

**TECHNICAL MANUAL  
OPERATOR'S, UNIT AND  
DIRECT SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)  
FOR**

**VOM MULTITESTER**

**MODEL 310, TYPE 5  
NSN 6625-00-691-6605**

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and the content requirements normally associated with Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.

**Approved for public release; distribution is unlimited.**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**28 SEPTEMBER 1990**

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### **SUPPLEMENTARY INTRODUCTORY MATERIAL**

#### 1-1. Maintenance Forms and Records.

Department of the Army forms and procedures used for equipment maintenance will be those described by DA Pam 738-750, The Army Maintenance Management System.

#### 1-2. Reporting Errors and Recommending Improvements

You can help improve this manual if you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letters, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual, directly to: Commander, U.S. Army Troop Support Command, ATTN. AMSTR-MCTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

#### 1-3. Destruction of Army Material to Prevent Enemy Use.

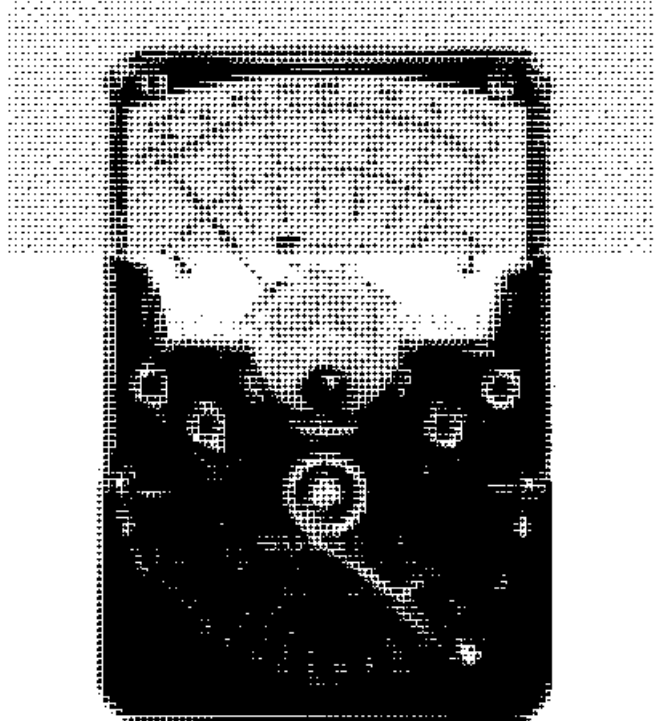
Refer to TM 750-244-3 for instructions covering the destruction of Army material to prevent enemy use.

#### 1-4. Administrative Storage of Equipment.

- a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period appropriate maintenance records will be kept.
- b. Before placing equipment in administrative storage, current preventive maintenance checks and services should be completed. Shortcomings and deficiencies should be corrected, and all modification work orders (MWO's) should be applied.
- c. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, Conex containers and other containers may be used.

**MODEL 310 TYPE 5**

**HAND-SIZED VOM**



**INSTRUCTION MANUAL**

**TRIPLETT  
CORPORATION**

*One Triplett Drive  
Bluffton, Ohio 45817*

## **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  
ADAPTER FROM TESTER  
WHEN MEASURING VOLTAGE**

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## INTRODUCTION

The Triplet Model 310 is a handy 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 a cover on the back. Its rugged, self-shielded, high torque bar-ring meter movement incorporating springback jewels provides 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 Model 310 allows you to have 20,000 ohms per volt DC sensitivity ( $5,000\Omega/V AC$ ) wherever you need it.

Versatility and readability have not been sacrificed in order to provide a portable VOM. The 310 offers 18 different ranges that can all be easily read on only 3 clearly defined scale arcs. 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 (5,000 ohms per volt)

Accuracy:

$\pm 3\%$  of full scale value

### AC Volts

Ranges:

0-3, 12, 60, 300, 1200 (5,000 ohms per volt)

Accuracy:

$\pm 4\%$  of full scale value (on 60 Hz sine wave at 77 ° F)

### Ohms

Ranges:

0-20,000, 200,000, 2 Meg , 20 Meg

Accuracy:

$\pm 3\%$  of DC scale length with fully charged battery

### Ohmmeter Specifications

	Range			
	X1	X10	X100	X1K
Max. Voltage (Volts)	1.6	1.6	1.6	18.0
Max. Current (mA)	8.0	.8	.08	.09
Max. Power (mW)	3.2	.32	.032	.605

### DC Milliamperes

Ranges:

0-.6, .6, 6, 60, 600

Accuracy:

±3% of full scale value

<b>Current Range</b>	<b>Approximate Full Scale Voltage Drop</b>
0-.6, 6, 60 mA	250 mV
0-600 mA	330 mV

