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TM 9-4925-226-10

D E P A R T M E N T O F T H E A R M Y T E C H N I C A L M A N U A L

OPERATOR'S MANUAL

TESTER, IGNITER CIRCUIT

(ALLEGANY INSTRUMENT COMPANY MODEL 101-5BF)
(MODEL 101-5BF)

(4925-712-0205)



H E A D Q U A R T E R S , D E P A R T M E N T O F T H E A R M Y

SEPTEMBER 1966

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *29 September 1966*

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Units org under fol TOE:
(2 cys each)
6-615
6-617
9-51
9-87
9-377
9-500 (FD)

NG: None

USAR: None.

For explanation of abbreviations used, see AR 320-50.

U. S. GOVERNMENT PRINTING OFFICE: 1966--254428/1467
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Operator's Manual
TESTER, IGNITER CIRCUIT
(ALLEGANY INSTRUMENT COMPANY
MODEL 101-5BF)
(4925-712-0205)

TM 9-4925-226-10, 29 September 1966, is changed as follows:
Page 4. Add the following paragraphs:

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Components of the End Item
Parts included with the end item and considered as components of the end item configuration are listed in the following table:

Table 1. Components of the End Item

Component	*Part No.*	*(FSCM)*	*Qty*
BATTERY, MERCURY:	RM12RT2	(90303)	1

Page 15. The appendix is superseded as follows:

APPENDIX
BASIC ISSUE ITEMS LIST
AND
ITEMS TROOP INSTALLED OR AUTHORIZED LIST

The basic issue items and items troop installed or authorized lists are not applicable.

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WECOM (10)
AVSCOM (2)
Ft Knox FLDMS (10)
BGDA (2)
MICOM (1)
LEAD (2)
USACOMZEUR (1)
USAFAS (2)
USACDCEC (10)
USAMMCS (5)
USASETAF (1)
USARJ (2)
USARYIS (2)
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6-615 (2)
6-617 (2)

NG: State AG (3)
USAR: None
For explanation of abbreviations used, see AR 310-50.

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A WORD ABOUT SAFETY.....

THE INSTRUMENT DESCRIBED IN THIS MANUAL IS A PRECISION DEVICE USED TO MEASURE THE RESISTANCE OF HAZARDOUS CIRCUITS.

SINCE THIS INSTRUMENT IS USED PRIMARILY FOR TESTING OF HAZARDOUS CIRCUITS, IT IS STRONGLY EMPHASIZED THAT SHOULD ANY REPAIRS BE NECESSARY, EXTREME CARE SHOULD BE EXERCIZED AND REPAIR OR ADJUSTMENT BE UNDERTAKEN ONLY BY QUALIFIED TECHNICIANS. ANY ALTERATION OR SUBSTITUTION WHATSOEVER OF THE WIRING OR COMPONENTS OF THIS INSTRUMENT MAY JEOPARDIZE THE SAFETY OF PERSONNEL AND PROPERTY.

SECTION I: GENERAL DESCRIPTION

1. Introduction:

The Model 101-5BF Igniter Circuit Tester is a stable, precision instrument designed primarily for the preflight testing of solid-fuel rocket-engine igniter bridge-wires for open or short-circuit conditions. Its use extends to the testing of various other detonators with low-resistance bridge-wire characteristics, such as explosive bolts. The tester insures the reliability of explosive bolts, which, for example, play a vital role when utilized to separate booster stages after rocket launching.

The tester is mounted in a compact weatherproof case and has a carrying handle which affords complete portability. The clip-on case cover is easily removed and all controls and terminals are convenient and accessible. The case is fitted with rubber pads so that the tester can sit in a horizontal or vertical position without damage to the case or the surface on which it is placed.

The basic circuit of this instrument is a modified version of the well-known Wheatstone Bridge. This time-tested circuit, the standard of instrumentation, assures the continued stability and reliability realized in the past.

Maximum accuracy of the tester can be realized if the firing leads to the igniter proper are isolated and their resistance measured. This permits an accurate calculation of the true resistance of the igniter.

