

WAR DEPARTMENT TECHNICAL MANUAL

TM 11-1242

**CRYSTAL RECTIFIER
TEST SET TS-268/U**



WAR DEPARTMENT

7 JUNE 1945

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WAR DEPARTMENT,
WASHINGTON 25, D. C., 7 June 1945.

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(For explanation of symbols, see FM 21-6).

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DESTRUCTION NOTICE

WHY — To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

- HOW** —
- 1. Smash**—Use sledges, axes, handaxes, pickaxes, hammers, crow-bars, heavy tools.
 - 2. Cut** — Use axes, handaxes, machetes.
 - 3. Burn** — Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
 - 4. Explosives** — Use firearms, grenades, TNT.
 - 5. Disposal** — Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

- WHAT**—
- 1. Smash** — Meter, crystal rectifier socket, selector switch, adjusting control, resistors, battery receptacle.
 - 2. Cut** — All wiring, meter coil.
 - 3. Burn** — Technical manuals, schematics.
 - 4. Bend** — Panel, case.
 - 5. Bury or scatter** — All of the above material after destroying its usefulness.

DESTROY EVERYTHING



Figure 1. Crystal Rectifier Test Set TS-268/U.

PART ONE

INTRODUCTION

1. DESCRIPTION.

Crystal Rectifier Test Set TS-268/U (fig. 1) is designed to make speedy qualitative tests on specific types of high-frequency crystal rectifiers. The test set is completely self-contained in a waterproof aluminum case approximately 3 inches high by 6 inches wide by 7 inches deep (fig. 2). On the front panel of the instrument (fig. 3) are mounted a crystal socket, a circuit selector switch, a meter adjusting control, and a specially calibrated 0-1 direct-current (d-c) milliammeter. A grounding spring is incorporated in the crystal socket in order to prevent damage to the crystal while it is being inserted into the circuit of the test set.

a. The circuit selector switch selects the appropriate circuit for the particular test being made.

b. The control marked MTR ADJ in the lower right section of the instrument panel adjusts the meter pointer to the zero mark on the scale when the circuit selector switch is in either of the two MTR ADJ positions (fig. 3). The MTR ADJ control has a built-in automatic shut-off switch which is actuated when the case cover is closed. The operation of this switch opens the battery circuit, thereby eliminating the possibility of leaving the equipment turned on when it is not being used, with consequent drain on the battery.

c. Meter indications are obtained on six scales; namely, 0-10 kilohms for resistance measurements, 0-1 milliampere (ma) for current measurements, and four colored scales which indicate the condition of the crystal under test as GOOD or POOR.

d. The test set is powered by a 1.5-volt dry cell which is mounted on the rear of the instrument panel. The equipment is shipped complete with spare parts in one container, which occupies 162 cubic inches of space and weighs approximately 4 pounds.

2. APPLICATION.

Crystal Rectifier Test Set TS-268/U measures the forward and the backward resistance of the crystal under test in order to obtain a ratio which indicates quality. The condition of the crystal rectifier can also be determined by measuring the current flow through the crystal in the backward direction.



Figure 2. Crystal Rectifier Test Set TS-268/U, exterior view.

Indications are obtained either on the MA scale of the meter, or in the GOOD or POOR section of the colored scale corresponding to the specific crystal under test. GOOD and POOR areas are shown on the meter scale for the following type crystals:

<i>Least sensitive</i>	<i>Medium sensitive</i>	<i>Most sensitive</i>
1N21	—	—
1N21	1N21A	1N21B
1N23	1N21B	1N23B

3. INSTALLATION.

Crystal Rectifier Test Set TS-268/U is usually shipped ready for immediate use. In some instances, however, the 1.5-volt operating dry cell may not be installed in the instrument before shipment. To install the dry cell, proceed as follows:

a. Loosen the four mounting screws in the corner of the instrument panel and lift the panel from the case. All circuit parts are mounted on the rear of the panel. The battery-mounting receptacle is located to one side of the meter (fig. 4).

b. Release the holding clip on the battery receptacle and insert the battery in the receptacle with the positive pole facing toward the lower section of the