### **Meter**

50 mA - 250 mV (Pivot and Jewel)

### **Overload Protection**

Meter movement protected by diode module  
RX1 range protected by fuse.  
Voltage ranges protected by high impedance

### **Batteries**

One 1.5 volt "N" size (NEDA 910)  
One 15 volt Eveready 504 (NEDA 220)

### **Weight**

Approximate 14 oz

### **Accessories supplied with Model 310**

1. One red and one black test lead
2. Alligator clips
3. Batteries: 1 - 1.5 V; and 1 - 15V
4. Instruction Manual

## OPERATION CHART

Lead Connections To Measure	Set Switch To	Black Lead "COM" Red Lead Listed Below	Read on Scale	Each Scale Div. Equals
<b>DC Volts</b>				
0-3	DCV 3	V-O-M	300 ÷ 100	.05 Volt
0-12	DCV 12	V-O-M	12	.20 Volt
0-60	DCV 60	V-O-M	60	1 Volt
0-300	DCV 300	V-O-M	300	5 Volt
0-1200	DCV 3	1200 V DC	12x100	20 Volt
<b>AC Volts</b>				
0-3	ACV 3	V-O-M	30 AC Amps ÷ 0	.05 Volt
0-12	ACV 12	V-O-M	12	.20 Volt
0-60	ACV 60	V-O-M	60	1 Volt
0-300	AC 300	V-O-M	300	5 Volt
0-1200	ACV 3	1200 V AC	12 x 100	20 Volt
<b>OHMS</b>				
0-20,000	Ω x1	V-O-M	0-20K	
0-200,000	Ω X10	V-O-M	0-20K x 10	
0-2 Meg.	Ω X100	V-O-M	0-20K x 100	
0-20 Meg.	Ω X1K	V-O-M	0-20K x 1000	
<b>DCmA</b>				
0-.6	MA.6	V-O-M	60 ÷ 100	.01mA
0-6	MA 6	V-C-M	60 ÷ 10	1 mA
0-60	MA 60	V-O-M	60	1mA
0-600	MA 600	V-O-M	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 electrochemical 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**

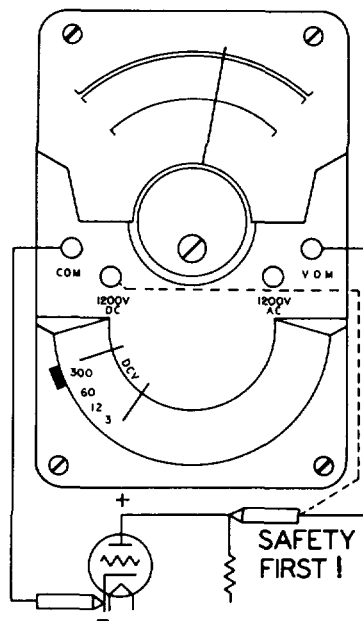
0-3 thru 0-300 Volts:

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!  
**BE CAREFUL** around high voltage!



## AC VOLTAGE MEASUREMENTS

0-3 thru 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.

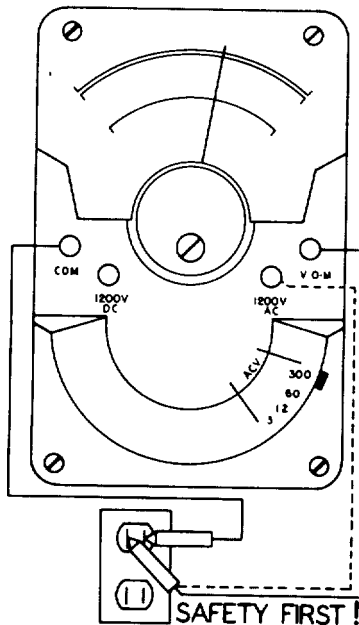
0-1200 Volts:

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!

BE CAREFUL around high voltage!

NOTE: For AC Amps measurements with the Model 10, disconnect the test leads The range switch should be set to 3 ACV.



## RESISTANCE MEASUREMENTS

X1 thru X1K Ohms:

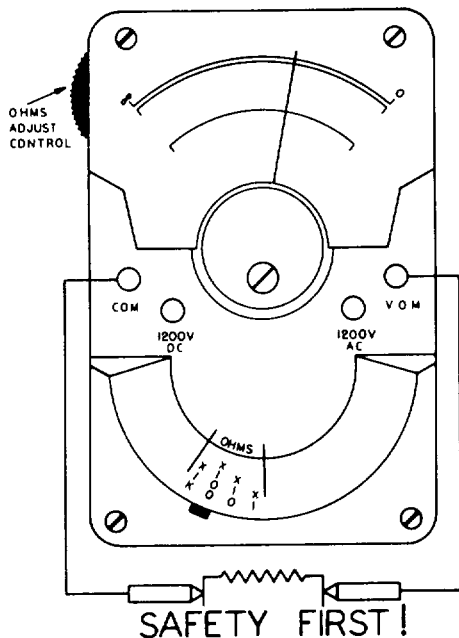
1. Insert test leads into VOM and COM jacks.
2. Set switch to appropriate OHMS range.
3. Short test probes together.

