# 91A TEST SET

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## 1. GENERAL

1.01 This section replaces Issue 2. It describes the 91A Test Set used in cable testing. It is reissued to advise that defective 703B or KS-14541 Networks in 147A Amplifiers are now being replaced with the KS-14556 Network used in the 147B Amplifier.

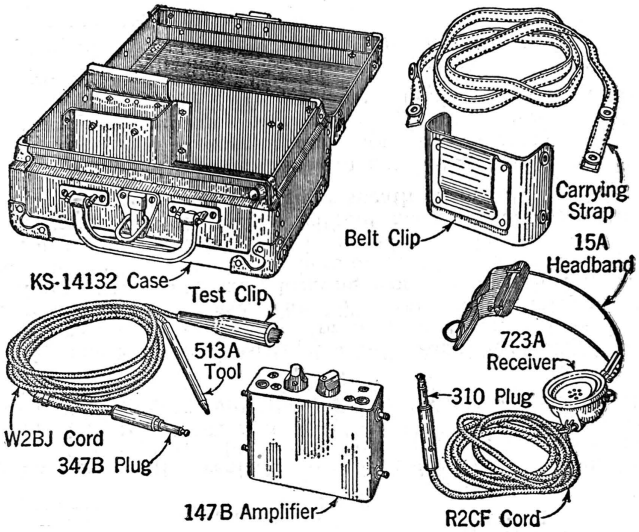
1.02 The 91A set consists of a 147B Amplifier, a 723A Receiver, a 513A Tool (probe), cords and plugs in a KS-14132 Carrying Case. The 147B Amplifier is intended to facilitate testing and fault locating work with exploring coils and other testing apparatus where an amplifier is required. The amplifier with the 513A Tool is intended for identifying wires in toll and exchange cables without making metallic contact with the conductors at a splice or sheath opening.

1.03 The 147-type amplifier can not be used with the 78A Test Set because it does not have sufficient gain at 20 cycles, the frequency of the tracing current used with the 78A set. An existing 107A Amplifier should be used with the 78A set.

1.04 Information on the use of the amplifier is covered in other sections.

## 2. DESCRIPTION

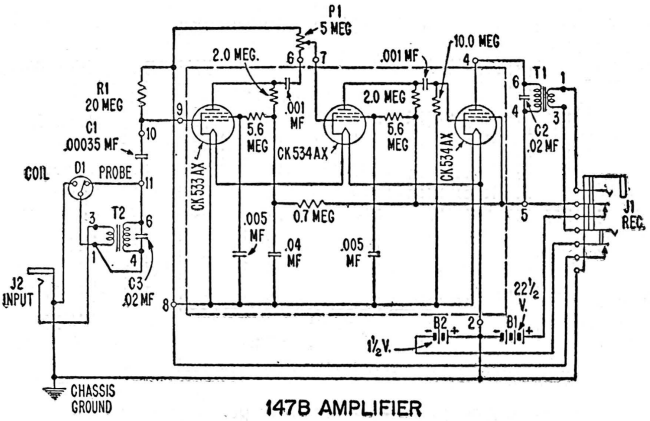
2.01 The 91A Test Set is illustrated in the following sketch.




**91A Test Set**

### 147B Amplifier

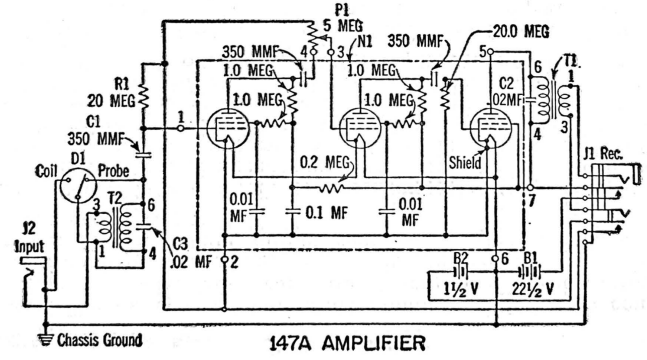
2.02 This is a three-tube dry battery operated amplifier. It is 4″ x 4″ x 1-1/2″ and weighs about 1-1/4 pounds. The circuit diagram is shown in the following sketch. The three stages of amplification are contained in a network, coded the KS-14556 Network. The network consists of a ceramic plate approximately 1-1/4″ x 1-1/8″ x 1/16″ thick on which the resistors and conductors are printed and to which the subminiature electron tube sockets and disc type capacitors are attached. One CK533AX and two CK534AX (Raytheon) electron tubes are used in the network. The network is indicated by the dotted lines in the circuit diagram.