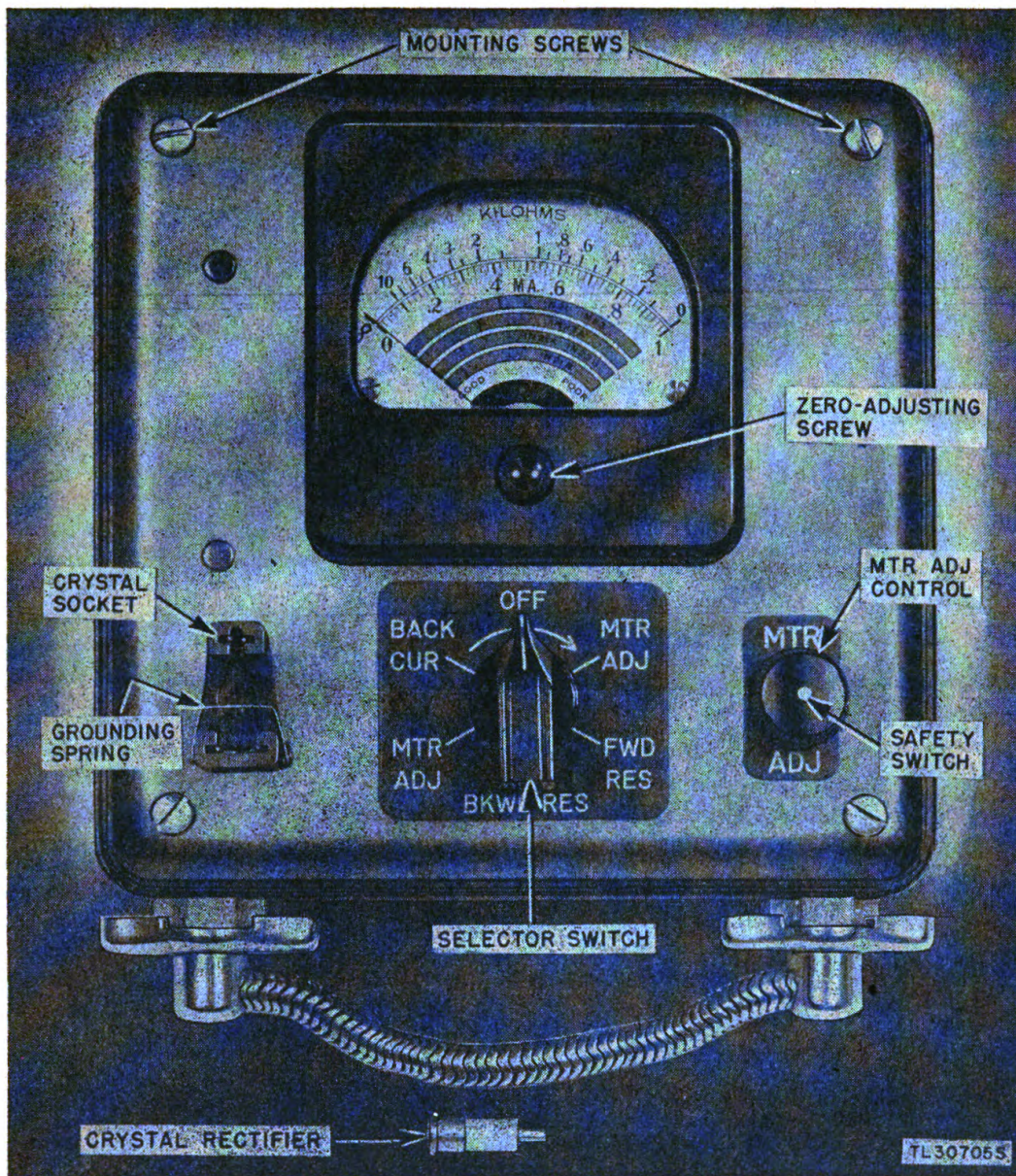


Figure 3. Front panel of test set.

panel. The positive polarity will usually be marked on the battery receptacle, but, in any event, install the battery as indicated in figure 4.

c. Fasten the holding clip firmly in place and return the instrument panel to the case.

4. INITIAL ADJUSTMENTS.

The only adjustment to be made on the test set before actual operation is to set the meter pointer to the zero mark on the **left** side of the scale. If the meter pointer does not come to rest at the zero mark, insert a small screwdriver into the zero-adjusting screw on the meter case and adjust the meter pointer to the mark. Only a slight adjustment should be necessary. Use care to avoid damage to the meter pointer.

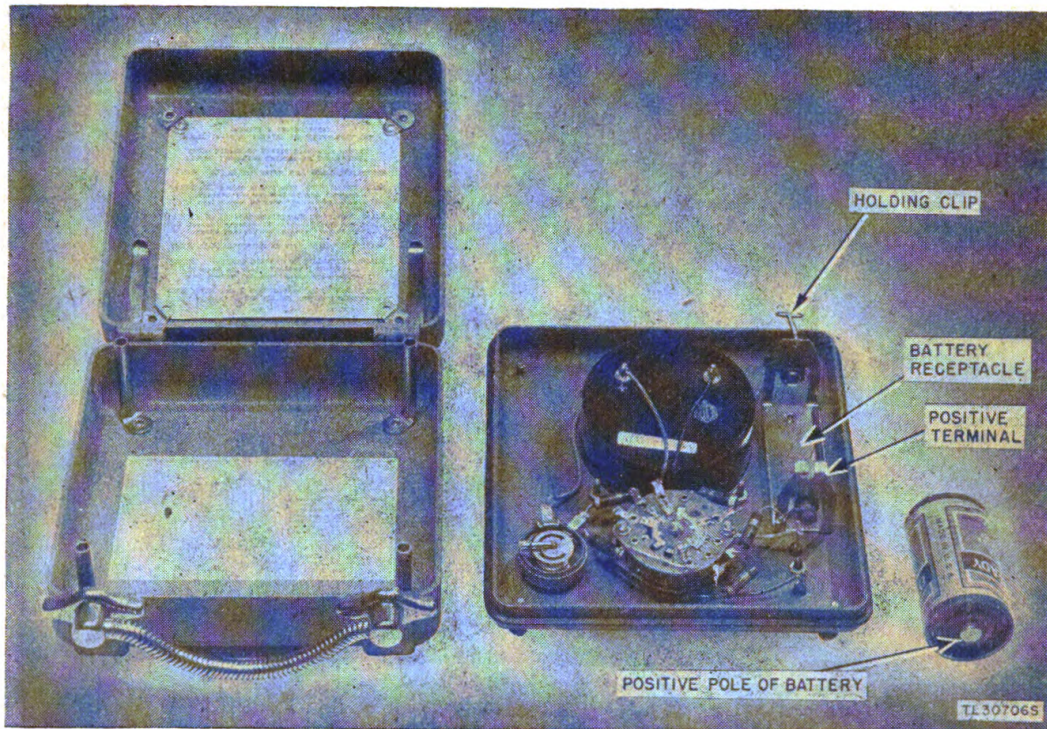


Figure 4. Details of battery installation.

PART TWO

OPERATING INSTRUCTIONS

5. INTRODUCTION.

The best test of any crystal is its performance in a radar system. However, valuable information of the performance of a crystal may be obtained by the use of Crystal Rectifier Test Set TS-268/U. The condition of the crystal is determined in two ways: by measurement of the front and back resistances and determination of the ratio, and by measurement of the current in the back direction. The resistances are measured on the meter directly in thousands of ohms. A ratio of 10 to 1 between the back and front resistances is the lowest desirable limit. If the ratio of any crystal (of which the operation in the radar set is considered doubtful) should fall below this ratio, the crystal should be replaced. A crystal with a front resistance greater than 500 ohms should also be replaced. The back current of the crystal is read in milliamperes on the meter, and the tolerances for different types of crystals are also indicated on the meter. The crystal should be replaced if the meter needle falls in the POOR section of the meter scale. While the meter gives reliable indications of the condition of the crystal, it must be remembered that these measurement are not taken under operating conditions; hence the meter indication is not infallible. **The final test of a crystal is its operation in the radar set.**

6. PREPARATION FOR TESTING.

CAUTION: Keep the crystal rectifiers in a metal box or wrapped in metal foil when not in use in order to avoid damage to them. Before inserting a crystal rectifier into the test set socket, hold the crystal rectifier by the body and touch one finger to the grounding spring on the socket to discharge any electrostatic charges that may be present.

