MODEL HHMA

SAFETY RULES • WARNING

This tester has been designed with your safety in mind. However, no design can completely protect against incorrect use. Electrical circuits can be dangerous and/or lethal when lack of caution or poor safety practices are used.

READ THE MANUAL

Read this Instruction Manual carefully and completely.

Voltages and currents within the capability of this test equipment can be hazardous. Follow the instructions in this manual for every measurement. Read and understand the general instructions before attempting to use this tester. Do not exceed the limits of the tester.

SAFETY CHECK

Double check the switch setting and lead connections before making measurements. Are you following all of the instructions?

Disconnect the tester or turn off the power before changing switch positions. Do not connect to circuits with voltage present when switch is in any ohms or current position.

When replacing fuses, use only specified type fuses and insert in correct fuse holder.

DON'T TOUCH

Don't touch exposed wiring, connections or other "live" parts of an electrical circuit. If in doubt, check the circuit first for voltage before touching it.

Turn off the power to a circuit before connecting test probes to it. Be sure there is no voltage present before you touch the circuit. Do not use cracked or broken test leads.

HIGH VOLTAGE IS DANGEROUS

Always start with the power off. Be sure there is no voltage present before making connections to the circuit.

Don't touch the tester, its test leads, or any part of the circuit while it is on.

Before disconnecting the tester, turn the circuit off and wait for the meter to return to "zero."

DISTRIBUTION CIRCUITS PACK A PUNCH

In high energy circuits such as distribution transformers and bus bars, dangerous arcs of explosive nature can occur if the circuit is shorted. If the tester is connected across a high energy circuit when set to a low resistance range, a current range, or any other low impedance range, the circuit is virtually shorted.

Special equipment designed for use with these circuits is available. Contact a qualified person for assistance before attempting to make measurements on any high energy circuit.

SAFETY IS NO ACCIDENT

WARNING

REMOVE CLAMP-ON AC AMMETER ADAPTOR FROM TESTER WHEN MEASURING VOLTAGE.

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INTRODUCTION

The Omega HHMA is a hand-sized VOM with all the versatility and performance of larger, more expensive bench-size models. It offers diode overload protection against damage to the meter movement caused by accidental overloads. A fuse is used to protect the RX1 range. The fuse and batteries can be easily replaced by removing the back cover.

The rugged bar-ring meter is a self-shielded high torque movement incorporating spring back measurement providing highly dependable measurement capabilities on the job anywhere, even in strong magnetic fields. Small enough to be carried in your tool box, glove compartment, brief case, or shirt pocket, the HHMA features 20,000 ohms per volts DC sensitivity and 5,000 ohms per volt AC.

Versatility and readability have not been sacrificed in order to provide a portable VOM. Both models have 18 different ranges that can be easily read on only 3 clearly defined scale areas. A single selector switch allows you to switch easily from range to range and function to function.

SPECIFICATIONS

DC Volts

Ranges: 0-3, 12, 60, 300, 1200 (20,000 ohms per volt)
Accuracy: ±3% of full scale value

AC Volts

Ranges: 0-3, 12, 60, 300, 1200 (5,000 ohms per volt)
Accuracy: (on 60Hz sine wave at 77° F)
±4% of full scale value

Ohms

Ranges: 0-20,000, 200,000, 2 Meg, 20 Meg
Accuracy: (with fully charged battery)
±3% of DC scale length

Ohmmeter Specifications:

Range	X1	X10	X100	X1K
Max Voltage (Volts)	1.6	1.6	1.6	14.0
Max Current (mA)	8.0	0.8	.08	.07
Max. Power (mW)	3.2	.32	.032	.245

DC Milliamperes

Ranges: *0-.6, 6, 60, 600*
Accuracy: *±3% of full scale value*

	Approximate Full Scale
Current Range	***Voltage Drop***
0-.6, 6, 60 mA	*250 mV*
0-600 mA	*330 mV*

Meter
50 µA - 250 mV (Pivot and Jewel)

Overload Protection
Meter movement protected by diodes.
RX1 range protected by fuse.
Voltage ranges protected by high impedance.

