WAR DEPARTMENT TECHNICAL MANUAL

TM 11-259[redacted].

RADIO SET
AN/PRT-1

WAR DEPARTMENT 16 JUNE 1943

WAR DEPARTMENT,
WASHINGTON 25, D. C., 16 June 1945.

TM 11-259, Radio Set AN/PRT-1, is published for the information and guidance of all concerned.

[A. G. 300.7 (30 March 45).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

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, crowbars, 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—Batteries, reels, transformer, clock, switch, spark gap, coils, and capacitors.

2. Cut —Wires and rope.

3. Burn —Housing, technical manuals.

4. Bury or scatter—Any or all of the above pieces after breaking.

DESTROY EVERYTHING

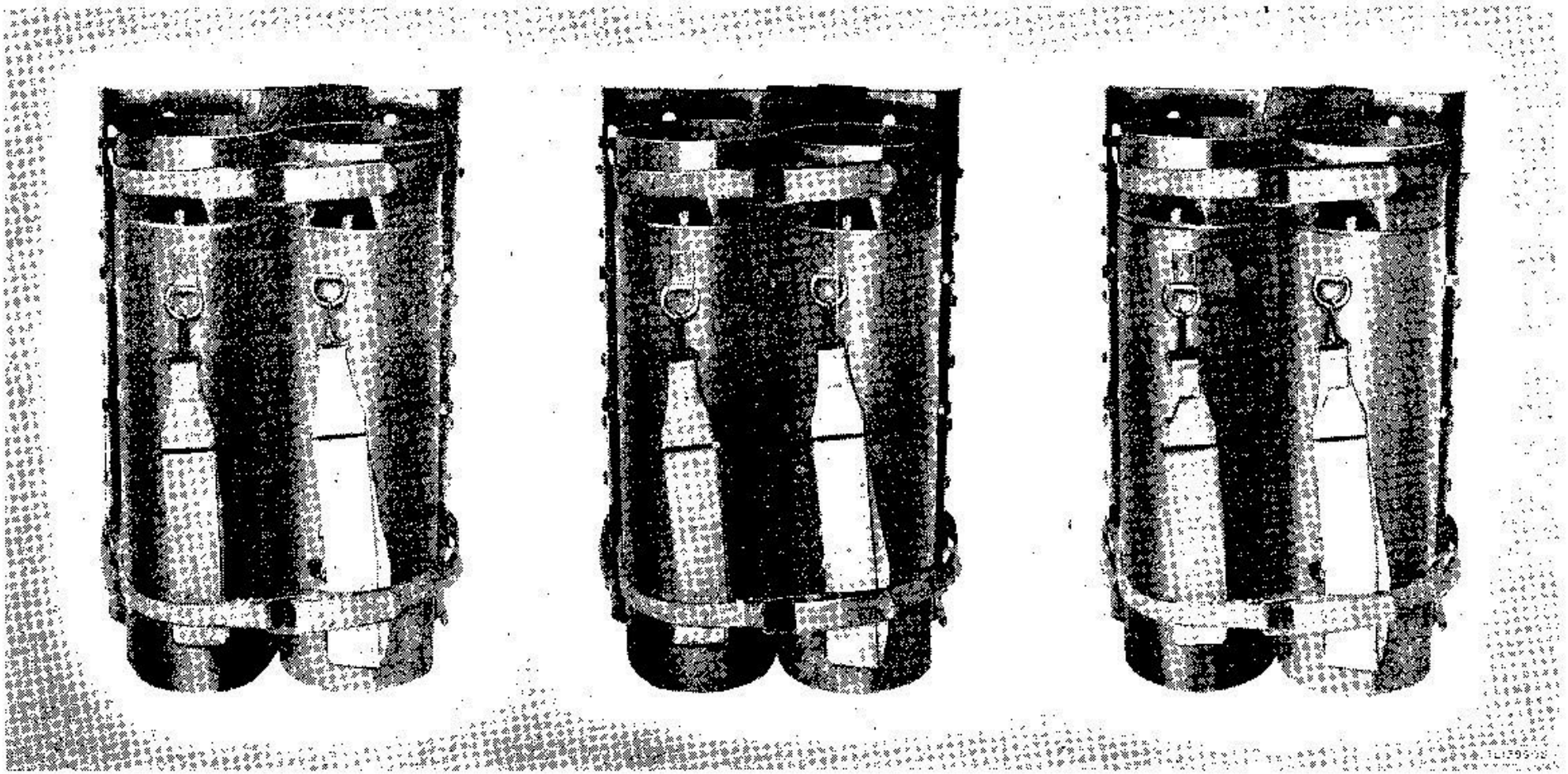


Figure 1. Radio Set AN/PRT-1.

[redacted]

PART ONE
INTRODUCTION

SECTION I
DESCRIPTION OF RADIO SET AN/PRT-1

1. GENERAL.

Radio Set AN PRT-1 is an expendable barrage-type jammer for use against enemy radio communications. The radio set transmits continuous broad-band spark signals effective over a very wide frequency range. Two transmitters are carried on a standard Quartermaster packboard, three of which are supplied with each Radio Set AN PRT-1 (fig. 1). If the use of the packboard is not desirable, the transmitters may be carried by means of a shoulder sling supplied with each unit. Preset time operation is provided by a timer mechanism, or the units may be set to operate immediately after placement.

2. APPLICATION.

a. General. Radio Set AN PRT-1 consists of a group of six units which cover a frequency band of 950 to 7,000 kilocycles (kc). The six units are intended to be used in a group.

b. Power Source. For each transmitter sixteen dry-cell Batteries BA-37 connected in series-parallel to supply 12 volts, give an operating life of 4 hours. Ninety-six Batteries BA-37 are required for Radio Set AN PRT-1.