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.



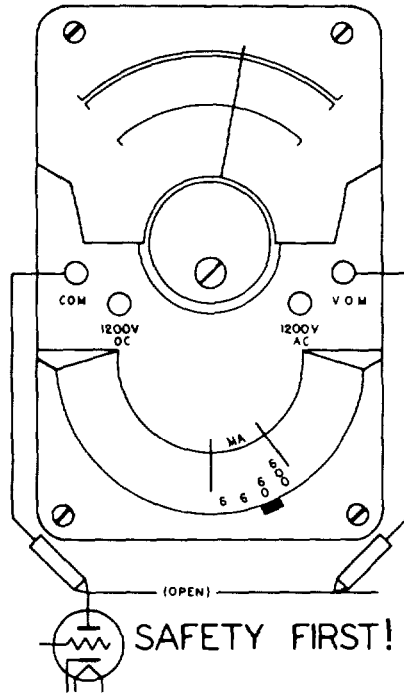
### DC CURRENT MEASUREMENTS

0-.6 thru 0-600 Millamperes:

- 1 Insert test leads into VOM and COM lacks.
- 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.

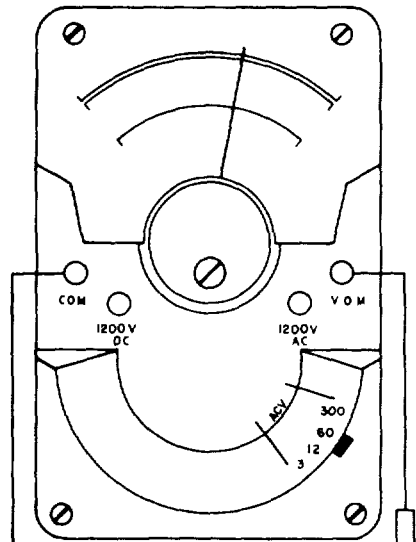
The approximate voltage drop across the Model 310 is shown In the specifications Generally, this drop will not affect the circuit But, In low voltage circuits, it may be necessary to compensate for this drop.

**DISCONNECT POWER** before connecting the Model 310 into the circuit.



### MEASURING OUTPUT VOLTS (dB)

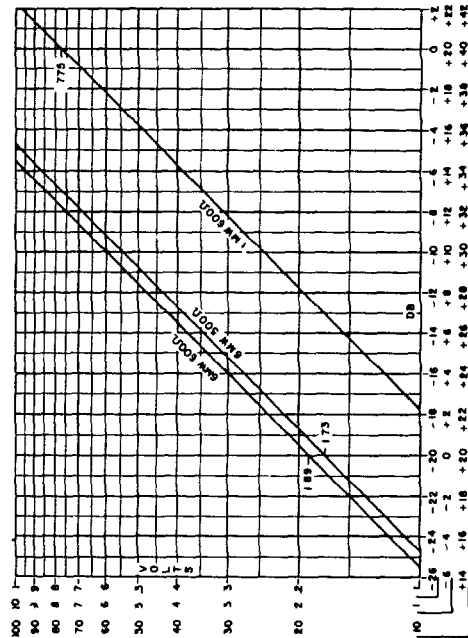
#### 12 MEASURING OUTPUT VOLTS (dB)



To read Output Voltage use the same procedure as shown on page 9 for AC Volts



#### MEASURING OUTPUT VOLTS (dB)



## ACCESSORIES FOR 310

**Model 10 Clamp-on AC Ammeter**- Cat No 60211

**Ranges**, 0-6-12-30-60-120-300

**Model 101 - Line Separator**-Cat. No 60-218

- Divides two conductor cords direct or increases Model 10 sensitivity 10x and 20x.

**Model 379 Carrying Case** - Cat No 10-1456  
For Model 310 and Model 10 combination, plus Model 101.

**Model 311 Lead** - Cat. No 79-41642" long lead to separate Model 10 from 310 unit for easy reading in awkward spots. (now shown)

**Model 369 Carrying Case** - Cat. No 10-1258.



## MODEL 10 INSTRUCTIONS

### AC CLAMP-ON AMMETER ADAPTER

This adapter 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 310 series VOMs directly as shown on Page 14.

### SPECIFICATIONS

Ranges:

0-6, 12, 30, 60, 120, 300 AC Amperes.