Batteries
One 1.5 volt "N" size (NEDA 910)
One 12 volt Eveready A23

Weight
Approximately 14 oz.

Accessories supplied with the HHMA
1. *One red and one black test lead*
2. *Alligator clips*
3. *Batteries: One 1.5V and One 12V*
4. *Instruction Manual*

OPERATION CHART

To Measure	Range	Set Switch To	Lead Connections Black Lead "COM" Red Lead Listed Below	Read On Scale	Each Scale Div. Equals
DC Volts	0 - 3	DCV 3	VOM	300 ÷ 100	.05 Volt
	0 - 12	DCV 12	VOM	12	.20 Volt
	0 - 60	DCV 60	VOM	60	1 Volt
	0 - 300	DCV 300	VOM	300	5 Volt
	0 - 1200	DCV 3	1200 V DC	12 x 100	20 Volt
AC Volts	0 - 3	ACV 3	VOM	AC Amps	.05 Volt
	0 - 12	ACV 12	VOM	12	.20 Volt
	0 - 60	ACV 60	VOM	60	1 Volt
	0 - 300	ACV 300	VOM	300	5 Volt
	0 - 1200	ACV 3	1200 V AC	12 x 100	20 Volt
Ohms	0 - 20,000	Ω X1	VOM	0 - 20K	
	0 - 200,000	Ω X10	VOM	0 - 20K x 10	
	0 - 2 Meg	Ω X100	VOM	0 - 20K x 100	
	0 - 20 Meg	Ω X1K	VOM	0 - 20K x 1000	
DC mA	0 - .6	MA .6	VOM	60 ÷ 100	.01 mA
	0 - 6	MA 6	VOM	60 ÷ 10	.1 mA
	0 - 60	MA 60	VOM	60	1 mA
	0 - 600	MA 600	VOM	60 x 10	10 mA

GENERAL INSTRUCTIONS

Parts Replacement

Parts available for replacement are listed in the parts list. When replacing any parts, be careful to not disturb or damage any others. Do not overheat resistors or diodes, but be sure to make a good solder connection.

In some cases, it is wise to leave part of the lead from the old component and solder the new component to the old lead to prevent damage to surrounding components.

If there is evidence of smoke or an electrical arc inside the VOM, return the VOM to the factory or an authorized service center. There is a chance of hidden damage that could cause another failure in the VOM.

Calibration

With normal use, readjustment of this VOM should not be necessary. Replacement parts are designed to be installed without any need for recalibration of the VOM. An occasional check of the VOM against a known reference voltage or another VOM is good practice. If there is a question about the accuracy of the VOM, it should be returned to the factory or an authorized service center for a calibration check.

Repair or Service

For repair of the VOM, return it to the factory or an authorized service center. To help in repairing the VOM, give a detailed description of the problem and any other data that might be helpful such as what kind of circuit was being measured when the problem was discovered.

If the VOM is damaged by an overload and there is evidence of smoke or an electrical arc inside, return it to the factory or an authorized service center for inspection and repair. There could be some hidden damage that would cause a future failure of the VOM.

Test Leads

Check the test leads periodically. Leads that are worn, have damaged insulation, damaged plugs, damaged probes or loose parts should be replaced.

The following section should be read carefully. It contains instructions and precautions to be observed in making measurements with the tester.

The alligator clips provided with the tester fit over the end of the test probes. When measuring high voltage, these alligator clips allow measurement without handling the test probes. ALWAYS SHUT OFF THE POWER source before attempting to connect alligator clips.

When the approximate value of the quantity being measured is not known, ALWAYS START ON THE HIGHEST RANGE. For greater accuracy, choose the range which will allow readings to be taken in the upper (right hand) portion of the scale.

Readings are taken on the scale having the appropriate significant figures (both 3 and 300 volts are read on the 0-300 scale) by multiplying or dividing by a factor of 10 or 100 as indicated by the range/scale ratio (i.e., on the 3 volt range, divide the scale readings by 100).

