Model HI-1600

Microwave Survey Meter

User Manual

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An ESCO Technologies Company

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Revision Record | HI-1600 Microwave Survey Meter, MANUAL
Part #H-600011, Rev. D

Revision	Description	Date
	Initial Release	January, 1988
A	Release	May, 1999
B	Release	August, 2004
C	Update to current style standards; add PIB; update photos	September, 2009
D	Update to specifications; formatting	May, 2016

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Notes, Cautions, and Warnings

Note: Denotes helpful information intended to provide tips for better use of the product.

Caution: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.

Warning: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.

Note: See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

Safety Information

High Voltage: Indicates presence of hazardous voltage. Unsafe practice could result in severe personal injury or death.

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1.0 Introduction

The HI-1600's meter case houses a rugged meter, movement driven by an operational amplifier and is powered by two 9 volt alkaline batteries. The negative battery is used in conjunction with a stable voltage regulator that provides the critical reference voltages required to maintain calibration of the instrument. The circuit provides a stable integration circuit with a fast and slow position switch. When used in the fast position the time required for the meter needle to reach 90% of final value (with a constant cw microwave field input) is less than one second. The slow position provides a longer time constant, just under three seconds, allowed by the DHEW Performance Standard for Microwave Ovens, CFR 1030.10. The meter is calibrated for measurements at both 915 MHz and 2450 MHz.

The diode detection array of eight hot carrier diodes is housed in the large end of the plastic probe. This antenna array has the unique feature of being able to sum microwave electric fields at any polarization in a plane perpendicular to the axis of the probe. The antenna lobe is also very broad, making the instrument easy to use when measuring leakage around an oven door. The spacer is designed to provide five centimeter spacing (as required by the HEW standard) from the outer surface of the probe cover to the center of the array. The shape of the probe provides minimum perturbation of the fields impinging on the diode array. This instrument is calibrated with the hemispherical cover in place, testing without the cover may cause erroneous readings. The probe is attached permanently to the meter case by 48 inch (1.2m) shielded cable. Each detection probe and meter amplifier is calibrated as a unit. Two ranges, 1-10 and 2-20 mw/cm^2, are provided at 915 MHz and one range, 1-10 mw/cm^2, at 2450 MHz.

The instrument is calibrated at an ambient temperature of 75° F (23º C) and will give reliable readings under most temperature ranges. Care should be taken, however, when using the instrument after it has been stored in extreme cold or hot conditions. The inability to zero the meter, or a zero that is drifting rapidly, prior to taking a reading usually notes this condition. If this condition is noted, allow 15 minutes for the meter to reach room temperature prior to recording readings.

ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Warranty information
- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS-Lindgren calibration service
- ETS-Lindgren contact information

2.0 Maintenance

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

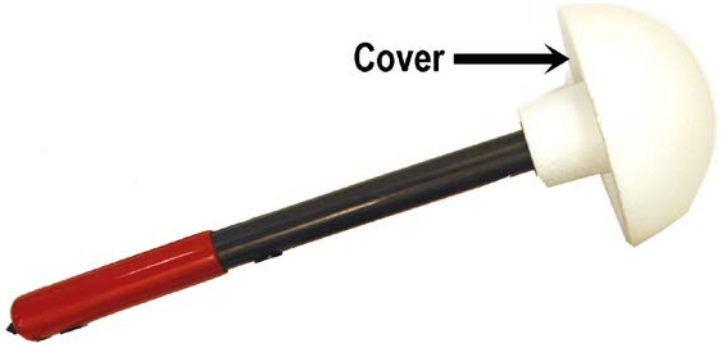
If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Maintenance Recommendations

The only maintenance required is the replacement of batteries or spacer cover should it become damaged or worn. The spacer cover may be purchased from ETS-Lindgren. The batteries, however, are the common 9 volt, alkaline type.

Spacer Cover Replacement

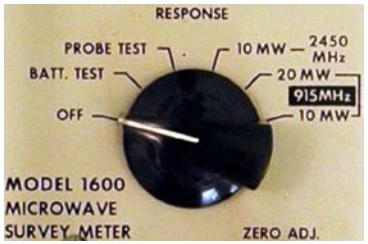
- Pull the cover off while holding the red portion of the handle.
- Slide the new cover into place, firmly seating it so that the back of the cover is flush with the black portion of the handle.



Battery Replacement

When replacing batteries, always replace both batteries.

- Turn the selector to “OFF”



- Unsnap the two clips on the side of the cover that hold the cover in place.
- Replace both batteries
- Replace the top of the case and re-secure the clips

- Turn the selector to “BATT TEST”. The meter should read above the green marker line. If it does not read at this level, the batteries are not charged.