Accuracy

See Model 10 Instruction Sheet.

Frequency:

See Model 10 Instruction Sheet.

VOM Range and Sensitivity:

3 AC Volts at 5,000 ohms/volt.

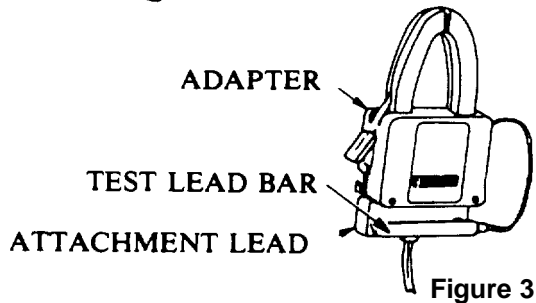
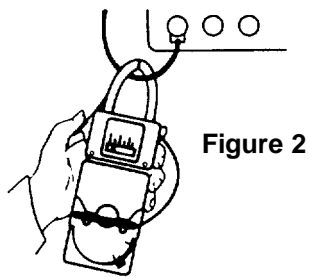
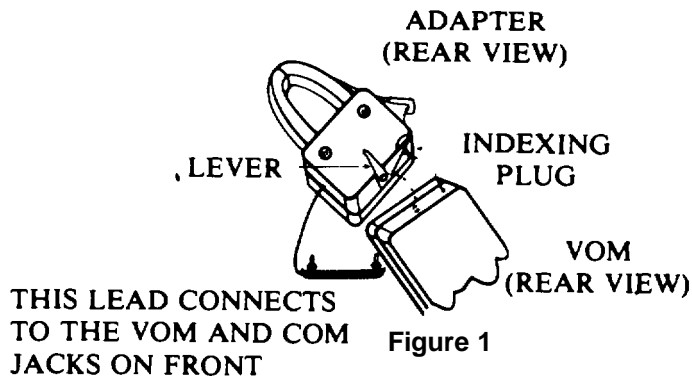
### AC CURRENT MEASUREMENTS

Using the adapter on top of Triplet Model 310 series VOMs -

- 1 Rotate the lever on the bottom of the adapter until it points straight out (See Figure 1).
- 2 Install the adapter on the top of the VOM Rotate the lever back against the adapter.

3. Plug the test lead bar from the adapter into the VOM and COM jacks of the VOM (Polarity of leads is not important).
4. Set the VOM switch to AC AMPS or 3 AC VOLTS.
5. Set the adapter switch to 300 AMPS.
6. Press the handle on the side of the adapter to open the jaws. Place the jaws around ONE conductor and release the handle (See Figure 2).
7. Adjust the adapter 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.

Adapter Range AC Amperes	Reading on 3 AC VOLTS Scale	Reading on AC Amps Scale
6	0-3 (x 2)	06
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)

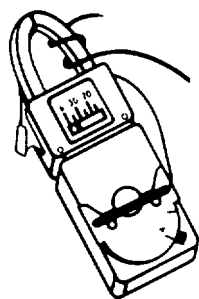


Using the adapter with the attachment lead -

1. Rotate the lever on the bottom of the adapter until it points straight out (See Figure 1).
2. Install the adapter on the top of the attachment lead Rotate the lever back against the adapter (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 adapter switch to 300 AMPS.
7. Press the handle on the side of the adapter to open the jaws Place the jaws around ONE conductor and release the handle (See Figure 2).
8. Adjust the adapter 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.

Adapter Range AC Amperes	Reading on 3 AC VOLTS Scale	Reading on AC Amps Scale
6	0-3 (x 2)	06
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 adapter 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 adapter, and the actual current flowing would be half that indicated by the meter. Likewise, more turns can be added around the jaws of the adapter 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 Model 10 on the single wire conductor.

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



## MODEL 101 INSTRUCTIONS

### LINE SEPARATION ADAPTER

This adapter is used to divide the two conductor cord so that AC current measurements can be made on equipment with a standard line cord.

It will increase sensitivity and ranges of the Model 310-Model 10 combination by 10 times and 20 times. Also the adapter has provisions for voltmeter prods for voltage measurements.

**Uses for Model 101** (With Model 310-10 combination V-O-M, clamp-on ammeter).

Fast checks on current of appliances, home freezers, radios, TV, etc.  
Checks for shorts, etc. in home radios, TV sets and other equipment.  
Checks on current of motors, starting and running.

### Current Capacity of Model 101

Range	Max. Capacity Amperes
Direct	30
Divide by 10	12
Divide by 20	6

## OPERATING INSTRUCTIONS

### Direct Range

For current readings on 30 amperes, on equipment having two conductor line cords.