The test probes should be disconnected from the voltage source (or the source shut off) before the switch position is changed. This practice will result in an increased life and reliability for the tester as well as a good safety practice.

The Meter Zero Adjust Screw is located near the center of the tester. It should be periodically adjusted so the meter pointer is on zero with no input into the tester.

Readings on the sensitive voltage, current and resistance ranges may sometimes be different than calculated values. Thermo-electric or electro-chemical reactions can sometimes generate voltage (and current) in a circuit due to elevated temperatures for soldering, contact of dissimilar metals, chemical fumes or moisture. Also, the fingers should never touch the metal parts of the test probes since body resistance can cause erroneous readings - particularly on the high ohmmeter ranges.

Care

Although this instrument is portable and rugged, it should be treated with care. Do not drop it or handle it roughly.

Avoid placing it on a bench where machine tools are used or severe vibration is encountered.

When possible, keep it in a place of moderate temperature. Avoid subjecting it to extreme temperatures and severe temperature changes.

If the tester has not been used for a long period of time, rotate the switch in both directions several times to wipe the switch contacts for good contact.

DC VOLTAGE MEASUREMENTS

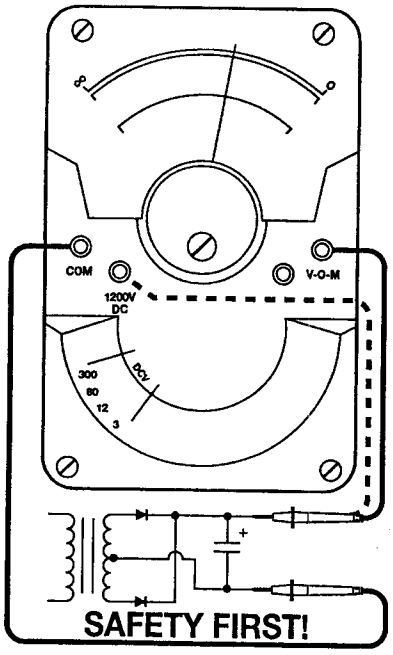
0-3 through 0-300 Volts:

1. *Insert test leads in VOM and COM jacks.*
2. *Set switch to appropriate DCV range.*
3. *Connect probes across voltage to be measured.*
4. *Read voltage on the black AC-DC scale.*

0-1200 Volts:

1. *Insert test leads in COM and 1200 VDC jacks.*
2. *Set switch to 3 DCV position.*
3. *Connect probes across voltage to be measured.*
4. *Read voltage on the black AC-DC scale.*

DO NOT TOUCH THE VOM while it is connected to high voltage!


COM
1200V
DC
V-Ω-M
300
80
12
3
DCV
+
SAFETY FIRST!

AC VOLTAGE MEASUREMENTS

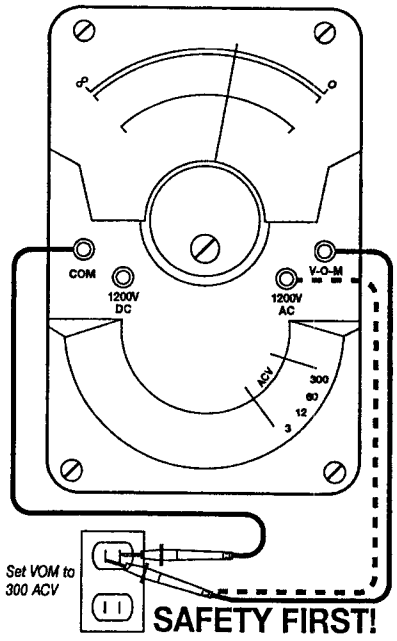
0-3 through 0-300 Volts:

1. Insert test leads in VOM and COM jacks.
2. Set switch to appropriate ACV range.
3. Connect probes across voltage to be measured.
4. Read voltage on black AC-DC scale.