3. TECHNICAL CHARACTERISTICS OF RADIO SET AN/PRT-1.

Frequency range:

Radio Transmitter T-135 PRT-1	950 to 1,330 kc
Radio Transmitter T-136 PRT-1	1,330 to 1,850 kc
Radio Transmitter T-137 PRT-1	1,850 to 2,589 kc
Radio Transmitter T-138 PRT-1	2,589 to 3,600 kc
Radio Transmitter T-139 PRT-1	3,600 to 5,020 kc
Radio Transmitter T-140 PRT-1	5,020 to 7,000 kc
Type of signal emitted	damped wave
Antenna	straight-wire

Counterpoise ..... [redacted] ..... straight-wire
Number of tubes ..... none
Type of transmitter ..... spark
Power output ..... 1.5 to 4 watts depending on frequency; lower output at higher frequencies.
Power supply ..... Batteries BA-37. 16 required for each transmitter; 96 required for complete Radio Set AN PRT-1.

4. TABLE OF COMPONENTS.

NOTE: This list is for general information only. See appropriate publications for information pertaining to requisition of spare parts.

Component	Required No.	Diameter in.	Length in.	Weight lb
Package 1	1			
Radio Transmitter T-135-PRT-1	1	6½	22¾	18
Radio Transmitter T-136-PRT-1	1	6½	22¾	18
Packaged	1	15	25½	61½
Package 2				
Radio Transmitter T-137-PRT-1	1	6	22¾	18
Radio Transmitter T-138-PRT-1	1	6½	22¾	18
Packaged	1	15	25½	61
Package 3				
Radio Transmitter T-139-PRT-1	1	6	22¾	18
Radio Transmitter T-140-PRT-1	1	6½	22¾	18
Packaged	1	15	25½	61½

(1) Width measurement.
NOTE: Batteries are not shipped with set.

5. PACKAGING DATA.

a. General. Radio Set AN PRT-1 is packed in three boxes. Each transmitter is padded and wrapped with paper and put into a

moistureproof foil bag. The units are then placed in paper cartons and packed two each in wooden export boxes.

b. Packed for Domestic and Export Shipping.

Pac. No.	Required No.	Height in.	Depth in.	Length in.	Gross weight lb.
1	1	15	20	32	70
2	1	15	20	32	70
3	1	15	20	32	70

6. DESCRIPTION OF MAJOR COMPONENTS.

Radio Transmitters T-135 PRT-1, T-136 PRT-1, T-137 PRT-1, T-138 PRT-1, T-139 PRT-1, and T-140 PRT-1 are identical except for frequency range. The transmitter unit consists of a spark transmitter, batteries, a counterpoise, and an antenna assembly built into a unit. Refer to figures 2 and 5.

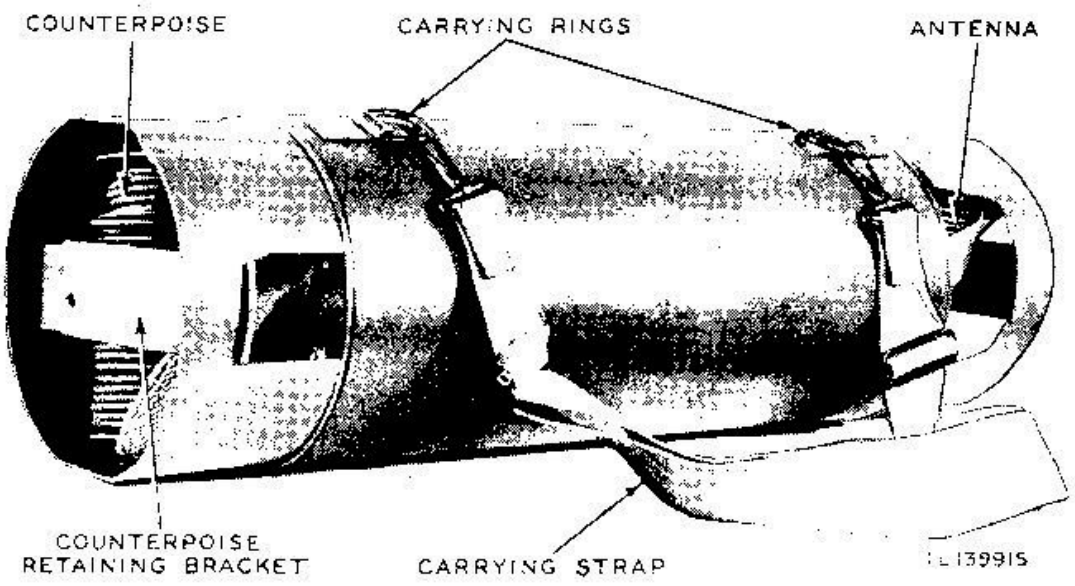


Figure 2. Radio Set AN/PRT-1, transmitter unit.

SECTION II
INSTALLATION OF RADIO SET AN/PRT-1

7. UNPACKING, UNCRATING, AND CHECKING.

Three boxes are used to ship Radio Set AN PRT-1. Each box should be opened carefully with the proper tools. Steel strapping can be broken easily with a claw hammer or tin snips. Remove the nails from the lid of each box with a nail puller, wrecking bar, or claw hammer, and lift out the transmitters and packboard. Take each carton out of the export box before removing any packing or paper. Inspect each piece of equipment as soon as it is unpacked for any possible damage caused in shipment.