- (1) Plug line of cord appliance or apparatus to be measured into the "Direct" outlet of the Model 101 (Fig 1) Plug model 101 into wall outlet.
- (2) With Model 10 adapter and Model 310 V-O-M connected and set properly for measuring AC current, snap Model 10 through the hole in Model 101 and take readings, starting at the highest current range. (Fig 2). Reset range switch on Model 10 for greatest pointer deflection.

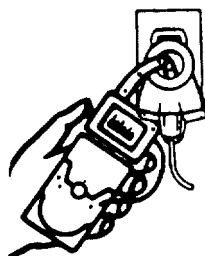


Figure 2

<b>Model 10 Setting AC Amperes</b>	<b>Multiply 3 AC Scale Reading on 310 by</b>	<b>Full Scale Reading in AC AMPS (Read on 3 AC Scale of 310)</b>
30	10	30
12	4	12
6	2	6

### Divide by 10 Range

To increase the sensitivity of your Model 10 Adapter 10 times.

- (1) Plug line cord of appliance or apparatus to be measured into the "DIVIDE BY 10" outlet of Model 101, (Fig 3).

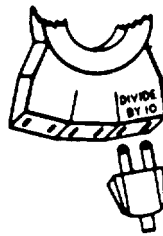


Figure 3

- (2) With Model 101 plugged into wall outlet, snap Model 10 through Model 101 - take reading and divide by 10.

<b>Model 10 Setting AC Amperes</b>	<b>Multiply 3 AC Scale Reading on 310 by</b>	<b>Full Scale Reading in AC AMPS (Read on 3 AC Scale of 310)</b>
120	4.0	12.0
60	2.0	6.0
30	1.0	3.0
12	.4	1.2
6	.2	.6

### Divide by 20 Range

To increase the sensitivity of your Model 10 Adapter 20 times.

- (1) Plug line cord of appliance or apparatus to be measured into the "DIVIDE BY 20" outlet of Model 101, (Fig 4).

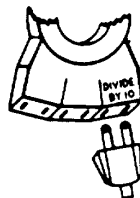


Figure 4

(2) With Model 101 plugged into wall outlet, snap Model 10 through Model 101- take reading and divide by 20

Model 10 Setting AC Amperes	Multiply 3 AC Scale Reading on 310 by	Full Scale Reading in AC AMPS (Read on 3 AC Scale of 310)
120	2.0	6.0
60	1.0	3.0
30	.5	1.5
12	.2	.6
6	.1	.3

**Notes:**

- (1) Never leave the Model 101 In a circuit carrying more than the capacity rating of the Model 101.
- (2) Motors draw a surge current while starting. Therefore, the Model 10 should be set on a high range to avoid overloading the meter when motor starts.

**LINE VOLTAGE MEASUREMENTS:**

To make line voltage measurements, remove the Model 10 from the 310, and set range switch to 300 ACV range Use the regular test leads for the 310 and measure line voltage at any unused outlet on the Model 101 adapter. This voltage measurement can then be made while the appliance is under load conditions. (Figure 5).

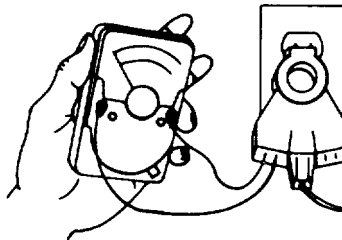


Figure 5

## MAINTENANCE

### Battery Replacement

If the pointer cannot be adjusted to full scale on the X1, X10, or X100 OHMS ranges, replace the 1.5 V battery. Replace the 15 V battery if the X1K OHMS range cannot be adjusted for full scale.

1.5V Battery - NEDA 910F or 910M

15V Battery - NEDA 220

### 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 under the 1.5V battery. Use a 1/16 AMP 8 AG, MKB, or equivalent 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 MODEL 10

The jaw surfaces must be kept clean. If film appears, clean the jaw with a very fine grade of sandpaper. Inspect test leads before use. Replace any worn, frayed or cracked test leads.

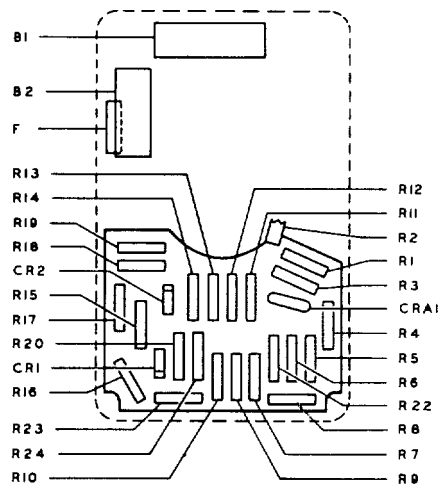
## SAFETY FIRST

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

FOLLOW ALL SAFETY RULES, PRECAUTIONS, AND WARNINGS in this VOM Instruction manual.

