TM 11-1140A

WAR DEPARTMENT TECHNICAL MANUAL

BEACON TRANSMITTER-RECEIVER *AN/PPN-1A

CONFIDENTIAL

WAR DEPARTMENT *16 MAY, 1944*

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TM 11-1140A, War Department Technical Manual, Beacon Receiver-Transmitter *AN/PPN-1A, is published for the information and guidance of all concerned.

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

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DESTRUCTION NOTICE

Beacon Transmitter Receiver *AN/PPN-1A is supplied with a destruction device built into the receiver-transmitter unit of the equipment. The destructor is operated by pulling on the red metal cap (marked DEST) located at the back of the receiver-transmitter unit in the manner described below.

CAUTION: Do not remove this cap until ready to fire the destructor. The explosive charge of the destructor is sufficient to destroy the receiver-transmitter unit effectively.

Destruction of the equipment should be carried out as follows:

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

WHEN — When ordered by your commander.

HOW — 1. Fire the destructor:

a. First remove headphones from set.

b. Unscrew the red DEST cap at the back of the unit until it comes free. The cap remains connected to a short length of wire.

c. Grasp the red cap firmly and jerk it violently away from the case of the receiver-transmitter unit until the attached wire pulls out at least 6 inches or comes completely out of the case. ***This fires the detonator.***

d. Get at least 25 feet away from the equipment at once. ***The destructor will explode in 5 seconds.***

2. Smash the remains, if time and conditions permit. Use sledges, axes, hammers, crowbars, tools, or any heavy objects.
3. Burn the remains. Use gasoline, kerosene, oil, flame throwers, etc.
4. Disposal—bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT— 1. All vacuum tubes, control dials, coils, transformers, vibrator pack.
2. The plastic battery-cell cases. Be careful that the battery acid does not splash on exposed portions of face, or hands.
3. The antenna rod at the top of antenna mast.
4. All wires, cables, connectors, etc.
5. Instruction cards and technical manuals.

The above detailed instructions should be carried out completely, if time and circumstances permit. In every case the explosive destructor must be used first.

DESTROY EVERYTHING

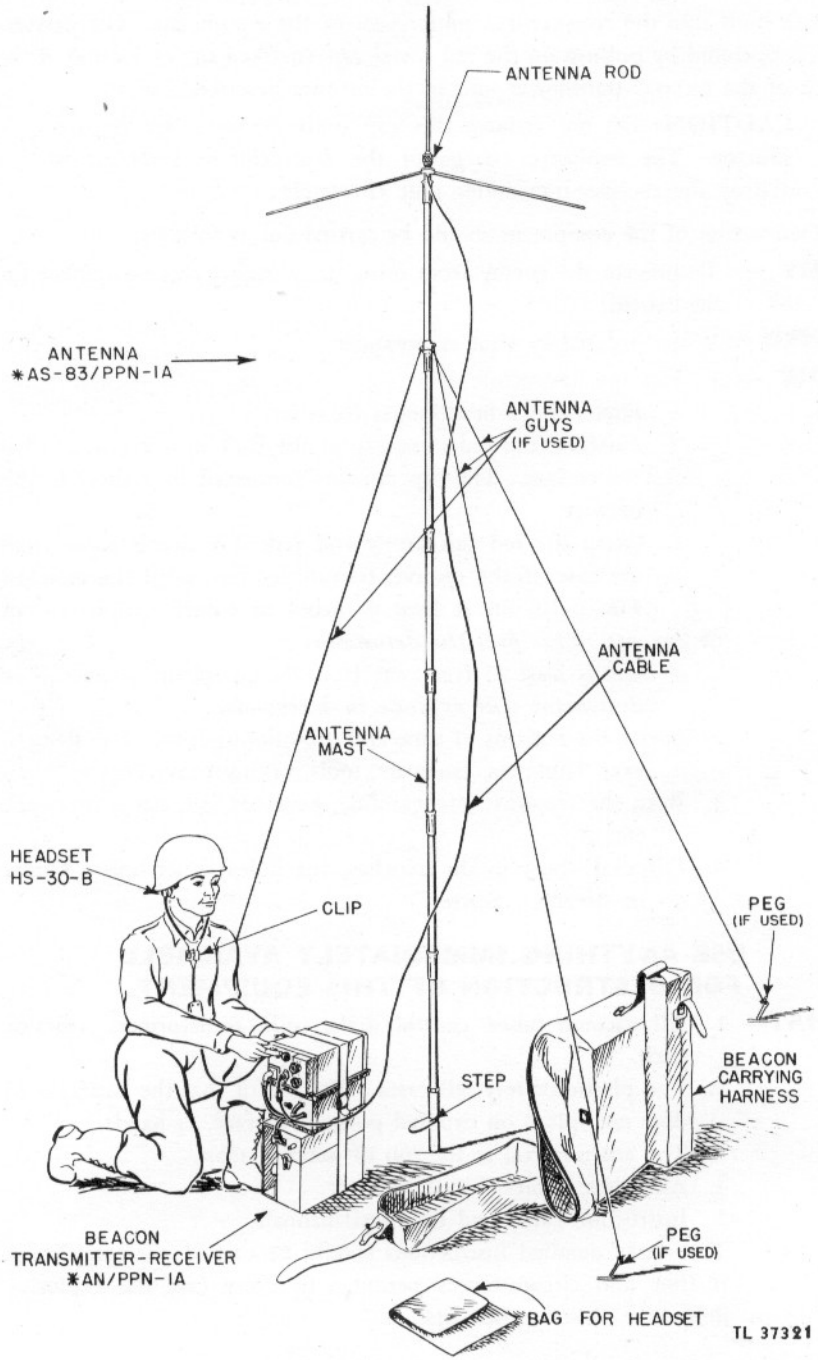

*Figure 1. Beacon Transmitter-Receiver *AN/PPN-1A set up for operation.*

SECTION I
DESCRIPTION

1. GENERAL.

a. Nature of Equipment. Beacon Transmitter-Receiver *AN/PPN-1A is a compact and lightweight responder-beacon. It is easily portable and can be set up quickly and operated by men who have had very little special training.

b. Uses. The principal applications of the beacon are based on the ease with which a man can carry it to a location and there cooperate with a friendly aircraft equipped with Airborne Equipment *AN/APN-2 in the following three ways:

(1) TO REVEAL POSITION. When a beacon is challenged by the airborne radar, the beacon replies automatically, thus enabling aircraft personnel to locate its position. The beacon is silent except when receiving a challenging signal.

(2) REVEAL IDENTITY. By manually *keying* the reply signal, the operator of a beacon can reveal his identity as well as his location to the cooperating aircraft, making it possible for aircraft personnel to distinguish a particular beacon when several are employed in an area.

(3) COMMUNICATION. The operator can hear his beacon being challenged by means of the headphones connected to it. Since he can also key the beacon's reply, the operator can exchange simple signals with the cooperating aircraft personnel. The beacon is not, however, primarily intended for communication purposes.

c. Carrying Arrangements. The beacon is carried in a rubber harness. It is hooked to the paratrooper's harness during the descent and may be carried on his back after landing by means of a strap. The complete beacon equipment packed, with storage battery installed ready for operation, weighs approximately 32 pounds.

2. OPERATION.

a. Frequencies. The receiver and transmitter of the beacon can each operate on any one of five different frequencies between 214 mc and 234 mc.

Before the beacon is operated in the field, the receiver and transmitter are adjusted to the five frequencies. The desired receiver frequency and transmitter frequency are obtained by turning two pointers on the equipment to the positions specified by the commanding officer. The same frequencies must never be selected for both transmitter and receiver, as this causes interaction between the receiver and transmitter circuits and, consequently, a loss of sensitivity and power. The transmitter and receiver frequency should be separated by at least 10 mc for best results.

b. Signals. The signal transmitted by the cooperating airborne equipment is a 4- to 6-microsecond pulse repeated about 400 times per second. The beacon automatically replies, pulse-for-pulse, with its own 8-microsecond pulse signal. The operator can key the signal transmitted by the beacon. When the CODE button on one of the units of the equipment is depressed, the pulse returned by the beacon becomes about $2\frac{1}{2}$ times as wide as the normal reply pulse.

c. Range. The transmitter of the equipment delivers a pulse-power output of 3 watts or more. The receiver sensitivity is better than 300 microvolts. The maximum satisfactory range is about 55 miles with the airborne equipment at 5,000 feet altitude and about 15 miles at 500 feet altitude. The actual range depends upon the nature of the surrounding terrain, the height of the antenna, and the altitude of the friendly aircraft.

3. PRINCIPAL COMPONENTS.

a. Shipping Entity. All components of Beacon Transmitter-Receiver *AN/PPN-1A, except the storage battery, are shipped in the beacon-carrying harness, just as though the equipment were ready for field use. Batteries and electrolyte are shipped separately and are assembled and installed in the battery box at the depot. Every carrying harness is packed in a carton. Three cartons containing complete beacons and one carton containing running spares are packed in each shipping case, which contains, in addition to the usual packing materials, a 30-foot roll of waterproof paper for use in repacking the shipping case after one beacon has been removed.

b. Components of Equipment. A complete beacon when ready for use (with battery installed) consists of the components shown in Table I and in figures 2 and 3.

c. Running Spares. The carton of running spares is made up of the components listed in Table II.

TABLE I

No. of units	Component	AN type or Signal Corps type	Over-all dimensions (inches)	Weight lb.–oz.
1	Carrying harness (ruuber)[a]	—	18 x 10 1/4 x 7 1/2	7–9
1	Battery box	*CY-77/PPN-1A	10 1/16 x 7 1/16 x 3 1/16	3–5
1	Phone compartment	—	8 5/8 x 7 1/8 x 1 11/16	1–6
1	Cloth bag	—	14 x 8	0–2
1	Receiver-transmitter	*RT-44/PPN-1A	8 1/2 x 4 5/16 x 2 13/16	3–0
1	Vibrator power supply	*PP-11A/PPN-1	8 1/8 x 4 5/16 x 2 5/16	4–3
1	Antenna system	AS-83/PPN-1A	—	2–0
1	Headset and cord	HS-30-B	—	0–10
1	Equipment strap	—	45 x 1	0–2
1	Carrying strap	—	72 x 3/4	0–1
2	Pads (rubber)[a]	—	9 x 4 3/8	0–4 each
3	Battery cells	BB-210/U	6 1/2 x 2 1/2 x 2 1/2	2–5 each empty
2	Technical manuals, 11-1140A	—	5 7/8 x 9	
2	Operating instruction sheets	—	—	
1	Carrying harness (fabric)[a]	—	18 x 10 1/4 x 7 1/2	5–7
2	Pads (felt)[a]	—	9 x 4 3/8	0–3

NOTE: Two extra 25-ft. lengths of RG-58/U cable may be supplied.

[a] Carrying harness (fabric) may be supplied as an alternate for carrying harness (rubber). If fabric harness is used, felt pads are supplied in place of rubber pads.

*Figure 2. Beacon Transmitter-Receiver *AN/PPN-1A principal components.*

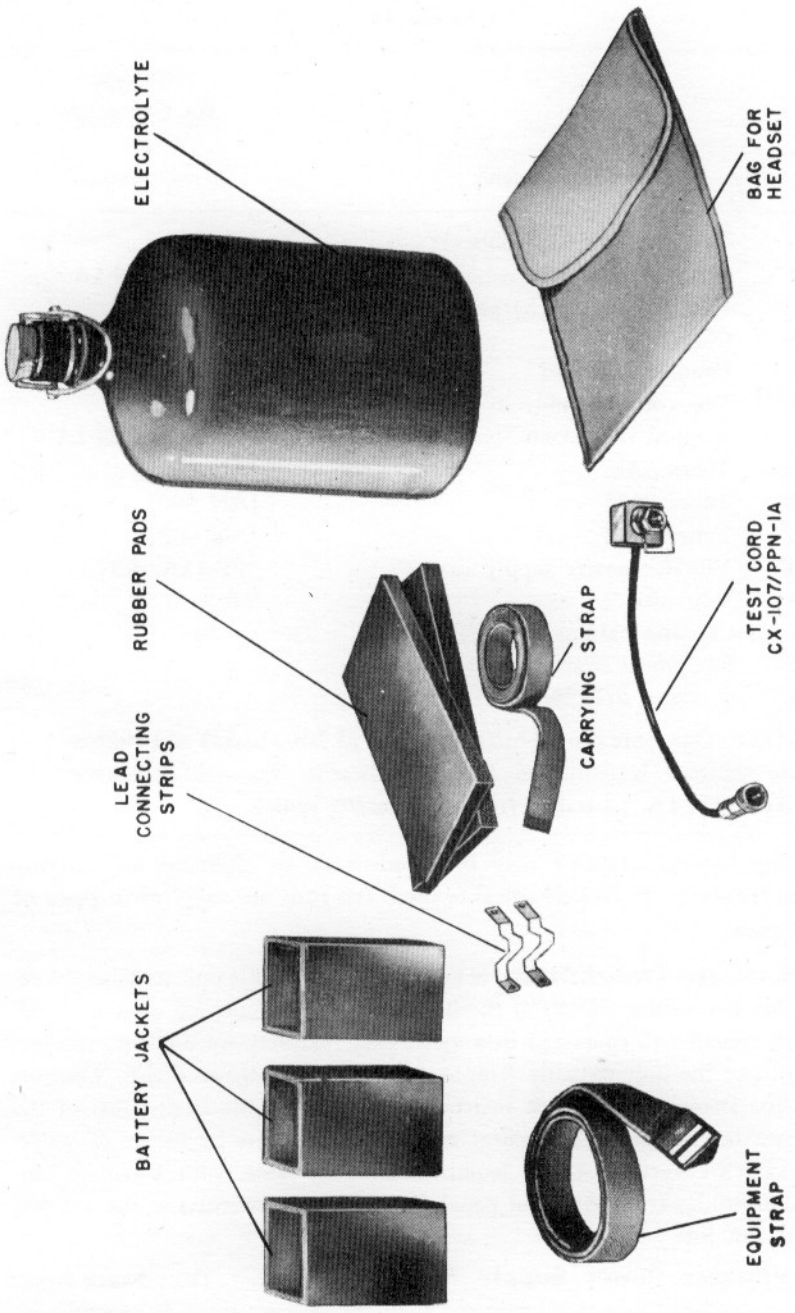

*Figure 3. Beacon Transmitter-Receiver *AN/PPN-1A minor components and accessories.*

TABLE II

Quantity	*Component*	*AN type Sig. Corps type or ref. symbol*
1	Carrying harness (rubber)[a]	—
1	Antenna assembly	*AS-83/PPN-1A
2	Pads for carrying harness (rubber)[a]	—
1	Cloth bag	—
1	Headset and cord	HS-30-B
1	Test cord assembly in carton stamped TEST CORD	*CX-107/PPN-1A
3	Tubes 6AK5	JAN 6AK5
6	Tubes 9001	JAN 9001
9	Tubes 9002	JAN 9002
1	Vibrator power supply	*PP-11A/PPN-1
3	Vibrators	VB-1
1	Carrying harness (fabric)[a]	—
1	Equipment strap	—
1	Carrying strap	—

NOTE: One spare storage battery (3 cells of BB-210/U) and electrolyte therefor is furnished for every Beacon Transmitter-Receiver *AN/PPN-1A, separately from the running spares.

[a] Carrying harness (fabric) may be supplied as an alternate for carrying harness (rubber). If fabric harness is used, felt pads are supplied in place of rubber pads.

d. Receiver-Transmitter *RT-44/PPN-1A. This unit contains the receiver and transmitter circuits of the beacon. They are mounted on a shielded, compact, chassis and contained in a metal case. Gaskets are used in construction to make the unit virtually rainproof but not submersion proof. Controls for setting frequencies and test switches are located on the front panel of the unit. Switches are protected against entrance of moisture by means of waterproof switch covers. A 4-inch length of 50-ohm cable, with a female connector, protrudes from the front panel for making connections to the antenna transmission line.

e. Vibrator Power Supply *PP-11A/PPN-1. The vibrator power supply is contained in a metal case and is of the self-rectifying or synchronous

type. An elaborate filter system is used to give a steady d-c voltage and to prevent unnecessary disturbances from entering the receiver.

f. Antenna Mast and Antenna *AS-83/PPN-1A. The antenna mast is divided into eight sections, with the antenna forming the top section of the mast. The sections are strung together on a thin steel cable, held in spring tension, and so designed that the folded mast and antenna, when removed from the carrying case, should automatically snap into a straight position. One end of the antenna cable is permanently fastened to the antenna; the male plug on its free end is designed to be plugged into the female receptacle on the cable attached to the receiver-transmitter unit. Suitable guy cords and pegs are provided to steady the mast, when the equipmnt is set up in strong winds.

g. Storage Battery. The primary source of power for Beacon Transmitter-Receiver *AN/PPN-1A is a lead-acid storage battery consisting of three light-weight, plastic-case cells (AN type BB-210/U), connected in series to provide 6 volts. The cells are housed in a metal battery box, AN type *CY-77/PPN-1A, which is equipped with a vent for escaping fumes. The cells are connected by means of lead strips shipped in the battery box. The condition of the charge of the battery can be determined by tilting the battery box and observing the positions of the three color-coded balls suspended in the electrolyte of each cell.

h. Headset. A lightweight headset HS-30-B with connecting cord is supplied to check the beacon for operation and to permit the operator to ascertain when the beacon is replying to an interrogation. The headphones also enable the operator to distinguish the louder sound produced when the set is transmitting a coded signal. The headphones are supplied in a cloth bag, stored in a metal compartment, which fits into the beacon-carrying harness alongside the battery box.

i. Carrying Harness (Rubber). The carrying harness which houses the beacon is made of rubber reinforced with thick sponge-rubber walls to protect the equipment against shock. A long rubber flap, which folds tightly over the main compartment of the harness, insures against the entrance of moisture. The main compartment of the harness holds the receiver-transmitter unit, vibrator power supply, battery box and battery, and a removable metal compartment for headphones and auxiliary equipment. A long rubber pocket on the side of the harness holds the antenna equipment. A wide strap, partially sewed to the bag, helps support the weight of the components. A large iron snaphook, which clips on to the paratrooper's harness, is attached to this strap. A hole in the front of the carrying harness is provided for the fume vent of the battery box.

j. Carrying Harness (Fabric). A beacon carrying harness made of waterproof fabric may be supplied as an alternate to the rubber harness. The principal distinguishing characteristics of the fabric harness are as follows:
(1) It is closed with a zipper and is, therefore, not completely waterproof.
(2) It is furnished with felt shock pads.
(3) It has no D-rings (subpar. *k* below).

k. Accessories. In addition to containing the headphones, the metal accessory compartment is used to hold an auxiliary carrying strap. This is a long strap which can be looped through the supporting strap and passed between the paratrooper's legs. This will prevent the beacon from swinging during the descent. Also, when strung through the D-rings on the rubber harness, it permits the bearer to carry the beacon on his back when on the ground.

SECTION II
INSTALLATION AND OPERATION

4. GENERAL.

a. Before the beacon is used on a mission, it is necessary to prepare and install the storage battery and to check the operation of the entire assembly to be sure that it is capable of operating satisfactorily at the assigned frequencies. This section describes the preparation of the beacon and gives instructions for packing it for field use.

b. The field-operating procedure is described in an instruction sheet (also called "instruction card") entitled "Operating Instructions *AN/PPN-1A." Since all of the information it contains is included in this section, this technical manual does not give a separate field-use procedure.

5. PREPARATION FOR USE. To prepare the equipment for use, proceed as follows:

a. To Prepare Storage Battery (fig. 4). (1) Obtain three storage battery cells, AN type BB-210/U, and one gallon jar of electrolyte. (One gallon is more than enough to fill 9 cells.)

(2) Place the three battery cells on a level surface, and remove the red filler caps.

(3) Open jars containing electrolyte and slowly pour electrolyte into each cell until it is filled to a level 1/4 inch above the LEVEL LINE located on its side.

(4) Replace the filler caps and tighten securely.

> IMPORTANT NOTE: In emergencies the battery may be placed in service immediately after completing instructions (1), (2), (3), and (4). In this condition the useful life of the battery is approximately 6 hours before recharging is required.

(5) Do not allow battery to stand less than 3 hours or more than 16 hours before charging. (For complete charging instructions see par. 32).