Before making an actual test on a crystal rectifier, operating personnel should become familiar with certain properties and characteristics of crystal rectifiers; some of them are outlined below. For a detailed description of crystal rectifiers, refer to TB SIG 162, Crystal Rectifiers, General Information.

a. A crystal rectifier usually consists of a small piece of silicon in contact with a thin tungsten wire (called "catwhisker") both mounted in a small cartridge-like container (fig. 3). Rectification, which occurs at the contact point between the crystal and the catwhisker, takes place because the resist-

ance in one direction is greater than that in the other direction. The rectifying properties of the crystal rectifier depend upon the type of contact between the crystal and the catwhisker; that is, upon the pressure, the contact area, and the point of contact. **This contact has been carefully adjusted at the factory and should not be disturbed by tampering with the setscrew in the end of the cartridge.**

b. The area of contact is very small, and, if too much power is passed through the crystal rectifier, the resulting heat will damage the rectifier or even burn it out completely. The crystal rectifier may be damaged by a static discharge through it. If the operator holds one end and touches the equipment with the other end of a crystal rectifier, any static charges on the body of the operator will discharge through the crystal rectifier. A crystal rectifier may also be damaged merely by being exposed to a strong radio-frequency (r-f) field. Therefore, the caution at the beginning of this paragraph must be observed carefully.

c. The following chart of testing limits has been compiled on a comparison basis in carefully controlled laboratory tests of a large number of crystal rectifiers.

Crystal rectifier types	Resistance ratio (minimum)	Back current in ma (maximum)
1N21	10 to 1	0.40
1N21A	10 to 1	0.175
1N21B	10 to 1	0.125
1N23	10 to 1	0.40
1N23A	10 to 1	0.30
1N23B	10 to 1	0.175

d. The limits listed in the chart in subparagraph c, particularly with regard to back current, have been determined for crystal rectifiers that were tested at an ambient temperature of 22° C (71° F). Since the d-c characteristics of crystal rectifiers vary somewhat with temperature changes, the following chart is included in order that a more accurate test may be made where necessary. The chart shows the back current in milliamperes at a potential of 1 volt.

Crystal rectifier types	Back current in ma			
	-15° C	0° C	+22° C	+50° C
1N21	0.32	0.35	0.40	0.50
1N21A	0.144	0.152	0.175	0.22
1N23	0.32	0.35	0.40	0.50
1N23A	0.24	0.26	0.30	0.375
1N23B	0.144	0.152	0.175	0.22

e. When a test is to be made on a crystal rectifier, place the test set well away from any r-f field. Use care when inserting the crystal rectifier

into the test set socket to avoid damage from electrostatic charges. The correct method of inserting the crystal rectifier into the socket is as follows:

- (1) Turn the circuit selector switch to the OFF position.
- (2) Hold the crystal rectifier by the body and touch a finger to the grounding spring on the socket.
- (3) Insert the crystal rectifier into the socket on the test set.

7. OPERATION.

To test a crystal rectifier of normal polarity (see par. 8 for crystals of reverse polarity), rotate the circuit selector switch **clockwise** to the positions shown on the instrument panel (fig. 3). The indications are obtained on the meter. Follow the step-by-step procedure outlined below:

a. Adjust Meter. Turn the circuit selector switch clockwise one step from the OFF position to the MTR ADJ position. Adjust the MTR ADJ control to give full-scale deflection of the meter pointer.

b. Forward Resistance. Turn the selector switch to the FWD RES position and read the forward resistance of the crystal rectifier in kilohms on the upper scale of the meter. The forward resistance should not be greater than 0.5 kilohm (500) for a good crystal rectifier.

c. Backward Resistance. Turn the selector switch to the BKWD RES position and read the backward resistance in kilohms on the upper scale of the meter. For a good crystal rectifier, the ratio of the backward resistance to the forward resistance is greater than 10 to 1.

d. Adjust Meter. Turn the selector switch clockwise to the next MTR ADJ position and adjust the MTR ADJ control to give full-scale deflection of the meter pointer.

NOTE: There are two positions marked MTR ADJ on the instrument panel. The adjustment in this subparagraph refers to the second MTR ADJ position as the selector switch is rotated in the clockwise direction.

e. Back Current. Turn the selector switch to the BACK CUR position and read the current value on the MA scale of the meter. A defective crystal rectifier is indicated if a reading is obtained in the POOR (red) portion of the colored scale corresponding to the type of crystal rectifier being tested.

CAUTION: When returning the crystal rectifier to the radio equipment, hold the crystal by the body and touch a finger to the chassis before placing the crystal in its socket.

8. TESTING CRYSTAL RECTIFIERS OF REVERSE POLARITY.

Crystal rectifiers of reverse polarity (British types) can be tested on Crystal Rectifier Test Set TS-268/U in the following manner:

a. Backward Resistance. Follow the procedure outlined in paragraph **7a** and **b**. However, with the selector switch in the FWD RES position, the reading indicated on the meter represents the **backward** resistance of the crystal rectifier.

b. Forward Resistance. Follow the procedure outlined in paragraph **7a**, **b**, and **c**. With the selector switch in the BKWD RES position, the reading indicated on the meter represents the **forward** resistance of the crystal rectifier. The basis for rejection of crystal rectifiers is the same as described in paragraph **7b** and **c**.

c. Back Current. Rotate the selector switch to the BACK CUR position and adjust the MTR ADJ control to give full-scale deflection of the meter pointer. Turn the selector switch **counterclockwise one step** to the position marked MTR ADJ. Read the back current value on the MA scale of the meter. A defective crystal rectifier is indicated if a reading is obtained in the POOR (red) portion of the colored scale corresponding to the type of crystal rectifier being tested.