2. Specifications:

RANGE:	0-30 ohms
(1) PHMS ADD Dial: (10-ohm increments)	0-20 ohms
(2) OHMS Dial: (Continuous)	0-10 ohms
ACCURACY:	
0-5 ohms:	± 0.02 ohm accuracy
5-30 ohms:	± 0.05 ohm accuracy
MAXIMUM CURRENT:	0.005 ampere
BATTERY LIFE:	one year
SIZE:	7-3/4"L. x 4-1/4”W. x 3-3/4"D. (overall size with cover and feet is 8-5/8”L. x 5-1/16”W. x 5-3/4"D.)
WEIGHT:	Four pounds

3. Inspection for Damages:

The tester is packed for the utmost protection against shock during shipment. Upon receipt of the tester, it should be removed from its shipping carton and inspected for any damages which may have been incurred during transportation.

Open the overpack container and remove the innerpack. Open the second carton, being careful not to damage the enclosed tester by the use of sharp tools, and remove it with the protective wrappings. The unit may now be taken from the polyethylene cover and tuflex wrapping for inspection. The shorting bar that has been placed across the binding posts to protect the galvanometer should not be disconnected at this time.

SECTION II: THEORY OF OPERATION

1. Functional Description:

The basic circuit of the Igniter circuit Tester is a modified 'Wheatstone Bridge as shown in Figure 1. The igniter circuit to be measured forms the unknown arm of the bridge, while resistors R-3, R-4, and R-5 form the balancing arm. Bridge arms R-1 and R-2 are in the ratio of one to ten; therefore, the igniter circuit is one-tenth the resistance value of that in the balancing arm when a balanced state of the Wheatstone Bridge has been effected. Front panel controls, OHMS and OHMS ADD, indicate the igniter circuit resistance value directly in ohms which is their cumulative value.

2. Circuit Description:

The schematic diagram (Figure 1) shows circuit details of the instrument. With an igniter circuit connected to the measuring arm of the bridge, J-1 and J-2, depressing switch S-1 applies excitation voltage from B-1 to the bridge input and places the galvanometer (M-1) across its output. Adjusting S-2 and R-3 for null voltage indication on the galvanometer balances the bridge and presents a front panel indication of the igniter circuit resistance on the OHM-S and OHMS ADD dials. Shunt resistor R-6 protects the galvanometer from damage by damping the coil when it is disconnected from the circuit. R-7 limits the bridge current and in turn the igniter current to 5 milliamperes.