(6) The condition of each cell's charge is shown by the positions taken by the three colored indicator balls, when the compartments holding them are flooded with electrolyte by tilting the battery box. Tap the battery box to allow the colored balls to float freely. When a cell is fully charged, all three

balls float on the surface of the electrolyte. The complete table showing condition of charge is as follows:

TABLE III

Color code	*Condition of charge*
All three up	Battery fully charged
Red and white up, green down	About 90% charged
Red up, green and white down	About 50% charged
All three down	Battery discharged

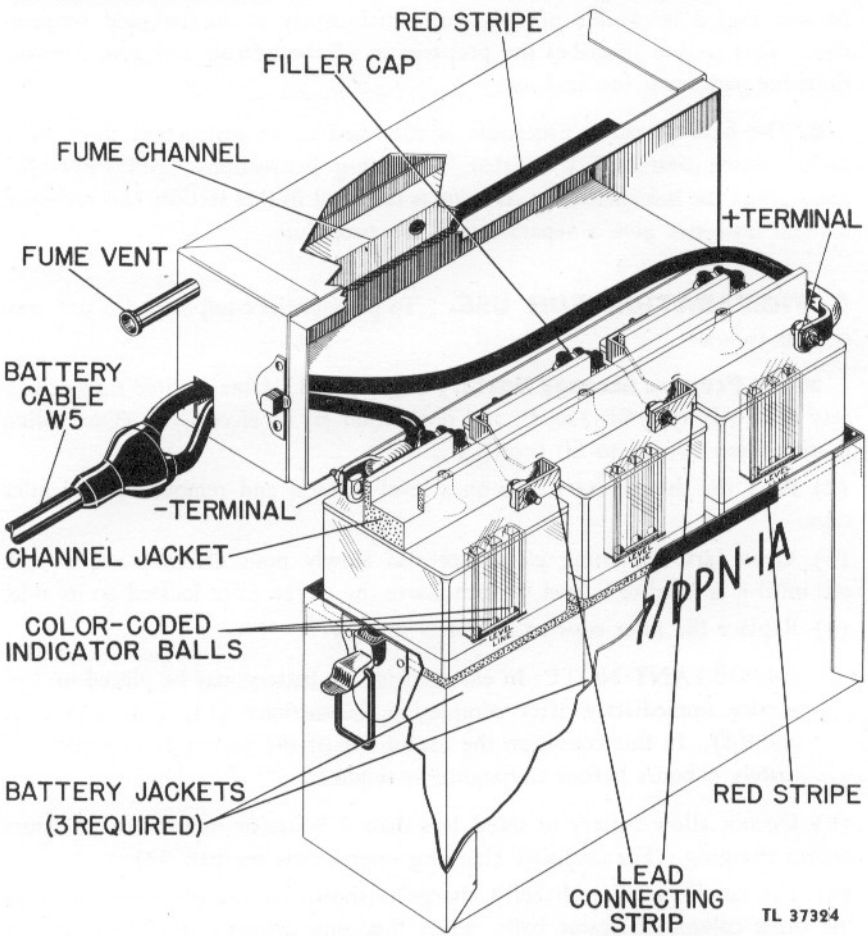

*Figure 4. Battery Box *CY-77/PPN-1A, three cells of Battery BB-210/U, and accessories, showing method of installing and making connections.*

CAUTION: Under no circumstances is the battery to be in the battery box while being filled with electrolyte or during charging. The battery must not be stored in the battery box except for periods of a week or two while awaiting employment on a tactical mission.

b. To Install Battery in Battery Box. (1) Remove the battery box from the carrying harness by unbuckling the harness, unfolding the rubber flap, and pulling the beacon out of the bag.

CAUTION: Grasp phone compartment; NOT the cables when pulling beacon out of the harness.

(2) Free the battery box by removing the strap that holds the beacon components together.

(3) Loosen the snap latches at each end of the battery box, and take off the cover. Also, remove the two inter-cell connector strips and the three rubber battery jackets that are packed inside the box.

(4) Slip each cell into one of the rubber battery jackets and place in the compartment of the battery box so that the colored coding balls face the side of the box marked with the AN type number and a red paint stripe.

(5) Connect the three battery cells in series by means of the two lead strips provided, in the manner shown in figure 4, thus leaving a free positive (+) and a negative (—) terminal to which the power-supply cable can be connected.

(6) Before connecting the battery cable, make sure that the ON-OFF toggle switch on the power supply unit is in the OFF position.

(7) Pass the two leads of the forked battery cable from the power-supply unit through the oblong opening in one end of the battery box cover. Let the cover rest on the cable leads.

(8) Connect the short lead from the battery cable to the unconnected negative (—) and the long lead to the unconnected positive (+) terminal. Tighten the nuts on these terminals.

(9) Replace the battery box cover. Note that the box cover will fit properly only when the red stripe on the cover rests next to the red stripe on the side of the box.

c. To Reassemble the Equipment. In order to reassemble the receiver-transmitter unit, power-supply unit, and battery box, proceed as follows (fig. 5):

(1) Place one of the oblong shock pads provided on top of the battery box.

(2) Place the power supply and receiver-transmitter, with an oblong shock pad between them, on top of the shock pad on the battery box so that the

ON-OFF switch, cables of the power supply, and the control knobs on the receiver-transmitter are all facing the operator.

(3) Tighten securely the screw-collar of the power-supply cable connector on the face of the receiver-transmitter.

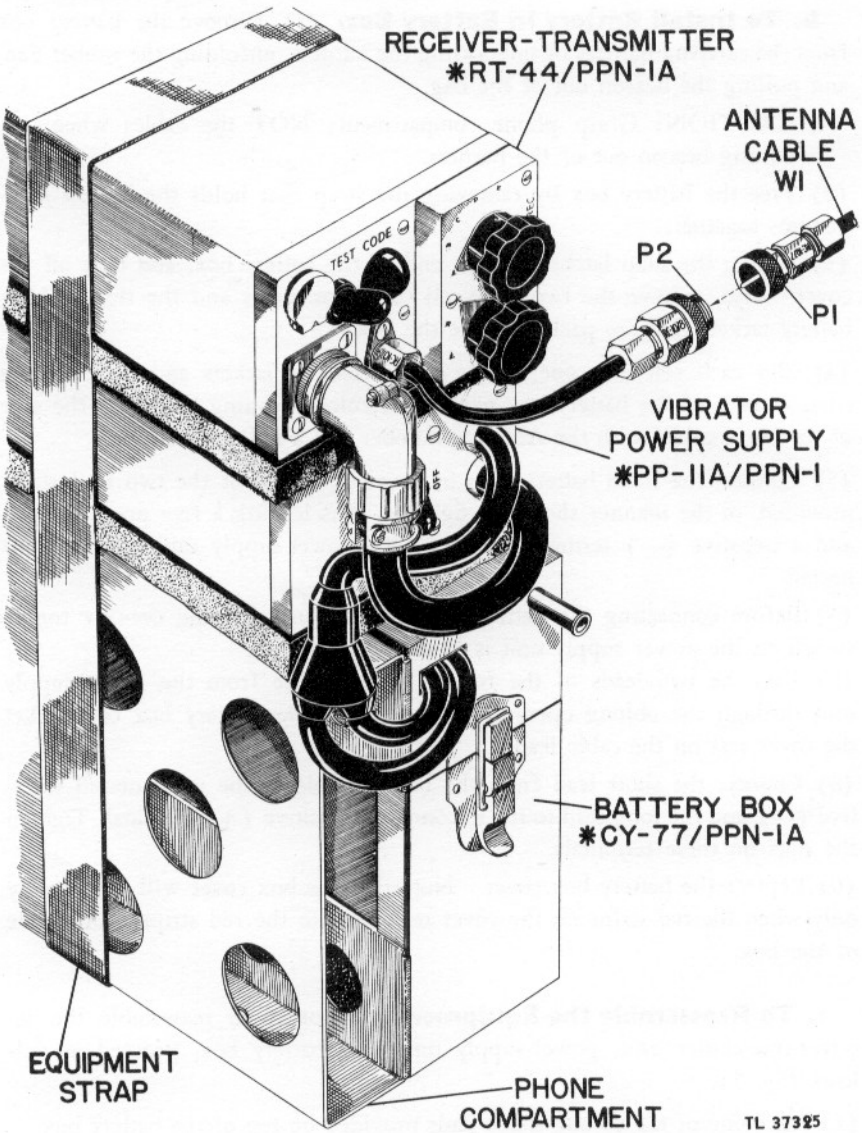

*Figure 5. Beacon Transmitter-Receiver *AN/PPN-1A showing component units strapped together and antenna connection.*

(4) Fasten the long web belt vertically around the components including the phone compartment, and tighten securely.

d. To Erect Antenna Assembly (figs. 1 and 5). (1) Remove the antenna assembly from the long pocket on the carrying harness and lay the sections out straight on a level surface. The antenna mast sections are held together by a thin cable through their centers, attached in the base section to a spring. When removed from the bag, the lengths should automatically snap into position. Examine the joints to see that they are snug.

(2) Lay the antenna cable alongside the mast.

(3) If the wind is strong, attach the guy cords, packed with the antenna, one to each of the three rings at the top of the mast and lay them alongside the antenna cable. Otherwise use mast without guys.

(4) Raise the mast upright. Two of the antenna rods should spring downward into position. Unfold the step which is located on the base section of the mast. Place one foot upon the step and force the base of the mast firmly into the ground. If using guys, extend them and anchor the pegs in the ground sufficiently far from the mast to prevent swaying.

NOTE: Guy cords should be used only when the beacon is set up in a high wind. Under normal conditions, disregard reference to the guy cords.

(5) Insert male plug (attached to the end of the antenna cable) in the female connector (attached to the cable extending from the panel of the receiver-transmitter unit), and tighten the screw cap.

(6) The beacon antenna should be mounted as high as possible. This will considerably increase the range when the plane is flying at a low altitude. Two extra 25-ft. lengths of RG-58/U transmission line may be supplied with the beacon. These cables are for mounting the beacon antenna high above ground; then the beacon may be operated in a foxhole, if necessary. One end of the 25-ft. length of cable is attached to the end of the beacon antenna cable, and the other end should either be attached to the other 25-ft. length of cable or to the cable extending from the receiver-transmitter unit. Only use one 25-ft. length of cable if this is sufficient.

NOTE: Some beacons may not have the extra lengths of cable supplied with them; instead the cable is stored in the depot.

6. TO CHECK RECEIVER - TRANSMITTER UNIT FOR OPERATION. Turn on the beacon and check to see that it is in operating condition.

a. Preliminary Steps. With the antenna connected and the battery installed, proceed as follows:

(1) Push the ON-OFF switch located on the power supply to the ON position. Allow 2 or 3 minutes for the set to warm up.

(2) Turn the TRANS pointer to any one of the letters and turn the REC pointer to a different letter.

(3) Open the cover of the headphone jack on the front of the receiver-transmitter panel and insert the plug on the end of the cord attached to Headset HS-30-B (fig. 6). Place the headphones on the ears. They are constructed to fit comfortably underneath a helmet.

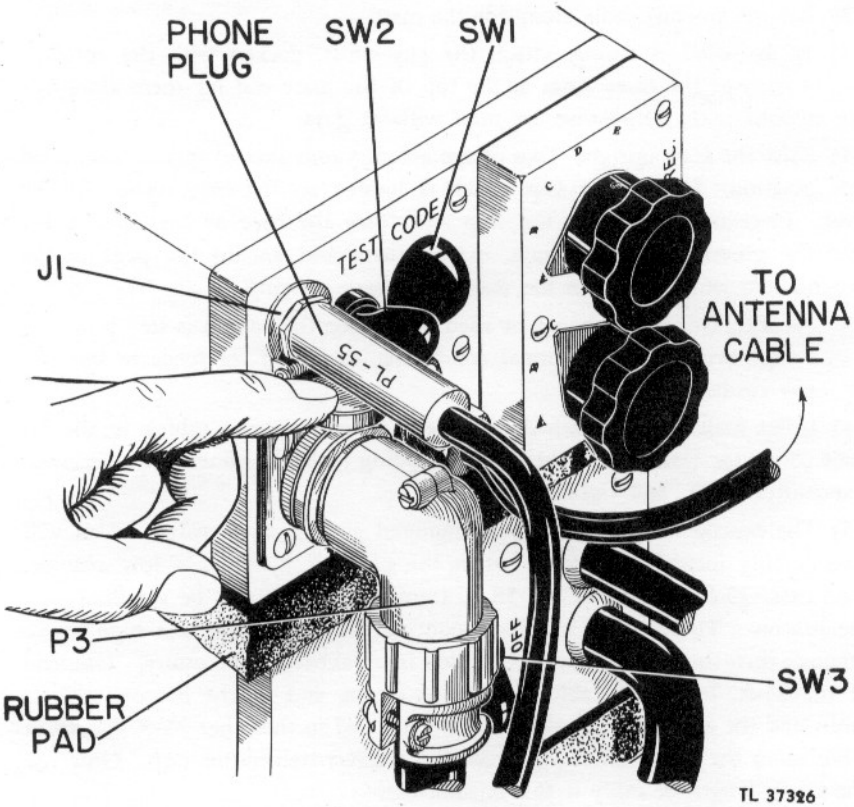

Figure 6. Method of connecting Headset HS-30-B to beacon.

b. To Test for Operation. (1) Hold down the TEST switch for a second. A rushing noise should be heard in the headphones. If no rushing noise is heard in the headphones, check the following points carefully:

(*a*) The longer wire from the power supply must go to the positive (+) terminal of the storage battery.

(b) See that the headphone plug is secure in the jack.

(c) Be sure the antenna connection is tightly fastened.

(d) Check the power-supply connection on the panel of the receiver-transmitter component.

> CAUTION: Do not hold down TEST switch for more than a second at a time. Do not operate it more often than necessary. Prolonged or excessive testing may damage the transmitter tube.

(2) If a rushing noise is heard in the headphones when the TEST switch is held down, the beacon is in operating condition.

7. TO CHECK RECEIVER-TRANSMITTER FOR FREQUENCY ADJUSTMENT.

a. General. The receiver and transmitter of the beacon must each be capable of operating at any one of five preset frequencies. Before being packed for use on a mission, the beacon must be carefully checked at each of these frequencies and, if necessary, the frequency-selector mechanism must be readjusted.

b. Description of Test Equipment. In order to check frequencies, Signal Generator I-196-B, Frequency Meter BC-906-D or BC-906-E, and Headset HS-23 (with Cord CD-307-A attached) are required. The signal generator and frequency meter are a part of Test Equipment IE-46-B.

(1) Signal Generator I-196-B (see fig. 8) has a single frequency range and is tuned by one knob. It covers the frequencies used by Beacon Transmitter-Receiver *AN/PPN-1A in the section of the tuning scale between the markings HI and RE. A control is provided to vary the pitch of the audio tone emitted. It is powered by self-contained dry batteries.

(2) Frequency Meter BC-906-D or BC-906-E is used for accurately measuring the frequency of the beacon transmitter and the frequency of Signal Generator I-196-B. The frequency meter has a single dial. It is powered by self-contained dry batteries. (Fig. 7).

(3) Headset HS-23 (with cord CD-307-A) is required for use with Signal Generator I-196-B and with Frequency Meter BC-906-D or BC-906-E. Note that this is not the same type of headset and cord furnished for use with Beacon Transmitter-Receiver *AN/PPN-1A.

c. Frequencies. The TRANS and REC controls located on the beacon panel are each provided with five tuning positions lettered *A, B, C, D,* and *E.* The beacon must be tuned so that these five letters will correspond to the frequencies listed in the following table:

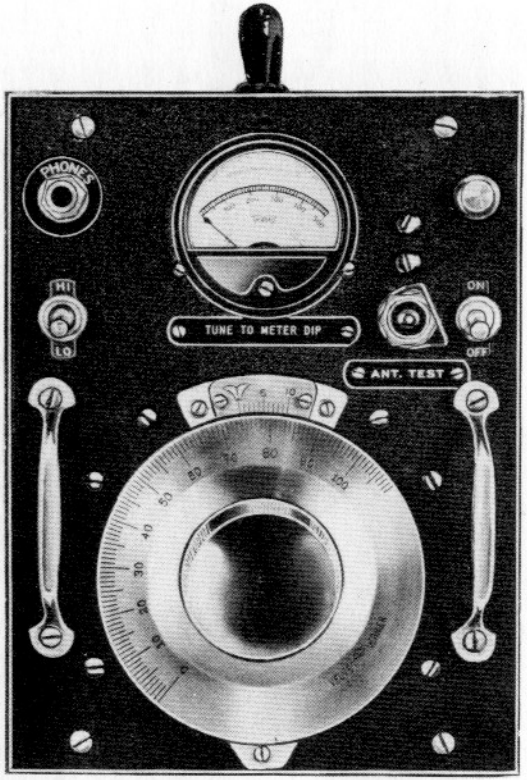

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Figure 7. Frequency Meter BC-906-D.

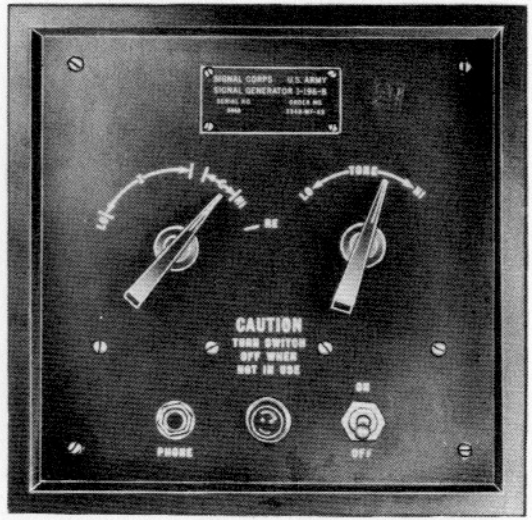

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Figure 8. Signal Generator I-196-B, panel view.

TABLE IV

Channel	*A*	214 mc
"	*B*	219 mc
"	*C*	224 mc
"	*D*	229 mc
"	*E*	234 mc

d. Frequency-Selector Mechanism. The details of the selector mechanism are explained in paragraph 27, where the method of adjusting it is described. For the present tests, it is necessary to know only that the shaft controlled by a REC or a TRANS knob is fitted with a detent or "click" device. As the shaft is rotated, it will seat itself or lock at each of the five positions determined by the detent stops. The operator must exert extra force to turn the knob past one of the seating points. Thus, the position of a knob for each frequency is definitely fixed.

e. Precautions. The following precautions shouid be observed when checking the frequencies of Beacon Transmitter-Receiver *AN/PPN-1A.

(1) The beacon's own case must be in place on Receiver-Transmitter *RT-44/PPN-1A and the two thumbnuts that hold it must be tightened securely.

(2) During all tests, the settings of the REC and TRANS knobs on the beacon must be separated by at least one letter, preferably two letters. For instance, when the receiver is being checked with the REC knob in position *A*, the TRANS knob can be set in positions *C*, *D*, or *E* only; not in positions *A* or *B*.

(3) The beacon and the test equipment should be set up in an open area away from obstructions.

(4) Both the beacon and the test equipment should warm up for at least 15 minutes before a frequency check is attempted.

(5) During the tests, no one within 10 feet of the test equipment or the beacon antenna should move about.

(6) Since this equipment operates in conjunction with airborne equipment, successful performance depends upon accurate adjustment of the frequencies of both equipments. If possible, the airborne equipment and the beacon should be checked by the same frequency meter. This will reduce the effects of error in the calibration of the frequency meter. Maximum range will be obtained when the airborne- and beacon-equipment frequencies correspond exactly.

f. Preparation of Test Equipment. (1) Turn on Signal Generator I-196-B.

(2) Plug Headset HS-23, with Cord CD-307-A attached, into the PHONE jack of the signal generator and listen for the characteristic operating tone.

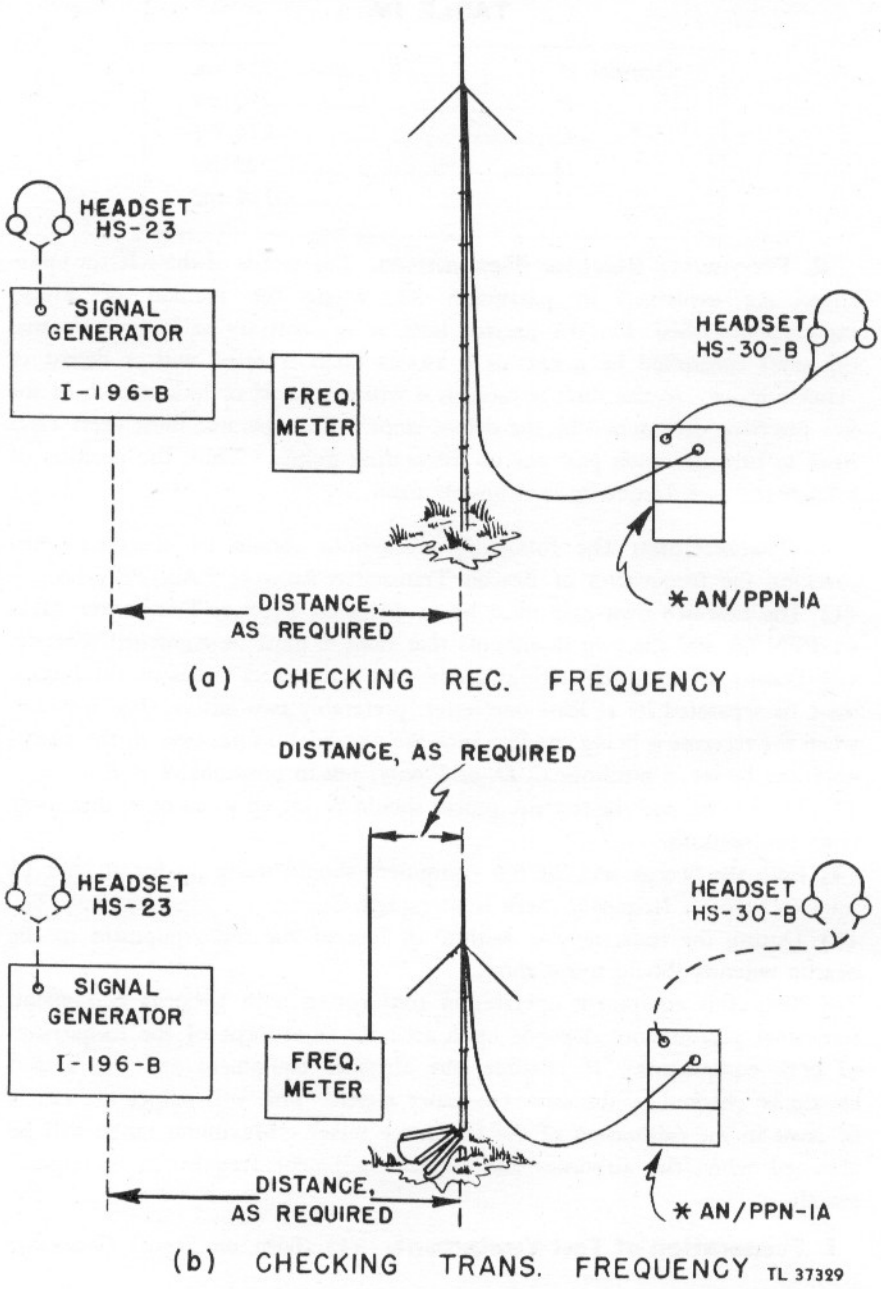


Figure 9. Method of using Signal Generator I-196-B and Frequency Meter BC-906-D or BC-906-E to check frequencies of beacon.