Annual Calibration

See the *Product Information Bulletin* included with your shipment for information on ETS-Lindgren calibration services.

Replacement Parts

Following are the part numbers for ordering replacement parts for the HI-1600 Microwave Survey Meter.

Part Description	Part Number
User Manual	H-600011
Carrying Case	H-490271
Probe Cover	H-470124
Plastic Beaker	H-44600

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

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3.0 Specifications

Electrical Specifications

Frequency Response	915 MHz & 2450 MHz
Range	2450 MHz: 1-10 mW/cm^2
	915 MHz : 1-10, 2-20 mW/cm^2
Accuracy	±1 dB
Response Time	Fast Mode: <1 second
	Slow Mode: <3 seconds
Overload Withstand	2.0 W/cm^2

Physical Specifications

Readout Dimensions (WxHxD)	8.9 x15.3 x 6.4 cm (3.5 x 6 x 2.5 in)
Probe Length	30 cm (12 in)
Probe Cable Length	1.2 m (3.94 ft.)

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4.0 Pre-Installation Tasks

Before operating any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

Before each use, both the batteries and the probe of the HI-1600 should be tested.

Battery Test

Turn the selection knob on the meter to the “BATT. TEST” position. The meter should read above the green marker line. If it does not read at this level, replace both batteries. To replace batteries, refer to the Maintenance Section.

Probe Test

Turn the selection knob on the meter to the “PROBE TEST” position. With the “ZERO ADJ.” knob in a center position, the meter should read between the green lines (in the “OK PROBE TEST” area). If it does not, the probe has been damaged and should not be used. A defective probe cannot be replaced in the field and should be returned to ETS-Lindgren for repair. See the Product Information Bulletin included with your shipment for details regarding returning instruments for repair.

5.0 Operation

Before placing into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

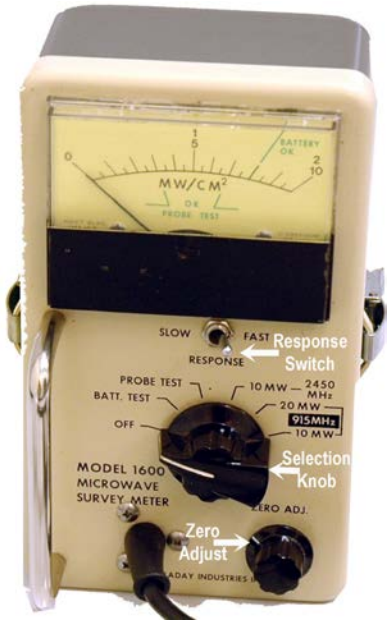
Probe

When holding the probe, use the handle provided. Do not place hands near the cover end of the probe. The probe should be held parallel to the direction of the propagated wave, i.e., keep the probe perpendicular to the range surface being measured.

Survey Meter

To operate the survey meter:

- Turn the selection knob to the desired meter range. Two meter ranges are available for 915 MHz ovens, 2-20 mw/cm^2 and 1-10 mw/cm^2. One meter range (1-10 mw/cm^2) is available for 2450 MHz.
- Select “Fast” response for initial scan of entire door periphery to locate the maximum leakage point. Once the origin of the maximum leakage has been identified, turn the select switch to “Slow” response and monitor for two minutes. Record the maximum repeatable values obtained during this survey.
- Adjust the meter pointer to true zero, using the “Zero Adj.” knob.



Under extreme temperature conditions the meter will not zero with the “Zero Adj.” knob. If this should occur, allow 10 to 15 minutes for the meter to warm up.

The selection knob should be turned off when the meter is not in use.

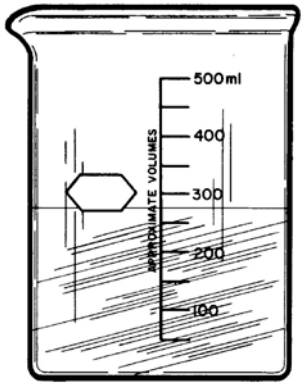
Standard “Load” Versus Time

Laboratory tests indicate maximum radiation usually occurs within three minutes after “Power On” with specified load. In order to measure maximum radiation, scan perimeter of door when power comes on. This initial scan will take approximately one minute and will locate the maximum leakage point(s). Monitor the maximum leakage point(s) for another two minutes.