NOTE: Definite limits have not been established for crystal rectifiers of reverse polarity. However, good results may be obtained by comparison with the test limits of corresponding crystal rectifiers of the American types.

PART THREE

PREVENTIVE MAINTENANCE

9. INTRODUCTION.

Preventive maintenance on Crystal Rectifier Test Set TS-268/U is limited to routine inspection with subsequent tightening of loose parts and cleaning of the instrument. Lubrication is not required on this test set. All operations are considered first echelon maintenance and the recommended time interval for performing them is monthly.

10. MAINTENANCE PROCEDURE.

a. Before preventive maintenance can be performed on the under side of the instrument panel, it is necessary to remove the panel from the instrument case. To do this, remove the four mounting screws from the corners of the panel and lift the panel from the case. Use care to avoid damaging connections or parts. Place the panel in such a position that the under side is accessible for maintenance work.

b. Thoroughly inspect the front and under side of the instrument panel. Look for loose or broken connections and loose mounting screws and terminals. Inspect the wiring for frayed or worn insulation. Inspect the meter, selector switch, meter adjust control and safety switch, crystal rectifier socket, battery receptacle, and control knobs. Check the condition of the rubber gasket to insure a watertight seal. Inspect the interior and exterior of the metal case.

c. Tighten all loose mountings, connections, and terminals. Do not tighten the mounting screws excessively when fastening the panel to the case.

d. Remove all dirt, dust, and other foreign matter from the under side of the instrument. Thoroughly clean the meter and the front of the panel with a cloth moistened with dry-cleaning solvent. After using the solvent, wipe the front of the panel and the meter face with a dry clean cloth. Clean the interior and exterior of the metal case and remove any signs of corrosion with crocus cloth.

e. When the meter pointer requires zero adjustment, follow the procedure outlined in paragraph 4.

11. MOISTUREPROOFING AND FUNGIPROOFING.

a. General.

(1) Excessive failure of parts and loss of operating efficiency are usually caused, not by inferior parts or equipment, but by the accumulated effects of moisture in high-humidity areas. Rapid temperature changes coupled with conditions of fog, rain and dew or high humidity promote such failures.

(2) The effects of moisture (and fungus growth) on resistors, capacitors, coils, chokes, transformer windings, terminal boards, and insulating strips can be recognized in the form of corrosion, low insulation resistance, and flash-overs.

b. Treatment to Reduce Failures.

(1) To reduce the above failures, a moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. The treatment consists of applying a film of moisture- and fungi-resistant varnish to all susceptible parts of the equipment. This film provides a nonwetting surface which forms a moisture barrier. Fungus growth is prevented by a fungicide in the varnish. Equipments which have been so treated are marked "MFP" and dated. Equipments not so marked should be examined and if it is obvious that the treatment has not been applied, the equipment should be returned at the first opportunity to third or higher echelon maintenance units for treatment.

(2) Re-treatment may be required after a period of use. The need for this re-treatment will be indicated by excessive failures or the effects outlined above (par. 11a(2)).

c. Moistureproofing and Fungiproofing Procedure. For a detailed description of the varnish-spray method of moistureproofing and fungiproofing, refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment. TB SIG 13 with Changes, together with the following information, gives the necessary procedure for treating the equipment.

CAUTION: Remove the meter and the battery from the test set before treating Crystal Rectifier Test Set TS-268/U.

d. Moistureproofing and Fungiproofing After Repairs. If, during repair, the coating of protective varnish has been punctured or broken, and if complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

PART FOUR
AUXILIARY EQUIPMENT

(Not Used)

PART FIVE

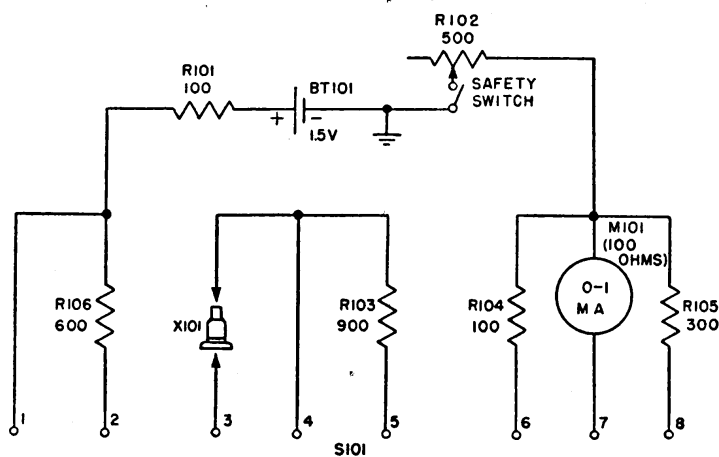
REPAIR INSTRUCTIONS

NOTE: Failure or unsatisfactory performance of equipment used by the Army Ground Forces and Army Service Forces will be reported on W.D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report) (fig. 12); by Army Air Forces, on Army Air Forces Form No. 54 (Unsatisfactory Report).

12. THEORY OF CRYSTAL RECTIFIER TEST SET TS-268/U.

a. General. Crystal Rectifier Test Set TS-268/U provides a means of testing crystal rectifiers in the field quickly and with sufficient accuracy to determine whether or not they are satisfactory for use. The testing is accomplished by measurement of the forward and backward resistance and the measurement of the back current at a potential of 1 volt. The crystal rectifiers may be accepted or rejected on the basis of the values obtained, in accordance with the allowable limits as stated in paragraph 7.

b. Circuit Details (fig. 5). The circuit of the test set actually consists of several individual circuits which may be interconnected, to perform the desired functions, by operation of a multi-contact rotary selector switch (S101). Each position of this switch selects a different combination of terminal connections; the various positions are described in the following subparagraphs. In operation, the switch is rotated one step at a time in a clockwise direction beginning with the OFF position.