Set the tuning knob to a position midway between the HI and RE limits of its scale. Adjust the tone control to obtain a tone of approximately 500 cycles per second.

(3) With the signal generator operating, place Frequency Meter BC-906-D or BC-906-E in a horizontal position so that the antenna of the frequency meter lies close to but not touching the case of the signal generator. Turn the frequency meter on, and place its HI-LO switch in the HI position.

(4) Rotate the dial of the frequency meter until a dip is observed on the MICROAMPERES DC meter. This will indicate that the signal generator and frequency meter are operating normally.

(5) Repeat the above procedures for a number of different settings of the signal generator in the HI-RE range to make certain that the signal generator and frequency meter are operating over the entire range of frequencies covered by the beacon.

g. Checking Receiver. The following procedure is for setting and checking channel *A*. Set up the beacon and the test equipment as shown in figure 9*a*.

(1) Obtain information from the calibration chart of the Frequency Meter BC-906-D or BC-906-E as to the settings of the dial of the frequency meter that correspond to the five frequencies listed in paragraph 7*c*.

(2) Set the TRANS knob on the beacon to *E* and the REC knob to *A*.

(3) Adjust the dial of the frequency meter to the setting corresponding to frequency *A*. Rotate the dial of the signal generator until a dip is observed on the MICROAMPERES DC meter of the frequency meter. When carefully tuned to the position that gives the maximum dip on the meter, the signal generator is on the frequency indicated by the frequency meter, provided that the frequency meter is not picking up a signal transmitted by the beacon. Although this condition is not likely, it can be checked by turning the beacon's ON-OFF switch to OFF momentarily. If the frequency meter continues to respond, it is not picking up the beacon signal.

NOTE: This same procedure applies to the setting of the signal generator for any other required frequency.

(4) Place Headset HS-30-B on the ears, plug the cord into the phone jack of the beacon, and listen for the sound of the signal transmitted by the signal generator. If no sound is heard, the signal may be too weak, the beacon may be out of tune, or the beacon may be defective. Try moving the signal generator closer to the beacon antenna; also try tuning for the signal by carefully rotating the REC knob over a small arc. If no signal can be obtained, the beacon should be considered defective.

(5) Let a second person switch the signal generator ON and OFF a number of times. Each time it is turned off, the signal in the headphones should stop.

If the signal continues after the signal generator is switched OFF, an extraneous signal is being received, and the operator should retune for the correct signal.

(6) While listening to the signal, check to see that the beacon responds best when the REC knob is seated in the *A* position as fixed by the frequency-selector mechanism. Carefully rotate the REC knob over a small arc and observe the points at which the tone disappears. The seated position of the knob should be at the midpoint of the tone. If it is not, the frequency-selector mechanism must be readjusted in the manner described in paragraph 27.

NOTE: Should the tone be heard over too large a travel of the REC knob, move the signal generator away from the beacon antenna until the tone is heard over only a narrow range.

(7) After the *A* setting has been verified, check the frequency of Signal Generator I-196-B with Frequency Meter BC-906-D or BC-906-E.

(8) Repeat the above-outlined procedure for each of the remaining four settings of the REC knob.

NOTE: When checking the *D* and *E* positions of the REC knob, the TRANS knob must be set at *A* or *B*.

h. Checking Transmitter. The following procedure is for checking and setting transmitter on channel *A*.

(1) Dismantle the antenna mast of the beacon until only a few sections remain. Then temporarily mount the top sections of the antenna at approximately the same height as the frequency meter antenna (fig. 9*b*).

(2) Place Frequency Meter BC-906-D or BC-906-E so that its antenna is vertical and about 18 inches away from the antenna of the beacon. This distance may be varied later to give a workable dip on the meter while tuning.

(3) Set the REC knob to position *E* and tune Signal Generator I-196-B until a signal is received as indicated by a steady tone in the beacon headphones.

(4) Set the TRANS knob to position *A* and then tune the dial of the frequency meter until a dip is observed. Adjust the distance between the beacon antenna and the frequency meter antenna until a dip of several divisions is obtained on the MICROAMPERES DC meter.

(*a*) It may be necessary to adjust the tone control on the signal generator to obtain a higher-pitched tone before sufficient indication on the frequency meter is noticed. However, the two antennas should be separated by at least 1 foot, if possible.

(*b*) If the dip is obtained over too wide a range of the frequency-meter dial, separate the two antennas.

(5) The frequency-meter dial reading obtained in step (4) should be noted

and compared with the correct frequency-meter dial setting for the *A* frequency. If the TRANS frequency is not correct, the frequency-selector mechanism must be adjusted in the manner described in paragraph 27.

(6) Repeat the procedure outlined above for each of the remaining four TRANS positions.

NOTE: When checking the *C, D,* and *E* positions of the TRANS knob, the REC control should be in position *A*. Change the tuning of Signal Generator I-196-B to give an output signal in the headphones of the beacon.

8. INSTALLATION AND REMOVAL OF DESTRUCTOR.

IMPORTANT NOTE: Do not install destructor unless beacon is to be used immediately on a tactical mission. The destructor used to destroy the beacon is contained in a long, thin, pencil-like tube inserted in the center of the receiver-transmitter chassis. It is held in place by a wire spring. A length of wire, attached to the inside of the DEST cap, fires the fuse when the wire is jerked out of the set.

a. To Insert a Destructor (fig. 10).

CAUTION: Great care should be exercised not to pull on the wire attached to the destructor. Any strain placed upon this wire is likely to fire the explosive!

(1) Unscrew the red DEST cap from the back of the receiver-transmitter unit. Remove the small wire spring by pinching the exposed ends together and then lifting the spring out of the cylindrical compartment of the component.

(2) Slip the beaded end of the destructor wire under the small metal flap inside the DEST cap and press the flap down *firmly,* thus securing the beaded wire to the inside of the red cap.

(3) Slip the destructor into the cylindrical compartment of the receiver-transmitter.

(4) Insert the wire spring, with the square end downward, into the destructor compartment (fig. 10*b*.). Pinch the ends of the spring together so that the small loops fit completely inside the rim of the extended portion of the compartment.

(5) Release hold on the spring. The loops should now press against the inside of the rim.

(6) Screw the red DEST cap on securely.

CAUTION: THE DESTRUCTOR IS NOW READY FOR USE. DO NOT REMOVE THE RED CAP UNLESS PREPARED TO DESTROY THE BEACON. IT IS SAFE AS LONG AS THIS RED CAP IS NOT REMOVED.

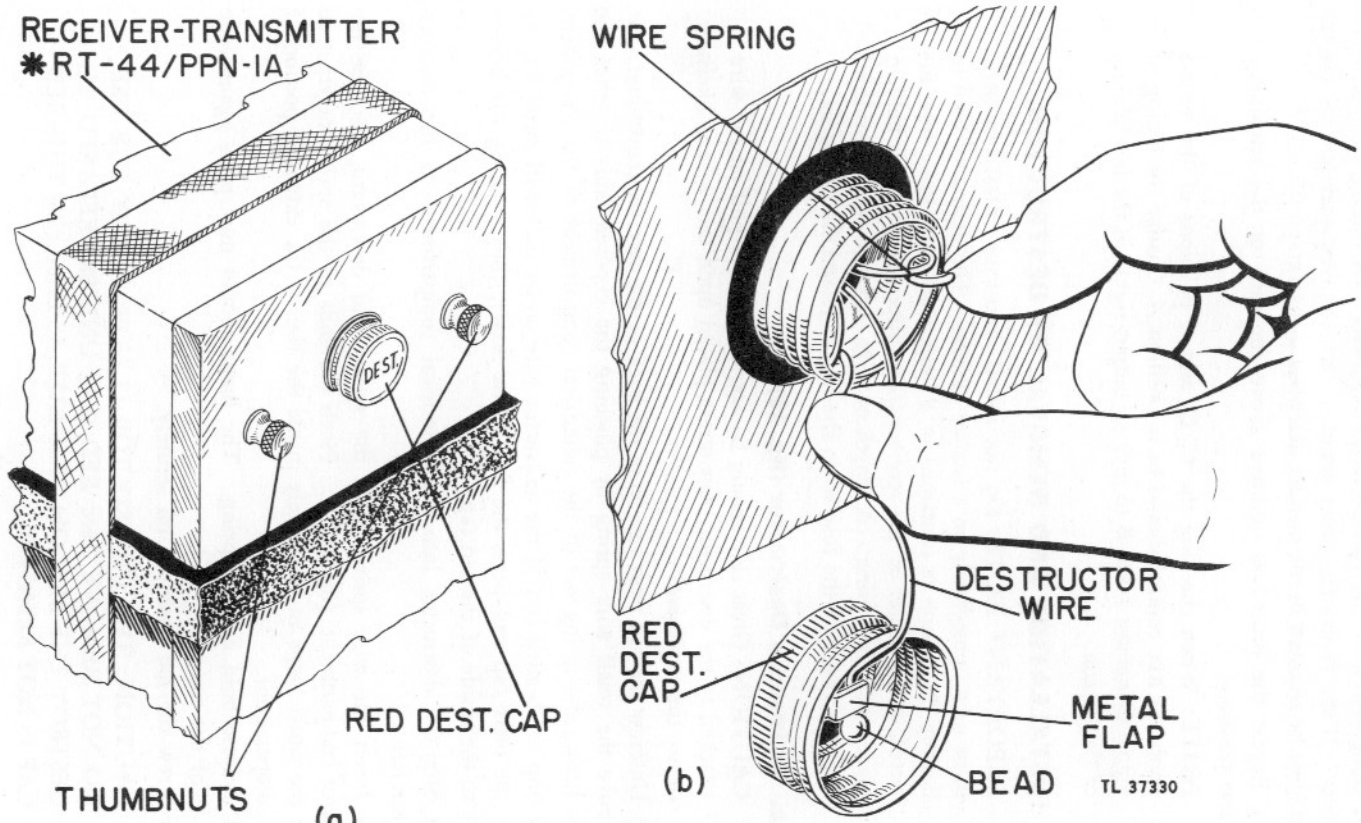


Figure 10. Method of installing (or removing) live destructor.

b. To Remove a Live Destructor (fig. 10). Under certain conditions, it may become necessary to remove a live destructor. To do this effectively and safely, proceed as follows:

(1) Carefully unscrew the red DEST cap.

CAUTION: DO NOT PLACE ANY STRAIN ON THE ATTACHED WIRE OR FORCE IT IN ANY WAY. SUCH ACTION MAY FIRE THE EXPLOSIVE.

(2) Grasp in the fingers the ends of the spring that are visible inside the rim of the opening. Squeeze the ends together. Be careful not to get the spring entangled in the wire attached to the explosive. Carefully lift the spring out of the destructor compartment.

(3) When the spring has been removed, turn the beacon upside down so that the destructor will slide out into the hand.

(4) The destructor is safe to handle, and no cause for alarm should exist when it becomes necessary to work with it. This explosive destructor can only be fired by pulling the wire fuse out of the detonator. No damage can occur as long as this wire is not pulled.

AT NO TIME SHOULD ANY STRAIN BE APPLIED TO THE DESTRUCTOR WIRE.

9. PACKING FOR OPERATION IN THE FIELD.

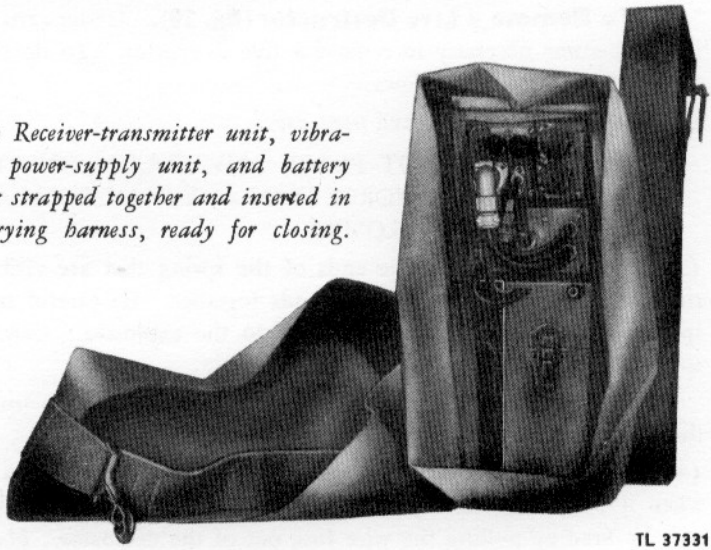
a. Receiver-Transmitter, Power Supply, and Storage Battery (1) Turn the ON-OFF switch on the power supply unit to the OFF position, and disconnect the antenna cable and headphones from the receiver-transmitter.

(2) Strap the components together as they were before removal from the carrying case and place the entire unit in the case with the controls facing out. Make sure that the fume vent on the battery box fits into the vent hole in the carrying case. (See fig. 11).

b. Headphones. Place headphones and connecting cord in the small cloth bag and slip the bag into the compartment alongside the battery box. Pack the carrying strap in the phone compartment, also.

c. Antenna. (1) Fold antenna and mast into sections. If mast is erected, start with the *top* section and pull lengths just far enough apart to fold each section back against the next. Always dismantle the mast by starting with the top section.

(2) Fold the antenna cable into loops about 15 inches in length, and place in compartment alongside the mast. Disconnect the guy cords from the mast, wrap them around the ground stakes, then stow cords and ground stakes with



(a) Receiver-transmitter unit, vibrator power-supply unit, and battery box strapped together and inserted in carrying harness, ready for closing.

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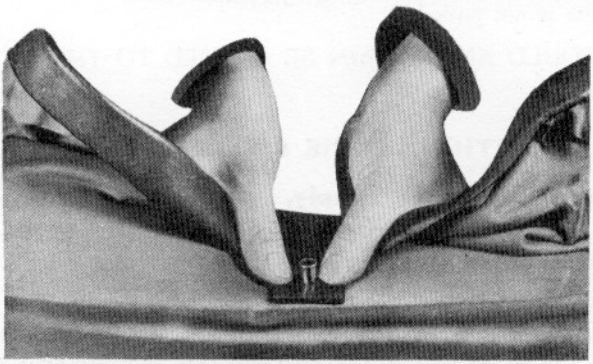

(b) Push fume vent on battery box through vent holes in harness.

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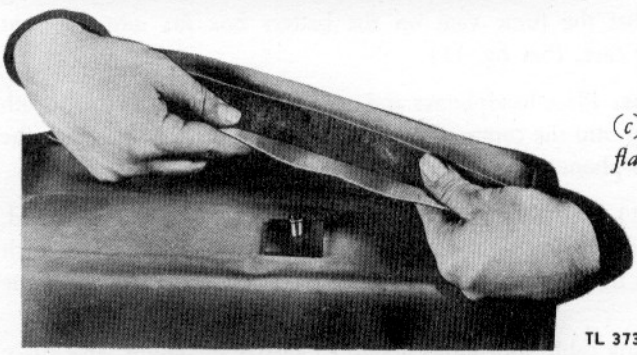

(c) Match edges of flap and fold over.

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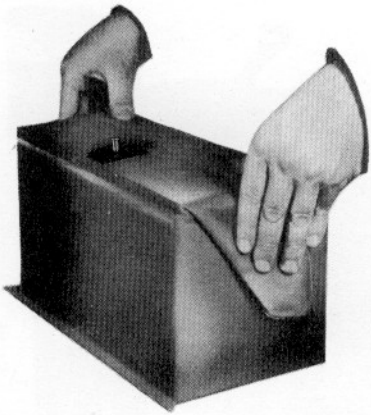
*Figure 11 (a, b, and c). Method of packing Beacon Transmitter-Receiver *AN/PPN-1A in carrying harness (rubber).*

(d) Fold down ends of flap.



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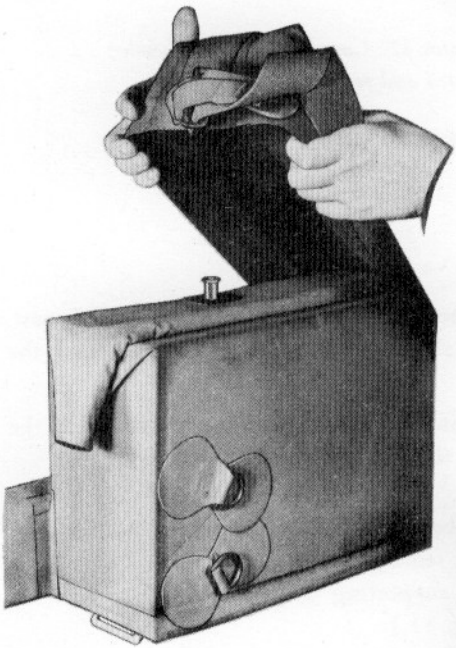

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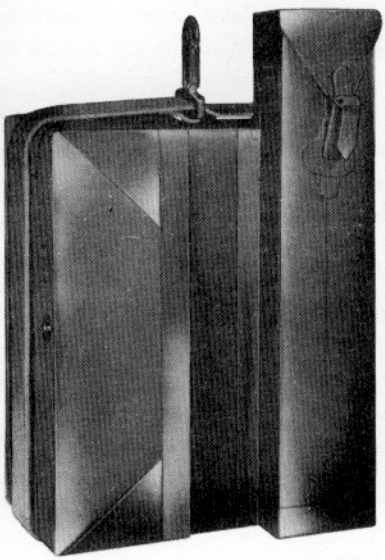
(e) Place front of harness over folded flap and fasten supporting strap through buckle.



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(f) Carrying harness with beacon and antenna packed ready for carrying in the field.

*Figure 11 (d, e, and f). Method of packing Beacon Transmitter-Receiver *AN/PPN-1A in carrying harness (rubber).*

Figure 12. Carrying harness (fabric) closed and ready for carrying.

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the antenna assembly. Never wrap the antenna cable around the folded mast. Avoid sharp bends. Extra caution should be observed when handling the cable in cold weather.

(3) Place folded antenna assembly in long compartment on the side of the carrying bag, with the top section of the antenna pointing downward.

d. Carrying Case. Fold the rubber apron of the carrying harness and tuck in the ends, as it was before the removal of the components. Pull up the front of the harness and fasten the supporting strap through the buckle at the side of the carrying case. (See fig. 11.)

e. Attachment to Parachute Harness (figs. 11f and 12). A large snap hook is attached to the supporting strap and is located at the top of the carrying case. By means of this snap hook, the paratrooper attaches the carrying case to his parachute harness so that the case rests along his right side under the arm. A strap, which can be attached to the bottom of the case, fits over the paratrooper's leg and prevents the bag from swinging during a descent.

SECTION III
FUNCTIONING OF PARTS

---

10. THEORY OF OPERATION. The theory of operation and functioning of the individual parts of the responder-beacon is as follows (figs. 13 and 30). In operation, a radio-frequency pulse signal from the airborne interrogator *AN/APN-2 is received by the antenna of the receiver-transmitter. This signal is fed through the 50-ohm transmission line to the radio-frequency amplifier stage (V-1) of the receiver-transmitter. This stage is tuned (L-1, C-1 to the center of the band (224 megacycles) and is heavily damped by (R-1), so that its selectivity causes a loss of only 3-4 decibels at the edges of the band. The plate load of this stage is the super-regenerator tank circuit (L-3, C-47).

11. SUPER-REGENERATION. The super-regenerator (V-2) is grid-quenched. The quench-frequency voltage (465 kilocycles) is produced by the quench oscillator (V-8). Bias for the super-regenerator is produced by the voltage divider (R-5, R-6) and by the AGS system, described in paragraph 16. The bias produced is sufficient to operate the tube just below the limit of oscillation. Positive peaks of the quench voltage on the grid will then cause the tube to oscillate. Operation is such that before the oscillation builds up to an overload condition, the quench voltage becomes negative and stops the oscillation. When a signal voltage is introduced, the oscillation starts earlier in the quench-frequency cycle and hence builds up to much greater amplitude before it is again stopped. As a result, the r-f voltage appearing across the tank circuit is proportional to the signal in the tank at the time the oscillation started. This voltage occurs at a quench-frequency rate. When no signal is being received, the voltage varies only with the noise present. When a radio-frequency pulse signal is received, the voltage increases in proportion to the strength of the signal.

12. DETECTOR. This signal is then detected in V-3 which is a type 9002 tube, the grid and cathode of which are used as a diode. The unused plate of V-3 is grounded through R-35 to prevent its building up a charge. The detected signal appearing across the diode load (R-9) consists of a pulse corresponding to the received pulse and noise pulses occurring at a quench-frequency rate.

13. MULTIVIBRATOR. This detected pulse is then fed to the single-step multivibrator. This consists of the pulse amplifier (V-4) and the cathode follower (V-9).