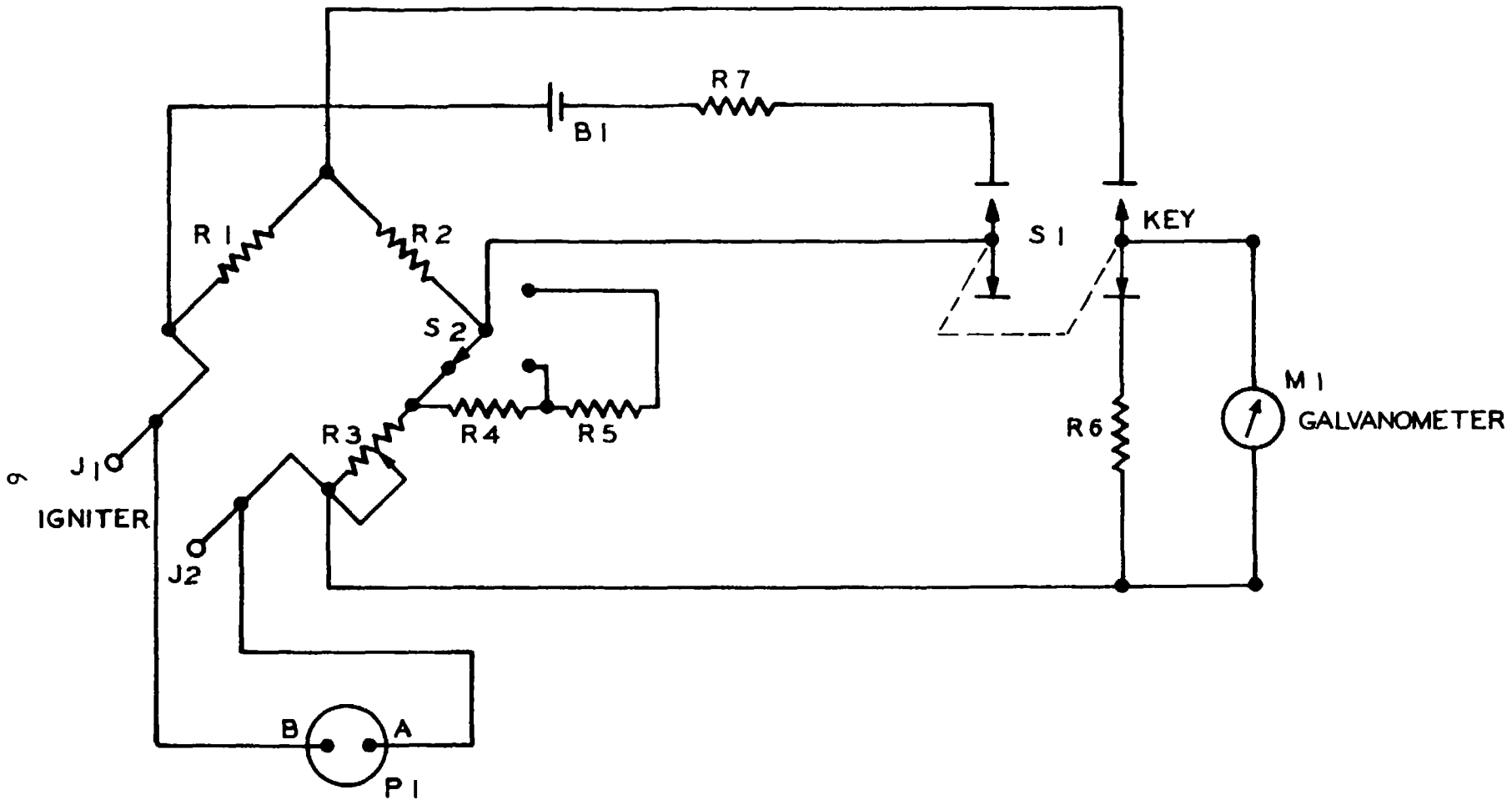

R7
B1
R1
R2
S1
KEY
S2
M1
GALVANOMETER
R3
R4
R5
R6
J1
IGNITER
J2
B
A
P1

FIG. 1

SECTION III: OPERATION

1. Front Panel Controls and Connections (Figure 2):

   a. Connections:

      (1) The only connections required for the operation of the igniter circuit tester is that of the igniter circuit to the binding posts labeled IGNITER CIRCUIT: Optional connection can be made to P-1, the two-pin AN connector on the end of the tester case. Igniter leads from this connector are terminated at the same points in the tester circuit as those from the binding posts.

   b. Controls:

      (1) MECHANICAL ZERO: Screwdriver adjustment on the galvo face for obtaining mechanical zero of the needle on the scale.

      (2) OHMS ADD: Rotary switch to change resistance measurements in 10-ohm increments to 20 ohms.

      (3) OHMS Ten-turn potentiometer with digital indication to change resistance measurements continuously from "0" to "10" ohms.

      (4) KEY: Pushbutton switch to engage self-contained battery and galvanometer for normal resistance measurements.

2. Operation:

      (1) Check the galvanometer for mechanical zero.

      (2) If the needle to the galvanometer does not rest on the center (zero graduation of the stale, rotate the zero adjustment located below the face of the meter in the appropriate direction to effect zero indication.