S101 SWITCH CONNECTIONS

POSITION	CONNECTIONS		
OFF	1-2	3-8	4-7
1 MTR. ADJ. (FOR FWD. AND BKWD RES.)	2-3-4-5-7-8		
2 FWD. RES.	2-3	4-7-8	
3 BKWD. RES.	2-4	3-7-8	
4 MTR. ADJ. (FOR BACK CUR.)	1-2-4	3-6	5-7
5 BACK CUR.	1-2-4	3-7	5-6

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Figure 5. Crystal Rectifier Test Set TS-268/U, schematic diagram.

(1) *OFF Position.* When the selector switch is turned to OFF, the battery circuit is open and no current will flow in any part of the circuit.

(2) *MTR ADJ Position (fig. 6).* With the selector switch in this position (first step), battery BT101, current-limiting resistors R101 and R106, meter M-101, and current-adjusting resistor R102 (MTR ADJ control) are all connected in series to form a complete circuit. This circuit is used to adjust the meter pointer to full-scale deflection before resistance measurements are made on crystal rectifiers. The adjustment is made by means of resistor R102 until sufficient current flows in the circuit to give full-scale deflection of the meter pointer. The meter is shunted with resistor R105 to provide the correct sensitivity for the resistance range.

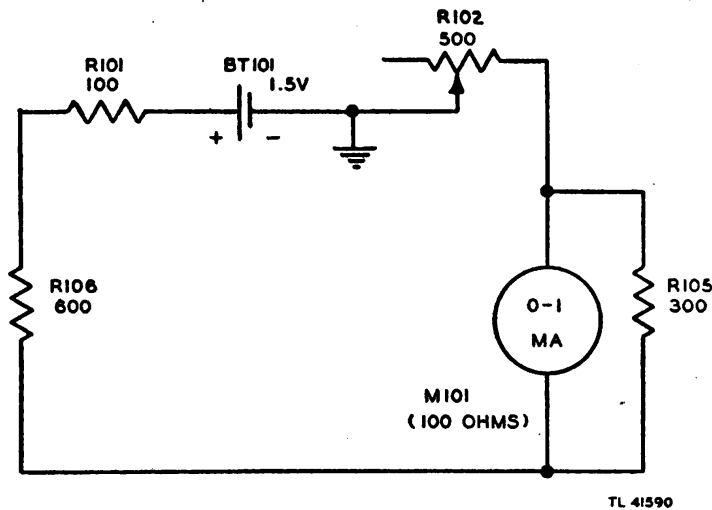


Figure 6. Meter-adjusting circuit for resistance measurements, simplified schematic diagram.

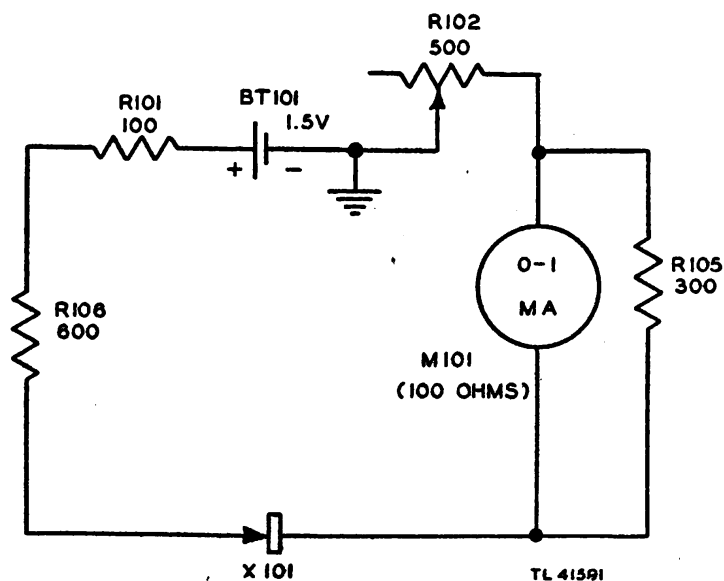


Figure 7. Circuit for forward resistance measurements, simplified schematic diagram.

(3) *FWD RES Position (fig. 7)*. When the selector switch is rotated to this position, the crystal rectifier under test is inserted into the series circuit described in subparagraph (2) above. The additional resistance introduced into the circuit by the crystal rectifier causes a decrease in the current flow, and the meter pointer will indicate at some point on the scale other than the full-scale mark. Since the upper scale of the meter is calibrated to express resistance in terms of the current flowing through the meter coil, the forward resistance of the crystal rectifier (in kilohms) is read directly from this scale.

(4) *BKWD RES Position (fig. 8)*. With the selector switch in this position, the same connections are made as in subparagraph (3) above except that the connections to the crystal rectifier are reversed. The subsequent reading obtained on the meter then represents the backward resistance of the crystal rectifier.

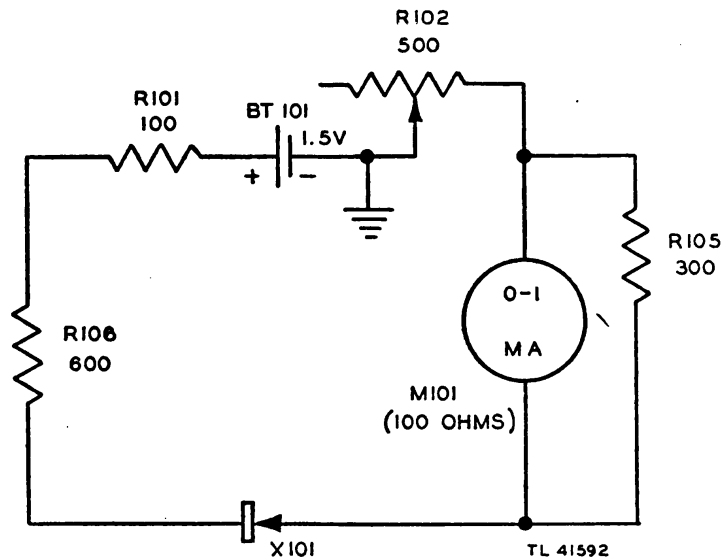


Figure 8. Circuit for backward resistance measurements, simplified schematic diagram.