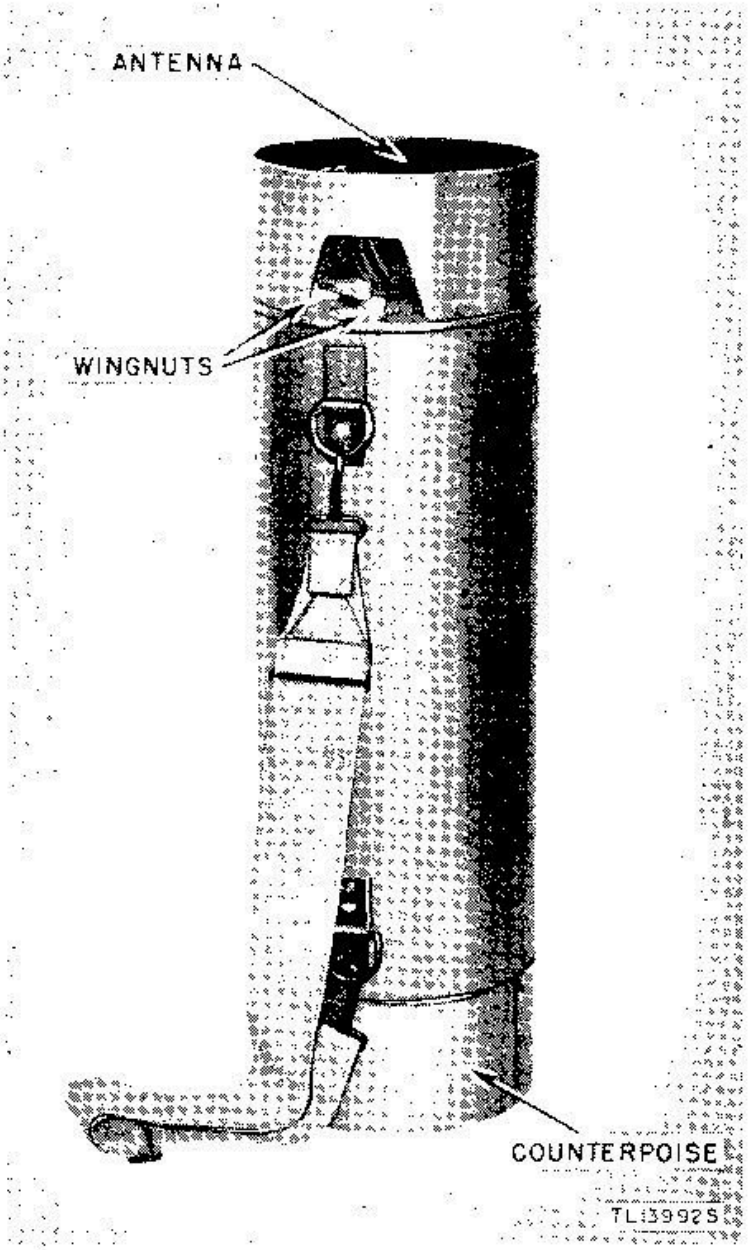


Figure 4. Transmitter unit, showing location of wingnuts.

8. INSTALLATION OF BATTERIES.

a. Have at hand 16 dry-cell Batteries BA-37.

b. Stand the unit on a flat surface. **Place the end with the four wingnuts uppermost** (fig. 3).

c. Unscrew the four wingnuts (fig. 3).

d. Lift off the end plate and plywood case (figs. 4 and 5).

e. Install batteries in the spaces provided, making sure that the positive end (small metal button terminal) is placed downward. The springs make contact with the negative ends.

f. The transmitter is now ready to be tested.

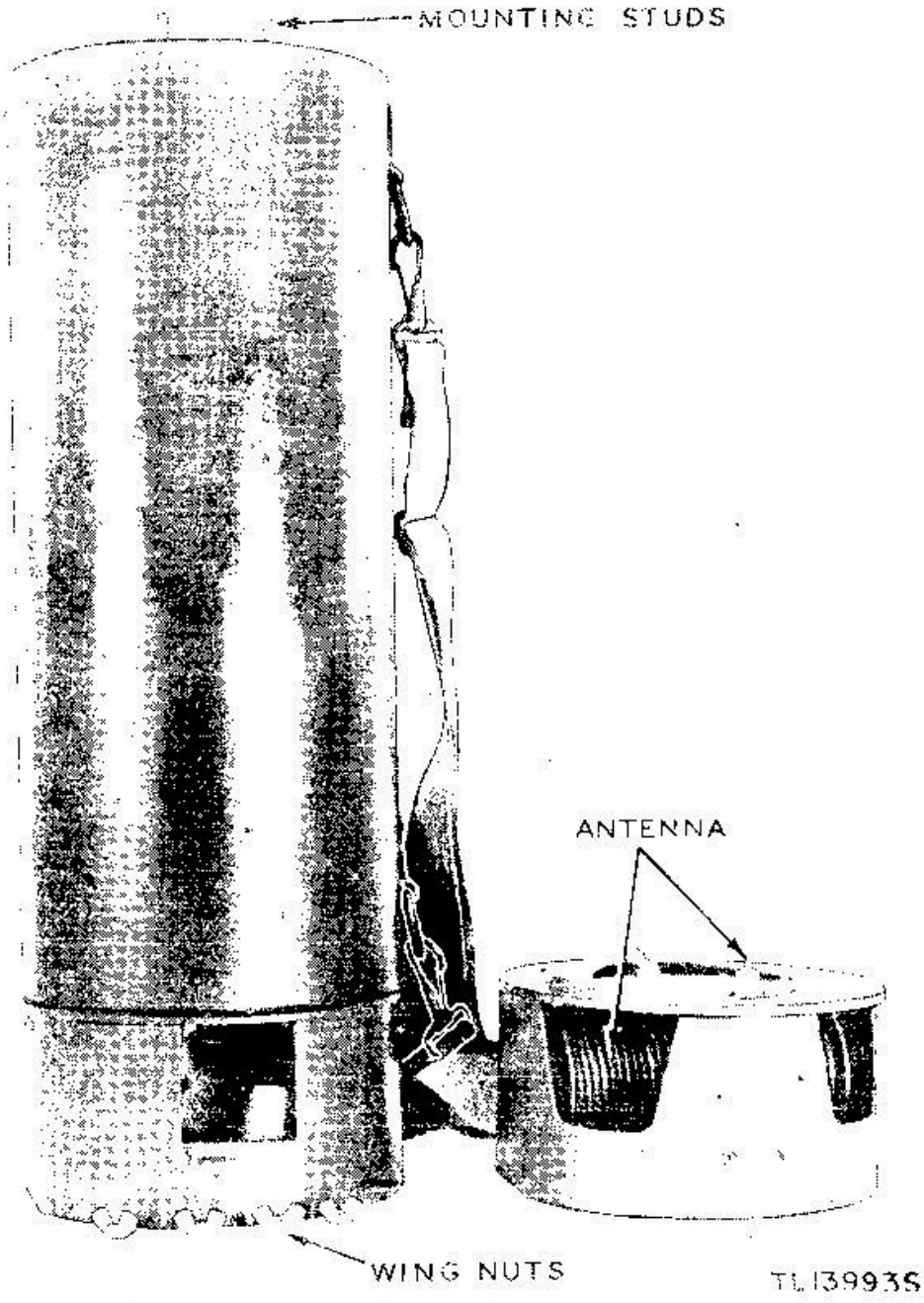


Figure 3. Transmitter unit, end plate removed.

