NAVSHIPS 91339

INSTRUCTION BOOK

for

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8

and

FREQUENCY SHIFT CONVERTER CV-60/URR

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION
Camden, New Jersey, U. S. A.

BUREAU OF SHIPS NAVY DEPARTMENT

IB-38483

Contract NObsr-39421

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Change 1 : 15 February 1951

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Change 1	7–31, 7–32	Change 1
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B, C	Original	7–63, 7–64	Change 1
i to vii	Original	7–65, 7–66	Change 1
1–0 to 1–5	Original	8–1	Change 1
1–6 to 1–9	Change 1	8–2	Original
1–10	Original	8–3, 8–4	Change 1
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7–25	Change 1	i–5	*Original
7–26 to 7–30	Original	i–6	Original

One print each of Figures 7–15, 7–16 also in envelope at end of instruction book.
Figure 7–15 Original
Figure 7–16 Change 1

* Original page with minor corrections made according to errata sheet issued with Change 1.

10 January 1951
Temporary Correction T-3
to Instruction Book for
Frequency Shift Converter-Comparator
Group AN/URA-8 and
Frequency Shift Converter CV-60/URR
NAVSHIPS 91339

1. In Figures 7-16 (on page 7-31, 7-32, and in the envelope at end of book) and Figure 7-33 (page 7-63, 7-64), make the following revisions:

(a) Break the connection between R922 and R923, and connect the lower end of R922 to pin 1 of X906. Connect the open top end of R923 to pin 8 of X907.

(b) Break the connection of the arm on R923 to pin 8 of X906. Instead, connect the arm of R923 to ground.

(c) Change resistance values of R921, R946, R945, R922, from 4.7K, 47, 47, 470, to 68K, 680, 680, 68K respectively.

(d) Delete resistor R940, and connect P901-3 directly to junction of R910 and R911. Insert resistor R940 (10K) between P901-2 and X906-6.

2. Corresponding changes to the wiring diagram, affected by the revisions in paragraph 1, will be made in Figure 7-34 (page 7-65, 7-66), to come later.

3. Make following changes to Section 8:

Page No.

8-23 For R-940: Change function to "V-906 and V-907 Plate Dropping".

RADIO CORPORATION OF AMERICA - RCA VICTOR DIVISON
Camden, New Jersey, U.S.A.

Contract: NObsr-39421

IB-38483-c

ERRATA SHEET WITH CHANGE 1
TO INSTRUCTION BOOK FOR
FREQUENCY SHIFT CONVERTER–COMPARATOR GROUP AN/URA-8
AND FREQUENCY SHIFT CONVERTER CV-60/URR
NAVSHIPS 91339

The following minor corrections should be made in the instruction book with pen and ink when Change 1 Revision Pages are inserted.

Page No.	*Location and Correction*
2–1	Second column, fifth line from bottom, change B± to B+
3–1	Second column, eleventh line from bottom, change "nuts" to "screws"
3–13, 3–14	In lower right-hand corner, delete "nut" from "8-32 x 3/8 screws with nut, flatwasher, and lockwasher"
8–7	For E-606, add Standard Navy Stock No. "N17-B-78083-1401"
8–9	For E-1201, add Standard Navy Stock No. "N17-F-74266-9227"
8–12	For M-1601, add Standard Navy Stock No. "N17-M-19051-9600"
8–13	Change first word of description for 0-1506 from "SCALE" to "BEZEL"
8–25	In column for T-601, change "N17-T-62664-3500" to "N17-T-62664-5501"
i–5	Change listing of "Repair Parts" to "Spare Parts"

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
29 June 1950

RESTRICTED

From: Chief, Bureau of Ships
To: All Activities concerned with the Installation, Operation and Maintenance of the Subject Equipment.

Subj: Instruction Book for Frequency Shift Converter-Comparator Group AN/URA-8 and Frequency Shift Converter CV-60/URR, NAVSHIPS 91339.

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2. NAVSHIPS 91339 is a RESTRICTED non-registered publication and shall be handled, transported and safeguarded in accordance with U. S. Navy Regulations. When superseded by a later edition, this publication shall be destroyed.

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D. H. CLARK
Chief of Bureau

RESTRICTED

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION
One	1/4/51	J. Newman

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* Also in envelope at back of book.

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GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number NObsr-39421 Date of Contract, 30 June 1947

Serial Number of equipment .....

Date of acceptance by the Navy .....

Date of delivery to contract destination .....

Date of completion of installation .....

Date placed in service .....

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the date of acceptance plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised).

The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the Bureau of Ships Manual or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Federal stock number or, when ordering from a Marine Corps or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water

Procedure:

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch and instrument boards.
3. Destroy all controls, switches, relays, connections and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water cooling systems in gas engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the Bureau of Ships Manual or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all time observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under no circumstances should any access gate, door, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

WARNING

Voltages over 300 volts shall be measured as follows:

1. De-energize the equipment. Ground terminals to be measured to ground to discharge any capacitors connected to these terminals. (See Note F).

2. Connect meter to terminals to be measured, using a range higher than the expected voltage.

3. WITHOUT TOUCHING METER OR TEST LEADS, energize the equipment and read the meter.

4. De-energize the equipment. Ground the terminals connected to the meter to ground before disconnecting meter.

NOTES:

A. MAKE SURE you are NOT GROUNDED whenever you are adjusting equipment or using measuring equipment.

B. In general, USE ONE HAND only when servicing live equipment.

C. If test meter must be held or adjusted while voltage is applied GROUND the case of the meter before starting measurement and DO NOT touch the live equipment or personnel working on live equipment while you are holding the meter. Some moving-vane type meters should not be grounded. These should not be held during measurements.

D. DO NOT FORGET that high voltages MAY BE PRESENT across terminals that are normally low voltage, due to equipment breakdown. Be careful even when measuring low voltages.

E. DO NOT use test equipment known to be in poor condition.

F. High-voltage high-capacity capacitors should be discharged with a grounding stick with approximately 10 ohms in series with the grounded line. Where neither terminal of a capacitor is grounded, short capacitor terminals to each other.

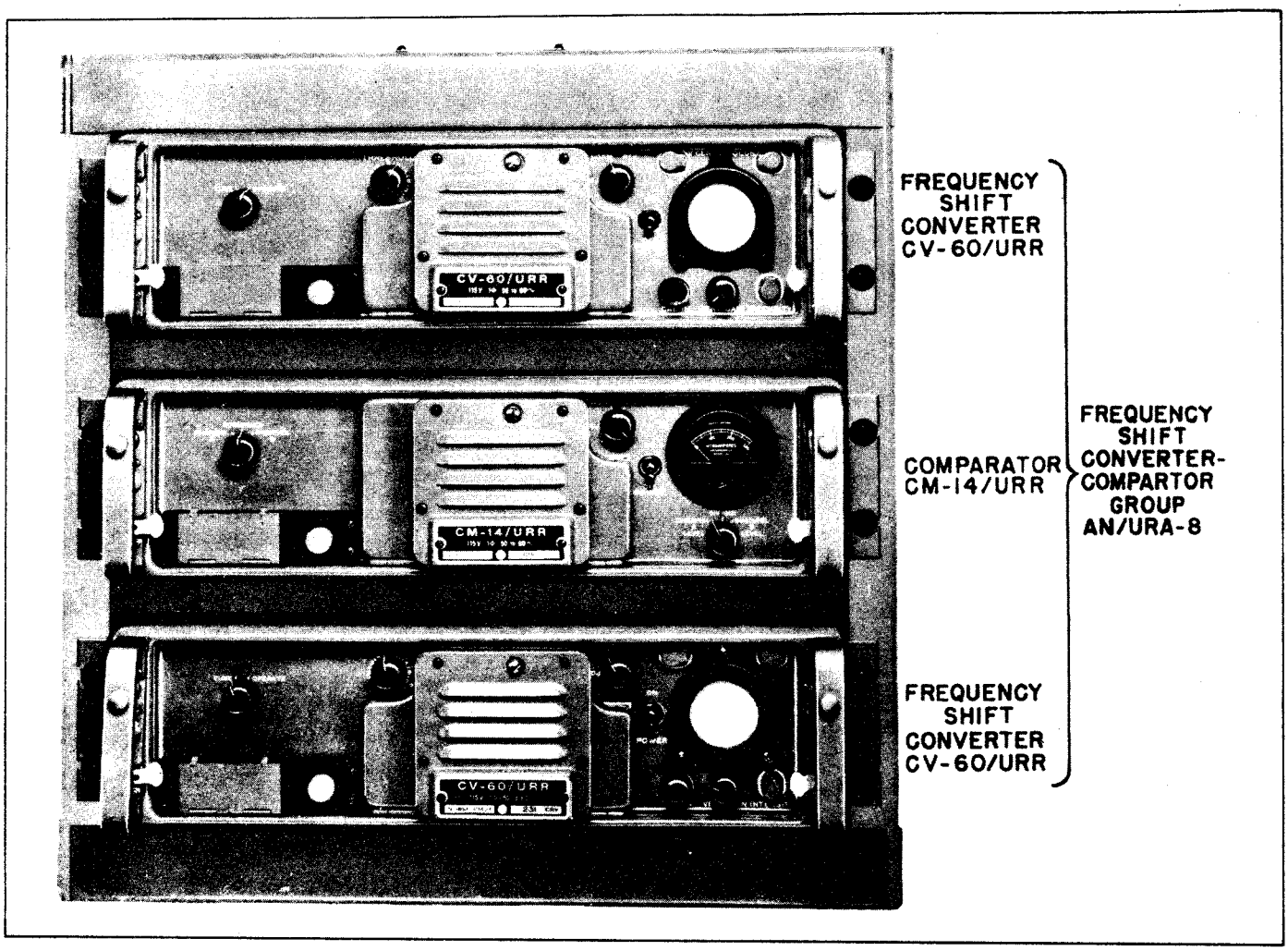


Figure 1–1. Frequency Shift Converter-Comparator Group AN/URA-8

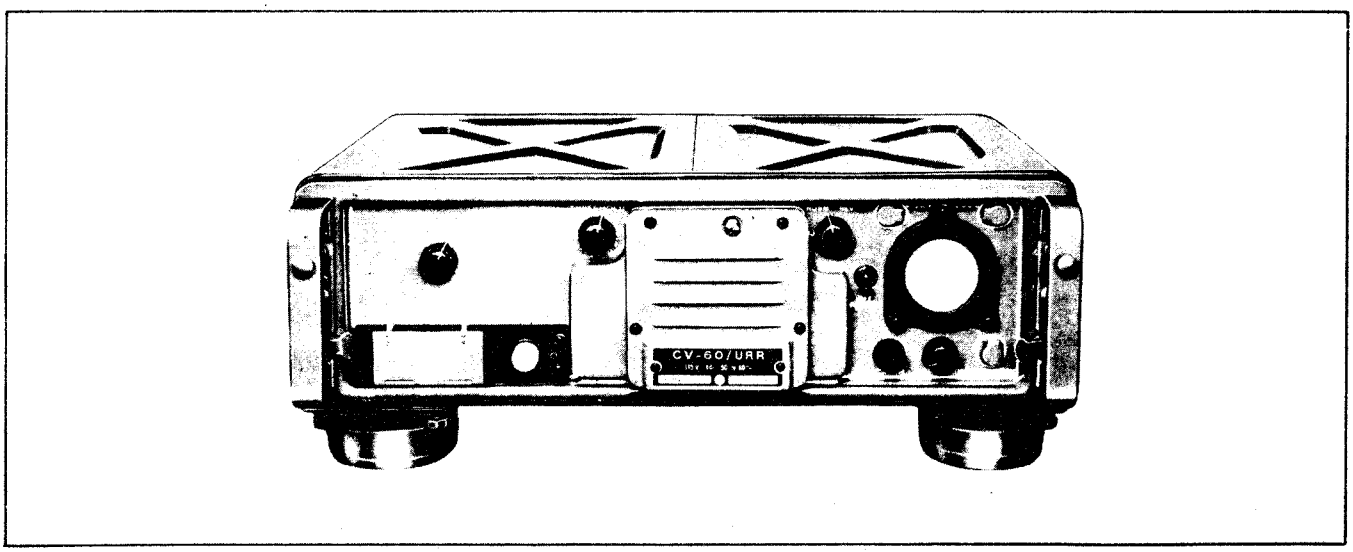


Figure 1–2. Frequency Shift Converter CV-60/URR

SECTION 1
GENERAL DESCRIPTION

1. SCOPE OF THIS BOOK.

This book covers Frequency Shift Converter CV-60/URR (AF type, single channel) and Frequency Shift Converter-Comparator Group AN/URA-8 (AF type, dual channel) equipment and includes description, theory, installation, operation, maintenance, and parts lists.

2. PURPOSE AND BASIC PRINCIPLES.

This equipment is designed to operate on frequency shift keyed radio telegraph signals, as derived from the audio-frequency outputs of communication receiving equipments, to provide keying facilities for the operation of teletype printers or other similar automatic recording devices.

To achieve the above purpose the incoming signals are filtered to remove all frequencies except those necessary for a good signal; amplified to a level above the saturation point of a limiter and passed through a discriminator to obtain positive and negative pulses. These pulses are filtered and used to trigger a double Eccles-Jordan flip-flop circuit to operate d-c keying tubes which key the teletypewriter loop. A d-c pulse, identical with the d-c pulses appearing in the teletypewriter loop, in addition keys an internal tone for transmission to a remote point.

In the AN/URA-8 equipment two receiving channels are used in a diversity arrangement with a Comparator (CM-14/URR) selecting the stronger signal to control the teletypewriter loop and the keyed tone.

3. DESCRIPTION OF UNITS.

a. FREQUENCY SHIFT CONVERTER CV-60/URR.—See Figure 1–2. Frequency Shift Converter CV-60/URR is housed in a case 5⅛ inches high, 17$^{5}/_{16}$ inches wide, and 11$^{13}/_{16}$ inches deep. All units are finished in smooth grey enamel. Removable brackets with shock mounts are supplied for table mounting. Brackets are supplied for standard relay rack installation without the shock mounting feature (see Figure 1–4). The chassis slides completely out of the cabinet, on rails, and can be placed in one of several positions for servicing convenience (see Figure 7–1). The front panel controls which do not normally need frequent attention are covered by a cover in the center of the panel containing an air filter. Screwdriver-operated controls are mounted behind oilcup-type hole covers. Jacks are provided, under a spring cover, on the lower left corner for checking the tone and teletypewriter outputs (see Figure 4–1). Power-line fuses are located on the filter unit attached to the rear of the cabinet and are accessible only from within the cabinet (see Figure 5–1).

The Frequency Shift Converter CV-60 URR is made up of the following units, which are described below (see Figure 1–5).

UNIT NAME	SYMBOL SERIES
Converter Chassis	1500
Cable Filter Unit	1200
Audio Input Unit	400
Keyer Unit	600
Tuning Monitor Unit	700
Power Supply Unit	800
Jumper Cable	W1502

(1) CONVERTER CHASSIS (see Figure 1–5). —The Converter Chassis supports all the Frequency Shift Converter units except the Cable Filter which is mounted on the back of the case. The separate units are interconnected by plugs and jacks when inserted in place. A plug P1501, on the rear of the main chassis connects the main chassis to J1201 on the Cable Filter when in operating position. When servicing the chassis, it can be slid out of the cabinet and locked in any one of four positions while still supported by cabinet rails. A jumper cable is provided for con-

necting the chassis (see Figure 3–6) with the cable filter when the chassis is withdrawn from the cabinet. An air filter, in the center of the panel, covers the controls requiring only occasional adjustment, but makes them readily accessible by a half-turn screw holding the cover against the panel. Two jacks, TTYP and PHONES, are located on the bottom left of the panel protected by a cover. To the right of the jacks is located the neon lamp B+ indicator. The POWER OFF-ON switch is located to the right center of the air filter.

(2) CABLE FILTER UNIT FOR CV-60/URR (see Figure 7–2).—All external connections to the equipment are made through the Cable Filter Unit. Filtering of the power lines and tone output circuits is provided. The Cable Filter Unit and Converter Chassis are interconnected automatically when the Converter Chassis is pushed in place. The entire filter assembly is fastened to the rear of the cabinet by eight screws accessible from the inside of the cabinet (see Figure 5–1).

Looking in the front of the cabinet, the major items of the Cable Filter Unit are arranged from left to right as follows: fuses, Allen wrenches, fan, and spare fuses. Located below the spare fuses is a jack, J1201, through which all connections between the Converter Chassis and the Cable Filter Unit are made. The fuses can only be replaced after sliding the Converter Chassis out of the case.

The housing is made in the shape of a triangle with the apex toward the rear. On the lower side of the triangle are mounted all jacks for external connections. A removable cover, held in place by five half-turn screws, forms the top of the assembly, making all internal connections and parts available for repair or replacement (see Figure 3–1).

(3) AUDIO INPUT UNIT. — The 600-ohm audio output of a communication receiver is fed to the Audio Input Unit through either the NARROW A-F INPUT jack J1211 or the WIDE A-F INPUT jack J1212. This signal is filtered, amplified, limited and fed into a discriminator which provides Tuning Indicator and remote oscilloscope vertical signals together with diversity and keyed signals.

The Audio Input Unit (see Figures 7–9 and 7–10) mounts on the left side of the Converter Chassis by front and rear flanges. Two captive screws hold the rear flange in place and one captive screw holds the front flange in place. Brackets, front and rear, permit lifting the unit in and out of the Converter Chassis. The transformer assemblies (Z401 and Z402) are mounted on the top rear of the chassis with the terminals extending through the bottom for wiring. In front of the transformers, from left to right, are a control resistor R403 and tubes V401 to V404 in numerical order. Capacitors C417 and C416 are located in front of V401 and V403, respectively. At the left center of the front bracket is S402, the TUNE-OPER-

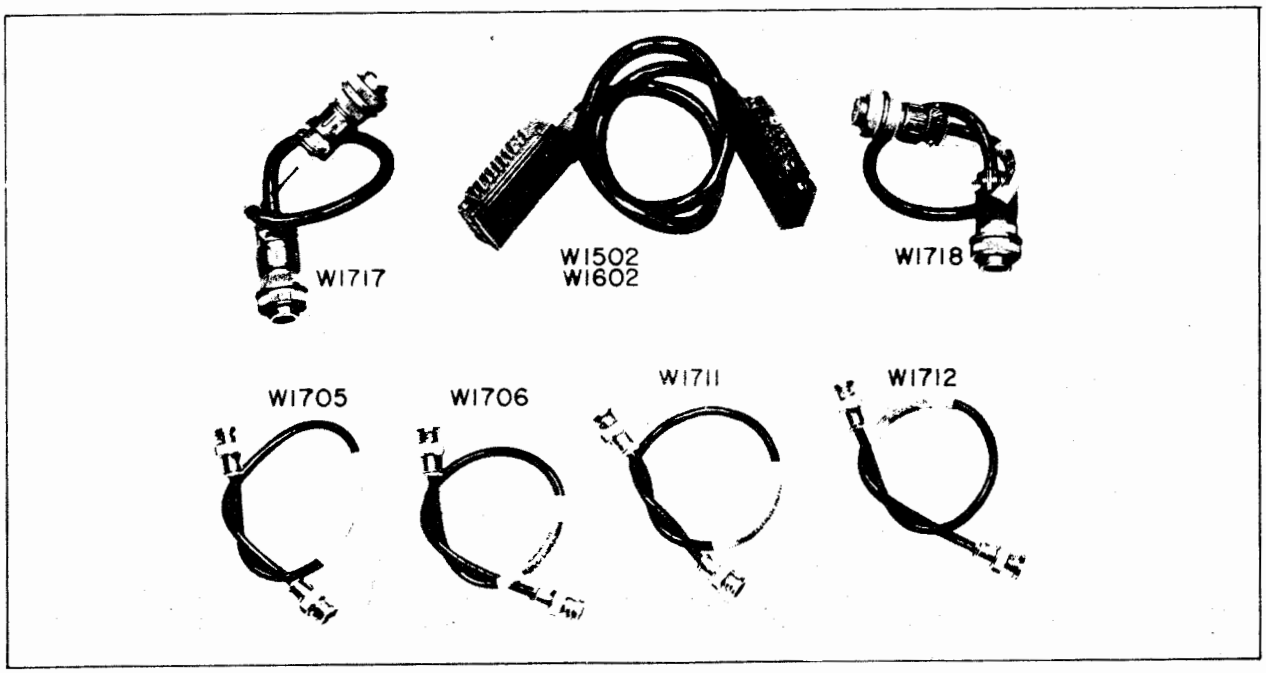


Figure 1–3. Cables for CV-60/URR and AN/URA-8 Equipments

ATE switch; and on the right side is the THRESHOLD control R421 mounted above S401, the NARROW-WIDE band switch. Mechanical couplers are provided for coupling the controls to the panel knobs on insertion of the unit into the chassis except R403 which is screwdriver-controlled and accessible only by withdrawing the chassis from the case.

The connecting plug P401 is mounted on the bottom front center, with terminal boards E404 on the left and E405 on the right. To the rear of the plug is the row of sockets and R403, with terminal board E402 to the rear of the sockets. Terminal board E403 is on the right side of E402 and mounts the audio coupling links. Mounted on the rear of the chassis is terminal board E401.

(4) KEYER UNIT.—The Keyer Unit is supplied with d-c signal pulses from the Audio Input Unit. These pulses serve to control the electronic keying tubes to key the external teletype loop. The unit also supplies an on-off tone signal of adjustable level and frequency for remote teletypewriter operation and monitoring purposes.

One Keyer Unit (see Figures 7–11 and 7–12) is mounted at the front center of the Converter Chassis and one also on the Comparator Chassis; each Keyer Unit is held in place by three captive screws, two at the rear and one at the front. Brackets at the front and rear serve as handles for lifting the unit into and out of the chassis. The front bracket is also the mounting for all the controls of the unit. On the bottom front center is located the connecting plug P601. On the right-hand side of the plug is terminal board E602 and on the left-hand side is termial board E601. To the rear of the plug is a row of capacitors (C603, C616, C615, and C601 from left to right) with four tube sockets (X601, X606, X602, and X603) to the rear of the capacitors. In back of the tube sockets are terminal boards E605 and E604 mounted over the terminals of Z601 and L601. Transformer T601 is to the right. To the rear of the items just mentioned are four tube sockets (X607, X608, X604, and X605) and four capacitors (C617, C618, C606, and C602). Terminal board E603 is fastened to the rear bracket. The rear bracket also mounts a toggle switch (S604).

Mounted on the front bracket are the following controls: S601, S602, S603, R613, R629, and R633. Looking at the top right of the rear of the front bracket is the TONE FREQ switch (S602), with the TONE LEVEL control (R629) located below. To the left is the terminal board E608 mounting the tone oscillator tuning capacitors C607 to C614 inclusive. To the top left of E608 is the SPEED (LOW-HI-ADJ) switch

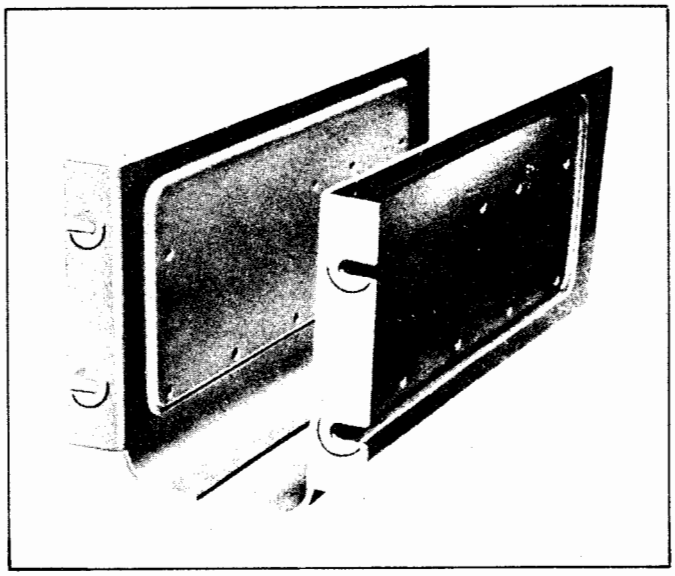


Figure 1–4. Gusset, Rack Mounts for Frequency Shift Converter CV-60/URR

(S601) with the MOD BAL control R633 below. On the extreme left is the NORM-REV switch (S603A, B) above the % MARK control R613. The controls S601, S602, S603, and R629 couple to the panel knobs by means of mechanical couplers. Controls R633 and R613 are screwdriver-adjusted through the front panel.

(5) TUNING MONITOR UNIT (see Figures 7–7 and 7–8).—The Tuning Monitor is supplied with d-c pulses from the Audio Input Unit discriminator to indicate proper tuning of the receiver. When the CAL IN button is depressed the proper setting of the THRESHOLD control can be observed.

The Tuning Monitor Unit is a separate unit fastened to the right side of the Converter Chassis by four captive screws, two at the front and two at the rear. Connections are made by a plug and jack when the unit is placed in position. All the controls, except the Vertical Linearity control, are on the front panel.

The chassis is formed from aluminum with a vertical crosswise bracket supporting the cathode-ray tube shield and three controls, CENT (R702), Vertical Linearity (R705), and FOCUS (R715). Clamped to the tube shield are the tube and socket clamp for the JAN-2BP1. A shelf, at the rear of the chassis, supports a capacitor (C701) and a tube socket (X701) with its shield. On the bottom of the chassis are the connecting plug (P701), a terminal board (E701 for resistors and small capacitors), and bracket mounting controls VERT GAIN (R701), INTENSITY (R713) and CAL IN switch (S701).

The control shafts of R701 and S701 are arranged to connect or disconnect with the panel knob shafts by means of mechanical couplings on removal or replacement of the unit. Controls R702, R713, and R715 are screwdriver-adjusted and are accessible through spring covers on the top of the front panel. Access to R705 can only be had by withdrawing the chassis from the case.

(6) POWER SUPPLY UNIT (for CV-60/URR).—See Figures 7–3 and 7–4. Power for all the units assembled on the Converter Chassis is supplied by the Power Supply Unit. This Unit has no controls and is readily changed by unscrewing four captive screws and lifting from position. All connections are made by a single plug (P801).

The chassis is formed from aluminum with flanges at both ends for support on the Converter Chassis (looking from the front of the Converter Chassis with the Power Supply Unit in its operating position). The right-hand flange has one captive screw and the left-hand flange has two captive screws. A fourth captive screw is located beside socket X801. These captive screws hold the unit in place on the Converter Chassis. The power transformer (T801) is mounted on the left side of the chassis and the remaining components are grouped on the right side. Capacitor C802A, B is mounted by an octal socket (X804) with a screw-adjusted clamp to hold it in place.

Filter Choke L801 and capacitor C801A, B, C are mounted on the top of the chassis with their terminals through the chassis for wiring convenience. A bracket, fastened to the right-hand side of the chassis, together with the power transformer provide means of lifting the unit into and out of the Converter Chassis. Four tube sockets are mounted in the chassis (X801 through X804), three for the tubes and one for the filter capacitor C802A, B. Under the chassis is located a terminal board (E801) and the connecting plug P801.

b. FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8.—Frequency Shift Converter-Comparator Group AN/URA-8 consists of two Frequency Shift Converter CV-60/URR units with one Comparator CM-14/URR unit secured within a table-mounting frame (see Figure 1–1). The units may be removed from this frame and be mounted in a standard relay rack. The CV-60/URR units are connected to separate receivers. The Comparator CM-14/URR selects the better of the two signals from the converters to key the teletypewriter loop and the tone signal.

The Comparator differs in appearance from the Frequency Shift Converters in that it has a meter in place of the cathode-ray tube of the Converter units.

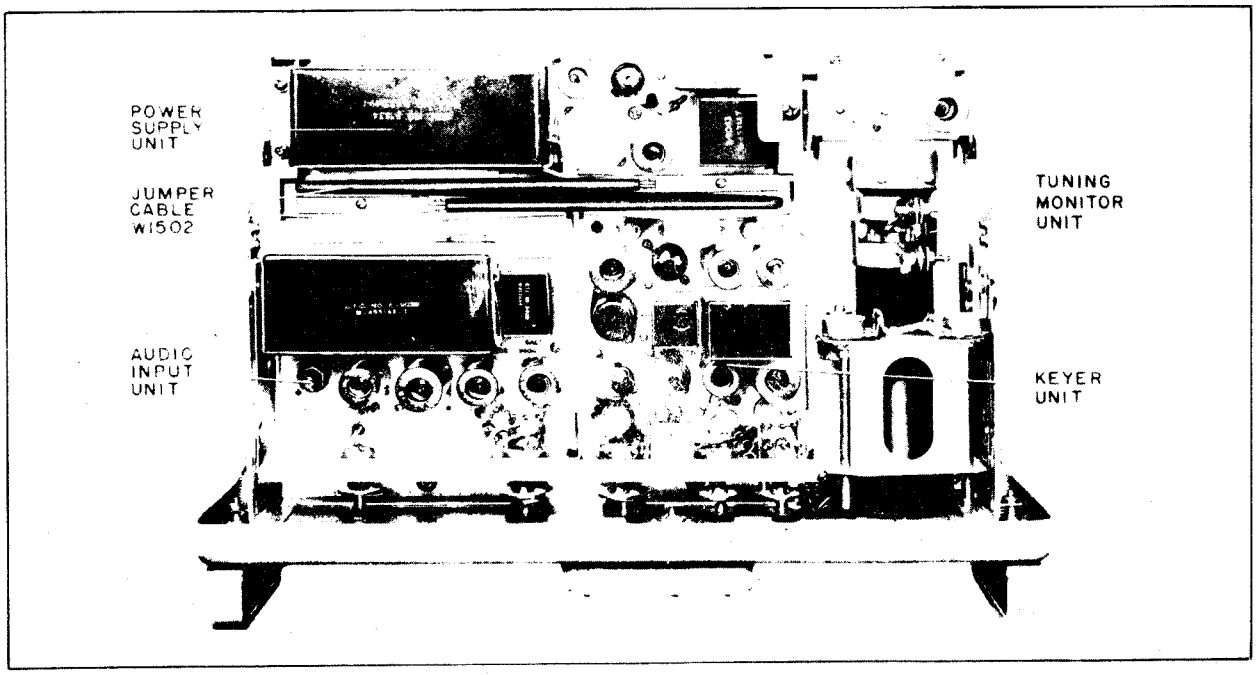


Figure 1–5. Frequency Shift Converter CV-60/URR Chassis, Top View

The Frequency Shift Converter CV-60/URR was described in the preceding paragraph. The Comparator CM-14/URR will now be described. It is made up of the following units.

UNIT NAME	SYMBOL GROUP
Comparator Chassis	1600
Cable Filter Unit	1300
Diversity Selector Unit	900
Keyer Unit	600
Power Supply Unit	1000
Jumper Cable	W1602

These units are described below, except the Keyer unit which is identical to the Keyer unit used in the CV-60/URR and was described previously in paragraph 3*a*(4).

(1) COMPARATOR CHASSIS.—See Figure 1–6. The Comparator Chassis assembly supports all the Comparator units except the Cable Filter Unit which is mounted on the back of the case. The separate units are interconnected by plugs and jacks when inserted in place. A plug, J1601, on the rear of the main chassis connects the main chassis to J1301 on the Cable Filter Unit when in operating position. When servicing, the chassis can be slid out of the cabinet and locked in any one of four positions while still supported by cabinet rails. A jumper cable is provided for connecting the chassis (similar to that shown in Figure 3–6) with the cable filter when the chassis is withdrawn from the cabinet. An air filter and cover in the center of the panel, cover the controls requiring only occasional adjustment, but make them readily accessible by a half-turn screw holding the cover against the panel.

Two jacks, TTYP and PHONES, are located on the bottom left of the panel protected by a cover. To the right of the jacks is the neon lamp B+ indicator. The POWER OFF-ON switch is located to the right center of the air filter.

(2) CABLE FILTER UNIT (for CM-14/URR).—See Figure 7–2. Converter and external connections to the Comparator are made through the Cable Filter Unit. Filtering of the power lines and tone output circuits is provided. Connections between the Cable Filter Unit and Comparator Chassis are made automatically when the Comparator Chassis is pushed in place. The entire filter assembly is fastened to the rear of the cabinet by eight screws accessible from the inside of the cabinet (see Figure 5–2).

The housing is made in the shape of a triangle with the apex toward the rear. On the lower side of the triangle are mounted all jacks for external connections. A removable cover held in place by five half-turn screws forms the top of the assembly, making all internal connections and parts available for repair or replacement (see Figure 7–2).

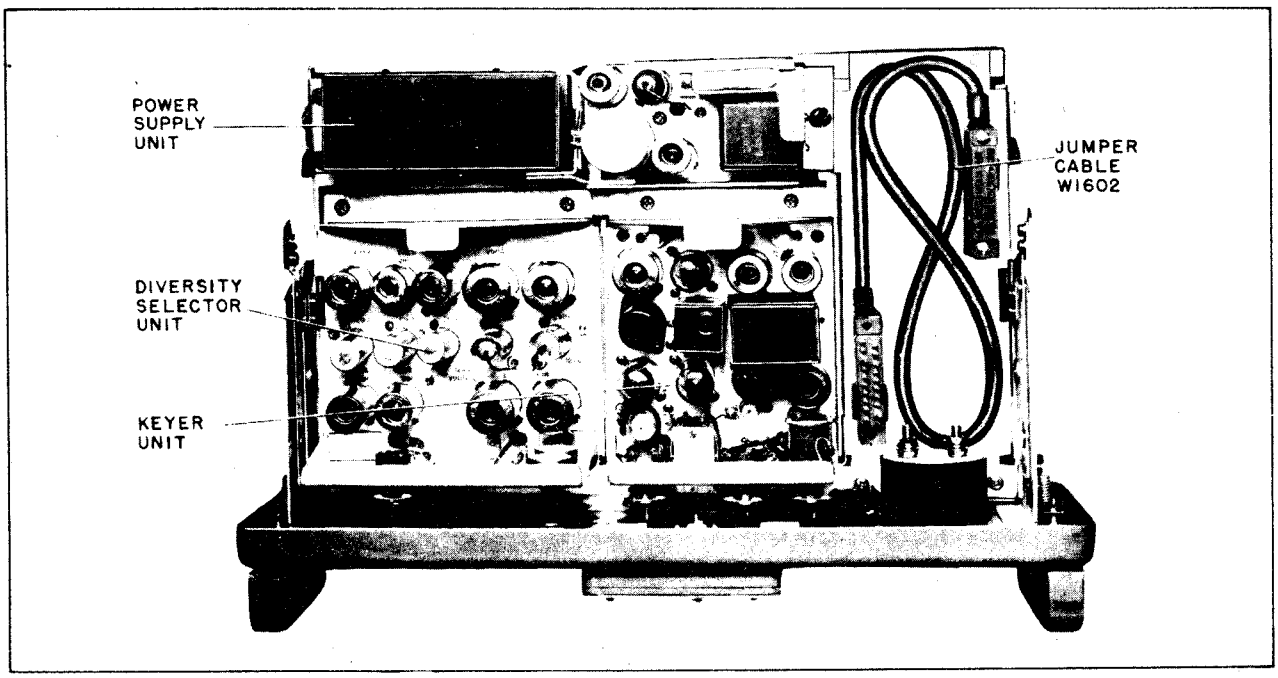


Figure 1–6. Comparator CM-14/URR Chassis, Top View

Looking at the front of the cabinet, the major items of the Cable Filter Unit are arranged from left to right as follows: fuses, Allen wrenches, fan, and spare fuses. Located below the spare fuses is a jack, J1301, by means of which all connections between the Camparator Chassis and the Cable Filter Unit are made. The fuses can only be replaced after sliding the chassis out of the case.

(3) DIVERSITY SELECTOR UNIT.—See Figures 7–13 and 7–14. The Diversity Selector unit receives the incoming signal being fed into each of the two converter channels and selects the stronger of the signals to operate a gating circuit. The d-c pulses from the two converter discriminators are fed into the gating circuit. The discriminator output from the converter receiving the stronger signal is selected to operate the Comparator Keyer Unit.

The Diversity Selector Unit is supported in the Comparator Chassis by front and rear flanges on the left front of the Comparator Chassis. Two captive screws through the rear flange and one captive screw through the front flange hold the unit in place. The front and rear brackets extend upward to make handles for inserting and removing the unit from the Comparator Chassis. The three controls (S901, R905 and R923) are mounted on the front bracket.

Underneath the chassis at the front center is a plug (P901) through which all connections are made. To the left is terminal board E904 and on the right is terminal board E905. To the rear of the plug are four tube sockets, X907, X906, X902, and X901 from left to right. In the center, arranged from left to right, are capacitors C919, C920, C914, C913, and C912. Mounted above the capacitors are terminal boards E902 and E903. Terminal board E906 is mounted on the right-hand side of E902. To the rear of the terminal boards is a row of tube sockets X905, X904, X903, X909, and X908 from left to right. Mounted on the rear bracket is terminal board E901.

Looking at the right rear of the bracket is the CHANNEL A-COMBINED-CHANNEL B switch (S901). To the top left is the GATE BAL control (R923) with the CONT BAL control (R905) below. The CHANNEL A-COMBINED-CHANNEL B switch couples to the panel knob by means of a mechanical coupler. The GATE BAL and CONT BAL controls are screwdriver-adjusted through the front panel.

(4) POWER SUPPLY UNIT (for CM-14/URR).—See Figures 7–5 and 7–6. Power for all the units assembled on the Comparator Chassis and is readily changed by unscrewing four captive screws and lifting from position. All connections are made by a single plug (P1001).

The chassis is formed from aluminum with flanges at both ends for support on the Comparator Chassis (looking from the front of the chassis with the Power Supply Unit in its operating position). The right-hand flange has one captive screw and the left-hand flange has two captive screws. A fourth captive screw is located beside the socket X1001. These captive screws hold the unit in place on the Comparator Chassis. The power transformer T1001 is mounted on the left side of the chassis and the remaining parts are grouped on the right side. Capacitor C1002A, B is mounted by an octal socket (X1004) with a screw-adjusted clamp to hold it in place.

Filter choke L1001 and capacitor C1001A, B, C are mounted on the top of the chassis with their terminals going through the chassis for wiring convenience. A bracket, fastened to the right side of the chassiss, together with the power transformer provide means of lifting the unit into and out of the Comparator Chassis. Four tube sockets are mounted in the chassis (X1001 through X1004), three for the tubes and one for the filter capacitor C1002A, B. Under the chassis is located a terminal board (E1001) and the connecting plug P1001.

4. REFERENCE DATA.

a. Equipment Designation:

(1) Frequency Shift Converter CV-60/URR (Single Channel).

(2) Frequency Shift Converter-Comparator Group AN/URA-8 (Dual Channel).

b. Contract Number: NObsr-39421 dated 30 June 1947.

c. Contractor: Radio Corporation of America, RCA Victor Division, Camden, New Jersey, U.S.A.

d. Cognizant Inspector: Inspector of Naval Material, Philadelphia District, Upper Darby, Pa.

e. Number of packages per complete shipment:
(1) CV-60/URR: two (includes equipment)
(2) AN/URA-8: two (spare parts)

f. Total cubical contents:

CV-60/URR	Crated 6.5	Uncrated 1.5
AN/URA-8	Crated 14.4	Uncrated 4.66

Equipment spare parts included.

g. Total Weights:

CV-60/URR	Crated 139	Uncrated 66
AN/URA-8	Crated 282	Uncrated 154

Equipment spare parts included.

h. Frequency Range: Audio with either a 1000-cycle or 2550-cycle center frequency.

i. Frequency Shift:

(1) Ten to 200 cycles total separation between mark and space frequencies for 1000-cycle center frequency (narrow band).

(2) 200 to 1000 cycles total separation between mark and space frequencies for 2550-cycle center frequency (wide band).

j. Output:

(1) Electron tube keyer for keying 60-ma teletype loop (loop current must be supplied from external teletype battery or power supply).

(2) Tone signal, 12 milliwatts into 600-ohm load.

(3) Tone signal frequencies, 595, 765, 935, 1105, 1275, 1445, 1615, 1785 cycles per second. Provision is also made for an externally supplied tone frequency for alternative use within the 595-1785-cycle range.

k. Input impedance:

(1) Wide band, 600 ohms balanced or unbalanced.

(2) Narrow band, 600 ohms balanced or unbalanced.

l. Audio input power required: 60 microwatts to 60 milliwatts 600-ohm line.

m. Type of signal: Frequency shift keying. Keying speeds up to 100 dot cycles per second, corresponding to four-channel multiplex, 100 words per minute each channel.

n. Power Supply: 105, 115 or 125 volts, 60 cycles, single phase.

o. Power required:

(1) CV-60/URR, 70 watts at 115 volts.

(2) AN/URA-8, 220 watts at 115 volts.

TABLE 1–1. EQUIPMENT SUPPLIED

SINGLE CHANNEL

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVERALL DIMENSIONS (INCHES)			VOLUME (CU. FT.)	WEIGHT (LBS.)
			HEIGHT	WIDTH	DEPTH		
1	Frequency Shift Converter (Single Channel) including tubes, external connecting plugs and jumper cable	CV-60/URR	5-1/8*	17-5/16**	15-1/4	1	43
2	Instruction Books (IB-38483)	NAVSHIPS 91339					
1	Suitable container, containing: (A) 1 Bracket Assembly, Shock Mount Right Hand (B) 1 Bracket Assembly, Shock Mount Left Hand (C) 1 Gusset, rack mount right hand (D) 1 Gusset, rack mount left hand (E) 1 Channel (F) 4 Shock Mounts (G) 1 Suitable container, containing: (1) 26 screws #8-32 x 3/8 pan head (2) 16 screws 1/4-20 x 1/2 hex head (3) 26 lock washers #8 (4) 16 lock washers 1/4 (5) 16 nuts 1/4-20 (6) 8 washers #8						

* Height 7-1/8" with shock mounting brackets.

** Width 19-1/16" with rack mounting brackets.

TABLE 1–1. EQUIPMENT SUPPLIED (Continued)

DUAL CHANNEL

1	Frequency Shift Converter-Comparator Group including tubes, external connecting plugs, and jumper cable	AN/URA-8	21-3/4	20-1/4	17-5/32	4.16	130
2	Instruction Books (IB-38483)	NAVSHIPS 91339					
2	Cables, Diversity Control, W1705 and W1706						
2	Cables, Diversity Signal, W1711 and W1712						
2	Cables, Power, W1717 and W1718						

Unless otherwise stated, dimensions are inches, volume in cubic feet, weight in pounds.

TABLE 1–2. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

FREQUENCY SHIFT CONVERTER CV-60/URR

(SINGLE CHANNEL)

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
1	Radio Receiver	RBA, RBB or RBC series**	Receiving signal	600-ohm 60-mw maximum audio output
1	Teletypewriter and loop power supply		Printing received signal	Standard or high speed
1	Headset		Monitoring signals	600-ohm impedance
5	Connecting cables, lengths depend on installation:			
	1 Power	MCOS-2	Power line connection	Two-wire power
	1 Input (Narrow or Wide)	TTHFWA-1 or RG-108/U	Receiver audio to input	Two-wire with shield
	1 Teletypewriter	MCOS-2	CV-60/URR to teletypewriter	Shielded single* or two-wire
	1 Tone Output (if used)	TTHFWA-1 or RG-108/U	Tone signal to telephone line	Shielded single* or two- or three-wire
	1 Cathode-ray Tube Remote Vertical (if used)	RG-11/U or RG-12/U	Oscilloscope signal (external)	Shielded single
4	Screws for rack mounting or 5/16-18 bolts and flat washers for table-top mounting			

* Depends on local system.

** or other receiver having good stability, suitable frequency range, and provided with bfo.

TABLE 1–2. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 (DUAL CHANNEL)

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
2	Radio Receivers	RBA, RBB, or RBC series**	Receiving signals	600-ohm 60-mw maximum audio output
1	Teletypewriter and loop power supply		Printing received signal	Standard or high speed
1	Headset		Monitoring signals	600-ohm impedance
6	Connecting cables, lengths depend on installation:			
	1 Power	MCOS-2	Power line connection	Two-wire power
	2 Input (Narrow or Wide)	TTHFWA-1 or RG-108/U	Receiver audio to input	Two-wire with shield
	1 Teletypewriter	MCOS-2	AN/URA-8 teletypewriter	Shielded single* or two-wire
	1 Tone Output	TTHFWA-1 or RG-108/U	Tone signal to telephone line	Shielded single* or two- or three-wire
	1 Cathode-ray Tube Remote Vertical (if used)	RG-11/U or RG-12/U	Oscilloscope signal (external)	Shielded single
4	3/8-in. bolts and nuts with matching threads of any available gauge, for table-top mounting			
8	3/8-in. (I. D.) flat washers for use with above bolts and nuts			
2	Blank panels, 4 screws, for relay rack mounting, see Fig. 3–13			

* Depends on local system.

** or other receiver having good stability, suitable frequency range, and provided with bfo.

TABLE 1–3. SHIPPING DATA

SHIPPING BOX NO.	CONTENTS		OVERALL DIMENSIONS (INCHES)			VOLUME (CU. FT.)	WEIGHT (LBS.)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1 of 1	Freq. Shift Converter	CV-60/URR	10.75	19.75	19	5.1	100
1 of 1	Freq. Shift Converter Comparator	AN/URA-8	29	29	25.5	13	242
1 of 1	CV-60/URR Set of Equipment Spares		8.5	16.75	16.5	1.4	39
1 of 1	AN/URA-8 Set of Equipment Spares		8.5	16.75	16.5	1.4	40

TABLE 1–4. BASIC SIMILARITIES IN THIS SERIES EQUIPMENT

MODEL	INPUT FREQUENCY	UNITS INVOLVED	REMARKS
CV-57/URR	395 to 475 kc.		Single-channel operation
CV-60/URR	1000 cps narrow, 2550 cps wide (center frequency)		Single-channel operation
CV-71/URR	47.5 to 52.5 kc.		Single-channel operation
CM-14/URR			Provides diversity switching on dual-channel systems
AN/URA-6	395 to 475 kc.	2—CV-57/URR 1—CM-14/URR	Dual-channel, diversity operation
AN/URA-7	47.5 to 52.5 kc.	2—CV-71/URR 1—CM-14/URR	Dual-channel, diversity operation
AN/URA-8	1000 cps narrow, 2550 cps wide (center frequency)	2—CV-60/URR 1—CM-14/URR	Dual-channel, diversity operation

TABLE 1–5. ELECTRON TUBE COMPLEMENT

COMPLEMENT FOR ONE (1) FREQUENCY SHIFT CONVERTER CV-60/URR											
UNIT	NUMBER OF TUBES OF TYPE INDICATED										
	1Z2	6X4	0A2	6C4	12AX7	6AU6	6AL5	2BP1	12AU7	6AQ5	Total No. of Tubes
Audio Input				1	1	1	1				4
Tuning Monitor					1			1			2
Keyer							1		5	2	8
Power Supply	1	1	1								3
Total Number of Each Type	1	1	1	1	2	1	2	1	5	2	17
COMPLEMENT FOR ONE (1) COMPARATOR CM-14/URR											
Diversity Selector				1		2	2		4		9
Keyer							1		5	2	8
Power Supply	1	1	1								3
Total Number of Each Type	1	1	1	1		2	3		9	2	20

SECTION 2

THEORY OF OPERATION

1. INTRODUCTION.

This instruction book covers two equipments, the single-channel Frequency Shift Converter CV-60/URR and the dual-channel diversity Frequency Shift Converter-Comparator Group AN/URA-8. An antenna, receiver, and teletypewriter with battery or power supply are required for the single-channel equipment. The dual-channel diversity equipment requires two antennas, two receivers, and a teletypewriter with battery or power supply.

These converters are used to convert a frequency shift signal into d-c pulses sufficient to operate a teletypewriter or other automatic recording devices. A frequency shift signal is one whose normal frequency is shifted to another frequency for a period of time corresponding to the coding of the information being transmitted. This equipment is designed to handle shifts of from 10 to 1000 cycles.

2. SINGLE CHANNEL FREQUENCY SHIFT CONVERTER CV-60/URR.

In the CV-60/URR units (see Figure 2-1, Single-Channel Equipment CV-60/URR Block Diagram) the signal is filtered, amplified, clipped (by the limiter) and fed through the discriminator. The discriminator output is amplified, filtered, amplified again, and triggers two Eccles-Jordan flip-flop stages in cascade to key the tone oscillator and teletypewriter loop keyer tubes.

Frequency Shift Converter CV-60/URR is made up of the following operating sub-assemblies shown interconnected on the System Schematic, Figure 7-15.

UNIT NAME	FIGURE NUMBER (Schematic Diagram)	SYMBOL SERIES
Converter Chassis	Part of 7-15	1500
Cable Filter Unit	7-19	1200
Audio Input Unit	7-29	400
Keyer Unit	7-31	600
Tuning Monitor Unit	7-27	700
Power Supply Unit	7-23	800

3. CONVERTER CHASSIS ASSEMBLY (FOR CV-60/URR).

Refer to the System Schematic Figure 7-15. All connections to the Cable Filter and to the units on the Converter chassis are made by plugs and jacks. Plug P1501, mounted on the rear of the Converter chassis, engages with jack J1201 on the Cable Filter Unit when the Converter chassis is properly seated in the case. This permits external cable connections, which are made to the Cable Filter Unit, to be carried into the chassis assembly cable and distributed to jacks J1503 to J1506 inclusive. These jacks, in turn, engage the proper sub-assembly plugs when these units are assembled in the Converter chassis. The other electrical items of the chassis are the B± "on" indicator and socket (I/X1501), the POWER OFF-ON switch S1501, and the TTYP and PHONES jacks J1501 and J1502.

The B+ "on" indicator is a neon lamp connected between ground and the 200-volt supply, in series with a limiting resistor R807 located in the power supply. The neon lamp glows to indicate that a voltage of 200 volts is present in the power supply.

The POWER OFF-ON switch makes or breaks both legs of the a-c line into the power transformer primary. The TTYP jack (J1501) is connected in series with the external teletype loop circuit and is used to meter the teletype current and otherwise monitor the teletype circuit. The PHONES jack (J1502) is supplied with keyed tone output signals through the Tone Output Filter (Z1201) for monitoring purposes.

4. CABLE FILTER UNIT.

Refer to Schematic Diagram, Figure 7-19. All external cable connections are made by jacks mounted on the rear of the Cable Filter Unit to facilitate connection and replacement of the equipment. The various jacks and their functions are listed below together with the names with which they are designated on the equipment:

SYMBOL NO.	NAME	FUNCTION
J1202	VERT. CRT-REMOTE	Remote vertical cathode-ray tube signal
J1204	EXT. TONE IN	External tone signal input
J1205	TONE OUTPUT	Tone output
J1206	TTYP OUTPUT	Teletypewriter signal (output)
J1207		A-C power outlet
J1208	PWR. INPUT	A-C power input
J1209	DIV. CONT.	Diversity control voltage
J1210	DIV. SIG.	Diversity output signal
J1211	NARROW A-F INPUT	600-ohm narrow-band input
J1212	WIDE A-F INPUT	600-ohm wide-band input

Electrical connections from these jacks to the various sub-assembly units on the Converter Chassis are made through jack J1201. This is mounted on the lower right hand of the inside panel and engages P1501 mounted on the Converter Chassis. The equipment is protected from overload by three-ampere fuses, F1201 and F1202, each in series with one leg of the line. The fuses *do not* protect circuits which may be connected to a-c power outlet jack J1207. A power line filter, Z1202, is inserted in the power line, in series with the power transformer primary. This filter has an attenuation of at least 65 db from 14 kc to 10 mc and of at least 50 db from 10 mc to 30 mc when fully loaded. It prevents any signal generated in the equipment from entering the power line and also prevents external signals from entering the equipment.

A fan, B1201, operates from the 115-volt power line. Capacitor C1201 provides the necessary phase shift to operate the fan motor. The fan maintains an even temperature distribution when the equipment is in use.

A tone output filter (Z1201) is inserted in series with the tone output from the Keyer Unit. It has the same attenuation and purpose as the power line filter previously described. The output connections of the tone filter are taken to the PHONES jack J1502 for monitoring purposes.

The tone output impedance is 600 ohms nominal from 595 to 1785 cycles with a power output of at least 12 milliwatts across a 600-ohm non-inductive load. The output circuit has its center tap brought out to terminal B of the Tone Output jack J1205 and may be grounded if required by external conditions.