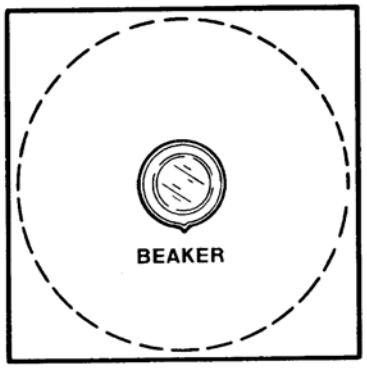
Range Preparation

Move oven to edge of cabinet so that lower slot (door to cabinet) overhangs.

- Place 275 cc of cold water in 600 cc beaker and place beaker in center of oven. Additional suitable beakers are available; see the Replacement and Optional Parts table in the Maintenance Section of this manual for more information.



Load specifications: 275 cc of cold tap water in a 600 cc beaker (Kimax #14005 or equivalent). Do not deviate from the specified.



The beaker must be placed in the center of the oven rack.

- Close and latch oven door.
- Set range timer to five minutes and select “High” (915 MHz) power.
- When power indicator (or “Cook”) lamp lights, range is ready for test.

Testing the Range

Testing should begin immediately after the power indicator lamp comes on. As you scan the perimeter of the oven door, watch the meter for deflection. The entire perimeter of the oven must be scanned.

- Place the white probe cover adjacent to slot between door and oven body, scan entire perimeter of oven door. Keep axis of probe perpendicular to oven surface being measured.
- Select “Fast” response for initial scan of entire door periphery to locate the maximum leakage point. Meter readings noted on first scan should indicate the suspect locations of radiation, if any exist.
- Once the origin of the maximum leakage has been identified, turn the select switch to “Slow” response and monitor for two minutes, recording the maximum repeatable values obtained during this survey.

Secondary Test

Before beginning this test, re-check the meter's battery and re-zero the meter. Also, perform the probe test. Steps to perform the probe test are outlined in the Pre-Installation Task section of this manual.

- Remove the beaker from the range. Empty the water and refill with cold water to 275 cc level and place in center of oven shelf. Close and latch the oven door.
- Set the timer for five minutes on "High" power.
- Start the scan when the power indicator lamp comes on, as before. Select "Fast" response and quickly scan the entire gasket perimeter to confirm location of maximum radiation indicated on initial test.
- Once the origin of the maximum leakage point has been confirmed, turn the select switch to "Slow" response and monitor for two minutes, recording the maximum repeatable values obtained during this survey.

This maximum reading is to be used in judging compliance with the following limit:

- All ovens manufactured after September 1971, maximum allowable 5 mw/cm^2.

If the maximum reading exceeds the acceptable limit, the range must be repaired.

After repairs are made, complete testing must be repeated.

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Appendix A: Warranty

See the *Product Information Bulletin* included with your shipment for the complete ETS-Lindgren warranty for your HI-1600 Microwave Survey Meter.

DURATION OF WARRANTIES FOR HI-1600 MICROWAVE SURVEY METER

All product warranties, except the warranty of title, and all remedies for warranty failures are limited to one year.

Product Warranted	Duration of Warranty Period
HI-1600 Microwave Survey Meter	1 Year

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Appendix B: EC Declaration of Conformity

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CE 96

Declaration of Conformity

We, ETS-Lindgren, L.P., 1301 Arrow Point Drive, Cedar Park, TX, 78613, USA, declare under sole responsibility that the:

Model/Part Number: HI-1600

Model/Part Name: Microwave Survey Meter, 915/2450 MHz

Date of Declaration: 24 May, 1996

Affirmation Date: 04 June, 2009

to which this declaration relates, meets the requirements and is in conformity with the relevant EC Directives listed below using the relevant section(s) of the following EC harmonized standards and other normative documents;

Applicable Directive(s):

Electomagnetic Compatibility Directive (EMC), 89/336/EEC and its amending directives

Applicable harmonized standard(s) and/or normative document(s):

EN 50082-1:1992 Electromagnetic compatibility - Generic immunity standard Part 1: Residential, commercial and light industry

EN 55011: Electromagnetic emissions requirements for Industrial, Scientific and Medical (ISM) Equipment

EN 61326:1997 (Amendment A2: 2001) Electrical equipment for measurement, control and laboratory use - EMC requirements

Authorized Signatories:

ETS-Lindgren L.P.
Bryan Sayler, General Manager

ETS-Lindgren L.P.
James C. Psencik, Vice President of Engineering

The authorizing signatures on this Declaration of Conformity document authorizes ETS-Lindgren, L.P. to affix the CE mark to the indicated product. CE marks placed on these products will be distinct and visible. Other marks or inscriptions liable to be mistaken with the CE mark will not be affixed to these products.

ETS-Lindgren, L.P. has ensured that technical documentation shall remain available on premises for inspection and validation purposes for a period ending at least 10 years after the last product has been manufactured.

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