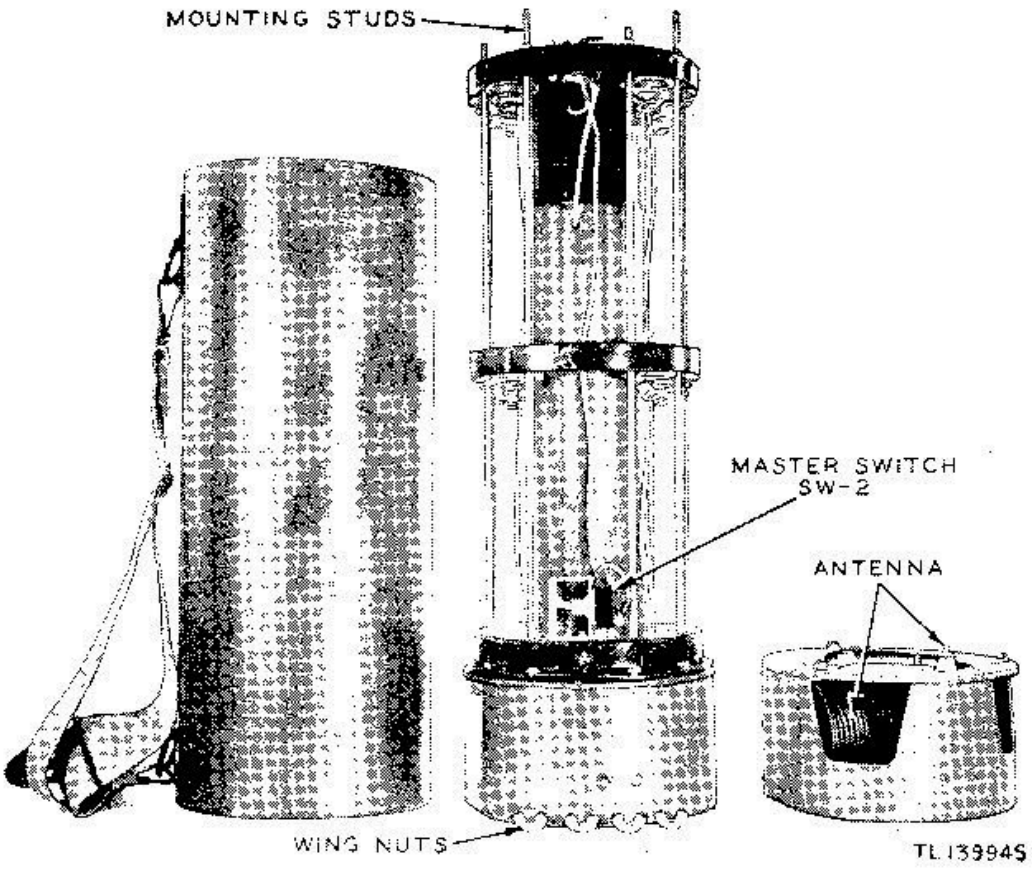


Figure 5. Transmitter unit, disassembled.

PART TWO
OPERATING INSTRUCTIONS

NOTE: For information on destroying the equipment to prevent enemy use, refer to the destruction notice at the front of the manual.

SECTION III
CONTROLS AND THEIR USE

9. TRANSMITTER CONTROLS (figs. 5, 6, and 7).

The controls for the transmitter unit consist of a master switch to control application of power, and four controls located on the clockface of each unit, as follows:

a. A lever installed on the lower part of the clockface provides for instant or delayed operation.

b. On the front of the clock is a key for winding.

c. Two pointers are provided on the face of the clock for timing.
(*1*) The white pointer sets the time for operation to start.
(*2*) The black pointer sets the time for operation to stop.

SECTION IV
OPERATION

10. GENERAL.

Each unit is adjusted for proper functioning during manufacture and no further adjustment should be attempted. Radio Set AN PRT-1 is expendable equipment. If any unit of the set fails to operate properly after the following test, use a new unit and destroy the faulty equipment, after having filled out an unsatisfactory equipment report (par. 20).

11. TESTING.

a. Set lever on clock to INSTANT position(fig. 7).

b. Set the master switch to the ON position (fig. 5). A buzzing sound should be heard.

c. At the completion of above test, set the master switch to the OFF position.

d. If a radio receiver is available, the following test is recommended:

(*1*) Tune the receiver to a frequency within the range of the units being tested.

(*2*) Select the units to be tested, and place them within 10 feet of the receiver.

(*3*) Throw lever on clock to INSTANT position (fig. 7).

(*4*) Throw master switch to ON position.

(*5*) If unit is operating properly, a roaring sound will be heard in the receiver.

(*6*) At the completion of above test, throw master switch to OFF position.

12. STARTING PROCEDURE FOR DELAYED OPERATION.

a. Each transmitter is equipped with a clock. The dial readings are standard Army-Navy time. Proper setting of the clock may delay the starting time of the operation for as long as 23 hours.

b. To set for *delayed action*, use the following procedure:

(*1*) Wind the clock with the key provided.

(*2*) Loosen the knurled nut one-fourth turn; set the white pointer to the time desired for the unit to start operating.

(*3*) Set the black pointer for the desired time for the operation to *stop*. The clock cannot be set for an operating time of less than $1\frac{1}{2}$ hours.