5. AUDIO INPUT UNIT.

See Schematic Diagram, Figure 7-29. The Audio Input Unit receives a detected frequency shift signal from the 600-ohm audio output of a communication receiver through the Cable Filter Unit. It is designed for a signal with a center frequency of 1000 cycles for narrow shift (10 to 200 cycles) or 2550 cycles for wide shift (200 to 1000 cycles). This signal is filtered, amplified, limited, and fed into an audio discriminator which transforms the frequency shift signal into d-c pulses. These pulses are filtered and fed into the Keyer Unit to key the teletypewriter loop.

The tubes used in the Audio Input Unit are as follows:

SCHEMATIC SYMBOL	TUBE TYPE	CIRCUIT FUNCTION
V401	JAN-6C4	Amplifier
V402	JAN-12AX7	Limiter
V403	JAN-6AU6	Driver
V404	JAN-6AL5	Discriminator

Two three-wire inputs are provided, one for wide-band (pins 12, 13, 14 of P401) and one for narrow-band (pins 9, 10, 11 of P401) input. Connecting links

O401 and O402 serve to connect both inputs in parallel. The wide-band channel is coupled through T401 and band-pass filter (Z403) to terminal 6 of S401B, the NARROW-WIDE switch. The narrow-band channel is coupled through T402 and the high-pass filter (Z404) to terminal 4 of S401B.

The band-pass filter (Z403) which filters the incoming signal in the wide position has a nominal input impedance of 600 ohms at 2550 cycles. When properly loaded, the bandwidth of the filter at 6 db down is not less than 2200 cycles, and at 40 db down is not more than 3400 cycles. At frequencies of 900 cycles and below and of 4500 cycles and above the attenuation is not less than 40 db.

The high-pass filter (Z404), which filters the incoming signal in the narrow position, has a nominal input impedance of 600 ohms at 1000 cycles. When properly loaded, the filter is flat within 3.5 db from 775 to 1400 cycles and is down not less than 40 db at all frequencies from 425 cycles and below. This filter is designed to complement a low-pass filter in the output of the Navy Low-Frequency Receiver to form a suitable band-pass filter. Resistor-capacitor networks, selected by switch S401A, B, tune the discriminator transformer (Z402) secondaries for narrow-band (1000-cycles center frequency) or wide-band (2550-cycles center frequency) operation.

The selected signal is then fed from terminal 5 of S401B to resistor R403. Since this signal has an amplitude proportional to the receiver output, it is also fed to pin 6 of P401 for diversity control in Comparator CM-14/URR.

Control R403 is screwdriver-adjusted for input to amplifier tube V401. The output of the amplifier tube is fed into a cathode-coupled, cathode-biased limiter (V402) clipping the signals and reducing them to a square wave of uniform amplitude. Control R403 provides adjustment for setting the proper limiting between the extreme input levels of 60 microwatts and 60 milliwatts.

The limiter output is amplified by the driver (V403) and fed to the discriminator transformer Z402. This discriminator transformer Z402 consists of two audio-frequency transformers (T403 and T404) in a common case with their primaries and their secondaries connected in series. The secondary terminals 3 and 5 are connected to the discriminator (V404) plates pins 2 and 7. The center tap of the transformer secondary is connected to the junction of the audio by-pass capacitors (C407 and C408) and load resistors (R415 and R416). Tuning of the discriminator is controlled by switch S401A as previously described.

The discriminator output signal from pin 5 of V404 is filtered by a twin T network, consisting of R417 through R420 and capacitors C409, C410, C411, having its maximum attenuation at 1000 cycles. This filter removes the 1000-cycle carrier from the discriminator output.

From the filter, the signal is fed through R422 and pin 5 of P401, to the Tuning Monitor Unit and to VERT. CRT-REMOTE jack J1202 for a remote oscilloscope. The signal from the filter is fed through the THRESHOLD control (R421) and TUNE-OPERATE switch S402 to pin 4 of plug P401. The signal then goes to the Keyer Unit, and also to the DIV. SIG jack J1210 for external connection to the Diversity Selector Unit of the Comparator CM-14/URR when this is used.

The TUNE-OPERATE switch S402 disconnects the output of the discriminator and grounds the Keyer input in the TUNE position.

The THRESHOLD control R421 sets the input level to the Keyer Unit to provide the proper signal amplitude at the clamping circuit as described under paragraph 6, Keyer Unit.

6. KEYER UNIT.

See Schematic Diagram, Figure 7–31. The Keyer Unit receives the d-c pulses from the discriminator, amplifies and filters them to energize the Eccles-Jordan flip-flop circuit which in turn keys a power output stage to key the teletype loop circuit. The output of the flip-flop circuit also keys on and off a tone oscillator for monitoring and transmission over telephone lines and radio links.

The tubes used in the Keyer Unit are as follows:

SCHEMATIC SYMBOL	TUBE TYPE	CIRCUIT FUNCTION
V601A	JAN-12AU7	A-F Amplifier I
V601B		A-F Amplifier II
V602A	JAN-12AU7	Balance Modulator
V602B		Trigger Driver
V603A	JAN-12AU7	Trigger I
V603B		
V604A	JAN-12AU7	Trigger II
V604B		
V605A	JAN-12AU7	Tone Modulator
V605B		Tone Oscillator
V606	JAN-6AL5	D-C Restorer
V607	JAN-6AQ5	Teletypewriter Loop Keyer
V608	JAN-6AQ5	Teletypewriter Loop Keyer

The audio signal from pin 14 of P601 is amplified by a-f amplifier I (tube V601A). The output of this stage is fed through the LOW-HI-ADJ. switch (S601) which is connected between the plate circuit of V601A and the input circuit of V601B. The LOW-HI-ADJ. switch (S601) inserts a low-pass filter (Z601) for either low- or high-speed teletype signals or a calibration signal in the ADJ. position.

The filter (Z601) serves to cut off frequencies above those necessary for teletype operation. In the LOW position the filter response is flat within 6 db from 80 to 140 cycles and is down not less than 40 db from 240 cycles and above. However, capacitors C617, C618 cause the overall circuit response to be flat within 6 db from 80 to 125 cycles and down not less than 40 db from 200 cycles and above (these are approximate values only). In the HI position the filter response is flat within 6 db from 80 to 300 cycles and is down not less than 40 db from 500 cycles and above. However, capacitor C618 causes the overall circuit response to be flat within 6 db from 80 to 240 cycles and down not less than 40 db from 415 cycles and above (these are approximate values only).

The output of a-f amplifier II (tube V601B) is applied to the trigger driver tube (V602B) grid pin 2 through capacitor C616 and resistor R605. This same signal is fed to the Tuning Monitor through pin 5 of P601 to indicate proper setting of the THRESHOLD control on the Audio Input Unit. This voltage, when the THRESHOLD control is properly adjusted, should be approximately 17 volts peak to peak and the traces on the cathode-ray tube screen will coincide with the top and bottom engraved lines on the Tuning Monitor window when the CAL IN switch (S701) is depressed. Accuracy of the trace indication can be checked by setting the LOW-HI-ADJ. switch (S601) to the ADJ. position and observing the traces to coincide with the top and bottom lines on the window when the CAL IN button is depressed. See Section 3, paragraph 5*a*(13).

Connected between the grid of the trigger driver (V602B) tube and ground is a d-c restorer tube (V606) and its associated circuits. This circuit selects a portion from the output of V601B near the zero-voltage axis, eliminating the superimposed noise and telegraph distortion. This is accomplished by two diodes, one which (pins 1 and 7) clips the negative portion and the other (pins 2 and 5), positively biased, clips the signal level above plus four volts. Therefore, appearing on the grid (pin 2) of the trigger driver (V602B) is a four-volt peak to peak square wave of plus two volts average. This square wave is identical to the discriminator square-wave output, except that the amplitude-modulated noise has been reduced and the d-c component has been removed by capacitive coupling.

In normal frequency shift teletypewriter operation the teletypewriter loop circuit is closed during the standby, or mark signal. This keeps the teletypewriter in condition to receive the coding pulses which key the teletypewriter loop circuit through the keyer tubes (V607 and V608). The d-c component, from the discriminator, could be used to return the output tubes to conduction after each coding pulse has been received; however, since this component has been removed, a mark-return circuit is provided at the grid of the trigger driver (V602B) to accomplish this result.

The mark-return circuit has a normal and a reverse position and consists of resistor R610 and switch S603B. The switch (S603B) is used in the NORM position when the detected audio output from the receiver returns to a higher frequency in the mark or standby position. This permits the grid of V602B to return to plus four volts through resistor R610 and results in the output tubes (V607 and V608) conducting. The REV position of switch S603B is used when the receiver output returns to a lower frequency and permits the grid of V602B to return to zero voltage.

The output signal of V602B is direct-coupled to an Eccles-Jordan flip-flop stage (V603A, B) which in turn is capacitively coupled to another Eccles-Jordan flip-flop stage (V604A, B) having two stable positions. The output, taken from the grids of the second stage (V604A, B), is fed to the control grids of the output tubes (V607 and V609) and the tone modulator tubes (V605A and V602A) through the NORM-REV switch (S603A).

The pulse appearing in the teletype loop circuit must be an exact duplicate of the pulse appearing at the discriminator output to prevent loss of printing margin on the teletypewriter. The keyer unit is provided with a % MARK control (R613) located in the cathode circuit of tube V602B; this permits adjustment of the operating bias of this tube to linearly amplify pulses appearing on its grid and therefore minimizing distortion of this pulse.

This control is adjusted to give a symmetrical square wave in the teletype loop circuit with the LOW-HI-ADJ. switch in the ADJ. position. The detailed procedure is given in Section 3, paragraph 5*a*(19).

The teletype output tubes (V607 and V608) obtain their plate voltage and current from an external power

supply or battery through the teletypewriter loop and are controlled by the negative pulses received from the grids of the second trigger stage (V604A, B).

Inserted in the common screen grid (pin 6) circuit of both output tubes, V607 and V608, is an ON-OFF toggle switch (S604). When the teletype equipment is disconnected from the output tubes their plate voltage is removed. Under this condition the design and construction of the tubes is such that they will oscillate at about 200 mc. To prevent this, the switch (S604) must be opened when the teletypewriter is not used.

Certain operating requirements necessitate transmission of the keyed teletype pulses over telephone lines or radio relay links. The tone oscillator (V605B) and tone modulator (V605A) provide facilities for the above.

The tone oscillator (tube V605B) and its tuned circuits (L601 and C607 through C614) provide a choice of eight tone frequencies, namely 595, 765, 935, 1105, 1275, 1445, 1615, and 1785 cycles per second. The output of the tone oscillator is fed through TONE LEVEL control R629, to the tone modulator V605A. The tone modulator is keyed by the square-wave signal from trigger II tube. The output of the tone modulator is coupled through transformer T601 and tone output filter Z1201 to the TONE OUTPUT jack J1205 for connection to an external line and the PHONES jack J1502 for monitoring purposes. A balance modulator (tube V602A) functions to balance out the transients resulting from square-wave signal currents. The MOD BAL control (R633) is adjusted for a minimum of transients as described in Section 3, paragraph 5*a*(18).

7. TUNING MONITOR UNIT.

See Schematic Diagram, Figure 7–27. The Tuning Monitor Unit is a direct-coupled oscilloscope which is used to indicate proper tuning of the associated radio receiver and to set the THRESHOLD control R421 to its proper level.

The following tubes are used in the Tuning Monitor Unit:

SCHEMATIC SYMBOL	TUBE TYPE	CIRCUIT FUNCTION
V701	JAN-12AX7	Vertical amplifier
V702	JAN-2BP1	Cathode-ray tube

When the associated radio receiver is tuned through the frequency range of the discriminator the average voltage from the discriminator will vary from a negative to a positive value. Since at the center of the discriminator characteristic the d-c component is zero, the discriminator voltage will indicate proper tuning of the radio receiver.

Intensity and focus voltages are provided by the –600-volt bleeder made up of R713 (the INTENSITY control), R714, R715 (the FOCUS control), and R716. The arm of the INTENSITY control (R713) adjusts the grid (pin 2, V702) bias to vary the brilliance of the pattern on the cathode-ray tube. Resistor R715 varies the voltage on pin 4 of V702 to change the focus of the pattern on the screen. The heater leads of V702 are connected, through P701 pins 9 and 10, to a special 6.3-volt winding on the power transformer in the Power Supply Unit. This is necessary because the cathode-ray tube operates at a cathode voltage of –600 volts to ground.

A sine-wave voltage for horizontal deflection is applied to pin 10 and is obtained from a tap on the power transformer (T801 located in the Power Supply Unit) through pin 2 of P701. Pin 9 of the cathode-ray tube is grounded to complete the sine-wave voltage circuit.

The d-c signal from the audio discriminator is applied to the VERT GAIN control R701 through pin 14 of P701. The level of the grid signal of V701A is adjusted by R701 to provide a pattern of reasonable size. The output of V701A is cathode-coupled to V701B through R702. The output of V701B is directly coupled to the vertical plate (pin 6 of V702) through the CAL IN switch S701.

Control R705 applies a d-c voltage to the other vertical plate (pin 7) and is adjusted so that the amplifier tube V701B operates over the linear portion of its characteristic. Detailed adjustment procedure is given in Section 3, paragraph 5*a* (6) (*e*).

The V CENT control R702 varies the vertical centering of the image on the cathode-ray tube. This control is in series with the cathode of V701A and a tap on the negative high-voltage bleeder. Therefore, the signal appearing on the arm of the resistor R702 consists of the normal cathode signal and an adjustable negative d-c voltage depending on the setting of the control. When this signal is fed into the grid of V701B the adjustable d-c voltage controls the average voltage appearing on the plate and, in effect, controls the vertical centering of the pattern. The V CENT control is initially adjusted as explained in Section 3, paragraphs 5*a*(6)(*d*),(*e*),(*f*) and (*g*).

The THRESHOLD control R421 is set to its proper level by comparing the voltage at the input of the clamping circuit (pin 6 of V601B in the Keyer Unit) against a pre-determined deflection of the cathode-ray tube which is marked by top and bottom lines engraved on the tube window. This procedure is given in detail in Section 3, paragraph 5*a*(13). The CAL IN switch, when depressed, applies the clamping circuit voltage to the vertical plate of V702 to make this comparison.

8. POWER SUPPLY UNIT FOR CV-60/URR.

See Schematic Diagram, Figure 7–23. The Power Supply Unit consists of a negative high-voltage supply for the cathode-ray tube, a regulated low-voltage supply for critical circuits, an unregulated low-voltage supply, filament voltage supply for all tubes, and an a-c voltage supply to provide horizontal deflection voltage for the cathode-ray tube.

The tubes used in the Power Supply Unit are as follows:

SCHEMATIC SYMBOL	TUBE TYPE	CIRCUIT FUNCTION
V801	JAN-1Z2	High-voltage Rectifier
V802	JAN-6X4	Low-voltage Rectifier
V803	JAN-0A2	Voltage Regulator

The high-voltage rectifier tube JAN-1Z2 (V801) supplies –600 volts. Capacitors C801A, B, C and resistors R801, R802 make up the filter for this high-voltage supply. Resistors R803 and R805 form a voltage divider and bleeder with a –45 volt tap.

This bleeder also discharges the capacitors when the line voltage is turned off, should the load be disconnected.

The 200-volt supply utilizes a JAN-6X4 (V802) rectifier and is filtered by capacitors C802A and B (35 microfarads each) and filter choke L801. Bleeder resistor R806 discharges the capacitors in case the load is disconnected.

The JAN-0A2 (V803) tube regulates the 150-volt supply, the current through the tube increasing or decreasing when the input voltage rises or falls. The 200-volt source feeds the regulator tube V803 through series resistor R804. The increase or decrease in tube current increases or decreases the voltage drop across resistor R-804 to provide a regulated output.

Resistor R807, in series with pin 11 of P801, limits the current through the neon B+ indicator I1501, located on the Converter Chassis panel.

The input power to the transformer T801 is fed through the power line filter Z1202 located in the Cable Filter Unit to suppress r-f noise.

Provision for 105-, 115- or 125-volt nominal line voltages is made by a tapped primary brought out to terminals 2, 3, and 4, respectively; terminal 1 provides the connection for the other side of the line.

Connections to plug P801 are as follows:

VOLTAGE	P801 PIN NUMBER	SERVICE
105, 115, 125 A-C	12 and 14	A-C input
115 A-C	5	Fan supply
6.3 A-C	9 and 10	Heater of cathode-ray tube (V702)
6.3 A-C	1 and 7	Heaters of all tubes except cathode-ray tube (V702) and H-V rectifier V801 (1Z2)
35 A-C	6	Horizontal sweep voltage for cathode-ray tube (V702)
+200 D-C	2	General plate voltage supply
+150 D-C	3	For Tuning Monitor Unit and audio amplifier and tone oscillator in Keyer Unit
–600 D-C	8	High voltage for cathode-ray tube V702
–45 D-C	4	Bias for trigger and teletype keyer tubes in Keyer Unit
+80 D-C (nominal)	11	Voltage for neon B+ indicator I1501
Ground	13	Return for D-C and 35 volt A-C voltages

9. DUAL CHANNEL FREQUENCY CONVERTER-COMPARATOR GROUP AN/URA-8.

The dual-channel equipment (see Figure 2–2, Dual-Channel Equipment AN/URA-8 Block Diagram) has two CV-60/URR units, which operate from separate receivers, and a Comparator CM-14/URR.

The Comparator CM-14/URR takes the discriminator output voltage and the diversity control voltage from two CV-60/URR units, and, by electronic switching, selects the discriminator voltage from the channel supplying the stronger control signal. The selected

discriminator voltage is then used to key the teletypewriter loop or provide a tone signal for transmission to a remote point. See Block Diagram, Figure 2–3.

The Comparator CM-14/URR is made up of the following operating sub-assemblies shown interconnected on the system schematic Figure 7–16:

UNIT NAME	FIGURE NUMBER (Schematic Diagram)	SYMBOL SERIES
Comparator Chassis	part of 7–16	1600
Cable Filter Unit	7–21	1300
Diversity Selector Unit	7–33	900
Keyer Unit	7–31	600
Power Supply Unit	7–25	1000

10. COMPARATOR CHASSIS ASSEMBLY (FOR CM-14/URR).

See Schematic Diagram, Figure 7–16. All connections to the Cable Filter Unit and the units on the Comparator Chassis are made by plugs and packs. Plug P1601, mounted on the rear of the Comparator chassis, engages with jack J1301 on the Cable Filter Unit when the Comparator chassis is properly seated in the case. This permits all external cable connections, which are made to the Cable Filter Unit, to be carried into the chassis assembly cable and distributed to jacks J1603 and J1605 inclusive. These jacks, in turn, engage the proper sub-assembly plugs when these units are assembled in the Comparator chassis. The other electrical items of the chassis, in addition to the jacks and cable, are the B+ indicator and socket (I/X1601), the POWER OFF-ON switch S1601, the meter switch S1602, comparison meter M1601 and the TTYP and PHONES jacks J1601 and J1602.

The B+ "on" indicator is a neon lamp connected between ground and the 200-volt supply, in series with a limiting resistor R1008 located in the power supply. The neon lamp glows to indicate that a voltage of 200 volts is present in the power supply.

The POWER OFF-ON switch makes or breaks both legs of the a-c line connecting into the power transformer primary. The TTYP jack (J1601) is in series with the external teletype loop circuit and is used to meter the teletype current and otherwise monitor the teletype circuit. The PHONES jack (J1602) is supplied with keyed tone output signals through the Tone Output Filter (Z1301) for monitoring purposes.

The CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL switch (S1602) connects the meter (M1601) to indicate the incoming signal level of either channel A or channel B or, in the DIV IND position, which channel is supplying the input to the Comparator Keyer Unit.

11. CABLE FILTER UNIT (FOR CM-14/URR).

Refer to Schematic Diagram, Figure 7–21. All external cable connections are made by jacks mounted on the rear of the Cable Filter Unit to facilitate connection and replacement of the equipment. The various jacks and their functions are listed below together with the names with which they are designated on the equipment.

SYMBOL NO.	NAME	CIRCUITS
J1302	Ext. Tone In	External tone signal input
J1303	Tone Output	Tone output
J1304	TTYP Output	Teletype output
J1305	Pwr. Input	A-C power input
J1306	Pwr. Output	A-C power output (paralleled with J1305 and J1307)
J1307	Pwr. Output	A-C power output (paralleled with J1305 and J1306)
J1308	Div-Cont Chan-A	Diversity control voltage channel A
J1309	Div-Cont Chan-B	Diversity control voltage channel B
J1310	Div-Sig Chan-A	Diversity signal input channel A
J1311	Div-Sig Chan-B	Diversity signal input channel B

Electrical connections from these jacks to the various sub-assembly units on the Comparator chassis are made through jack J1301. This jack is mounted on the lower right-hand of the inside panel and engages plug P1601 mounted on the Comparator chassis.

The equipment is protected from overload by three-ampere fuses, F1301 and F1302, each in series with one leg of the line. The fuses *do not* protect circuits to the Converters, through jacks J1306 and J1307. These circuits are fused in the individual converters. A power line filter, Z1302, is inserted in the power line in series with the power transformer primary. This filter has an attenuation of at least 65 db from 14 kc to 10 mc and at least 50 db from 10 mc to 30 mc when fully loaded. It prevents any signals generated in the

equipment from entering the line and also prevents external signals from entering the equipment.

A fan, B1301, operates from the 115-volt power line. Capacitor C1301 provides the necessary phase shift to operate the fan motor. The fan maintains an even temperature distribution when the equipment is in use.

A tone output filter (Z1301) is inserted in series with the tone output from the Keyer Unit. It has the same attenuation and purpose as the power line filter previously described. The output connections of the tone filter are taken to the PHONES jack J1602 for monitoring purposes.

The tone output impedance is 600 ohms nominal from 595 to 1785 cycles with a power output of at least 12 milliwatts across a 600-ohm non-inductive load. The output circuit has its center tap brought out to terminal B of the Tone Output jack J1303 and may be grounded if required by external conditions.

12. DIVERSITY SELECTOR UNIT.

See Schematic Diagram, Figure 7–33. The Diversity Selector Unit compares the Channel A and Channel B diversity control signals and permits the stronger signal to operate the gating circuit with switches the discriminator output of either Channel A or Channel B converters to the input of the Keyer Unit.

The following tubes are used in Diversity Selector Unit:

SCHEMATIC SYMBOL	TUBE TYPE	CIRCUIT FUNCTION
V901	JAN-6AU6	Channel A Amplifier
V902	JAN-6AL5	AVC and Differential Rectifier Channel A
V903	JAN-6C4	D-C Amplifier
V904	JAN-12AU7	First Control Trigger
V905	JAN-12AU7	Second Control Trigger
V906	JAN-12AU7	Gate B and Gate B Control
V907	JAN-12AU7	Gate A and Gate A Control
V908	JAN-6AU6	Channel B Amplifier
V909	JAN-6AL5	AVC and Differential Rectifier Channel B

The diversity control signal from channel A is amplified by V901 and its output is rectified negatively by a diode, pins 5 and 2 of V902. The diversity control signal from channel B is amplified by V908 and its output is rectified positively by a diode, pins 5 and 2 of V909. The two rectified outputs are combined across resistors R931 and R932 which form a differential rectifier circuit, the output of which is used to control the gating circuits. A negative voltage at the junction of R931 and R932 indicates channel A signal is the stronger. Conversely, a positive voltage indicates a reverse condition.

A portion of the output appearing at the plate of V901 and a portion of the output of V908 are rectified negatively by two diodes, pins 1 and 7 of V902 and pins 1 and 7 of V909. The outputs of these diodes are combined across a common load resistor R947 and returned to both grids through R902, R941, and R942. This voltage provides AVC control which extends the operating range of the amplifier tubes to accommodate approximately 50 db input range of signal amplitude.

The output of the differential rectifier which appears at the junction of resistors R931 and R932 is fed to the grid of the d-c amplifier tube V903 through a twin-T network, links O901 and O902, and the CHANNEL A-COMBINED-CHANNEL B switch S901. Since the Comparator Unit CM-14/URR is designed for use with either the a-f or i-f type converter the links O901 and O902 permit connection to the twin-T network for the a-f type converter or the filter capacitor C909 for the i-f type converter. This adjustment is made at the time of installation.

The twin-T network is a low-pass filter having its maximum attenuation at 100 cycles and is used to remove the 1000- or 2550-cycle component which may be present on the incoming signal supplied by the Audio Input Unit.

The CHANNEL A-COMBINED-CHANNEL B switch S901 permits single channel operation from channel A or channel B or diversity operation from both channels. In the CHANNEL A position it applies a fixed negative voltage to the grid of V903 to hold this tube in non-conducting condition. In the CHANNEL B position it applies a fixed positive voltage to the V903 grid to hold this tube in a conducting condition. In the combined position the switch applies the output voltage of the differential rectifier to operate V903 in the normal manner.

The Control Balance resistor (R905) permits the gating circuits to switch channels with an equal change of input level for either channel. This adjustment is explained in detail in Section 3, paragraph 5*b*(10).

The output of V903 is direct-coupled to an Eccles-Jordan flip-flop stage (V904) which in turn is capacitively coupled to another Eccles-Jordan flip-flop stage (V905) having two stable positions. The output, taken from the grids of the second stage (V905)

is fed to the control grids of the gate A control tube (V907) and the gate B control tube (V906).

The gate circuits consist of a control tube in series with a gate tube for each of the two channels. The discriminator outputs of channels A and B are fed to grids (pin 2) of the gate tubes V907 and V906 respectively.

When the grid (pin 7) of V907 receives a positive voltage from V905, current flows through the cathode resistors R921 and R946, impressing a voltage on the plate (pin 1) of V907 and permitting the input signal on the grid (pin 2) of this tube to appear across the cathode resistor R926. When a positive voltage appears on the gate A control (V907, pin 7) a negative voltage appears on the gate B control (V906, pin 7). Such a condition stops the flow of current through its cathode resistors R923, R922, and R945 resulting in no plate voltage on gate B. Since no plate current can flow, the signal on the input grid cannot appear across the common cathode resistor R926.

When the channel B input signal level exceeds the channel A signal level the polarities on the gate control grids are reversed and the opposite condition exists on the gate tubes. The outputs of the two gate tubes, combined across cathode load resistor R926 are then fed to the input of the Keyer Unit.

The GATE BAL control (R923) varies the plate voltage on V906 (pin 1) to compensate for differences in gain of the two gate tubes. When properly balanced the switched plate voltage pulse created by the switching action of the control tubes is effectively cancelled in the common cathode resistor R926. Adjustment is explained in detail in Section 3, paragraph 5*b*(10).

The CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL switch (S1602) connects the meter (M1601) to indicate the incoming signal level of either channel A or channel B or, in the DIV IND position, which channel is supplying the input to the Comparator Keyer Unit. In the CHANNEL A position the meter is inserted in series with the cathode resistor (R948) of the AVC rectifier V902. A similar connection to V909 is made when the switch is in the CHANNEL B position. The current reading of the meter is therefore proportional to the voltage appearing across its respective differential rectifier. Further use of the meter is explained in Section 4, paragraph 5*e*. In the DIV IND position the meter is inserted across the resistors R944, R945, and R946 to indicate which of the gate tubes (V906 and V907) has voltage on its plate and is therefore conducting. A reading to the left of center indicates channel A is conducting and a reading to the right indicates channel B is conducting.

13. KEYER UNIT.

The Keyer Unit receives the d-c pulses from either channel A or channel B discriminator through jack J1310 or J1311 depending on which channel is selected by the Diversity Selector Unit. The selected pulses are then use to key the teletype loop circuit and to key on and off a tone oscillator for transmission to a remote point. The detailed theory of the Keyer Unit is given in paragraph 6 of this section, since the Keyer Units used on the Comparator and on the Converter are interchangeable.

14. POWER SUPPLY UNIT (FOR CM-14/URR).

See Schematic Diagram, Figure 7–25. The Power Supply Unit consists of a negative-voltage supply for bias voltages, a regulated d-c voltage supply for critical circuits, an unregulated d-c voltage supply and a filament voltage supply for all the tubes.

The tubes used in the Power Supply Unit are as follows:

SCHEMATIC SYMBOL	TUBE TYPE	CIRCUIT FUNCTION
V1001	JAN-1Z2	Negative Voltage Rectifier
V1002	JAN-6X4	Positive Voltage Rectifier
V1003	JAN-0A2	Voltage Regulator

Connections to P1001 are as follows:

VOLTAGE	P1001 PIN NUMBER	SERVICE
105, 115, 125 A-C	12 and 14	A-C input
115 A-C	5	Fan supply
6.3 A-C	1 and 7	Heaters of all tubes except negative voltage rectifier (V1001)
+200 D-C	2	General plate voltage supply
+150 D-C	3	Tone Oscillator and Audio Amplifier plate voltage in Keyer Unit
−130 D-C	8	Trigger and gate bias in Diversity Selector Unit
−45 D-C	4	Bias for trigger and teletype keyer tubes in Keyer Unit
+80 D-C (nominal)	11	Voltage for neon B+ indicator I1601
Ground	13	Return for D-C Voltages

The negative voltage rectifier tube JAN-1Z2 (V1001) supplies –130 and –45 volts. Capacitors C1001A, B, C and resistors R1001, R1002 make up the filter for the negative voltage supply. Resistors R1003 and R1005 form a voltage divider and bleeder with a –45 volt tap. They also serve to discharge the capacitors when the line voltage is turned off, should the load be disconnected.

The 200-volt supply utilizes a JAN-6X4 (V1002) rectifier and is filtered by capacitors C1002A and B (35 microfarads each) and filter choke L1001. Bleeder resistor R1006 discharges the capacitors in case the load is disconnected.

The JAN-0A2 (V1003) tube regulates the 150-volt supply, the current through the tube increasing or decreasing when the input voltage rises or falls. The 200-volt source feeds the regulator tube V1003 through the series resistors R1004 and R1007. The increase or decrease in tube current increases or decreases the voltage drop across resistors R1004 and R1007 to provide a regulated output.

Resistor R1008, in series with pin 11 of P1001, limits the current through the neon B+ indicator I1601, located on the Comparator Chassis panel.

The input power to the transformer T1001 is fed through the power line filter Z1302 located in the Cable Filter to suppress r-f noise.

Provision for 105-, 115-, or 125-volt nominal line voltages is made by a tapped primary brought out to terminals 2, 3, and 4 respectively; terminal 1 provides the connection for the other side of the line.

JACK SYMBOL	NAME
J1202	VERT. CRT-REMOTE
J1204	EXT. TONE IN
J1205	TONE OUTPUT
J1206	TTYP OUTPUT
J1207	
J1208	PWR. INPUT
J1209	DIV. CONT.
J1210	DIV. SIG.
J1211	NARROW A-F INPUT
J1212	WIDE A-F INPUT

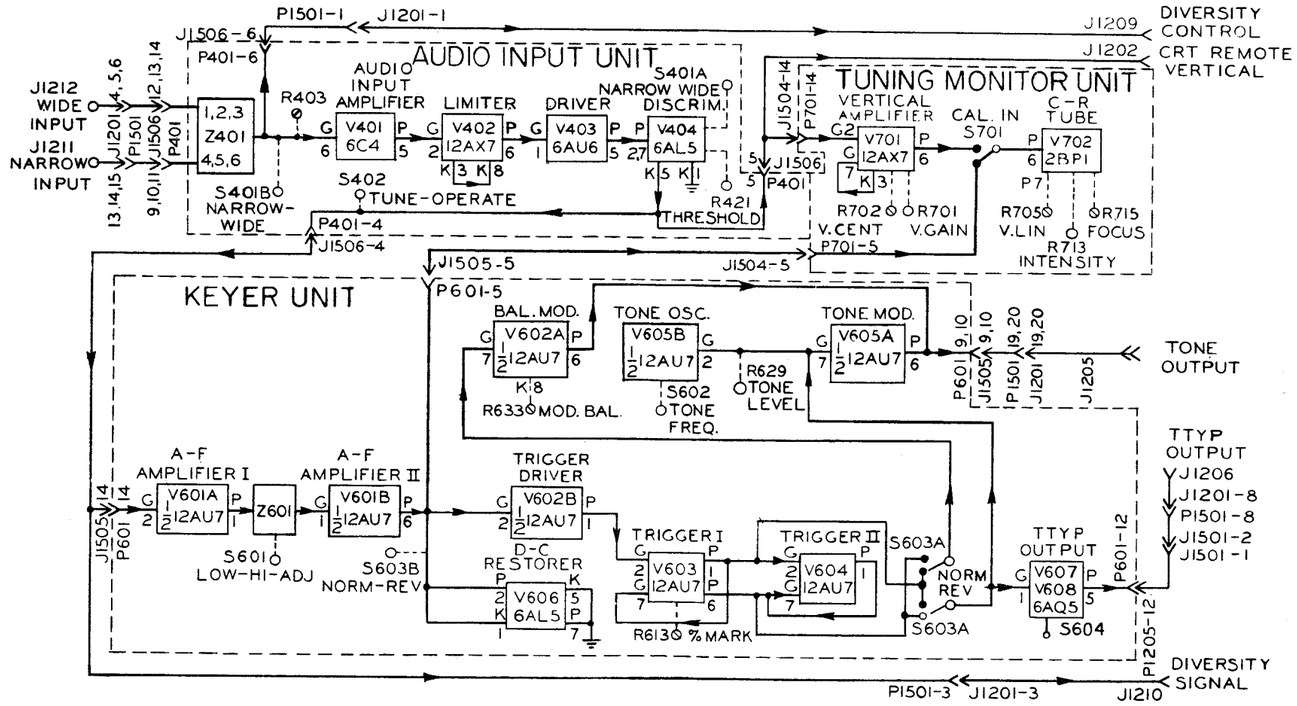


Figure 2–1. Frequency Shift Converter CV-60/URR Block Diagram

JACK SYMBOL	NAME
J1208	PWR. INPUT
J1209	DIV. CONT.
J1210	DIV. SIG.
J1211	A-F INPUT NARROW
*J1212	A-F INPUT WIDE
J1302	EXT. TONE IN
J1304	TTYP OUTPUT
J1305	PWR. INPUT
J1306	PWR. OUTPUT
J1307	PWR. OUTPUT
J1308	DIV-CONT. CHAN-A
J1309	DIV-CONT. CHAN-B
J1310	DIV-SIG CHAN-A
J1311	DIV-SIG CHAN-B

*J1212 replaces J1211 when wide signals (2550 center frequency) are being received.

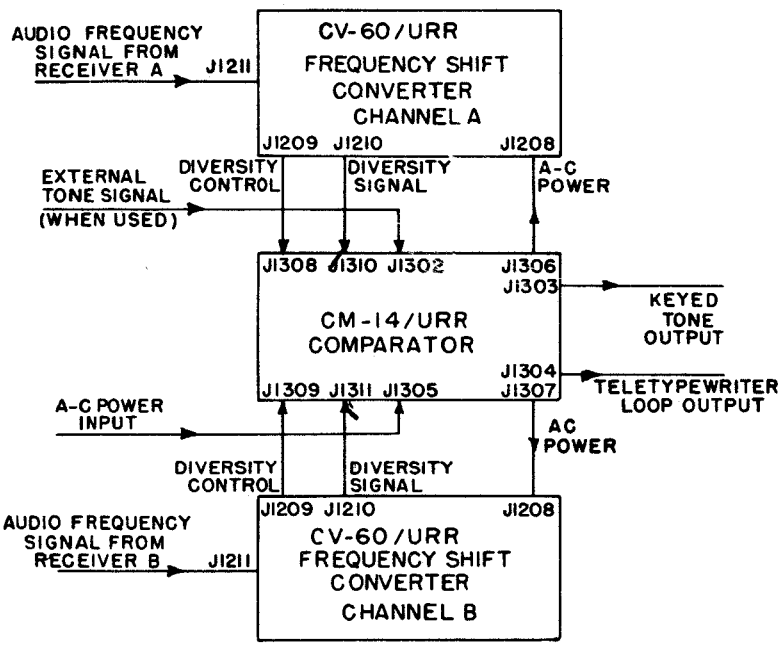


Figure 2–2. Dual-Channel Equipment AN/URA-8 Block Diagram

JACK SYMBOL	NAME
J1302	EXT. TONE IN
J1303	TONE OUTPUT
J1304	TTYP OUTPUT
J1305	PWR. INPUT
J1306	PWR. OUTPUT
J1307	PWR. OUTPUT
J1308	DIV-CONT CHAN-A
J1309	DIV-CONT CHAN-B
J1310	DIV-SIG CHAN-A
J1311	DIV-SIG CHAN-B

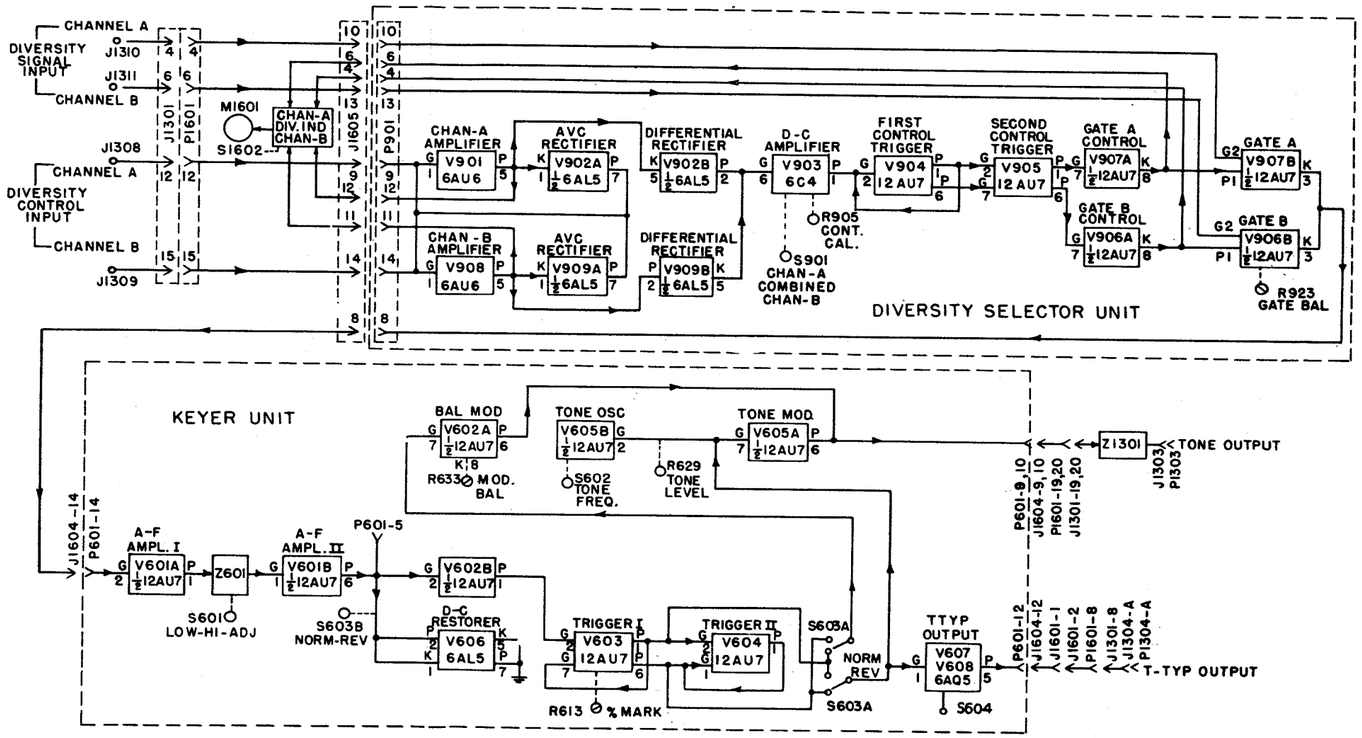


Figure 2-3. Comparator CM-14/URR Block Diagram

SECTION 3
INSTALLATION

1. UNPACKING.

CAUTION

THE EQUIPMENT IS SUPPLIED WITH THE CHASSIS INSTALLED IN THE CABINET AND THE ELECTRON TUBES IN PLACE. IT IS THEREFORE VERY IMPORTANT THAT ALL MECHANICAL SHOCKS BE AVOIDED WHEN UNPACKING AND INSTALLING THE EQUIPMENT IN ORDER NOT TO DAMAGE ANY PART.

The following special precautions should be observed:

Keep boxes and crates containing equipment in an upright position at all times.

Observe the weights marked on the boxes and make certain that appropriate lifting and transporting gear is available to handle the equipment without subjecting it to shock or damage.

Remove at least three sides from the boxes or crates with a nail puller. Do not use a hammer or pinch bar for this purpose.

2. INSTALLATION, GENERAL.

The various pieces of equipment making up the complete system should be arranged for convenience of operation and accessibility for maintenance. Allow front clearance for tuning and maintenance and rear clearance for connection plugs and cables to the Cable Filter Units. See Figure 3–11 for clearance dimensions of the CV-60/URR and Figures 3–12 and 3–13 for clearance dimensions of the AN/URA-8. Observe tilting clearances shown on drawing, for equipment that may be installed in the relay rack above or below.

CAUTION

THE EQUIPMENT FRAME SHOULD BE SECURELY GROUNDED TO INSURE BEST PERFORMANCE AND ELIMINATE POSSIBILITY OF ELECTRIC SHOCK TO PERSONNEL.

3. INSTALLATION OF FREQUENCY SHIFT CONVERTER CV-60/URR.

a. RACK MOUNTING.—Place the equipment on a bench; place the rack mounts (see Figure 1–4) identified as (C) and (D) in Table 1–1 against the cabinet sides so the slotted flanges turn outward, parallel to the front panel, and fasten each in place with nine No. 8-32 x ⅜ screws supplied. Put lock washers under the screw heads. See Figure 3–11 for further information. Mount the cabinet in the rack, using rack screws and washers (not supplied).

b. TABLE MOUNTING. — Assemble the shock mount first. Proceed as follows:

(1) Assemble the shock mounts, (F) of Table 1–1, two each on the bracket assemblies, (A) and (B) of Table 1–1, using ¼-20 screws, lock washers and nuts supplied (see Figure 3–11). Put the lock washers under the nuts.

(2) Attach the above two assemblies to the channel, (E) of Table 1–1, using eight No. 8-32 x ⅜ screws. Put flat washers and lock washers under the ~~nuts~~ screws, with the lock washers next to the nuts.

(3) Turn the case up side down and put shock mount assembly in place.

(4) Fasten shock mount in place with nine No. 8-32 x ⅜ screws and lock washers on each side of cabinet.

(5) Drill the four mounting holes in the table for $^{5}/_{16}$-inch diameter bolts (not supplied). Two holes with centers 14 inches apart for the front shock mounts, and two holes with their centers 7⅝ inches to the rear of the front bolt hole centers.

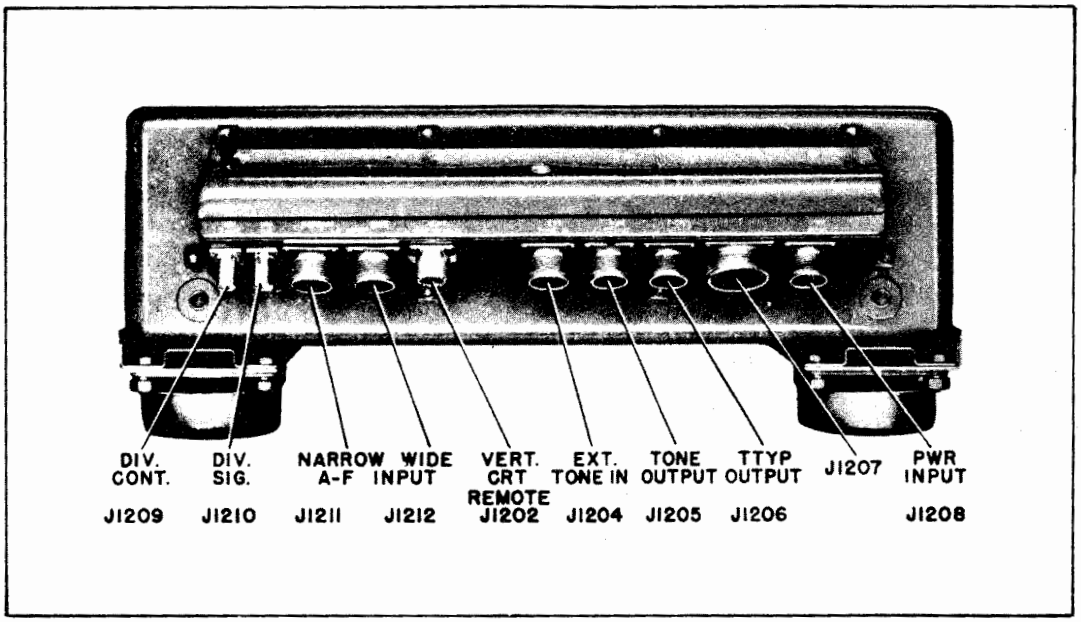


Figure 3–1. Frequency Shift Converter CV-60/URR, Rear View

(6) Turn the equipment to rest on the shock mounts and bolt to the table with $\frac{5}{16}$-inch bolts. The following Table 3–1 shows a listing of external connectors, and related information. Figure 3–1 is a rear view of the CV-60/URR unit showing the locations of these connectors.

TABLE 3–1. EXTERNAL CONNECTORS, CV-60/URR

SYMBOL	TYPE	PIN NUMBERS USED	FUNCTION
J1202	C-49194	Center and shell	Cathode-ray Tube Remote Vertical jack
P1202	C-49195	Center and shell	Cathode-ray Tube Remote Vertical plug
J1204	AN-3102-14S-7S	A, B, C	External Tone Input jack
P1204	AN-3106-14S-7P	A, B, C	External Tone Input plug
J1205	AN-3102-14S-7S	A, B, C	Tone Output jack
P1205	AN-3106-14S-7P	A, B, C	Tone Output plug
J1206	AN-3102-14S-9P	A, B	Teletype Output jack
P1206	AN-3106-14S-9S	A, B	Teletype Output plug
J1207	49435	1, 2	A.C. Outlet
J1208	AN-3102-14S-7P	A, B, C	Power Input jack
P1208	AN-3106-14S-7S	A, B, C	Power Input plug
J1209	JAN-UG-290/U	Center and shell	Diversity Control for diversity operation*
J1210	JAN-UG-290/U	Center and shell	Diversity Signal for diversity operation*
J1211	AN-3102-14S-7S	A, B, C	Narrow Input jack
P1211	AN-3106-14S-7P	A, B, C	Narrow Input plug
J1212	AN-3102-14S-7S	A, B, C	Wide Input jack
P1212	AN-3106-14S-7P	A, B, C	Wide Input plug

* Used for dual-channel operation only. See Table 3–2.

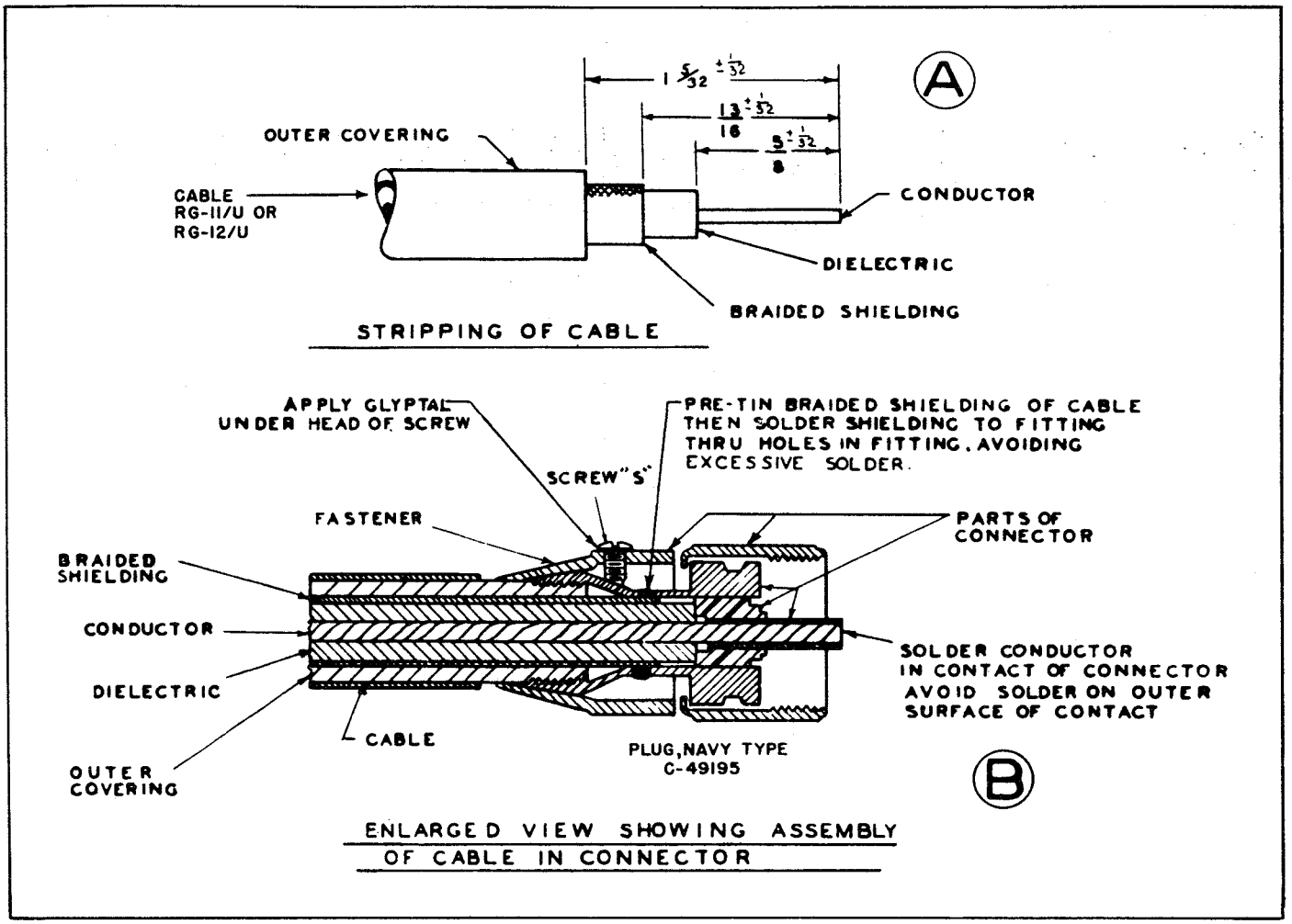


Figure 3–2. Cable Fabrication Instructions

c. CONNECTING CABLES.

(1) GENERAL.—Connections to the equipment vary with different installations, so the following information serves only as a guide. Use cables with an insulating sheath if possible.

Length and termination of connecting cables depend on the installation. The equipment is delivered with the mating plugs (and their associated cable clamps and ferrules) connected to their corresponding receptacles (jacks) on the unit. Remove each plug, one at a time, when it is ready for cable fabrication. For single-conductor cable fabrication refer to Figure 3–2. For multi-conductor cable fabrication refer to Figure 3–4. To disassemble the plug, first unscrew its associated cable clamp on the back of the plug. Be careful not to lose the ferrule seated inside the cable clamp, between the clamp and plug. Refer to Figure 3–4 for further details.

(2) POWER CABLE.—Remove plug P1208 from PWR INPUT jack J1208, disassemble and, using a two-wire power cable, solder the wires to pins A and C. Reassemble the plug and replace on PWR INPUT jack J1208.

(3) TELETYPEWRITER OUTPUT CABLE.—Remove plug J1206 from TTYP. OUTPUT jack J1206, disassemble, and, using two-wire cable connect leads to A and B. Note that pin B is grounded inside the unit. If using single conductor shielded wire, solder conductor to A and shield to B. Reassemble plug and replace on TTYP. OUTPUT jack J1206. The teletype loop current must be supplied from external teletype battery or power supply. The negative side of the teletype loop is grounded in the Frequency Shift Converter CV-60/URR. See Figure 3–3.