## NOTES

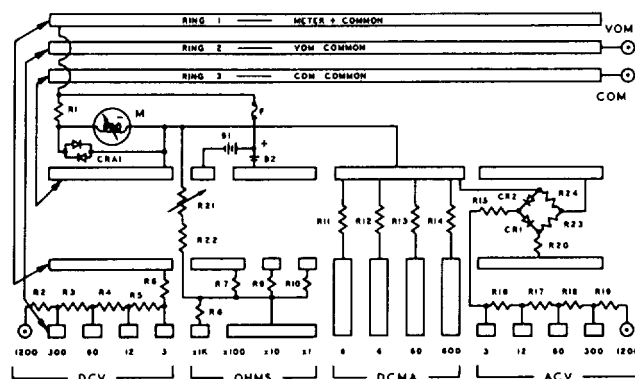
### COMPONENT LOCATION



### REPAIR OR SERVICE

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

## CIRCUIT DIAGRAM



### REPLACEABLE PARTS LIST MODEL 310 TYPE 5

Circuit Symbol	Part Number	Qty. Used	Description
M	52-8184	1	Instrument assembly, pivot & jewel 50 $\mu$ A
	10-3116	1	Front assembly
	41-5385	1	Base assembly
	20-718	1	Battery cover assembly
	46-32	1	Contact, battery 1.5V negative
	46-33	1	Contact, battery 15V negative
	46-89	1	Contact, battery positive
	24-776	1	Screw, battery contact retaining
B1	37-22	1	Battery 15 volt (NEDA 220)
B2	37-21	1	Battery 1 5 volt (NEDA 910-F or 910-M)
	87-405	1	P C Board with components
	87-250	1	P C. Board less components
R1	15-C-310	1	Resistor, (Value may vary from 2300 to 3250 $\Omega$ )
R2	15-2593	1	Resistor 18 Meg 1% 1 watt
R3	15-2436	1	Resistor 4 8 Meg 1% 1/2 watt
R4	15K-9603TB4	1	Resistor 960k $\Omega$ 1% 1/4 watt
R5, R8	15K-1803TA3	2	Resistor 180k $\Omega$ 1% 1/8 watt
R6, R7	15K-5502TA3	2	Resistor 55k $\Omega$ 1% 1/8 watt
R9	15K-2201TC5	1	Resistor 2 2k $\Omega$ 1% 1/2 watt
R10	15K-2000TA3	1	Resistor 200 $\Omega$ 1% 1/8 watt
R11	15K-4550TB4	1	Resistor 455 $\Omega$ 1% 1/4 watt

Circuit Symbol	Part Number	Qty. Used	Description
R12	15K-420FTB4	1	Resistor 42 $\Omega$ 1% 1/4 watt
R13	15-3496	1	Resistor 4.17 $\Omega$ 1% 3 watts
R14	15-3647	1	Resistor .414 $\Omega$ 1% 3 watts
R15	15-C-305	1	Resistor (Value may vary from 10.4k to 10.7k)
R16	15K-4502TA3	1	Resistor 45k $\Omega$ 1% 1/8 watt
R17	15K-2403TA3	1	Resistor 240k $\Omega$ 1% 1/8 watt
R18	15K-1204TB4	1	Resistor 1.2 Meg 1% 1/4 watt
R19	15-4986	1	Resistor 4.5 Meg 1% 1/2 watt
R20	15-C-304	1	Resistor (Value may vary from 2.4k to 2.9k)
R21	16-31	1	Resistor, Variable 20k $\Omega$
	65-815	1	Bracket, R21 retaining
	5168	2	Lockwasher, R21 to bracket
	27-83	2	Nut, R21 to bracket
	32-5C	1	Terminal, R21 to circuit
	2434-2-6	1	Screw, R21 bracket & terminal
	5168	1	Lockwasher, R21 bracket & terminal
R22	15K-1502TA3	1	Resistor 15k $\Omega$ 1% 1/8 watt
R23, R24	15K-5001TA3	2	Resistor 5k $\Omega$ 1% 1/8 watt
CR1, CR2	11056	2	Diode
CRA1	11670	1	Diode assembly
	79-153	1	Test leads, needle point
	79-296	1	Test leads, blunt point
	2250-70	1	Rectifier service kit
F	3207-37	1	Fuse, 1/16 Amp, 8 AG, MKB
	12478	1	Lever assembly
	12317	1	Battery cover latch repair kit
	3206-27	1	Handle, painted

## NOTES

## NOTES



## LIMITED WARRANTY

The Triplett Corporation warrants instruments and test equipment manufactured by it to be free from defective material or factory workmanship and agrees to repair or replace such products which, under normal use and service, disclose the defect to be the fault of our manufacturing, with no charge for parts and service. If we are unable to repair or replace the product, we will make a refund of the purchase price. Consult the Instruction Manual for instructions regarding the proper use and servicing of instruments and test equipment. Our obligation under this warranty is limited to repairing, replacing or making refund on any instrument or test equipment which proves to be defective within three years (one year guaranteed calibration) from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence or accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries and fuses, not of our manufacture used with this product are not covered by this warranty.