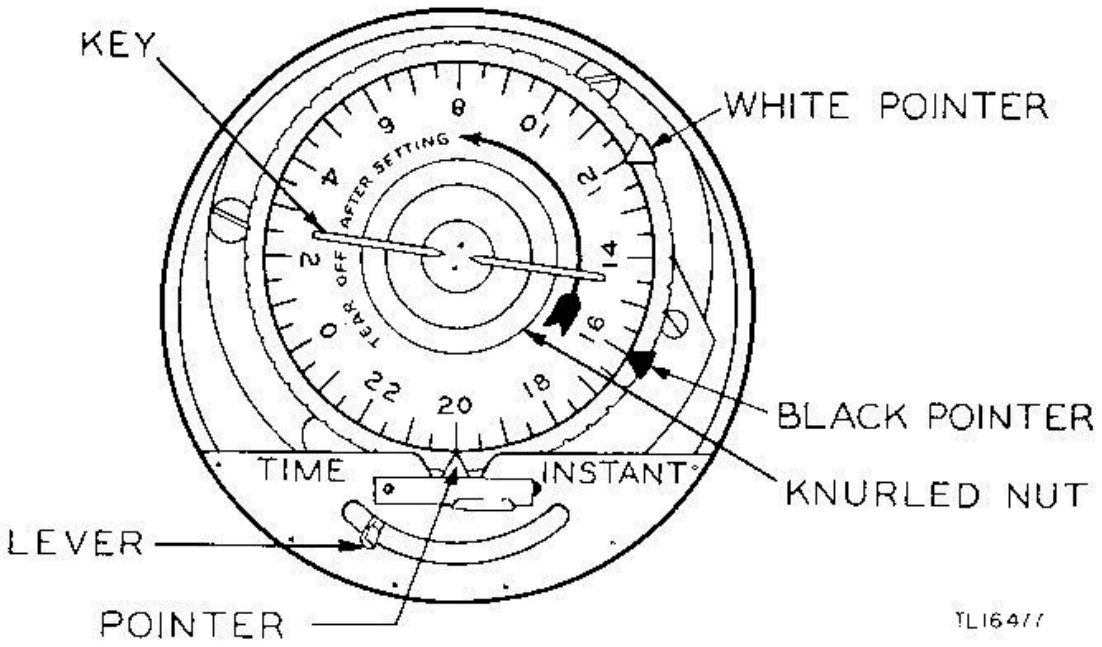


Figure 6. Time clock set for delayed operation.

(4) Turn the dial until the time of day is opposite pointer.

(5) Tighten the knurled nut while holding the dial, making sure the white and black pointers are still in position.

(6) Be sure the lever is moved to the TIME position.

(7) *Tear off the paper clock dial.*

(8) For an example of how to set the clock, see figure 6. The clock is set to start the unit at 1200 hours and to stop at 1600 hours. The time of day is 2000 hours.

(9) After the clock has been set, reassemble the unit.

13. INSTANTANEOUS OPERATION INSTRUCTIONS.

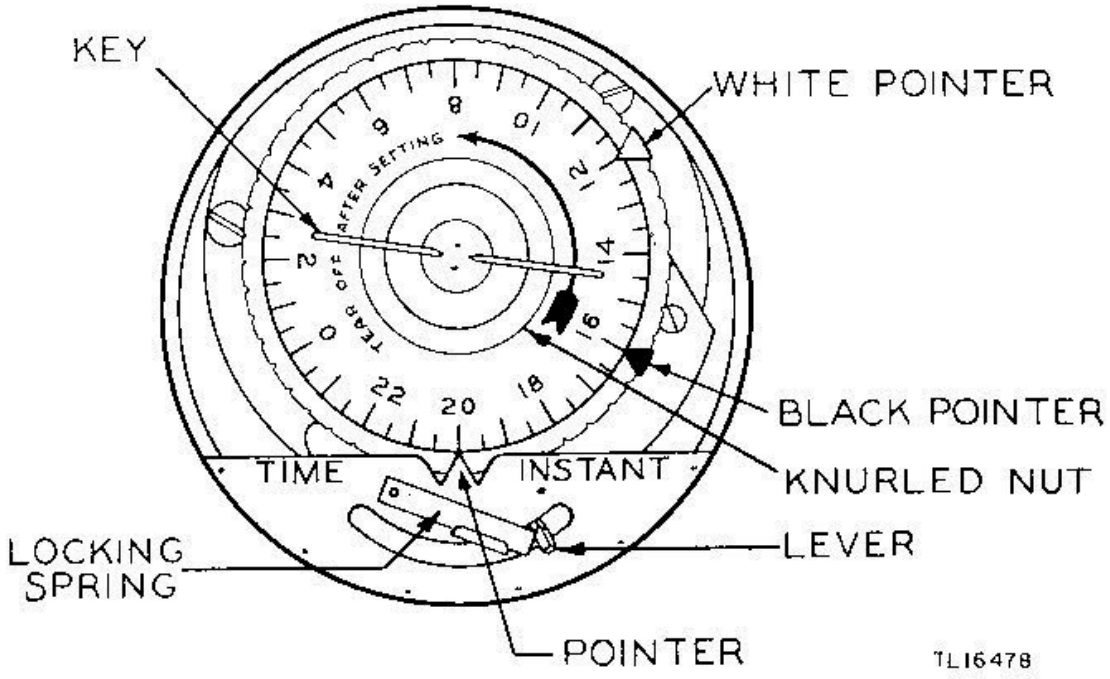


Figure 7. Time clock set for instantaneous operation.

The unit may be set for instantaneous operation; that is, set to operate the moment the counterpoise reel is removed.

a. Move lever to INSTANT position.

b. Lift up the locking spring and swing it downward until the spring locks in long slot.

c. *Tear off paper clock dial.*

d. Reassemble the unit.

14. MASTER SWITCH.

To prevent accidental operation of the transmitter, an automatic master switch is provided. The lever of the master switch is connected to the counterpoise reel by means of a piece of soft wire. When the counterpoise reel is removed, this wire closes the switch and then breaks, thus rendering the unit operative subject

to the time switch on the clock. The set will not become operative until the master switch has been closed by the removal of the counterpoise reel.

15. USE.

a. Radio Set AN PRT-1 is most effective against enemy radiotelephone communication. The transmitters should be placed as close as possible to the enemy receivers (not more than $\frac{1}{2}$ mile away). If it is desired to jam enemy continuous-wave (c-w) signals, the number of Radio Sets AN PRT-1 used must be considerably increased or placed in closer proximity to the enemy receiver. Table I shows the approximate jamming signal strength that can be expected from Radio Set AN PRT-1 at various distances from the transmitter.

TABLE I. FIELD STRENGTH OF RADIO SET AN/PRT-1

No. of Radio Sets AN PRT-1	Field strength (microvolts)				
	1 10 mile	2 10 mile	3 10 mile	4 10 mile	5 10 mile
1	50	24	20	10	8
2	95	47	39	19	15
3	141	70	56	28	21

b. The number of units required depends upon the strength of the enemy signals at the victim receiver. The jamming signal should be equal to, or greater than enemy signals. The field strength to be expected from various enemy radio sets is hard to predict. Table II gives the approximate transmitted field strength of Radio Set SCR-284, similar to some enemy equipment. The table may serve as a guide in deciding the number of Radio Sets AN PRT-1 to be used, taking into account the distances involved.

