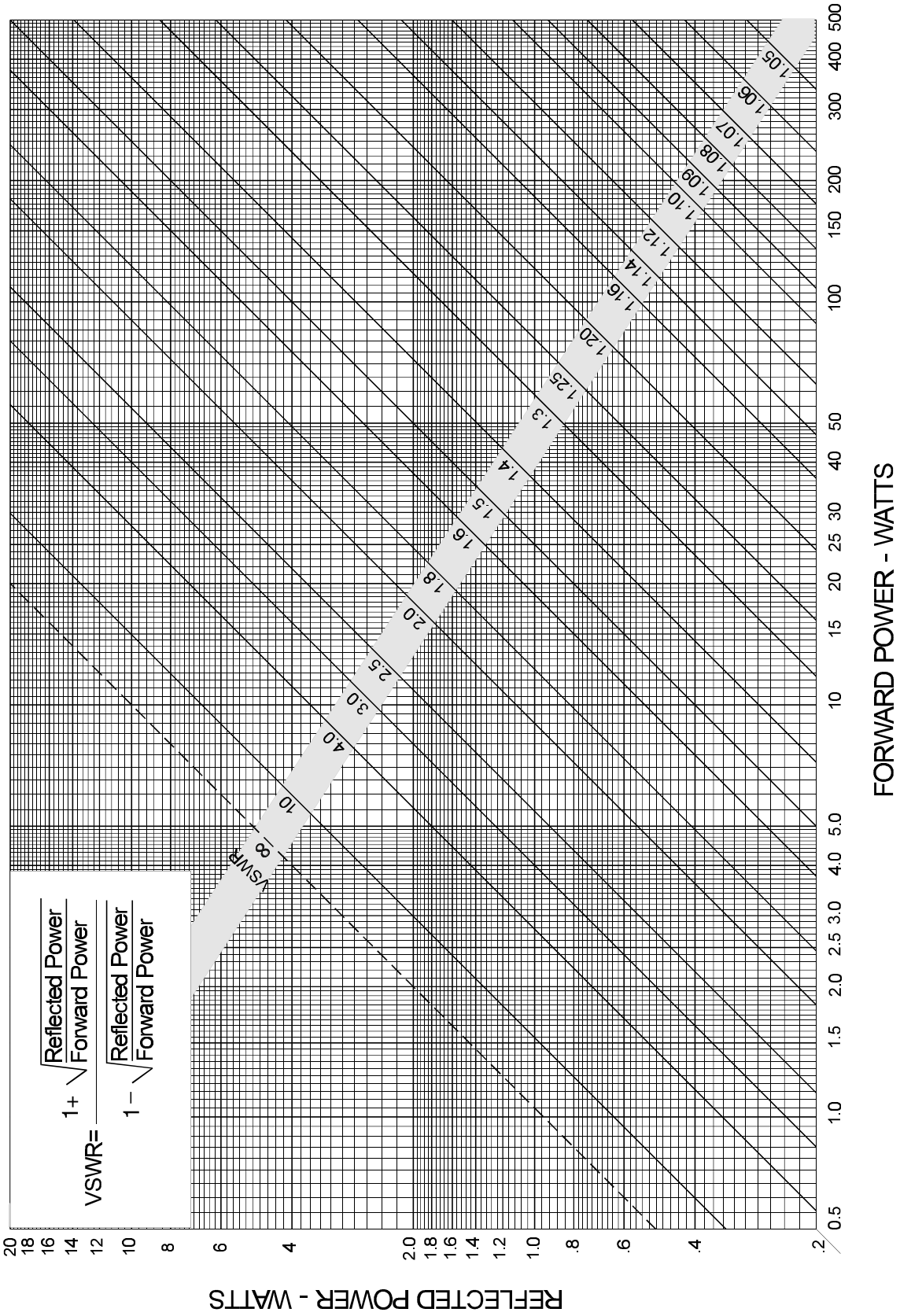
Alarm Condition

If the reflected power reading reaches the trip level, (for longer than 50ms) the buzzer will sound if enabled, the alarm LED will flash, and the interlocks will be active. This condition will continue until the condition has been corrected and the reset button is pushed.