To register a claim under the provisions of this warranty, return the Instrument or test equipment to Triplett Corporation, Bluffton, Ohio 45817, transportation prepaid. Upon our inspection of the product, we will advise you as to the disposition of your claim.

**ALL WARRANTIES IMPLIED BY LAW ARE HEREBY LIMITED TO A PERIOD OF THREE YEARS, AND THE PROVISIONS OF THE WARRANTY ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED.**

The purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the product by the purchaser, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability Triplett Corporation may have, including incidental or consequential damages.

Some states (USA only) do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. No representative of Triplett Corporation or any other person is authorized to extend the liability of Triplett Corporation in connection with the sale of its products, beyond the terms hereof.

Triplett Corporation reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

**TRIPPLET CORPORATION  
Bluffton, Ohio 45817**

**84392 Rev. B**

APPENDIX A

REFERENCES

A-1. **Scope.** This appendix contains all forms, pamphlets and technical manuals referenced in both the Air mobile and Semitrailer mounted Laboratories.

A-2. **Forms.**

Recommended Changes to Publications .....	DA Form 2028
	DA Form 2028-2
Quality Deficiency Report.....	SF 368
Equipment Inspection and Maintenance Work Sheet.....	DA Form 2404
Hand Receipts.....	DA Form 2062

A-3. **Field Manuals.**

Petroleum Testing Facilities.	
Laboratories and Kits.....	FM 10-72
Inspecting and Testing Petroleum Products.....	FM 10-70
ASTM Test Method Supplement to.....	FM 10-92C1/C2

A-4 **Technical Manuals.**

Atlas-Copco Compressor.....	TM 10-4310-392-13&P
Alcor Jet Fuel Thermal Oxidation Tester Operating and Maintenance Manual .....	TM 10-6635-210-13&P
Bacharach Gas Alarm and Calibration Data .....	TM 10-6665-297-13&P
Brother Portable Typewriter.....	TM 10-7430-218-13&P
Chemtrix Field Ph Meter .....	TM 10-6630-237-13&P
Elkay Manufacturing 30 GPH Cooler .....	TM 10-4130-240-13&P
Emcee Micro-Separometer .....	TM 10-6640-222-13&P
Foxboro Pressure Recording Gauge .....	TM 10-6685-365-13&P
Gammon Aqua Glo Water Detector.....	TM 10-6640-221-13&P
Gammon Mini Monitor Fuel Sampling Kit .....	TM 10-6630-230-13&P
Jelrus Burn-Out Furnace .....	TM 10-6640-231-13&P
Koehler Cleveland Open Tester .....	TM 10-6630-236-13&P
Koehler Cloud and Pour Point Chamber .....	TM 10-6630-238-13&P
Koehler Copper Strip Corrosion Bomb Bath .....	TM 10-6640-220-13&P
Koehler Distillation Apparatus .....	TM 10-6630-233-13&P
Koehler Dropping Point Apparatus .....	TM 10-6635-211-13&P
Koehler Electric Pensky-Martins Tester .....	TM 10-6630-231-13&P
Koehler Foaming Characteristics Determination Apparatus .....	TM 10-6640-228-13&P
Koehler Kinematic Viscosity Bath.....	TM 10-6630-239-13&P
Koehler Tag Closed Cup Flash Tester.....	TM 10-6630-235-13&P
Lab-Line Explosion Proof Refrigerator .....	TM 10-6640-219-13&P
Lily Freezer .....	TM 10-6640-234-13&P
Millipore OM 39 Filter Holder .....	TM 10-6640-225-13&P
Millipore Vacuum Pump .....	TM 10-6640-217-13&P
Ohaus Harvard Trip Balance.....	TM 10-6670-278-13&P
Precision Gas-Oil Distillation Test Equipment .....	TM 10-6630-219-13&P
Precision General Purpose Water Bath.....	TM 10-6640-229-13&P