TABLE II. FIELD STRENGTH OF TYPICAL RADIO SET (SCR-284)

Distance (miles)	Field strength (microvolts)
1	150
2	40
3	10
4	8
5	6
6	5
7	4

16. ANTENNA ARRANGEMENTS.

a. Figure 8 shows the antenna placed in a tree to provide a 90-foot vertical radiator. In actual use it may be impossible to achieve this height. However, every effort should be made to get the antenna as high as possible. The counterpoise should be unreeled and laid on the ground in a scrambled fashion about the unit. This arrangement will radiate the same signal strength in all directions.

Figure 8. Vertical antenna arrangement.

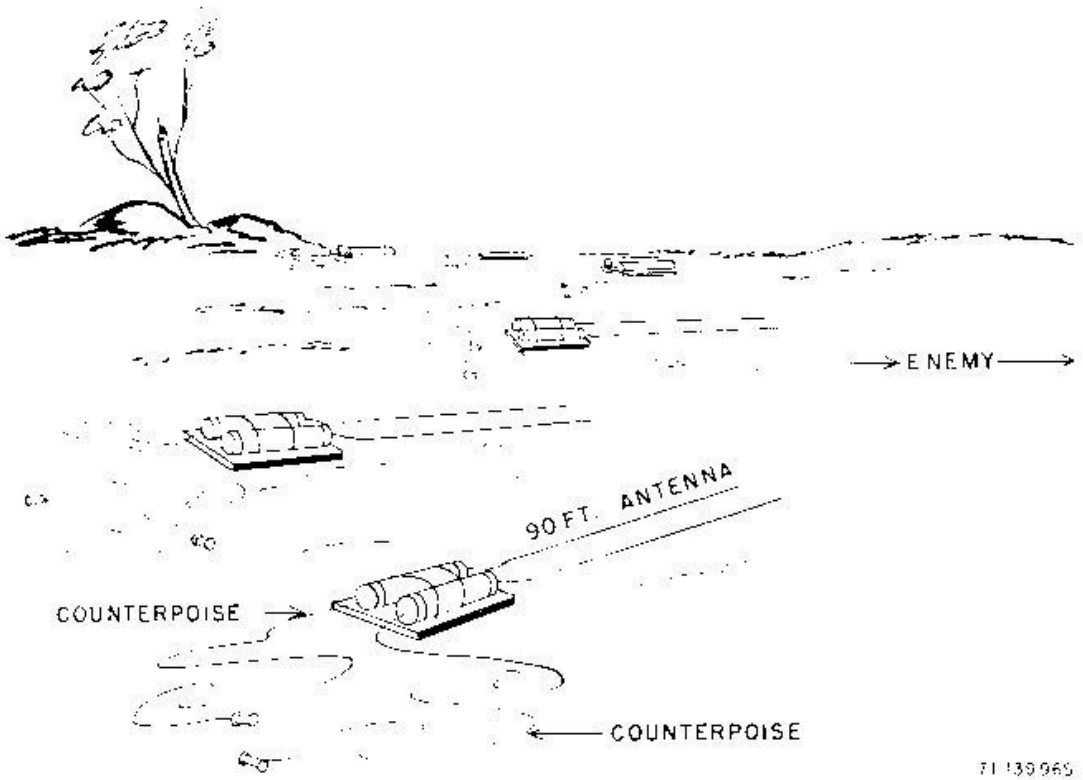


Figure 9. Alternate antenna arrangement, directional.

b. Figure 9 illustrates an alternate method useful in terrain where there are no trees. The general direction of the enemy receiver must be known. The counterpoise should be unreeled and laid on the ground in a scrambled fashion about the unit. The antenna should be unreeled and stretched out full length pointing toward the enemy receiver.

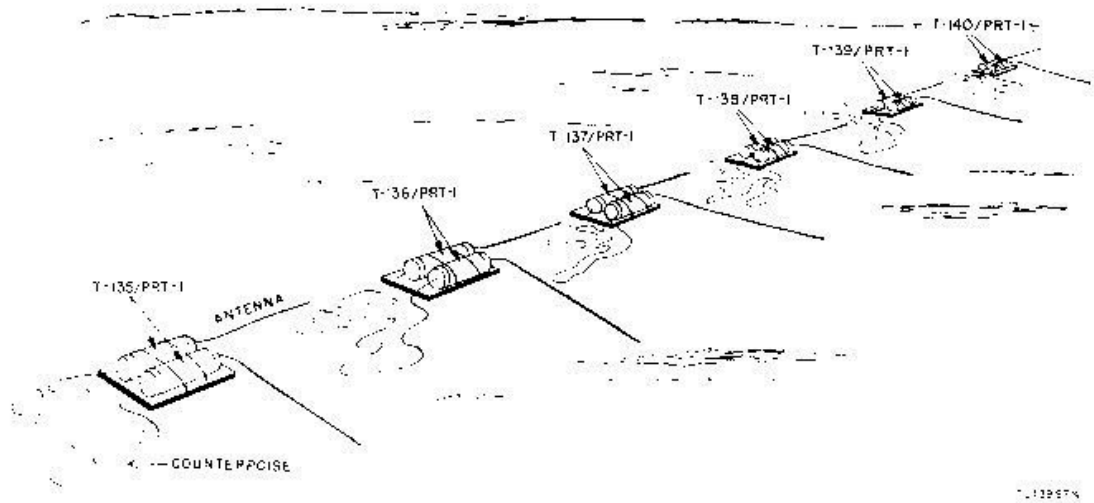


Figure 10. Alternate antenna arrangement, nondirectional.

c. Figure 10 shows an antenna arrangement which may be used when the direction of the enemy receiver is doubtful and no trees are nearby. It should be noted that at least two of each type transmitter must be used for this layout.