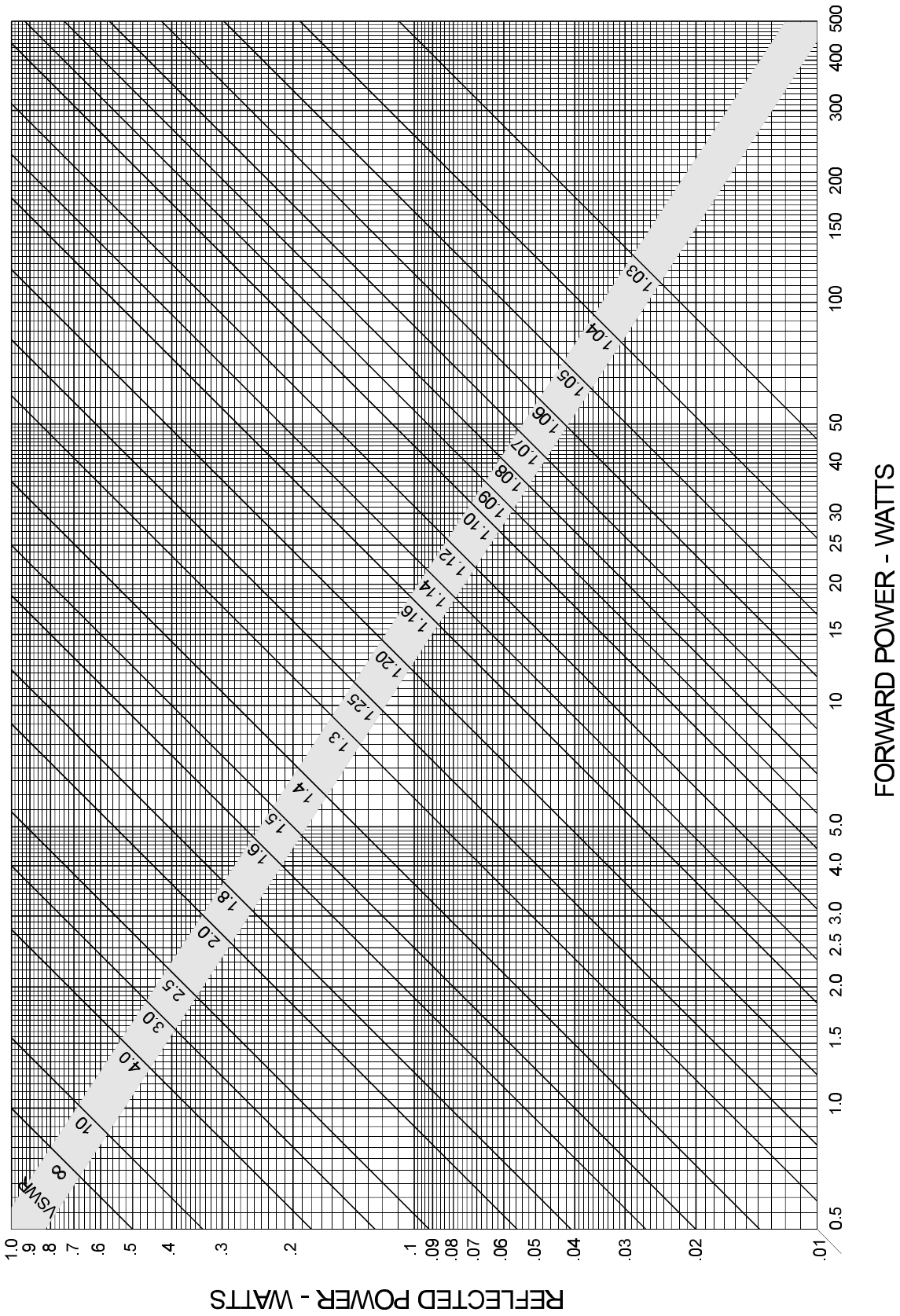
Determining VSWR

The forward/reverse RF power ratio is readily calculated from the readings, and VSWRs may be determined from the following figures. Following the vertical and horizontal grid, determine intersection of forward and reverse power values. Slanted lines passing closest to this point indicate VSWR.