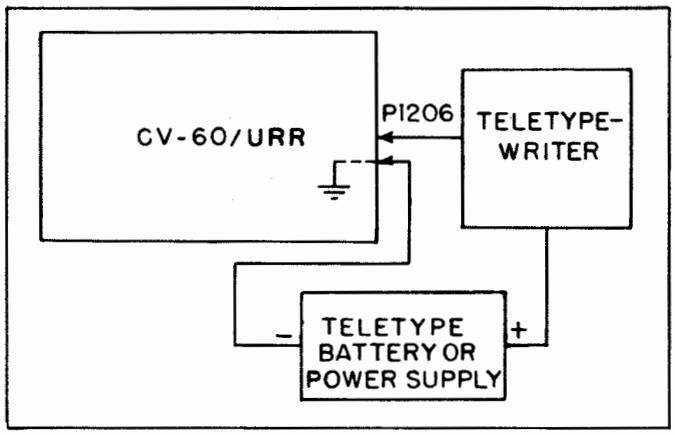


Figure 3–3. Teletypewriter Loop Circuit, Block Diagram

(4) INPUT PLUG P1211 or P1212.—Remove plug from NARROW A-F INPUT jack J1211 or WIDE A-F INPUT jack J1212, as the case may be, and disassemble. Using two-conductor shielded cable, connect the leads to A and C. Pin B is the center tap of the input transformer and should not be used unless a ground at this point is required to maintain a balanced grounded circuit. Reassemble the plug and replace on proper jack.

(5) TONE OUTPUT. — Remove plug P1205 from TONE OUTPUT J1205 and disassemble. If two-wire or single-wire shielded cable is used, solder leads to A and C. Pin B is the center tap of the output transformer and should be used only when a balanced grounded output is required. Reassemble plug and replace on TONE OUTPUT jack J1205. Connect a short length of bus wire from pin B of TONE OUTPUT jack J1205 to GND 5 (see Figure 7–20) if a ground is necessary.

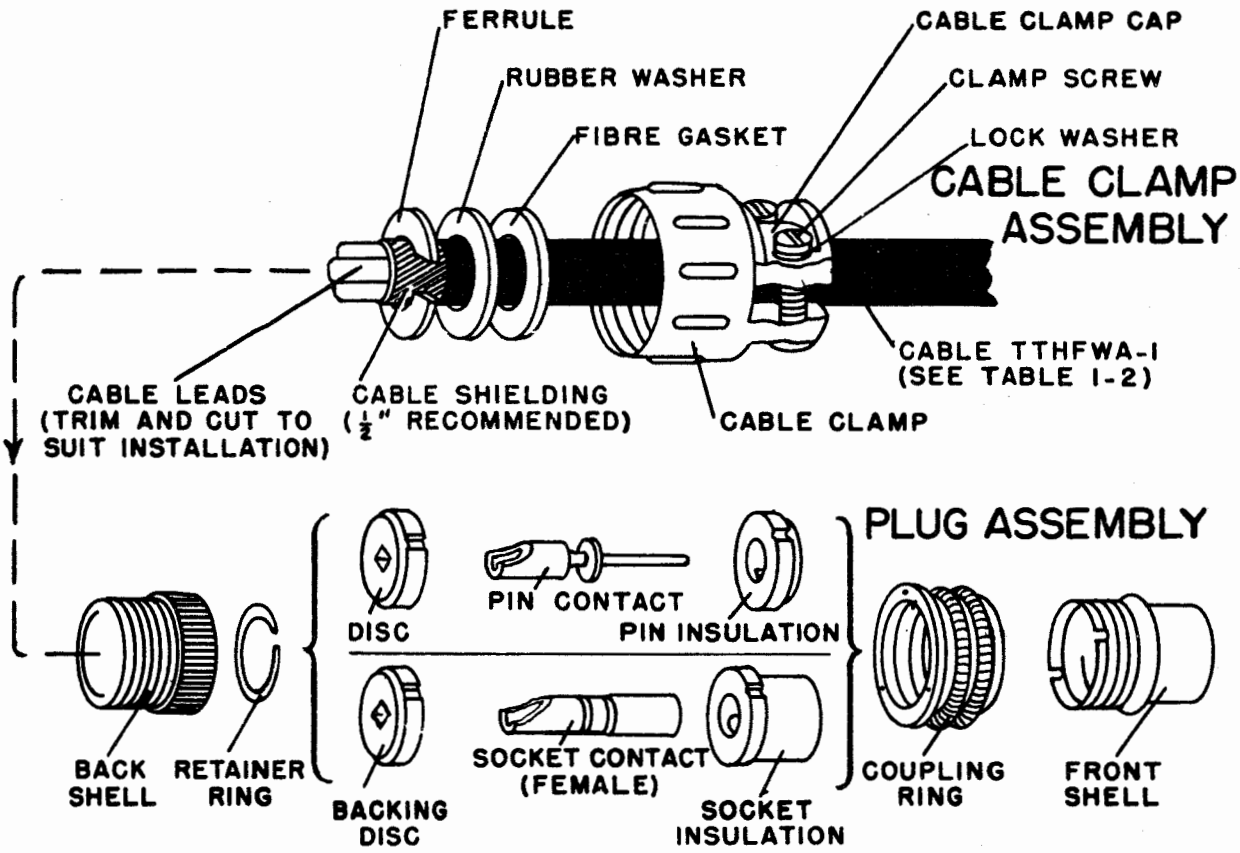
4. INSTALLATION OF FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8.

a. MOUNTING.—The AN/URA-8 equipment is supplied in a rack for table mounting. Four holes are provided in the base to bolt the rack to the table with ⅜-inch bolts (not supplied), see Figure 3–12. The centers of the front holes are 15½ inches apart, located $1^{11}/_{16}$ inches back from the front of the cabinet. The centers of the rear holes are $11^{1}/_{16}$ inches directly to the rear of the centers of the front holes.

TABLE 3–2. EXTERNAL CONNECTIONS, AN/URA-8

(1200 Symbol Series, one on each converter or two per equipment. 1300 Symbol Series, one per equipment.)

SYMBOL	TYPE	PIN NUMBERS USED	FUNCTION
J1202	C-49194	Center and shell	Cathode-ray Tube Remote Vertical jack
P1202	C-49195	Center and shell	Cathode-ray Tube Remote Vertical plug
J1204	AN-3102-14S-7S	A, B, C	External Tone Input jack
P1204	AN-3106-14S-7P	A, B, C	External Tone Input plug
J1205	AN-3102-14S-7S	A, B, C	Tone Output jack
P1205	AN-3106-14S-7P	A, B, C	Tone Output plug
J1206	AN-3102-14S-9P	A, B	Teletype Output jack
P1206	AN-3106-14S-9S	A, B	Teletype Output plug
J1207	49435	1, 2	A.C. Outlet
J1211	AN-3102-14S-7S	A, B, C	Narrow Input jack
P1211	AN-3106-14S-7P	A, B, C	Narrow Input plug
J1212	AN-3102-14S-7S	A, B, C	Wide Input jack
P1212	AN-3106-14S-7P	A, B, C	Wide Input plug
J1302	AN-3102-14S-7S	A, B, C	External Tone Input jack
P1302	AN-3106-14S-7P	A, B, C	External Tone Input plug
J1303	AN-3102-14S-7S	A, B, C	Tone Diversity Output jack
P1303	AN-3106-14S-7P	A, B, C	Tone Diversity Output plug
J1304	AN-3102-14S-9P	A, B	Teletype Diversity Output jack
P1304	AN-3106-14S-9S	A, B	Teletype Diversity Output plug
J1305	AN-3102-14S-7P	A, B, C	Power Input jack
P1305	AN-3106-14S-7S	A, B, C	Power Input plug



1. Unscrew cable clamp from plug, being careful not to lose ferrule, rubber washer, and fibre gasket.
2. Remove cable clamp cap by unfastening the two clamp screws.
3. Slip cable through cable clamp, fibre gasket, and rubber washer, the threaded portion of clamp being towards the end of cable.
4. Disassemble plug for soldering wires by unscrewing its back shell. Slip the cable through back shell and the plug coupling ring, which is freed when the back shell is removed.
5. Cut and strip cable and wires to suit. Pre-tin each wire. Cut back the shielding to within one half inch of the outer covering.
6. Pre-tin braided shielding of cable.
7. Solder wires to plug contacts. Avoid excessive solder.
8. Reassemble plug. The cable shielding should show about ¼ inch beyond the assembled plug.
9. Slip ferrule over cable so that shielding is on side that will be within connector housing. Solder shielding to ferrule, not permitting any solder to get near outer edge of ferrule as this causes a barrier between ferrule and rim of connector shell.
10. Push the cable in so that the ferrule is up against the connector shell rim, position the clamp rubber washer and fibre gasket, and then screw the cable clamp body onto the back shell of plug.
11. Reassemble the cable clamp cap with the two associated clamp screws and lock washers.

Figure 3–4. Cable Fabrication with AN-3106 Plugs, AN-3057 Cable Clamps, and Associated Ferrules.

Access to the two front bolt holes can be had by removing the four screws holding the bottom Converter in the cabinet and then removing the Converter. After bolting the cabinet to the table, replace the Converter previously removed.

The Converters and Comparator can be removed from the table-mounting rack for installation in a standard relay rack. This is shown in Figure 3–13. The units may be fastened to the relay rack by the same screws as are used in the table-mounting rack. Spaces between the units may be covered by blank panels, each being held by two screws (one at each end). These panels and their screws are not supplied as parts of the subject equipment and must be procured separately. Observe the clearances shown on the drawing to allow for pulling out the chassis and tilting them for servicing, in order to avoid interference with other equipment that may be mounted in the relay rack above or below the units of the AN/URA-8 equipment.

b. CONNECTING CABLES.

(1) GENERAL.—Connections to the equipment vary with different installations, so the following information serves only as a guide. Use cables with an insulating sheath if possible. Length and termination of connecting cables, except those supplied, depends on the individual installation.

The equipment is delivered with the mating plug (and their associated cable clamps and ferrules) connected to their corresponding receptacles (jacks) on the unit. Remove each plug, one at a time, when it is ready for cable fabrication. For single-conductor cable fabrication refer to Figure 3–2 and Table 1–2. For multi-conductor cable fabrication refer to Figure 3–4. To disassemble the plug, first unscrew its associated cable clamp on the back of the plug. Be careful not to lose the ferrule seated inside the cable clamp, between the clamp and plug. Refer to Figure 3–4 for further details.

(2) CONVERTER-TO-CONVERTER CABLES. —Connect the six cables supplied with the equipment (Figure 3–5) as follows:

(a) Cable W1705 from DIV. CONT. jack J1209 of top converter to DIV.-CONT. CHAN-A jack J1308 of Comparator.

(b) Cable W1706 from DIV. CONT. jack J1209 of bottom converter to DIV.-CONT. CHAN-B jack J1309 of Comparator.

(c) Cable W1711 from DIV. SIG. jack J1210 of top converter to DIV.-SIG. CHAN-A jack J1310 of Comparator.

(d) Cable W1712 from DIV.-SIG. jack J1210 of bottom converter to DIV.-SIG. CHAN-B jack J1311 of Comparator.

(e) Cable W1717 from PWR INPUT jack J1208 of top converter to PWR OUTPUT jack J1306 of Comparator.

(f) Cable W1718 from PWR INPUT jack J1208 of bottom converter to PWR OUTPUT jack J1307 of Comparator.

(3) POWER CABLE.—Remove plug P1305 from PWR INPUT jack J1305, disassemble and, using a two-wire power cable, solder the wires to pins A and C. Reassemble the plug and replace on PWR INPUT jack J1305.

(4) TELETYPEWRITER CABLE.—Remove plug P1304 from TTYP. OUTPUT jack J1304, disassemble, and using two-wire cable, solder leads to A and B. The teletypewriter loop current must be supplied from external teletype battery or power supply. The negative side of the teletypewriter loop is grounded in the Frequency Shift Converter-Comparator Group AN/URA-8. See Figure 3–3.

(5) INPUT P1211 OR P1212 ON BOTH CONVERTERS.—Remove the plugs from NARROW A-F INPUT or WIDE A-F INPUT jacks J1211 or J1212 and disassemble. Solder the two conductors to A and C. Pin B is the center tap on the input transformer and should not be used unless a ground is required at this point to maintain a balanced grounded circuit. Ground shield externally. Reassemble plugs and place in proper jacks. The two cables of the two converters will go to separate receivers.

(6) TONE OUTPUT.—Remove the plug from TONE OUTPUT jack J1303 and disassemble. If two-wire or single-wire shielded cable is used, solder leads to A and C. Pin B is the center tap of the output transformer and should be used only when a balanced grounded output is required. Reassemble plug and replace on TONE OUTPUT jack J1303. Connect a short length of bus wire from pin B of TONE OUTPUT jack J1303 to GND. 4 (see Figure 7–22) if a ground is necessary.

5. INITIAL ADJUSTMENTS.

NOTE

Certain adjustments may require the chassis to be withdrawn or removed from the case. This is done as follows:

TO SLIDE THE CHASSIS OUT OF THE CASE:

(1) Grasp the handles, push the button near the top of each handle with the thumb, turn the left-hand handle clockwise and the right-hand handle counterclockwise as far as they will go.

(2) Pull the chassis out of the case as far as it will go, and return the handles to their original positions.

TO SLIDE CHASSIS INTO CASE:

(1) Grasp the handles, push the button near the top of each handle, turn the left-hand handle clockwise and the right-hand handle counterclockwise as far as they will go.

(2) Slide the chassis into the case as far as it will go.

(3) When completely in case, return handles to normal position to lock chassis in place.

TO CHANGE CHASSIS POSITION AFTER WITHDRAWING CHASSIS FROM CASE:

(1) Grasp the handles, push the bell-shaped buttons near the inside bottom of the handles, and raise or lower the chassis approximately to one of the locking positions.

(2) Release the buttons and move the chassis until the locking mechanism snaps into position.

TO REMOVE CHASSIS FROM RAILS:

(1) Slide chassis out of case and set to vertical position.

(2) Slide retainers (just forward of chassis pivots) upward until top eyelet is free of slot.

(3) Let retainers drop. Press bell-shaped buttons and lift chassis forward from rails.

TO REPLACE CHASSIS ON RAILS:

(1) Check that the retainers on each side are hanging downward.

(2) Hang chassis on rails, by the pivots, pushing it to the rear as far as it will go.

(3) Push bell-shaped buttons. Pull the retainers as high as they will go, press them against mounting plate, and slide downward as far as they will go being careful to see that top rivet in retainer engages slot in mounting plate.

WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted. Always observe all safety regulations and precautions. See safety notice and high-voltage warning printed on pages viii and ix in the Front Matter of this book.

a. FREQUENCY SHIFT CONVERTER CV-60/URR.

(1) Measure the power-line voltage by connecting a 150-volt range a-c voltmeter across the two contacts of the a-c outlet J1207, located next to PWR INPUT jack J1208 (see Figure 3–1). Adjust tap on

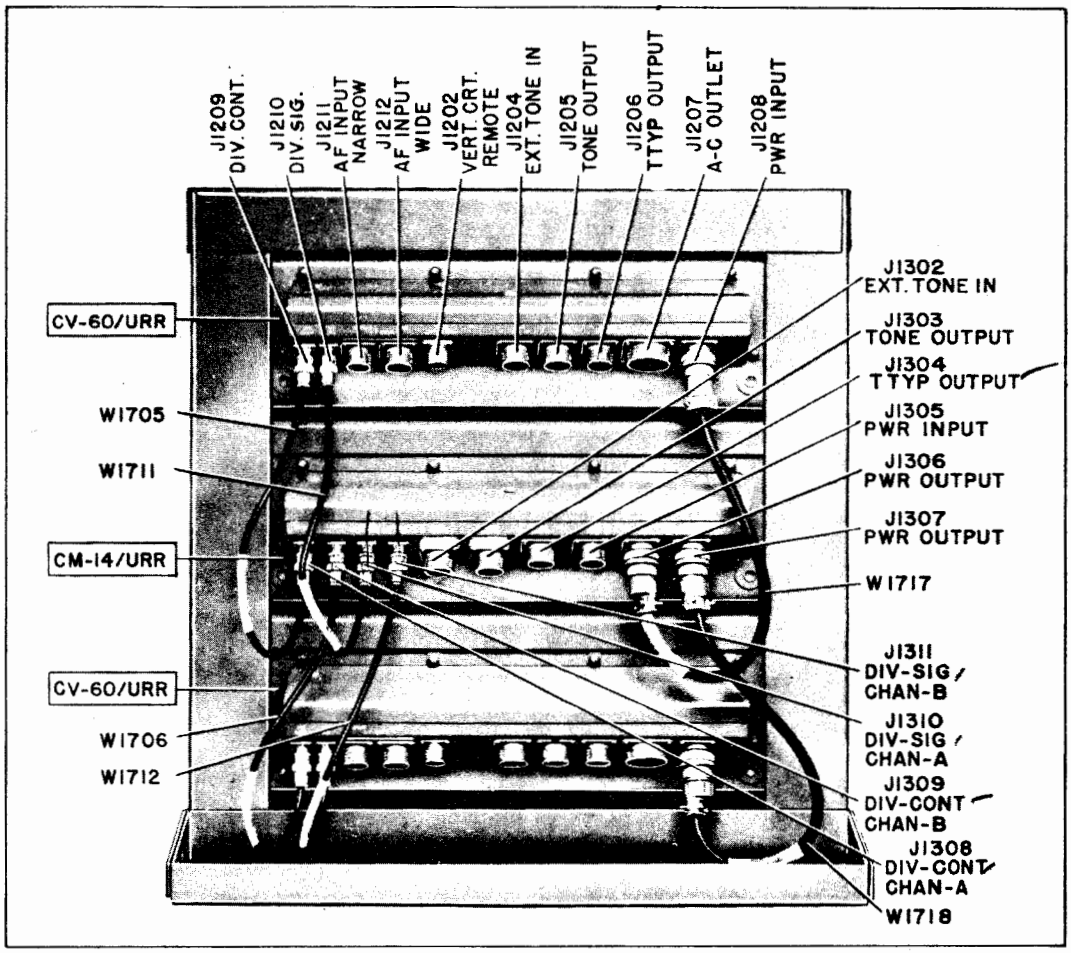


Figure 3–5. Frequency Shift Converter-Comparator Group AN/URA-8, Rear View

power transformer T801, if necessary, by changing the grey lead on terminal 2, 3 or 4. Transformer terminals 2, 3, and 4 are, respectively, for approximate line voltages of 105, 115, and 125 volts. Leave the fan lead (brown) on terminal 3 of the transformer. See Figure 7–4.

(2) Turn POWER switch to ON. Neon pilot light on front panel should light about ten seconds later, which allows for tube warm-up.

(3) Check input plug is in correct jack, narrow or wide band input. Links O401 and O402 in the Audio Input Unit permit paralleling the WIDE and NARROW input jacks to permit the receiving of wide or narrow frequency shift from the same receiver. For this type operation the links are placed in the C position (see Figure 7-10). Adjust NARROW-WIDE switch on front panel, under cover to suit.

(4) Set TUNE-OPERATE switch to TUNE.

(5) Set the TONE FREQ switch, under the cover on the front panel, to the desired frequency. If an external tone frequency is used, set TONE FREQ to EXT and adjust frequency of tone generator. Adjust to suitable output level with TONE LEVEL control.

(6) After about one minute, adjust the Tuning Monitor as follows:

(a) Using a screwdriver, adjust the INTENSITY to give a reasonably bright trace. Too bright a trace will result in short tube life and focusing difficulties.

(b) Using a screwdriver, adjust the FOCUS for sharpest trace.

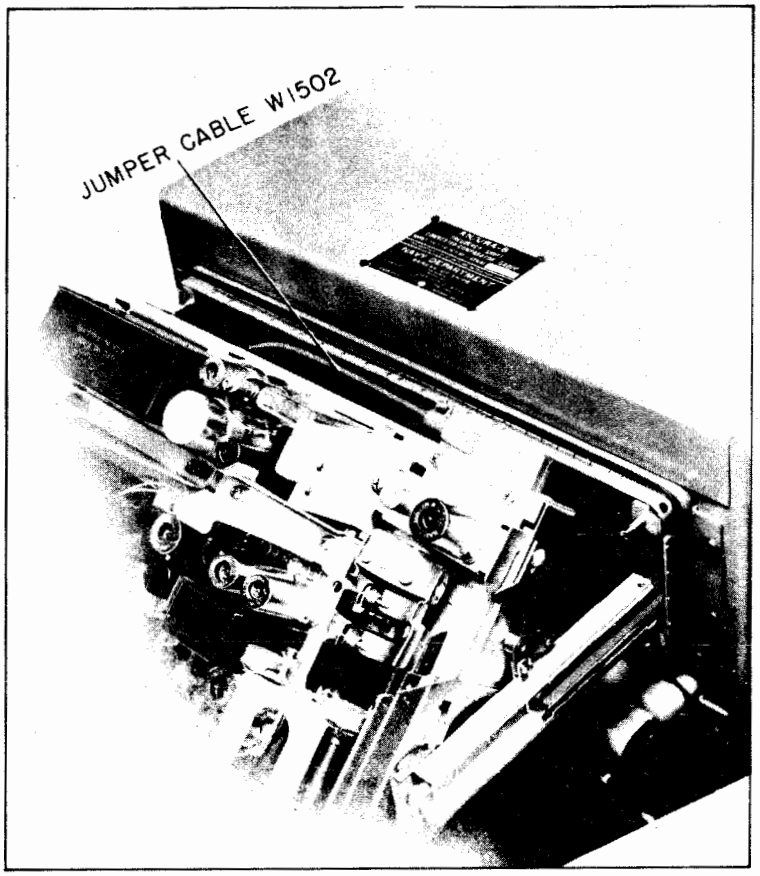


Figure 3–6. Jumper Cable W1502 in Use in Frequency Shift Converter CV-60/URR

(c) Turn POWER switch to OFF. Slide chassis out of case and connect Cable Filter Jack (J1201) and Converter plug (P1501) with jumper cable furnished. See Figure 3–6.

(d) Turn POWER switch to ON and allow about one minute for warm-up. Push CAL IN button (no signal input, VERT GAIN fully counterclockwise set).

(e) Loosen lock nut and adjust R705 (located on the rear of the cathode-ray tube mounting bracket, below the V CENT potentiometer R702) until scope line coincides with engraved center line. Tighten lock nut. See Figure 7–7.

(f) Release CAL IN button.

(g) Adjust V CENT on panel with a screwdriver until scope line coincides with engraved center line.

(h) Readjust FOCUS with a screwdriver for best average focus with CAL IN button depressed and released.

(i) Make certain S604 (toggle switch on rear bracket of Keyer Unit) is in ON position.

(j) Remove jumper cable and push chassis back in case.

(7) Set SPEED switch to LOW for normal (60 words per minute speed) or HIGH for high-speed multiple or speeds greater than 60 words per minute.

(8) Plug an 0-100 ma milliammeter, such as Navy Model OE (connected to a phone plug with the tip to the "minus" and the shank to the "plus" terminal of the meter), into the TTYP jack on the front panel. With no keying signal adjust the loop current control, at the teletype power supply for 60 ma. When the unit is keying normally the current will drop to 30 ma.

(9) Tune in the radio receiver to a frequency shift signal with the receiver bfo adjusted to give a 1000- or 2550-cycle beat note, depending on whether a narrow or wide band frequency shift signal is being received. The 1000-cycle beat note is for 10- to 200-

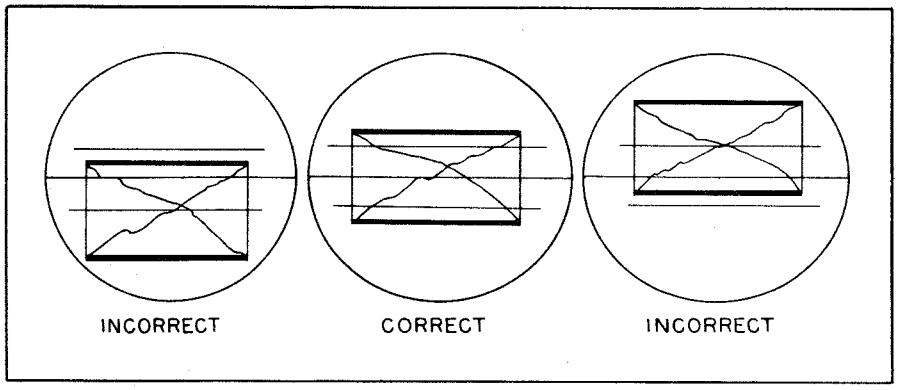


Figure 3–7. Radio Receiver Tuning Patterns as Seen on Tuning Monitor

cycle separation between mark and space; and the 2550-cycle signal for 200- to 1000-cycle separation between mark and space signals.

(10) With the VERT GAIN control, adjust the separation of the two lines, on the cathode-ray tube, to a convenient distance apart.

(11) Adjust receiver tuning (main dial and bfo) to center the lines on the cathode-ray tube (see Figure 3–7.

(12) Set TUNE-OPERATE switch to OPERATE; teletypewriter may start printing.

(13) Push CAL IN button and adjust THRESHOLD control, to produce a pattern on the cathode-ray tube which matches the top and bottom lines engraved on cathode-ray tube window. (see Figure 3–8).

(14) Release CAL IN button.

(15) Teletypewriter should be printing; if it does not, change position of NORM-REV switch or tune radio receiver to other side of zero beat.

(16) Turn the LOW-HIGH-ADJ switch to the ADJ position and push the CAL IN button. The cathode-ray tube pattern should just fit between the top and bottom engraved lines of the window. This is a sensitivity check of the tuning monitor tube V702 and amplifier tube V601B.

(17) Turn the LOW-HIGH-ADJ switch to original position.

(18) Connect an external test oscilloscope such as Navy Models OBL or OBT series, to the TONE OUTPUT or PHONE jacks and with TONE FREQ on EXT, TONE LEVEL on 10, no tone input adjust MOD BAL for minimum transients on the signal.

(19) Adjust the % MARK control as follows:

(a) Set SPEED switch on the ADJ position.

(b) Connect external oscilloscope input across a 20-ohm resistor connected to a plug inserted in the TTYP jack.

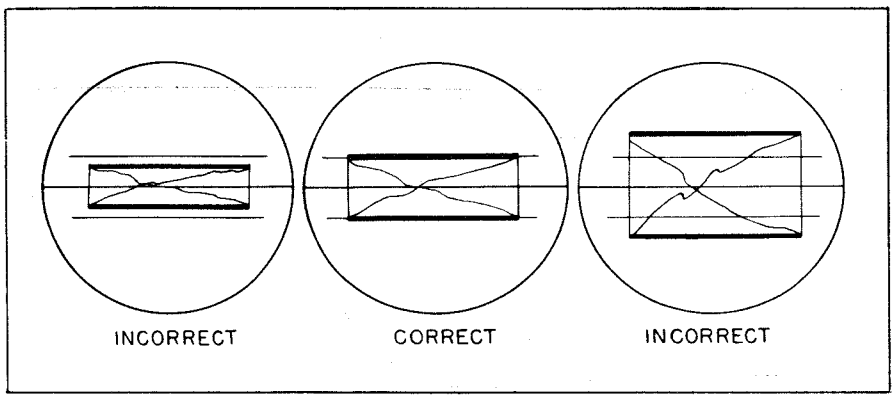


Figure 3–8. Tuning Pattern (CAL IN) On Tuning Monitor

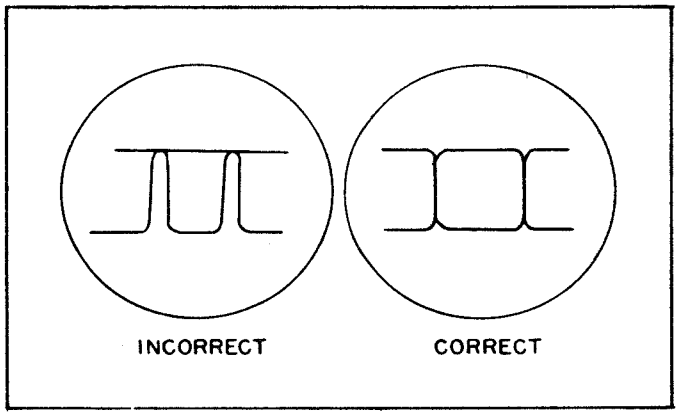


Figure 3–9. Test Oscilloscope Patterns for % MARK Control Adjustment

(c) Set test oscilloscope sweep for approximately 90 cycles with sync off.

(d) Adjust sweep control on scope for the peak of one cycle to be centered in the trough of another cycle.

(e) Adjust the % MARK control until the peaks and troughs are equal in width (see Figure 3–9).

(f) Remove test oscilloscope and return SPEED switch to former position. Teletypewriter should be printing normally.

b. FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8.

(1) Set up each channel as described in paragraph 5*a* of this section with:

(a) The teletypewriter plugged into the channel being adjusted.

(b) Both radio receivers tuned to the same side of zero beat.

(2) Measure the power-line voltage by connecting a 150-volt range a-c voltmeter across contacts of the a-c outlet on one of the two converter units (see paragraph 5*a* (1) of this section). Adjust tap on power transformer T1001 of the Comparator, if necessary, by changing the grey lead on terminal 2, 3 or 4. Transformer terminals 2, 3, and 4 are, respectively, for approximate line voltages of 105, 115, and 125 volts. Do not change the fan lead (brown) from terminal 3. See Figure 7–6.

(3) Turn Comparator POWER switch to ON. Neon pilot light on front panel should light after about ten seconds.

(4) Set the TONE FREQ switch, under the front panel cover of the comparator, to the desired frequency. If an external tone frequency is used set TONE FREQ to EXT and adjust the frequency of the tone generator. Adjust signal to suitable output level with TONE LEVEL control.

(5) Set SPEED switch on comparator to low for normal (60 words per minute) or HIGH for high-speed multiplex or speeds greater than 60 words per minute.

(6) Plug an 0-100 ma milliammeter, such as a Navy Model OE (connected to a phone plug with the tip to the "minus" and the shank to the "plus" terminal of the meter), into the TTYP jack on the front panel. With no keying signal adjust the loop current control, at the teletype power supply, for 60 ma. When the unit is keying normally the current will drop to 30 ma.

(7) With channel A (top CV-60/URR) receiving signals, set CHANNEL A-COMBINED-CHANNEL B switch to CHANNEL A position.

(8) Connect an external test oscilloscope, such as Navy Models OBL or OBT series, to the TONE OUTPUT or PHONE jack of Comparator and with TONE FREQ on EXT, TONE LEVEL on 10, no tone output adjust MOD BAL for a minimum of transients on the signal.

(9) Adjust % MARK of Comparator control as follows:

(a) Set SPEED switch to ADJ.

(b) Use test oscilloscope connected as in step 7.

(c) Set test oscilloscope horizontal sweep for approximately 90 cycles with sync off.

(d) Adjust test oscilloscope sweep control for the peak of one cycle to be centered in the trough of another cycle.

(e) Adjust the % MARK control until the peaks and troughs are equal widths (see Figure 3–9).

(f) Remove oscilloscope and return SPEED switch to original position. Teletypewriter should print normally. If it does not, change position of Comparator NORM-REV switch.

(10) Adjust GATE BAL as follows:

(a) Slide the Comparator out of the cabinet and connect to Cable Filter Unit by jumper cable supplied.

(b) Connect a jumper from a filament lead to grid of V903, pin 6 (location of this tube is shown in Figures 5–4 and 7–34).

(c) Set CHANNEL A-COMBINED-CHANNEL B switch to COMBINED.

(d) Connect a test oscilloscope to V906 cathode, pin 3, and ground.

(e) Channel switching is now occurring at a 60-cycle rate. The test oscilloscope pattern will be a

square wave switching oscillogram. Adjust the GATE BAL for minimum of pattern (see Figure 3–10).

(f) Remove jumper and test oscilloscope.

(g) Throw switch S604 on the rear bracket of Keyer Unit to the ON position.

(11) Adjust CONT BAL as follows:

(a) Set CHANNEL A-COMBINED-CHANNEL B switch to COMBINED.

(b) Set CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL switch to DIV IND.

(c) Set links O901 and O902 (on top face of Diversity Selector Unit) to AUDIO position. See Figure 7–14.

(d) Apply separate 1000-cycle signals of about 0.1 volt to DIV-CONT CHAN-A jack J1308 and DIV-CONT CHAN-B jack J1309 on the rear of the Cable Filter. One channel will conduct. If the panel meter (M1601) reads approximately 50, channel A is conducting; if meter reads approximately 150, channel B is conducting; and if meter reads approximately 100, the channels are switching too fast for the meter to follow. The latter case will not occur during this adjustment. The output signals of the two associated receivers may be used for this purpose if an electron-tube a-c voltmeter is used to measure the diversity control voltages which appear at DIV-CONT CHAN-A jack J1308 and DIV-CONT CHAN-B jack J1309. To connect the voltmeter to these jacks, first remove the Cable Filter Unit top cover, and this will give access to the desired terminals at the rear of the jacks.

(e) Increase the input voltage to the channel not conducting until it conducts, as indicated by the meter. Record the increase in voltage necessary to make it conduct, then reduce the voltage to 0.1 volt.

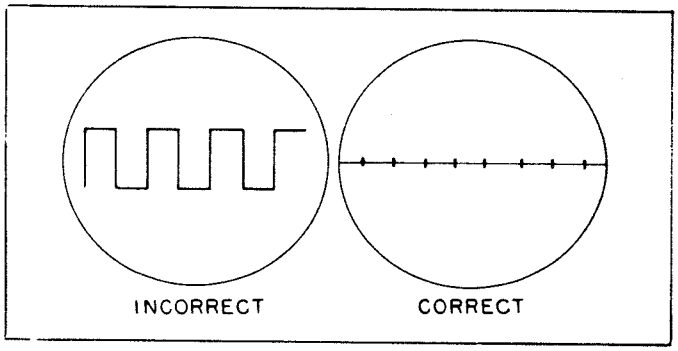


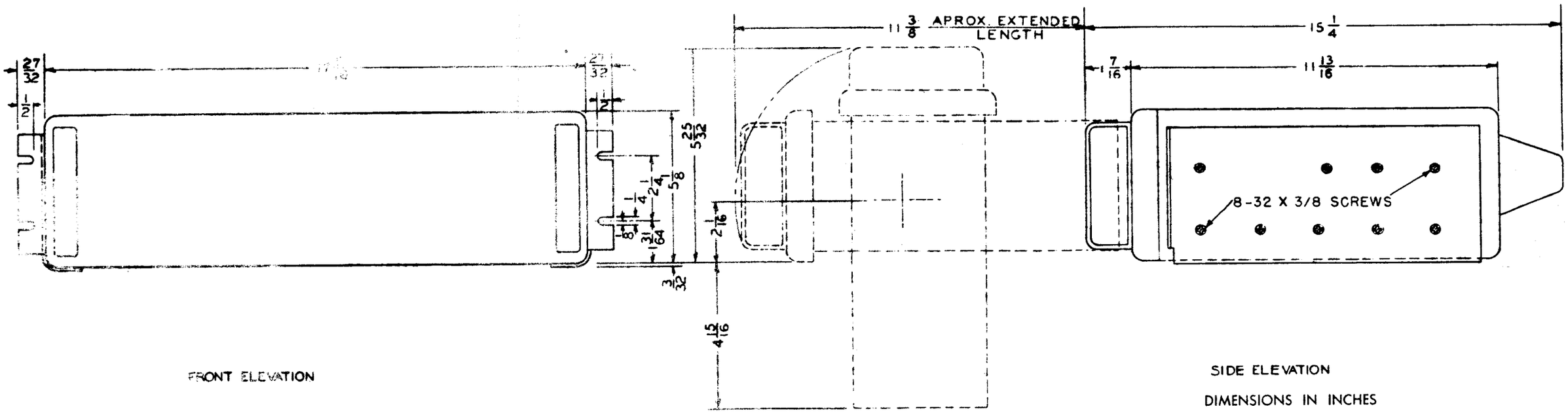
Figure 3–10. Test Oscilloscope Patterns for GATE BAL Control Adjustment

(f) Increase input voltage on other channel until it conducts, as shown by panel meter and record voltage. If the two voltages recorded in steps *(e)* and *(f)* are within 10 per cent of each other, then the CONT BAL is correctly adjusted. If they are not, change the CONT BAL setting and repeat procedure until voltages to shift each channel are equal.

(g) Remove signal from DIV-CONT CHAN-A and DIV-CONT CHAN-B jacks J1308 and J1309, and plug original cables in place. This completes the adjustment of the AN/URA-8.

CAUTION

Any of the Keyers not connected to teletypewriters in operating condition must have switch S604 (on rear bracket of Keyer Unit) in the OFF position.



DIMENSIONS IN INCHES

WEIGHTS:

34 POUNDS IN CASE FOR RACK MOUNTING
40 POUNDS IN CASE WITH SHOCK MOUNTS

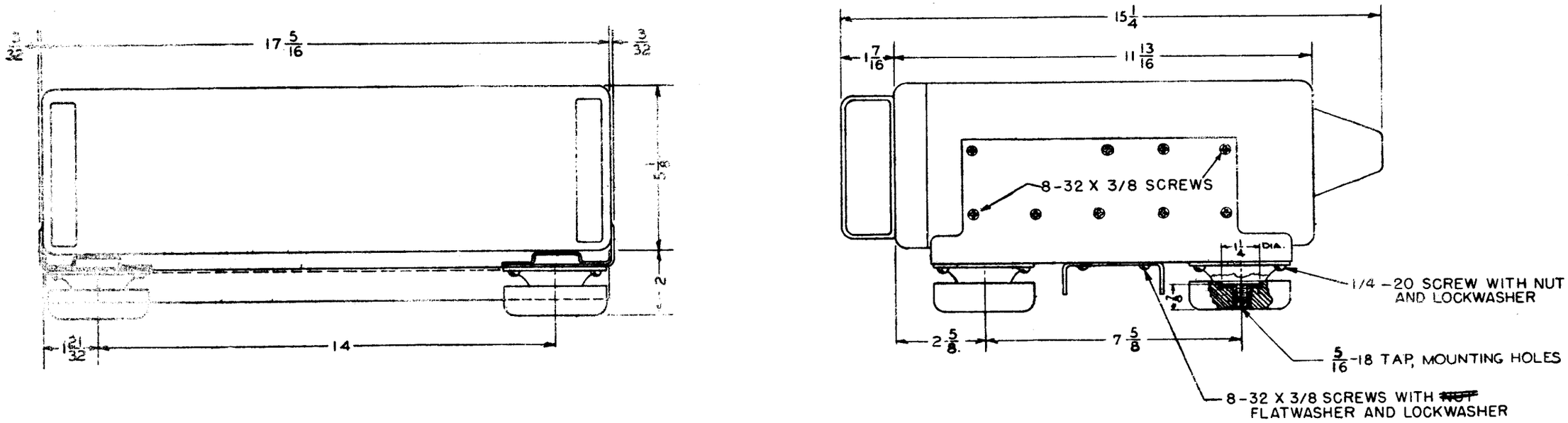
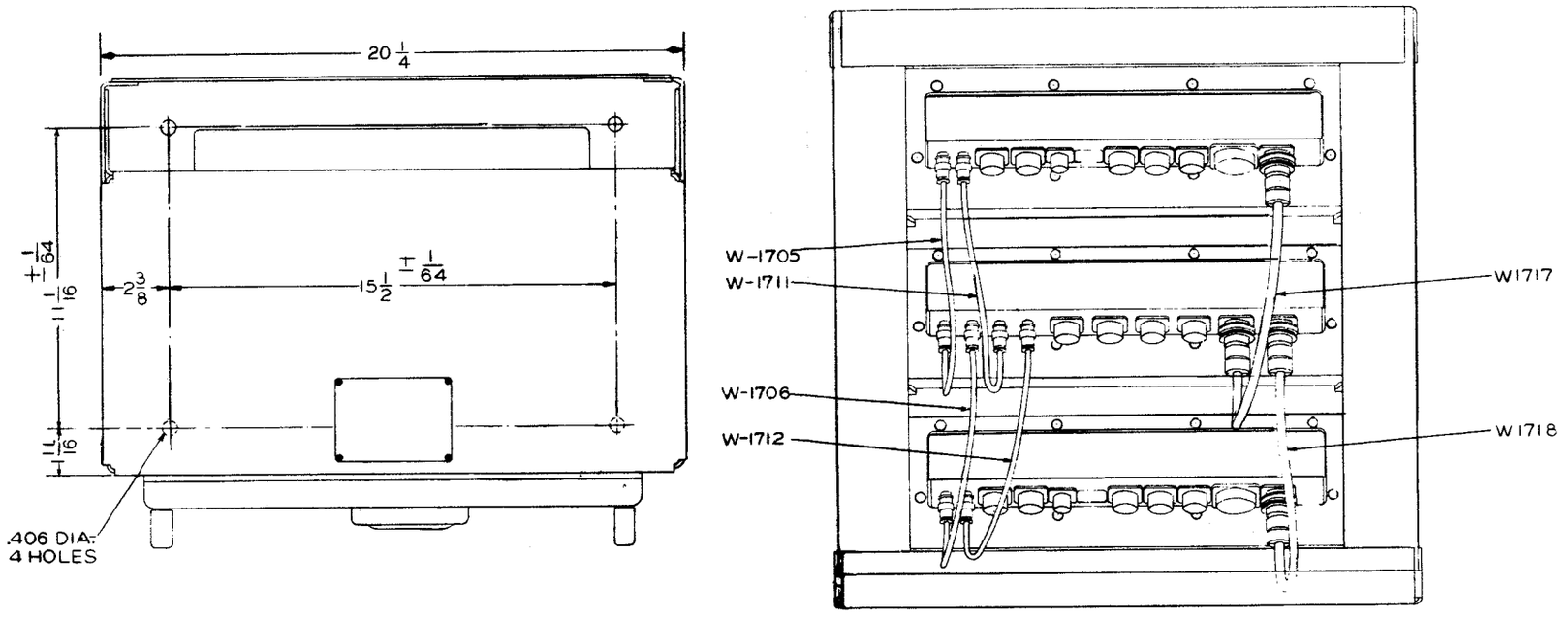


Figure 3–11. Frequency Shift Converter CV-60/URR Outline Drawing



REAR ELEVATION

DIMENSIONS IN INCHES
WEIGHT: 125 POUNDS

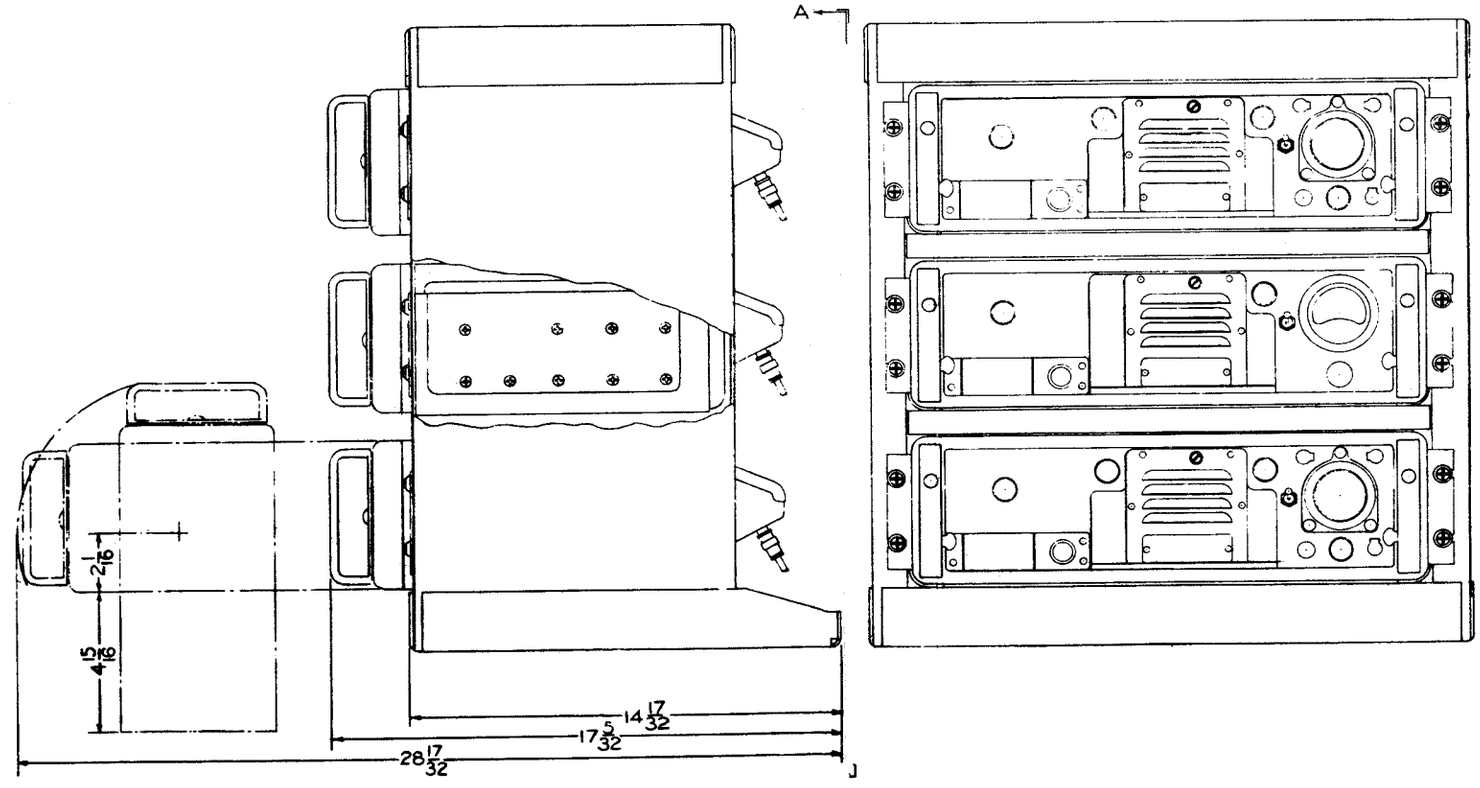


Figure 3–12. Frequency Shift Converter-Comparator Group AN/URA-8 Outline. Drawing

NAVSHIPS 91339

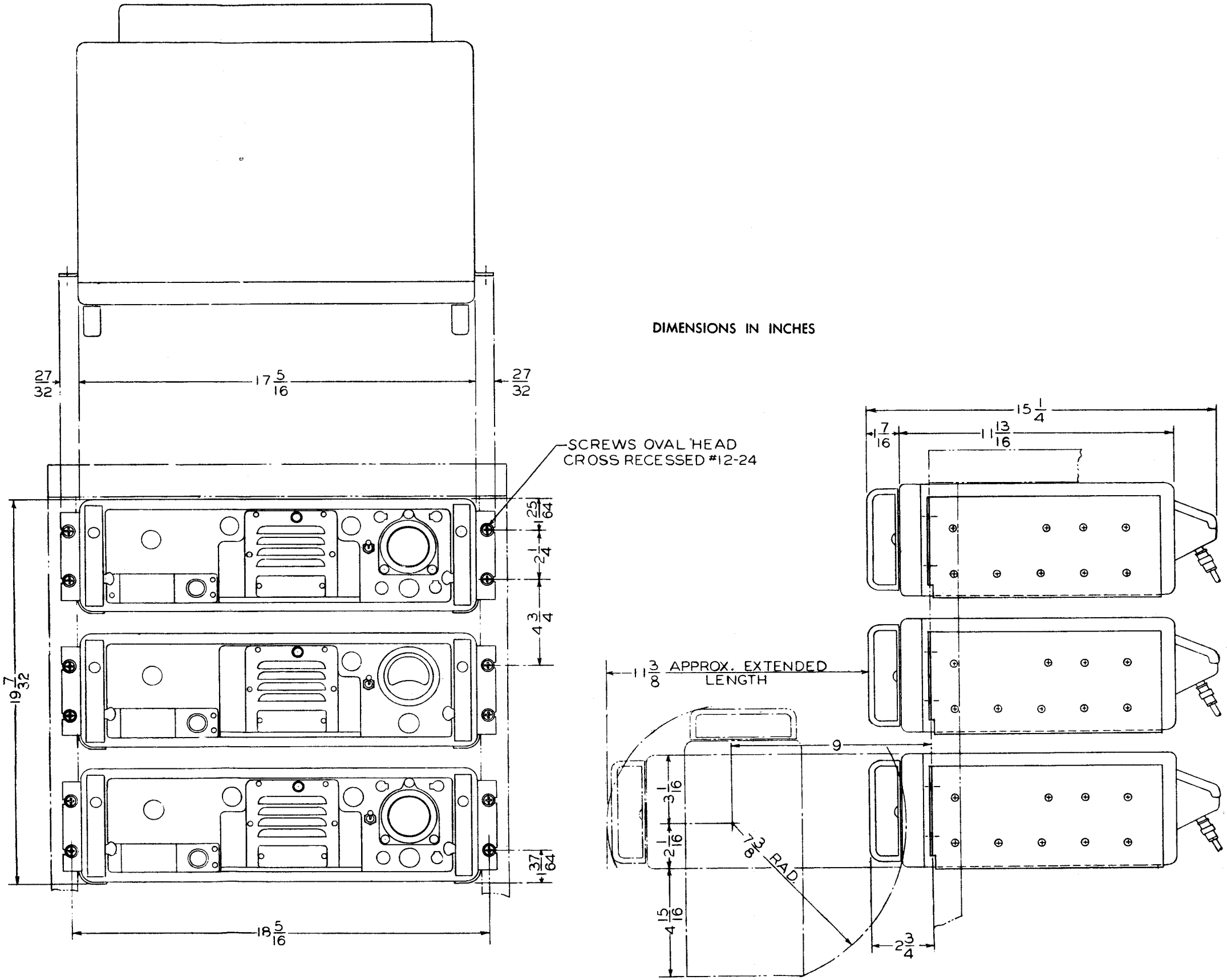


Figure 3–13. Frequency Shift Converter-Comparator Group AN/URA-8 Relay Rack Mounting Installation Drawing

SECTION 4
OPERATION

1. INTRODUCTION.

The Frequency Shift Converters covered by this instruction book are only part of a complete teletypewriter radio receiving system. Other equipment necessary for use of Frequency Shift Converter CV-60/URR includes an antenna to pick up the radio signals, a radio receiver to select and amplify the radio signals, and a teletypewriter with teletypewriter battery or d-c power supply to provide loop current. If the tone signal is used for transmission to a remote point, terminal equipment to operate from the on-off keyed tone must also be provided. A Frequency Shift keyed audio signal centered about 1000 cycles for mark and space frequency separation of 200 cycles or less, or centered about 2550 cycles, for mark and space frequency separation of 200 to 1000 cycles, obtained from the radio receiver is the input signal for the Frequency Shift Converter. This signal shifts to higher and lower frequencies corresponding to the characters transmitted. The Frequency Shift Converter translates the frequency shifts into off-on keyed d-c square-wave pulses to key the receiving teletypewriter loop circuit.

Since the teletypewriter signals are essentially d-c signals (square waves), transmission over telephone lines is impracticable; therefore, a tone modulator, keyed on and off by the teletype signals, is provided. This on-off keyed tone signal must be demodulated to operate a teletypewriter.

The Frequency Shift Converter-Comparator Group, AN/URA-8, serves the same purpose as Frequency Shift Converter CV-60/URR, except that two receivers, are used for diversity operation. The Comparator CM-14/URR functions to compare continuously the levels of the two signals, and select the stronger one to key the teletypewriter loop circuits. When diversity operation is not required, the two CV-60/URR Converters can be used for different signals and operate different teletypewriters.

2. CAPABILITIES AND LIMITATIONS.

The equipment provides the best possible teletype signals when not subjected interference and the irregularities of radio transmission. It will give accurate conversion up to the point when the noise level is approximately equal to or greater than the signal. The Radio receiver audio output signal level must be high enough to keep the input to the limiter stage well above saturation level.

Little attention of the operator is required during operation after the equipment has warmed up (warm-up time for the CV-60/URR and CM-14/URR is about one minute; additional time may be required for the associated receivers). A tuning monitor gives continuous, visible monitoring of the discriminator output. The neon ON indicator, operating from the +200 volt supply, gives a continuous indication of the B-power supply for the tubes.

The meter in the Comparator can be switched to indicate the signal strength of each channel or to indicate which channel is selected at the moment to control the keyer.