147B AMPLIFIER

**147A Amplifier**

2.03 The superseded 147A Amplifier is similar in size, external appearance and performance to the 147B Amplifier. The network in the amplifier formerly coded as the 703B Network and now designated as the KS-14541 Network, consists of three electron tubes, resistors and capacitors wired together and cast in a block of wax. The network is indicated by the dotted lines in the following circuit diagram. If a defect develops, the network must be replaced.




147A AMPLIFIER

**147A and 147B Amplifiers**

2.04 The 147-type amplifiers are equipped with a gain control, labeled VOL, calibrated from 0 to 100. The control P1 is a conventional voltage divider in the signal path of the amplifier. The input and output jacks are labeled INPUT and REC, respectively.

2.05 The 147-type amplifiers are equipped with a strap and a belt clip for carrying purposes. Amplifiers can be operated in the carrying case or outside. There are two studs at each end of the amplifier to which the snap fasteners on the belt clip and strap are engaged. The amplifier can be carried upside down on the strap or in the belt clip to prevent rain entering the jack openings when the plugs are not inserted.

2.06 Two KS-14368 Dry Batteries are used for the filament supply and a KS-14773 Dry Battery for the plate supply. These batteries must be ordered separately.

2.07 The 723A Receiver is equipped with a 15A Headband, and R2CF Cord and a 310 Plug. The 528 and 716B Receivers can also be used.

2.08 The 513 Tool is equipped with a W2BJ Cord, a 347B Plug and a test clip.

2.09 The KS-14132 Carrying Case is a black fibre case measuring 9" x 11-1/4" x 5-3/8" over the hardware. Provision is made for strapping the amplifier against sponge rubber pads along one side of the case. The case has a small compartment for storing two KS-14368 and one KS-14773 batteries.

## 3. USE WITH OTHER TEST SETS

3.01 **75A, 181A and 105A Test Sets:** With these test sets the switch of the amplifier should be set either at COIL or PROBE depending on which gives the better pickup.

3.02 **75B, 101B and 105B Test Sets:** With these sets the switch of the amplifier should be set at COIL.

3.03 **79-type Test Set:** This set can be used in the usual manner with the amplifier switch at COIL, for identifying battery wires and checking for power on coaxials.

3.04 **93A Test Set:** This set is used in the usual manner with the amplifier switch at PROBE, for determining the path and depth of buried conductors.

3.05 **572A Tool:** This is a magnetic type probe intended for wire identification at 250 kc with the 71A and 72A Test Sets. The 572A Tool should be used with the amplifier switch

set at COIL, to identify wires to which tone from the 76-type set has been applied. It is useful in identifying wires that are grounded or crossed, as in the case of a total cable failure.

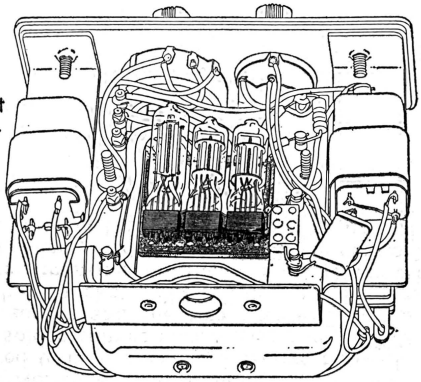
## 4. MAINTENANCE

### 147B Amplifier

4.01 Voltage measurements, using 1000-ohm-per-volt voltmeter, should be made at the network terminals to determine whether it is defective. With the receiver plug in the jack, Terminal 8 should measure 1-1/2 volts negative with respect to the chassis (Terminal 2); Terminals 4 and 5 should measure 22-1/2 volts positive with respect to the chassis. The continuity of the filament circuit between Terminals 2 and 8 can be checked with an ohmmeter when the receiver plug is removed from the jack. The resistance should measure between 30 and 65 ohms. The continuity of the wiring can also be tested with the ohmmeter. The low windings of both transformers have a resistance of about 5 ohms; the high windings are about 1200 ohms.