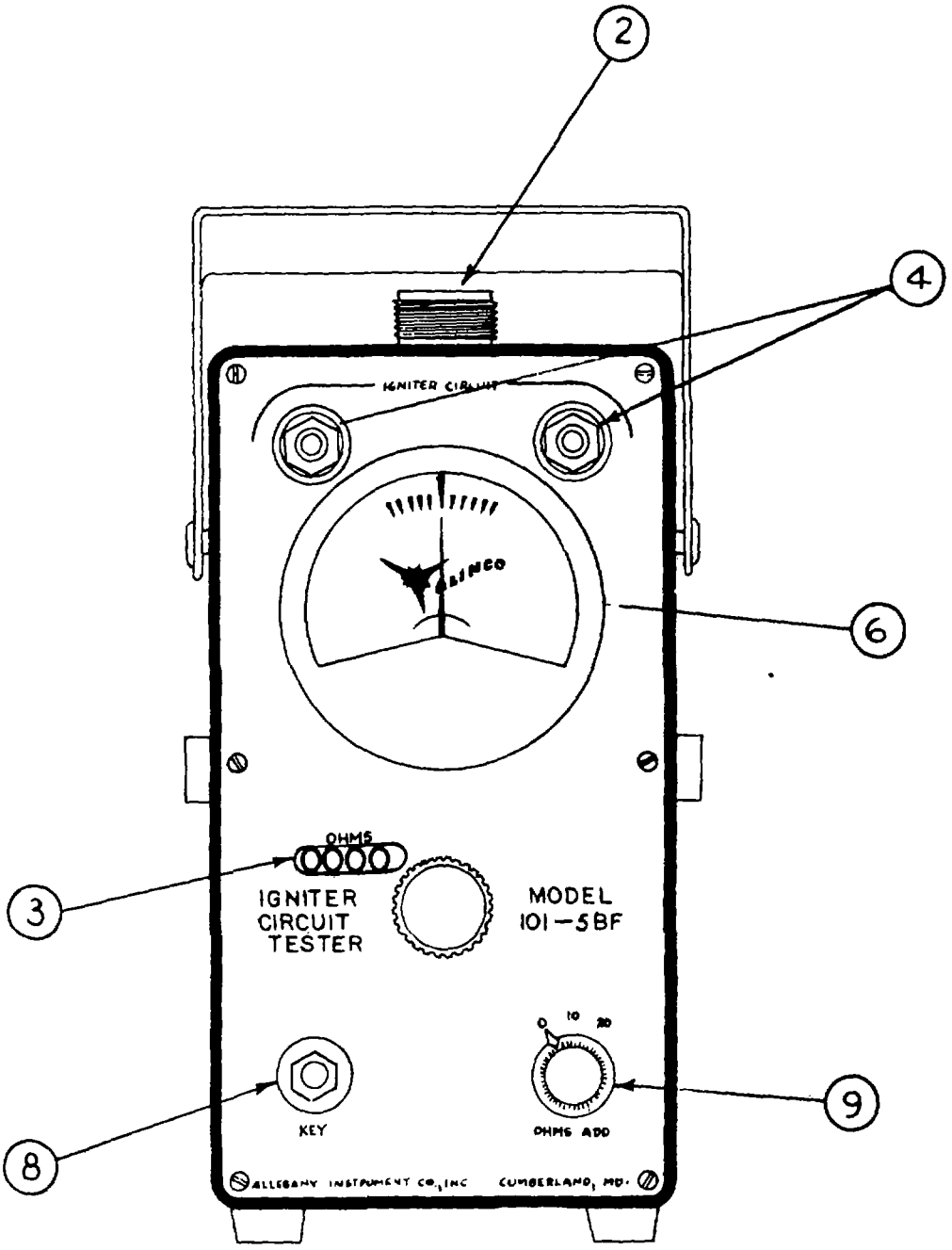

2
4
IGNITER CIRCUIT
6
OHMS
3
IGNITER
CIRCUIT
TESTER
MODEL
101-5BF
0
10
20
8
KEY
OHMS ADD
9
ALLEGANY INSTRUMENT CO., INC CUMBERLAND, MD.

FIGURE 2

(3) Remove the shorting bar from the input binding posts.

(4) Connect the igniter circuit lines to the input receptacle or binding posts of the tester.

(5) Set the cumulative OHMS dial and OHMS ADD control value for the igniter resistance expected.

(6) Depress the operating key and rotate the OHMS control unit, until the galvanometer needle indicates zero.

NOTE

If the needle deflects to the right, the resistance setting of the dials is too high and must be changed in the direction of lower resistance (counterclockwise). In turn, if the needle deflects to the left, the resistance setting of the dials should be increased (clockwise).

WARNING

(a) The galvanometer in this instrument like all others is an extremely sensitive unit and can be damaged if overloaded, as indicated, by violent deflection of the indicator in either direction. For example, an open circuit will cause violent deflection to the left. Therefore, initial attempts to effect a galvanometer balance should be made by momentarily depressing the operating key for short durations until a balanced condition has been approached.

(b) The life of the digital indicator will also be shortened if it is rotated at an excessive rate of speed in order to overcome extreme off-resistance conditions.