14. CATHODE FOLLOWER. The cathode follower is used to provide a low-impedance modulator for the transmitter. It consists of the screen grid, control grid, and cathode of a type 9001 tube. A load is also provided in the plate circuit (R-27). A received pulse appears at the diode load as a negative pulse; this then becomes a positive pulse at the plate of the pulse amplifier and also at the cathode follower. On the plate of the cathode follower, it is negative. This negative pulse is fed to the grid of the pulse amplifier through C-11, reinforcing the signal already present. In this manner tubes V-4 and V-9 act as a multivibrator circuit. The pulse is made to stop after a single step, by biasing the cathode follower grid beyond cut-off. The duration of the pulse produced by the multivibrator is determined in the pulse-amplifier grid circuit (C-11, R-10, R-11). Increasing the resistance in this

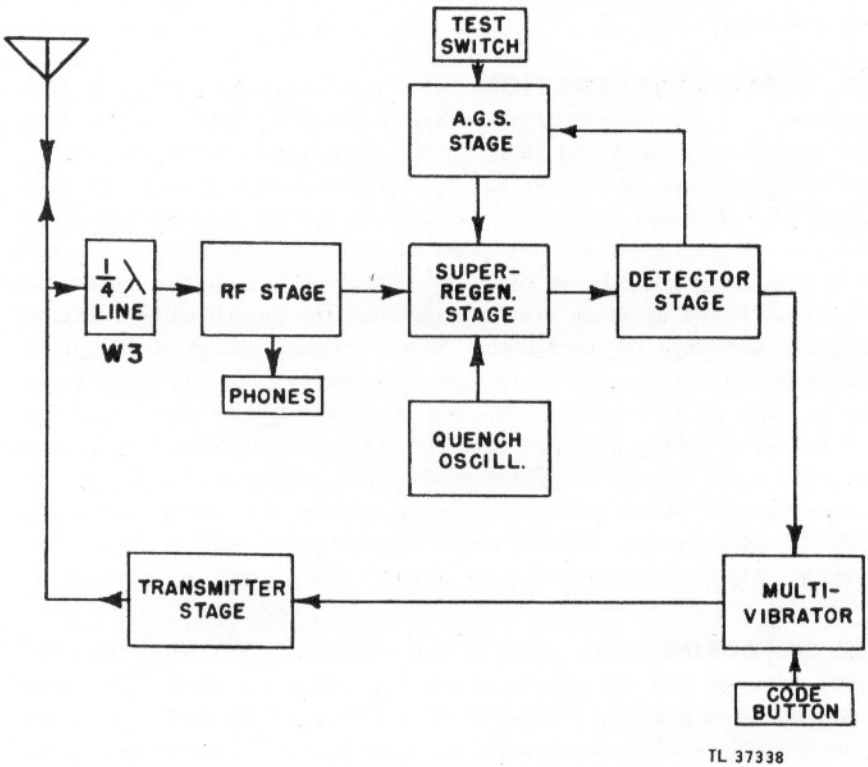


*Figure 13. Beacon Transmitter-Receiver *AN/PPN-1A, block diagram.*

circuit, by operating the CODE switch (SW-1), produces the long pulses for coding the beacon.

15. TRANSMITTER. The multivibrator output (positive pulse) is taken from the cathode of the cathode follower, directly connected to the grid of the transmitter (V-10). This tube is biased beyond cut-off, so that it oscillates only when a positive pulse is applied to its grid. Bias is developed across resistors R-29 and R-30 by the quench oscillator. Approximately —50 volts are produced in this manner, half being used to bias the multivibrator and half to bias the transmitter. The transmitter output is coupled to the transmission line through the variable capacitor C-29. Because a common antenna is used for transmitting and receiving, some means must be provided to avoid absorption of the transmitter power by the receiver circuits. This is accomplished by using a quarter-wavelength line between the transmitter and the r-f amplifier stage. When the transmitter is in operation, a strong signal is applied to the grid of the r-f amplifier. This causes the tube to draw grid current, thus presenting a very low impedance at the grid. This impedance appears still lower at the point where the line is tapped on the grid circuit. Because of the impedance transformation of a quarter-wave line, this grid circuit appears as a high impedance to the transmitter and therefore reduces the amount of power absorbed by the receiver circuit. Owing to the rectifying action of the r-f amplifier described above, an a-f pulse voltage appears across its cathode bias resistor R-7. By connecting the headphones across this resistance, a signal is heard when the transmitter is operating, thus giving an over-all check of the operation of the beacon. Since the voltage for the wide coding pulse is greater, an operator can determine by the sound whether he is coding the beacon correctly.

16. AUTOMATIC GAIN STABILIZATION (AGS) SYSTEM.

Within limits, this system compensates for variations in tube characteristics, circuit element tolerances, and variation in supply voltages. The AGS system operates on the noise voltage which appears at the diode load (R-9). This voltage is amplified in the pulse amplifier stage. It is then fed to the AGS amplifier (V-5), which has a plate load tuned to quench frequency by C-15 and L-4, and damped by R-28. The signal developed across the tuned circuit is rectified in the diode (V-6). The d-c voltage produced is filtered (R-19, C-18) and applied as negative bias between the grid and cathode of the d-c amplifier (V-7). From the cathode of the d-c amplifier, d-c voltage is applied to the grid of the super-regenerator. Operation of the AGS system is as follows: If the noise output of the super-regenerator increases above normal value, it will appear as an increase in amplitude of the 465-kc signal at the output of the AGS amplifier, and when this signal is rectified by the diode, it

will increase the bias on the d-c amplifier. This, in turn, causes less current to flow through this tube and makes its cathode less positive. The cathode is connected to the grid of the super-regenerator so that the effect is to increase the bias on this stage, which then reduces its output. Conversely, if the super-regenerator output decreases, the effect of the AGS system will be to reduce its bias. For checking the receiver-transmitter in the absence of an interrogating signal, a test key is provided which grounds the screen of the AGS amplifier, causing the bias on the super-regenerator to be decreased. This increases its output and the multivibrator fires on noise pulses. This is heard in the phones as a hissing or rushing sound.

17. POWER SUPPLY. The wiring diagram of the power supply is shown in figure 32. Radio-frequency filtering is provided by pi-section filters on the vibrator leads, and on the battery input and transformer output leads. In order to obtain the full value of this filtering, the filter elements are shielded, and ceramic feed-through capacitors are used where the leads go through the shields. A 6-volt synchronous vibrator is used to eliminate the additional power required by a rectifier tube. Nonpolarized electrolytic capacitors are used for low-frequency filtering to reduce the size and weight which would result from the use of paper capacitors. The voltage at the filter output is 260 volts at 30-ma drain. Voltage is also taken off at the input to the low-frequency filter for the transmitter stage; the voltage at this point is about 280 volts.

18. BATTERY. The battery is made up of three Willard cells, AN type BB-210/U, which are delivered partially dry-charged. With the addition of the electrolyte, the battery takes on a partial charge. The useful operating life of the fully charged battery is approximately 6 hours.

> IMPORTANT NOTE: If the battery is operated in the partial-charge condition (electrolyte added without supplementary charge), its useful life before needing a charge is limited to 6 hours.

19. ANTENNA AND MAST. The antenna is a vertical quarter-wave radiator with two trap rods called counterpoises mounted on top of a collapsible mast about 8 feet high. The antenna is normally connected to the receiver-transmitter by a 12-foot length of 50-ohm RG-58/U coaxial transmission line.

20. WATERPROOFING. The receiver-transmitter unit is sealed by a neoprene gasket inside the front panel. Into this gasket the front edge of the case is forced when the two thumbnuts on the back are tightened. Neoprene gaskets are provided under the power connector and other panel mountings. The power supply also is protected from moisture by neoprene gaskets. This insures against rain leakage, but does not make the units submersionproof.

SECTION IV
MAINTENANCE

21. GENERAL PROCEDURE.

a. It is highly important that Beacon Transmitter-Receiver *AN/PPN-1A be maintained in condition for immediate operation. An individual group of running spares is supplied with each shipment of three beacons and these spares constitute the most essential replacements. In addition, sufficient depot spares will be supplied to meet the requirements for service and repair[a].

However, in areas where no depot spare parts are available, it may be necessary to resort to *cannibalizing*, which means using the serviceable parts of a damaged beacon to make repairs on another. In this manner, beacons damaged beyond repair may yield enough operating parts to rebuild another completely. Paragraphs 28-36 provide the basic information necessary to service Beacon Transmitter-Receiver *AN/PPN-1A and to perform cannibalizing maintenance if the occasion should warrant (figs. 14-32).

b. The replacement of parts in the beacon may seriously disturb the frequency and tuning adjustments, requiring realignment of the transmitter and receiver and necessitating other detailed measurements. A description of the basic testing procedures necessary for adjusting the beacon appears in paragraphs 22-26.

These include:

(1) Procedure for Measuring Sensitivity (par. 23).
(2) Procedure for Measuring Receiver Bandwidth (par. 23*b*).
(3) Procedure for Measuring Power Output (par. 24).
(4) Procedure for Measuring Recovery Time (par. 25).
(5) Procedure for Measuring Frequency (par. 7).

22. DESCRIPTION OF TEST EQUIPMENT.

a. The following test equipment is required to service properly the components of the beacon.

(1) Test Equipment IE-45.
(2) RCA oscilloscope 158 or equivalent.

[a] Depot spares are not being supplied concurrently with initial procurement of *AN/PPN-1A.

(3) General Radio signal generator type 804-B or equivalent, modified for pulse modulation. (This is referred to hereafter as Signal Generator GR-804-B.)

b. In addition, Signal Generator I-196-B and Frequency Meter BC-906-D or BC-906-E must be used whenever frequencies are to be measured. This equipment was described in paragraph 7*b*.

c. Test Equipment IE-45 is used to make power-output, receiver-sensitivity, pulse-width, and other detailed measurements, and consists of the following components:

(1) Modulator BC-1203 furnishes the following outputs:

(*a*) A fixed modulating pulse of approximately 10 microseconds duration, 250 volts amplitude, and repetition rate of 200-3,500 pulses per second. This pulse may be controlled by a switch on the modulator panel.

(*b*) A sliding modulating pulse of the same character as the fixed pulse except that it can be delayed up to 600 microseconds from the fixed pulse. These two pulses are available at one plug for connection to the signal generator.

(*c*) A timebase sweep voltage that is applied to the horizontal plates of RCA oscilloscope 158 or equivalent. This timebase sweep starts with the fixed modulating pulse, and three sweep frequencies are provided: 150, 400, and 700 microseconds.

(*d*) Marker pulses spaced 50 microseconds apart to permit calibrating the timebase sweep.

(*e*) A d-c voltage which may be applied to the cathode circuit of the rectifier tube in Diode Coupling Head BC-1201. This application affords a method of measuring the power output of the transmitter.

(2) Diode Coupling Head BC-1201 comprises a diode peak-rectifier circuit for rectifying the r-f output pulses of the beacon. Provisions are made for interconnecting Signal Generator GR-804-B, the beacon, the vertical deflection plates of RCA oscilloscope 158, and the marker-pulse circuit from Modulator BC-1203. The r-f impedance of the signal generator and the diode head in parallel is 50 ohms. A toggle switch is provided so that either a 1-megohm resistor or a 4,700-ohm resistor can be selected as the diode output. The 1-megohm resistor on the bias position is used for measuring power output by adjusting the DIODE BIAS control on the modulator unit until the pulse just disappears. The 4,700-ohm marker position is used to measure pulse widths and to observe the shape of the transmitted pulse. The marker pulses at 50-microsecond intervals are visible on the oscilloscope screen when the diode switch is in the MARKER position.

23. PROCEDURE FOR MEASURING SENSITIVITY. Before measurements of beacon sensitivity can be made, the REC and TRANS frequencies must be checked and, if necessary, readjusted. Methods of checking receiver frequencies are given in paragraph 7. The readjusting procedure will be found in paragraph 27.

a. Connect the beacon to Test Equipment IE-45 as shown in the block diagram figure 14, using Test Adapter Cord *CX-107/PPN-1A supplied in the beacon running spare parts.

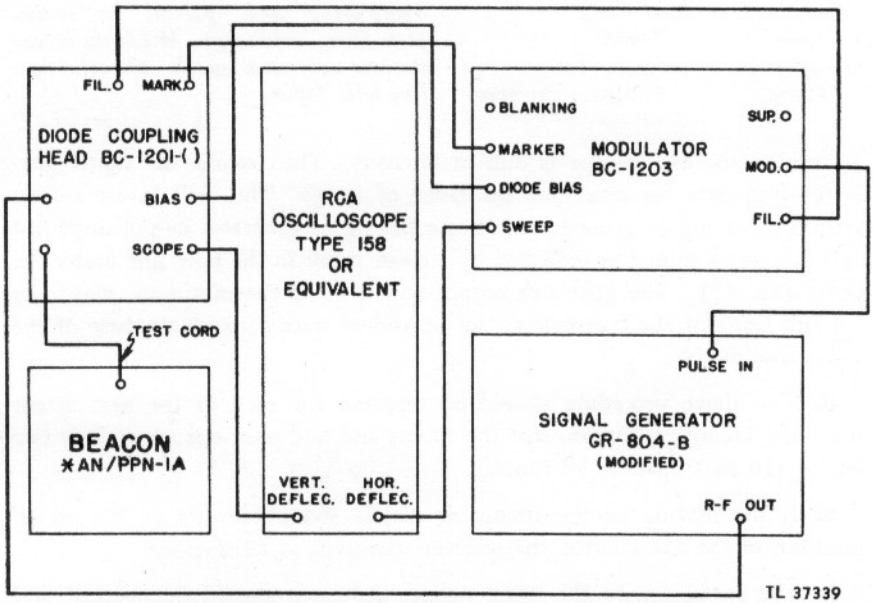


*Figure 14. Test Equipment IE-45 showing method of making connections to Beacon Transmitter-Receiver *AN/PPN-1A for making power output, sensitivity, and other measurements.*

b. Turn on the beacon, Signal Generator GR-804-B, and modulator and allow them to warm up for approximately 15 minutes. Set the signal generator to give several millivolts at approximately the desired frequency as determined from its calibration data.

c. Set the repetition rate of Modulator BC-1203 to 500 pulses per second. Calibrate the signal generator by throwing the CAL-USE switch to the CAL position and the toggle switch on the signal generator to PULSE. Adjust the carrier control to give a carrier meter reading of 100%. Return the CAL-USE switch to USE. Throw the FIXED PULSE switch on the modulator to the OFF

position. Set the REC control to the detent position desired and the TRANS control to any position at least two letters removed from the receiving setting. Carefully tune the signal generator until a single pulse of the largest possible amplitude appears on the oscilloscope. The toggle switch on the DIODE HEAD should be in the BIAS position (the position that will give a sloping trailing edge to the pulse). Reduce the signal generator signal output until the pulse

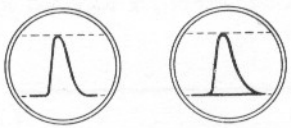


Figure 15. Oscilloscope pulse patterns for "full firing" and "partial" or "incomplete firing" of beacon. When the beacon misfires only occasionally, the solid base line will flicker.

as seen on the oscilloscope is dim in intensity. Then retune the signal generator frequency for maximum brilliance of image. This will insure correct frequency setting of generator. Increase the signal generator output until just full firing is obtained as indicated by a clean break in the base line under the pulse (fig. 15). The generator output will then be the maximum sensitivity for full firing of the transmitter. An occasional trace through the base of the pulse is allowable.

d. The above procedure should be repeated for each of the REC detent positions, taking precautions that the TRANS and REC positions are at least two letters (10 mc) apart at all times.

e. If the reading on the attenuator dial is 300 microvolts or less on all positions of the REC control, the receiver sensitivity is satisfactory.

f. The reading with the CODE button depressed should be checked and should be substantially the same as with the normal or narrow pulsing.

g. If the reading is higher than 300 microvolts, the beacon is not sufficiently sensitive and should be checked for possible defects.

h. Bandwidth Measurement. After setting up the receiver for maximum sensitivity, the bandwidth may be measured in the following manner:

(1) Double the r-f signal output (example: If sensitivity reading is 300 microvolts increase output to 600 microvolts). The image as seen on the oscilloscope should be of maximum brilliance, i.e., full firing, as indicated by a clean break in the base line under the pulse (see fig. 15).

(2) Turn the GR-804-B frequency control slowly clockwise until the pulse begins to reduce in intensity, and an occasional misfire is seen. Note the frequency at which the set begins to misfire. Rotate frequency control counter-

clockwise and note frequency at which set begins to misfire. The bandwidth in megacycles is the difference between these two frequencies.

24. PROCEDURE FOR MEASURING POWER OUTPUT. Before measuring power output of the beacon, determine that the transmitter frequency is correct. Checking methods are described in paragraph 7; for readjustment procedures, see paragraph 27. Follow the same method outlined in paragraphs 23*a* and 23*b*. Set the TRANS control to the desired position and the REC control to a position at least two letters distant. Adjust the signal generator tuning and attentuator to give full firing of the transmitter.

a. Place the toggle switch on Diode Coupling Head BC-1201 in the BIAS position so that a pulse with a sloping trailing edge is seen on the oscilloscope. Advance the diode BIAS control on Modulator BC-1230 until the pulse on the oscilloscope just disappears. The bias required to blank out the pulse can be read directly from the diode bias dial. This d-c voltage is equal to the peak r-f voltage during the pulse appearing across the 50-ohm diode coupling head input impedance. The power output can be calculated from the following formula or obtained from the accompanying table.

TABLE V

POWER CONVERSION TABLE

Voltage	*Pulse power (watts)*	*Voltage*	*Pulse power (watts)*
10	1	21.0	4.5
14	2	22.5	5
16	2.5	23.5	5.5
17.5	3	24.5	6
18.5	3.5	25.5	6.5
20.0	4	26.5	7

NOTE: $P = \frac{E^2}{2 \times R} = \frac{E^2}{100}$, where E equals the diode-bias voltage, R equals the load resistance across which the peak voltage is measured (i.e., 50 ohms), and P is the pulse power in watts.

b. The above procedure should be repeated for each TRANS position, at all times keeping the TRANS and REC controls at least two letters apart.

c. The power output with the CODE button depressed (wide pulse) should be essentially the same as when in the normal position.

d. If the power output is less than three watts, the beacon should be checked for possible defects (see trouble chart, Table VII, pp. 42-44).

25. PROCEDURE FOR MEASURING RECOVERY TIME.

a. The recovery time of Beacon Transmitter-Receiver *AN/PPN-1A is measured with Test Equipment IE-45 interconnected as shown in figure 14.

b. Steps to be taken in making this test are:

(1) Determine the sensitivity of the receiver at the frequency desired, as described in paragraph 23.

(2) Throw the FIXED pulse switch on the Modulator BC-1203 to the ON position and set the signal generator attenuator to give a microvolt reading that is twice the number of microvolts obtained as the sensitivity reading.

(3) By adjusting the PULSE DELAY control on the modulator, move the sliding pulse towards the fixed pulse at the start of the time-base until full firing for the sliding pulse ceases.

(4) Throw the switch on Diode Coupling Head BC-1201 to the marker position and determine the separation of the fixed pulse and the sliding pulse in microseconds. Time is measured from a 50 per cent point on the trailing edge of the fixed pulse to the start of the sliding pulse. If the separation is not more than 100 microseconds, the recovery time is satisfactory.

26. PROCEDURE FOR MEASURING PULSE WIDTH.

Use the same procedure as outlined in paragraph 23 to obtain a pulse on the screen of RCA oscilloscope 158. The toggle switch on the diode head should be in the MARKER position so that the marker pulses and the correct shape of the transmitter pulse appear on the oscilloscope.

a. Compare the output pulse with the 50-microsecond spacing between the marker pulses. In this manner the pulse width in microseconds can be read.

b. Pulses should measure 7 to 11 microseconds for the normal pulse and 15 to 25 microseconds for the wide pulse. Depressing the CODE button produces the wide pulse.

27. FREQUENCY - SELECTOR ADJUSTMENT PROCEDURE.

When a check on beacon-receiver and beacon-transmitter frequencies shows that readjustment of one or more points on the frequency-selector mechanisms is required, proceed as follows (fig. 16):

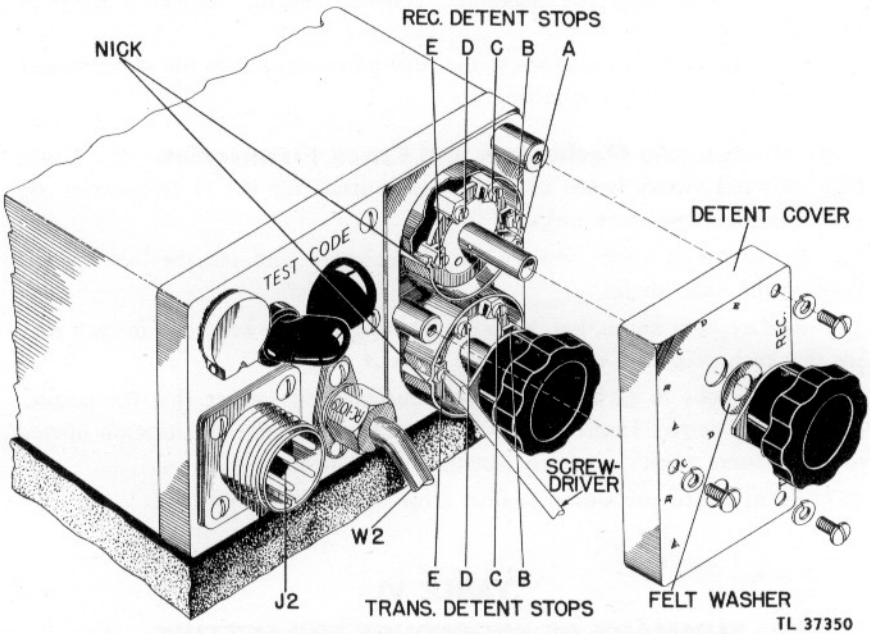


Figure 16. Exploded view of frequency-selector mechanism. (Note that TRANS *knob and screwdriver are shown in position for adjusting the detent stop for frequency E).*

a. Prepare Frequency Selector. The frequency-selector mechanism should be prepared for adjustment by removing the REC and TRANS knobs, taking off the detent cover, and then restoring the knobs.

b. To Readjust Receiver Frequencies. (1) Turn the REC knob until the detent stop corresponding to the frequency in question is seated in the nick of the detent housing.