PART THREE
MAINTENANCE INSTRUCTIONS

NOT APPLICABLE

PART FOUR
AUXILIARY EQUIPMENT

NOT USED

PART FIVE
REPAIR INSTRUCTIONS

NOTE: Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on W.D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report); by Army Air Forces, on Army Air Forces Form No. 54 (Unsatisfactory Report). If either form is not available, prepare the data according to the sample form reproduced in figure 12.

SECTION V
THEORY OF EQUIPMENT

17. GENERAL.

Each unit of this set is a simple spark transmitter which will jam enemy radio communications over a very wide band of frequencies. Thus, fewer transmitter units are required for jamming an extremely wide range of frequencies. Spark interference is particularly effective against amplitude-modulated signals, widely used by the enemy. Since the equipment is expendable and has a short life, the design of this equipment is as simple as possible.

18. SIMPLIFIED SCHEMATIC DIAGRAM.

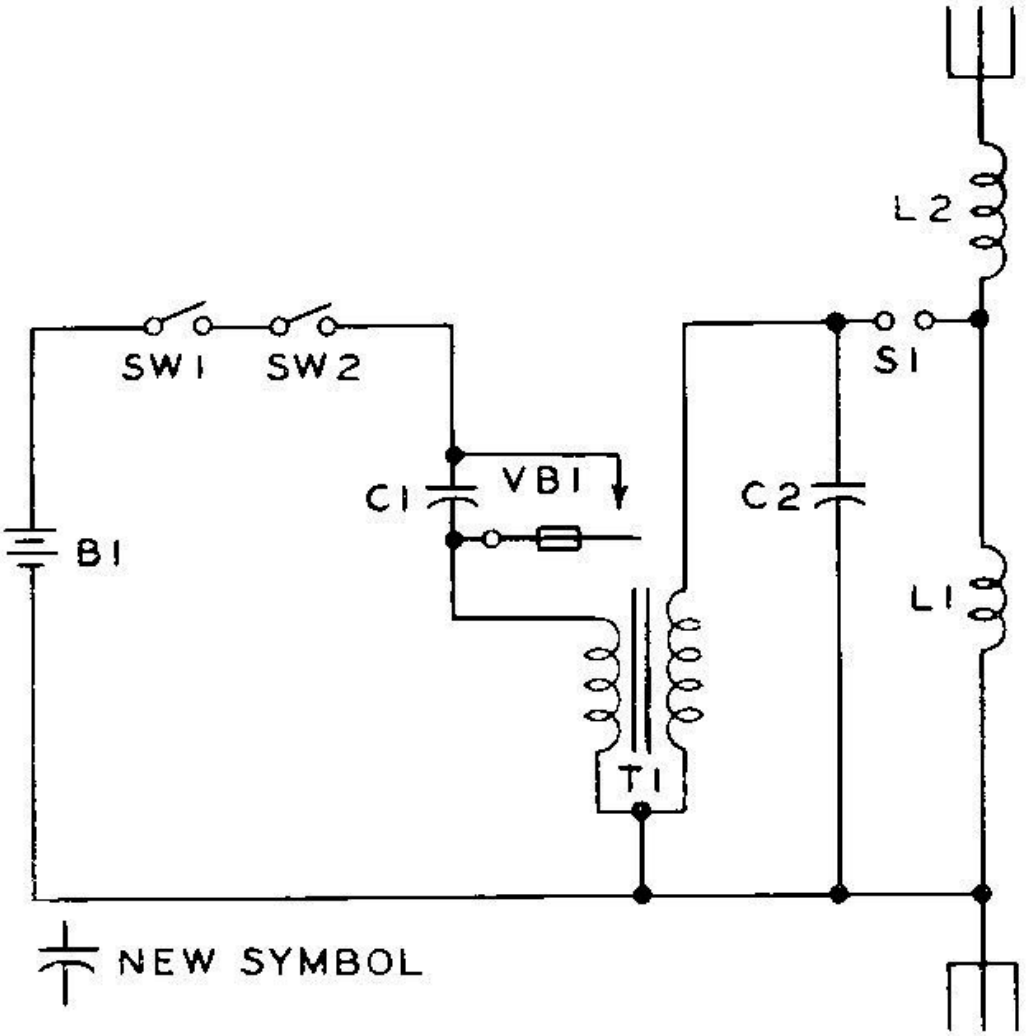
For the following circuit analysis, refer to the schematic diagram (fig. 11).

a. When switches SW1 and SW2 are closed, current flows from the 12-volt battery supply through switches SW1 and SW2, vibrator VB1, and the primary of the induction coil to the negative side of the battery. Time switch SW1 is operated by the time clock, and is also controlled by the lever which provides instant or delayed operation. Both switches must be closed to make the unit operate. To prevent operation of the unit before it is desired, master switch SW2 remains open until the counterpoise reel is removed. At this time, switch SW2 closes automatically.

b. The vibrator interrupts the direct current, so that a pulsating current flows through the primary of induction coil T1. Capacitor C1 reduces sparking at the vibrator points. The pulsating current in the primary induces a high voltage across the secondary of induction coil T1. This high voltage is applied across capacitor C2 which is part of the radio-frequency (r-f) oscillating circuit composed of coil L1 and capacitor C2. This high voltage breaks down the spark gap S1, so that capacitor C2 discharges through coil L1 and r-f oscillations occur in this circuit. These oscillations continue until the energy is dissipated and the spark gap becomes noncon-

ducting. At each successive high-voltage pulse from the induction coil secondary, the spark gap breaks down and r-f oscillations occur.

c. As a result of this action, a series of damped waves are generated by the transmitter. The average frequency of the oscillations is determined by the resonant frequency of the oscillatory circuit C2 and L1. The r-f power generated by the transmitter is fed to the antenna system composed of a straight-wire antenna and a counterpoise. Coil L2 is used on low-frequency Radio Transmitters T-135 PRT-1, T-136 PRT-1, and T-137 PRT-1 as a loading coil which electrically lengthens the antenna.



NOTE: COIL L2 IS USED ON RADIO TRANSMITTERS T-135/PRT-1, T-136/PRT-1, AND T-137/PRT-1. COIL L2 IS OMITTED ON RADIO TRANSMITTERS T-138/PRT-1, T-139/PRT-1 AND T-140/PRT-1.