(7) The value of the resistance measured by the tester is indicated as the sum of the OHMS and OHMS ADD dials. For example, if the OHMS dial setting is 1.25 and the OHMS ADD dial setting is 10, then the resistance of the circuit measured is 10 + 1.25 or 11.25 ohms.

(8) The resistance of the squib or igniter grid proper is calculated by subtracting the igniter circuit line resistance from the value obtained in (7) above.

(9) The igniter circuit line resistance is readily determined by shortening the line at the igniter end and measuring its value with the tester as outlined in (4) through (7) above.

SECTION IV. MAINTENANCE

The Igniter Circuit Tester has been designed and constructed to be as rugged as is practical for a precision instrument. It will, there fore, provide maximum service for a long period of time if it receives the proper care that this type of equipment warrants.

The unit should be kept in a dry, dust-free location with its cover replaced when not in use. The binding posts should be cleaned periodically with a non-corrosive agent to ensure consistent measurements.

The illustrated parts utilized in Figures 2, 3, and 4, show the location of the basic parts utilized in the circuitry, but since the calibration of the tester is affected by the replacement of many components, except for replacement of the battery, field repairs are not recommended. If repairs do become necessary, refer the malfunction to the next higher category of maintenance.

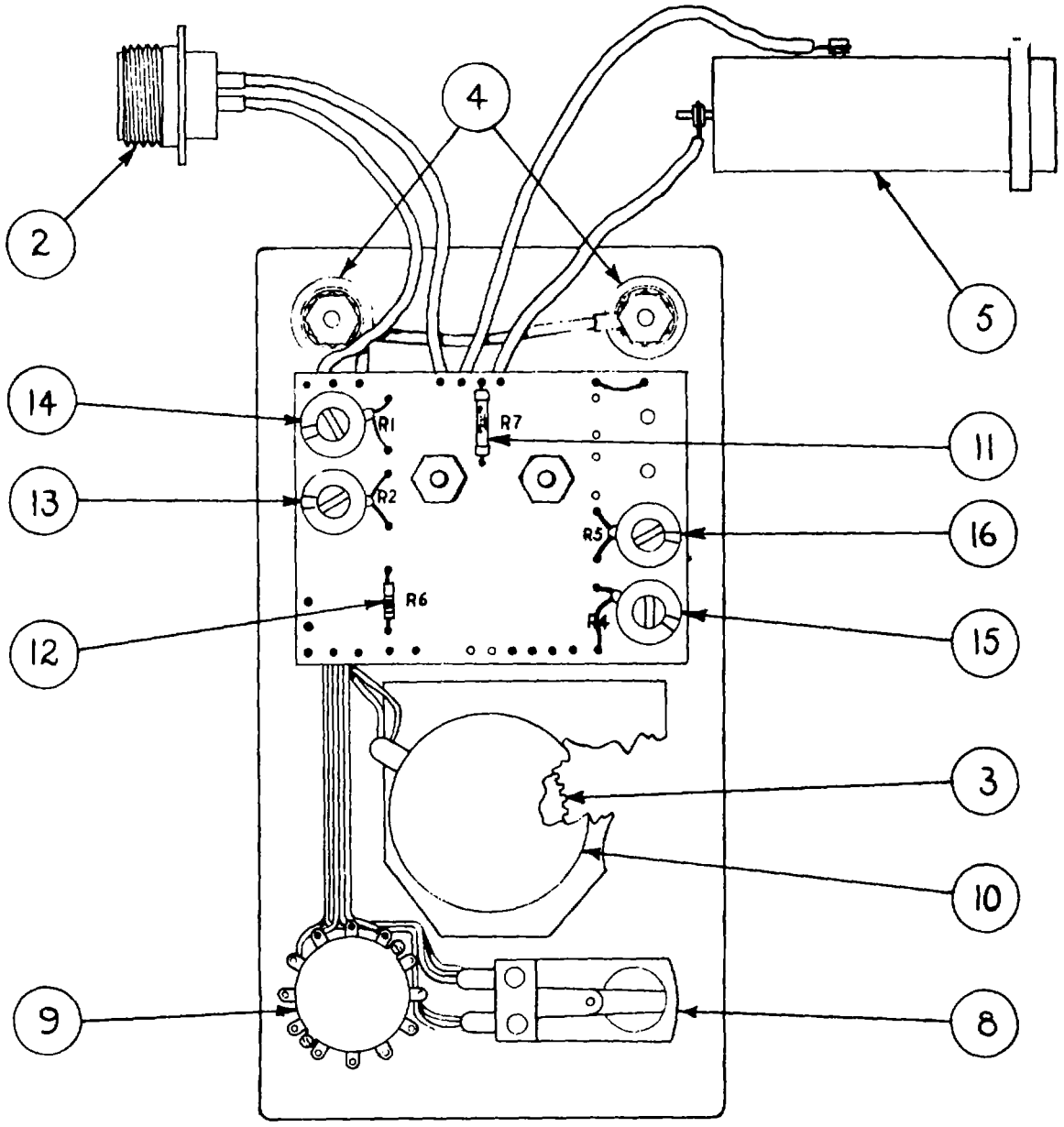


FIGURE 3

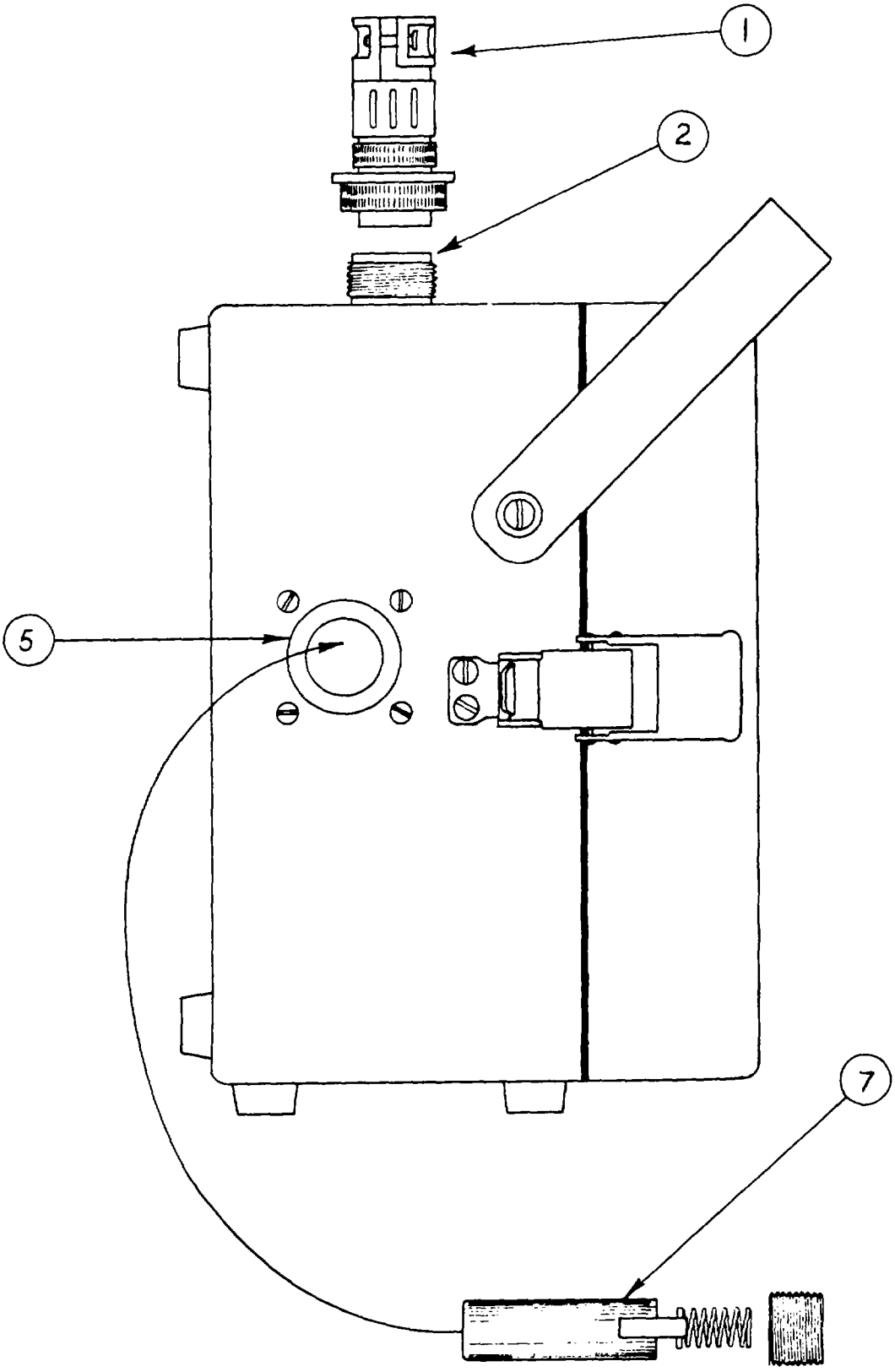


FIGURE 4

ILLUSTRATED PARTS IDENTIFICATION

(FIGURES 2, 3, and 4)

NUMBER		PART NUMBER
1	AN Cable Commentor	P2
2	AN Chassis Connector	P1