(2) Loosen the detent stop screw with a small screwdriver.

(3) Using the frequency-checking method described in paragraph 7, adjust the REC knob until the tone heard in the headphones is centered between the two points at which the signal disappears.

(4) Tighten the detent stop screw and proceed in the same manner to readjust all other REC settings requiring it.

c. To Readjust Transmitter Frequencies. (1) Turn the TRANS knob until the detent stop corresponding to the frequency in question is seated in the nick of the detent housing.

(2) Loosen the detent stop screw with a small screwdriver.

(3) Using the frequency-checking method described in paragraph 7, adjust

the TRANS knob until the maximum response on the frequency meter is obtained.

(4) Tighten the detent stop screw and proceed to readjust in the same manner all other TRANS settings requiring it.

d. Reassemble Mechanism and Check Frequencies. (1) Turn both REC and TRANS knobs until the detent stops for the *A* frequencies are seated in their respective nicks.

(2) Remove both knobs, replace the detent cover, and put the felt washers back on the knob shafts.

(3) Replace both knobs, but, before tightening the two setscrews in each one, see that each pointer is exactly on the letter *A*.

(4) Turn knobs to each of the other four positions to see that the pointer indicates the correct letter. It may be necessary to change the location of one or more letters when completely resetting frequencies.

(5) As an added precaution against error, check all frequencies.

TABLE VI

SUMMARY OF PROCEDURE FOR SETTING TRANSMITTER AND RECEIVER FREQUENCIES

Receiver	*Transmitter*
Set up equipment in open area; allow set and test equipment to warm up for 15 minutes.	Set up equipment in open area; allow set and test equipment to warm up for 15 minutes.
Remove detent cover, felt washers, and knobs, and replace knobs on shafts.	Remove detent cover, felt washers, and knobs, and replace knobs on shafts.
Set TRANS detent to channel *E* and REC to channel *A* (by noting position of detent stops in fig. 16).	Set REC detent to channel *E* and TRANS to channel *A* (by noting position of detent stops in fig. 16).
Set BC-906-D to channel *A* frequency by referring to calibration chart.	Set BC-906-D to channel *A* frequency by referring to calibration chart.
Tune I-196-B for maximum dip in meter on BC-906-D.	Tune I-196-B for best signal in beacon headset.
Loosen channel *A* REC detent stop screw on set and turn REC knob until tone of signal generator is heard in phones. If signal is broad, move sig-	Place antenna of set near antenna of BC-906-D and tune BC-906-D for maximum dip of meter. Compare with correct reading. If reading is

TABLE VI (continued)

Receiver	*Transmitter*
nal generator farther away until sharp signal is received in phones. Turn signal generator ON and OFF to find out whether the signal from the generator is being received. If extraneous signal, retune for correct signal.	not correct, loosen transmitter detent stop screw for channel *A*, set BC-906-D for correct reading, and tune TRANS detent for maximum dip on meter.
Tighten detent stop screw.	Tighten detent stop screw.
Replace cover, felt washers, and knobs (2 set screws).	Replace cover, felt washers, and knobs (2 set screws).
Check all 5 REC and TRANS frequencies.	Check all 5 REC and TRANS frequencies.

NOTE: The above procedure is for setting receiver frequency or transmitter frequency to channel *A*. Identical procedure is to be followed for setting on other channels. Separate transmitter frequency from receiver frequency by at least 10 mc (one letter) during each test.

28. ADJUSTMENT FOR MAXIMUM SENSITIVITY AND POWER OUTPUT (COUPLING).

a. Adjustment of sensitivity and power output will be necessary under the following circumstances:

(1) Whenever measurement shows the sensitivity to be low (i.e., when the number of microvolts required to produce substantially full firing is too great).

(2) Whenever measurement shows power output to be too low.

(3) Whenever a measurement of sensitivity or power shows that operation is unstable (double pulsing, for instance).

(4) Whenever repair work of any kind has been done on the radio-frequency circuits of the receiver-transmitter.

b. The adjustment of sensitivity involves readjusting C-1 (fig. 26); the adjustment of power output involves readjusting the coupling capacitor C-29

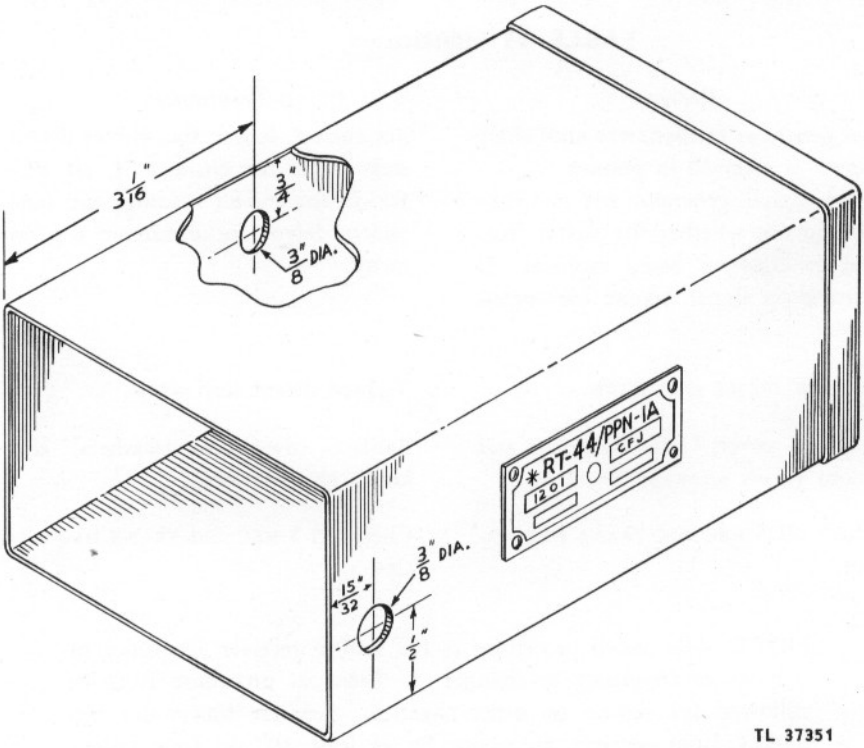


*Figure 17. Location of holes needed in dummy case when adjusting Receiver-Transmitter *RT-44/PPN-1A for sensitivity and power.*

(fig. 26). It is necessary to remove the recevier-transmitter unit from its case in order to reach these capacitors. This can be done by removing the two thumbnuts located in the back and sliding the chassis out of the case. A used case from a damaged beacon is modified by cutting holes through which C-1 and C-29 can be reached. Figure 17 shows the location and size of these holes. The dummy case is then slipped over the chassis and fastened down by means of the two thumbnuts.

CAUTION: Reliable measurements cannot be made on the beacon unless a case is in place. Furthermore, the beacon's own case (not the dummy case) should be in place and fastened down securely when the frequency-selector mechanism is being adjusted (par. 27) or checked (par. 7).

c. The procedure given below describes the method of making adjustments assuming that complete readjustment has been necessary. When only a partial readjustment is necessary, certain steps may be omitted. However, the beacon

should not be released for use in the field until sensitivity, power output, and frequency have been checked at each setting of the REC and TRANS knobs.

d. Sensitivity Adjustments. (1) Connect the beacon to Test Equipment IE-45 according to the block diagram figure 14.

(2) Set the REC knob on the desired frequency and the TRANS knob at least 10 mc away and proceed, as in paragraph (23), to obtain a single pulse on the screen of the oscilloscope. If a double pulse (fig. 18) appears on the screen, or if the pulse amplitude is too small to be usable, try readjusting coupling capacitor C-29 (fig. 26).

(3) Adjust C-1 (fig. 26) until maximum receiver sensitivity is obtained.

e. Coupling Capacitor Adjustment for Maximum Power. (1) With the beacon and test equipment connected as above, set the TRANS knob for the desired frequency and turn the REC knob at least 10 mc away.

(2) Adjust coupling capacitor C-29 until maximum power output is obtained, without, however, allowing a double-pulse condition to develop.

(*a*) As C-29 is rotated counterclockwise toward the correct setting, the power output will gradually increase until a maximum is reached, after which a second pulse trace will appear inside the original pulse trace. Further rotation of C-29 may result in the power's falling off by as much as 90 per cent. This behavior is illustrated in figure 18.

(*b*) The correct setting will be obtained when C-29 is turned back past the double-pulse and maximum-power points until the pulse amplitude is 1 or 2 volts less than maximum. At this point, the power output of the beacon is still high and its operation is stable.

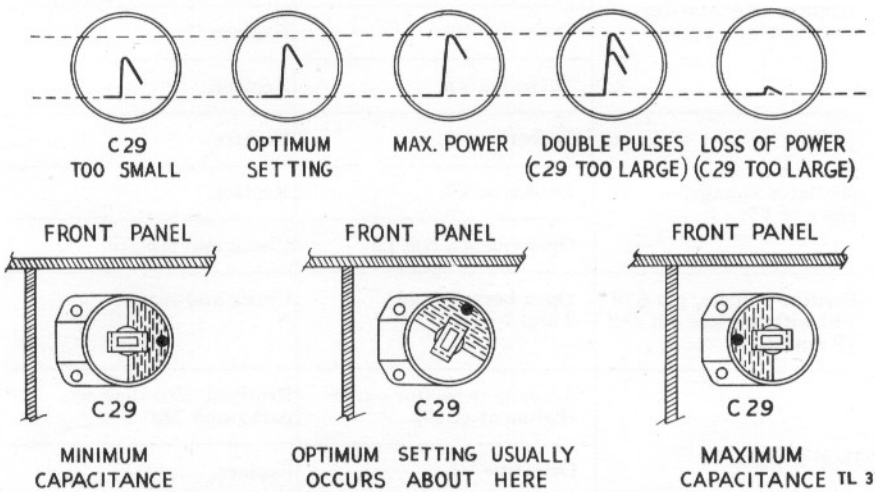


Figure 18. Effect on transmitted pulse of adjusting coupling capacitor C-29. The correct setting gives a pulse of slightly less amplitude than at maximum power.

TABLE VII

TROUBLE CHART

NOTE: Normal quench oscillator voltage measured at R29 and R30: −50 volts. Normal automatic gain stabilization system measured at R-23: 15 to 50 volts.

Trouble	*Possible cause*	*Remedy*
Low power output.	Battery voltage low.	Replace with freshly charged battery.
	Defective V10.	Replace.
	Incorrect antenna coupling.	Readjust according to paragraph 28*e*.
	Incorrect r-f trimmer adjustment.	Readjust according to paragraph 28*d*.
Low quench-oscillator voltage (less than about 47 v).	Defective V9.	Replace.
	Defective V8.	Replace.
High quench-oscillator voltage (more than about 55 v).	Open capacitor C23.	Check and replace.
Transmitter fires few minutes after starting and then won't stop.	Quench oscillator voltage too critical; should be 50 to 54 volts.	
	Defective V9.	Replace.
	Defective V5.	Replace.
Positive quench oscillator voltage, pin 2 of V9.	Defective V8.	Replace.
	Defective V9.	Replace.
	Open quench coil L5.	Check and replace.
Positive voltage, pin 6 of V10 with voltage pin 2 of V9 normal.	Open between pins 2 and 7 of V9.	Check and repair.
Double pulse.	Antenna capacitor out of alignment (C29).	Readjust according to paragraph 28*e*.
	Defective V4.	Replace.
	Defective V9.	Replace.

TABLE VII (continued)

TROUBLE CHART

Trouble	*Possible cause*	*Remedy*
Beacon does not squitter with TEST key depressed; i.e., no rushing noise heard in beacon headphones.	Defective V10.	Replace.
	Defective V2.	Replace.
	Check all other tubes.	
	Phone capacitor C31.	Test and replace according to paragraph 30.
	TEST key open.	Check for poor connection or damaged switch.
	Capacitor C23 grounded.	Check shield lead through chassis wall.
Squitters or fires continuously without TEST key depressed.	Defective V9.	Replace.
	Defective V5.	Replace.
	Defective V4.	Replace.
	High resistance short in capacitor C13.	Test and replace if necessary.
	Open AGS coil L4.	Check and replace if necessary.
	TEST key shorted.	Replace.
Oscillation.	Defective V9.	Replace.
	Defective V4.	Replace.
	Defective V5.	Replace.
	Defective V1.	Replace.
	R-f trimmer capacitor or antenna coupling capacitor out of adj.	Readjust according to paragraph 28.
	Quench-oscillator circuit grounded.	Repair.
Low sensitivity.	Defective V1.	Replace.
	Defective V2.	Replace.
	Defective V9.	Replace.
	Capacitor C7 open.	Check and replace.
	Defective V5.	Replace.

TABLE VII (continued)
TROUBLE CHART

Trouble	*Possible cause*	*Remedy*
Low or no grid voltage on V2.	Defective V9.	Replace.
	Defective V7.	Replace.
	Defective V2.	Replace.
Varying sensitivity.	Antenna connector loose.	Clean and tighten.
	Defective tubes, generally V2.	Replace.
Vibrator hash.	Defective vibrator.	Replace.
	Defective V5.	Replace.
	Defective V4.	Replace.
	Defective buffer capacitor.	Test and replace.
	Defective feed-thru type by-pass capacitor 55 μμf mounted on wall of power pack.	Test and replace.
	Loose connections to ground at power plug.	Check and repair.
	Open capacitor C49.	Test and replace.
Hash develops after power-supply case is tightened.	Shield buckled on bottom of power pack, bending away from baffle walls.	Remove and bend to form a slight crease so that the shield will tend to buckle against the baffle wall.

29. TUBE REPLACEMENT.

a. Sufficient tubes are supplied in the running spares furnished with Beacon Transmitter-Receiver *AN/PPN-1A to take care of normal replacements. However, if it should become necessary to draw replacement tubes from another source of supply, they should be aged by running their heaters at normal voltage for at least 48 hours. Plate voltage need not be applied.

NOTE: The characteristics of some tubes are unstable until they have been aged. Beacons equipped with unaged tubes sometimes show excessive loss of sensitivity after a few hours of use. However, they return to normal after a few hours use.

b. To remove tubes: (1) Grasp the metal cover of the tube (fig. 25) firmly between the thumb and index finger.

(2) Press down and twist the shield approximately ¼ inch to the right.

(3) When the bayonet lock comes free, lift the shield from the tube. (It may be necessary to use a pair of small pliers. Avoid crushing the shield).

(4) Grasp the envelope of the tube between the thumb and index finger and rock the tube gently back and forth, at the same time pulling upward until the tube comes out of the socket.

30. TROUBLE CHART. Table VII (pp. 42-44) classifies the more general failures that may occur in the beacon and the most probable causes of failure, arranged in order of their importance. Before making any of the checks recommended in the chart, be certain that no loose connections exist in the transmission-line receptacle and plug, or the headphone cord and plug. It is also necessary to check the condition of the phone capacitor C-31 located along the center line of the chassis (fig. 26). This can be done by momentarily connecting the cathode of V-1 (pin No. 7) to the ground, thus short-circuiting R-7. When C-31 is in operating condition, a click will be heard in the headphones when the connection is made and broken.

31. POWER SUPPLY. Figure 29 shows the internal parts of the power supply and their locations on the chassis. Figure 22 shows the resistances at the important terminals of the power-supply, and referencue to the trouble chart will give the most common sources of noise trouble to be found in the supply unit. The vibrator is of the plug-in type and is easily replaceable. In some cases, it has been found that the 2-section electrolytic capacitor C-46 has caused the power supply to fail. Usually a short circuit caused the resistors R-32 and R-34 to burn out. Reference to figure 29 will show the locations of these parts.

32. STORAGE BATTERY (fig. 4).

a. Under ordinary circumstances, the storage battery supplied for Beacon Transmitter-Receiver *AN/PPN-1A should be given a 1½- to 2-ampere charge for a period of 24 hours before placing in service. A complete drawing of Battery BB-210/U is shown in figure 4. The cells of the battery should be filled with electrolyte having a specific gravity of 1.280 (32 Baumes) at 83° F. Sufficient electrolyte must be added to the cells until the fluid reaches a level ¼ inch above level-line mark on the side of the battery. Approximately 10 fluid ounces, or 280 cubic centimeters, are needed to fill a battery completely.

NOTE: Electrolyte with specific gravity of 1.280 is used for filling the battery in both tropical and temperate zones.

b. Allow the battery to stand not less than 3 nor more than 16 hours before charging, after the addition of the electrolyte.

c. Continue charge at the rate of 1½ to 2 amperes for 5 hours after the green ball has risen.

d. Two hours after completion of the charge, the electrolyte level ought to be 1/16 inch above the level mark on the battery. If the level should be higher, drain off the extra electrolyte to reduce the level to the marker. If the level is low, add only pure distilled water.

e. When the battery is fully charged, the three color-coded balls should be floating at the level line. Table shows the relative state of charge according to the color balls.

CAUTION: When the battery is placed in emergency service immediately after the addition of the electrolyte, it must be recharged as soon as possible after use.

f. In emergencies, the battery can be placed in service as soon as the electrolyte is added. However, its life in this condition is greatly reduced.

TABLE III (repeated)

Color code	*Condition of charge*
All three up	Battery fully charged
Red and white up, green down	Battery 90% charged
Green and white down, red up	Battery 50% charged
All three down	Battery discharged

33. CARE OF IDLE BATTERIES.

a. When batteries containing electrolyte are not put into service immediately, take special care to keep them in proper condition for operation when needed

b. Batteries so stored should be removed from the metal battery box.

c. The electrolyte level must be observed and kept up to the marker line. Only pure distilled water should be added to the battery electrolyte. Do not overfill.

d. Batteries that are on the shelf, not being used, must be recharged as soon as the white ball sinks.

e. Always store the batteries in a cool location. Warmer locations will necessitate more frequent charging.

f. Because the failure of a battery when in use might result in serious consequences, follow out carefully the above instructions to guard against premature damage to batteries while in storage.

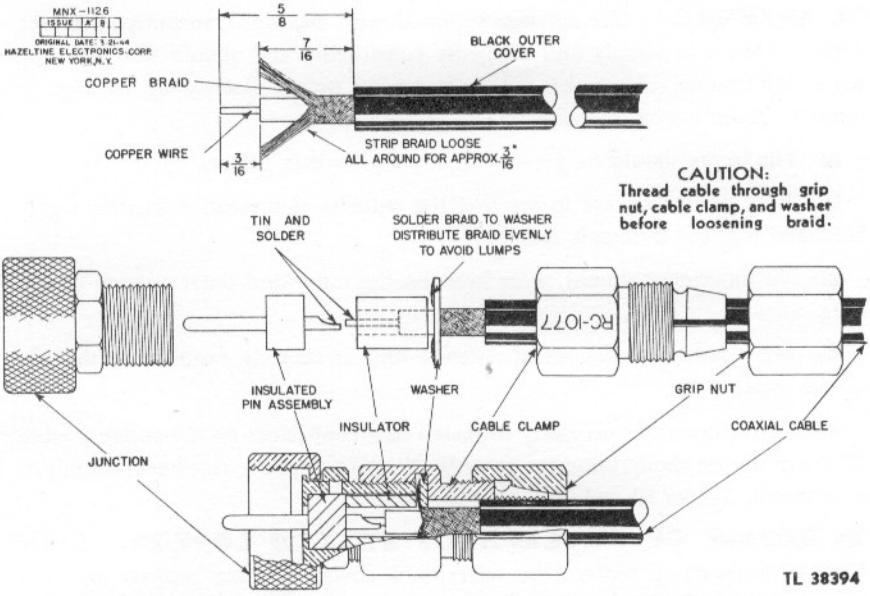


Figure 19. Method of installing plug P-1 on cable W-1.

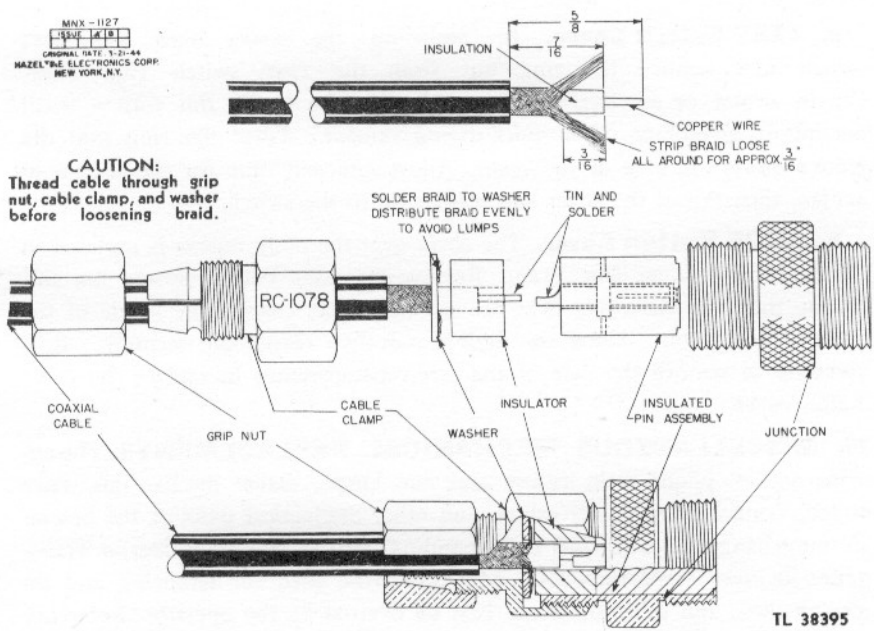


Figure 20. Method of installing plug P-2 on antenna cable W-2.