TL 15947A

Figure 11. Transmitter unit, schematic diagram.

LEGEND

Radio Transmitter T-135

B1 12-v dry-cell battery
C1 0.5-mf, 600-v capacitor
C2 0.005-mf capacitor (composed of two 0.01-mf capacitors) 1,600-v
L1 4.38-uh inductor
L2 11.1-uh inductor
S1 Spark gap
SW1 Time switch
SW2 Master switch
T1 Induction coil:
Primary, 120 uh
Secondary, 3.24 h

Radio Transmitter T-136

B1 12-v dry-cell battery
C1 0.5-mf, 600-v capacitor
C2 0.0033-mf capacitor (composed of three 0.01-mf capacitors) 1,600-v
L1 3.09-uh inductor
L2 1.54-uh inductor
S1 Spark gap
SW1 Time switch
SW2 Master switch
T1 Induction coil:
Primary, 120 uh
Secondary, 3.24 h

Radio Transmitter T-139

B1 12-v dry-cell battery
C1 0.5-mf, 600-v capacitor
C2 0.0012-mf capacitor (composed of five 0.006-mf capacitors) 1,600-v
L1 1.03-uh inductor
S1 Spark gap
SW1 Time switch
SW2 Master switch
T1 Induction coil:
Primary, 120 uh
Secondary, 3.24 h

Radio Transmitter T-137

B1 12-v dry-cell battery
C1 0.5-mf, 600-v capacitor
C2 0.0025-mf capacitor (composed of four 0.01-mf capacitors) 1,600-v
L1 2.16-uh inductor
L2 1.44-uh inductor
S1 Spark gap
SW1 Time switch
SW2 Master switch
T1 Induction coil:
Primary, 120 uh
Secondary, 3.24 h

Radio Transmitter T-138

B1 12-v dry-cell battery
C1 0.5-mf, 600-v capacitor
C2 0.00175-mf capacitor (composed of four 0.007-mf capacitors) 1,600-v
L1 1.59-uh inductor
S1 Spark gap
SW1 Time switch
SW2 Master switch
T1 Induction coil:
Primary, 120 uh
Secondary, 3.24 h

Radio Transmitter T-140

B1 12-v dry-cell battery
C1 0.5-mf, 600-v capacitor
C2 0.001083-mf capacitor (composed of six 0.0065-mf capacitors) 1,600-v
L1 0.86-uh inductor
S1 Spark gap
SW1 Time switch
SW2 Master switch
T1 Induction coil:
Primary, 120 uh
Secondary, 3.24 h

SECTION VI
TROUBLE SHOOTING

NOT APPLICABLE

SECTION VII
REPAIRS

19. GENERAL.

Since Radio Set AN PRT-1 is an expendable item, no repair instructions are required. Defective equipment should be destroyed, after determining that no batteries have been left in the unit.

20. UNSATISFACTORY EQUIPMENT REPORT.

a. When trouble in equipment used by Army Ground Forces or Army Service Forces occurs more often than repair personnel feel is normal, War Department Unsatisfactory Equipment Report, W.D., A.G.O. Form No. 468, 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.

WAR DEPARTMENT

UNSATISFACTORY EQUIPMENT REPORT

FOR — Technical Service: Signal Corps — MATERIEL — Date: 1 Feb 45

FROM — Organization: 175 Signal Repair Co — Station: APO 102

TO — Next superior headquarters: Supply Sec, Hq Fourth Army Sig Sv — Station: APO 110 — Technical Service: Signal Corps

COMPLETE MAJOR ITEM

Nomenclature: Radio Transmitter BC-123-A — Type: Ground, vehicular — Model: A

Manufacturer: American Radio Corp — Order No.: 1234-Phila-45 — Serial No.: 12345 — Date received: 5 Jan 45

Equipment with which used: Radio Set SCR-456-A in Tank, Medium, M4

DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE

Part No.: Sig C Stk No. 3E47-2 — Type: Capacitor C20; fixed; 1-mf; 500 vdcw — Manufacturer: American Radio Corp — Date installed: When manufactured

Description of failure and probable cause: Capacitor C20 shorts out due to humid operating conditions

Date of initial trouble	Total time installed: Years	Months	Days	Total period of operation before failure: Years	Months	Days	Hours	Miles	Rounds
15 Jan 45	-	-	-	0	0	5		-	-

Brief description of unusual, service conditions and any remedial action taken: Operation in tropics; heavy rainfall. Was replaced and set given moistureproofing and fungiproofing treatment, 20 Jan 45.

Training or skill of using personnel: Poor — Fair — Good: X

Recommendations: Substitute capacitor designed for tropical operation

ORIGINATING OFFICER

Typed name, grade, and organization: E.A.Wilson, 1st Lt, Sig C, 175 Signal Repair Co — Signature: E. A. Wilson

FIRST ENDORSEMENT

TO CHIEF — Technical Service — Office

Name, grade, and station — Station — Date

Instructions

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]

W.D., A.G.O. Form No. 468

Figure 12. W.D., A.G.O. Form No. 468 with sample entries.

SECTION VIII
ALIGNMENT AND ADJUSTMENT

NOT APPLICABLE

APPENDIX

SECTION IX
REFERENCES

21. PUBLICATIONS.

SIG 4-1	Allowances of Expendable Supplies
SIG 4-2	Allowances of Expendable Supplies for Schools, Training Centers, and Boards
SIG 11-6	Dry Battery Supply Data
SIG 5	Defense against Radio Jamming
TM 1-455	Electrical Fundamentals
TM 11-455	Radio Fundamentals

22. FORMS.

W.D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report).

Army Air Forces Form No. 54 (Unsatisfactory Report).

23. ABBREVIATIONS.

c-w	continuous-wave
h	henry
in.	inch
kc	kilocycle
lb	pound
mf	microfarad
uh	microhenry
r-f	radio-frequency
v	volt

24. GLOSSARY.

Refer to glossary in TM 11-455.

SECTION X
MAINTENANCE PARTS

25. MAINTENANCE PARTS FOR RADIO SET AN/PRT-1.

This radio set is 100 percent expendable; it is used once and then destroyed. Therefore there are no maintenance parts for this equipment.

Order No. 2555-MPH-45; 4895 copies; 16 June 44