3. OPERATING CONTROLS.

All operating controls are located on the front panel with all but the essential operating controls located under a center cover or behind oil-cup-type hole covers. This feature helps prevent breaks in service due to the operator manipulating the wrong knob accidentally. All but two controls, primarily of a maintenance nature, are accessible from the front panel.

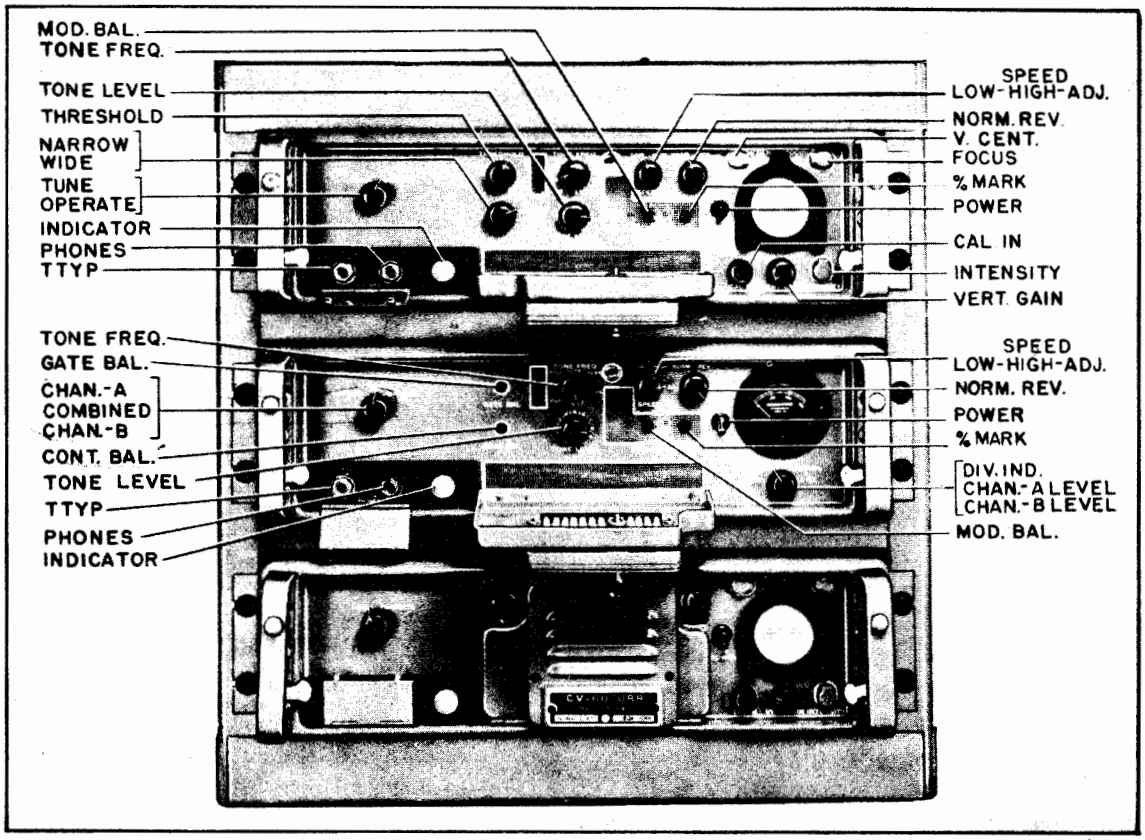


Figure 4–1. Operating Panel Controls

4. TUNING ADJUSTMENT.

Tuning is accomplished with the associated radio receiver, but the following adjustments are necessary on the CV-60/URR and AN/URA-8 equipments (see Figure 4–1):

CONTROL	FUNCTION
TUNE-OPERATE	In the Tune position it prevents the keyer from keying the teletypewriter loop.
THRESHOLD	Adjusts the input signal to the keyer, for the proper level.
NARROW-WIDE	Selects input signal and switches the discriminator for narrow or wide shift.
TONE FREQ.	Adjusts tone signal to one of eight internal fixed frequencies or an external frequency.
TONE LEVEL	Adjusts the amplitude of the tone signal.
SPEED	Selects proper filter for standard or high speed teletypewriter. Applies a standard voltage for adjustments in the ADJ position.
NORM-REV.	Reverses polarity of teletype signals. Same effect can be obtained by tuning radio receiver to the other side of zero beat. (Latter is not recommended.)
POWER, OFF-ON	Turns power to equipment on or off. Does not deenergize fuses, convenience outlet, power line filter, or switch wiring.
VERT GAIN	Adjusts height of pattern on cathode-ray tube.
CAL IN	When depressed, connects cathode-ray tube to indicate Keyer input voltage.

The following controls are on the Comparator CM-14/URR, part of the AN/URA-8 equipment.

CONTROL	FUNCTION
CHANNEL A-COMBINED-CHANNEL B	Switches comparator keyer to channel A alone, both channels in diversity operation, or channel B alone.
CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL	Shows signal level of channel A, which channel is supplying the signal in diversity operation, or the signal level of Channel B.

5. SUMMARY OF OPERATION.

a. SINGLE-CHANNEL CV-60/URR STARTING PROCEDURE.

(1) Turn POWER switch of Frequency Shift Converter to ON, turn on power to radio receiver and teletypewriter and allow sufficient time for all equipment to warm up.

(2) Set TUNE-OPERATE switch of the Frequency Shift Converter to TUNE.

(3) Tune in a frequency shift signal on the radio receiver with receiver bfo adjusted to give a 1000 or 2550-cycle beat note. The 1000-cycle beat note is for narrow shift (mark and space frequency separation of 200 cycles, or less); the 2550-cycle beat note is for wide shift (mark and space frequency separation of 200 to 1000 cycles,. Adjust TUNING carefully by vertically centering the horizontal lines on the Tuning Monitor. See Figure 3–7.

(4) Set TUNE-OPERATE switch to OPERATE.

(5) Push CAL-IN button and adjust the THRESHOLD control, to produce cathode-ray tube pattern which matches lines engraved on tuning monitor window. See Figure 3–8.

(6) Release CAL-IN button.

(7) Teletypewriter should be printing correctly; if it is not, change the position of the NORM-REV switch. If trouble is not corrected, advise technician.

(8) Observe the Tuning Monitor indication occasionally and re-adjust receiver tuning as necessary to maintain proper operation until the equipment has thoroughly stabilized.

b. TUNING SINGLE-CHANNEL, CV-60/URR, TO ANOTHER FREQUENCY.

(1) Set TUNE-OPERATE switch to TUNE.

(2) Tune in new signal on the radio receiver with receiver bfo adjusted to give either a 1000 or 2550-cycle beat note as required. Adjust receiver carefully by centering vertically, the horizontal lines on the tuning monitor. See Figure 3–7.

(3 Set TUNE-OPERATE switch to OPERATE.

(4) Push CAL-IN button and adjust THRESHOLD control, to produce cathode-ray tube pattern which matches lines engraved on the Tuning Monitor window. See Figure 3–8.

(5) Release CAL-IN button.

(6) Teletypewriter should now be printing; if it is not, change the position of the NORM-REV switch.

c. OTHER ADJUSTMENTS, SINGLE CHANNEL.

(1) TONE LEVEL. Adjustment can be made any time by means of the TONE LEVEL control R629. If an external tone source is used, adjustment can also be made, independently, by changing the amplitude at the source. Tone will not be keyed on and off when TUNE-OPERATE switch is in TUNE position when there is no signal being received and when a steady mark signal is being received.

(2) TONE FREQUENCY.—Adjustment can be made at any time convenient to the operator when using the internal tone oscillator. An external signal (switch on EXT) can only have its frequency adjusted at the source.

(3) MAINTENANCE ADJUSTMENTS.—Adjustments other than those mentioned are part of the initial and maintenance adjustments. For further information see sections 3 and 7 of this book.

d. STOPPING THE SINGLE-CHANNEL EQUIPMENT.—To stop the equipment throw the Frequency Shift Converter POWER switch to OFF.

e. DUAL-CHANNEL AN/URA-8 STARTING PROCEDURE.

(1) Throw the POWER switches of each of the three units to ON. Turn on power to the two radio receivers and teletypewriter and allow sufficient time for all equipment to warm up.

(2) Set the TUNE-OPERATE switches of the two Frequency Shift Converters to TUNE.

(3) Tune in the same frequency-shift signal on both radio receivers, with each receiver bfo adjusted to give 1000-cycle or 2550-cycle beat note. The 1000-cycle beat note is for narrow shift (mark and space frequency separation of 200 cycles or less); the 2550-cycle beat note is for wide shift (mark and space frequency separation between 200 and 1000 cycles). Both receivers must be tuned to the same side of zero beat.

(4) Adjust the frequency of each receiver accurately by vertically centering the horizontal lines on the respective tuning monitor. See Figure 3–7.

(5) Set TUNE-OPERATE switch on each of the Converters to OPERATE.

(6) Push CAL-IN button and adjust each THRESHOLD control to produce cathode-ray tube pattern which matches lines engraved on tuning monitor window. See Figure 3–8.

(7) Release CAL IN button.

(8) Set CHANNEL A-COMBINED-CHANNEL B switch of the Comparator to CHANNEL A. The

teletypewriter should operate. If the printing appears to be garbled, change the position of the NORM-REV switch of the Comparator.

(9) Set CHANNEL A-COMBINED-CHANNEL B switch of the Comparator to CHANNEL B. The teletypewriter should operate. If the printing appears to be garbled, tune the channel B radio receiver to the other side of zero beat.

(10) Set channel B receiver gain to zero. Set CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL switch to CHANNEL A and adjust channel A radio receiver output for a reading of approximately 90 microamperes on the Comparator meter. Adjust channel B receiver gain until meter reads half of above setting.

(11) Set CHANNEL A-DIV IND-CHANNEL B switch to DIV IND. A reading of approximately 50 microamperes indicates channel A is supplying the signal, 150 microamperes indicates channel B is supplying the signal and 100 microamperes indicates the channels are switching too rapidly for the meter to follow. If one channel carries the signal most of the time increase the level of the other channel.

f. TUNING DUAL-CHANNEL, AN/URA-8, TO ANOTHER FREQUENCY.

(1) Set the TUNE-OPERATE switches of the Converters to TUNE.

(2) Tune in new signal on both receivers with bfo adjusted to give either a 1000- or a 2550-cycle beat note as required. Tune each radio receiver to the same side of zero beat.

(3) Adjust the frequency of each receiver accurately by vertically centering the horizontal lines on the respective tuning monitor. See Figure 3–7.

(4) Set TUNE-OPERATE switch on each of the Converters to OPERATE.

(5) Push CAL-IN button and adjust each THRESHOLD control to produce cathode-ray tube pattern which matches lines engraved on tuning monitor window. See Figure 3–8.

(6) Release CAL-IN button.

(7) Set CHANNEL A-COMBINED-CHANNEL B switch of the Comparator to CHANNEL A. The teletypewriter should operate. If the printing appears to be garbled, change the position of the NORM-REV switch of the Comparator.

(8) Set CHANNEL A-COMBINED-CHANNEL B switch of the Comparator to CHANNEL B. The teletypewriter should operate. If the printing appears to be garbled, tune the channel B radio receiver to the other side of zero beat.

(9) Set channel B receiver gain to zero. Set CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL switch to CHANNEL A and adjust channel A radio receiver output for a reading of approximately 90 microamperes on the Comparator meter. Adjust channel B receiver gain until meter reads half of above setting.

(10) Set CHANNEL A-DIV IND-CHANNEL B switch to DIV IND. A reading of approximately 50 microamperes indicates channel A is supplying the signal, 150 microamperes indicates channel B is supplying the signal and 100 microamperes indicates the channels are switching too rapidly for the meter to follow. If one channel carries the signal most of the time increase the level of the other channel.

g. OTHER ADJUSTMENTS, DUAL CHANNEL.

(1) TONE LEVEL.—Adjustments can be made any time by means of the TONE LEVEL control R629. If an external source is used, adjustment can also be made, independently, by changing the amplitude at the source.

(2) TONE FREQUENCY.—Adjustment can be made at any time, operating or non-operating.

(3) SINGLE CHANNEL OPERATION.—Should it be desired to operate the teletypewriter from one particular channel only, set the CHANNEL A-COMBINED-CHANNEL B switch to CHANNEL A or CHANNEL B, depending on which channel is to operate the teletypewriter. Each Frequency Shift Converter CV-60/URR can be used independently by connecting separate teletypewriter loops to TTYP OUTPUT jack J1206 of the respective Converters.

(4) MAINTENANCE ADJUSTMENTS.—Adjustments other than those mentioned are part of the maintenance or initial adjustments. For further information, see sections 3 and 7 of this book.

h. STOPPING THE DUAL-CHANNEL EQUIPMENT.—To stop the equipment throw the POWER switches on each of the three units to OFF.

SECTION 5
OPERATOR'S MAINTENANCE

1. ROUTINE CHECKS.

Make the following checks once a week when possible.

a. SYSTEM SENSITIVITY CHECK.—This check requires the use of a signal generator and is therefore described in Section 6, Preventive Maintenance.

b. TUNING MONITOR SENSITIVITY CHECK.

(1) Set the SPEED switch of the Frequency Shift Converters to the ADJ position.

(2) Observe the lines on the Tuning Monitor screen. They should coincide, within 1/16 inch, with the top and bottom lines inscribed on the tuning monitor window. If they do not, report to technician.

2. EMERGENCY MAINTENANCE.

NOTICE TO OPERATORS

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

a. REPLACING FUSES.

WARNING

Never replace a fuse with one of a higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been corrected.

(1) SYMPTOMS OF FUSE FAILURE.—Pilot light not lighted. Tubes will be cold when chassis is pulled from case.

(2) FUSE LOCATIONS.—The fuses are located one above the other at the left rear of the cabinet in the Cable Filter Compartment. Spare fuses will be found to the right of the fan. See Figures 5–1 and 5–2.

(3) REPLACEMENT.

(a) Slide chassis out of cabinet and tilt 45 degrees.

(b) Reach in cabinet and unscrew one fuse holder cap by turning cap counterclockwise. Cap with fuse is now free of holder.

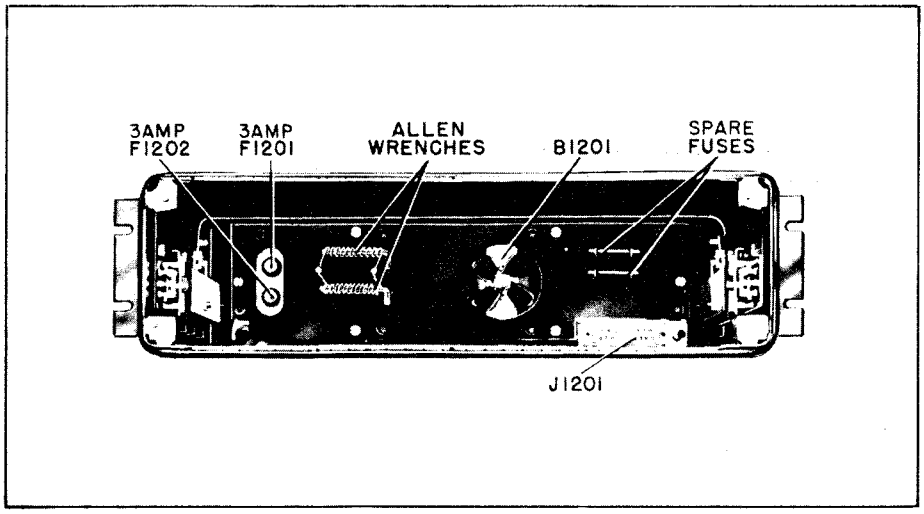


Figure 5–1. Frequency Shift Converter CV-60/URR, Fuse Locations

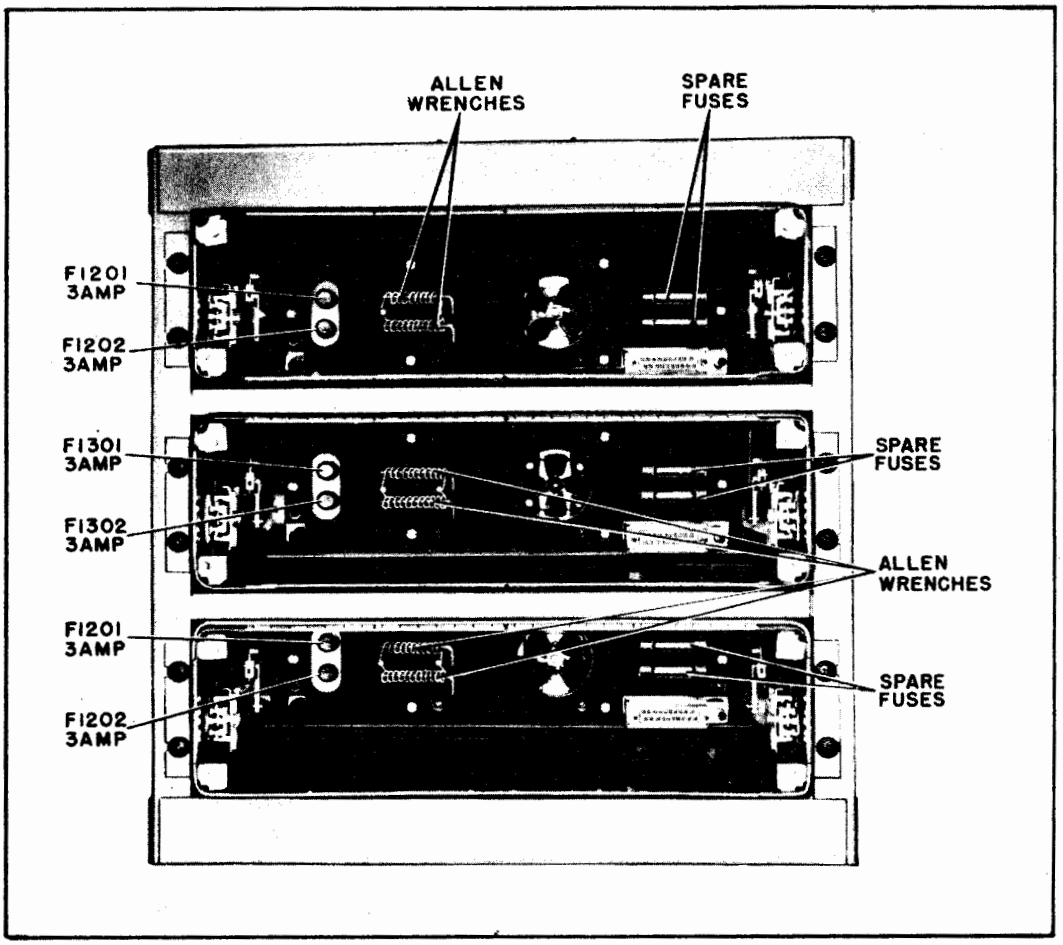


Figure 5–2. Frequency Shift Converter-Comparator Group AN/URA-8, Fuse Locations

(c) Pull fuse from cap and replace with new one, if blown.

(d) If fuse is good screw cap, in a clockwise direction, back in holder and repeat with the other fuse.

(e) Slide chassis back in cabinet.

b. REPLACING ELECTRON TUBES.

WARNING

THIS EQUIPMENT EMPLOYS VOLTAGES WHICH ARE DANGEROUS AND MAY BE FATAL IF CONTACTED. ALWAYS OBSERVE ALL SAFETY REGULATIONS AND PRECAUTIONS. REFER TO THE SAFETY NOTICES AND HIGH-VOLTAGE WARNING PRINTED ON PAGES VI AND VII IN THE FRONT MATTER OF THIS INSTRUCTION BOOK.

(1) LOCATING DEFECTIVE TUBE.—Defective tubes may be located as follows: Turn the POWER switch to OFF. Slide the chassis out of the case and connect the jumper cable (W1502 for the Converter or W1602 for the Comparator) between the Cable Filter jack (J1201 or J1301 as the case may be) and the corresponding plug. Turn the POWER switch to ON and allow about one minute warm-up time. Defective tubes will fail to glow and also will appear cold when touched. KEEP AWAY FROM LIVE CIRCUITS.

(2) REPLACING ELECTRON TUBES.

(a) SPECIAL PRECAUTIONS.

1. Turn off power before changing tubes.

2. When replacing the 1Z2 tube (V801 or V1001) AVOID CONTACT WITH THE INSIDE CLIP OF THE CAP or a shock may be experienced if the bleeder resistors are open. The cap is insulated and normal handling of the cap will prevent contact,

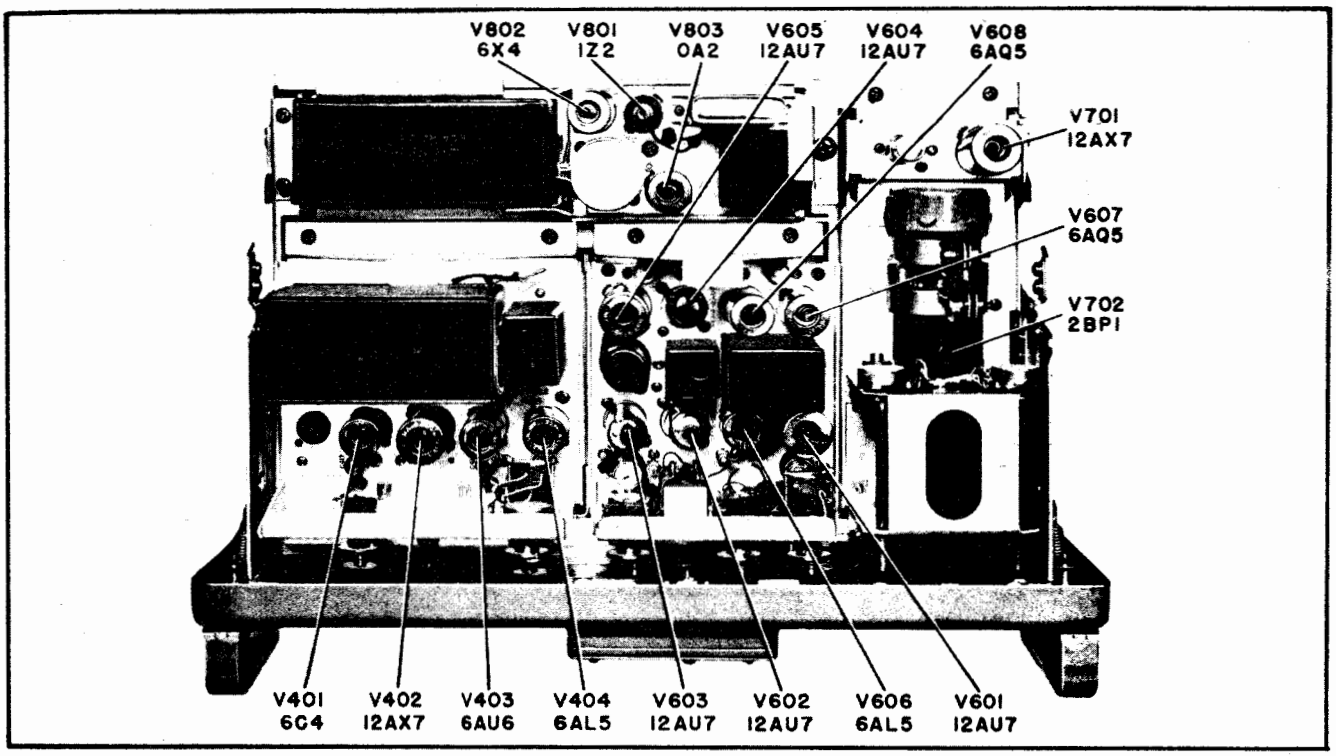


Figure 5–3. Frequency Shift Converter CV-60/URR, Tube Locations

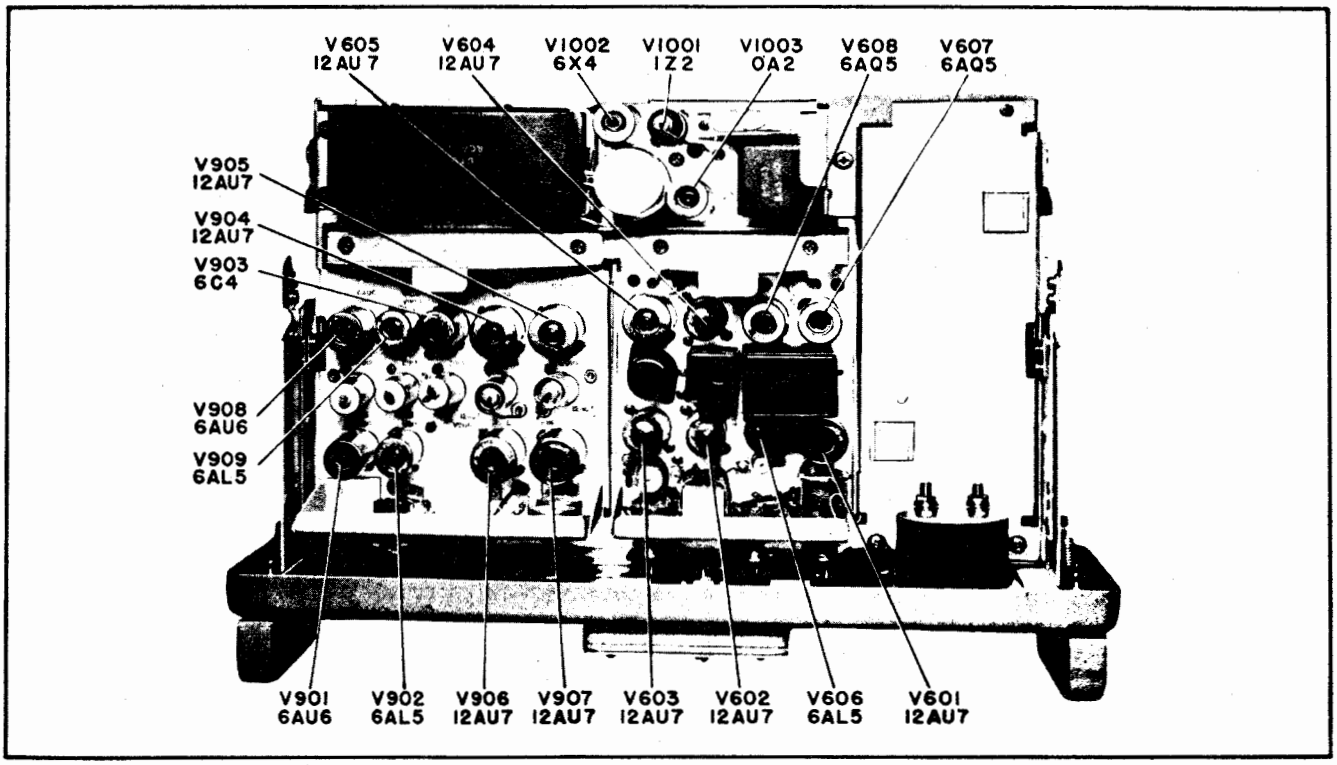


Figure 5–4. Comparator CM-14/URR, Tube Locations

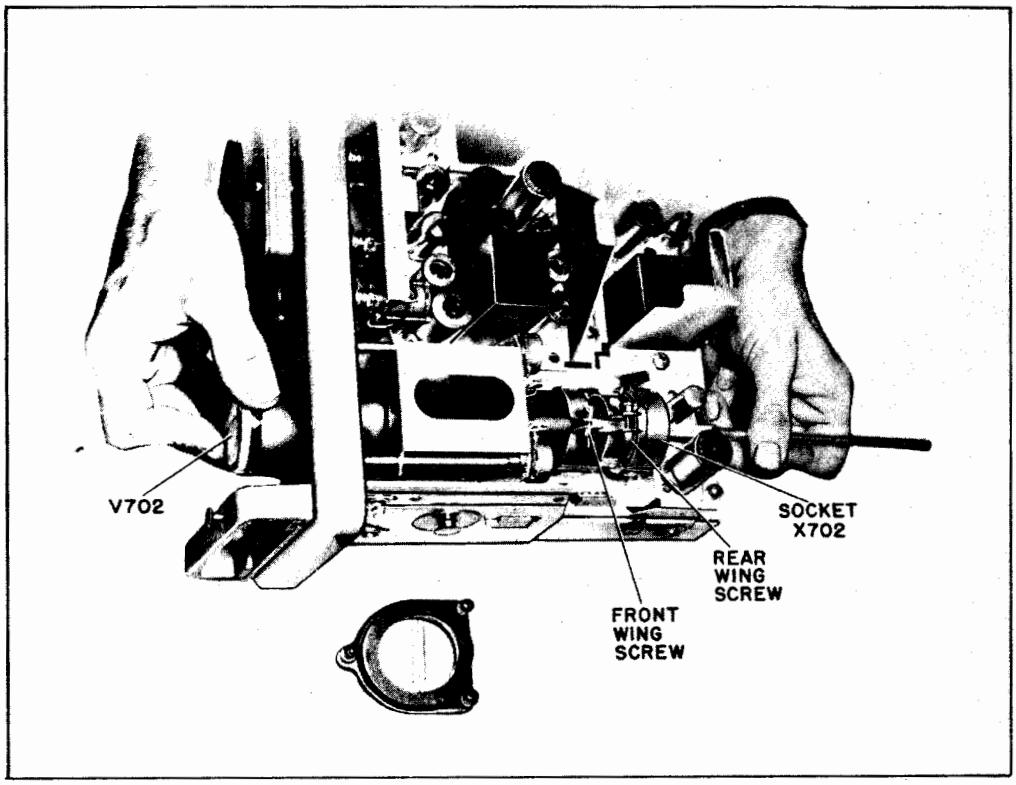


Figure 5–5. Removal of Cathode-ray Tube from Tuning Monitor

but the inside contact of the cap may be discharged as follows: hold the shank of a screwdriver firmly in contact with the chassis, then touch the inside metal clip of the cap to the tip of the screwdriver.

3. The cathode-ray tube (V702) MUST BE HANDLFD CAREFULLY. Always keep these tubes in their shipping cartons when not in use. Scratches on the bulb may impair their useability and increase the chance of breakage; do not knock the tubes. IT IS RECOMMENDED THAT PROTECTIVE GOGGLES, GLOVES, AND CLOTHING BE WORN WHILE HANDLING A CATHODE-RAY TUBE.

(b) TUBE CLAMPS.—Three types of tube clamps are used, the push-and-turn shield, the spring-wire type and the screw-clamp type (used only on the cathode-ray tube). Remove and replace clamps as follows:

1. PUSH-AND-TURN SHIELD.—Push shield downward, turn counterclockwise as far as it will go, and lift off. Replace tube, slide shield down over locking pins as far as it will go, turn clockwise, and release.

2. SPRING-WIRE CLAMP.—Push spring wire to side and pull out tube, insert new tube and release spring wire.

3. SCREW CLAMP.—WARNING: JUMPER CABLE SHOULD NOT BE CONNECTED. See Figure 5–5. Unscrew rear thumbscrew of cathode-ray tube socket, remove front window on panel, and through hole in socket, push tube forward through hole in front panel. Replace tube, tighten thumbscrew and replace panel window. Front thumbscrew may have to be loosened to rotate tube so image lines on tube are parallel to engraved lines on window.

c. REPLACING SUB-CHASSIS.—The sub-chassis units may be replaced in little more time than necessary to change a tube. Three (or four) screws hold the units in place and all connections are made automatically by plugs and jacks. When removing a sub-chassis from the main chassis, loosen rear screws first, and front screws last. When installing a sub-chassis, tighten the front screws first and the rear screws last.

If the equipment fails to operate correctly after the above measures have been taken, advise a technician.

SECTION 6
PREVENTIVE MAINTENANCE

1. ROUTINE MAINTENANCE.

Every 1000 hours check or adjust the following items:

a. JUMPER CABLES.—Check each jumper cable by sliding the chassis out of the case and operating the equipment with the cable in place.

b. TUBES.—Check all tubes except the cathode-ray tube in a tube tester and replace any showing signs of deterioration. The condition of the cathode-ray tube is best shown by the unit control settings. Controls associated with tubes being replaced should be readjusted as described in Section 3 and 7.

c. SYSTEM SENSITIVITY.—Check the system sensitivity as follows:

(1) Connect an audio oscillator (such as Navy Model LAJ) adjusted to 1000 or 2550 cycles to A-F INPUT NARROW (J1211) or A-F INPUT WIDE (J1212) respectively. The output impedance must be 600 ohms.

(2) Connect an external oscilloscope (such as Navy Model OBL or OBT), adjusted to between 400- and 600-cycle sweep, to the grid, pin 1, of the Driver tube V403 and ground.

(3) Vary the output voltage of the audio oscillator over a range of 0.19 to 6 volts. The pattern should be a square wave over the entire range showing limiter action. After completion of test remove audio oscillator aand external oscilloscope.

d. TUNING MONITOR SENSITIVITY.—Set the SPEED switch of the Converter units to the ADJ position and depress the CAL IN button. The image lines on the cathode-ray tube should coincide with the top and bottom lines on the tuning monitor window. If the amplitude is less than it should be, check the circuits of V601B in the Keyer, the voltage source (resistors R639 and R640 in the Keyer) or replace the cathode-ray tube V702.

e. TUNING MONITOR ADJUSTMENT.—Readjust the Tuning Monitor as follows

(1) Using a screwdriver, adjust the INTENSITY to give a reasonably bright trace. Too bright a trace will result in short tube life and focusing difficulties.

(2) Using a screwdriver, adjust FOCUS for sharpest trace.

(3) Slide chassis out of case and connect Cable, Filter jack and Converter plug with jumper cable furnished.

(4) Set TUNE-OPERATE switch to TUNE, SPEED switch on HIGH or LOW.

(5) Push CAL IN button.

(6) Loosen lock nut and adjust R705 until horizontal trace on oscilloscope is centered vertically with center line engraved on tuning monitor window. Tighten lock nut.

(7) Release CAL IN button.

(8) Adjust V CENTER on panel, with a screwdriver, so tuning monitor trace is centered vertically with center line engraved on tuning monitor window.

(9) Remove jumper cable and push chassis back in case.

f. % MARK CHECK.

(1) Set the SPEED switch to ADJ position.

(2) Connect an external test oscilloscope such as Navy OBL or OBT series across a 20-ohm resistor connected to a plug inserted in the TTYP jack.

(3) Set the test oscilloscope sweep speed for approximately 90 cycles with sync off.

(4) Adjust the sweep control on the test oscilloscope for the peak of one cycle to be centered in the trough of another cycle (see Figure 6–1).

(5) If the troughs and peaks are unequal in width adjust the % MARK control to make them equal.

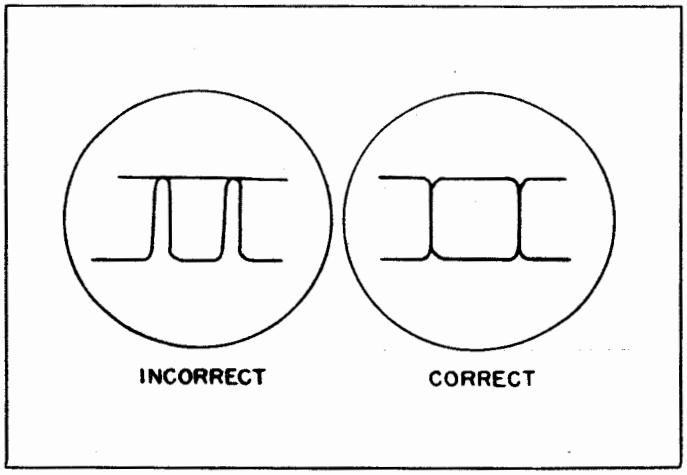


Figure 6–1. Test Oscilloscope Patterns for % MARK Control Adjustment

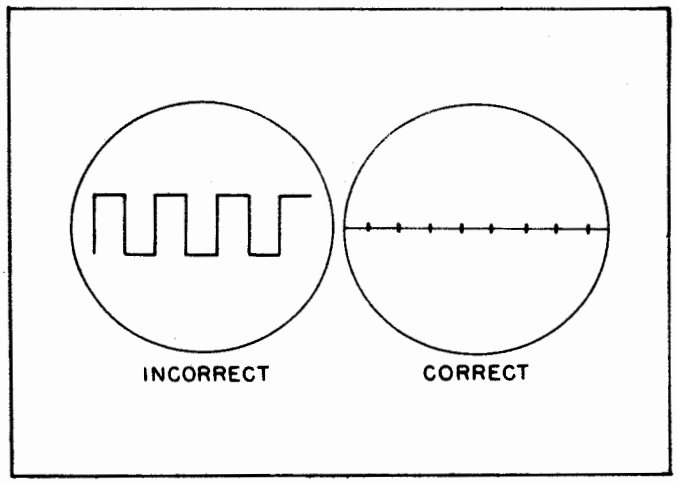


Figure 6–2. Test Oscilloscope Patterns for GATE BAL Control Adjustment

(6) After completion of check return SPEED switch to former position.

g. MOD BAL CHECK.—With the TONE FREQ control on EXT, TONE LEVEL control on 10 and no tone signal input, look for transients as part of the pattern of the test oscilloscope connected to the TONE OUTPUT or to the PHONE jack. Adjust the MOD BAL control for minimum transients. Disconnect the test oscilloscope.

h. GATE BALANCE ADJUSTMENT.

(1) Slide the Comparator out of the cabinet and connect to Cable Filter by means of the jumper cable supplied.

(2) Connect a jumper from a filament lead to grid of V903, pin 6 (location of this tube is shown in Figures 5–4 and 7–34).

(3) Set CHANNEL A-COMBINED CHANNEL B switch to COMBINED.

(4) Connect a test oscilloscope from V906 cathode, pin 3, to ground.

(5) Channel switching is now occurring at a 60-cycle rate.

The oscilloscope pattern will be a square wave switching oscillogram. Adjust the GATE BAL for minimum of pattern (see Figure 6–2).

(6) Remove jumper and oscilloscope.

i. TELETYPEWRITER LOOP CURRENT ADJUSTMENT.—Plug an 0-100 ma milliammeter, such as Navy Model OE (connected to a phone plug with the tip to the "minus" and the shank to the "plus" terminal of the meter), into the TTYP jack on the front panel. With no keying signal adjust the loop current control, at the teletype power supply, for 60 ma. When the unit is keying normally the current will drop to 30 ma.

2. ADJUSTMENT AFTER REPLACEMENT OF D-C AMPLIFIER, V903.

Adjust CONT BAL control (shown in Figure 4–1) as follows:

a. Set CHANNEL A-COMBINED-CHANNEL B switch to COMBINED.

b. Set CHANNEL A-LEVEL-DIV IND-CHANNEL LEVEL B switch to DIV IND.

c. Apply a 1000-cycle signal of about 0.1 volt to jacks DIV-CONT CHAN-A and DIV-CONT CHAN-B (J1308 and J1309) on the Cable Filter. One channel will conduct. If the panel meter (M1601) reads about 50, channel A is conducting; if meter reads 150, channel B is conducting; and if meter reads 100, the channels are switching too fast for the meter to follow. The latter case will not occur during this adjustment.

d. Increase the input voltage to the channel not conducting until it conducts, as indicated by the meter. Record the increase in voltage necessary to make it conduct, then reduce the voltage to 0.1 volt. The output signals of the two associated receivers may be used for this purpose if an electron-tube a-c voltmeter is used to measure the diversity control voltages which appear at DIV-CONT CHAN-A jack J1308 and DIV-CONT CHAN-B jack J1309. To connect the voltmeter to these jacks, first remove the Cable Filter Unit top cover, and this will give access to the desired terminals at the rear of the jacks.

e. Increase input voltage on other channel until it conducts, as shown by panel meter and record voltage. If the two voltages recorded are equal, then the CONT BAL is correctly adjusted. If they are not, change the CONT BAL setting and repeat procedure until voltages to shift each channel are equal.

f. Remove signal from J1308 and J1309 and plug original cables in place.

3. LUBRICATION.

The only mechanism requiring lubrication is the rail system for sliding the main chassis into and out of the cabinet. Apply a light oil such as Military Symbol MX-2175 or specification MIL-L-15016 (Standard Navy Stock No. 14-0-2586 for a five-gallon can) when necessary.

SECTION 7

CORRECTIVE MAINTENANCE

WARNING

THIS EQUIPMENT EMPLOYS VOLTAGES WHICH ARE DANGEROUS AND MAY BE FATAL IF CONTACTED. ALWAYS OBSERVE ALL SAFETY REGULATIONS AND PRECAUTIONS. REFER TO THE SAFETY NOTICES AND HIGH-VOLTAGE WARNINGS PRINTED ON PAGES VI AND VII IN THE FRONT MATTER AT THE BEGINNING OF THIS INSTRUCTION BOOK.

1. LOCALIZING TROUBLE.

NOTE

Refer to Section 3, page 3–6A, paragraph 5, for instructions regarding the removal of chassis from case.

a. FREQUENCY SHIFT CONVERTER, CV-60/URR, See Table 7–1.

(1) Check power (fuses good, pilot light on).

(2) If two lines appear on the tuning monitor while receiving frequency-shift signals and can be made to merge by reducing the radio receiver gain to zero, the Audio Input Unit is operating.

(3) Press the CAL IN button. Two flickering lines on the tuning monitor indicate proper operation of circuits up to and including V601B in the Keyer.

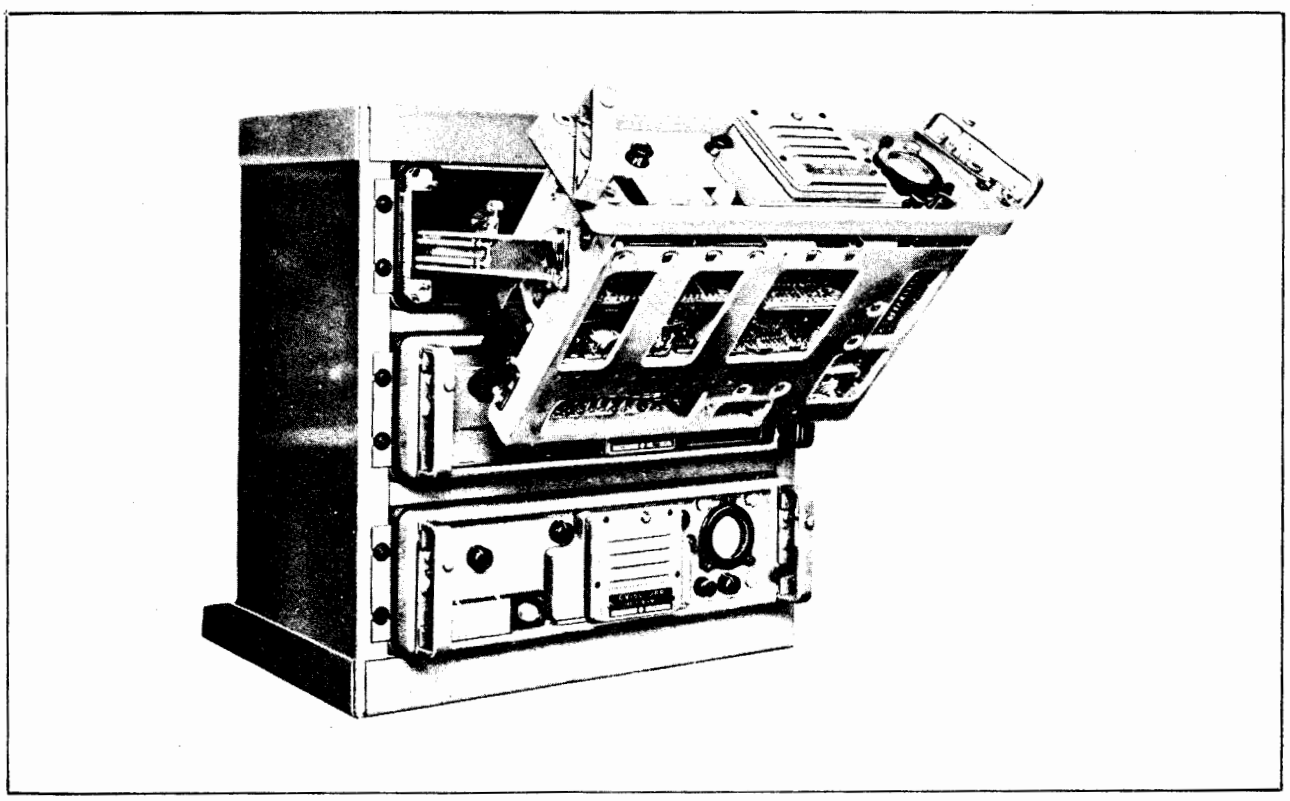


Figure 7–1. Frequency Shift Converter-Comparator Group AN/URA-8 with Chassis Extended for Servicing

FAILURE REPORTS

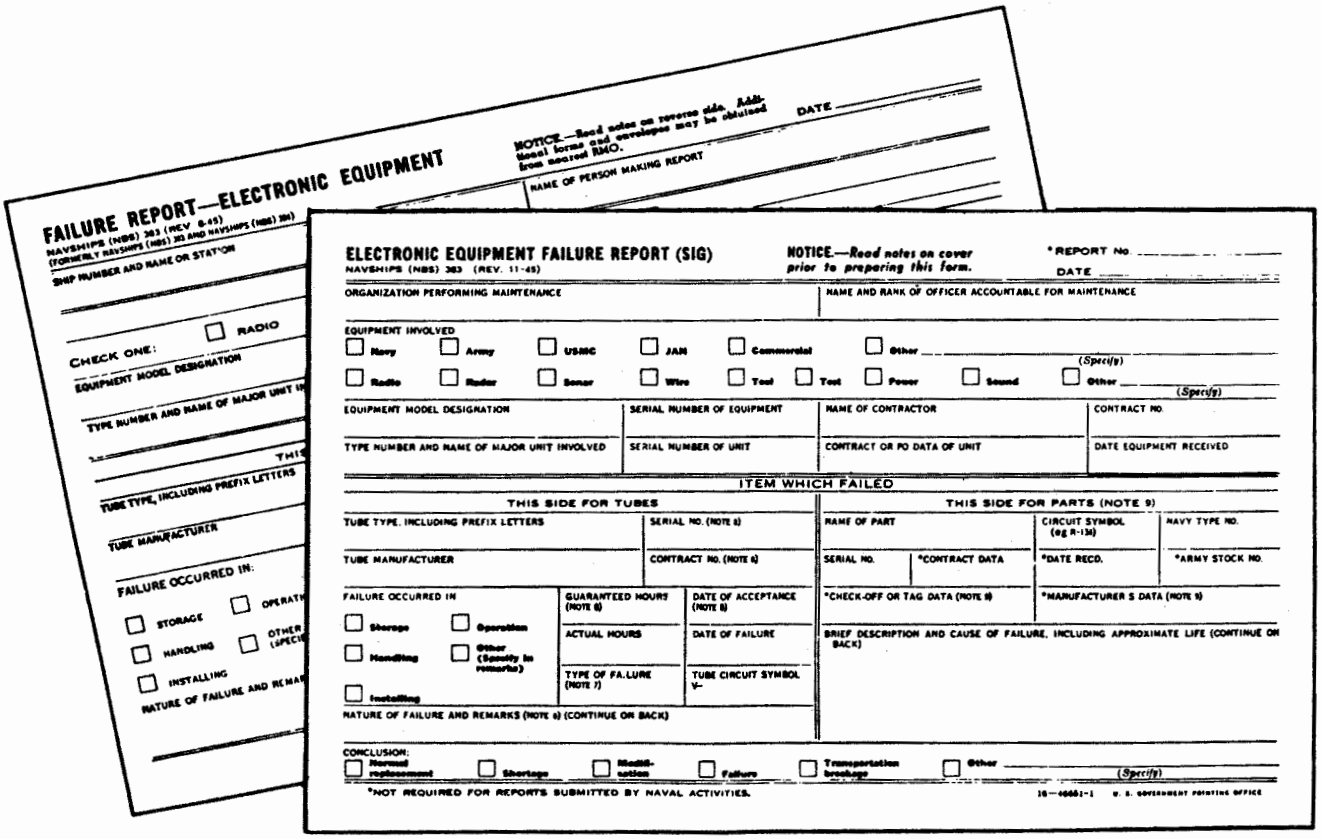
A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example, under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from any Electronics Officer.



FAILURE REPORT—ELECTRONIC EQUIPMENT

NOTICE—Read notes on reverse side. Additional forms and envelopes may be obtained from nearest BuO.

DATE

NAME OF PERSON MAKING REPORT

SHIP NUMBER AND NAME OR STATION

CHECK ONE: RADIO

EQUIPMENT MODEL DESIGNATION

TYPE NUMBER AND NAME OF MAJOR UNIT IN

TUBE TYPE, INCLUDING PREFIX LETTERS

TUBE MANUFACTURER

FAILURE OCCURRED IN:

STORAGE

HANDLING

INSTALLING

NATURE OF FAILURE AND REMA

ELECTRONIC EQUIPMENT FAILURE REPORT (SIG)

NAVSHIPS (NBS) 383 (REV. 11-45)

NOTICE.—*Read notes on cover prior to preparing this form.*

*REPORT No.

DATE

ORGANIZATION PERFORMING MAINTENANCE

NAME AND RANK OF OFFICER ACCOUNTABLE FOR MAINTENANCE

EQUIPMENT INVOLVED

Navy Army USMC JAN Commercial Other (Specify)

Radio Radar Sonar Wire Test Test Power Sound Other (Specify)

EQUIPMENT MODEL DESIGNATION | SERIAL NUMBER OF EQUIPMENT | NAME OF CONTRACTOR | CONTRACT NO.

TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED | SERIAL NUMBER OF UNIT | CONTRACT OR PO DATA OF UNIT | DATE EQUIPMENT RECEIVED

ITEM WHICH FAILED

THIS SIDE FOR TUBES

TUBE TYPE, INCLUDING PREFIX LETTERS | SERIAL NO. (NOTE 5)

TUBE MANUFACTURER | CONTRACT NO. (NOTE 6)

FAILURE OCCURRED IN: Storage Operation Handling Other (Specify in remarks) Installing

GUARANTEED HOURS (NOTE 8) | DATE OF ACCEPTANCE (NOTE 8)

ACTUAL HOURS | DATE OF FAILURE

TYPE OF FAILURE (NOTE 7) | TUBE CIRCUIT SYMBOL V-

NATURE OF FAILURE AND REMARKS (NOTE 6) (CONTINUE ON BACK)

THIS SIDE FOR PARTS (NOTE 9)

NAME OF PART | CIRCUIT SYMBOL (eg R-134) | NAVY TYPE NO.

SERIAL NO. | *CONTRACT DATA | *DATE RECD. | *ARMY STOCK NO.