34. ANTENNA. The antenna supplied with Beacon Transmitter-Receiver *AN/PPN-1A is simply and ruggedly constructed and should not give any particular trouble. However, there are several points that should be kept in mind to make operation easier.

a. The joints should be greased lightly with a thin grease.

b. Take particular care to see that the antenna connector is securely tightened and that the terminals are clean.

c. No movement should occur between the inner and outer portion of the plug.

d. Make sure that the actual antenna unit is securely fastened to the top of the mast.

e. The information necessary to install new connectors on the antenna cable W-1 and on the short connector cable W-2, attached to the receiver-transmitter, is shown in figures 19 and 20.

35. REPAIR OF WATERPROOF SWITCH COVERS. It may become necessary to replace the waterproof covers that are secured over the TEST and ON-OFF switches and CODE button. An exploded view showing the mechanical construction of these covers and the method of attachment is shown in figure 21.

a. TEST Switch Cover. In replacing the cover over the TEST switch, first remove the ring nut from the TEST switch (fig. 21*a*). Obtain a new or serviceable cover and wipe the inside rim with a small amount of glyptol or other quick-drying cement. Force the ring into the groove inside the base of the cover. Allow sufficient time for the cement to harden, then thread the cover and washer on to the switch.

b. CODE Button Cover. The cover over the CODE button is replaced in the following manner (fig. 21*b*). Remove the CODE button outside rim and button, then slip the cover over the assembly after coating the inside of the cover with glyptol. Allow for drying and then reassemble securely. It is necessary to remove the case of the receiver-transmitter to replace the CODE button cover.

36. MISCELLANEOUS MECHANICAL REPLACEMENTS. The antenna socket, phone jack, TRANS and REC knobs, detent mechanisms, TEST switch, CODE button, power cables, and other mechanical parts of the beacon are interchangeable with their corresponding parts in any other Beacon Transmitter-Receiver *AN/PPN-1A. Methods to be used for removing and replacing these and other units can best be devised by the operator. Reference to the many drawings and photographs in this manual will identify and show the location of these parts on the chassis.

37. MOISTURE- AND FUNGUS-RESISTANT TREATMENT.

a. A moisture- and fungus-resistant treatment may have been given to some beacons before they reach the field. When replacing any part or when making any repairs on a beacon that has been given this treatment, the connecting leads should be cleared of all coating materials before soldering.

b. Beacons that have been treated for moisture and fungus resistance will bear a label stating this fact. The label, if used, will appear on the back face of the receiver-transmitter chassis adjacent to the threaded throat on which the red DEST cap is screwed.

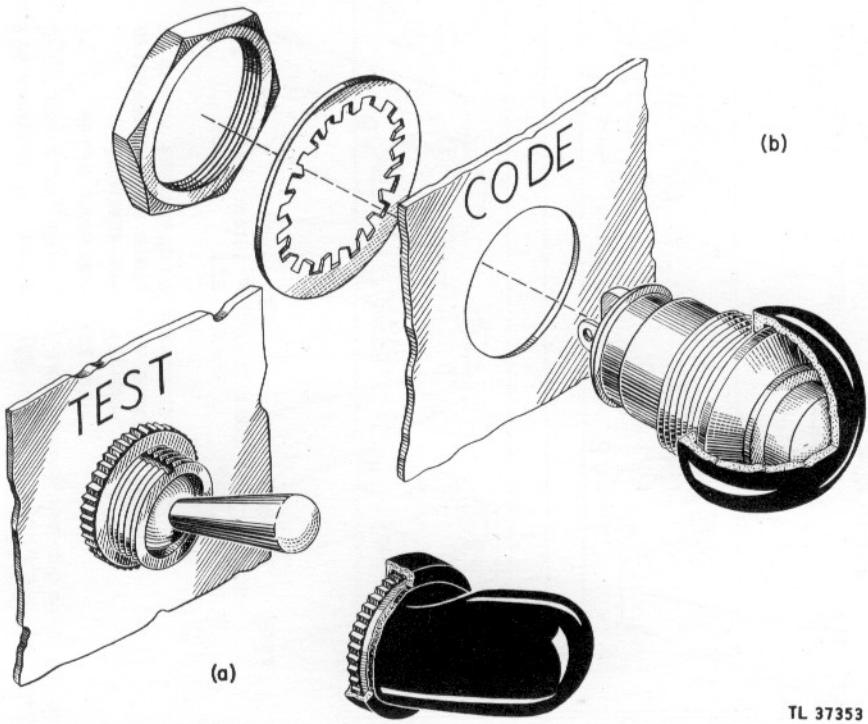


Figure 21. Method of installing switch covers: (a) on CODE *switch; (b) on* TEST *switch (applies also to* ON-OFF *switch).*

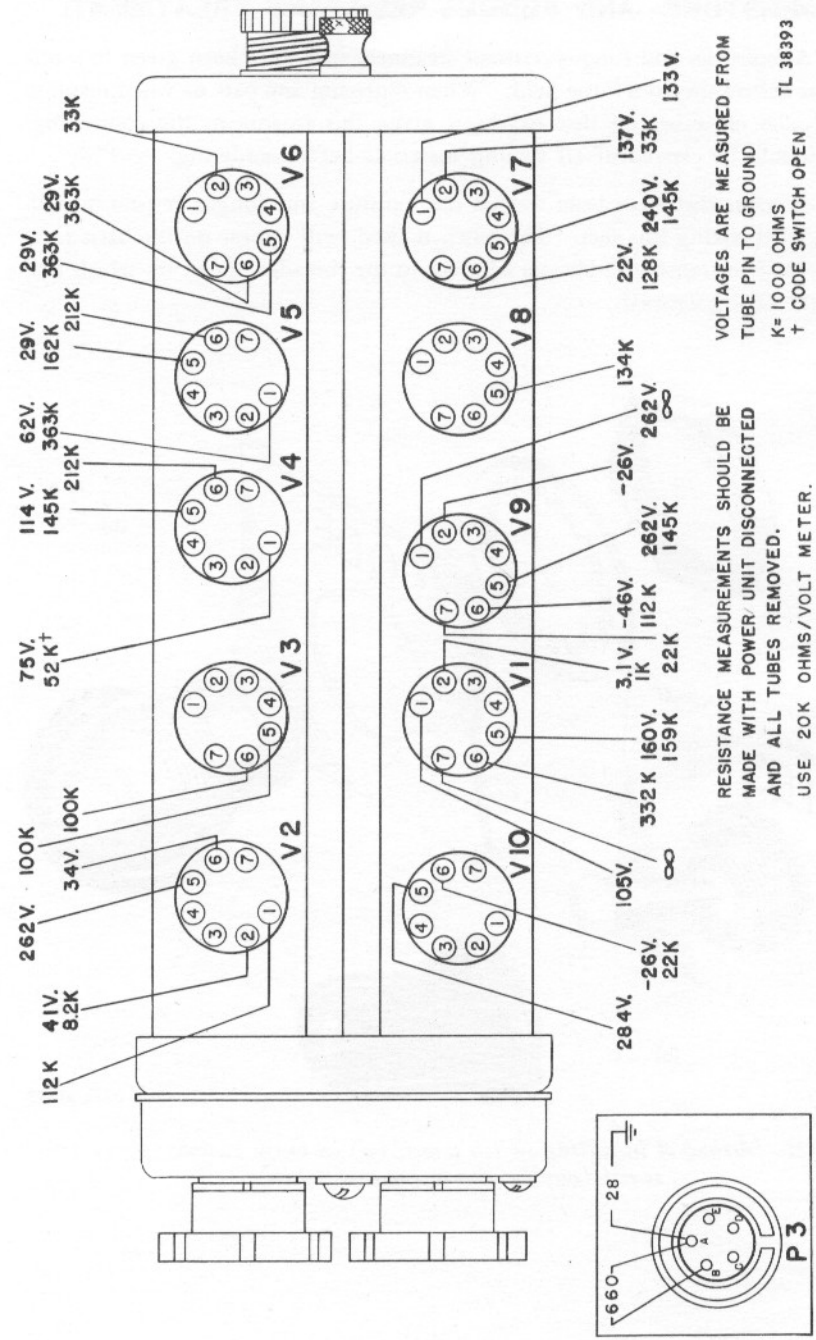


*Figure 22. Voltage and resistance-measurement chart for Receiver-Transmitter RT-44/PPN-1A and Vibrator Power Supply *PP-11A/PPN-1. (Power-supply resistance measurements in ohms at plug P-3.)*

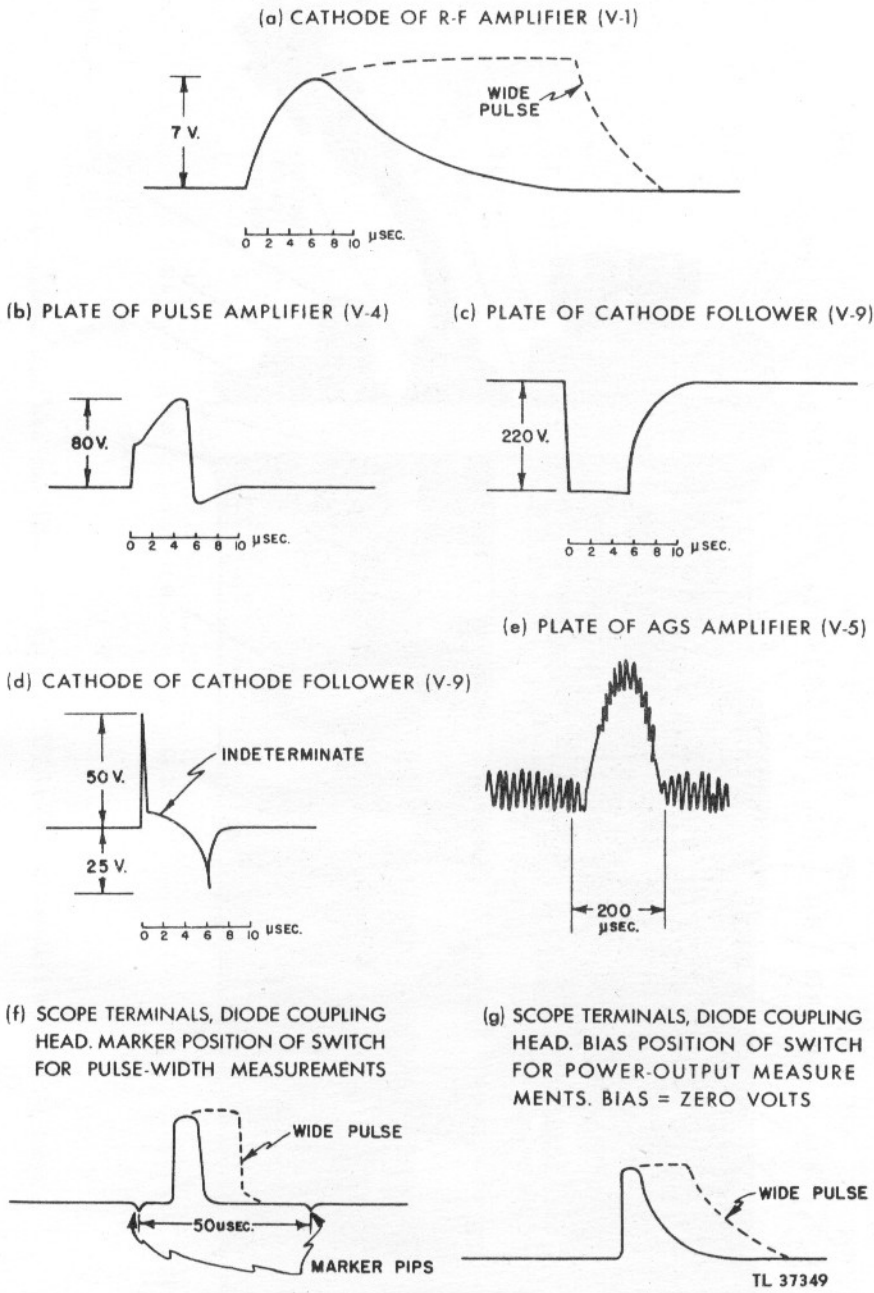


Figure 23. Wave forms observable on oscilloscope at various points in the beacon circuit and at the output of the diode coupling head.

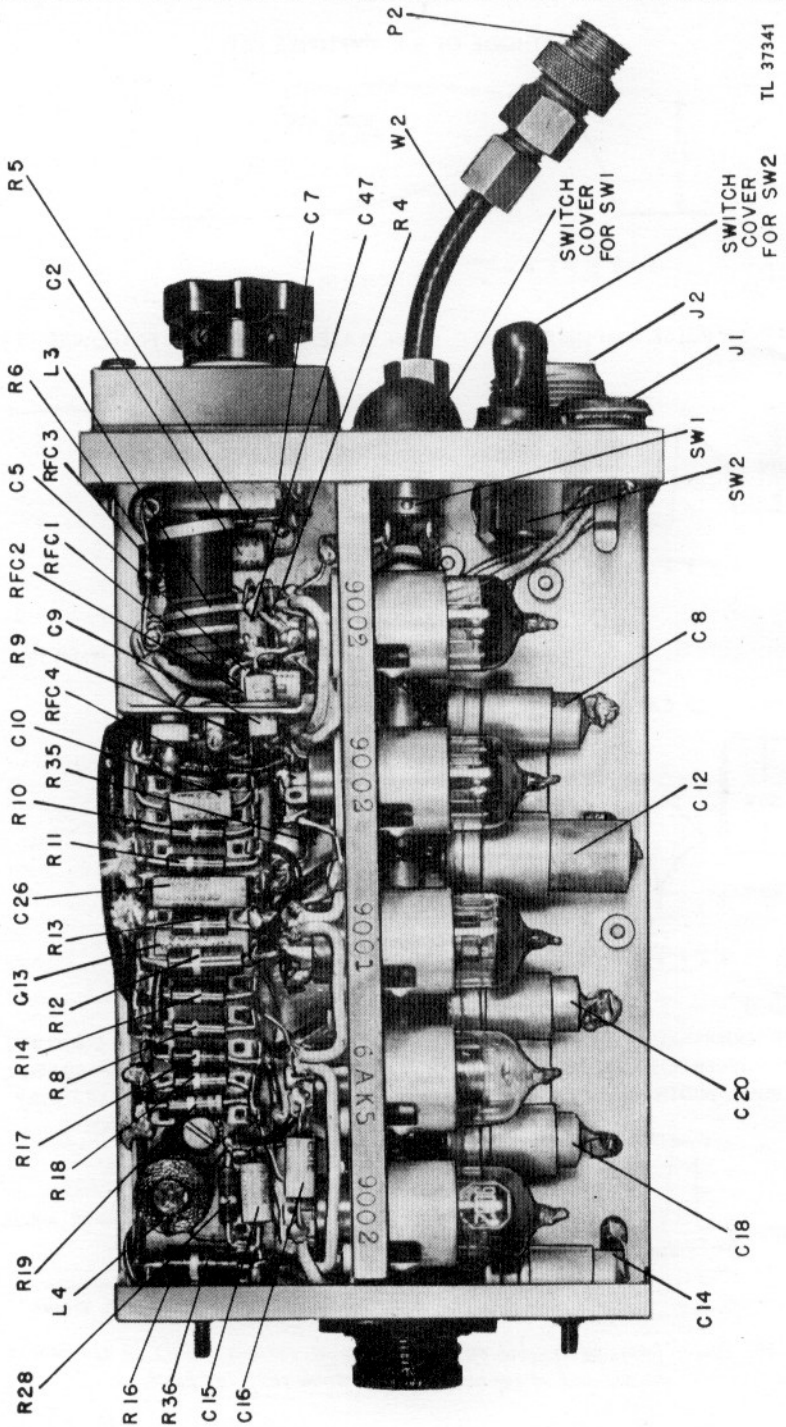


*Figure 24. Receiver-Transmitter *RT-44/PPN-1A top view with case and tube shields removed.*

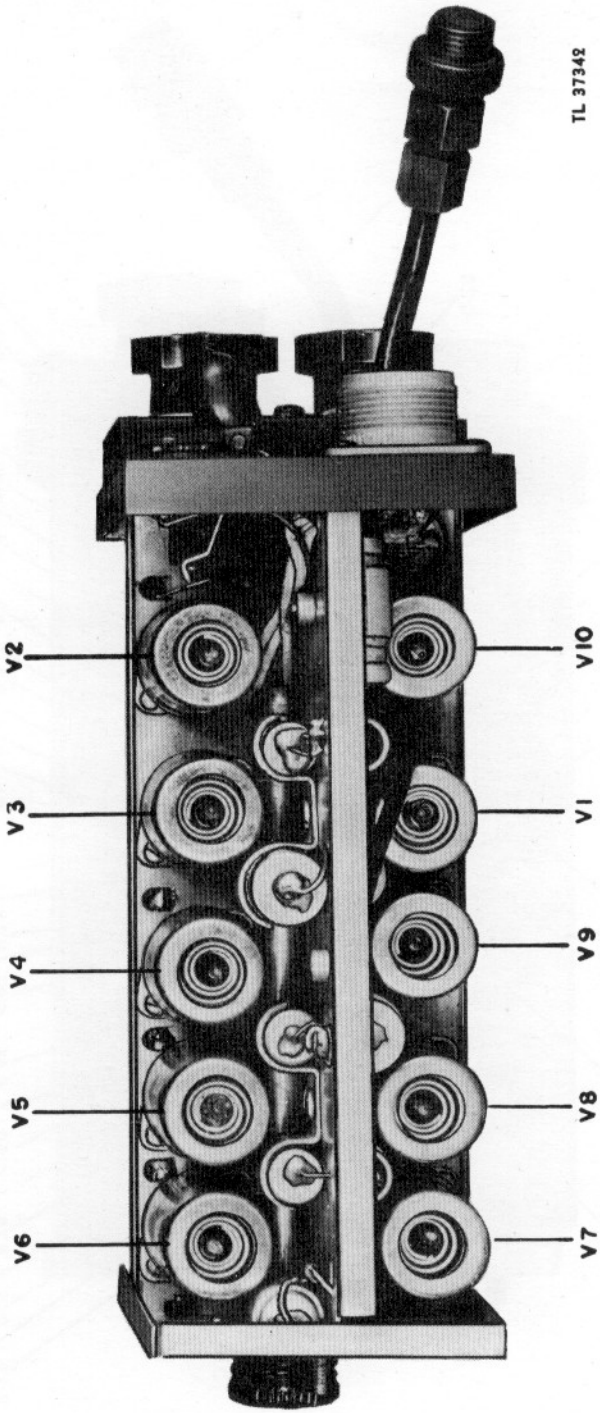


*Figure 25. Receiver-Transmitter *RT-44/PPN-1A, tube layout and left side view with case removed.*

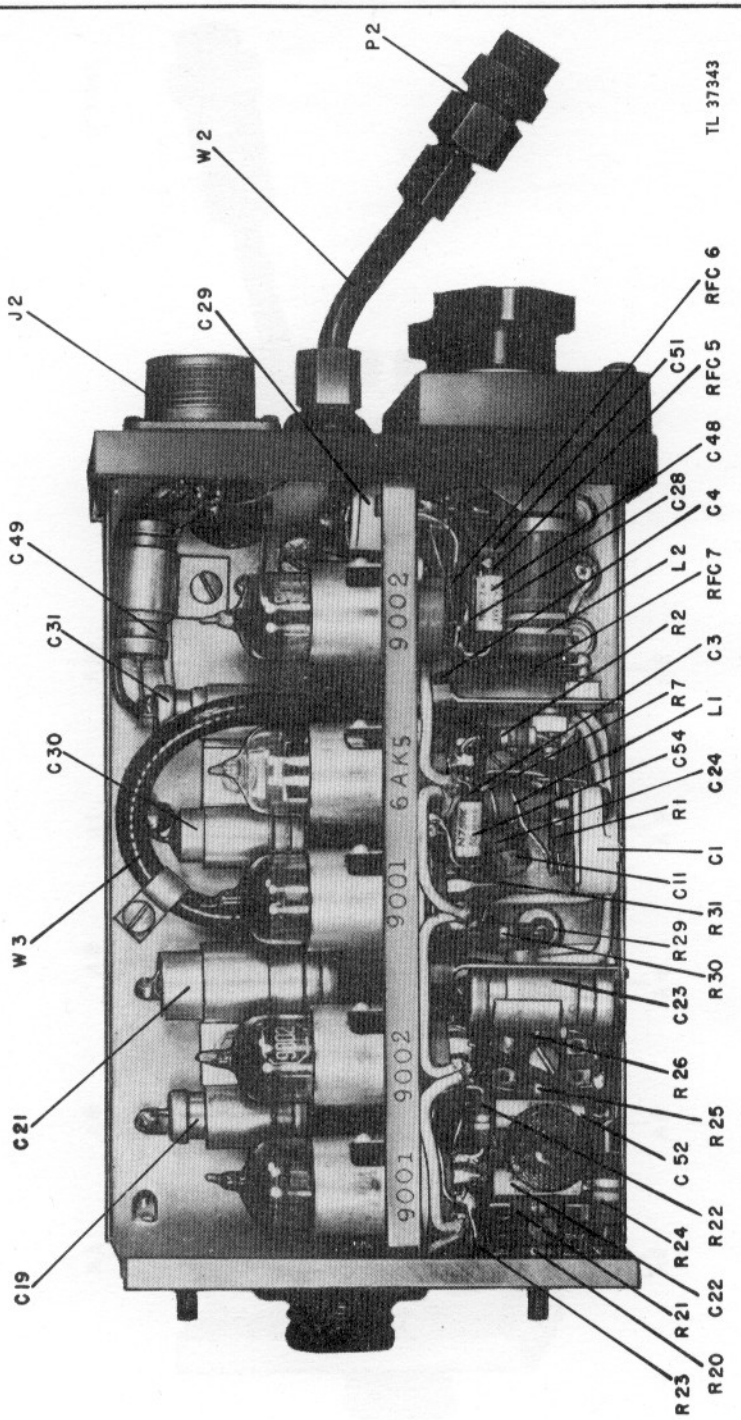


*Figure 26. Receiver-Transmitter *RT-44/PPN-1A, bottom view with case and tube shields removed.*