0-1200 Volts:

1. Insert test leads in COM and 1200 VAC jacks.
2. Set switch to 3 ACV.
3. Connect probes across voltage to be measured.
4. Read voltage on the black AC-DC scale.

DO NOT TOUCH THE VOM while it is connected to high voltage!


COM
1200V DC
1200V AC
V-Ω-M
ACV
300
60
12
3
Set VOM to 300 ACV
SAFETY FIRST!

RESISTANCE MEASUREMENTS

X1 through X1K Ohms:

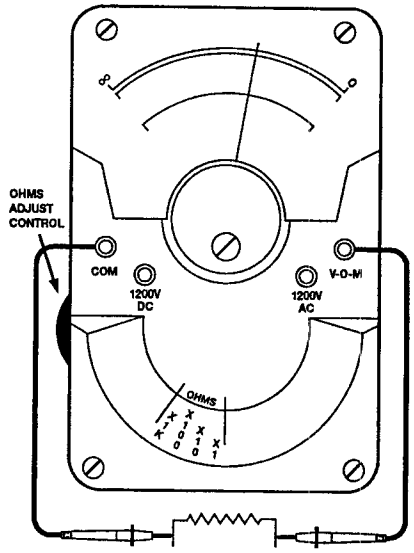
1. *Insert test leads into VOM and COM jacks.*
2. *Set switch to appropriate OHMS range.*
3. *Short test probes together.*
4. *Adjust OHMS ADJUST CONTROL until meter reads zero ohms.*
5. *Connect probes to component to be measured.*
6. *Read ohms on OHMS scale (multiply value read by multiplier indicated by the switch).*

A fuse protects the X1 range against accidental overloads. If the fuse should blow, all OHMS ranges will not operate.

DO NOT TOUCH circuitry while making measurements.

DISCONNECT or ISOLATE the device being tested from other circuitry.

NOTE: 1K equals 1000.



SAFETY FIRST!

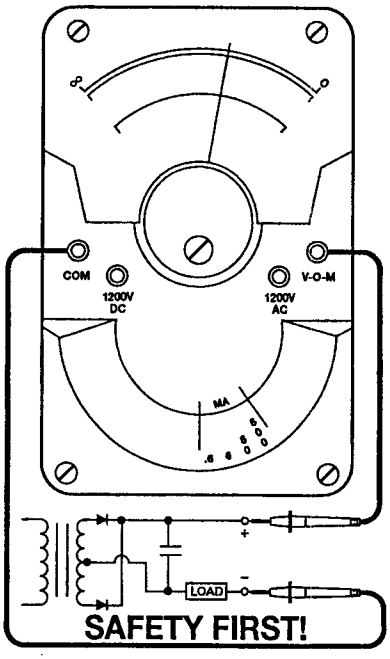
DC CURRENT MEASUREMENTS

0-.6 through 0-600 Milliamperes:

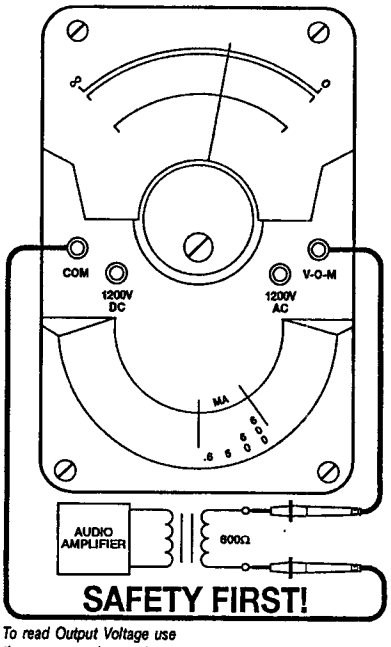
1. *Insert test leads into VOM and COM jacks.*
2. *Set switch to appropriate mA range.*
3. *Connect the probes in series with the circuit (use alligator clips).*
4. *Turn circuit on.*
5. *Read current on black AC-DC scale.*

The approximate voltage drop across the HHMA is shown in the specifications. Generally, this drop will not affect the circuit. But, in low voltage circuits, it may be necessary to compensate for this drop.