4.02 A defective KS-14556 Network should be replaced as a unit. For this purpose the amplifier should be returned in accordance with local routine for making such repairs, or, if authorized, the network can be replaced in the field. To make the replacement, the defective network should be removed by removing the clamp and unsoldering the seven wire leads from the terminals. The new network should be placed so that the bottom edge is in alignment with the location marks on the terminal strips. Cut the wire leads to the required length and sleeve them with No. 20 varnished tubing. Solder the leads to the same numbered terminals as the defective network without disturbing other solder connections. Insert the CK533AX tube in the left-hand socket and the two CK534AX tubes in the center and right-hand sockets. The red dot on the tubes should align with the red marking on the sockets. New tubes are equipped with 1-1/2-inch leads; these should be cut to 1/4 inch before the tube is placed in the socket. Then replace the clamp.

For clearness the clamp that holds the network in place has been omitted.

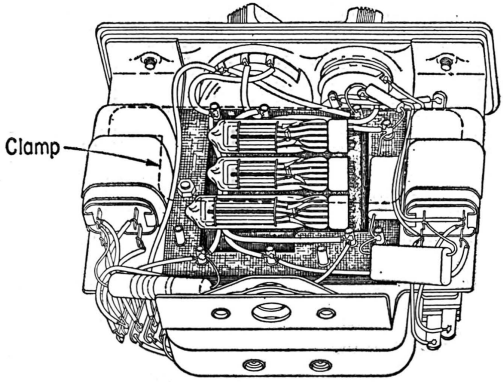


Note:- Shaded portion indicates the KS-14556 Network.

**147A Amplifier**

4.03 Voltage measurements, using a 1000-ohm-per-volt voltmeter, should be made at the network terminals to determine whether it is defective. With the receiver plug in the jack, Terminal 2 should measure 1-1/2 volts negative with respect to the chassis (Terminal 6); Terminals 5 and 7 should measure 22-1/2 volts positive with respect to the chassis. The continuity of the filament circuit between Terminals 2 and 6 can be checked with an ohmmeter when the receiver plug is removed from the jack. The resistance should measure between 5 and 20 ohms for the 703B Network and 30 to 65 ohms for the KS-14541 Network. The continuity of the wiring and the transformer windings can also be tested with the ohmmeter. The low windings of both transformers have a resistance of 5 ohms; the high windings, 1200 ohms.

4.04 A defective 703B or KS-14541 Network must be replaced with a KS-14556 Network. For this purpose the amplifier should be returned in accordance with local routine. The chassis of a 147A Amplifier equipped with a KS-14556 Network is shown in the sketch below.




147A Amplifier equipped with a KS-14556 Network

4.05 **Batteries:** The batteries are held in place in the 147-type amplifier by means of spring clips on the amplifier chassis, which can be removed from the case after first turning the lock on the bottom, 1/4 turn counterclockwise. The filament and plate batteries should be discarded when their voltages reach 1.0 and 17.0 volts, respectively. The filament voltage should be measured with the battery in the amplifier and the receiver plug in the jack; the plate battery should be measured with the amplifier turned off.

4.06 **Parts for Field Replacement:**

**Amplifier, 147-type**

**Battery, Dry, KS-14773** (Plate battery) ←

**Battery, Dry, KS-14368** (2 required) (Filament battery) ←

**Clip, Belt,** for 147-type Amplifier

**Cord, R2CF**

**Cord, W2BJ**

**Network, * KS-14556**

**Strap, Carrying,** for 147-type Amplifier

**Tube, Electron, CK533AX** (1 required) ←

**Tube, Electron, CK534AX** (2 required) ←

* The KS-14556 Network is supplied without tubes.