*CHECK-OFF OR TAG DATA (NOTE 10) | *MANUFACTURER'S DATA (NOTE 9)

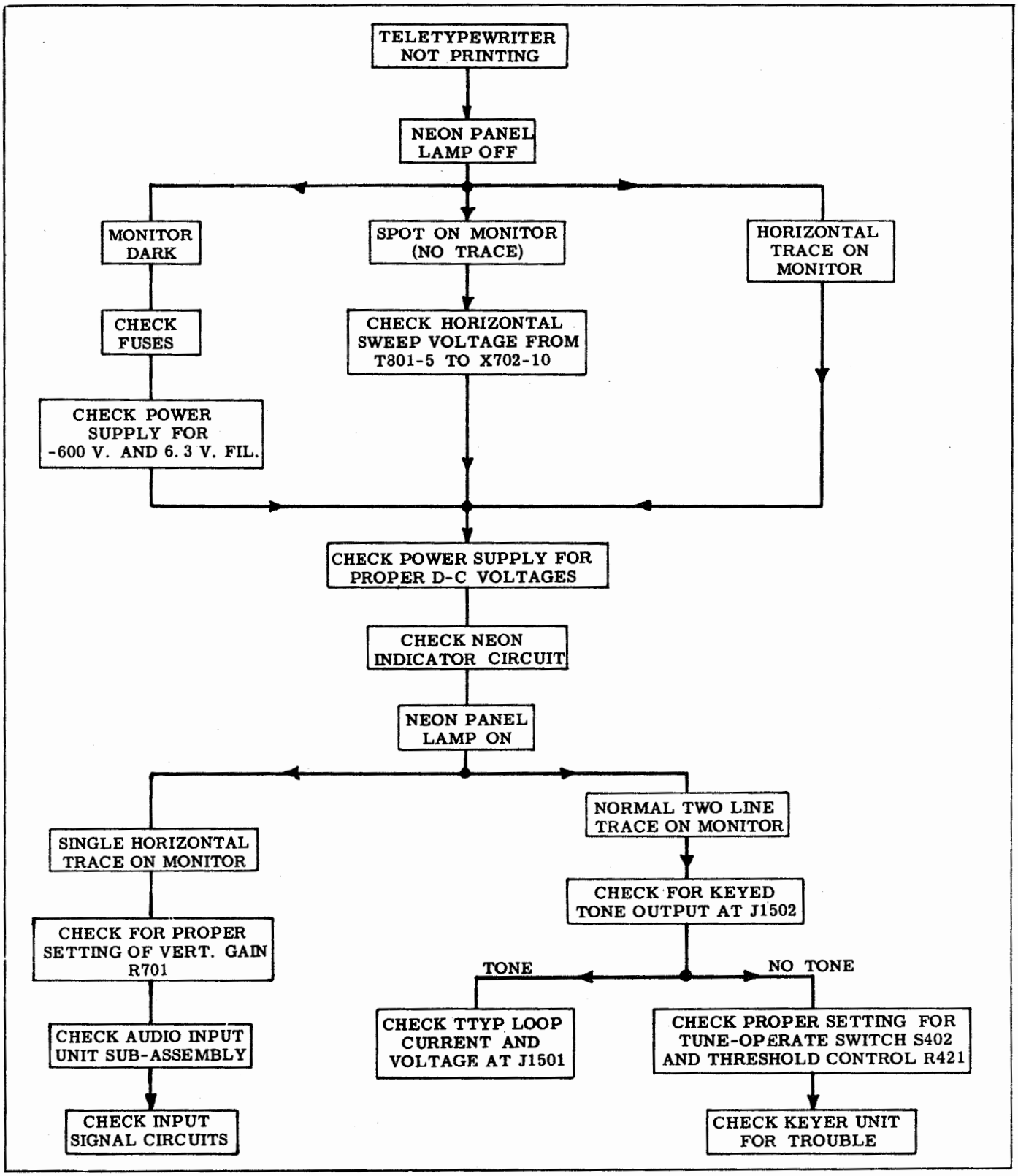
BRIEF DESCRIPTION AND CAUSE OF FAILURE, INCLUDING APPROXIMATE LIFE (CONTINUE ON BACK)

CONCLUSION: Normal replacement Shortage Modification Failure Transportation breakage Other (Specify)

*NOT REQUIRED FOR REPORTS SUBMITTED BY NAVAL ACTIVITIES.

16—46661-1 U. S. GOVERNMENT PRINTING OFFICE

TABLE 7–1. FREQUENCY SHIFT CONVERTER CV-60/URR TROUBLE SHOOTING CHART



(4) Plug a pair of headphones into the PHONES jack. A keyed tone signal will indicate the Keyer is operating, except for the output tubes, V607 and V608, which are checked in step 5.

(5) Plug a 0-100 ma milliammeter such as Navy Model OE (connected to a phone plug with the tip to the "minus" and the shank to the "plus" terminal of the meter) into the TTYP jack on the front panel. A reading of about 60 ma on the milliammeter and a reading of 70 volts on a d-c voltmeter connected from jack to ground indicate the output tubes of the Keyer to be conducting but not keying. A reading of 30 ma indicates normal keying.

(6) Replace the unit that the above tests have shown to be defective. Most troubles in any of the units can be located by replacing tubes or by checking voltages and resistance values within that unit. Troubles in the Cable Filter Unit, Power Supply, or Tuning Monitor can best be located by continuity checks. See later paragraphs in this section, referring to the individual units.

b. FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP, AN/URA-8, See Table 7–2.

(1) Check power of each unit (fuses good, pilot light on).

(2) If two lines appear on each of the Tuning Monitors and can be made to merge by reducing the respective radio receiver gain to zero, the Audio Input Units of the Converters are operating.

(3) Set the CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL first on CHANNEL A LEVEL and then on CHANNEL B LEVEL. Indication of similar levels shows the Diversity Selector Unit channel amplifiers and avc rectifiers (V901, V908, V902 and V909) to be functioning.

(4) Set the CHANNEL A LEVEL-DIV IND-CHANNEL B LEVEL switch to DIV IND. Change the CHANNEL A-COMBINED-CHANNEL B switch first to CHANNEL A, then to CHANNEL B. The meter should read 50 on the CHANNEL A position and 150 on CHANNEL B position, showing that the channel switching circuits are operating correctly.

(5) Plug a pair of phones in the PHONES jack of the Comparator. If a keyed tone is heard, the trouble is in the output tubes of the keyer or in the teletypewriter loop which are checked in step 7.

(6) Turn the Comparator SPEED switch to ADJ. If a keyed signal is heard, the trouble is in, or ahead of, the circuits of V601B of the Keyer.

(7) Plug a 0-100 ma milliammeter such as Navy Model OE (connected to a phone plug with the tip to the "minus" and the shank to the "plus" terminal of the meter) into the TTYP jack on the front panel. A reading of about 60 ma on the milliammeter and a reading of about 70 volts on a d-c voltmeter connected from jack to ground indicate the output tubes of the Keyer to be conducting but not keying. A reading of 30 ma indicates normal keying.

(8) Replace the defective unit (note that the Keyer Units of the Frequency Shift Converter CV-60/URR and Comparator CM-14/URR are interchangeable) and shoot the trouble by checking tubes, voltages, and resistances, as shown in Tables 7–3 to 7–10 inclusive in another part of this section.

2. UNIT TROUBLE SHOOTING AND REPAIR.

a. EQUIPMENT REQUIRED.—The equipment for trouble shooting should consist of the following:

(1) A 20,000 ohms per volt multimeter such as Navy Model OE series or equivalent.

(2) An electronic multimeter such as multimeter ME-25/U series, Navy Model OBQ series or equivalent.

(3) An oscilloscope, such as Navy Models OBL or OBT series or equivalent.

(4) A microammeter such as Navy Type 60107.

(5) An adjustable audio oscillator such as Navy Model LAJ series or equivalent, with minimum range 10 to 5000 cycles.

(6) A 14-conductor cable approximately 4 feet long with a 14-prong plug on one end and a 14-prong jack on the other end to match the connectors for the operating sub-assemblies.

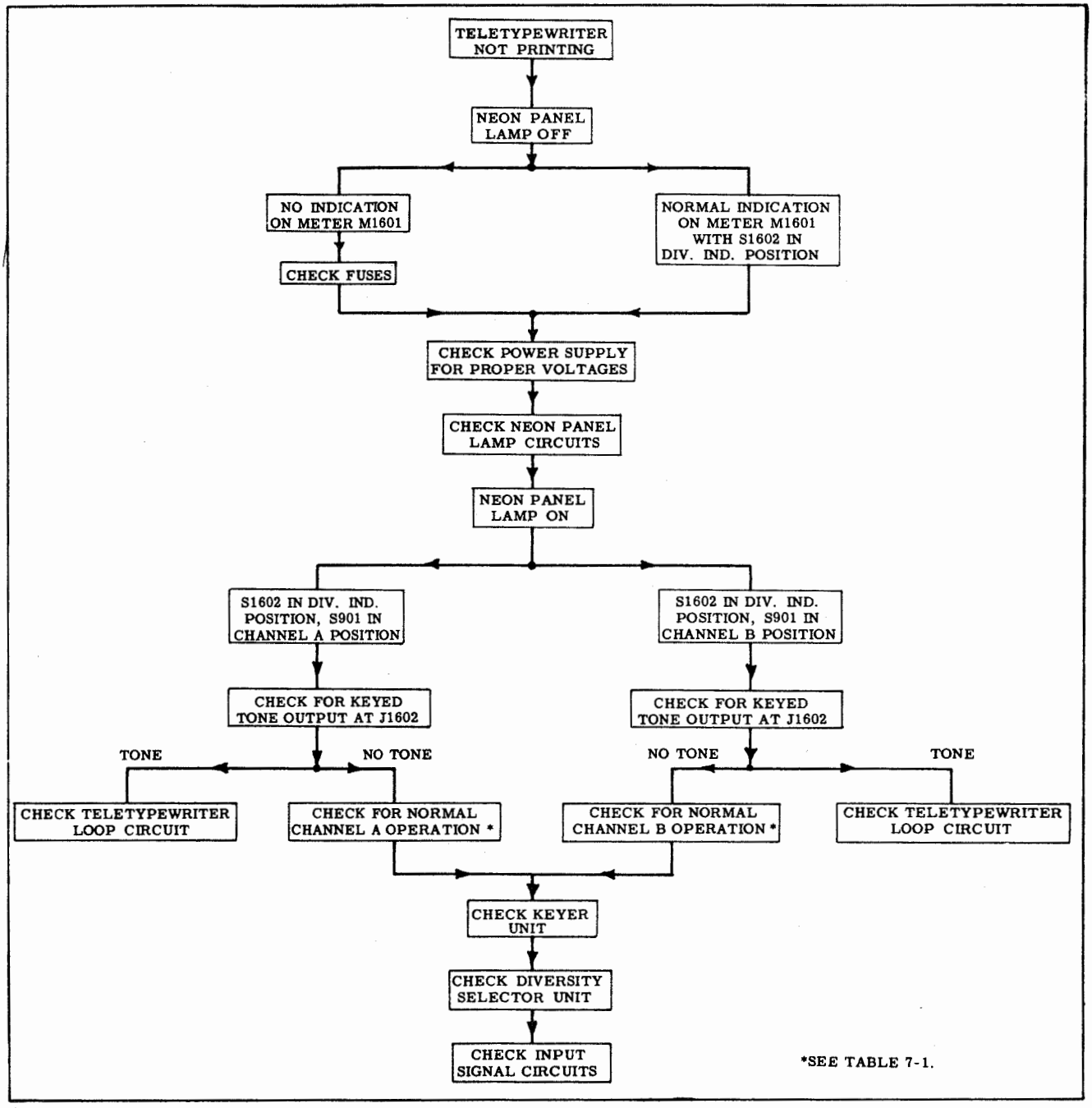
(7) Use the equipment itself for servicing during non-operating periods. Where continuous operation is required, a separate maintenance system, comparable to the equipment in use, may be desirable.

(8) Tools normally used in the electronic technician's work will be satisfactory for this work.

NOTES

1. Before attempting to remove the individual units controlled by panel knobs, pull the

TABLE 7–2. FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 TROUBLE SHOOTING CHART



panel knobs outward to disengage the mechanical coupling. After the unit has been re-seated in the chassis, merely pushing the knobs will engage the mechanical couplers if the settings have not been disturbed; otherwise it will be necessary to push and turn the knobs to engage the couplings.

2. Remove the chassis by unscrewing the rear screws and then the front screw. Replace units by tightening the rear screws first and then the front screw.

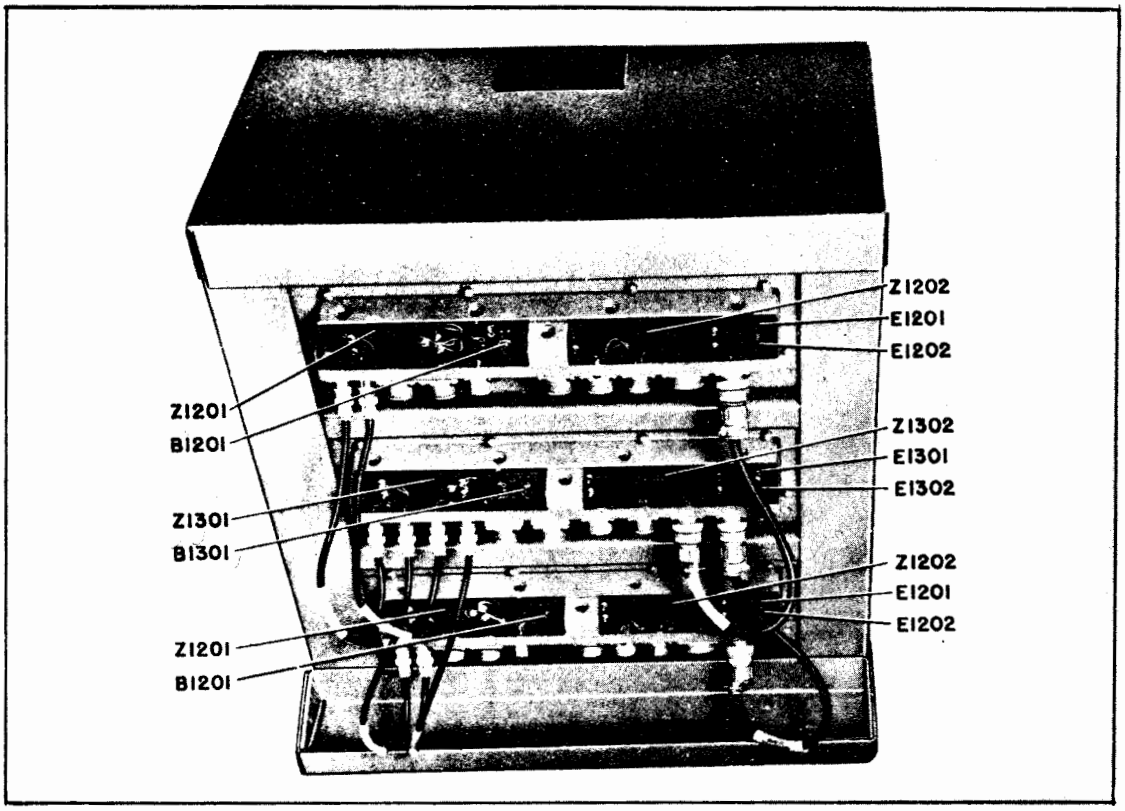


Figure 7–2. Cable Filters

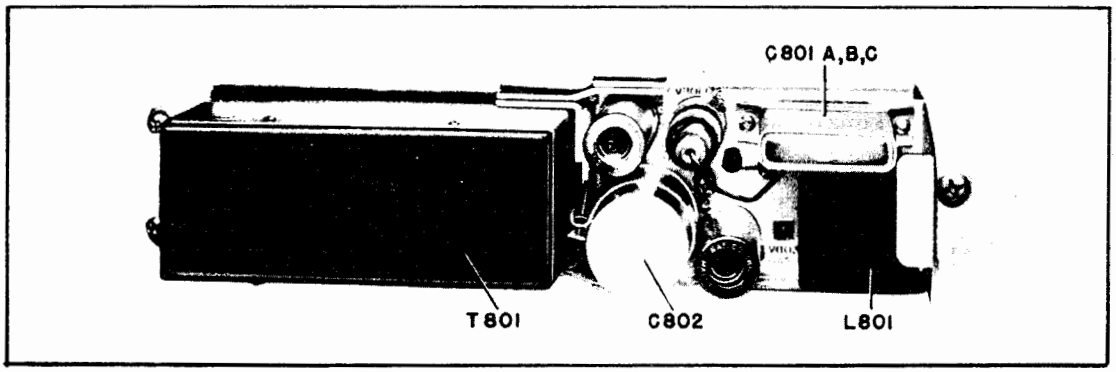


Figure 7–3. Converter Power Supply Chassis, Top View

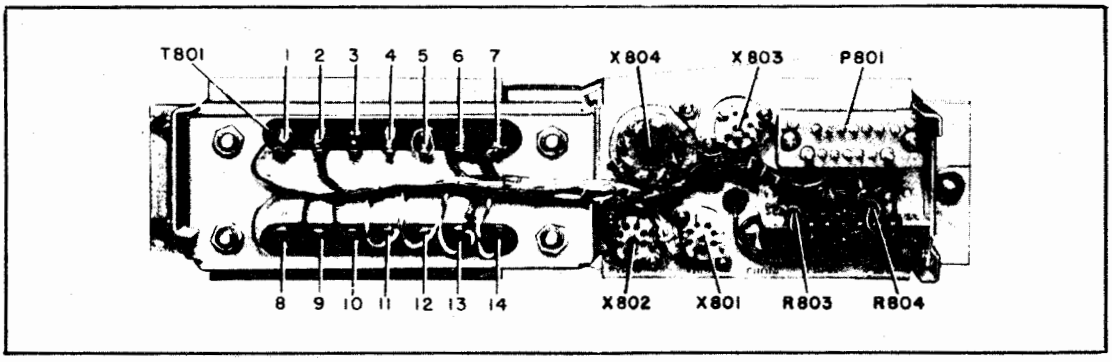


Figure 7–4. Converter Power Supply Chassis, Bottom View

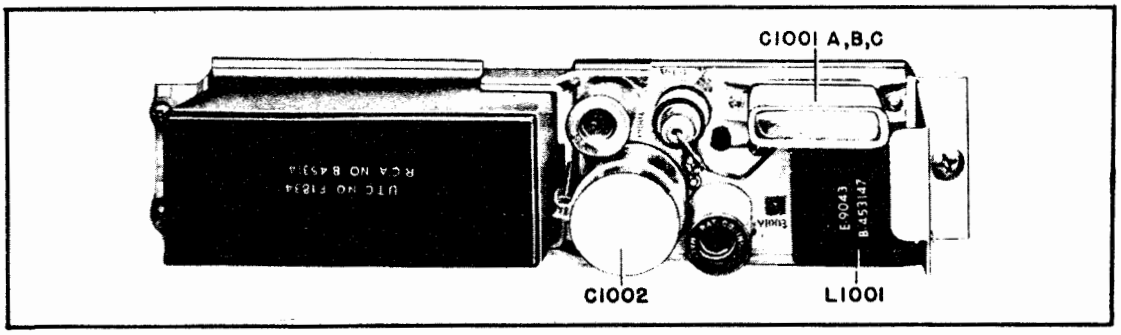


Figure 7–5. Comparator Power Supply Chassis, Top View

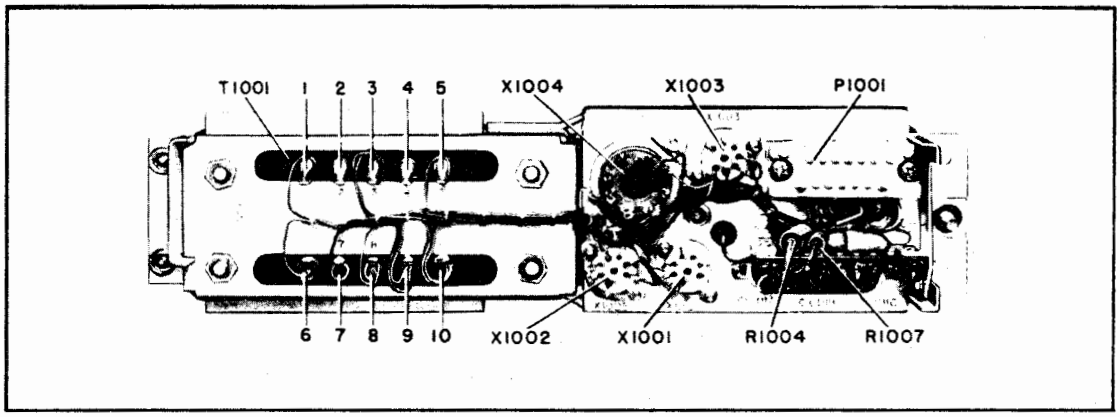


Figure 7–6. Comparator Power Supply Chassis, Bottom View

b. CABLE FILTERS.—See Figure 7–2. Check the circuits for continuity and shorts, using an ohmmeter. Trouble in the fan motor can best be remedied by replacing the motor or motor capacitor. See Figures 7–19 and 7–20 for the Converter Cable Filter schematic and wiring diagram and Figures 7–21 and 7–22 for the Comparator Cable Filter schematic and wiring diagram.

c. POWER SUPPLIES.—See Figures 7–3 to 7–6 inclusive. First check the resistance values as given in Table 7–6 for the Converter Power Supply and Table 7–7 for the Comparator Power Supply. Measure voltages only when the Power Supply is delivering normal load. The proper load voltages are indicated on the schematic and wiring diagrams, Figures 7–23 and 7–24, for the Converter Power Supply and Figures 7–25 and 7–26 for the Comparator Power Supply.

d. TUNING MONITOR.—See Figures 7–7 and 7–8. Circuit check (resistance and continuity) and tube replacement will locate troubles in the Tuning Monitor. See Table 7–5 for the resistance measurements. See Figures 7–27 and 7–28 for the schematic and wiring diagrams giving electrical part values.

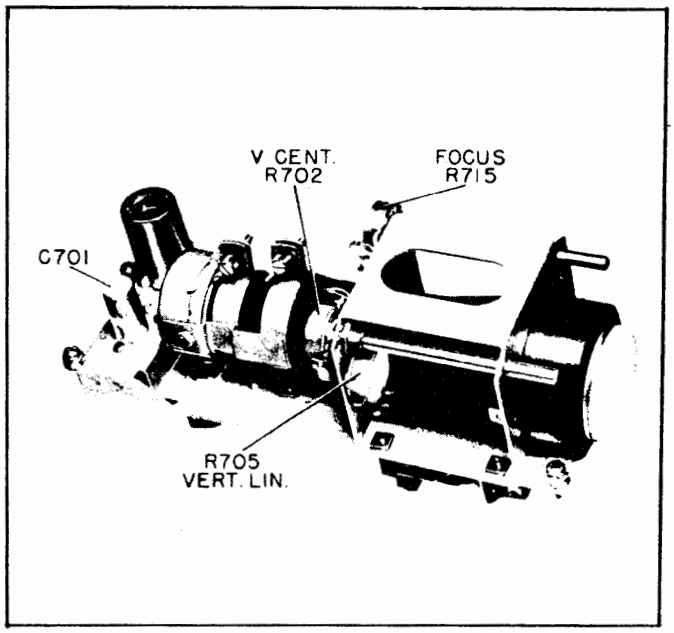


Figure 7–7. Tuning Monitor Chassis, Top View

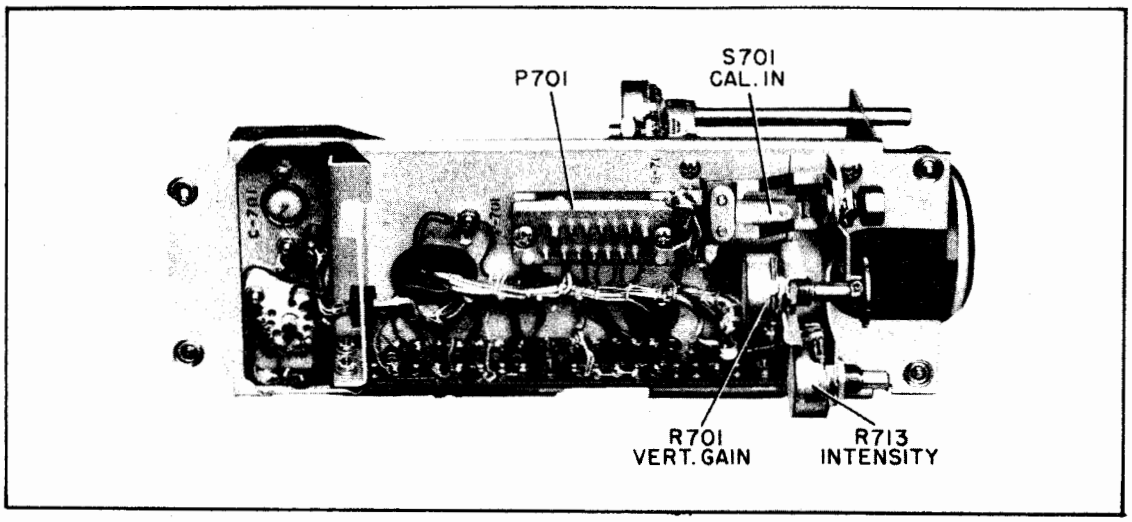


Figure 7–8. Tuning Monitor Chassis, Bottom View

After the trouble has been corrected, the vertical centering for both positions of the CAL IN button must be adjusted with no signal input.

(1) Depress the CAL IN button and adjust R705 so the sweep line coincides with the engraved center line on the Tuning Monitor window.

(2) Adjust the V CENT control so the horizontal sweep line coincides with the center line engraved on the Tuning Monitor window.

After the centering is completed, adjust the FOCUS for the best average focus for the two CAL IN positions.

e. AUDIO INPUT UNIT.—See Figures 7–9 and 7–10. Check the tubes, then circuit-check the unit for shorts, open circuits, or off-value parts (see Figures 7–29, 7–30 and Table 7–3). If the trouble is not located, use the following signal tracing procedure:

(1) Apply a 1000-cycle audio signal of about 0.1 volt to the narrow input, pins 9 and 11 of P401. Set the NARROW-WIDE switch to NARROW. Connect an external test oscilloscope to the diversity control line, pin 6 of P401. If no signal is observed, the trouble is in the circuits of Z401 or the back wafer of S401. If a signal is observed on the test oscilloscope, proceed as in step (2).

(2) Check the test oscilloscope lead to pin 2 of V402. Adjust R403 clockwise as far as it will go. Absence of a signal indicate trouble in the circuits of V401. If a signal of greater amplitude than in step (1) is obtained, proceed with step (3).

(3) Change the test oscilloscope lead to pin 1 of V403. The signal should have flat top and bottom peaks due to limiter action. If no signal is obtained, the trouble is in the limiter circuits V402. If a signal is obtained, proceed with step (4).

(4) Turn off power and connect test oscilloscope to pin 5 of V403. Turn on power. Signal should appear the same as in step (3) but of greater amplitude. If no signal is obtained, the trouble is in the circuits of V403. If a signal is obtained, proceed to step (5) and remove the test oscilloscope.

(5) Connect an electronic voltmeter to pin 5 of V404. Adjust the audio input frequency to approximately 1000 cycles. A small or no d-c voltage should be indicated on the meter. Decreasing the input frequency should produce a negative voltage which decreases until a maximum is reached at approximately 650 cycles. Return frequency to 1000 cycles and reverse polarity of meter. Increase the oscillator frequency; the voltage indicated on the meter should increase (positive voltage) to a peak at 1300 cycles. This test checks the discriminator circuits, including Z402, tuning capacitors and resistors, and V404 with its output circuits in the NARROW position of NARROW-WIDE switch.

(6) Check the WIDE position of the NARROW-WIDE switch by feeding a signal of approximately 0.5 volt into pins 12 and 14 of P401 and, using an adjustable 2550-cycle signal for center frequency (zero voltage), 1600 cycles should correspond to approximate maximum negative and 3400 cycles to approximate maximum positive voltage. Disconnect the signal generator and the electronic voltmeter.

(7) The output circuits can best be checked by an ohmmeter, checking the values indicated on the schematic and wiring diagrams, Figures 7–29 and 7–30.

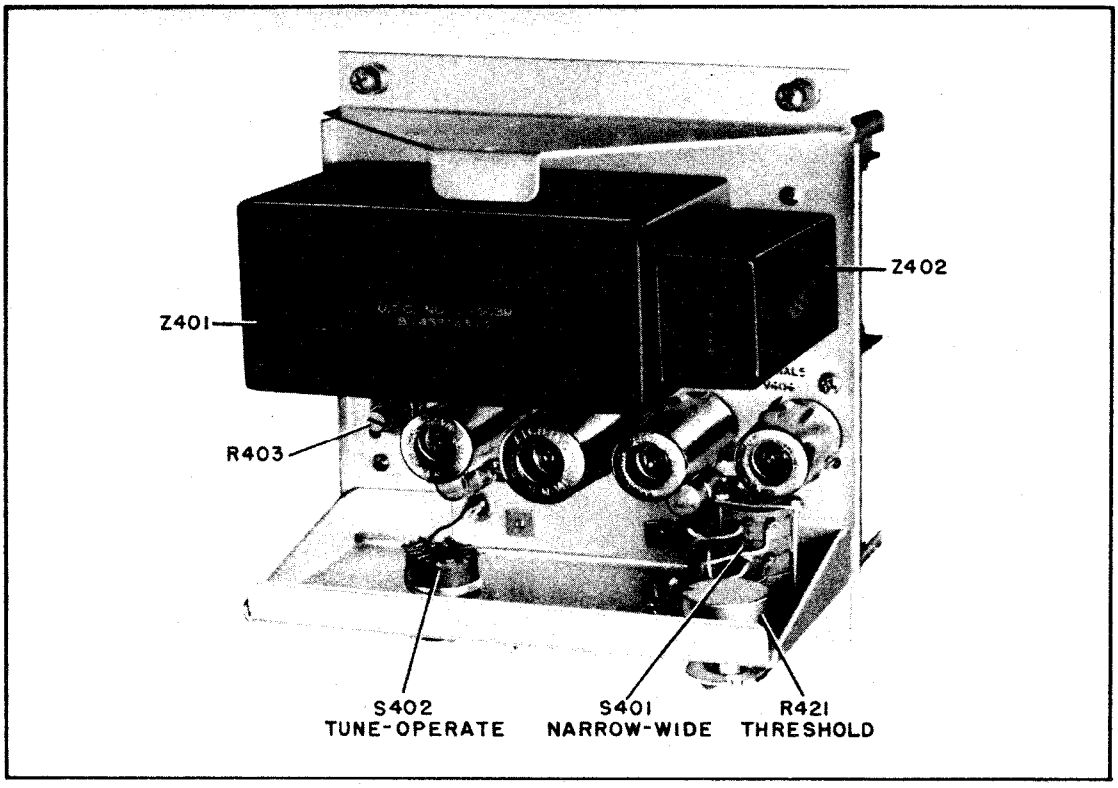


Figure 7–9. Audio Input Unit Chassis, Top View

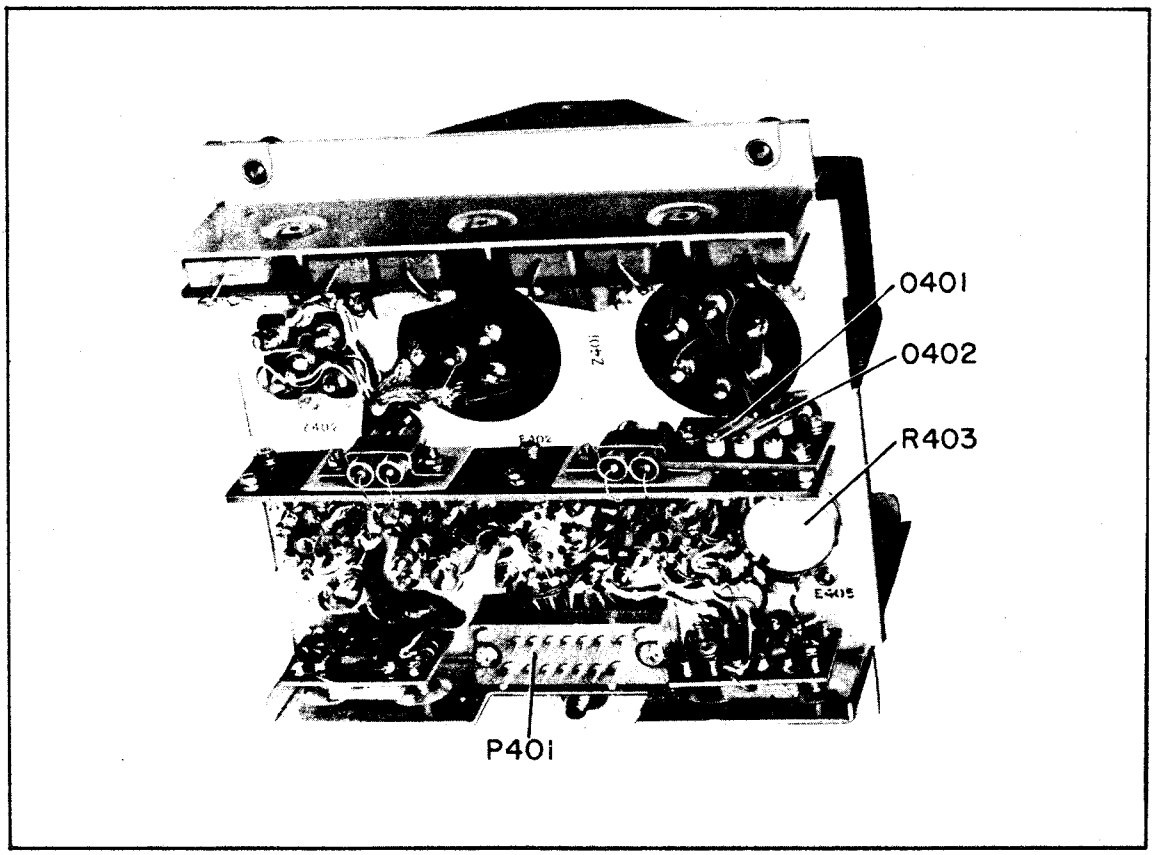


Figure 7–10. Audio Input Unit Chassis, Bottom View

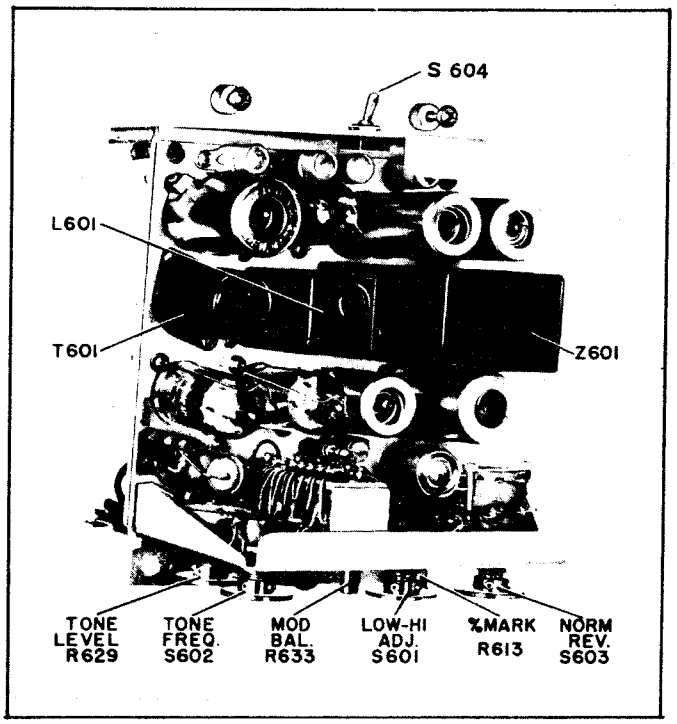


Figure 7–11. Keyer Chassis, Top View

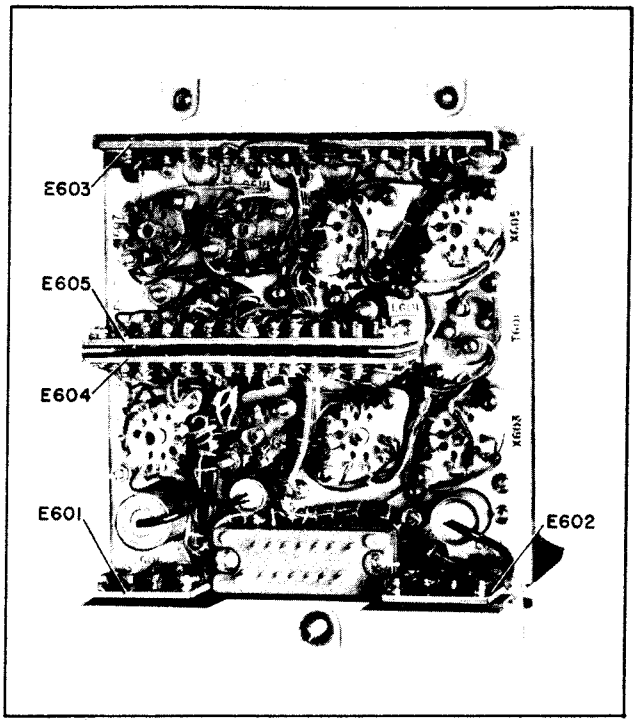


Figure 7–12. Keyer Chassis, Bottom View

f. KEYER UNIT.—See Figures 7–11 and 7–12. Check the tubes then circuit check the unit for shorts, open circuits or off-value parts (see Figures 7–31, 7–32 and Table 7–4).

Switch S604 (on the rear bracket) must be in the ON position for the teletypewriter to operate. The switch, in the OFF position, opens the screen grid circuit of the output tubes when the Keyer is not connected to a teletypewriter.

Connect an 0.5-volt source of 60-cycle sine wave voltage to P601-14 or E609 and ground. Proceed from stage to stage, using the test oscilloscope as an indicator (see Figures 7–31 and 7–32).

(1) Connect the test oscilloscope to pin 1 of V601 before turning on the power. Turn on the power and adjust the test oscilloscope to 30 cycles sweep frequency, giving a pattern with two complete cycles. A signal indicates that the 1, 2, 3 triode of V601 is working astisfactorily. Turn off power and remove oscilloscope leads.

(2) Connect the test oscilloscope to pin 7 of V601. Turn on the power and check the three positions of S601, the SPEED switch. LOW and HIGH positions should give the same amplitude, but the ADJ position may give a different amplitude since the signal will be coming from a different source. Return S601 to its original position. This checks the signal to the grid, pin 7, of V601B.

(3) Connect the test oscilloscope to E610. A signal with the same shape but increased amplitude, compared to step (2), should be obtained.

(4) With the power turned off, connect the test oscilloscope input to the indicated pins of tubes V603 and V604 in the order 2, 7, 1, 6. Turning on the power, a square wave should be obtained in all cases with the NORM-REV switch in either position. If the signal is anything but a square wave, check the values of parts in the circuits of the tubes V603 and V604.

(5) Turn off power, connect the test oscilloscope to either pin 1 or 7 of first V607, and then V608, turning on the power every time. If the square-wave keying signal is obtained, turn the power off and change the test oscilloscope lead to pin 5 of V607. Turn the power on, and if no signal is obtained the trouble is in the output circuits of the keyer tubes V607 and V608.

(6) Connect the test oscilloscope to the center contact of the TONE LEVEL control R629 or pin 7 of V605 to check the Tone Oscillator operation. Further check of tube V605 can be had by connecting the test oscilloscope (with the power turned off) to pin 6 of V605 and then across the output (terminals 3 and 4) of T601.

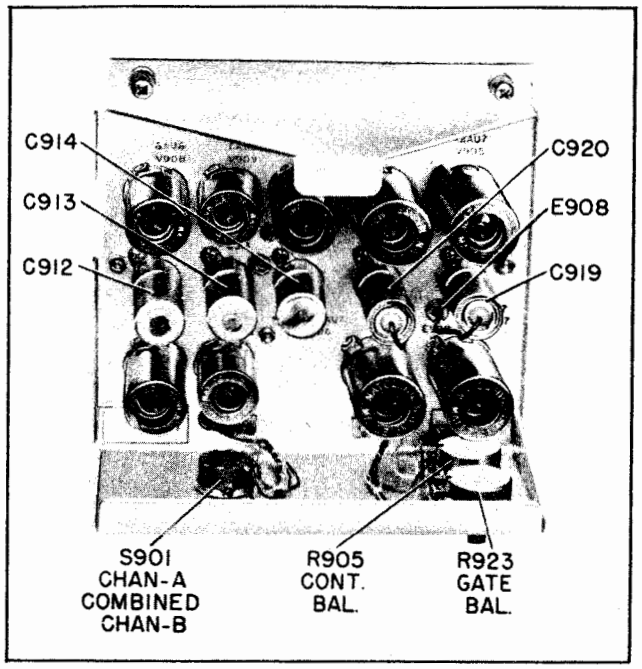


Figure 7–13. Diversity Selector Unit Chassis, Top View

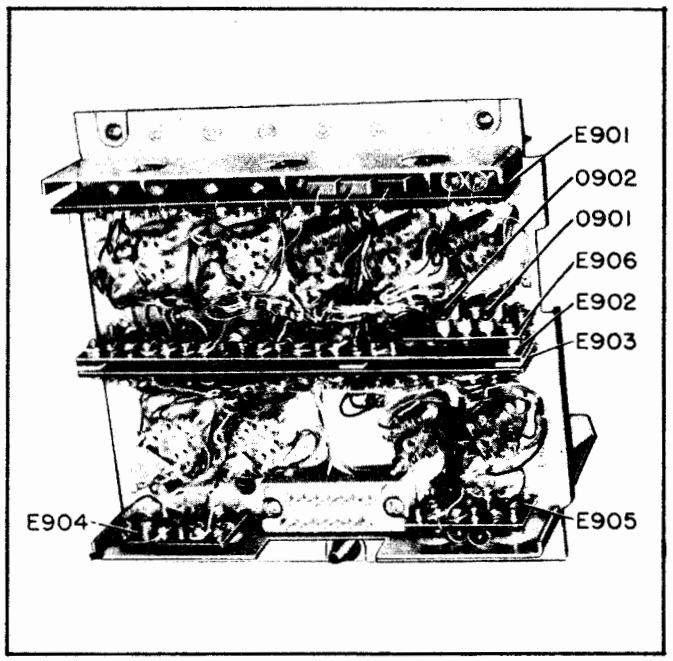


Figure 7–14. Diversity Selector Unit Chassis, Bottom View

g. DIVERSITY SELECTOR UNIT.—See Figures 7–13, and 7–14. Check tubes, then circuit check the unit for shorts, open circuits or off-value parts (see Figures 7–33, 7–34 and Table 7–8).

Apply an adjustable 1000-cycle sine wave voltage (0.5 volt maximum) to pins 9 and 14 on plug P901. Check to make sure the connectors O901 and O902 are set to AF.

(1) Connect the microammeter first to pin 12 of P901, and adjust a-c voltage to give a 50-microampere reading. Change meter to pin 11 of P901. The reading should also be about 50 microamperes. If these readings are obtained the channel amplifier and avc rectifier circuits are satisfactory. Continue with step (3). If not satisfactory, continue with step (2).

(2) If no indication is obtained in step (1), connect a test oscilloscope first to pin 1 and then to pin 5 of each of the two input tubes V901 and V908. A 1000-cycle sine wave should appear at each point indicated, but the amplitude of the signal at pin 5 should be greater than at pin 1. Turn the power off before contacting pin 5. If a signal is on pin 5 check the circuits of V902 and V909 pins 1 and 7 each.

(3) Connect the test oscilloscope to O901. A sine-wave signal should be had. If one half of the cycle is a square wave shape, the corresponding channel is not conducting.

(4) With S901 on COMBINED (center position) put the test oscilloscope lead on pin 6 of V903. If a sine wave is obtained, connect test oscilloscope to pin 1 with the power turned off. If the amplitude is greater, continue with step (5). If no signal is obtained on pin 6, circuit-check the audio filter consisting of resistors R933, R934, R935 and capacitors C904, C905, C906.

(5) Connect the test oscilloscope (with the power turned off) to pins 2, 7, 1 and 6 of tubes V904 and V905. At all points a square-wave signal should be obtained, if not, check circuit values and voltages for the trouble.

(6) Connect the test oscilloscope to pin 7 of V906 and then to pin 7 of V907. A 1000-cycle square-wave signal should be on each grid and cathode (pin 8). A similar signal should appear on the plate (pin 1 of V906 and V907).

(7) Any further trouble would be in the signal input and output circuits and may be readily located by circuit check. See the Schematic Diagram, Figure 7–28.

3. VOLTAGE AND RESISTANCE MEASUREMENTS.

The following Tables 7-3 to 7-8 inclusive show voltage and resistance measurements made on the equipment under the following conditions.

1. TUNE-OPERATE control in TUNE position.
2. NARROW-WIDE control in WIDE position.
3. TONE FREQ control at 595 position.
4. TONE LEVEL control at 10 position.
5. SPEED control at LOW position.
6. NORM-REV control in NORM position.
7. VERT GAIN control at maximum clockwise position.
8. FOCUS control in normal operating position.
9. THRESHOLD control at 0.
10. INTENSITY control in normal operating position.
11. Teletypewriter out, Keyer Unit toggle switch S604 in OFF position.
12. On Comparator CM-14/URR, CHANNEL A—COMBINED—CHANNEL B control and CHANNEL A—DIV IND—CHANNEL B control set to CHANNEL A position.
13. Units assembled in chassis for voltage measurements to chassis ground.
14. Units removed from chassis for resistance measurements to chassis ground.
15. No signal input.
16. Voltage readings taken with a 20,000 ohms per volt multimeter Model OE series or equivalent.

WARNING

THIS EQUIPMENT EMPLOYS VOLTAGES WHICH ARE DANGEROUS AND MAY BE FATAL IF CONTACTED. PERSONNEL MUST OBSERVE ALL SAFETY REGULATIONS AND PRECAUTIONS. REFER TO THE SAFETY NOTICES AND HIGH-VOLTAGE WARNING PRINTED ON PAGES VI AND VII IN THE FRONT MATTER AT THE BEGINNING OF THIS INSTRUCTION BOOK.

TABLE 7–3. AUDIO INPUT UNIT VOLTAGE AND RESISTANCE MEASUREMENTS

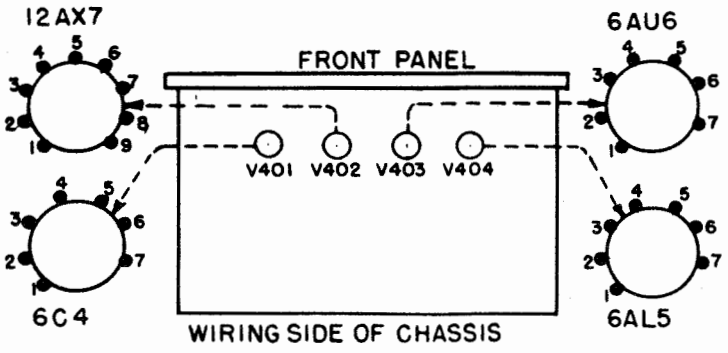


TABLE 7–3. AUDIO INPUT UNIT VOLTAGE AND RESISTANCE MEASUREMENTS (Continued)

VOLTAGE MEASUREMENTS TO CHASSIS GROUND (volts)

TUBE SYMBOL	PIN NUMBERS									PLATE CAP
	1	2	3	4	5	6	7	8	9	
V401	80	—	3.1*	3.1*	80	0	2.6	—	—	—
V402	206	0	2.3	3.1*	3.1*	202	0	2.3	3.1*	—
V403	0	2.8	3.1*	3.1*	205	173	2.8	—	—	—
V404	0	–0.5	3.1*	3.1*	0.05	—	–0.5	—	—	—

* a-c volts

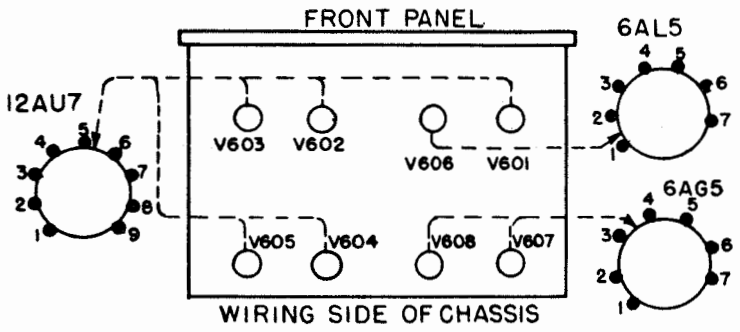
RESISTANCE MEASUREMENTS TO CHASSIS GROUND (ohms; K = 1000 ohms)

V401	inf.	—	inf.	inf.	inf.	65K	1K	—	—	—
V402	inf.	100K	6.8K	inf.	inf.	inf.	0	6.8K	inf.	—
V403	1 meg	470	inf.	inf.	inf.	inf.	470	—	—	—
V404	0	130K	inf.	inf.	250K	—	130K	—	—	—

RESISTANCE MEASUREMENTS ON P401 TO CHASSIS GROUND

PIN NO.	RESISTANCE, OHMS	PIN NO.	RESISTANCE, OHMS
1	inf.	8	inf.
2	inf.	9	inf.
3	inf.	10	inf.
4	0	11	inf.
5	1.5 meg	12	inf.
6	19K	13	inf.
7	inf.	14	inf.

TABLE 7–4. KEYER UNIT VOLTAGE AND RESISTANCE MEASUREMENTS



VOLTAGE MEASUREMENTS TO CHASSIS GROUND (volts)

TUBE SYMBOL	PIN NUMBERS									PLATE CAP
	1	2	3	4	5	6	7	8	9	
V601	105	0	2.25	3.1*	3.1*	55	0	2.1	3.1*	—
V602	42	4.0†	6.0	3.1*	3.1*	107	–20	0	3.1*	—
V603	158	42	65	3.1*	3.1*	120	62	65	3.1*	—
V604	16.5	1.7	1.6	3.1*	3.1*	105	–23	1.6	3.1*	—
V605	87	0.02	19	3.1*	3.1*	110	0.4	3.2	3.1*	—
V606	4.0†	4.0†	3.1*	3.1*	4.6	—	0	—	—	—
V607	–0.2	0	3.1*	3.1*	180	0	–0.2	—	—	—
V608	–0.2	0	3.1*	3.1*	180	0	–0.2	—	—	—

* a-c volts. † measured with electron-tube voltmeter.

TABLE 7–4. KEYER UNIT VOLTAGE AND RESISTANCE MEASUREMENTS (Continued)

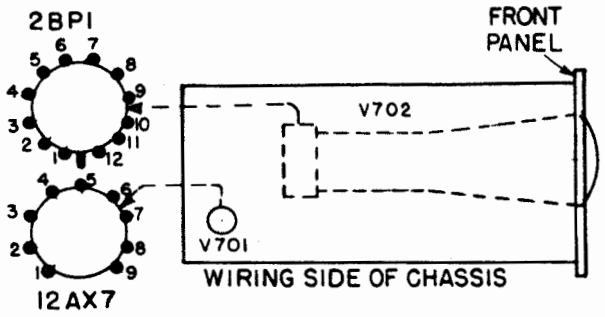
RESISTANCE MEASUREMENTS TO CHASSIS GROUND (ohms; K = 1000 ohms)

TUBE SYMBOL	PIN NUMBERS									PLATE CAP
	1	2	3	4	5	6	7	8	9	
V601	inf.	1.8 meg	390	56K	56K	inf.	1.8 meg	1800	56K	—
V602	300K	1 meg	5.5K	56K	56K	150K	400K	900	56K	—
V603	130K	300K	19K	56K	56K	140K	72K	19K	56K	—
V604	210K	250K	1K	56K	56K	210K	250K	1K	56K	—
V605	inf.	3700	12K	56K	56K	150K	420K	600	56K	—
V606	1 meg	1 meg	56K	56K	56K	—	0	—	—	—
V607	270K	0	56K	56K	180K	inf.	270K	—	—	—
V608	270K	0	56K	56K	180K	inf.	270K	—	—	—

RESISTANCE MEASUREMENTS ON P601 TO CHASSIS GROUND

PIN NO.	RESISTANCE, OHMS	PIN NO.	RESISTANCE, OHMS
1	56K	8	1200
2	125K	9	inf.
3	inf.	10	inf.
4	260K	11	0
5	inf.	12	180K
6	inf.	13	0
7	56K	14	inf.