DISCONNECT POWER before connecting the HHMA into the circuit.

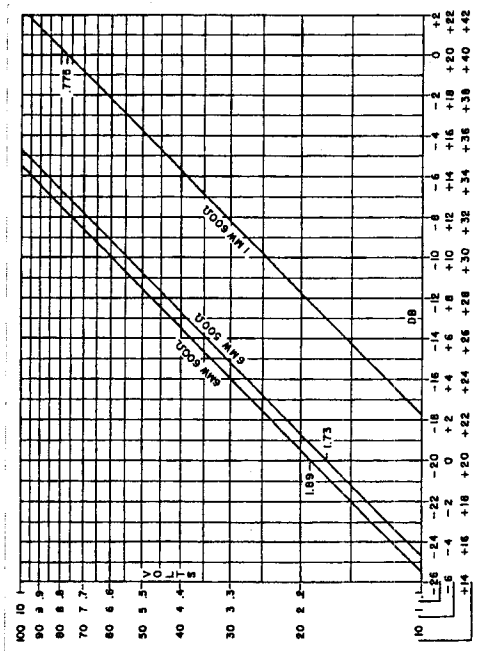

COM
1200V DC
1200V AC
V-Ω-M
MA
+
-
LOAD
SAFETY FIRST!

MEASURING OUTPUT VOLTS (dB)



To read Output Voltage use the same procedure as shown on page 14 for AC Voltage.

MEASURING OUTPUT VOLTS (dB)



ACCESSORIES

Model HHMA-CP Clamp-on Ammeter:
Ranges: 0-6-12-30-60-120-300

MODEL HHMA-CP
AC CLAMP-ON AMMETER ADAPTOR
INSTRUCTIONS

This adaptor allows measurement of AC current with a VOM. It is attached to the VOM with an extension lead. It may also be attached to the top of the Omega HHMA VOM directly as shown on page 25.

SPECIFICATIONS

Ranges:
0-6, 12, 30, 60, 120, 300 AC Amperes

Accuracy:
See Model HHMA Instruction Sheet.

Frequency:
See Model HHMA Instruction Sheet.

VOM Range and Sensitivity:
3 AC Volts at 5,000 ohms/volt

AC CURRENT MEASUREMENTS

Using the adaptor on top of Omega HHMA VOM:

1. *Rotate the lever on the bottom of the adaptor until it points straight out (see Figure 1).*
2. *Install the adaptor on the top of the VOM. Rotate the lever back against the adaptor.*
3. *Plug the test lead bar from the adaptor into the VOM and COM jacks of the VOM. (Polarity of the test leads is not important).*
4. *Set the VOM switch to AC AMPS or 3 AC VOLTS.*
5. *Set the adaptor switch to 300 AMPS.*
6. *Press the handle on the side of the adaptor to open the jaws. Place the jaws around ONE conductor and release the handle (See Figure 2).*
7. *Adjust the adaptor switch for maximum meter deflection without going off-scale.*
8. *Read AC Amperes on the AC AMPS or 3 AC VOLTS scale as directed below.*

Adaptor Range AC Amperes	Reading on 3 AC Volts Scale	Reading on AC Amps Scale
6	0-3 (x 2)	0-6
12	0-3 (x 4)	0-12
30	0-3 (x 10)	0-30
60	0-3 (x 20)	0-6 (x 10)
120	0-3 (x 40)	0-12 (x 10)
300	0-3 (x 100)	0-30 (x 10)

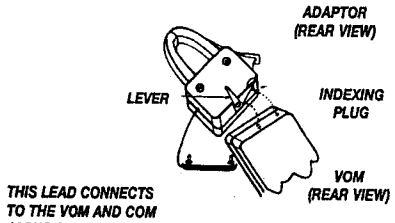


FIGURE 1

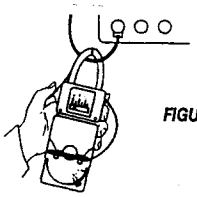


FIGURE 2

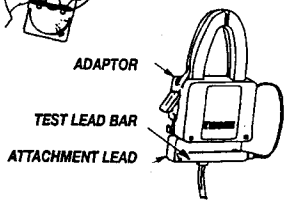


FIGURE 3

AC CURRENT MEASUREMENTS

Using the adaptor with the attachment lead:

1. *Rotate the lever on the bottom of the adaptor until it points straight out (See Figure 1).*
2. *Install the adaptor on the top of the attachment lead (PN 79-416). Rotate the lever back against the adaptor (See Figure 3).*
3. *Plug test lead bar into attachment lead (See Figure 3).*
4. *Plug attachment lead into VOM (+) and COM (-) jacks of VOM (polarity of leads is not important).*
5. *Set the VOM switch to AC AMPS or 3 AC VOLTS.*
6. *Set the adaptor switch to 300 AMPS.*
7. *Press the handle on the side of the adaptor to open the jaws. Place the jaws around ONE conductor and release the handle (See Figure 2).*
8. *Adjust the adaptor switch for maximum meter deflection without going off-scale.*
9. *Read AC Amperes on the AC AMPS or 3 AC Volts scale as directed below.*

Adaptor Range AC Amperes	Reading on 3 AC Volts Scale	Reading on AC Amps Scale
6	0-3 (x 2)	0-6
12	0-3 (x 4)	0-12
30	0-3 (x 10)	0-30
60	0-3 (x 20)	0-6 (x 10)
120	0-3 (x 40)	0-12 (x 10)
300	0-3 (x 100)	0-30 (x 10)

OPERATING NOTES

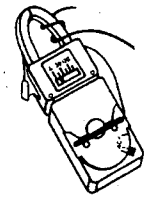


FIGURE 4

Do not place the jaws of the adaptor around more than one wire. An incorrect reading will result.

When reading is below half scale on the 6 AC Ampere range, greater accuracy can be achieved by wrapping the conductor around the jaws twice (Figure 4). This would double the sensitivity of the adaptor, and the actual current flowing would be half that indicated by the meter. Likewise, more turns can be added around the jaws of the adaptor for increased sensitivity. The actual current in each case is the indicated current divided by the number of turns around the jaws.

Best accuracy is obtained by hanging the HHMA-CP on the single wire conductor.

Do not try to change ranges by changing the switch on the VOM. The adaptor is calibrated to work on the AC AMPS or the 3 AC VOLTS ranges only.

MAINTENANCE FOR OMEGA HHMA

Battery Replacement
If the pointer cannot be adjusted to full scale on the X1, X10, or X100 OHMS ranges, replace the 1.5V battery. Replace the 12V battery if the X1K OHMS range cannot be adjusted for full scale.

1.5V Battery - NEDA 910F or 910M
12V Battery - A23

Battery Cover Latch Repair
If the slide on the battery cover breaks, order a new battery cover assembly. To repair the tab on the tester body, order the battery cover latch repair kit.

Fuse Replacement
If none of the OHMS ranges work, replace the fuse. Use a 1/16 AMP, 5 mm x 20 mm fuse.

Cleaning Plastic Window
The plastic window has been treated at the factory to dissipate static charges. If cleaning is necessary use cotton dipped in a solution of common household detergent and water. After cleaning, allow the solution to dry without rubbing; the resultant detergent film will effectively dissipate static charges.

CAUTION:
Solvents and liquids used in radio and TV shop work may craze or scar the plastic window if applied to it.

MAINTENANCE FOR OMEGA HHMA-CP

The jaw surfaces must be kept clean. If film appears, clean the jaw with a very find grade of sandpaper.