(5) *MTR ADJ Position (fig. 9)*. When the selector switch is in this position, battery BT101, fixed resistor R101, and variable resistor R102 are connected in series with a two-branch parallel circuit consisting of the crystal rectifier and resistor R104 (100 ohms) in one branch, and meter M101 (100 ohms) and resistor R103 (900 ohms) in the other branch. The connections to the crystal rectifier are such that the backward resistance of the crystal is in the circuit. Since the backward resistance of a crystal rectifier is quite high, the effective resistance of the parallel circuit is essentially that of the branch containing the meter and resistor R103, or 1,000 ohms. This circuit is used to adjust the meter pointer to full-scale deflection before measuring the current in the reverse direction through the crystal rectifier. Since the sensitivity of the meter is 1 milliampere, adjustment of resistor R102 to give full-scale deflection of the meter pointer causes a potential of

1 volt to be applied across the parallel circuit. (Note that this is the second MTR ADJ position as the selector switch is rotated in the clockwise direction.)

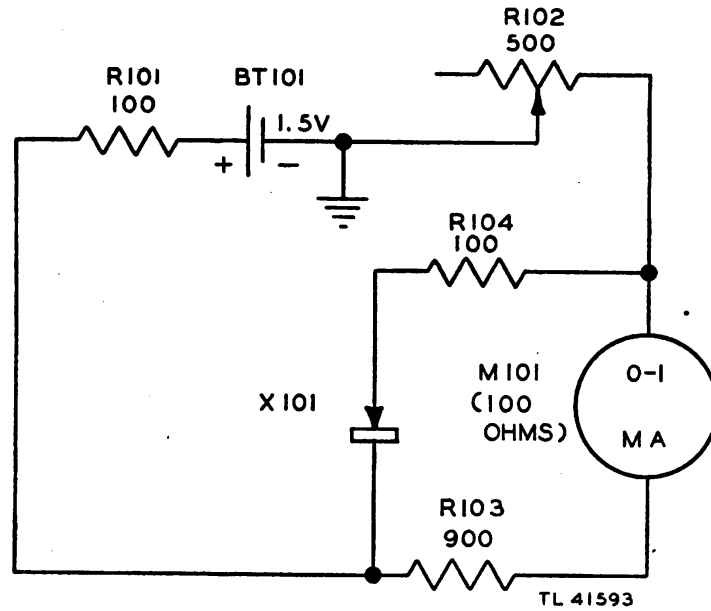


Figure 9. Meter-adjusting circuit for back current measurements, simplified schematic diagram.

(6) BACK CUR Position (fig. 10). When the selector switch is rotated to this position, the circuit selected is the same as in subparagraph

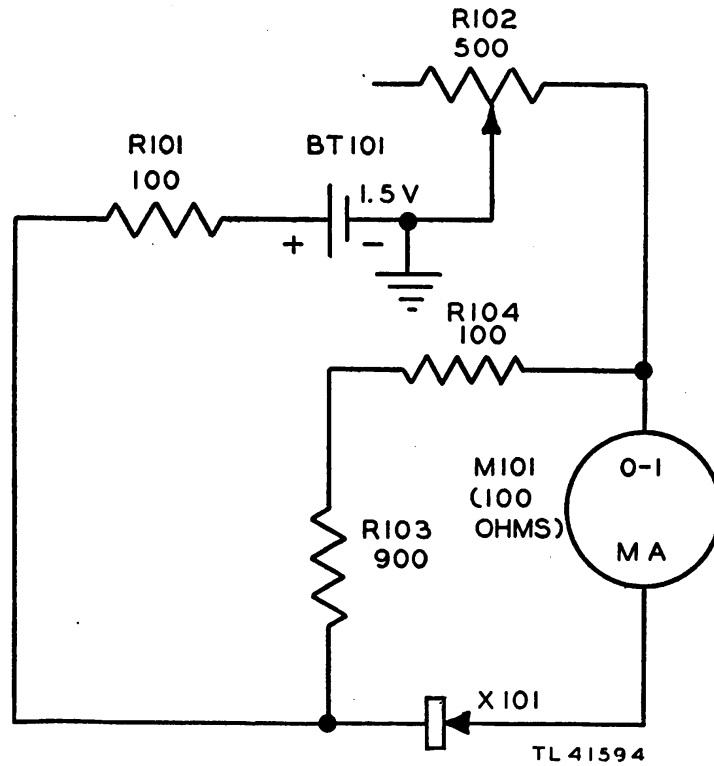


Figure 10. Circuit for back current measurements, simplified schematic diagram.

(5) above except that the positions of the crystal rectifier and resistor R103 are reversed in the parallel circuit. The crystal rectifier is now connected in series with the meter and, with 1 volt impressed across this circuit as described in subparagraph (5) above, the meter pointer will indicate the current flowing through the crystal rectifier in the backward direction. The magnitude of this current, which is read on the MA scale of the meter, will be inversely proportional to the backward resistance of the crystal rectifier.

13. TROUBLE-SHOOTING PROCEDURES.

a. General.

(1) Replace the 1.5-volt battery BT101 when the meter pointer cannot be adjusted to full-scale deflection with the selector switch in the second MTR ADJ position. Remove the instrument panel and replace the battery as described in paragraph 3.

(2) Replace the crystal rectifier socket when the contact springs no longer provide satisfactory contact with the crystal rectifier inserted in the socket. To remove the socket, disconnect the wires from the terminals and then remove the flathead mounting screw, nut, and lockwasher that mount the socket assembly on the panel.



Figure 11. Rear view of panel showing location of parts.