TABLE 7–5. TUNING MONITOR UNIT VOLTAGE AND RESISTANCE MEASUREMENTS



VOLTAGE MEASUREMENTS TO CHASSIS GROUND (volts)

TUBE SYMBOL	PIN NUMBERS											
	1	2	3	4	5	6	7	8	9	10	11	12
V701	150	0	1.7	3.1*	3.1*	80	–0.5	0	—	—	—	—
V702	–560	–570	–560	–300	—	80	80	150	0	35*	—	–560

* a-c volts

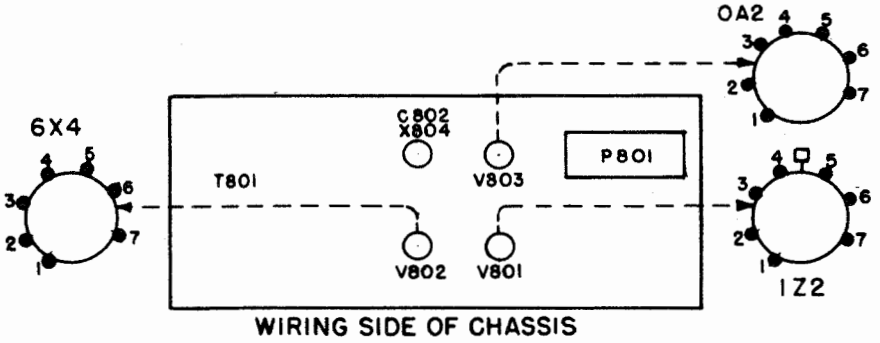
RESISTANCE MEASUREMENTS TO CHASSIS GROUND (ohms; K = 1000 ohms)

V701	85K	1 meg	inf.	inf.	inf.	550K	inf.	0	inf.	—	—	—
V702	5 meg	5 meg	5 meg	3 meg	—	550K	48K	85K	0	0	—	5 meg

RESISTANCE MEASUREMENTS ON P701 TO CHASSIS GROUND

PIN NO.	RESISTANCE, OHMS	PIN NO.	RESISTANCE, OHMS
1	inf.	8	5.5 meg
2	inf.	9	5 meg
3	85K	10	5 meg
4	inf.	11	inf.
5	inf.	12	inf.
6	inf.	13	0
7	inf.	14	1 meg

TABLE 7–6. CONVERTER POWER SUPPLY VOLTAGE AND RESISTANCE MEASUREMENTS



WIRING SIDE OF CHASSIS

VOLTAGE MEASUREMENTS TO CHASSIS GROUND (volts)

TUBE SYMBOL	PIN NUMBERS								PLATE CAP
	1	2	3	4	5	6	7	8	
V801	—	600*	600*	—	—	—	—	—	–670
V802	197*	—	3.1*	3.1*	—	197*	215	—	—
V803	—	—	—	—	150	—	0	—	—

* a-c volts

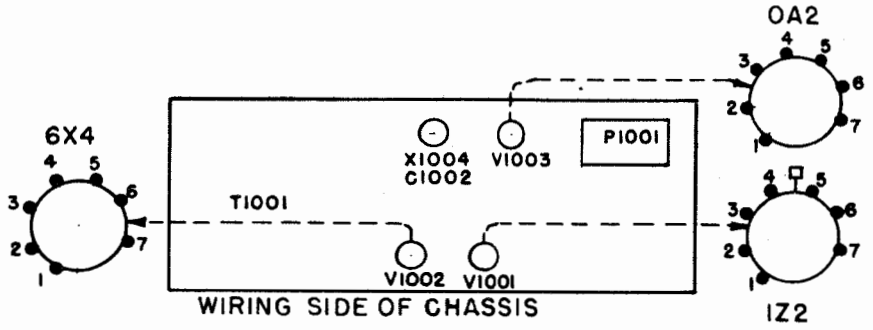
RESISTANCE MEASUREMENTS TO CHASSIS GROUND (ohms; K = 1000 ohms)

V801	—	1700	1700	—	—	—	—	—	600K
V802	110	—	0.1	0.1	—	105	550K	—	—
V803	—	—	—	—	550K	—	0	—	—

RESISTANCE MEASUREMENTS ON P801 TO CHASSIS GROUND

PIN NO.	RESISTANCE, OHMS	PIN NO.	RESISTANCE, OHMS
1	0.1	8	550K
2	550K	9	inf.
3	550K	10	inf.
4	150K	11	700K
5	inf.	12	inf.
6	19	13	0
7	0.1	14	inf.

TABLE 7–7. COMPARATOR POWER SUPPLY VOLTAGE AND RESISTANCE MEASUREMENTS



VOLTAGE MEASUREMENTS TO CHASSIS GROUND (volts)

TUBE SYMBOL	PIN NUMBERS								PLATE CAP
	1	2	3	4	5	6	7	8	
V1001	—	200*	200*	—	—	—	—	—	175
V1002	200*	—	3.1*	3.1*	—	200*	200	—	—
V1003	—	—	—	—	150	—	0	—	—

* a-c volts

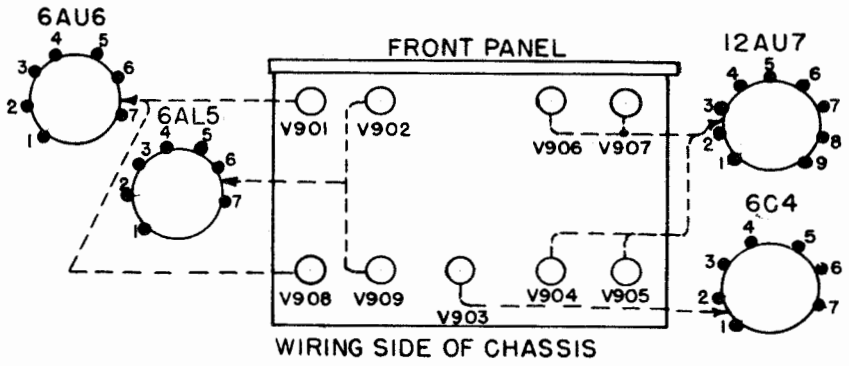
RESISTANCE MEASUREMENTS TO CHASSIS GROUND (ohms; K = 1000 ohms)

V1001	—	70	70	—	—	—	—	—	230K
V1002	75	—	0.1	0.1	—	70	550K	—	—
V1003	—	—	—	—	550K	—	0	—	—

RESISTANCE MEASUREMENTS ON P1001 TO CHASSIS GROUND

PIN NO.	RESISTANCE, OHMS	PIN NO.	RESISTANCE, OHMS
1	0.1	8	210K
2	550K	9	inf.
3	550K	10	inf.
4	150K	11	700K
5	inf.	12	inf.
6	inf.	13	0
7	0.1	14	—

TABLE 7–8. DIVERSITY SELECTOR UNIT VOLTAGE AND RESISTANCE MEASUREMENTS



VOLTAGE MEASUREMENTS TO CHASSIS GROUND (volts)

TUBE SYMBOL	PIN NUMBERS									PLATE CAP
	1	2	3	4	5	6	7	8	9	
V901	–0.5	0	3.1*	3.1*	14	95	0	—	—	—
V902	0.01	–0.01	3.1*	3.1*	0.01	—	–0.02	—	—	—
V903	65	—	3.1*	3.1*	65	–1.5	2.3	—	—	—
V904	105	65	65	3.1*	3.1*	140	40	65	3.1*	—
V905	120	–16†	0	3.1*	3.1*	150	–0.03	0	3.1*	—
V906	0	0	1.6	3.1*	3.1*	150	–18†	0	3.1*	—
V907	23	0	1.6	3.1*	3.1*	150	18†	23	3.1*	—
V908	–0.5	0	3.1*	3.1*	14	95	0	—	—	—
V909	0.01	0.01	3.1*	3.1*	–0.01	—	–0.02	—	—	—

* a-c volts. † measured with electron-tube voltmeter.

RESISTANCE MEASUREMENTS TO CHASSIS GROUND (ohms; K = 1000 ohms)

V901	2.25 meg	0	inf.	inf.	inf.	inf.	0	—	—	—
V902	inf.	400K	inf.	inf.	270K	—	270K	—	—	—
V903	325K	—	inf.	inf.	325K	4.7K	5.25K	—	—	—
V904	160K	325K	18K	inf.	inf.	170K	85K	18K	inf.	—
V905	250K	1.5 meg	0	inf.	inf.	250K	1.5 meg	0	inf.	—
V906	6K	1 meg	56K	inf.	inf.	165K	500K	6K	inf.	—
V907	4.7K	1 meg	56K	inf.	inf.	165K	500K	6K	inf.	—
V908	2.25 meg	0	inf.	inf.	inf.	inf.	0	—	—	—
V909	inf.	270K	inf.	inf.	400K	—	270K	—	—	—

TABLE 7–8. DIVERSITY SELECTOR UNIT VOLTAGE AND RESISTANCE MEASUREMENTS (Continued)

RESISTANCE MEASUREMENTS ON P901 TO CHASSIS GROUND

PIN NO.	RESISTANCE, OHMS	PIN NO.	RESISTANCE, OHMS
1	inf.	8	56K
2	inf.	9	inf.
3	165K	10	inf.
4	1200	11	inf.
5	260K	12	inf.
6	47	13	inf.
7	inf.	14	inf.

TABLE 7–9. TUBE OPERATING VOLTAGES AND CURRENTS

TUBE SYMBOL	TUBE TYPE	FUNCTION	PLATE VOLTS	PLATE MA	SCREEN VOLTS	SCREEN MA	SUP-PRESSOR VOLTS	CATH-ODE VOLTS	GRID VOLTS	HEATER VOLTS AC
V401	6C4	A-F Amplifier	80	2.6	—	—	—	2.6	0	6.3
V402A	12AX7	A-F Limiter	206	0.29	—	—	—	2.3	0	6.3
V402B		A-F Limiter	202	0.15	—	—	—	2.3	0	6.3
V403	6AU6	Driver	205	4.4	173	1.5	2.8	2.8	0	6.3
V404A	6AL5	A-F Discriminator	—	—	—	—	—	—	—	6.3
V404B		A-F Discriminator	—	—	—	—	—	—	—	6.3
V601A	12AU7	A-F Amplifier I	105	5.75	—	—	—	2.25	0	6.3
V601B		A-F Amplifier II	55	1.17	—	—	—	2.1	0	6.3
V602A	12AU7	Balanced Modulator	107	0	—	—	—	0	–20	6.3
V602B		Trigger Driver	42	0.43	—	—	—	6	4	6.3
V603A	12AU7	Trigger I	120	3.0	—	—	—	65	62	6.3
V603B		Trigger I	158	0	—	—	—	65	42	6.3
V604A	12AU7	Trigger II	16.5	1.6	—	—	—	1.6	1.7	6.3
V604B		Trigger II	105	0	—	—	—	1.6	–23	6.3
V605A	12AU7	Tone Modulator	107	6.7	—	—	—	3.2	0.4	6.3
V605B		Tone Oscillator	87	1.5	—	—	—	19	0.1	6.3
V606A	6AL5	D-C Restorer	4	—	—	—	—	4.6	—	6.3
V606B		D-C Restorer	0	—	—	—	—	4.0	—	6.3
V607†	6AQ5	TTYP Keyer	80	30	97	3.2	—	0	0	6.3
V608†	6AQ5	TTYP Keyer	80	30	97	3.2	—	0	0	6.3
V701A	12AX7	D-C Amplifier	150	0.2	—	—	—	1.7	0	6.3
V701B		D-C Amplifier	80	0.15	—	—	—	0	–0.5	6.3
V702	2BP1	CRT (Tuning Monitor)	150	0	–300	0	150	–560	–570	6.3
V801	1Z2	High Voltage Rectifier	–670	2	—	—	—	600*	—	1.5
V802	6X4	Low Voltage Rectifier	197*	70	—	—	—	21.5	—	6.3

* Represents a-c volts. † With TTYP plug inserted and S604 on.

TABLE 7–9. TUBE OPERATING VOLTAGES AND CURRENTS (Continued)

TUBE SYMBOL	TUBE TYPE	FUNCTION	PLATE VOLTS	PLATE MA	SCREEN VOLTS	SCREEN MA	SUP-PRESSOR VOLTS	CATH-ODE VOLTS	GRID VOLTS	HEATER VOLTS AC
V803	OA2	Voltage Regulator	150	15	—	—	—	0	—	—
V901	6AU6	Channel "A" Amplifier	14	3.3	95	2.5	0	0	–0.5	6.3
V902A	6AL5	AVC Rectifier	—	—	—	—	—	—	—	6.3
V902B		Differential Rectifier	—	—	—	—	—	—	—	6.3
V903	6C4	D-C Amplifier	65	0.32	—	—	—	2.3	–1.5	6.3
V904A	12AU7	First Control Trigger	105	3.6	—	—	—	65	65	6.3
V904B			140	0	—	—	—	65	40	6.3
V905A	12AU7	Second Control Trigger	120	0	—	—	—	0	–16	6.3
V905B			15	1.2	—	—	—	0	–0.03	6.3
V906A	12AU7	Gate B Control	150	0	—	—	—	0	–18	6.3
V906B		Gate B	0	0	—	—	—	1.6	0	6.3
V907A	12AU7	Gate A Control	150	3	—	—	—	23	18	6.3
V907B		Gate A	23	4.7	—	—	—	1.6	0	6.3
V908	6AU6	Channel B Amplifier	14	3.3	95	2.5	0	0	–0.5	6.3
V909A	6AL5	AVC Rectifier	—	—	—	—	—	—	—	6.3
V909B		Differential Rectifier	—	—	—	—	—	—	—	6.3
V1001	1Z2	Negative Voltage Rectifier	–175	—	—	—	—	200*	—	1.5
V1002	6X4	Positive Voltage Rectifier	200*	70	—	—	—	200	—	6.3
V1003	OA2	Voltage Regulator	150	15	—	—	—	0	—	—

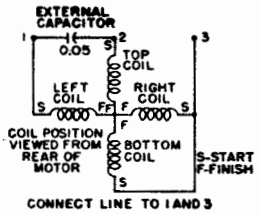
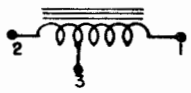
* Represents a-c volts. † With TTYP plug inserted and S604 on.

TABLE 7–10. RATED TUBE CHARACTERISTICS

TUBE TYPE	FILA-MENT VOLT-AGE (V)	FILA-MENT CUR-RENT (A)	PLATE VOLT-AGE (V)	GRID BIAS (V)	SCREEN VOLT-AGE (V)	PLATE CUR-RENT (MA)	SCREEN CUR-RENT (MA)	A-C PLATE RESIST-ANCE (OHMS)	VOLT-AGE AMPLI-FICA-TION FAC-TOR (MU)	TRANSCON-DUCTANCE (MICROMHOS)		EMISSION	
										NOR-MAL	MINI-MUM	IS (MA)	TEST VOLT
0A2	—	—	150	—	—	5 to 30	—	—	—	—	—	30	185*
1Z2	1.25	265	15KV	—	—	8.5	—	—	—	—	—	9.5	100
2BP1	6.3	0.6	2750 max.	200 max.	1100 max.	—	—	—	—	—	—	—	—
6AL5	6.3	0.3	165	—	—	10 max.	—	—	—	—	—	40	10
												40	10
6AQ5	6.3	0.45	250	–12.5	250	45	3.75	2000	—	5200	3000	100	30
6AU6	6.3	0.3	250	–0.8	150	11	6	—	—	6250	4150	60	20
6C4	6.3	0.15	25	–8.5	—	14.5	—	—	18.5	4000	2500	70	30
6X4	6.3	0.6	400	—	—	75	—	—	—	—	—	140	50
												140	50
12AU7	6.3	0.3	250	–8.5	—	14.5	—	—	18.5	2650	1750	70	30
	12.6	0.15										70	30
12AX7	6.3	0.3	250	–2	—	1.75	—	—	115	2050	1250	55	30
	12.6	0.15										55	30

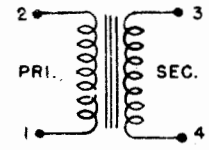
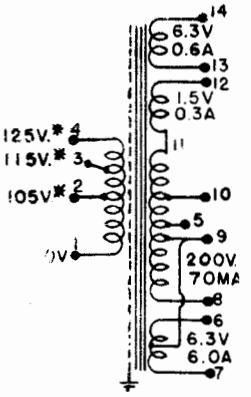
* Applied through a dropping resistor.

TABLE 7–11. WINDING DATA

SYMBOL DESIG-NATION	RCA PART NUMBER	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESIST-ANCE IN OHMS	IMPEDANCE RATIO	HIGH-POT A-C VOLTS	REMARKS
B1201	454892		Bobbin Bobbin	No. 40SE No. 40SE	Top or bottom 1900 Right or left 1800	358 340			Dry at 121°C (250°F) for one hour. Apply 1 coat of varnish to coils and bake at 121°C (250°F) two hours. Apply second coat of varnish and bake 8 hours at 135°C (275°F).
B1301	Same as B1201	See B1201							Same information as given under B1201.
*L601	453141		Close, layer wound	No. 43SE	10,000½ tapped at 9360	1-2 3354 1-3 3081		750	Adjust air gap in core for frequency. Approx. 0.017.
†L601	Same as above	Same as above.	Close, layer wound	No. 43SE	10,857 tapped at 10,179	1-3 3284 3-2 271			Halowax Dip for impregnation and potted in wax.
*L801	453147		Close, layer wound	No. 34SE	1850	150		1000	0.003-inch air gap in core. Layers separated by 0.001-inch thick paper. 4.5 henrys min. 30v-60 cycles at 70 ma d-c.
†L801	Same as above	Same as above	Close, layer wound	No. 33SE	2600	150		1000	Vacuum varnish impregnation asphalt potting. 4.5 henrys min. 30v-60 cycles at 70 ma d-c.
L1001	Same as L801	See L801							Same information as given under L801.
*T401	Subassembly of 453143 Part of Z401	See Schematic of Z401 following this table	Close, layer wound Primary Secondary	 No. 35SE No. 41SE	 506 tapped at 253 2040	 20.9		 500 500	 0.001-inch paper between layers. 0.00075-inch paper between layers.
†T401	Same as above	Same as above	Close, layer wound Primary Secondary	 No. 34SE No. 33SE	 582 c. t. 600	 18.58 21.4		 500 500	
*T402	Same as T401	See Schematic of Z401 following this table	Close, layer wound Primary Secondary	 No. 35SE No. 43SE	 506 tapped at 253 3210	 20.9		 500 500	 0.001-inch paper between layers. 0.00075-inch paper between layers.
†T402	Same as T401	Same as above	Close, layer wound Primary Secondary	 No. 34SE No. 33SE	 582 c. t. 600	 18.33 21.4		 500 500	

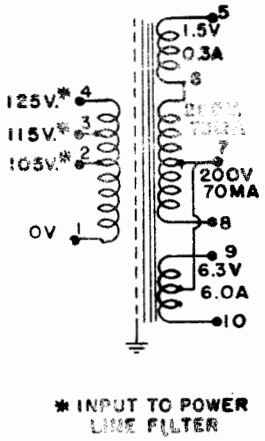
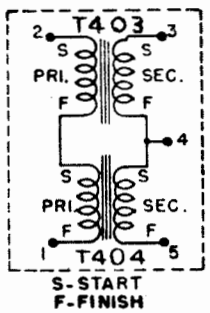
* Made by Chicago Transformer.
† Made by United Transformer.

TABLE 7–11. WINDING DATA—Continued

SYMBOL DESIGNATION	RCA PART NUMBER	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIGH-POT A-C VOLTS	REMARKS
*T403	Subassembly of 453145	See Schematic of Z402	Close, layer wound						0.045-inch air gap in center leg. Wind both coils in same direction.
			Primary	No. 36SE	2072			1000	0.001-inch paper between layers.
			Secondary	No. 41SE	2072	154		1000	0.00075-inch paper between layers.
†T403	Same as above	Same as above	Close, layer wound						Wax impregnation and potting.
			Primary	No. 37SE	1670	178			
			Secondary	No. 35SE	1670	91			0.6 henrys at 3 volts-1000 cycles 5 ma d-c.
*T404	Subassembly of 453145	See Schematic of Z402	Close, layer wound						
			Primary	No. 38SE	3082			500	0.001-inch paper between layers.
			Secondary	No. 43SE	3082	359		500	0.00075-inch paper between layers.
†T404	Same as above	Same as above	Close, layer wound						
			Primary	No. 40SE	3160	727			
			Secondary	No. 38SE	3160	334			2.15 henrys at 3v-1000 cycles, 5 ma. d-c.
*T601	453142		Close, layer wound						
			Primary 1-2	No. 42SE	3096	842		1000	0.0075-inch paper between layers.
			Secondary 3-4	No. 38SE	744	57.63		1000	0.001-inch paper between layers.
†T601	Same as above	Same as above	Close, layer wound						Vacuum wax dip, wax potted.
			Primary 1-2	No. 41SE	4500	1045		1000	
			Secondary 3-4	No. 37SE	936	65		1000	
*T801	453149	 *INPUT TO POWER LINE FILTER	Primary 1-4	No. 25SE	351 tapped at 213 and 284	7.2		2500	0.004-inch paper between layers.
			Secondary 8-10	No. 34SE	3136 tapped at 1568 and 1831.5	347		2500	0.0015-inch paper between layers.
			Secondary 10-11	No. 39SE	3040	1317		2500	0.001-inch paper between layers.
			Secondary 11-12	No. 25SE	11.5	0.13		2500	
			Secondary 13-14	No. 25SE	49	0.805		2500	
			Secondary 6-7	2 No. 16SE	46	0.49		2500	Wound one on top of other.

* Made by Chicago Transformer.
† Made by United Transformer.

TABLE 7–11. WINDING DATA—Continued

SYMBOL DESIGNATION	RCA PART NUMBER	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIGH-POT A-C VOLTS	REMARKS
†T801	Same as *T801	Same as *T801	Primary 1-4	No. 23SE	608 tapped at 503 and 555	5.86		1260	
			Secondary 8-10	No. 34SE	2190 tapped at 1095 and 1285	204		2000	
			Secondary 10-11	No. 42SE	2275	1418		2000	
			Secondary 11-12	No. 26SE	8	0.293		2000	
			Secondary 13-14	2 No. 25SE	34	0.346		2000	
			Secondary 6-7	3 No. 17SE	34	0.068		1015	
*T1001	453148		Primary 1-4	No. 24SE	356 tapped at 217 and 288	6.4		1500	0.004-inch paper between layers.
			Secondary 6-8	No. 31SE	2836 tapped at 1418			1500	0.0015-inch paper between layers.
			Secondary 5-6	No. 23SE	11.5	0.14		1500	
			Secondary 9-10	2 No. 16SE	46 each, center tapped	0.049		1500	One wound on top of other.
†T1001	Same as above	Same as above	Primary 1-4	No. 23SE	646 tapped at 534 and 589	6		1500	Vacuum varnish impregnation.
			Secondary 6-8	No. 32SE	2280 center tapped 8½	147.5		1500	
			Secondary 5-6	No. 26SE		0.305		1500	Asphalt compound potting.
			Secondary 9-10	No. 13 center tapped	36 center tapped	0.066		1500	
*Z401	453143	See *T401, *T402 and Schematic following this table							
†Z401	Same as above	See †T401, †T402 and Schematic following this table							
*Z402	453145		Primary 1-2	See *T403 and *T404	See *T403 and *T404	2760		500	Two transformers (*T403 and *T404) potted in one case.
			Secondary 3-4			454		500	
			Secondary 4-5			354		500	

* Made by Chicago Transformer.
† Made by United Transformer.

TABLE 7–11. WINDING DATA—Concluded

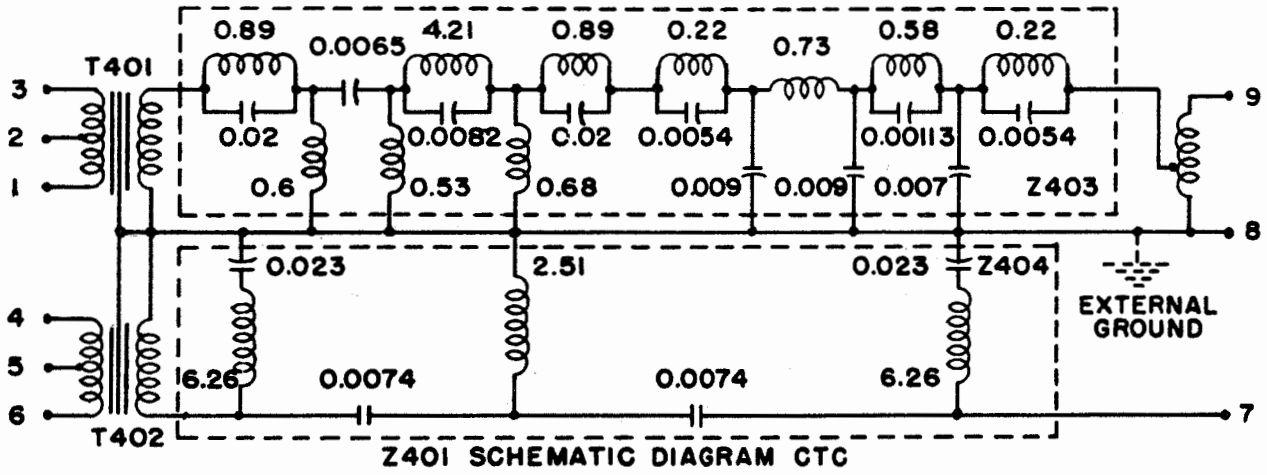
SYMBOL DESIGNATION	RCA PART NUMBER	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE IN OHMS	IMPEDANCE RATIO	HIGH-POT A-C VOLTS	REMARKS
†Z402	Same as *Z402	Same as *Z402	Primary 1-2 Secondary 3-4 Secondary 4-5	See †T403 and †T404	See †T403 and †T404	905 91 334		500 500 500	Two transformers (†T403 and †T404) potted in one case.
*Z601	453144	See Schematic following this table.	1-2 4-5			2620 5800		500 500	Values given in Schematic following this table.
†Z601	Same as above	See Schematic following this table.	1-2 4-5			2293 5024		500 500	Values given in Schematic following this table.
*Z1201	453539	See Schematic following this table. (Input transformer. / Output transformer.)	Primary 1-2 Secondary Primary Secondary 3-4	No. 35SE No. 41SE No. 41SE No. 36SE	570 1980 1980 688 tapped at 344	24 36.3		500 500 500 500	0.001-inch paper between layers. 0.00075-inch paper between layers. 0.00075-inch paper between layers. 0.001-inch paper between layers.
†Z1201	Same as above	See Schematic following this table. (Input transformer. / Output transformer.)	Primary 1-2 Secondary Primary Secondary 3-4 Secondary 4-5	No. 33SE No. 32SE No. 33SE No. 32SE No. 32SE	500 490 500 490 c. t.	12.7 13.7 12.7 6.41 7.31		500 500 500 500 500	Vacuum varnish impregnation. Asphalt compound potting.
†Z1202	453146	See Schematic following this table.	Terminals 1-4 Terminals 2-3			0.738 0.738		250 250	
Z1301	See Z1201	See Z1201							
Z1302	See Z1202	See Z1202							

* Made by Chicago Transformer.
† Made by United Transformer.

SCHEMATICS FOR WINDING DATA

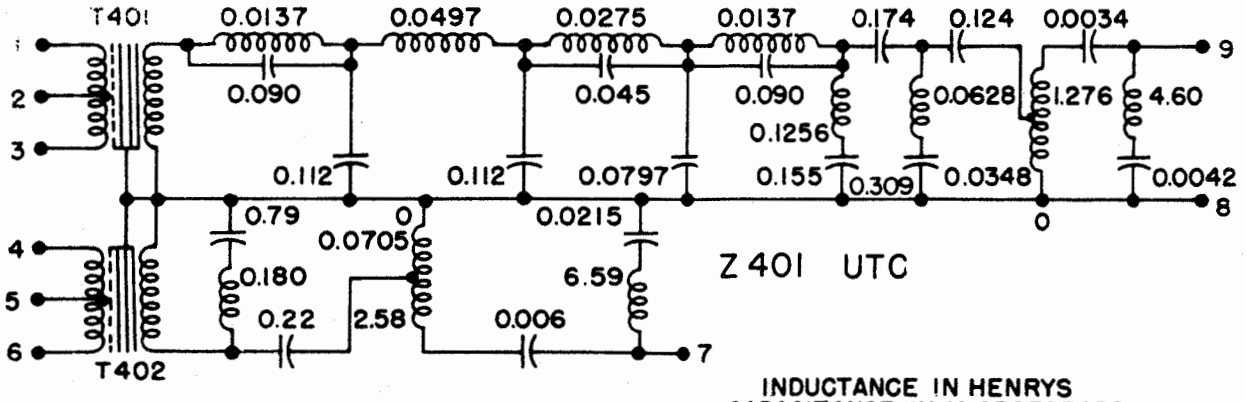
Complete repair of the filter assemblies is an intricate factory procedure and is not described here. In addition to values of components shown on schematic diagrams, refer to the filter characteristics given in the following paragraphs of Section 2:

Filter Symbol	*Paragraph*
Z401	5
Z601	6
Z1201	4
Z1202	4
Z1301	11
Z1302	11



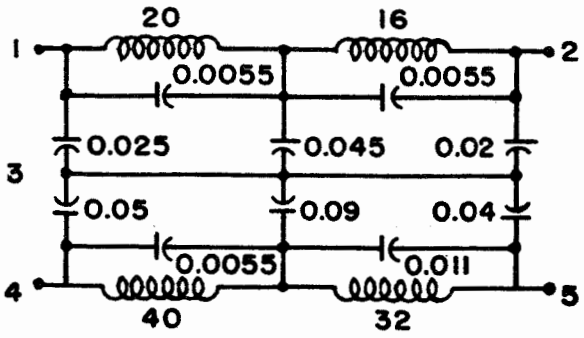
Z401 SCHEMATIC DIAGRAM CTC

INDUCTANCE VALUES IN HENRYS
CAPACITANCE VALUES IN MICROFARADS



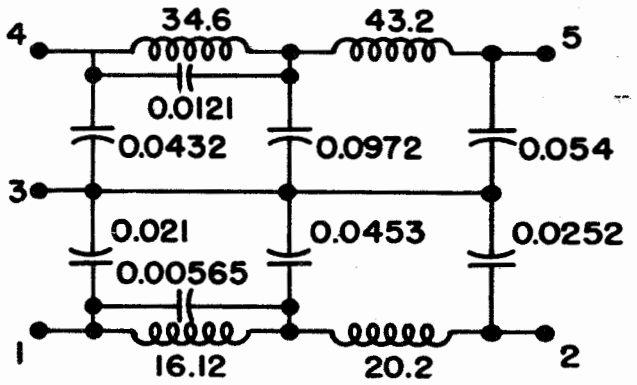
Z401 UTC

INDUCTANCE IN HENRYS
CAPACITANCE IN MICROFARADS
RESISTANCE IN OHMS



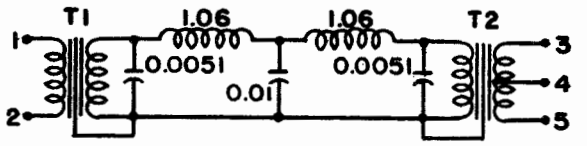
Z601 SCHEMATIC DIAGRAM CTC

INDUCTANCE VALUES IN HENRYS
CAPACITANCE VALUES IN MICROFARADS



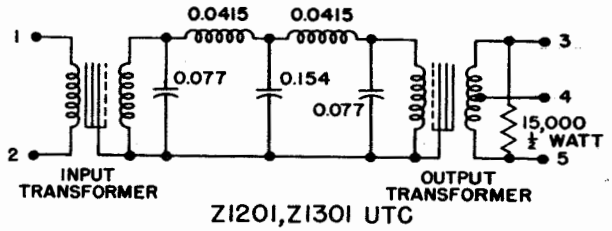
Z601 UTC

INDUCTANCE IN HENRYS
CAPACITANCE IN MICROFARADS
RESISTANCE IN OHMS



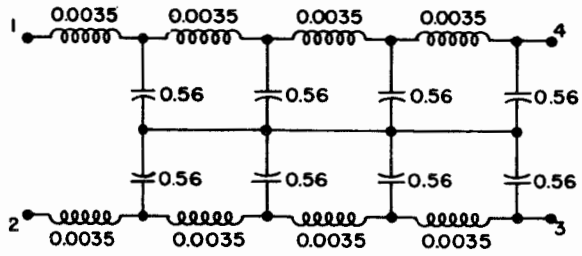
Z1201,Z1301 TONE OUTPUT FILTER CTC

INDUCTANCE VALUES IN HENRYS
CAPACITANCE VALUES IN MICROFARADS



Z1201,Z1301 UTC

INDUCTANCE IN HENRYS
CAPACITANCE IN MICROFARADS
RESISTANCE IN OHMS



Z1202,Z1302 UTC

INDUCTANCE IN HENRYS
CAPACITANCE IN MICROFARADS
RESISTANCE IN OHMS

TRANSFORMER DATA FOR T801

WINDING	TERMINALS	VOLTAGE 60 CPS	CURRENT AMPERES	RESISTANCE OHMS	
				CTC TRANSFORMER	UTC TRANSFORMER
Primary	1–2	105*	0.65		
	1–3	115*	0.6		
	1–4	125*	0.55	7.2	5.86
Secondary	6–7	6.3 CT	6.	0.099	0.068
Secondary	8–10	400 CT	0.07	347	204
Secondary	9–11	625	0.002		
Secondary	11–12	1.5	0.3	0.13	0.293
Secondary	13–14	6.3	0.6	0.805	0.346
Secondary	9–5	35	—		

* Applied through power line filter.

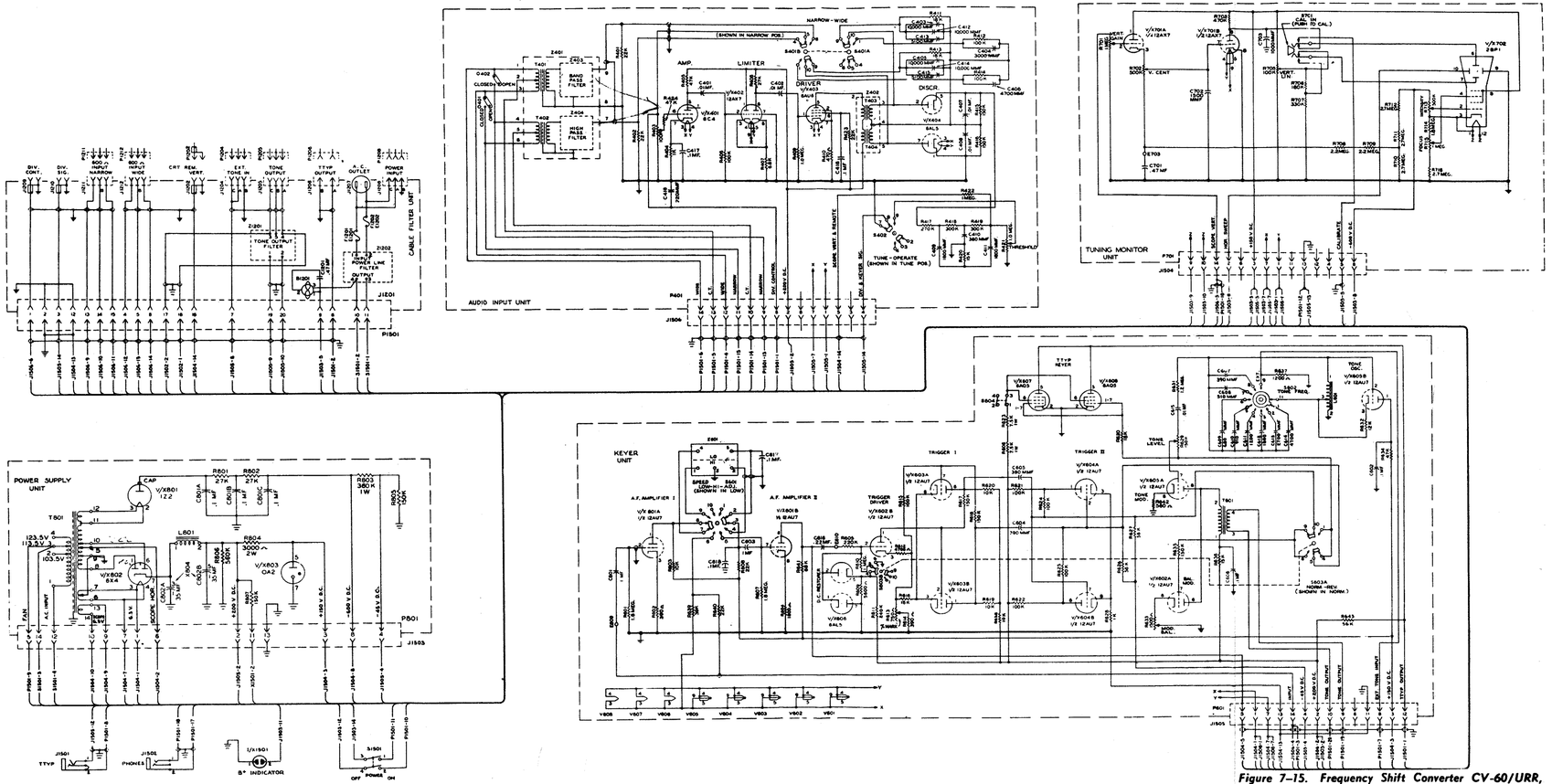


Figure 7–15. Frequency Shift Converter CV-60/URR, Schematic Diagram. (For a Larger Print of this Drawing, see Envelope at End of this Instruction Book.)

SHIPPING BOX NO.	CONTENTS		OVERALL DIMENSIONS (INCHES)			VOLUME (CU. FT.)	WEIGHT (LBS.)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1 of 1	Freq. Shift Converter	CV-60/URR	10.75	19.75	19	5.1	100
1 of 1	Freq. Shift Converter Comparator	AN/URA-8	29	29	25.5	13	242
1 of 1	CV-60/URR Set of Equipment Spares		8.5	16.75	16.5	1.4	39
1 of 1	AN/URA-8 Set of Equipment Spares		8.5	16.75	16.5	1.4	40

Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

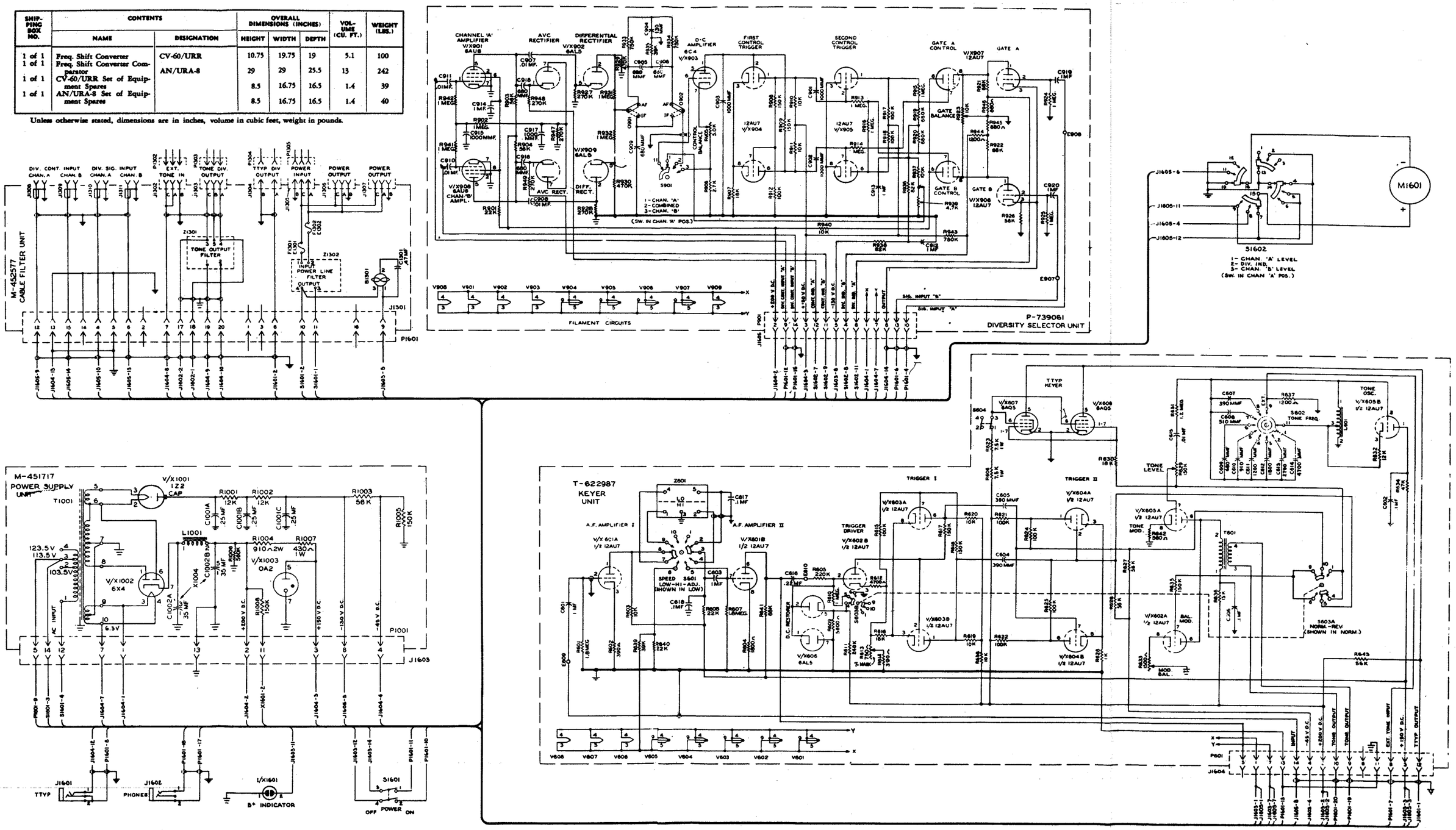


Figure 7–16. Comparator CM-14/URR, Schematic Diagram. (For a Larger Print of this Drawing, see Envelope at End of this Instruction Book.)

WIRE TABLE	
WIRE NO.	DESCRIPTION
1	CABLE SPECIFICATIONS
3 TO 4	
6	
8	
10	
12	
14 TO 15	
18	
20	
22 TO 23	
25 TO 26	
28 TO 29	
31	
33	CABLE SPECIFICATIONS
35 TO 36	WIRE-BROWN
38 TO 39	WIRE-GRAY
41 TO 48	WIRE-BLACK
50	WIRE-BROWN
59 TO 60	WIRE-RED
62 & 63	WIRE-WHITE
64	WIRE-RED/YELLOW TR.
65 TO 67	WIRE-RED/GREEN TR.
69 TO 70	WIRE-WHT/GREEN TR.
72	WIRE-RED/BLACK TR.
74 TO 77	WIRE-BUSS-.020 DIA.
81 TO 86	WIRE-BROWN

NOTE: Numbers in wires refer to wire table, Coding at ends of wires indicate wire number and destination.

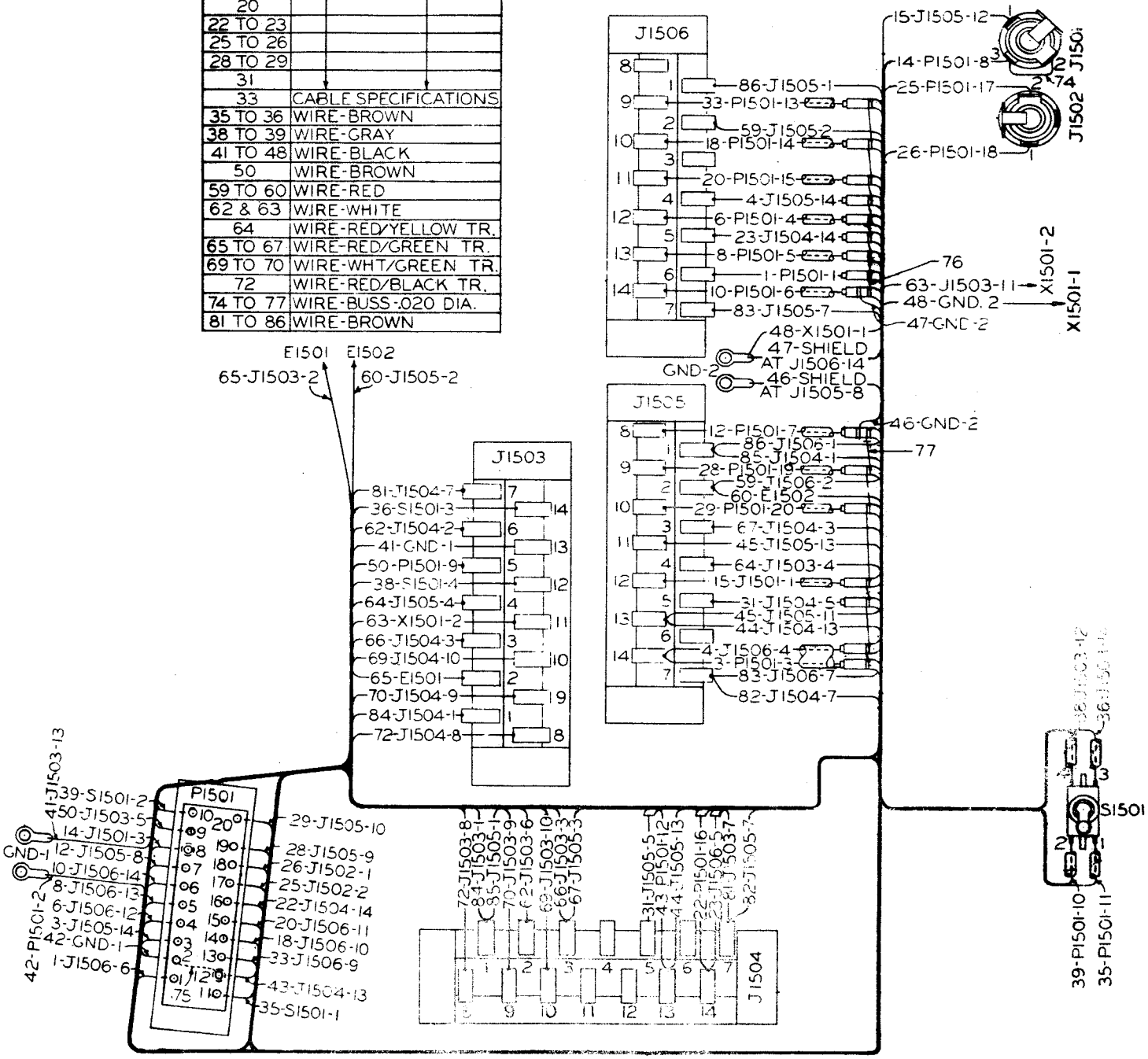


Figure 7-17. Frequency Shift Converter CV-60/URR, Main Chassis Wiring Diagram

WIRE TABLE	
WIRE NO.	DESCRIPTION
1	CABLE SPECIFICATIONS
3	
5	
7	
9	
11	
13 TO 14	
16 TO 17	
19 TO 20	CABLE SPECIFICATIONS
22 TO 23	WIRE-GRAY
25 TO 26	WIRE-BROWN
28 TO 36	WIRE-BLACK
43	WIRE-BROWN
47 TO 49	WIRE-RED
51	WIRE-RED/YELLOW TR
53 TO 54	WIRE-RED/GREEN TR.
56	WIRE-WHT/GREEN TR.
58	WIRE-WHT/BLACK TR.
60	WIRE-GRN/YELLOW TR.
62	WIRE-RED/BLACK TR.
65	WIRE-GRN/BLACK TR.
66 TO 76	WIRE-BUSS .020 DIA.
77 TO 79	EXT. TUB. .053 I.D. BLK.
80 TO 83	WIRE-BROWN
87	WIRE-WHITE

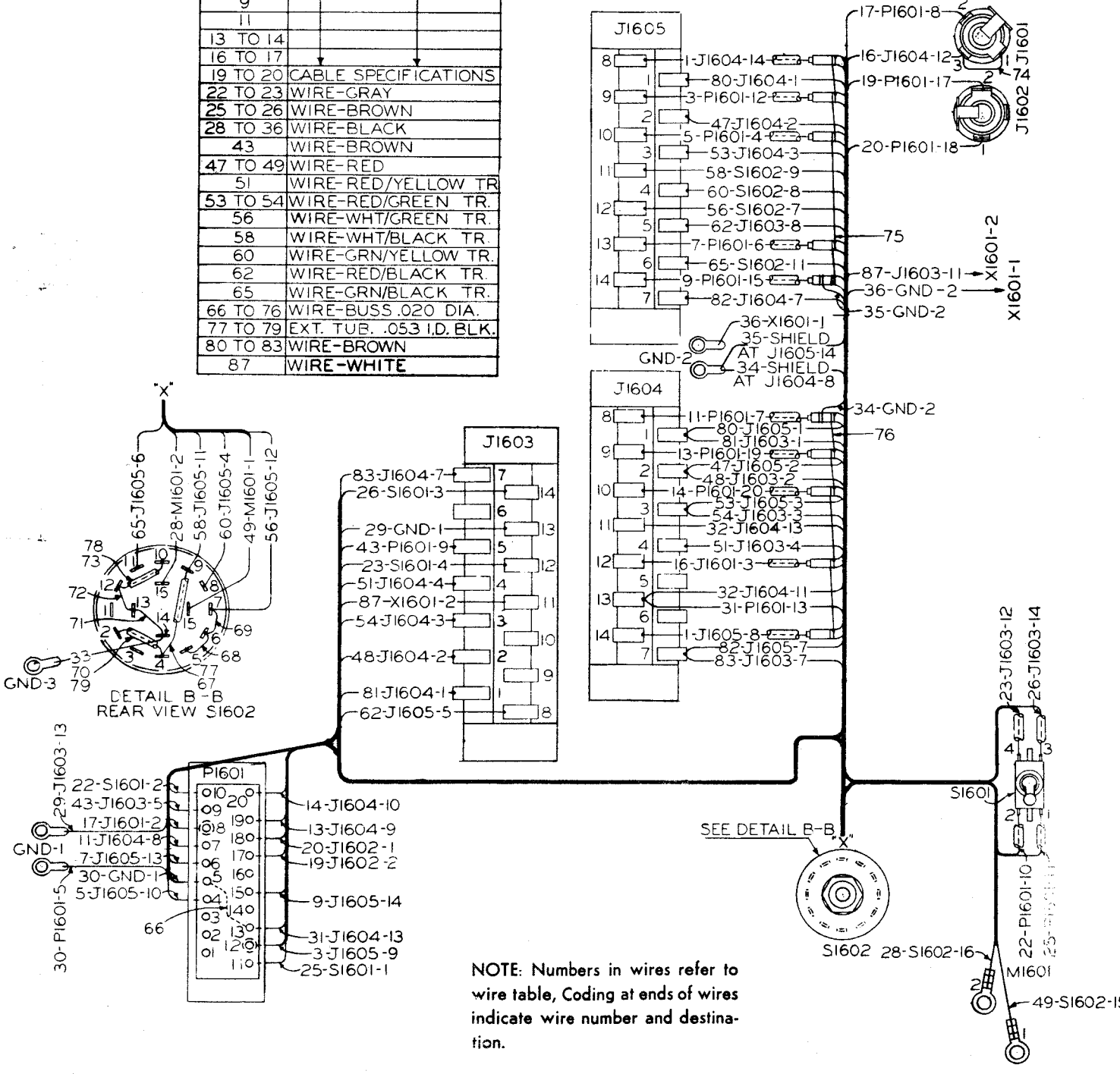


Figure 7-18. Comparator CM-14/URR Main Chassis Wiring Diagram

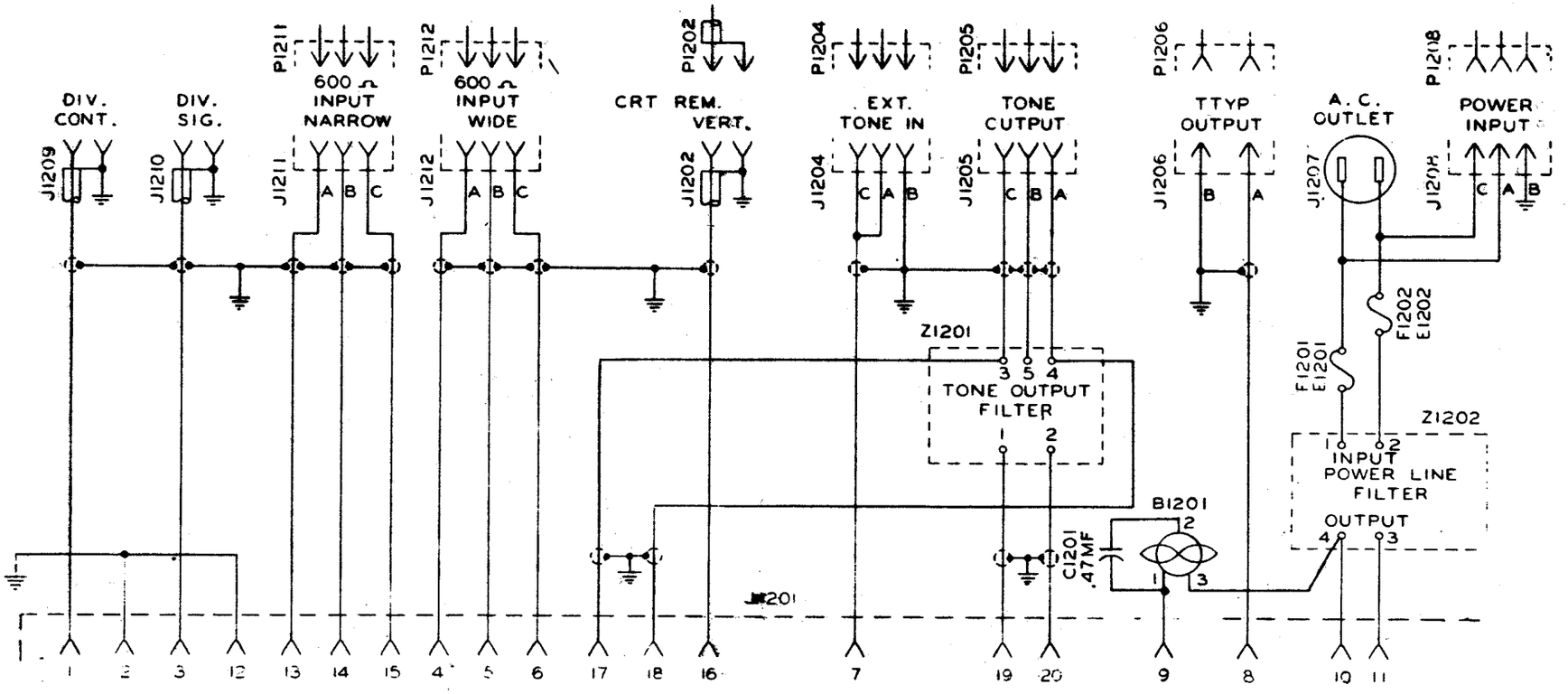
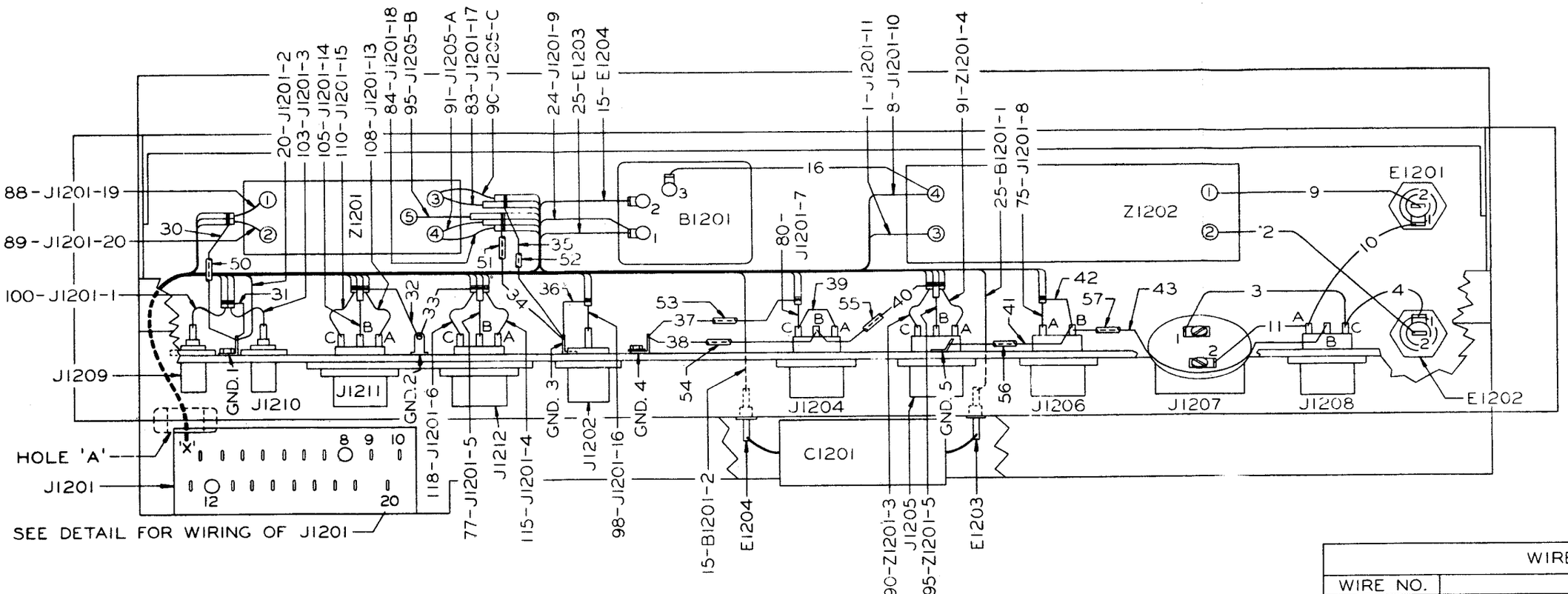
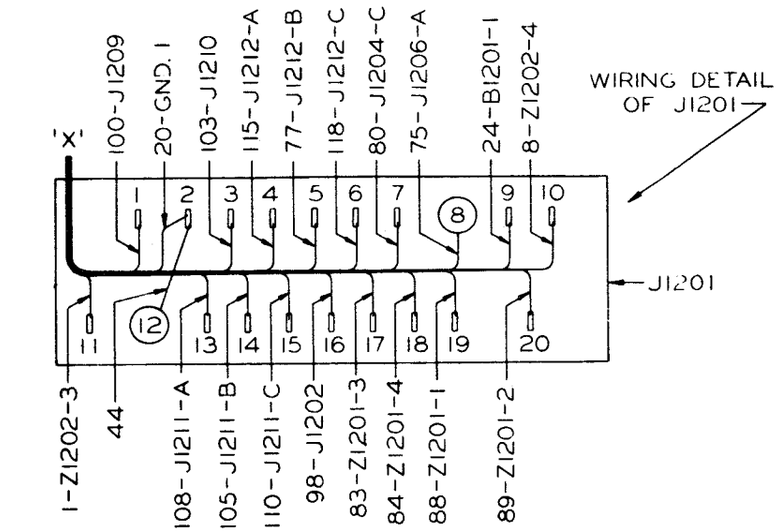


Figure 7–19. Frequency Shift Converter Cable Filter, Schematic Diagram





"DETAIL ENDS OF CABLES"

NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATES WIRE NUMBER & DESTINATION OF WIRE THUS; 77-J1201-5, 77=WIRE NO., J1201=CONNECTOR J1201, AND 5= TERMINAL 5 OF J1201 AS INDICATED ON THIS DRAWING.