VSWR Conversion Nomograph



VSWR Conversion Nomograph



Any maintenance or service procedure beyond the 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:

Service Group

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

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

Sales Office

For the location of the sales office nearest you, give us a call or visit our Web site at:

http://www.bird-electronic.com

Preparation for Shipment

Elements

The elements can be left in the sockets of the line section with their ARROWS turned midway between the measuring positions. Any additional elements should be well padded and wrapped before being put in the shipping container.

Line Section

Wrap the connectors on the flanged models with padding and tape them securely in place. Cover both ends of the line section and the socket to keep out dust and foreign material. Place the line section in a sturdy shipping container such as a corrugated paper box.

DC Cables

Pad and wrap the dc connector plugs and then coil the cables tightly.

Meter

Cover the meter face with padding to protect the glass window, then wrap the housing and place it in the same box as the line section.

Storage

No special preparations for storage are necessary other than to cover the equipment to keep out dust and dirt. For an extra precaution, leave an element in the socket with the arrow turned midway between the measuring positions.

Troubleshooting

The following table contains troubleshooting information for problems which can occur during normal operation. Locate the problem, review the possible cause, and perform the corrective action listed.

Only those functions within the scope of normal maintenance are listed. This manual cannot list all malfunctions that may occur, or all corrective actions. If a malfunction is not listed or not corrected by the listed corrective actions, notify a qualified service center.

Table 1 Troubleshooting

PROBLEM	CAUSE	AREAS TO CHECK / CORRECTION
No meter indication	No RF power	Check RF source.
	Arrow on plug-in element pointing in wrong direction	Change position of element
	No pickup from dc contact finger	Adjust
	Open or short circuit in dc cable	Replace defective dc meter cable (RG-58/U)
	Meter burned out or damaged	Return Wattcher, line section, and elements to the factory for meter replacement and calibration.
Intermittent or inconsistent meter readings	Faulty transmission line	Inspect line
	Dirty dc contact on elements	Clean dc contacts
	Sticky or defective meter	Return Wattmeter line section, and elements to the factory for meter replacement and calibration.
Alarm Active LED does not Illuminate	No Line Power	Check power source, restore
	Fuses Opened	Check fuses, replace if needed
	Defective LED	Replace LED
High VSWR or reflected power	Bad load or poor connectors	Replace load or connectors
	Shorted or open transmission line	Have line serviced.
	Foreign material in the section or in RF connector bodies	Remove foreign material.

Cleaning

> WARNING
> When using dry cleaning solvents, provide adequate ventilation and observe normal safety precautions. Many dry cleaning agents emit toxic fumes that may be harmful to your health, if inhaled.

If any of the contacts or line connectors become dirty, they should be wiped off with a clean cloth and a dry cleaning solvent. Use an aerosol contact cleaner that is self-drying, but forms no residue, on the inaccessible internal parts. Clean all contact areas and especially the exposed faces of the Teflon insulators.

It is important to keep the following surfaces clean:

Socket bore

Element body circumference

Bottom rim of element body

Seat at the base of the socket in the line section

DC contacts on the element

The outside surface of the Wattcher can be cleaned with a soft cloth dampened with a mild detergent solution. Do not wipe the meter glass with a dry cloth, if a static charge could develop causing an erroneous indication on the meter.

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

Inspection

Inspect the Wattcher Unit cleanliness, proper adjustment, and with the RF power removed, check the ZERO setting and adjust if necessary.

Preventive Maintenance

The element socket should be kept plugged as much as possible to prevent the intrusion of dust. If a Plug-In Element is to be used for this purpose, use the highest power element available. The element should be positioned so that the ARROW is pointing midway between the FWD and RFL measuring positions. This will not only protect the meter by shunting the movement, but will also avoid exposing the element's crystal to dangerous potentials if the RF line section should be energized.

Line Section Care

> CAUTION
> Do not remove RF center conductor. Placement is critical for proper calibration and obtaining specified accuracy.

If there is any evidence of contamination inside the RF line section, the accessible portions should be cleaned and the interior carefully blown out. Keep all connections tight, and keep the nut of the meter cord plug turned tight on the line section dc jack. This connection may often be serviced by simply loosening the nut of the dc plug, rotating the body several times through a fraction of a turn and retightening the knurled nut securely.