(3) If the meter becomes defective and an exact replacement is not at hand, it may be replaced with a standard 3½-inch AWS (American War Standard) unit if the resistance of the meter is 100 ohms or less. When the resistance of the meter is less than 100 ohms, a suitable resistor must be connected in series with the meter to bring the total resistance to 100 ohms.

(4) Figure 11 is an interior view of the instrument showing the location of all the parts mounted on the rear of the panel.

b. Trouble-shooting chart. In trouble shooting the test set with the aid of the following chart, rotate the selector switch progressively in a clockwise direction until the symptom of the defect is indicated. Insert a good crystal rectifier into the socket in order to provide circuit continuity for the various positions of the selector switch.

Symptom	Probable causes of trouble
1. MTR ADJ position. Meter pointer does not indicate or cannot be adjusted to full-scale deflection.	1. Weak battery. Defective safety switch or faulty contacts on selector switch. Check all parts in this circuit (fig. 6) for an open circuit.
2. FWD RES and BKWD RES positions. No indication obtained on meter.	2. Defective socket assembly or faulty contacts on selector switch.
3. Second MTR ADJ position. No indication obtained on meter.	3. Defective resistor R103. Faulty contacts on selector switch.
4. BACK CUR position. No indication obtained on meter.	4. Faulty contacts on selector switch.

14. SERVICING AND REPAIRS.

Use care in maintaining and servicing this equipment. All service and repair work should be performed only by competent personnel supplied with adequate tools and servicing instruments. Removal and replacement of defective parts in this equipment must be done carefully in order to avoid further damage to the equipment. An inexperienced operator attempting to locate and repair troubles may damage the equipment to such an extent that shipment to a higher repair echelon will be necessary.

a. Identification of Leads. In order to insure proper reinstallation, make a record of the connections to each removed element and of the position of the element in the equipment.

b. Electrical Connections. When replacing leads, clip them as short as conveniently possible for satisfactory connection and avoid using more solder

than necessary to make a secure connection. A very slight amount of excess solder dropped accidentally inside the equipment may short other circuits or parts. Use care when soldering and do not heat the lug or connection more than is absolutely necessary. Save time and trouble by making a thorough electrical check of any part that appears defective **before** removing it from the circuit.

NOTE: When replacing mechanical parts in the equipment, mount them securely but do not overtighten any mounting screws and nuts.

15. UNSATISFACTORY EQUIPMENT REPORT.

a. When trouble in equipment used by Army Ground Forces or Army

WAR DEPARTMENT UNSATISFACTORY EQUIPMENT REPORT										
FOR	TECHNICAL SERVICE <i>Signal Corps</i>	MATERIEL	DATE <i>15 April 1945</i>							
FROM	ORGANIZATION <i>885 Signal Repair Co</i>	STATION <i>APD 258, New York</i>					TECHNICAL SERVICE			
TO	NEXT SUPERIOR HEADQUARTERS <i>Signal Officer</i>	STATION <i>Army</i>			COMPLETE MAJOR ITEM					
NOMENCLATURE <i>Crystal Rectifier Test Set TS-268/U</i>		TYPE			MODEL					
MANUFACTURER <i>R. F. Labs. Inc.</i>		U. S. A. REG. NO. <i>Order No. 2333-MPD-45</i>		SERIAL NO. <i>68</i>		DATE RECEIVED <i>20 Feb 1945</i>				
EQUIPMENT WITH WHICH USED (If applicable)										
DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE										
PART NO. <i>R102</i>	TYPE <i>Wire wound</i>	MANUFACTURER <i>P. R. Mallory</i>			DATE INSTALLED <i>3 Mar 1945</i>					
DESCRIPTION OF FAILURE AND PROBABLE CAUSE (If additional space is required, use back of form) <i>Resistance element open. Movable arm caused excessive wear.</i>										
DATE OF INITIAL TROUBLE <i>10 Apr 1945</i>		TOTAL TIME INSTALLED			TOTAL PERIOD OF OPERATION BEFORE FAILURE					
		YEARS	MONTHS	DAYS	YEARS	MONTHS	DAYS	HOURS	MILES	ROUNDS
			<i>1</i>	<i>7</i>			<i>28</i>	<i>4</i>		
BRIEF DESCRIPTION OF UNUSUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN										
TRAINING OR SKILL OF USING PERSONNEL			RECOMMENDATIONS (If additional space is required, use back of form)							
POOR	FAIR	GOOD	<i>X</i> <i>Element should be made of more durable wire.</i>							
ORIGINATING OFFICER										
TYPED NAME, GRADE, AND ORGANIZATION <i>JOHN S. OSBORNE, CAPT, SIG C 885 SIG REPAIR CO</i>					SIGNATURE <i>John Osborne</i>					
FIRST ENDORSEMENT										
TO CHIEF	TECHNICAL SERVICE				OFFICE					
NAME, GRADE, AND STATION					STATION		DATE			
Instructions										
<ol style="list-style-type: none"> 1. It is imperative that the chief of technical service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in matériel. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data. 2. This form will be used for reporting manufacturing, design, or operational defects in matériel, petroleum fuels, lubricants, and preserving materials with a view to improving and correcting such defects, and for use in recommending modifications of matériel. 3. This form will not be used for reporting failures, isolated material defects or malfunctions of matériel resulting from fair-wear-and-tear or accidental damage nor for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operational or performance records. 4. Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR 780-10 (change No. 3). 5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches, or other illustrative material are highly desirable. 6. When cases arise where it is necessary to communicate with a chief of service in order to assure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means. 7. This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service; one copy will be forwarded through command channels. 8. Necessity for using this form will be determined by the using or service troops. 										

W. D., A. G. O. Form No. 468
20 August 1944

This form supersedes W. D., A. G. O. Form No. 468, 1 December 1943, which may be used until existing stocks are exhausted.
TL30708-S

U. S. GOVERNMENT PRINTING OFFICE 16-41546-1

Figure 12. Sample Unsatisfactory Equipment Report.