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-4 INCL.	BROWN
8-11	GRAY
15-16	GRAY
20	BLACK
24-25	BROWN
30-44	TINNED COPPER WIRE .020 DIA.
50-57 INCL	EXTRUDED TUBING BLACK
75	CABLE SPEC. (BLUE)
77	(GREEN)
80	(GRAY)
83-84	(WHT./BLUE TR.)
88-91 INCL.	(WHT./GRN. TR.)
95	(WHT./BLK. TR.)
98	(YELLOW)
100	(WHITE)
103	(ORANGE)
105	(RED)
108	(RED/YEL.TR.)
110	(RED/GRN.TR.)
115	(GRN./YEL.TR.)
118	CABLE SPEC. (GRN./BLK.TR.)

Figure 7–20. Frequency Shift Converter Cable Filter, Wiring Diagram

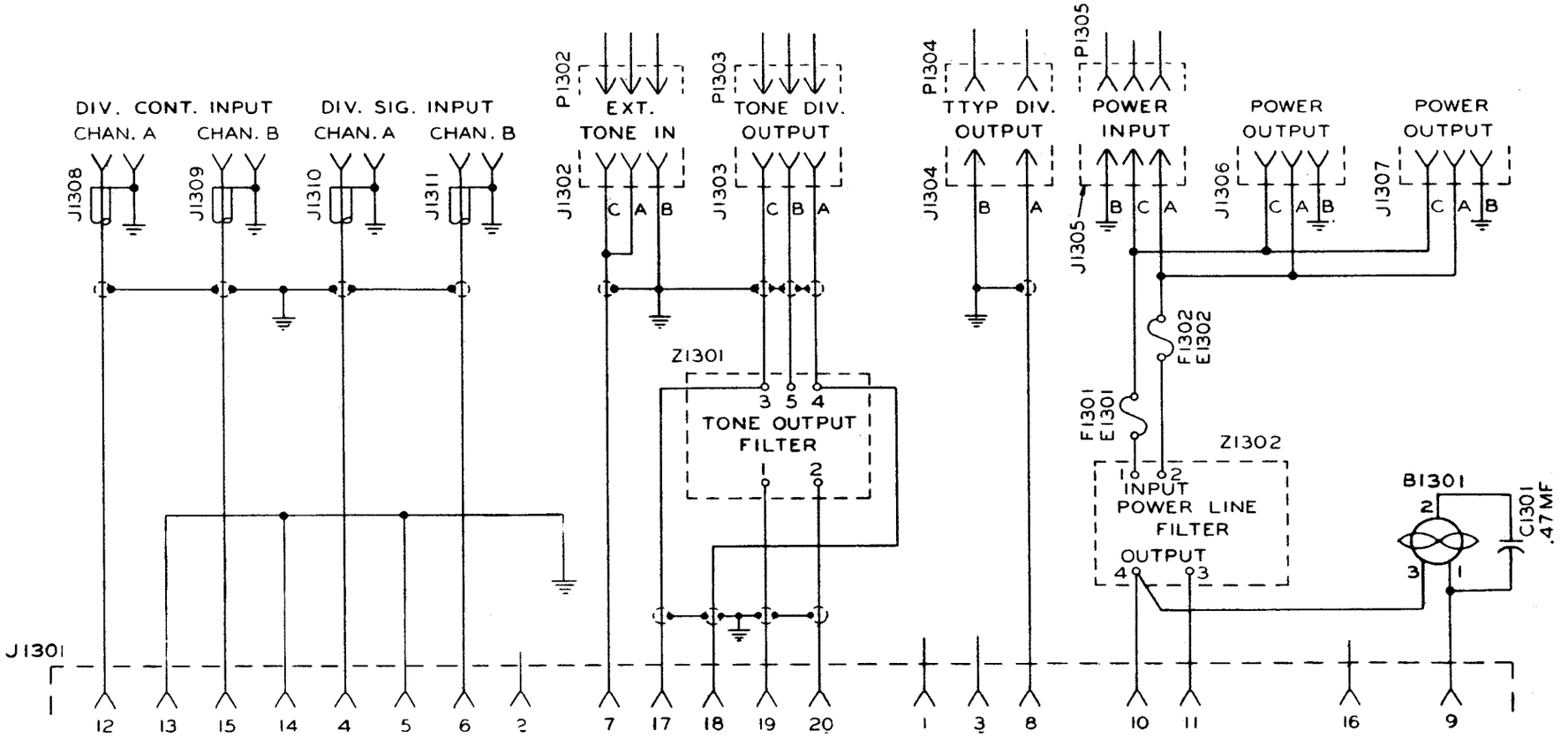
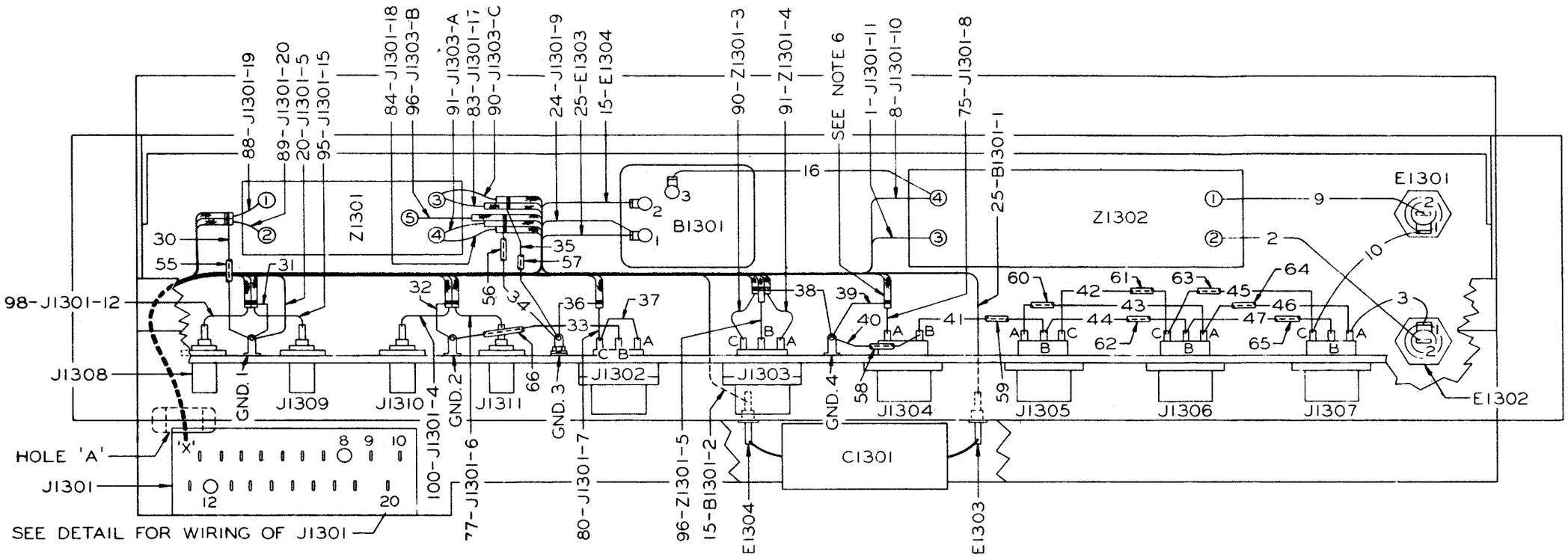
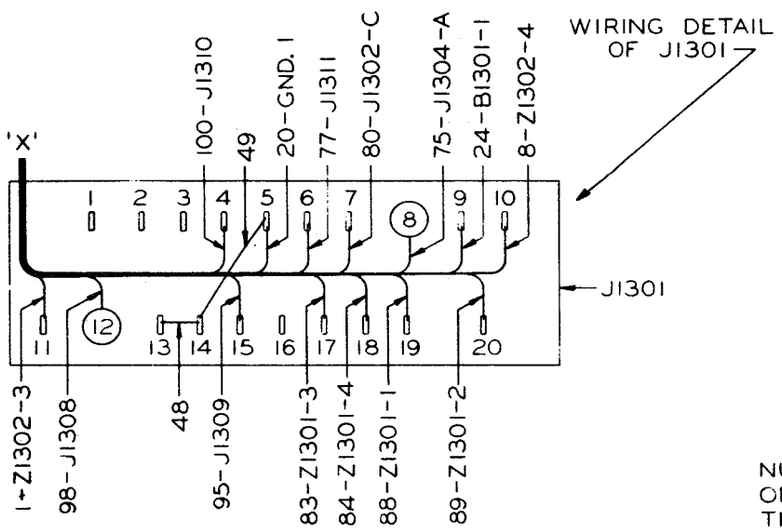


Figure 7–21. Comparator Cable Filter Schematic Diagram





NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATES WIRE NUMBER & DESTINATION OF WIRE THUS; 77-J1301-6, 77=WIRE NO., J1301=CONNECTOR J1301, AND 6= TERMINAL 6 OF J1301 AS INDICATED ON THIS DRAWING.

WIRE TABLE

WIRE NO.	DESCRIPTION
1-3 INCL.	BROWN
8-10 INCL.	GRAY
15-16	GRAY
20	BLACK
24-25	BROWN
30-49 INCL	TINNED COPPER WIRE .020 DIA.
55-66 INCL	EXTRUDED TUBING BLACK
75	CABLE SPEC. (BLUE)
77	(GREEN)
80	(GRAY)
83-84	(WHT./BLUE TR.)
88-91 INCL.	(WHT./GRN. TR.)
95-96	(WHT./BLK. TR.)
98	(WHITE)
100	CABLE SPEC. (ORANGE)

"DETAIL ENDS OF CABLES"

Figure 7-22. Comparator Cable Filter Wiring Diagram

TRANSFORMER DATA FOR T801

WINDING	TERMINALS	VOLTAGE 60 CPS	CURRENT AMPERES	RESISTANCE OHMS	
				CTC TRANSFORMER	UTC TRANSFORMER
Primary	1–2	105*	0.65		
	1–3	115*	0.6		
	1–4	125*	0.55	7.2	5.86
Secondary	6–7	6.3 CT	6.	0.099	0.068
Secondary	8–10	400 CT	0.07	347	204
Secondary	9–11	625	0.002		
Secondary	11–12	1.5	0.3	0.13	0.293
Secondary	13–14	6.3	0.6	0.805	0.346
Secondary	9–5	35	—		

* Applied through power line filter.

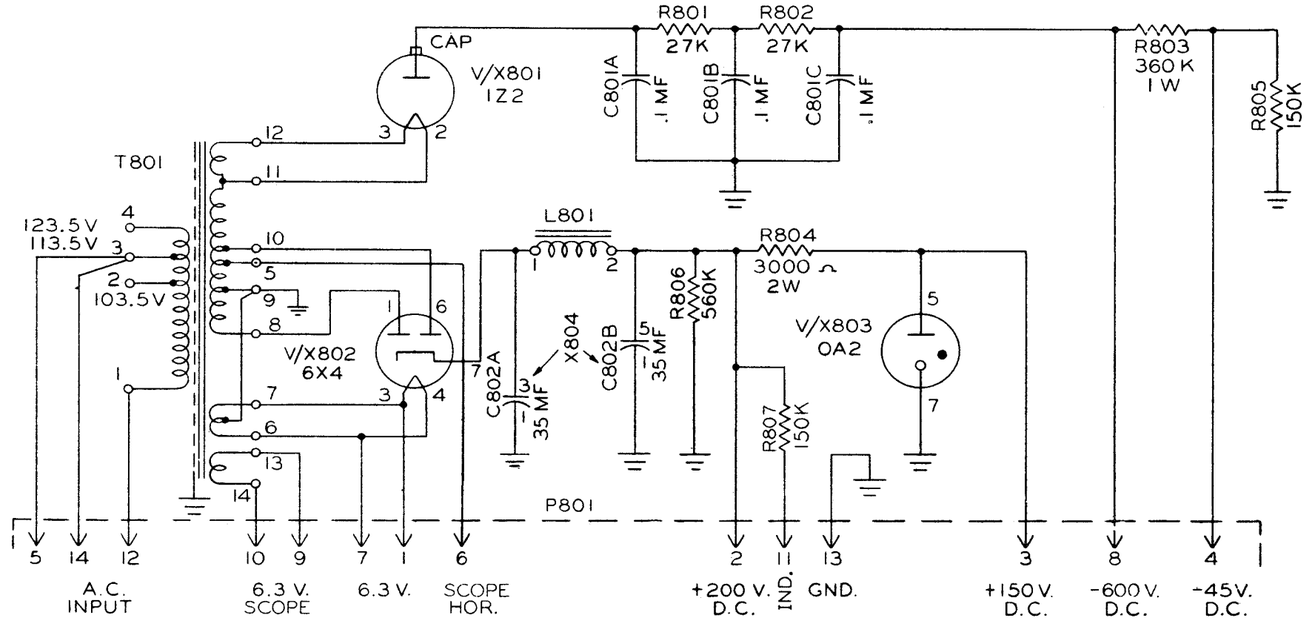
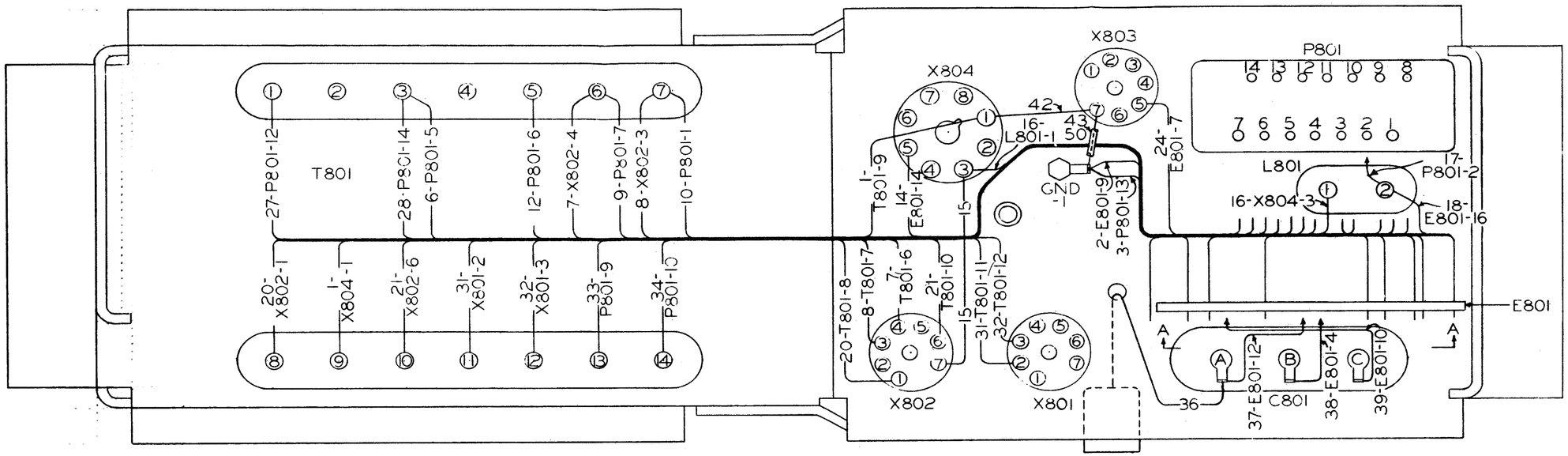
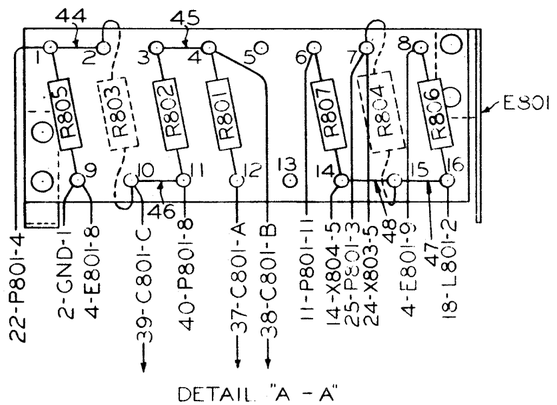


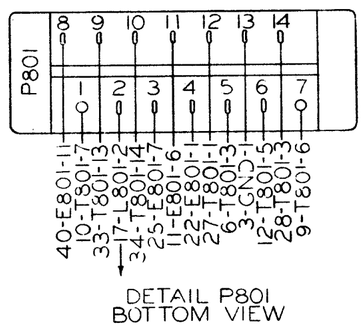
Figure 7–23. Frequency Shift Converter Power Supply Schematic Diagram



WIRE TABLE	
WIRE NO.	DESCRIPTION
1 TO 4	WIRE-BLACK
6 TO 8	WIRE-BROWN
11 — 12	WIRE-WHITE
14 TO 18	WIRE-RED
20 TO 22	WIRE-RED/YELLOW TR.
24 TO 25	WIRE-RED/GREEN TR.
27-28	WIRE-GRAY
	WIRE-BROWN
31 TO 34	WIRE-WHT/GREEN TR.
36 TO 40	WIRE-RED/BLACK TR.
42 TO 48	WIRE-BUSS .032 DIA.
50	EXT. TUBING
9 — 10	WIRE-BROWN



DETAIL "A - A"



DETAIL P801
BOTTOM VIEW

CODING AT ENDS OF WIRES INDICATES WIRE NUMBER AND DESTINATION OF WIRE THUS, 32-X801-3, 32=WIRE NO., X801=SOCKET X801 AND 3=TERMINAL 3 OF X803 AS INDICATED ON THIS DRAWING.

Figure 7-24. Frequency Shift Converter Power Supply Wiring Diagram

TRANSFORMER DATA FOR T1001

WINDING	TERMINALS	VOLTAGE 60 CPS	CURRENT AMPERES	RESISTANCE OHMS	
				CTC TRANSFORMER	UTC TRANSFORMER
	1–2	105*	0.51		
Primary	1–3	115*	0.55		
	1–4	125*	0.61	6.4	6.0
Secondary	5–6	1.5	0.3	0.14	0.305
Secondary	6–8	400 CT	0.07	166	147.5
Secondary	9–10	6.3 CT	6.	0.04	0.066

* Applied through power line filter.

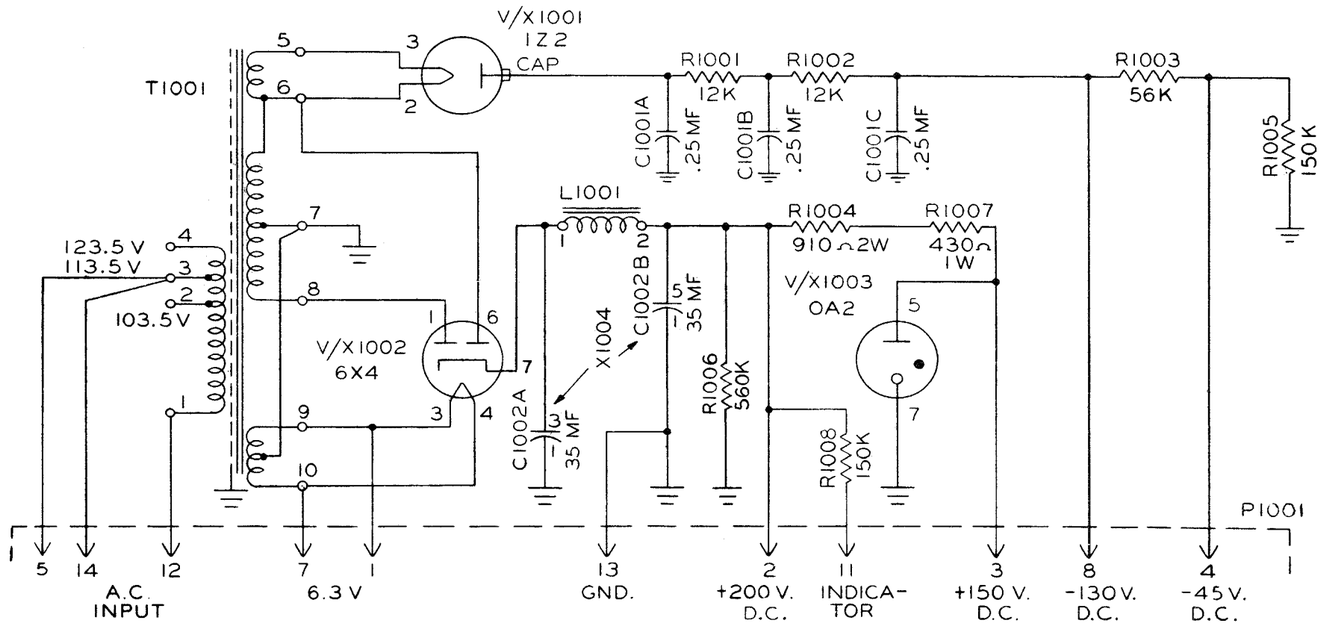
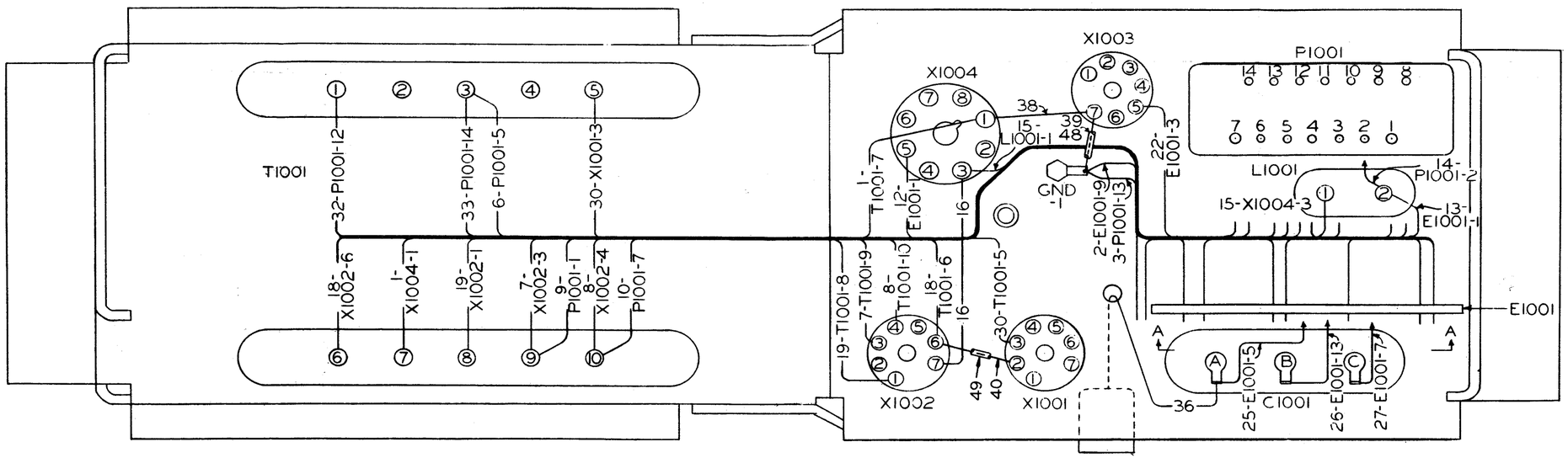
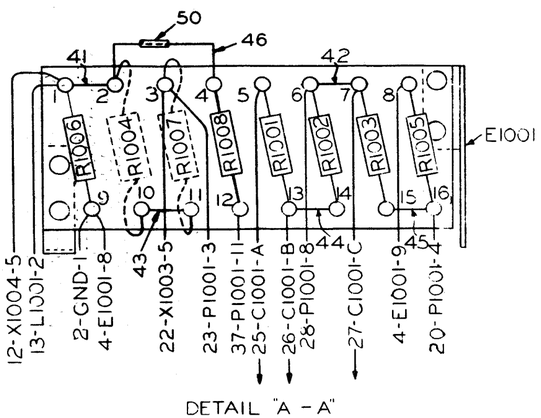


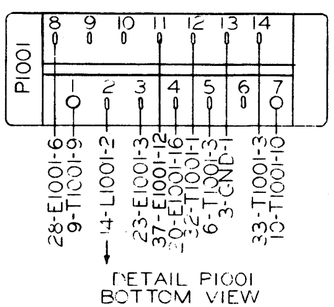
Figure 7–25. Comparator Power Supply Schematic Diagram



WIRE TABLE	
WIRE NO.	DESCRIPTION
1 TO 4	WIRE-BLACK
6 TO 8	WIRE-BROWN
12 TO 16	WIRE-RED
18 TO 20	WIRE-RED/YELLOW TR.
22 TO 23	WIRE-RED/GREEN TR.
25 TO 28	WIRE-RED/BLACK TR.
30	WIRE-GREEN/YELLOW TR.
32-33	WIRE-GRAY
	WIRE-BROWN
36	WIRE-RED
38 TO 46	WIRE-BUSS .032 DIA.
48 TO 50	EXT. TUBING
9—10	WIRE BROWN
37	WIRE WHITE



DETAIL "A - A"



DETAIL P1001
BOTTOM VIEW

CODING AT ENDS OF WIRES INDICATES WIRE NUMBER AND DESTINATION OF WIRE. THUS, 30-X1001-3, 30=WIRE NO., X1001=SOCKET X1001 AND 3=TERMINAL 3 OF X1001 AS INDICATED ON THIS DRAWING.

Figure 7-26. Comparator Power Supply Wiring Diagram

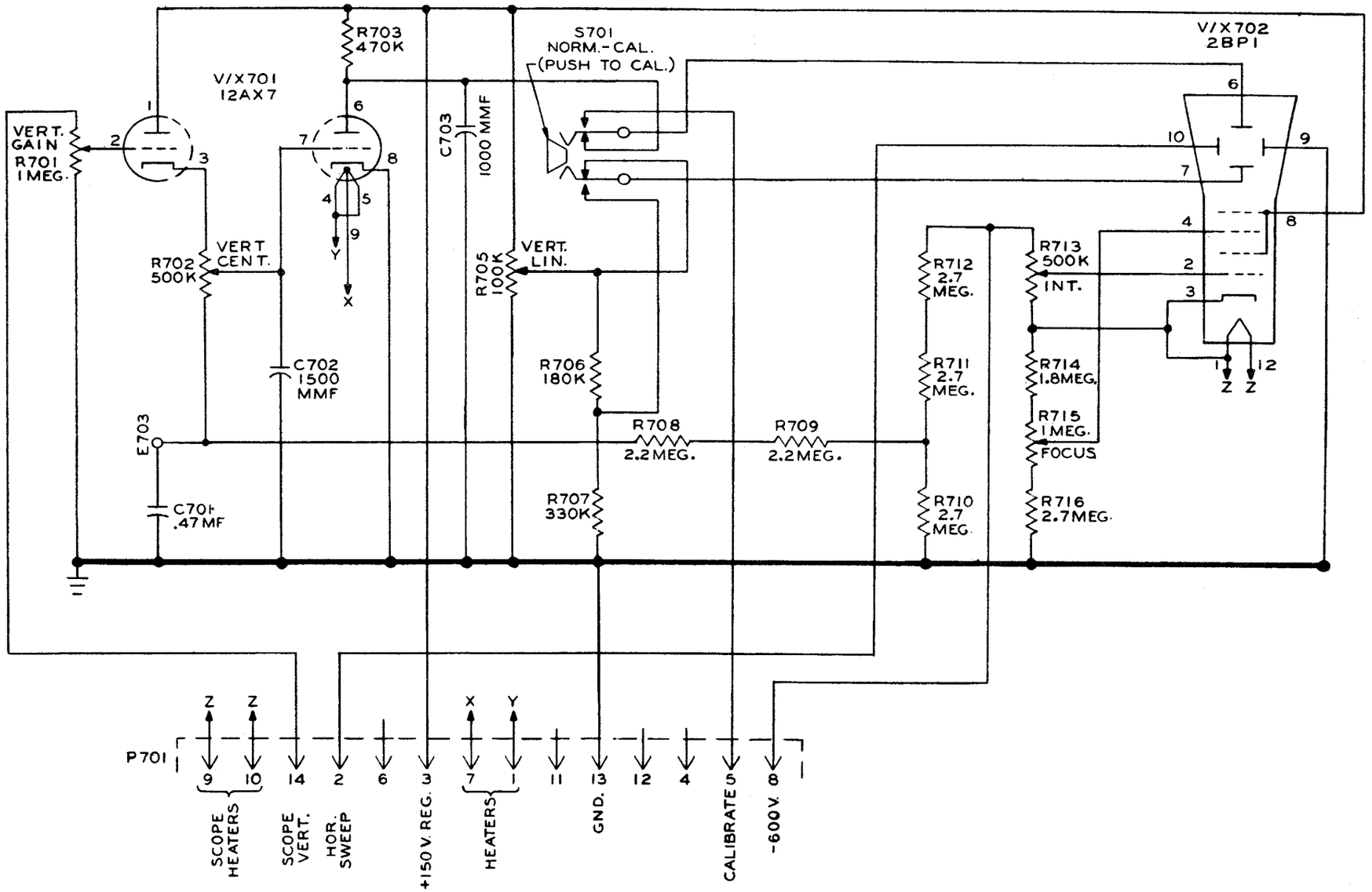
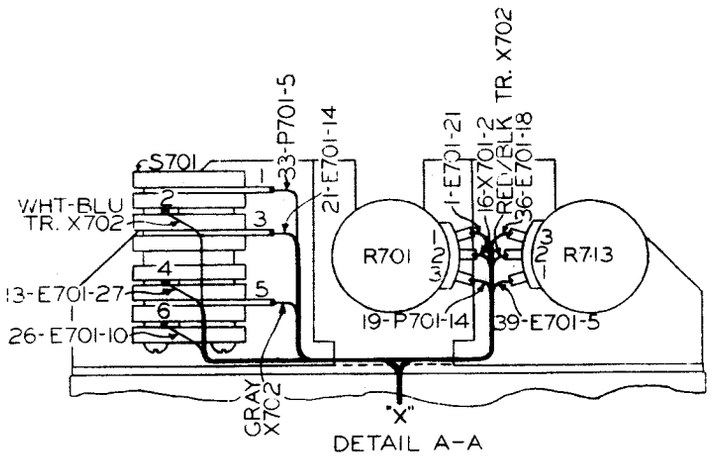
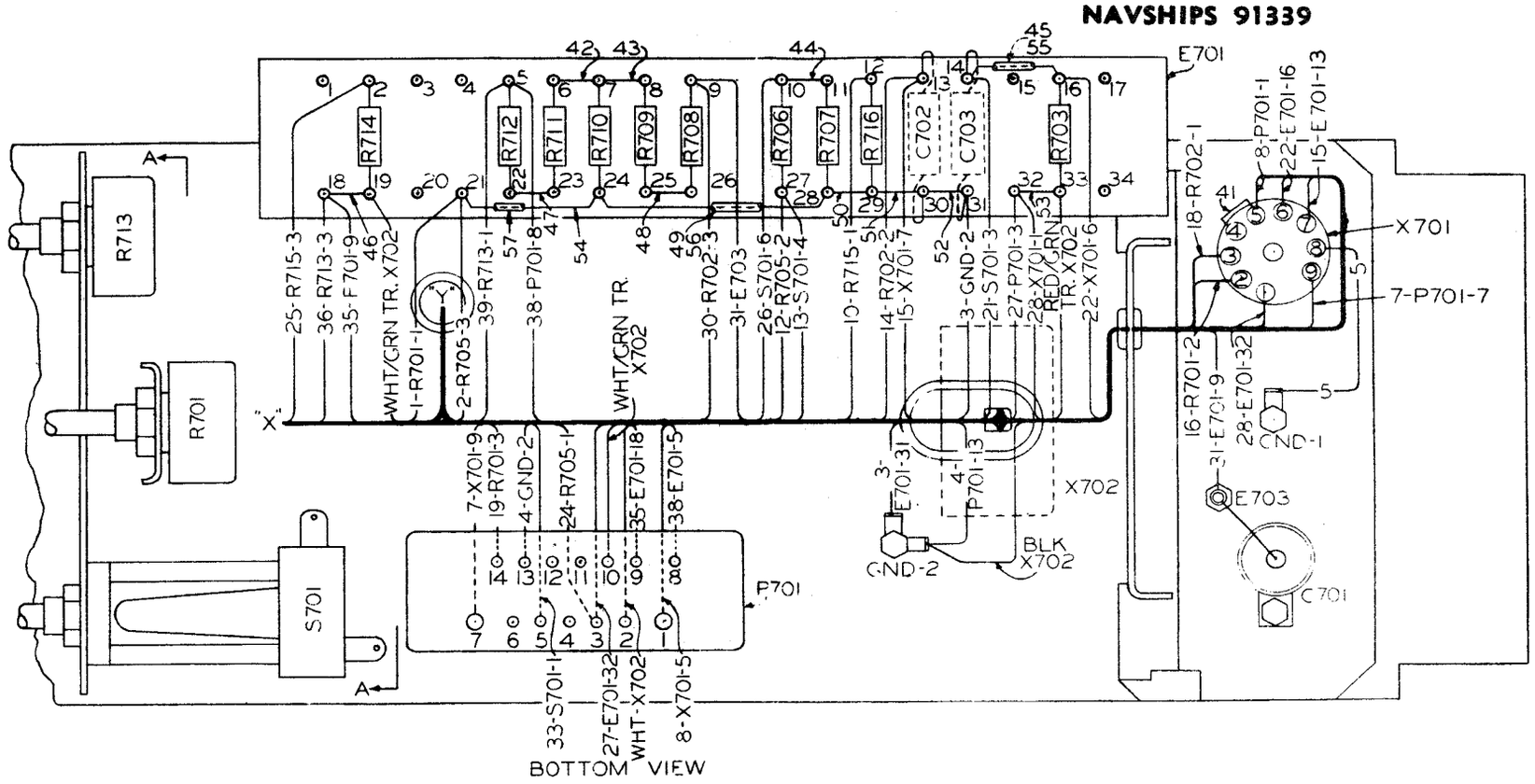


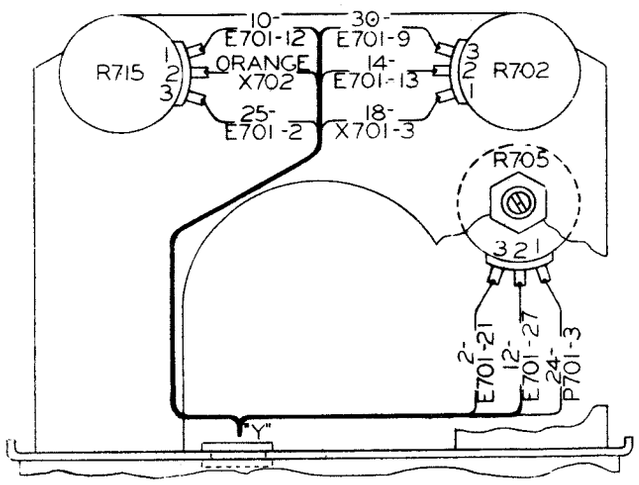
Figure 7-27. Tuning Monitor Schematic Diagram



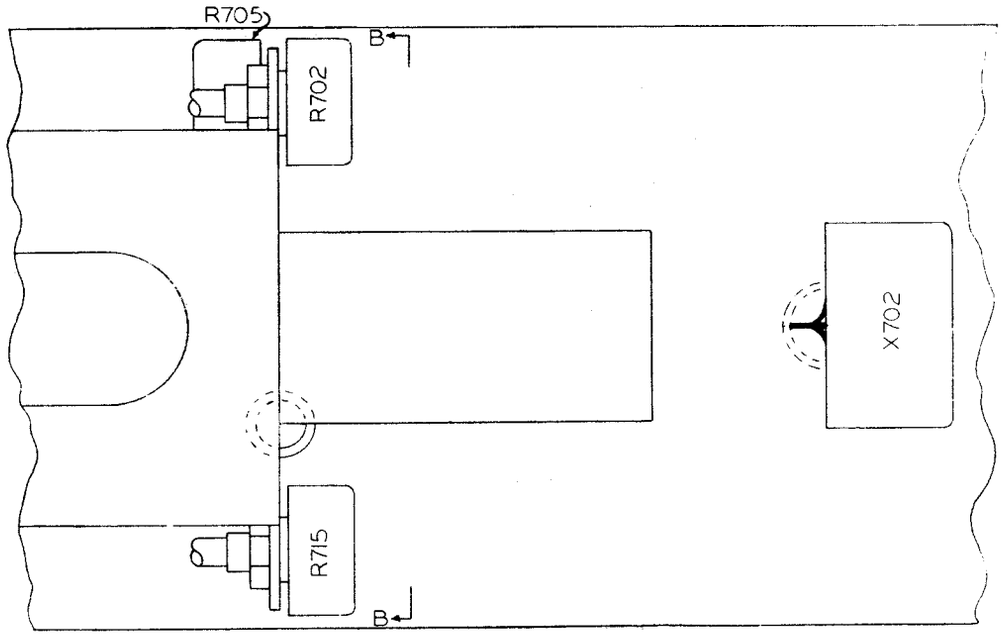
DETAIL A-A



BOTTOM VIEW



DETAIL B-B

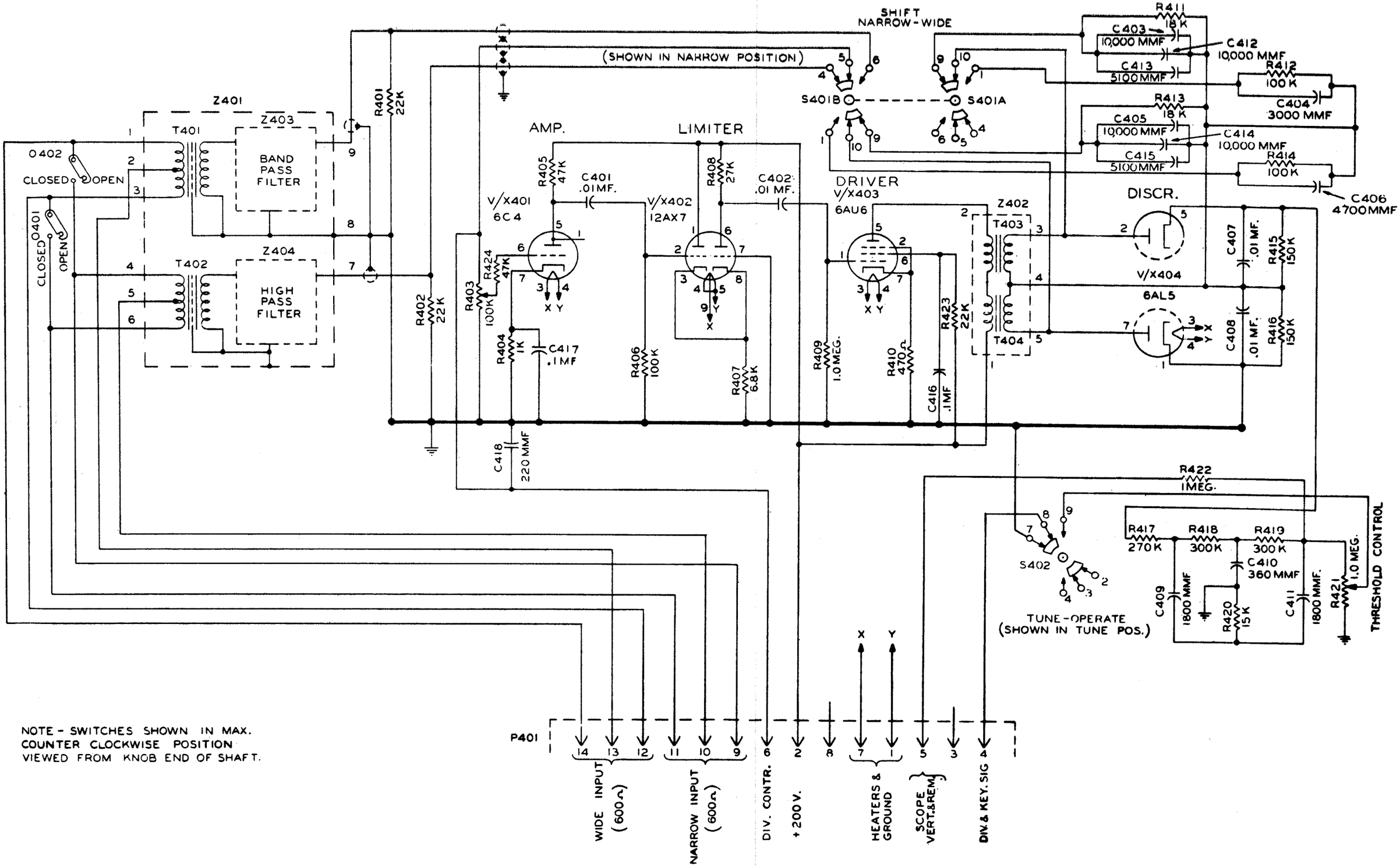


TOP VIEW

WIRE TABLE	
WIRE NO.	DESCRIPTION
1 TO 5	WIRE-BLACK
7 TO 8	WIRE-BROWN
10	WIRE-WHITE
12 TO 16	WIRE-GREEN
18 TO 19	WIRE-YELLOW
21 TO 22	WIRE-BLUE
24 TO 28	WIRE-RED/GREEN TR.
30 TO 31	WIRE-WHT/BLUE TR.
33	WIRE-WHT/BLACK TR.
35 TO 36	WIRE-WHT/GRN TR.
38 TO 39	WIRE-RED/BLACK TR.
41 TO 54	WIRE-BUSS .032 DIA.
55 TO 57	EXT. TUBING

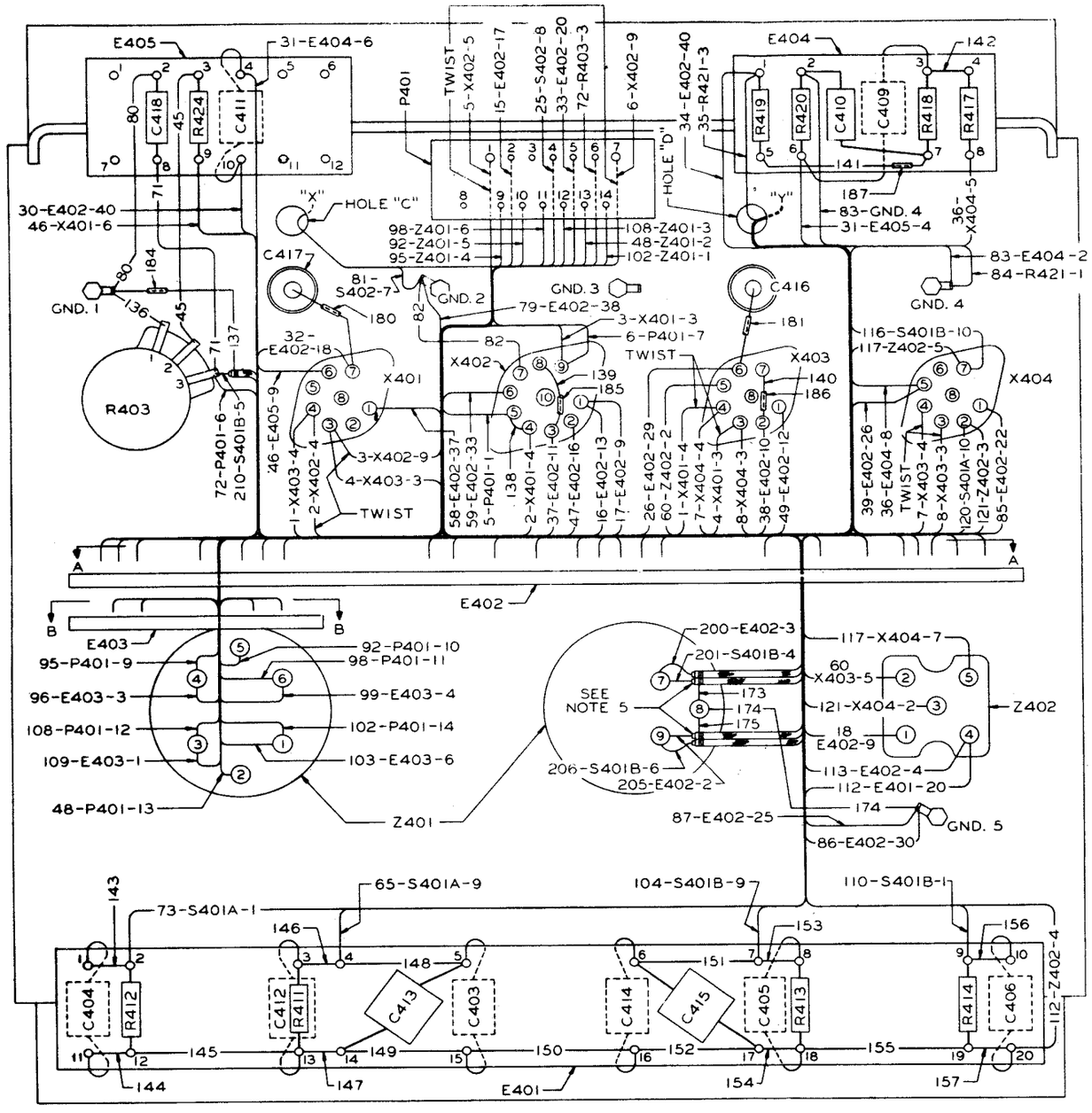
CODING AT ENDS OF WIRES INDICATES WIRE NUMBER AND DESTINATION OF WIRE THUS; 28-X701-1, 28 = WIRE NO., X701 = SOCKET X701 AND 1 = TERMINAL 1 OF X701 AS INDICATED ON THIS DRAWING.