3	Digital Dial Assembly	1756
4	Input Binding Posts	J1 & J2
5	Battery Case Assembly	1899
6	Galvanometer	M1
7	Mercury Battery	B1
8	DPDT Pushbutton Switch	S1
9	1P 3 pos. Rotary Switch	S2
10	100-ohm Ten-turn Hilipot	R3
11	280-ohm Carbon Film Resistor	R7
12	470-ohm Carbon Resistor	R6
13	500-ohm Wire ground Resistor	R2
14	50-ohm Wire Around Resistor	R1
15	100-ohm Wire Wound Resistor	R4
16	100-ohm Wire Wound Resistor	R5

APPENDIX

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. General

This appendix is a list of basic issue items. It is composed of those items which make up the major end item of equipment and the operator's tools and equipment that are issued with the equipment and are required for stockage.

2. Explanation of Columns

a. Source, Maintenance, and Recoverability Code (Colm 1).

(1) *Materiel code (colm 1a*). This column is not required.

(2) *Source (colm 1b)*. This column indicates the selection status and source for the listed item. Source code used in this list is:

Code	*Explanation*
P-------	Applied to repair parts which are stocked in or supplied from the FSA/DSA, or Army supply system, and authorized for use at indicated maintenance category.

(3) *Maintenance level (colm 1c)*. This column indicates the category of maintenance authorized to install the listed item. Maintenance level code used in this list is:

Code	*Explanation*
C------	Operator and crew maintenance

(4) Recoverability (colm 1d). This column indicates whether unserviceable items should be returned for recovery or salvage. When no code is indicated, the item will be considered expendable. Recovery code used in this list is:

Code	*Explanation*