Meter Replacement

> Caution
> Do not attempt to check the microammeters with an ohmmeter. Damage to the movement or pointer will result.

Disassembly

1. Remove four screws securing the front panel.
2. Pull front panel forward until it clears the lamps and switches.
3. Lay the front panel face down so that the meter terminals are accessible.
4. Remove leads taking note of wire locations, red to positive, black to negative.
5. Remove nuts securing the meter bezel.
6. Remove meter.
7. Assemble in reverse order.
8. Torque the four meter mounting screws to 10 in/lbs.

Contact Adjustment

In cleaning the socket bore the operator should be careful not to disturb the spring finger of the dc contact. It is important that the operating position of this part be properly maintained. If the spring finger of the dc contact requires adjustment, it may be done manually if carried out with care. The tip must be positioned far enough out to maintain good contact with the element but not so far as to interfere with easy entry of the element body. The dc jack, with attached spring finger, may be detached for service by removing the two 4-40 fillister head machine screws which fasten it to the side of the RF line section. Then lift off the jack assembly carefully to avoid losing the small Teflon insulating bead that straddles the base of the phosphor bronze spring and nests in a counterbore on the side of the RF body. When replacing the assembly, be sure that the bead is again properly inserted.

Fuse Replacement

> Caution
> Replace with only the same type and rating fuse. T, 125 mA, 250VAC

Use a screwdriver to remove fuse receptacle, insert new fuse and replace.

Replacement Parts

Qty.	Description	Part Number
1	BR1, Rectifier, full wave silicone bridge	5-1661
1	LS1, Buzzer, alarm	5-1714
2	F1 - F2, Fuse .125A at 250 Vac	5A2257-7
1	LS1, Fuse holder, alarm	5A2295-1
2	K1, Power relay, 3pdt	5A2116-1
1	M2, Meter, triple scale, incident power	
	Model 3126, 100uA 15/30/60kW scale	2150-259
	Model 3127, 100uA 5/10/25kW scale	2150-230
	Model 3128, 30uA 25/50/100W scale	2150-256
1	M1, Meter, triple scale, reflected power	
	Model 3126, 100uA 1.5/3.0/6.0kW scale	2150-257
	Model 3127, 100uA 1.0/2.5/5.0kW scale	2150-259
	Model 3128, 30uA 25/50/100W scale	2150-258
1	S1, Alarm, enable/disable switch	5-1899-42N
1	S2, Alarm level adjust switch	5-1899-42N
1	S3, Alarm reset switch	5A2292-21-CN
1	S4, Mode selector switch	5-1899-42N
1	T1, Power transformer	5A2309-8
1	AC power input receptacle	5A2297
1	J4, Remote terminal plug connector (4 contacts)	5A2075-4
1	J5, Interlock terminal plug connector (6 contacts)	5A2075-6
2	J1 - J2, BNC connectors	5A2319-1

Coupling Kits

Line Type	Impedance	Kit Part Number
$^{7}/_{8}$“ EIA flanged	50Ω	4240-220
1&” EIA flanged	50Ω	4712-020
3@“ EIA flanged	50Ω	4600-020
3@” EIA flanged	50Ω	5-726
6@“ EIA flanged	50Ω	5-1322
6@” EIA flanged	50Ω	4902-020

Available QC Type Connectors

For $^{7}/_{8}$“ line section equipped with quick change “qc” connectors.
Note: When selecting “QC” connectors, consideration must be given to frequency and power range capability of size of connector.

N-Female	4240-062
BNC-Male	4240-132
N-Male	4240-063
LT-Female	4240-018
HN-Female	4240-268
LT-Male	4240-012
HN-Male	4240-278
C-Female	4240-100
LC-Female	4240-031
C-Male	4240-110
LC-Male	4240-025
UHF-Female (So-239)	4240-050
BNC-Female	4240-125
UHF-Male (PL-259)	4240-179
$^{7}/_{8}$" EIA Air Line	4240-002

Record model and serial numbers located on back panel.

MODEL NUMBER_____

SERIAL NUMBER_____