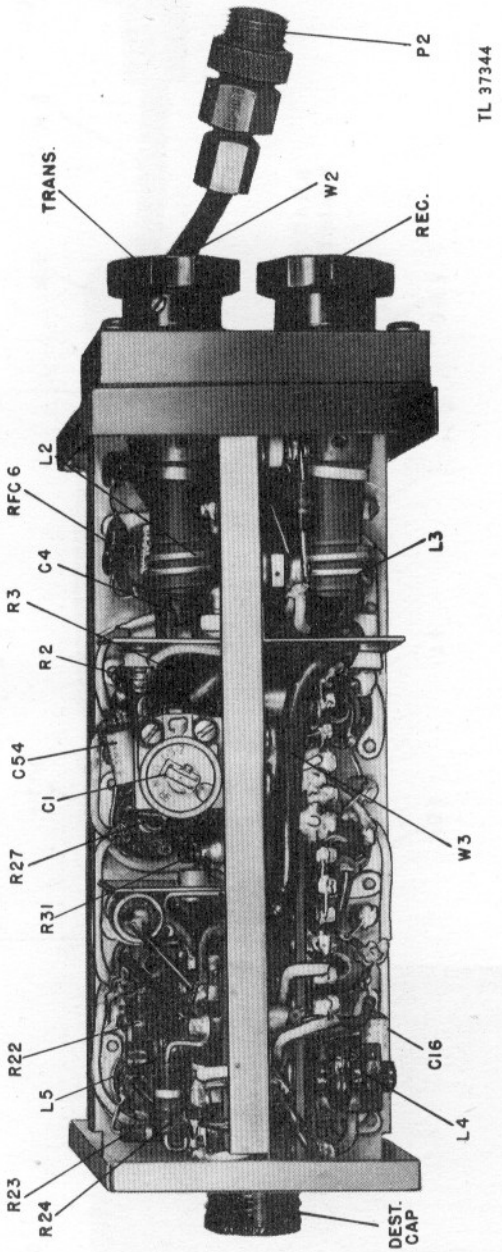


*Figure 27. Receiver-Transmitter *RT-44/PPN-1A, right side view with case removed.*

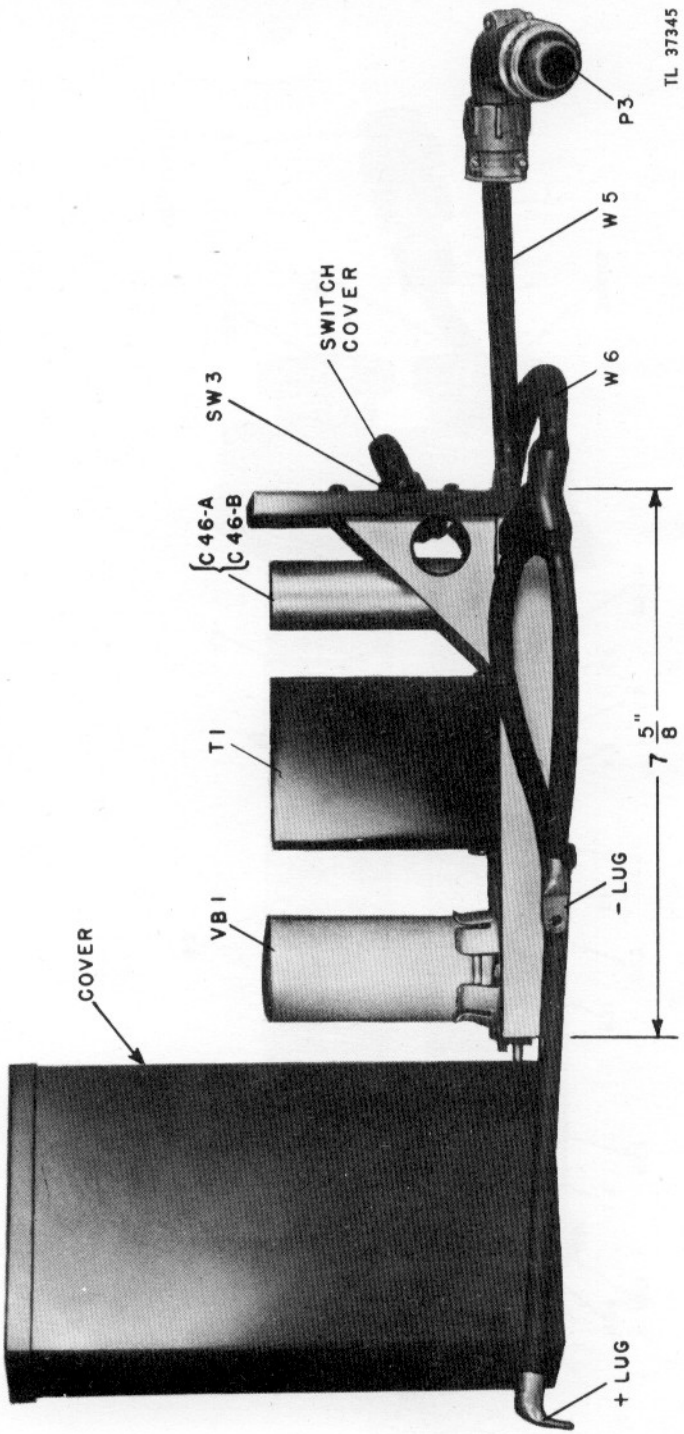


*Figure 28. Vibrator Power Supply *PP-11A/PPN-1, bottom view with case removed.*

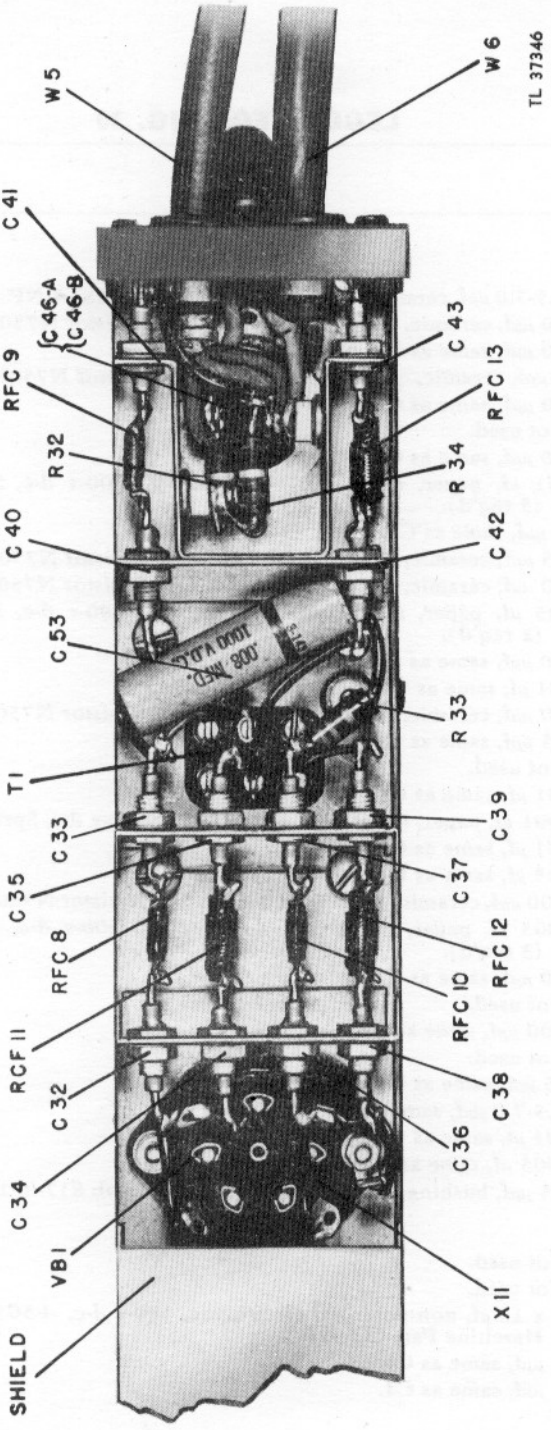


*Figure 29. Vibrator Power Supply *PP-11A/PPN-1, left side view with case removed.*

LEGEND FOR FIG. 30

Ref. Symbol	Description
	Capacitors
C1	1.5-7.0 μμf, ceramic, 500-v d-c, Erie Resistor TS2A-NP (mod.) (2 req'd).
C2	50 μμf, ceramic, ±10 %, 500-v d-c, Erie Resistor N750K-50. (7 req'd).
C3	50 μμf, same as C2.
C4	5 μμf, ceramic, ±10 %, 500-v d-c, Erie Resistor N750K-5. (4 req'd).
C5	50 μμf, same as C2.
C6	Not used.
C7	50 μμf, same as C2.
C8	.01 μf, paper, metal can, +30 %-20 %, 600-v d-c, Sprague PX24A. (5 req'd).
C9	5 μμf, same as C4.
C10	25 μμf, ceramic, ±10 %, 500-v d-c, Erie Resistor N750K-25. (3 req'd).
C11	10 μμf, ceramic, ±10 %, 500-v d-c, Erie Resistor N750K. (2 req'd).
C12	.05 μf, paper, metal can, +30 %-20 %, 600-v d-c, Sprague PX24A. (2 req'd).
C13	10 μμf, same as C11.
C14	.01 μf, same as C8.
C15	40 μμf, ceramic, ±10 %, 500-v d-c, Erie Resistor N750K-40.
C16	25 μμf, same as C10.
C17	Not used.
C18	.01 μf, same as C8.
C19	.001 μf, paper, metal can, +60 %-20 %, 600-v d-c, Sprague PX24A.
C20	.01 μf, same as C8.
C21	.05 μf, same as C12.
C22	100 μμf, ceramic, ±10 %, 500-v d-c, Erie Resistor N750L-100. (3 req'd).
C23	.005 μf, paper, metal can, +60 %-20 %, 600-v d-c, Sprague PX24B. (3 req'd).
C24	50 μμf, same as C2.
C25	Not used.
C26	100 μμf, same as C22.
C27	Not used.
C28	25 μμf, same as C10.
C29	1.5-7.0 μμf, same as C1.
C30	.01 μf, same as C8.
C31	.005 μf, same as C23.
C32 to C43	55 μμf, bushing, ±10 %, 600-v d-c, Centralab 817-001. (12 req'd).
C44	Not used.
C45	Not used.
C46	2 x 10 μf, non-polarized electrolytic, 300-v d-c, +50 %-10 % at 20° C. Hazeltine Part CO-928.
C47	5 μμf, same as C4.
C48	5 μμf, same as C4.

LEGEND FOR FIG. 30 (continued)

Ref. Symbol	Description
C49	.005 μf, same as C23.
C51	50 μμf, same as C2.
C52	100 μμf, same as C22.
C53	.008 μf, paper, ±10%, 2000-v d-c, Sprague PX-39B.
C54	50 μμf, same as C2.

Jacks and Receptacles

J1	Jack, phone, Hazeltine Part RC-1069.
J2	Receptacle, male, Amphenol Type AN-3102-14S-5P.

Coils

L1	Coil, r-f, 2 turns, #18 gauge, coils tinned-copper wire. Hazeltine e CL-1083.
L2	Coil, TRANS tuning, 2 turns, soft-brass wire #16 A.W.G. silver plated, Hazeltine Part CL-1087.
L3	Coil, REC tuning, similar to L2. Hazeltine Part CL-1088.
L4	Coil, A.G.S., 2 sections, each 317 turns wire #36 S.S.E., Hazeltine Part t CL-1084.
L5	Coil, Q.O., 2 sections, each 332 turns wire #36 S.S.E., Hazeltine Part t CL-1085.

Plugs (Connectors)

P1	Plug, antenna, Hazeltine Part RC-1077.
P2	Plug, antenna, Hazeltine Part RC-1078.
P3	Plug, power, Amphenol Type AN-3108-14S-5S.

Resistors

R1	2,200 ohms, ±10%, ½ watt, Allen-Bradley Type EB.
R2	47,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB. (2 req'd).
R3	220,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB. (4 req'd).
R4	4,700 ohms, ±10%, ½ watt, Allen-Bradley Type EB.
R5	8,200 ohms, ±10%, ½ watt, Allen-Bradley Type EB.
R6	150,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB. (2 req'd).
R7	1,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB.
R8	33,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB. (5 req'd).
R9	100,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB. (5 req'd).
R10	200,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB.
R11	68,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB.
R12	33,000 ohms, ±10%, 1 watt, Allen-Bradley Type GB.
R13	100,000 ohms, same as R9.
R14	330,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB. (2 req'd).
R16	100,000 ohms, ±10%, 1 watt, Allen-Bradley Type GB. (2 req'd).
R17	100,000 ohms, same as R9.
R18	330,000 ohms, same as R14.
R19	680,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB.
R20	33,000 ohms, same as R8.
R21	150,000 ohms, same as R6.
R22	220,000 ohms, same as R3.
R23	33,000 ohms, same as R8.
R24	22,000 ohms, ±10%, 1 watt, Allen-Bradley Type GB.
R25	100,000 ohms, same as R9.
R26	47,000 ohms, same as R2.

LEGEND FOR FIG. 30 (continued)

Ref. Symbol	Description
R27	33,000 ohms, same as R8.
R28	33,000 ohms, same as R8.
R29	22,000 ohms, ±10%, ½ watt, Allen-Bradley Type EB. (2 req'd).
R30	22,000 ohms, same as R29.
R31	220,000 ohms, same as R3.
R32	330 ohms, ±10%, 1 watt, Allen-Bradley Type GB. (2 req'd).
R33	4,700 ohms, ±10%, 1 watt, Allen-Bradley Type GB.
R34	330 ohms, same as R32.
R35	100,000 ohms, same as R9.
R36	100,000 ohms, same as R16.

R-F Chokes

RFC 1 to RFC 10	Choke, 20 turns of #28 enameled copper wire. (10 req'd).
RFC 11 to RFC 13	Choke, 12 turns #22 enameled copper wire. (3 req'd).

Switches

SW1	Switch, button, Hetherington Type DSP (modified).
SW2	Switch, toggle, S.P.S.T., G.E. Type GA1A2 (modified).
SW3	Switch, toggle, D.P.S.T., G.E. Type 1GA2B1.

Transformers

T1	Transformer, power, Hazeltine Part TR-1037.

Vacuum Tubes

V1, V5	Tube, vacuum, JAN Type 6AK5. (2 req'd).
V2, V3, V6, V8, V10	Tube, vacuum, JAN Type 9002. (5 req'd).
V4, V7, V9	Tube, vacuum, JAN Type 9001. (3 req'd).

Vibrators

VB1	Vibrator, synchronous, primary current: 2.5 amp. d-c; secondary voltage 270-v before filter; frequency: 115 c.p.s., Mallory type 561C.

Cables

W1	Cable, coaxial, AN Type RG-58/U, 50 ohm (12 feet).
W2	Cable, coaxial, same as W1 (4 inches).
W3	Cable, coaxial, AN Type RG-59/U, 70 ohm, Uniradio #32 (10½ inches).
W5	Cable, rubber covered, four-wire #20 strand tinned copper, shielded, Hazeltine Type CA-1169. (10½ inches).
W6	Cable, conductor, rubber cov., four-wire, 16-strand #30 tinned copper, 2 conductor arms 5¾ inches and 12¾ inches, Hazeltine CA-1168.
W7	Wire, shielded, 10/30 stranded tinned copper, Hazeltine Part WI-1118. (4 inches).

Vacuum-Tube Sockets

X1 to X10	Socket, vacuum tube, midget, Cinch Mfg. Type 9824. (10 req'd).

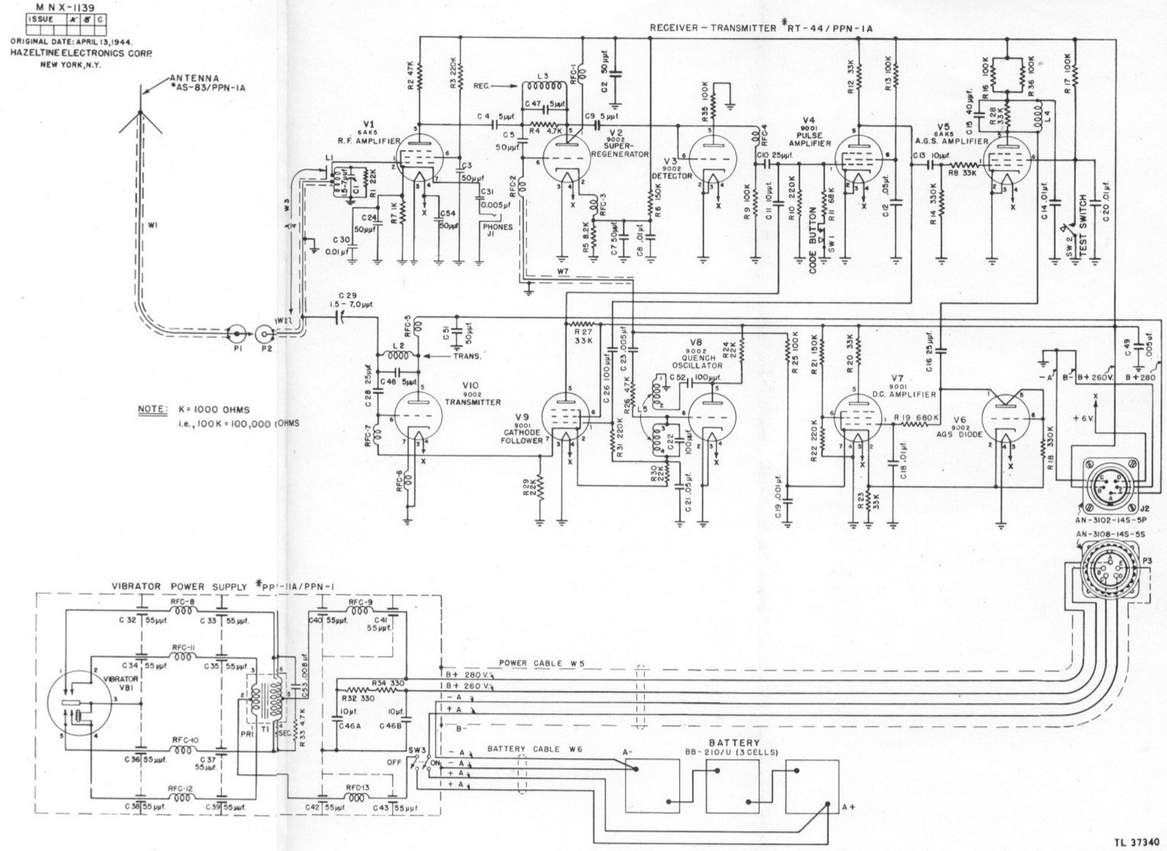
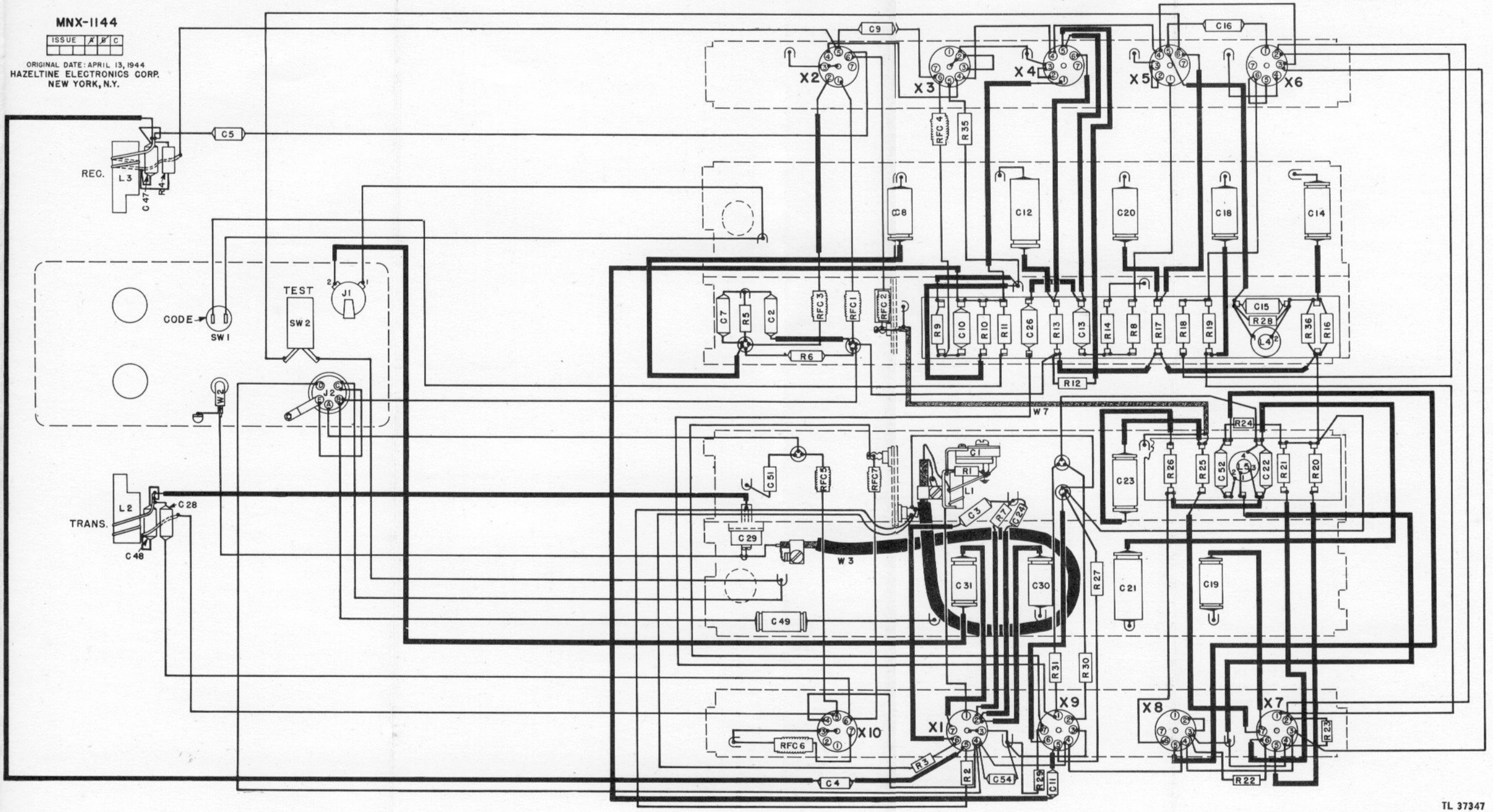


*Figure 30. Beacon Transmitter-Receiver *AN/PPN-1A, schematic wiring diagram.*

MNX-1144

ISSUE	A	B	C

ORIGINAL DATE: APRIL 13, 1944
HAZELTINE ELECTRONICS CORP.
NEW YORK, N.Y.