R------	Items which axe economically repairable at direct and general support maintenance activities and are normally furnished by supply on an exchange basis.

b. Federal Stock Number (Colm 2). Self explanatory.

c. Description (Colm 3). This column indicates the Federal item name (shown in capital letters) and any additional description required for supply operations. The manufacturer's code and part 'number are also included for reference.

Code	*Explanation*
72665	Mallory Battery Company
99719.	Allegany Instrument Co. Div. of Textron Electronics, Inc.

d. Unit of Issue (Colm 4), Quantity Authorized (Colm 5), and Illustrations (Colm 6). Self explanatory.

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Section II. BASIC ISSUE ITEMS

(1) Source, Maintenance, and Recoverability Code				(2)	(3)	(4)	(5)	(6) Illustration	
(a) Materiel-Code	(b) Source	(c) Maintenance level	(d) Recoverability ability	Federal stock No.	Description	Unit of issue	Quantity Incorporated in unit	(a) Figure Number	(b) Item Number
					MAJOR COMBINATION The major combination listed below is requisitioned for initial issue only.				
	---	---	R	4925-712-0205	TESTER, IGNITER CIRCUIT: (Allegany Instrument Company Model 101-5BF) (4925-112-0205).				
					COMPONENTS OF MAJOR COMBINATION: None authorized.				
					SPARE PARTS: None Authorized.				
					TOOLS AND EQUIPMENT FOR: TESTER, IGNITER CIRCUIT (99719: 101-5BF).				
	P	C	---	6135-725-3941	BATTERY, MERCURY: cylindrical, 1.35 v (72665:RM-12-RT2).	EA	1	4	7

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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 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 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			

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