Service Forces occurs more often than repair personnel feel is normal, War Department Unsatisfactory Equipment Report, W.D., A.G.O. Form No. 468 (fig. 12), should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, Army Air Forces Form No. 54 should be filled out and forwarded through channels.

c. If either form is not available, prepare the data according to the sample form reproduced in figure 12.

APPENDIX

16. MAINTENANCE PARTS FOR CRYSTAL RECTIFIER TEST SET TS-268/U.

The following information was compiled on 25 May 1945. The appropriate pamphlets of the ASF Signal Supply Catalog for Crystal Rectifier Test Set TS-268/U are:

SIG 7—TS-268/U, Organizational Spare Parts, when published.

SIG 8—TS-268/U, Higher Echelon Spare Parts, when published.

For an index of available catalog pamphlets, see the latest issue of ASF Signal Supply Catalog SIG 2.

Ref symbol	Signal Corps stock No.	Name of part and description
R101, R104	3Z6010-59	RESISTOR, fixed: WW; 100 ohms $\pm 5\%$; $\frac{1}{2}$ watt; $\frac{5}{8}$ " lg x $\frac{3}{16}$ " diam; IRC type BW $\frac{1}{2}$; R.F.L.* stock No. H-1220-2; (inductive; ceramic core; 2 wire leads $1\frac{1}{2}$ " lg).
R102	3Z7250-30	RESISTOR, variable: WW; 500 ohms $\pm 10\%$; 2 watt; 2 term; $1\frac{1}{32}$ " diam x $\frac{7}{16}$ " d; Mallory type C-500-R; (linear taper; special safety off-switch R.F.L. dwg #H-1303; inclosed body; hex nut and washer for mtg; bushing $\frac{3}{8}$ -32 x $\frac{3}{8}$ " lg, shaft $\frac{1}{4}$ " diam x $\frac{3}{8}$ " lg; solder lug term).
R103	3Z6090-28	RESISTOR, fixed: carbon; 900 ohms $\pm 5\%$; $\frac{1}{2}$ watt; $\frac{5}{8}$ " lg x $\frac{3}{16}$ " diam; IRC type BT- $\frac{1}{2}$; R.F.L. stock No. H-1009-35; (molded bakelite; noninductive; 2 wire leads $1\frac{1}{2}$ " lg).
R105	3RC21BE301J	RESISTOR, fixed: carbon; 300 ohms $\pm 5\%$; $\frac{1}{2}$ watt; $\frac{5}{8}$ " lg x $\frac{3}{16}$ " diam; IRC type BT- $\frac{1}{2}$; JAN spec R-11, type RC21BE301J; R.F.L. stock No. H-1009-33; (molded bakelite; noninductive; 2 wire leads $1\frac{1}{2}$ " lg).
R106,	3Z6060-2	RESISTOR, fixed: carbon; 600 ohms $\pm 5\%$; $\frac{1}{2}$ watt; $\frac{5}{8}$ " lg x $\frac{3}{16}$ " diam; IRC type BT- $\frac{1}{2}$; JAN spec R-11, type RC20AE601J; R.F.L. stock No. H-1009-34; (molded bakelite; noninductive; 2 wire leads $1\frac{1}{2}$ " lg).

* R.F.L.=Radio Frequency Laboratories, Inc.

**16. MAINTENANCE PARTS FOR CRYSTAL RECTIFIER TEST SET
TS-268/U (contd).**

Ref symbol	Signal Corps stock No.	Name of part and description
S101	3Z9826-76	SWITCH, rotary: single deck; 6 positions; oval shaped, 2" x 1 $\frac{3}{4}$ " x $\frac{7}{8}$ " d behind panel; Oak type H, R.F.L. dwg #H-1221; (non-shorting contacts; bushing $\frac{3}{8}$ -32 x $\frac{3}{8}$ " lg; shaft $\frac{1}{4}$ " diam x $\frac{3}{8}$ " lg; solder lug term).
X101	2Z5042-27	SOCKET CRYSTAL ASSEMBLY: molded bakelite; 1" x $\frac{9}{16}$ " x $\frac{1}{2}$ " overall; R.F.L. dwg/part #H-1195; (one hole 6-32 thread for mtg; complete with contact springs).
BT101	3A30	BATTERY, sal ammoniac type: Sig C Battery BA-30; 1.5v; cylindrical; 2 $\frac{13}{32}$ " h x 1 $\frac{11}{32}$ " diam; JAN spec B-18; (chipboard or metal container; flat surface type term).
M101	3F4325-268.1	METER, milliammeter: DC; 0-1 ma; rectangular; black bakelite flush mtg case; 3 $\frac{1}{8}$ " lg x 3" wd flange; 2 $\frac{3}{4}$ " diam x 1 $\frac{3}{64}$ " d body; Weston type #301; special scale as per R.F.L. dwg #H-1213; (accuracy 2%; d'Arsonval movement; black numerals on white scale 2.36" lg; 100 ohms resistance; self-contained; 4 mtg studs $\frac{1}{4}$ " diam, $\frac{3}{4}$ " lg on 2 $\frac{1}{4}$ " x 2 $\frac{1}{4}$ " centers; term studs $\frac{1}{4}$ -32 x $\frac{3}{4}$ " lg).
	2Z5786.50	KNOB, round: black bakelite; fits $\frac{1}{4}$ " diam shaft; single 6-32 setscrew; $\frac{3}{4}$ " diam x $\frac{1}{2}$ " d; Daka Ware, R.F.L. dwg #H-1211; (metal insert; shaft hole $\frac{1}{4}$ " d; fine straight knurl).
	2Z5786.94	KNOB, bar: black bakelite; fits $\frac{1}{4}$ " diam shaft; single 6-32 setscrew; 1 $\frac{1}{8}$ " x $\frac{9}{16}$ " d; Daka Ware, R.F.L. dwg #H-1212; (metal insert; shaft hole $\frac{1}{4}$ " d).

Order No. 2333-MPD-45; 8,273 copies; 25 June 1945.