Precision High Temperature Bronze Block Gum Bath .....	TM 10-6630-234-13&P
Precision General Purpose Ovens.....	TM 10-6640-218-13&P
Precision Heater Instruction Manual and Parts List .....	TM 10-6640-223-13&P
Precision Oxidation Stability Bath .....	TM 10-6640-232-13&P
Precision Pensky-Martens Flash Testers.....	TM 10-6630-231-13&P
Precision Reid Vapor Pressure Bath.....	TM 10-6640-226-13&P
Precision Slo-Speed Stirrer .....	TM 10-6640-224-13&P
Precision Universal Centrifuge .....	TM 10-6640-230-13&P
Precision Universal Penetrometer .....	TM 10-6640-228-13&P
Sargent-Welch Vacuum Pump .....	TM 10-4310-391-13&P
Sartorius Analytical Balance.....	TM 10-6670-277-13&P
Scotsman Cuber .....	TM 10-6640-227-13&P
Soltec VOM-Multimeter.....	TM 10-6625-3127-13&P
Teel Self-Priming Centrifugal Pump.....	TM 10-6640-217-13&P
Teel Submersible Pump.....	TM 10-4320-320-13&P
Texas Instrument TI-503011 Calculator .....	TM 10-7420-210-13&P

**A-5. Pamphlets.**

The Army Maintenance Management System (TAMMS).....	DA Pam 738-750
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**A-6. Miscellaneous Publications.**

The Army Integrated Publishing and Printing Program .....	AR 25-30
Laboratory, Airmobile, Aviation Fuel .....	MIL-L-52733A(ME)
Apparatus, Instruments, Chemicals, Furniture, and Supplies for Industrial, Clinical, College and Government Laboratories .....	Fisher Scientific Laboratories Catalog
Petroleum-Petrochemical Testing Equipment.....	Precision Scientific Catalog

## APPENDIX B

## MAINTENANCE ALLOCATION CHART

## Section I. INTRODUCTION

B-1. **General.**

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the Identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental Instructions and explanatory notes for a particular maintenance function.

B-2. **Maintenance Functions.** Maintenance functions will be limited to and defined as follows.

a. Inspect. To determine the serviceability of an Item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an Item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e, to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of knob accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and Install the same Item when required to perform service or other maintenance functions Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

i. Repair. The application of maintenance services<sup>1</sup>, including fault location/troubleshooting,<sup>2</sup> removal/installation, and disassembly/assembly procedures<sup>3</sup> and maintenance actions,<sup>4</sup> to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

### B-3. Explanation Of Columns In The MAC, Section II.

a. Column 1. Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End Item group number shall be "00."

b. Column 2. Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3. Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2 (For a detailed explanation of these functions, see paragraph B-2).

d. Column 4. Maintenance Category. Column 4 specifies, by the listing of a work time Figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in column 3. This Figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time Figures will be shown for each category. The work time Figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows.

---

<sup>1</sup> Services - inspect, test, service, adjust, align, calibrate, and/or replace.

<sup>2</sup> Fault locate/troubleshoot- the process of investigating and detecting the cause of equipment malfunctioning, the act of isolating a fault within a system or unit under test (UUT).

<sup>3</sup> Disassemble/assemble - encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least commonality identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

<sup>4</sup> Actions - welding, grinding, riveting, straightening, facing, remachining, and/or resurfacing.

- C ..... Operator/Crew
- O ..... Unit Maintenance
- F ..... Direct Support Maintenance
- H ..... General Support Maintenance
- D ..... Depot Maintenance

e. Column 5. Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6. Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in section IV.

**B-4. Explanation Of Columns In Tool And Test Equipment Requirements, Section III.**

a. Column 1. Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, section II, column 5.

b. Column 2. Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3. Nomenclature. Name or identification of the tool or test equipment.

d. Column 4. National Stock Number. The National stock number of the tool or test equipment.

e. Column 5. Tool Number. The manufacturer's part number.

**B-5. Explanation Of Columns In Remarks, Section IV.**

a. Column 1. Reference Code. The code recorded in column 6, Section II.

b. Column 2. Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, section II.

**Section II. MAINTENANCE ALLOCATION CHART**

**NOT APPLICABLE**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	MULTIMETER	INSPECT REPLACE REPAIR	0.1	0.1		2.0		A	

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS**

**FOR**

**MAINTENANCE ALLOCATION CHART**

**NOT APPLICABLE**

**Section IV. REMARKS**

REFERENCE CODE	REMARKS
A	REPAIR OF THE INSTRUMENT NORMALLY REQUIRES ASSISTANCE OF COMMERCIAL DEALER OR SPECIALIZED REPAIR ACTIVITY.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

NOT APPLICABLE



**APPENDIX D**  
**ADDITIONAL AUTHORIZATION LIST**  
**NOT APPLICABLE**

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

NOT APPLICABLE

By Order of the Secretary of the Army:

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# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 decagram = 10 grams = .35 ounce  
 1 hectogram = 10 decagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

## Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
----	------------------------	----------------------------	---------------------	----



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