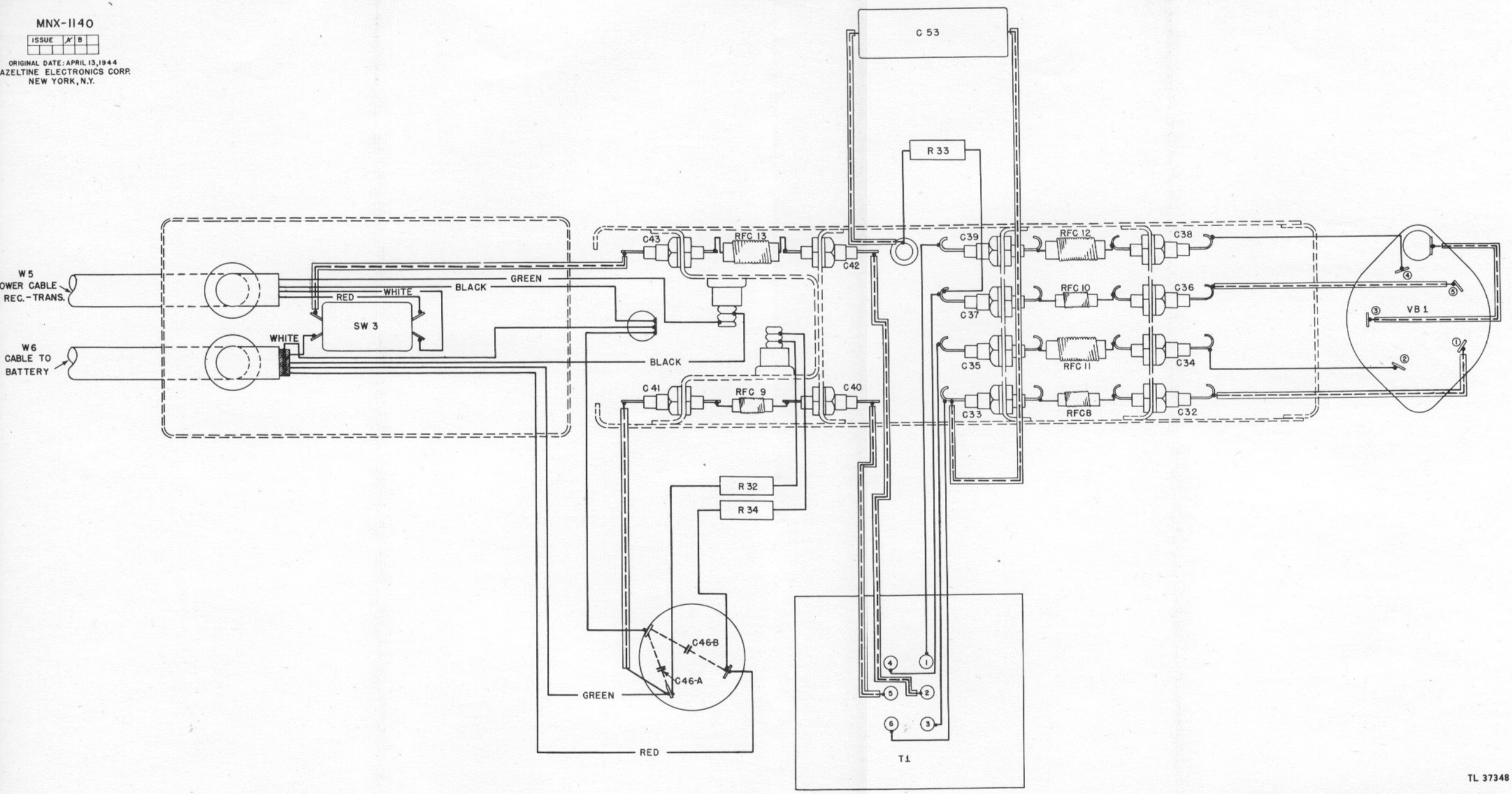
TL 37347

*Figure 31. Receiver-Transmitter *RT-44/PPN-1A, actual wiring diagram.*

MNX-1140

ISSUE	A	B		

ORIGINAL DATE: APRIL 13, 1944
AZELTINE ELECTRONICS CORP.
NEW YORK, N.Y.



TL 37348

*Figure 32. Vibrator Power Supply *PP-11A/PPN-1, actual wiring diagram.*

SECTION V

SUPPLEMENTARY DATA

38. MAINTENANCE PARTS LIST FOR BEACON TRANSMITTER-RECEIVER *AN/PPN-1A.

NOTE: Order maintenance parts by stock number, name, and description.

Ref. Symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan per equipment*	*Running spares*	*Orgn stock*	*3d echn*	*4th echn*	*5th echn*	*Depot stock*
W6	3E7181	CABLE ASSEMBLY, (Battery to PWR supply) rubber covered, 4 wire, 8¾″ long, 16 strand #30 tinned copper, 2 conductor arms 5¾″ and 12¾″, 41/32 stranded bare copper conductor, moulded junction with 2 lugs.	1						*
	1F434-107	TEST CORD ASSEMBLY CX-107/PPN-1A, 12″ long.	1	*					*
W3	1F425-58.11.6	RF TRANSMISSION LINE ASSEMBLY, 10½″ long, (CA 1100) ground lug on each end.	1						*
C4, C9, C47, C48	3D9005-24.2	CAPACITOR, ceramic, 5 mmf. ±10%, 500 volts DC, 7/16″ long x 7/32″ dia., leads 1¾″ long, Erie type N750-K-5.	4						*
C11, C13	3D9010-48	CAPACITOR, ceramic, 10 mmf. ±10%, 500 volts DC, 7/16″ long x 7/32″ dia., leads 1½″ long, Erie type N750-K-10.	2						*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR BEACON TRANSMITTER-RECEIVER *AN/PPN-1A (continued).

NOTE: Order maintenance parts by stock number, name, and description.

Ref. Symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan per equipment*	*Running spares*	*Orgn stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
C10, C16, C28	3D9025-39	CAPACITOR, ceramic, 25 mmf. ±10%, 500 volts DC, 3/16" long x 7/32" dia., leads 1½" long, Erie type N750-K-25.	3						*
C15	3D9040-14	CAPACITOR, ceramic, 40 mmf. ±10%, 500 volts DC, 7/16" long x 7/32" dia., leads 1½" long, Erie type N750-K-40.	1						*
C2, C3, C5, C7 C24, C51, C54	3D9050-49	CAPACITOR, ceramic, 50 mmf. ±10%, 500 volts DC, 7/16" long x 7/32" dia., leads 1⅜" long, Erie type N750-K-50.	7						*
C32 thru C43	3D9055-4	CAPACITOR, bushing type, 55 mmf. ±10%, 600 volts DC, 1/32" long including leads, bushing dia. .166", Centralab type 817-001.	12						*
C22, C26, C52	3D09100-65	CAPACITOR, ceramic, 100 mmf. ±10%, 500 volts DC, 11/16" long x ¼" dia., leads 1⅜" long, Erie type N750-L-100.	3						*
C19	3DA1-111.1	CAPACITOR, paper, 1000 mmf. +60% −20%, 600 volts DC, metal can, 1" long x 7/16" dia., leads 2¼" long, Sprague type PX-24A.	1						*
C23, C31, C49	3DA5-54.1	CAPACITOR, paper, 5000 mmf. +60% −20%, 600 volts DC, metal can insulated, 1 1/16" long x 7/16" dia. leads 2¼" long, Sprague Type PX24B.	3						*

C53	3DA8-15	CAPACITOR, 8000 mmf. ±10%, 2000 volts, 1¾″ long x ½″ dia. Sprague Type PX-39B.	1							*
C8, C14, C18, C20, C30	3DA10-212	CAPACITOR, paper, 10,000 mmf. +30% −20%, 600 volts, metal can, 1″ long x 7/16″ dia. leads 2¼″ long, Sprague Type PX-24A.	5							*
C12, C21	3DA50-25.2	CAPACITOR, paper, 50,000 mmf. +30% −20%, 600 volts DC, metal can 1⅜″ long x 9/16″ dia. leads 2¼″, Sprague Type PX-24A.	2							*
C46-A, C46-B	3DB10-76	CAPACITOR, 10-10 mfd. −10% +50%, 300 volts DC, electrolytic 3″ long x 1″ dia. Sprague Specialties Co.	1							*
C1, C29	3D9007V-9	CAPACITOR, trimmer, 1.5-7 mmf., 500 volts DC, ceramic, 1 11/16″ x 41/64″, screwdriver adj. Erie type TS2A-Np, (modified).	2							*
RFC 1 thru RFC 10	3C323-53A	CHOKE (small) 20 turns of #28 copper wire 3/32″ x ½″, Bakelite form, Automatic Winding Co.	10							*
RFC 11 thru RFC 13	3C325-53B	CHOKE (large) 12 turns of #22 copper wire on 3/16″ x 5/8″ Bakelite form, Automatic Winding Co.	3							*
L4	2C5130-44/C2	COIL, AGS, laminated phenolic form, ¼″ dia. 2 sections each 317 turns wire #36 S.S.E. Fairchild Camera & Inst. Corp.	1							*
L5	2C5130-44/C1	COIL, Q.O., laminated phenolic form, ¼″ dia. 3 sections each 332 turns wire #36 S.S.E., Fairchild Camera & Inst. Corp.	1							*
	2Z3005-12	CONNECTOR ASSEMBLY (antenna end of W1).	1							*
P1	2Z7111.106	CONNECTOR, cable male.	2							*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR BEACON TRANSMITTER-RECEIVER *AN/PPN-1A (continued).

NOTE: Order maintenance parts by stock number, name, and description.

Ref. Symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan per equipment*	*Running spares*	*Orgn stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
J1	2Z5534A	JACK, PHONE, open circuit, opening .250" dia. to fit standard telephone plug includes threaded bushing 3/8-32 NS2 thread. Aircraft Radio Corp.	1						*
P3	2Z8675.53	PLUG, style S, type AN-3108-14S-5S, American Phenolic.	1						*
J2	2Z8799-80	RECEPTACLE, style P, type AN-3102-14S-5P, American Phenolic.	1						*
P2	2Z7111.105	RECEPTACLE, female (for ant. ext. cable).	1						*
	3G1839-39	INSULATOR, standoff.	11						*
SW-3		SWITCH, toggle, D.P.S.T., 1/4" long, slotted mounting bushing, GE, type 1GA2B1.	1						*
SW-2	3ZK9859-23	SWITCH, toggle, S.P.S.T., momentary contact, normally open, 13/32" long, slotted mounting bushing, straight, type Trigger.	1						*
SW-1	3Z9824-266.1	SWITCH, push button, momentary open, normally closed, type DSP, Robert Hetherington & Son, Inc.	1						*
R32, R34	3ZK6033-19	RESISTOR, 330 ohms, ±10%, 1 watt, Carbon, type GB, Allen Bradley.	2						*
R7	3Z6100-58	RESISTOR, 1000 ohms ±10%, 1/2 watt, carbon, type EB, Allen Bradley.	1						*
R1	3Z6200-3	RESISTOR, 2200 ohms, ±10%, 1/2 watt, carbon, type EB, Allen Bradley.	1						*

R4	3Z6470-8	RESISTOR, 4700 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	1							*
R33	3Z6470-17	RESISTOR, 4700 ohms, ±10%, 1 watt, carbon, type GB, Allen Bradley.	1							*
R5	3Z6582-1	RESISTOR, 8200 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	1							*
R29, R30	3Z6622-10	RESISTOR, 22,000 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	2							*
R24	3Z6622-11	RESISTOR, 22,000 ohms, ±10%, 1 watt, carbon, type GB, Allen Bradley.	1							*
R8, R20, R23, R27, R28	3ZK6633-20	RESISTOR, 33,000 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	5							*
R12	3Z6633-9	RESISTOR, 33,000 ohms, ±10%, 1 watt, carbon, type GB, Allen Bradley.	1							*
R2, R26	3Z6647-5	RESISTOR, 47,000 ohms, ±10%, ½ watt, carbon type EB, Allen Bradley.	2							*
R11	3Z6668-3	RESISTOR, 68,000 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	1							*
R9, R13, R17, R25, R35	3Z6700-54	RESISTOR, 100,000 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	5							*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR BEACON TRANSMITTER-RECEIVER *AN/PPN-1A (continued).

NOTE: Order maintenance parts by stock number, name, and description.

Ref. Symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan per equipment*	*Running spares*	*Orgn stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
R16, R36	3ZF4041	RESISTOR, 100,000 ohms, ±10%, 1 watt, carbon, type GB, Allen Bradley.	2						*
R6, R21	3Z6715-24	RESISTOR, 150,000 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	2						*
R3, R10, R22, R31	3Z6722-5	RESISTOR, 220,000 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	4						*
R14, R18	3Z6733-17	RESISTOR, 330,000 ohms, ±10%, ½ watt, carbon, type EB, Allen Bradley.	2						*
R19	3Z6768-6	RESISTOR, 680,000 ohms, ±10%, ½ watt, type EB, Allen Bradley.	1						*
XI thru X10	2Z8677.38	SOCKET, miniature, 7-pin moulded phenolic, Cinch type 9824.	10						*
	2Z8675.10	SOCKET (for vibrator) 5-pin laminated phenolic.	1						*
V1, V5	2J6AK5	TUBE, vacuum, type 6AK5.	2	*					
V4, V7, V9	2J9001	TUBE, vacuum, type 9001.	3	*					

V2, V3, V6, V8, V10	2J9002	TUBE, vacuum, type 9002.	5	*						
	2Z9428-9	RESISTOR BOARD ASSEMBLY, AGS.	1							*
	2Z9412.48	TERMINAL BOARD ASSEMBLY, Q.O., laminated phenolic, 1 15/16" x 1 1/8" including 13 terminal pins.	1							*
	2Z9413.6	RESISTOR BOARD ASSEMBLY, Q.O.	1							*
	2Z9428-10	TERMINAL BOARD ASSEMBLY, AGS, laminated phenolic, 4 11/32" x 1 1/16" including 28 terminal pins.	1							*
Fig. 2	3B275-210	BATTERY BB-210/U, 2 volts, Willard type ERH-25-2.	3	*						*
Fig. 10	2Z1607-4	CAP (screw type) destructor. 3/4" dia. metal painted red and stamped DEST.	1							*
	2Z565-1.2	BAG HARNESS.	1	*						
	2Z2703-10	CLIP (for soldering to DEST cap).	1							*
Fig. 16	2Z5091-5	COVER DETENT, C.R.S. 2 11/16" x 1 3/4" x .437" x .025" thick.	1							*
	2Z3401.19	COVER ASSEMBLY (for phone jack) brass, 13/16" x 11/16" overall.	1							*
Fig. 21	2Z3351-23	COVER, (PUSH BUTTON SWITCH), black rubber, durometer 50-45, 1/16" wall, 7/16" high, 3/8" R, 3/4" O.D. x 5/8" I.D.	1							*
Fig. 21	2Z3351-22	COVER, TOGGLE SWITCH, black rubber durometer 40-45, 3/8" wall, 25/32" high, 9/16" O.D. x 15/32" I.D.	2							*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR BEACON TRANSMITTER-RECEIVER *AN/PPN-1A (continued).

NOTE: Order maintenance parts by stock number, name, and description.

Ref. Symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan per equipment*	*Running spares*	*Orgn stock*	*3d ech*	*4th ech*	*5th ech*	*Depot stock*
Fig. 16	6Z3542	DECALCOMANIA, set, 5 white letters, A,B,C,D,E, 1/8" high (for detent cover).	2						*
	2C5130-44/D-1	DETENT ASSEMBLY, left. (TRANS.).	1						*
	2C5130-44/D-2	DETENT ASSEMBLY, right. (REC.)	1						*
	3B1514	ELECTROLYTE, bottle.	for 3 cells	*					*
Fig. 17	2C5130-44/E1	ENCLOSURE ASSEMBLY, (case rec. trans.) (to be supplied with cut outs for adjusting C1 and C29) steel, American Tool & Stamping Co.	1						*
	2Z4868.82	GASKET, (for antenna cable clamp on panel), black neoprene, durometer 50-60, 1/16" thick, 3/8" O.D. .136 I.D.	1						*
	2Z4868.83	GASKET, (for DEST cap).	1						*
	2Z4868.86	GASKET, detent cover, black neoprene, durometer 50-60 1/32" thick.	1						*
	2Z4868.85	GASKET, (cover rec. trans.), black neoprene, durometer 50-60, 3/32" thick, 3/8" O.D., .136 I.D.	2						*
	2Z4868.84	GASKET, (front panel rec. tran.) black neoprene, 1/16" thick, 4 15/64" x 2 49/64" overall.	1						*

	2Z4868.80	GASKET, (power connector) black neoprene, durometer, 50-60, 1/32" thick, one 3/16" sq. hole 25/32" dia.	1						*
	2Z4868.81	GASKET, (rear panel rec. trans.).	1						*
	6G1005.6	GLYPTOL, 2 oz. bottle.							*
	2B830B.1	HEAD SET AND CORD ASSEMBLY (SC. type HS. 30-B headset).	1	*					
	3E1605-6.5	CORD CD-605.	1	*					
	6G237	HEAVY PREG S-191 (jar).							*
Fig. 3	3B375-77/J1	JACKET, BATTERY, sponge rubber 1/4" thick 4 3/8" high x 3" wide x 2 1/2" deep.	3						*
Fig. 4	3B375-77/J2	JACKET, CHANNEL, sponge rubber, overall dimensions 8 1/8" x 27/32" x 7/8" punched with three 3/8" dia. holes, special.	1						*
Fig. 16	2Z5822-73	KNOB, black moulded phenolic, 1 1/8" x 5/8" over-all, white plastic pointer; Kurz-Kasch type S-308-64-BB-40275 with 2 set screws 8-32 x 3/16".	2						*
Fig. 4		LUG, (battery cable).	2						*
Fig. 2	2Z6911-4	PADS, (for separating components in transit).							*
	2A288A-11	RADIATOR ASSEMBLY, (antenna rod).	1						*
Fig. 29	2Z8302.7	SHIELD, power unit .015" thick, steel, C.R., half hard, cadmium plated, 7 9/16" long.	1						*
Fig. 25	2Z8304.27	SHIELD, tube, midget, Cinch Mfg. Co., #1006.	10						*

* Indicates stock available.

MAINTENANCE PARTS LIST FOR BEACON TRANSMITTER-RECEIVER *AN/PPN-1A (continued).

NOTE: Order maintenance parts by stock number, name, and description.

Ref. Symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan per equipment*	*Running spares*	*Orgn stock*	*3d echn*	*4th echn*	*5th echn*	*Depot stock*
Fig. 27	2Z9048-3	STRAP, lock, (for holding sockets), cadmium plated, steel, 2 tapped holes #4-40, Cinch Mfg. Co.	10						*
Fig. 4	3B1059	STRIP, LEAD, 1/16" thick, x 1 25/32" long x 3/8" wide, .156" dia. hole on each end.	2						*
VB1	3H6690	VIBRATOR, Mallory type No. 561C.	1	*					*
	6Z7505	PAPER, waterproof, 30 feet, roll.		*					
	6L80028	Complete sets of screws, nuts and washer assemblies which are removed during normal servicing of the Beacon including battery terminal screws with nuts.							*
Figs. 1 & 2		ANTENNA ASSEMBLY AS-83/PPN-1A.	1	*					*
	3H4497-11A	VIBRATOR POWER PACK PP-11A/PPN-1.	1	*					*
	3B375-77	BOX BATTERY CY-77/PPN-1A, Fairchild Camera and Inst. Corp.	1						*
	2C5130-44	RECEIVER TRANSMITTER, RT-44/PPN-1A.	1						

* Indicates stock available.

Order No. 759-MSCPD-44; 4085; 16 May 1944