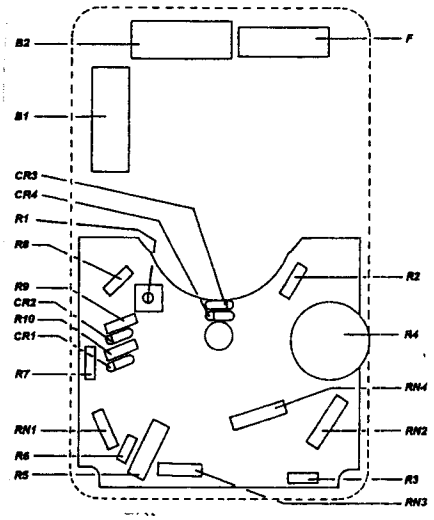
Inspect test leads before use. Replace any worn, frayed or cracked test leads.

SAFETY FIRST

DO NOT ALLOW TEST LEAD BAR to hang loose. When the adaptor is not in use, remove it from the VOM.

FOLLOW ALL SAFETY RULES, PRECAUTIONS, AND WARNINGS IN THIS VOM INSTRUCTION MANUAL.

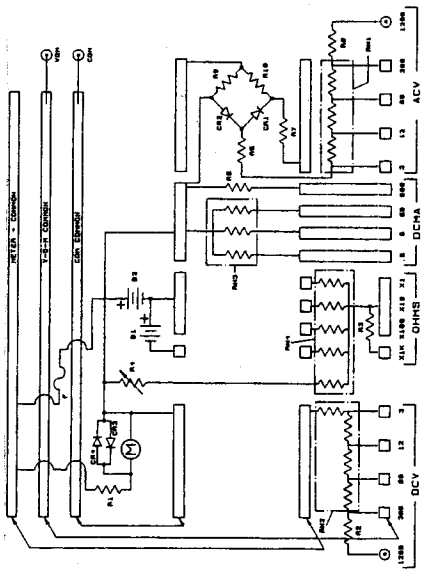
COMPONENT LOCATION HHMA



Repair or Service

In the event repair or service is required, please outline the nature of the difficulty. By providing this information, we can supply more efficient service.

CIRCUIT DIAGRAM HHMA



REPLACEABLE PARTS FOR HHMA

Circuit Symbol	Part Number	Qty. Used	Description
M	52-9266	1	INSTRUMENT ASSEMBLY, PIVOT & JEWEL 50μA
	10-3861	1	FRONT ASSEMBLY
	24-326	2	SCREW, CASE UPPER (INSIDE)
	24-327	2	SCREW, CASE LOWER
	20-836	1	BATTERY, COVER ASSEMBLY
	46-277	1	CONTACT, BATTERY 1.5V
	46-276	1	CONTACT, BATTERY 12V
	2451-199	2	CONTACT, FUSE
B1	37-60	1	BATTERY 12V
B2	37-21	1	BATTERY 1.5V
	87-1105	1	PC BOARD W/COMPONENTS
R1	16-423	1	RESISTOR VARIABLE 5 K OHMS
R2	15-2593	1	RESISTOR, 18 MEG 1% 1/2 WATT
R3	15K-1783TA3	1	RESISTOR, 178K 1% 1/8 WATT
R4	16-428	1	RESISTOR VARIABLE 20 K OHM
R5	15-3647	1	RESISTOR, .414 OHM 1% 3 WATT
R6	15K-1182TA3	1	RESISTOR, 11.8 K 1% 1/8 WATT
R7	15K-6651TA3	1	RESISTOR, 6.65 K 1% 1/8 WATT
R8	15-4986	1	RESISTOR, 4.5 M 1% 1/2 WATT
R9, R10	15K-4991TA3	2	RESISTOR, 4.99 K 1% 1/8 WATT
RN1	159-51	1	NETWORK, ACV
RN2	159-52	1	NETWORK, DCV
RN3	159-53	1	NETWORK, CURRENT
RN4	159-54	1	NETWORK, OHMS
CR1, CR2	11056	2	DIODE, AC BRIDGE
CR3, CR4	127-114	2	DIODE, IN4148
	79-153	1	TEST LEADS
F	3207-112	1	FUSE, 1/16 AMP/250 V
	12478	1	SWITCH LEVER, ASSEMBLY
	12317	1	BATTERY COVER REPAIR LATCH KIT
	3206-27	1	HANDLE, PAINTED