Figure 7-28. Tuning Monitor Wiring Diagram

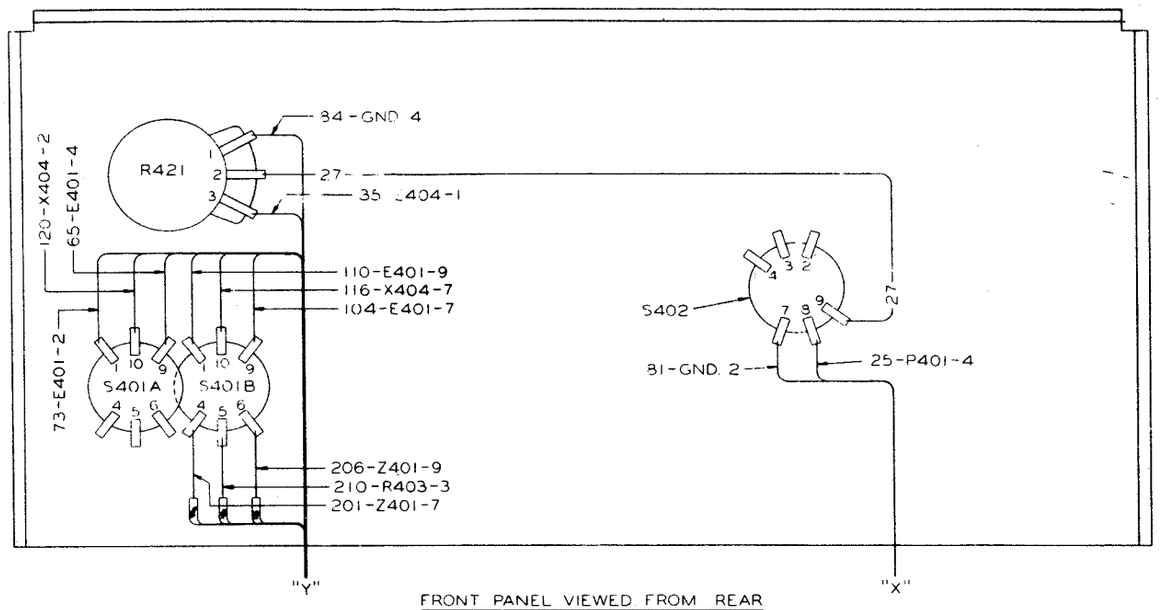


NOTE - SWITCHES SHOWN IN MAX. COUNTER CLOCKWISE POSITION VIEWED FROM KNOB END OF SHAFT.

Figure 7-29. Audio Input Unit Schematic Diagram

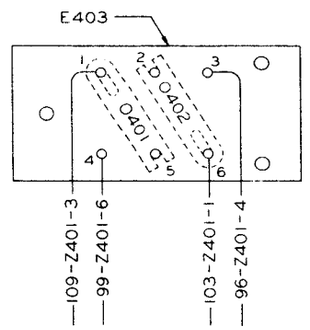


BOTTOM VIEW



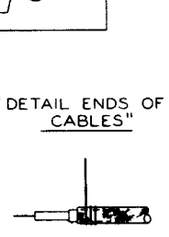
FRONT PANEL VIEWED FROM REAR

WIRE TABLE	
WIRE NO.	DESCRIPTION
1-8 INCL.	BROWN
15-18	RED
25-27	ORANGE
30-39	YELLOW
45-49	GREEN
58-60	BLUE
65	GRAY
71-73	WHITE
79-87 INCL.	BLACK
92	RED/BLK. TR.
95-96	RED/YEL. TR.
98-99	RED/GRN. TR.
102-104 INCL.	GRN./BLK. TR.
108-110 INCL.	GRN./YEL. TR.
112-113	WHT./BLK. TR.
116-117	WHT./GRN. TR.
120-121	WHT./BLUE TR.
136-175 INCL.	TINNED COPPER WIRE .020 DIA.
180-181	EXTRUDED TUBING BLK.
184-192 INCL.	EXTRUDED TUBING BLK.
200-201	CABLE SPEC. (RED)
205-206	CABLE SPEC. (GREEN)
210	CABLE SPEC. (WHITE)



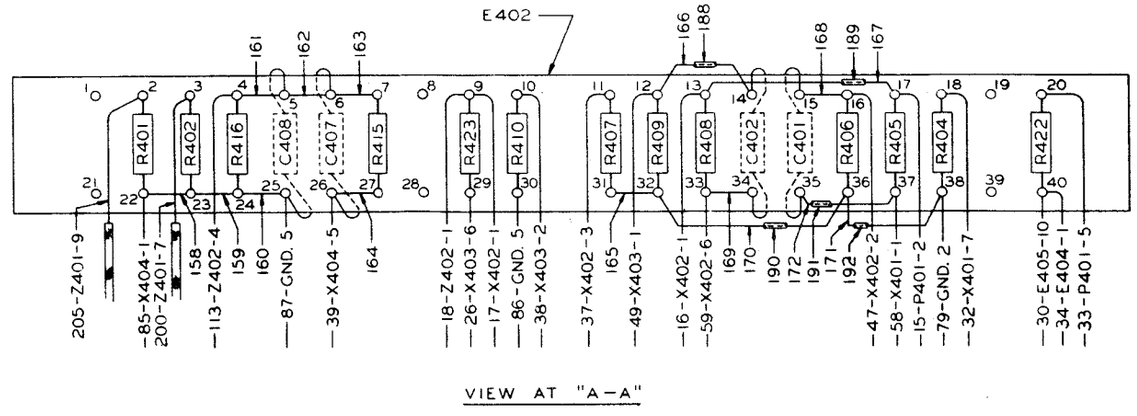
VIEW AT "B-B"

"DETAIL ENDS OF CABLES"



NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATES WIRE NUMBER & DESTINATION OF WIRE THUS; 65-E401-4, 65=WIRE NUMBER, E401= TERMINAL BOARD E401, AND 4 = TERMINAL 4 OF E401 AS INDICATED ON THIS DRAWING.

ASSEMBLE ENDS OF SHIELDED LEADS AS PER "DETAIL ENDS OF CABLES" FOR TWO LEADS ASSEMBLE IN A SIMILAR MANNER.



VIEW AT "A-A"

Figure 7–30. Audio Input Unit Wiring Diagram

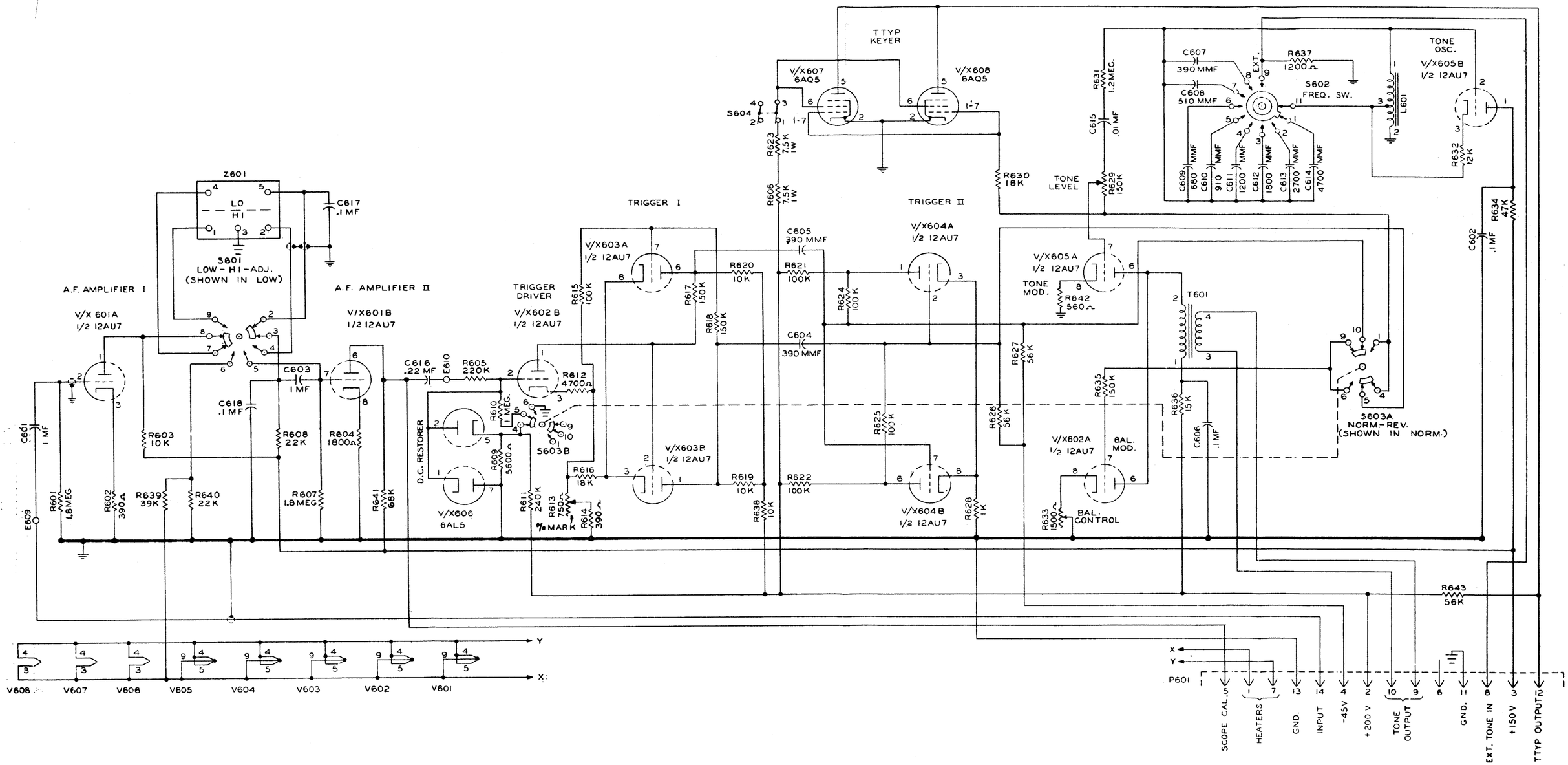
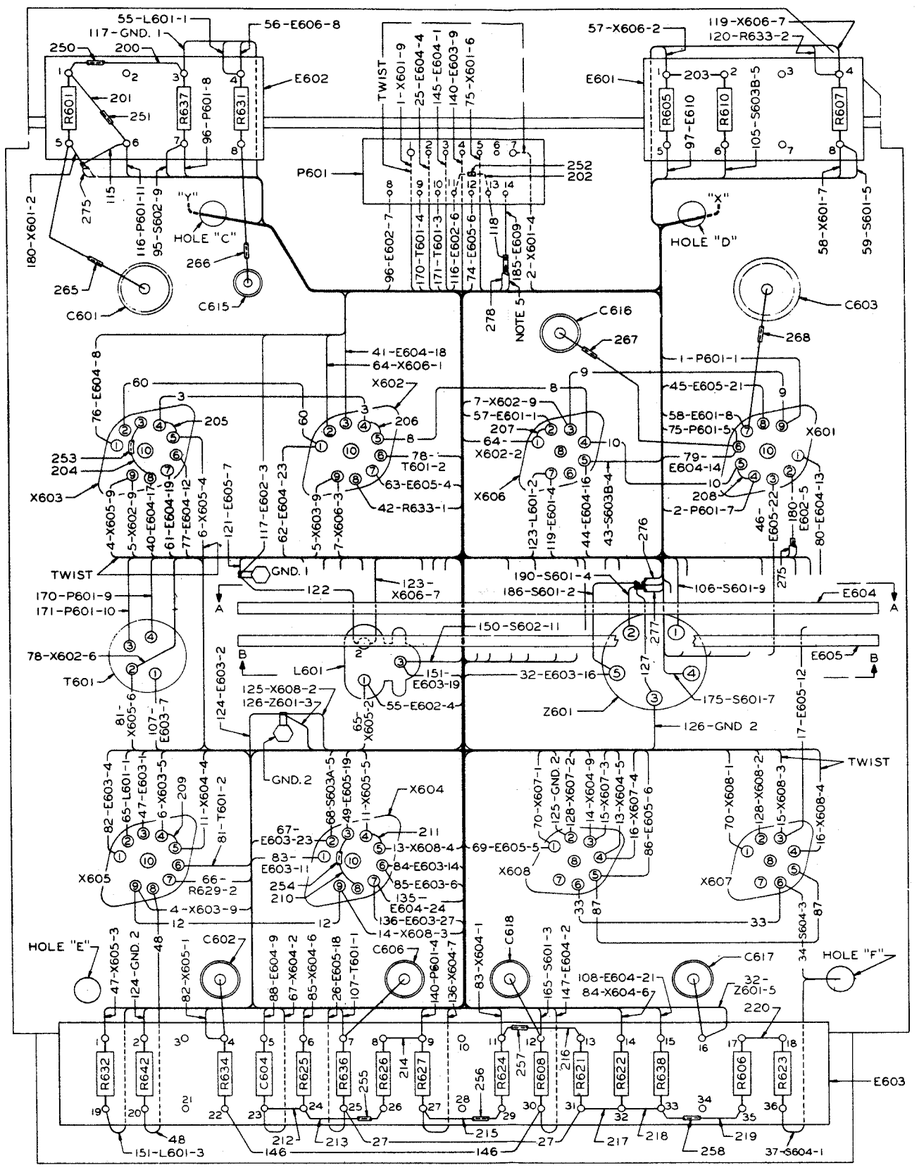
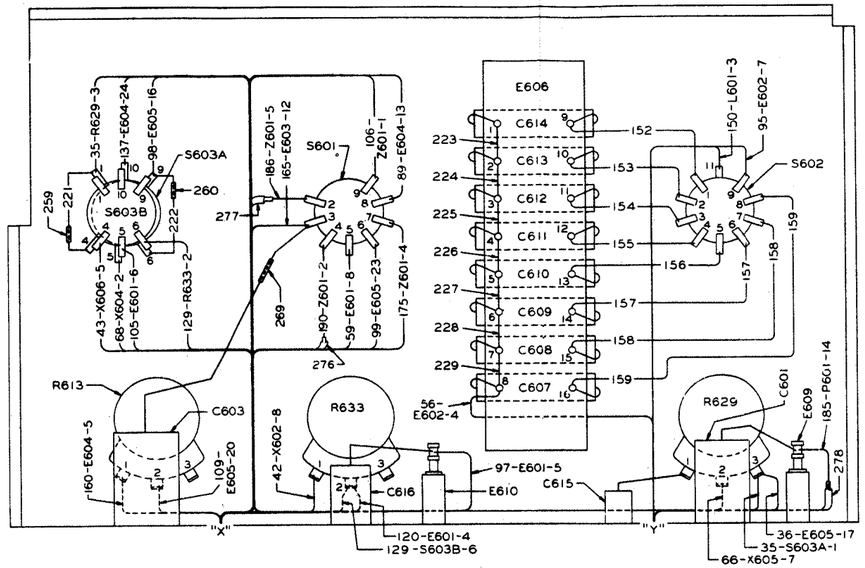
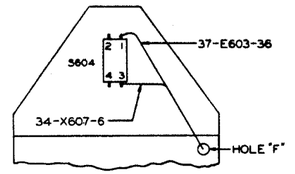


Figure 7–31. Keyer Unit Schematic Diagram

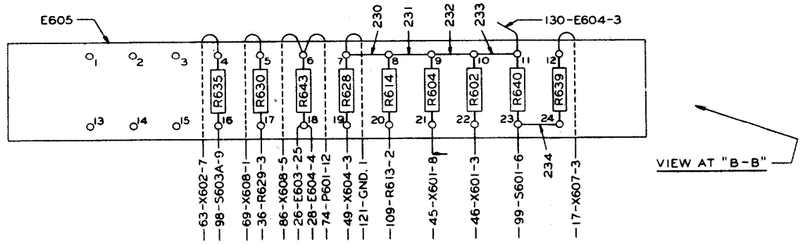


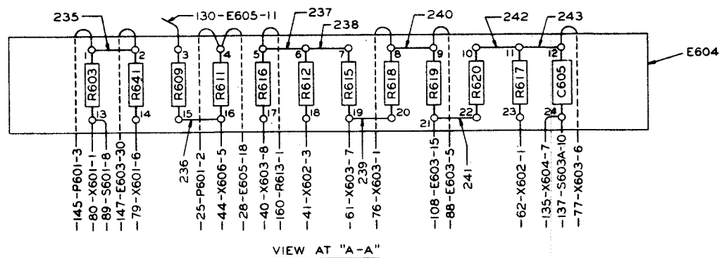


WIRE TABLE	
WIRE NO.	DESCRIPTION
1-17 INCL.	BROWN
25-28	RED
32-37	ORANGE
40-49	YELLOW
55-70	GREEN
74-89	BLUE
95-99	GRAY
105-109	WHITE
115-130	BLACK
135-137	RED/BLACK TR.
140	RED/YELLOW TR.
145-147	RED/GREEN TR.
150-160 INCL.	GREEN/YELLOW TR.
165	GREEN/BLACK TR.
170-171	WHITE/GREEN TR.
175	WHITE/BLUE TR.
180	CABLE SPEC. (GREEN)
185-186	CABLE SPEC. (ORANGE)
190	CABLE SPEC. (BLUE)
200-243 INCL.	TINNED COPPER WIRE .020 DIA.
250-260 INCL.	EXTRUDED TUBING BLK.
265-269 INCL.	EXTRUDED TUBING BLK.
275-278 INCL.	EXTRUDED TUBING BLK.



REAR PANEL VIEWED FROM FRONT





NUMBERS IN WIRES REFER TO WIRE TABLE. CODING AT ENDS OF WIRES INDICATES WIRE NUMBER & DESTINATION OF WIRE THUS; 86-E605-6, 86=WIRE NUMBER, E605=TERMINAL BOARD E605, AND 6=TERMINAL 6 OF E605 AS INDICATED ON THIS DRAWING.

ASSEMBLE ENDS OF SHIELDED LEADS AS PER "DETAIL ENDS OF CABLES." FOR TWO LEADS ASSEMBLE IN SIMILAR MANNER.

"DETAIL ENDS OF CABLES"

Figure 7-32. Keyer Unit Wiring Diagram

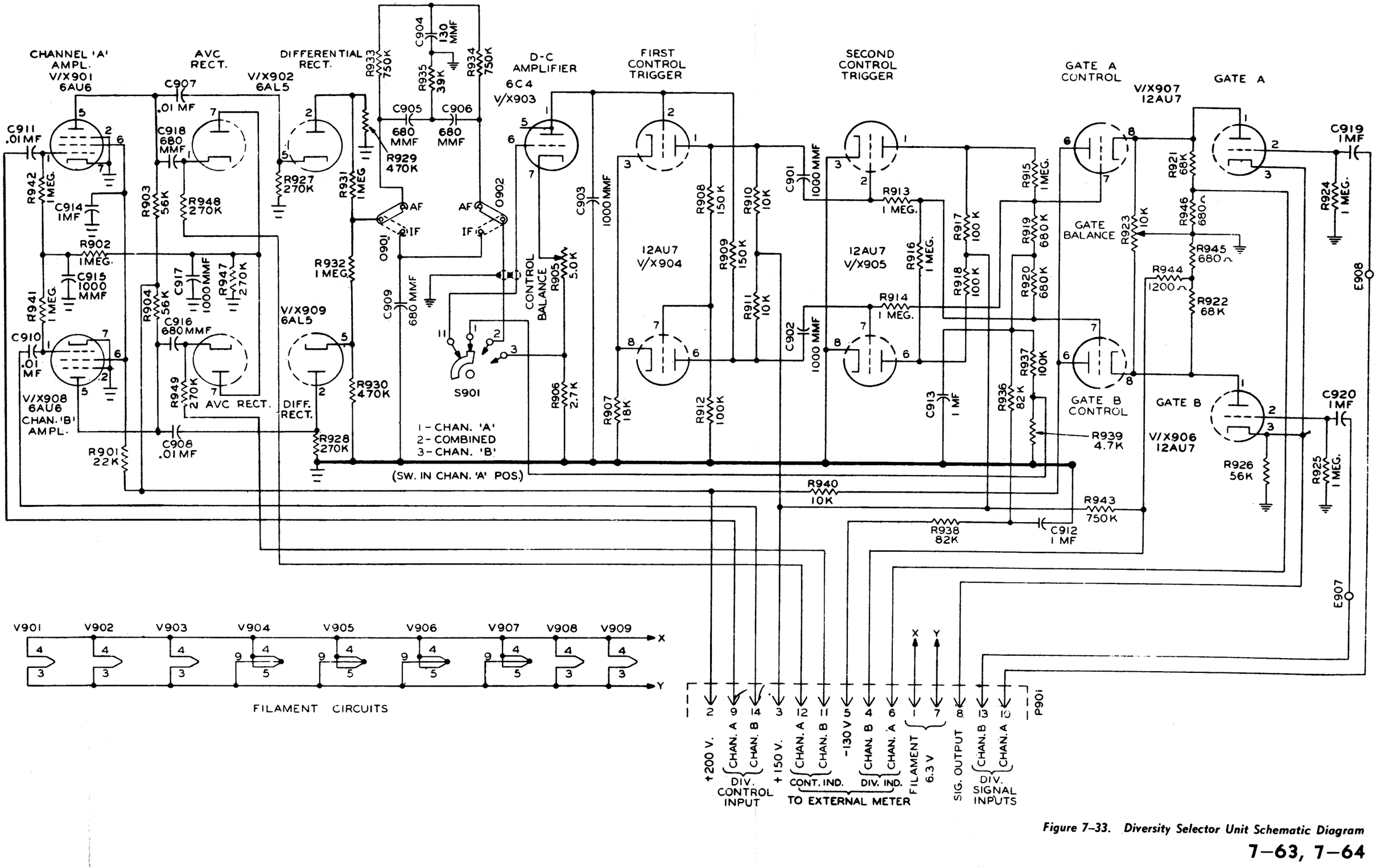
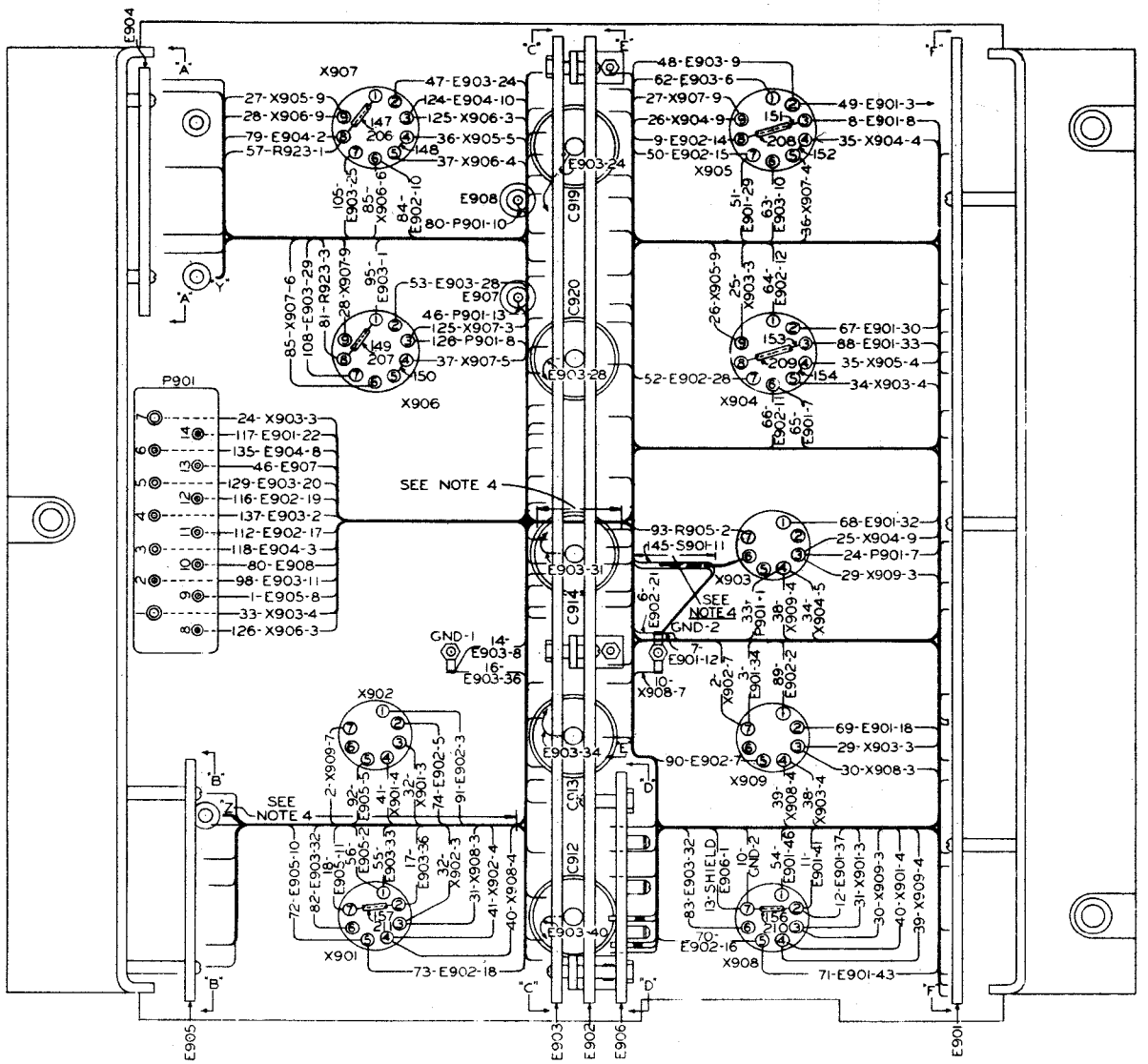
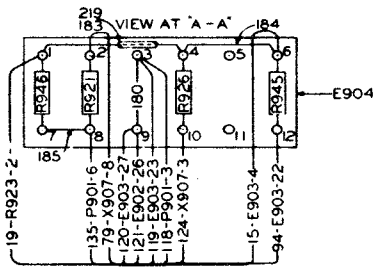
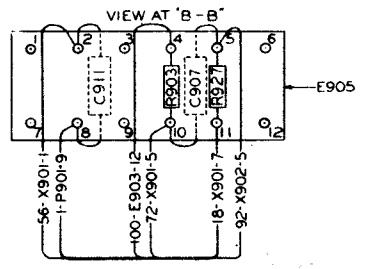


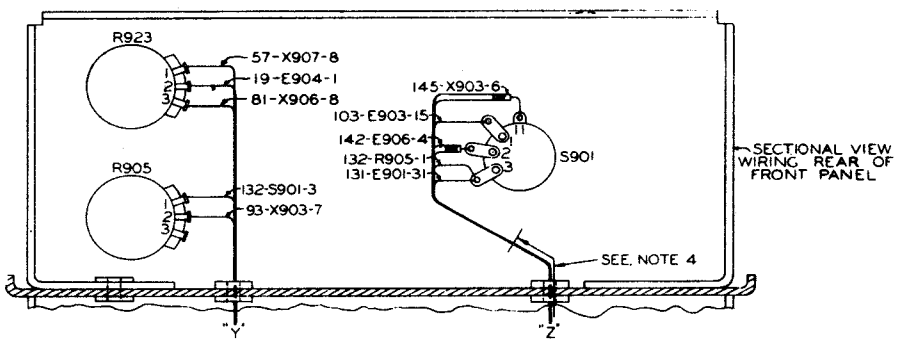
Figure 7–33. Diversity Selector Unit Schematic Diagram

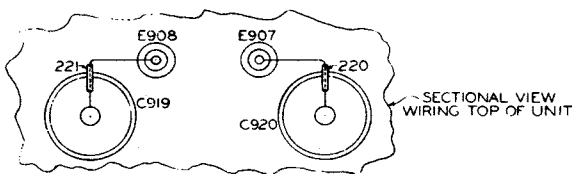
WIRE TABLE	
WIRE NO.	DESCRIPTION
1 TO 3	WIRE-WHITE
6 TO 19	WIRE-BLACK
24 TO 41	WIRE-BROWN
46 TO 58	WIRE-GREEN
62 TO 75	WIRE-BLUE
79 TO 85	WIRE-ORANGE
88 TO 95	WIRE-YELLOW
98 TO 101	WIRE-RED
103	WIRE-GRAY
105 TO 112	WIRE-WHT-BLUE TR.
116	WIRE-WHT-GREEN TR.
117	WIRE-WHT-BLACK TR.
118 TO 121	WIRE-RED-GREEN TR.
124 TO 126	WIRE-RED-YELLOW TR.
129 TO 132	WIRE-RED-BLACK TR.
135	WIRE-GRN-BLACK TR.
137 TO 139	WIRE-GRN-YELLOW TR.
142 TO 143	CABLE SPECS.
145	CABLE SPECS.
147 TO 199	WIRE-BUSS .020 DIA.
206 TO 219	EXT. TUBING .027 I.D. BK.
220 TO 221	EXT. TUBING .034 I.D. BK.

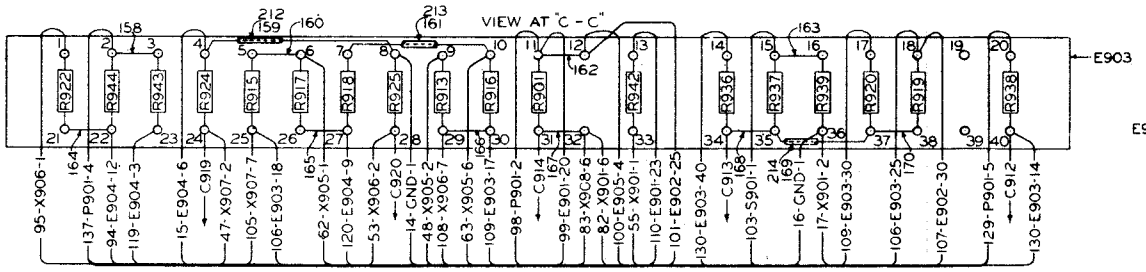


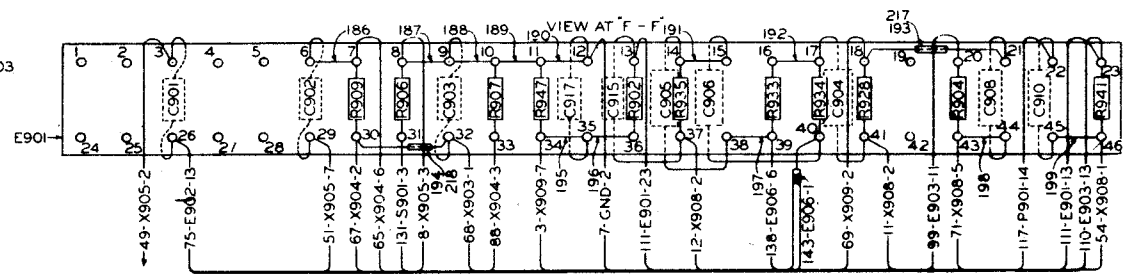


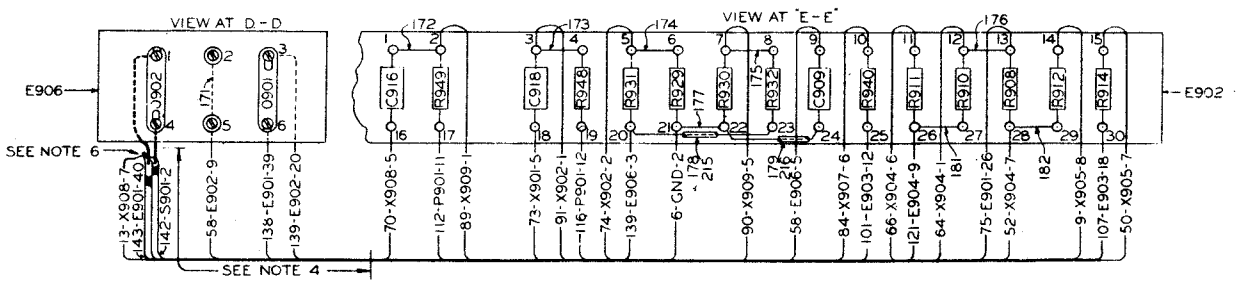












CODING AT ENDS OF WIRES INDICATES WIRE NUMBER AND DESTINATION OF WIRE THUS: 51-E901-29, 51=WIRE NO., E901=TERMINAL BOARD E901 AND 29=TERMINAL 29 OF E901 AS INDICATED ON THIS DRAWING.

Figure 7–34. Diversity Selector Unit Wiring Diagram

TABLE 8–1. WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARE PARTS						TENDER SPARE PARTS						STOCK SPARE PARTS					
SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME CU. FT.	WEIGHT	SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME CU. FT.	WEIGHT	SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME CU. FT.	WEIGHT
	HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH		
CV-60/URR	6	12	12	0.5	23	NONE SUPPLIED						SUPPLIED AS ITEMS OF A KIND IN BULK					
AN/URA-8	6	12	12	0.5	24												

CV-60/URR box is labeled MI-16295 and AN/URA-8 box is labeled MI-16296.

TABLE 8–2. SHIPPING WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES							TENDER SPARES							STOCK SPARES						
SHIPPING BOX NUMBER	SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME	WEIGHT	SHIPPING BOX NUMBER	SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME	WEIGHT	SHIPPING BOX NUMBER	SPARE PARTS BOX	OVERALL DIMENSIONS, IN.			VOLUME	WEIGHT
		HEIGHT	WIDTH	DEPTH					HEIGHT	WIDTH	DEPTH					HEIGHT	WIDTH	DEPTH		
1 of 1	CV-60/URR	8.5	16.75	16.5	1.4	39	NONE SUPPLIED							SUPPLIED AS ITEMS OF A KIND IN BULK						
1 of 1	AN/URA-8	8.5	16.75	16.5	1.4	40														

CV-60/URR box is labeled MI-16295 and AN/URA-8 box is labeled MI-16296.

TABLE 8–3. LIST OF MAJOR UNITS

SYMBOL GROUP	NAME OF MAJOR UNIT	NAVY TYPE DESIGNATION	STANDARD NAVY STOCK No.
1500	Frequency Shift Converter	CV-60/URR	F16-C-90906-3001
1600	Comparator	CM-14/URR	F16-C-83571-1005
	Frequency Shift Converter-Comparator Group (Consists of two CV-60/URR and one CM-14/URR units)	AN/URA-8	F16-C-83659-1001

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS							
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL			
									EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
B-1201	MOTOR, AC: capacitor-start induction type; 1/2000 hp approx, 3000 rpm w/ 0.5 mf capacitor; closed frame; ambient temp, power-off −20 to +55° C, power-on 0 to +65°C; plain shaft w/ ¼″ x 45 deg chamfer on end; 1½″ lg x 1⅝″ wd x 2″ h excluding term o/a w/ shaft 0.124″ +0.000″ −0.001″ diam x ¾″ lg protruding from one side of frame; 115 v, 60 cyc, single phase, 8 w max; mtd by two #6-32 tapped holes on 1″ ctr on shaft end of frame; ball bearings; marked w/ NT # prefixed by mfr's ltr and RCA part/dwg #, continuous duty; run any position; all metal parts corrosion resistant to 200 hr salt spray drives a 2¼″ diam fan	Ventilator Fan		N17-M-54301-8001	1567 Type AC-470-B	B-454892-1	B-1201, B-1301	1		1		2	3		1		2
B-1301	Same as B-1201	Ventilator Fan															
C-401	CAPACITOR, FIXED: miniature, paper; single sect; 10,000 mmf p/m 10%; 400 vdcw; HS metal case; ⅞″ lg x 1¾″ diam; castor oil impr; 2 axial wire leads; no int gnd connections; marked w/ cap, tol, working v, and NT # when assigned	Coupler to Grid of Limiter V-402		N16-C-42733-5951	216 Type 20M	A-8890699-48	C-401, C-402, C-407, C-408, C-907, C-908, C-910, C-911	4		2		0	12		4		0
C-402	Same as C-401	Coupler to Grid of Driver V-403															
C-403	CAPACITOR, FIXED: mica; 10,000 mmf p/m 2%; 300 vdcw; temp coef ltr C; 1⅛″ lg x 41/64″ wd x 11/64″ thk, less leads; molded bakelite case, 2 axial wire leads; color coded; spec JAN-C-5	Seed Tuning Capacitor of T-403	CM40C103G	N16-C-33612-3634		P-722038-563	C-403, C-405, C-412, C-414	4		0		0	8		0		0
C-404	CAPACITOR, FIXED: mica dielectric; 3000 mmf p/m 2%; 500 vdcw; temp coef ltr C; case 53/64″ lg x 53/64″ wd x 9/32″ thk less leads; molded phenolic case; 2 axial wire leads; color coded; spec JAN-C-5	Seed Tuning Capacitor of T-403	CM30C302G	N16-C-32188-1009		P-722020-570	C-404	1		0		0	2		0		0
C-405	Same as C-403	Seed Tuning Capacitor of T-403															
C-406	CAPACITOR, FIXED: mica; 4700 mmf p/m 2%; 500 vdcw; temp coef ltr C; 53/64″ lg x 53/64″ wd x 11/32″ thk less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Seed Tuning Capacitor of T-403	CM35C472G	N16-C-32636-4583		P-722029-555	C-406	1		0		0	2		0		0
C-407	Same as C-401	Cathode Bypass of Discr V-404															
C-408	Same as C-401	Cathode Bypass of Discr V-404															
C-409	CAPACITOR, FIXED: mica dielectric; 1800 mmf p/m 5%; 500 vdcw; temp coef ltr C; 53/64″ lg x 53/64″ wd x 9/32″ thk less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Output Filter of Discr V-404	CM30C182J	N16-C-31665-6489		P-722020-515	C-409, C-411	2		0		0	4		0		0
C-410	CAPACITOR, FIXED: mica; 360 mmf p/m 5%; 500 vdcw; temp coef ltr C; 53/64″ lg x 15/32″ wd x 7/32″ thk less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Output Filter of Discr V-404	CM20C361J	N16-C-29819-2401		P-722004-536	C-410	1		0		0	2		0		0
C-411	Same as C-409	Output Filter of Discr V-404															
C-412	Same as C-403	Seed Tuning Capacitor of T-403															

C-413	CAPACITOR, FIXED: mica; 5100 mmf p/m 2%; 500 vdcw; temp coef ltr C; 53/64" lg x 53/64" wd x 13/32" thk less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Secd Tuning Capacitor of T-403	CM35C512G	N16-C-32715-6053		P-722029-556	C-413, C-415	2	0	0	4	0	0
C-414	Same as C-403	Secd Tuning Capacitor of T-403											
C-415	Same as C-413	Secd Tuning Capacitor of T-403											
C-416	CAPACITOR, FIXED: paper; single sect; 100,000 mmf +30% −20%; 200 vdcw; HS metal case; 13/16" lg x 13/32" diam less leads; vitamin Q impr; 1 axial wire lead; int gnd; mts by single 0.120" diam hole in mtg bkt located near end opposite to lead; marked w/ cap, tol, rated working v, and mfr name	Screen Bypass of Driver V-403		N16-C-45814-8985	1	B-454030-10	C-416, C-417	2	1	0	4	2	0
C-417	Same as C-416	Cathode Bypass of Amplr V-401											
C-418	CAPACITOR, FIXED: ceramic dielectric; 220 mmf p/m 20%; var temp coef; 300 vdcw; case 1/2" lg x 1/4" diam less leads; 2 radial wire leads; uninsulated; color coded; oper temp range 85° C; in accordance w/ spec RCA part/dwg #897113	Diversity Control Bypass		N16-C-17731-5200	1682 Type K-1200	K-99372-59	C-418	1	1	0	2	1	0
C-601	CAPACITOR, FIXED: paper dielectric; one sect; 1 mf +20% −10%; 100 vdcw; HS metal can; 1 13/32" max lg x 31/64" max diam, less leads; vitamin Q impr; 2 axial term leads 1 1/2" lg; no int gnd; mts by snap on body bkt having 1 mtg ear w/ 0.120" diam hole; spec JAN-C-25	Grid Coupler of Amplr V-601A		N16-C-48841-9390	1	B-454030-53	C-601	1	1	0	3	2	0
C-602	CAPACITOR, FIXED: paper dielectric; single sect; 100,000 mmf +20% −10%; 200 vdcw; HS metal case; 15/16" lg x 13/32" diam, less leads; vitamin Q impr; 1 axial wire lead; int gnd; mts by single 0.120" diam hole in mtg bkt located near end of body; marked w/ cap, tol, rated working v, and mfr name	Plate Bypass of Osc V-605B		N16-C-45801-8800	1	B-454030-50	C-602, C-606, C-617, C-618	4	2	0	12	3	0
C-603	CAPACITOR, FIXED: paper dielectric; one sect; 1 mf +20% −10%; 200 vdcw; HS metal case; 1 29/32" max lg x 11/16" max diam, less leads; vitamin Q impr; 2 axial term leads 1 1/2" lg; no int gnd; mts by snap on body bkt having 1 mtg ear w/ 0.120" diam hole; spec JAN-C-25	Grid Coupler of Amplr V-601B		N16-C-48841-9487	1	B-454030-54	C-603	1	1	0	3	1	0
C-604	CAPACITOR, FIXED: ceramic; 390 mmf p/m 20%; hi-dielectric constant (does not fall within limits); 300 vdcw; 0.500" lg x 0.250" diam; radial wire leads; ceramic ins; humidity resistant; flash test 1500 v DC; pf 3% from 1 kc to 1 mc; meets RCA part/dwg K-897113-1	Grid Coupler of Trigger V-604A		N16-C-18049-8437	1682 Type 1200	A-99372-65	C-604, C-605	2	1	0	6	2	0
C-605	Same as C-604	Grid Coupler of Trigger V-604B											
C-606	Same as C-602	+B Plate Filter of Mod V-605A											
C-607	CAPACITOR, FIXED: mica dielectric; 390 mmf p/m 2%; 500 vdcw; temp coef ltr D; 51/64" lg x 15/32" wd x 7/32" thk, less leads; molded phenolic case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 1785 Cycles	CM20D391G	N16-C-29893-2126		P-722006-587	C-607	1	0	0	3	0	0
C-608	CAPACITOR, FIXED: mica; 510 mmf p/m 2%; 500 vdcw; temp coef ltr E; 53/64" lg x 53/64" wd x 9/32" d, less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 1615 Cycles	CM30E511G	N16-C-30183-3619		P-722024-552	C-608	1	0	0	3	0	0
C-609	CAPACITOR, FIXED: mica; 680 mmf p/m 2%; 500 vdcw; temp coef ltr E; 53/64" lg x 53/64" wd x 9/32" d, less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 1445 Cycles	CM30E681G	N16-C-30526-2819		P-722024-555	C-609	1	0	0	3	0	0
C-610	CAPACITOR, FIXED: mica; 910 mmf p/m 2%; 500 vdcw; temp coef ltr E; 53/64" lg x 53/64" wd x 9/32" d, less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 1275 Cycles	CM30E911G	N16-C-30921-8819		P-722024-558	C-610	1	0	0	3	0	0
C-611	CAPACITOR, FIXED: mica; 1200 mmf p/m 2%; 500 vdcw; temp coef ltr E; 53/64" lg x 53/64" wd x 9/32" thk, less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 1105 Cycles	CM30E122G	N16-C-31264-8019		P-722024-561	C-611	1	0	0	3	0	0
C-612	CAPACITOR, FIXED: mica; 1800 mmf p/m 2%; 500 vdcw; temp coef ltr E; 53/64" lg x 53/64" wd x 9/32" d, less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 935 Cycles	CM30E182G	N16-C-31660-5019		P-722024-565	C-612	1	0	0	3	0	0

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS								SPARE PARTS							
								CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL		
								EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
C-613	CAPACITOR, FIXED: mica; 2700 mmf p/m 2%; 500 vdcw; temp coef ltr E; 53/64″ lg x 53/64″ wd x 1/2″ d, less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 765 Cycles	CM30E272G	N16-C-32135-3219		P-722024-569	C-613	1		0		0	3		0		0
C-614	CAPACITOR, FIXED: mica; 4700 mmf p/m 2%; 500 vdcw; temp coef ltr E; 53/64″ lg x 53/64″ wd x 11/32″ thk, less leads; molded bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Tunes L-601 to 595 Cycles	CM35E472G	N16-C-32636-4863		P-722033-555	C-614	1		0		0	3		0		0
C-615	CAPACITOR, FIXED: paper dielectric; single sect; 10,000 mmf +20 −10%; 400 vdcw; HS metal case; 3/4″ lg x 15/64″ diam, less mtg; vitamin Q impr; 2 axial wire lead term; no int gnd connections; "C" clamp w/ mtg hole 0.120″ diam on extended fl	Grid Coupler of Osc V-605B		N16-C-42761-8675	1	B-454030-55	C-615	1		1		0	3		1		0
C-616	CAPACITOR, FIXED: paper dielectric; 1 sect; 220,000 mmf +20% −10%; 200 vdcw; HS metal case; 1 13/32″ max lg x 7/16″ max diam, less leads; vitamin Q impr; 2 axial term leads 1 1/2″ lg; no int gnd; mts by snap in body bkt having 1 mtg ear w/ 0.120″ diam hole; spec JAN-C-25	Plate Coupler of Amplr V-601B and Mark Return Timing of V-602B		N16-C-46200-9900	1	B-454030-52	C-616	1		1		0	3		1		0
C-617	Same as C-602	Filter of Z-601															
C-618	Same as C-602	Filter of Z-601															
C-701	CAPACITOR, FIXED: paper dielectric; single sect; 470,000 mmf +30% −20%; 200 vdcw; HS metal case; 1 5/16″ lg x 3/8″ diam, less leads; vitamin Q impr; one axial wire lead; int gnd; mts by single 0.120″ diam hole in mtg bkt located near one end of body opposite lead; marked w/ cap, tol, rated working v, and mfr name	Cathode Filter of Amplr V-701A		N16-C-47148-1001	1	B-454030-7	C-701	1		1		0	2		1		0
C-702	CAPACITOR, FIXED: ceramic dielectric; 1500 mmf p/m 20%; hi-dielectric constant (does not fall within limits); 300 vdcw; 0.812″ lg x 0.250″ diam, less leads; axial wire leads; ins; marked w/ cap value and type # or RMA color coded	Grid Bypass of Amplr V-701B		N16-C-18785-8460	1	A-984005-62	C-702	1		1		0	2		1		0
C-703	CAPACITOR, FIXED: ceramic dielectric; 1000 mmf p/m 20%; hi-dielectric constant (does not fall within limits); 300 vdcw; 0.812″ lg x 0.250″ diam, less leads; axial wire leads; ins; marked w/ cap value and type # or RMA color coded	Plate Bypass of Amplr V-701B		N16-C-18657-8451	1	A-984005-58	C-703, C-901, C-902, C-903, C-915, C-917	1		1		0	7		2		0
C-801	CAPACITOR, FIXED: paper dielectric; 3 sect; 100,000 mmf +20% −10% ea sect; 1000 vdcw; HS metal can; case 1 3/4″ lg x 2 1/8″ h x 41/64″ wd, less term; chlorinated oil impr; 3 solder tab term 3/4″ h on bottom; ea sect has one side int gnd to case; mtg bkt has 2 mtg slots 0.156″ wd on 2 1/8″ mtg/c; spec JAN-C-25	−B Supply Filter	CP69B5FG104V	N16-C-54460-6510		K-984662-337	C-801	1		0		0	2		0		0
C-801A	Part of C-801																
C-801B	Part of C-801																
C-801C	Part of C-801																

C-802	CAPACITOR, FIXED: electrolytic dielectric; 2 sect; 35 mf ea sect; 300 vdcw; oper temp range from −55 deg C to +85 deg C; case 2½″ lg x 1½″ diam, less term; HS metal can; 4 prong type 7/16″ lg term on bottom; has single neg term not gnd to case; octal socket mtd; spec JAN-C-62	+B Supply Filter	CE52F350N	N16-C-21941-1255		P-735714-69	C-802, C-1002	1		0		0	3		0		0
C-802A	Part of C-802																
C-802B	Part of C-802																
C-901	Same as C-703	Grid Coupler of Trigger V-905															
C-902	Same as C-703	Grid Coupler of Trigger V-905															
C-903	Same as C-703	Plate Bypass of Amplr V-903															
C-904	CAPACITOR, FIXED: mica dielectric; 130 mmf p/m 5%; 500 vdcw; temp coef ltr C; case 51/64″ lg x 13/32″ wd x 1/32″ thk, less leads; molded bakelite case; 2 axial wire lead term; color coded; spec JAN-C-5	Output Filter of Differential Rect V-902 and V-909	CM20C131J	N16-C-28816-8201		P-722004-526	C-904	0		0		0	1		0		0
C-905	CAPACITOR, FIXED: mica; 680 mmf p/m 5%; 500 vdcw; temp coef ltr B; case 1 1/16″ max lg x 7/32″ max h x 15/32″ max wd less term; molded low loss bakelite case; 2 axial wire leads; color coded; spec JAN-C-5	Output Filter of Differential Rect V-902 and V-909	CM25B681J	N16-C-30531-4592		P-722009-543	C-905, C-906	0		0		0	2		0		0
C-906	Same as C-905	Output Filter of Differential Rect V-902 and V-909															
C-907	Same as C-401	Cathode Coupler to Differential Rect V-902															
C-908	Same as C-401	Cathode Coupler to Differential Rect V-909															
C-909	CAPACITOR, FIXED: ceramic dielectric; 680 mmf p/m 20%; hi-dielectric constant (does not fall within limits); 300 vdcw; 0.812″ lg x 0.250″ diam, less leads; axial wire leads; ins; marked w/ cap value and type # or RMA color coded	Output Filter of Differential Rect V-902 and V-909		N16-C-18401-8451	1	A-984005-54	C-909, C-916, C-918	0		0		0	3		1		0
C-910	Same as C-401	Grid Coupler of Amplr V-908															
C-911	Same as C-401	Grid Coupler of Amplr V-901															
C-912	CAPACITOR, FIXED: paper dielectric; single sect; 1.0 mf +20% −10%; 200 vdcw; HS metal case; 1 13/16″ lg x 43/64″ diam, less leads; vitamin Q impr; 1 axial wire lead; int gnd; mts by single 0.120″ diam hole in mtg bkt located near 1 end of body opposite lead; marked w/ cap, tol, rated working v, and mfr name	−B Supply Filter		N16-C-48841-9486	1	B-454030-48	C-912, C-913, C-914	0		0		0	3		1		0
C-913	Same as C-912	−B Supply Filter															
C-914	Same as C-912	Screen Bypass of Amplr V-901															
C-915	Same as C-703	AVC Filter															
C-916	Same as C-909	Cathode Coupling to AVC Rect V-909															
C-917	Same as C-703	AVC Filter															
C-918	Same as C-909	Cathode Coupling to AVC Rect V-902															
C-919	CAPACITOR, FIXED: paper dielectric; single sect; 1.0 mf +20% −10%; 200 vdcw; HS metal case; 1 7/8″ lg x 43/64″ diam less leads; vitamin Q impr; 2 axial wire lead; no int gnd; mts by single 0.120″ diam hole in mtg bkt located near 1 end of body; marked w/ cap, tol, rated working v, and mfr name	Grid Coupler of Gate V-907		N16-C-48841-9485	1	B-454030-49	C-919, C-920	0		0		0	2		1		0
C-920	Same as C-919	Grid Coupler of Gate V-906															

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TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS									
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL				
									EQUIP		STOCK			EQUIP		STOCK		
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
C-1001	CAPACITOR, FIXED: paper dielectric; 3 sect; 250,000 mmf +20% −10%; 600 vdcw; HS metal can; case 1¾″ lg x 2⅛″ h x 1¼″ wd less term and mtg; characteristic E; 3 solder tab ¾″ h term on bottom; 1 side ea sect int gnd to case; mts by channel bkt having two 0.156″ diam slots on 2⅛″ mtg/c; spec JAN-C-5	−B Supply Filter	CP69B5FF254V	N16-C-54535-8505		K-984662-333	C-1001	0		0		0	1		0		0
C-1001A	Part of C-1001																	
C-1001B	Part of C-1001																	
C-1001C	Part of C-1001																	
C-1002	Same as C-802	+B Supply Filter																
C-1002A	Part of C-1002																	
C-1002B	Part of C-1002																	
C-1201	CAPACITOR, FIXED: paper dielectric; single sect; 470,000 mmf p/m 20%; 400 vdcw; HS metal case; 1⅞″ lg x 0.670″ diam; vitamin Q impr; 2 axial wire lead term 1⅝″ lg; int gnd; marked w/ cap, tol, working v, and mfr name; oper temp range −55°C to +85°C	Phase Capacitor of Motor B-1201		N16-C-47147-9001	590 Type 91P	P-737816-276	C-1201, C-1301	1		1		0	3		1		0
C-1301	Same as C-1201	Phase Capacitor of Motor B-1301																
E-401	BOARD, TERMINAL: general purpose term board strip; 20 brass, solder dipped term, mtd single and in pairs in 2 rows; no 2 term closer than ¼″ c to c; 1/16″ thk lam phenolic sheet; 5⅞″ lg x 1 1/16″ wd x 1 1/32″ d o/a; seven 0.147″ diam mtg holes; 4 holes on 5½″ x ¾″ mtg/c; 3 holes down ctr of board on 1⅞″ mtg/c; wax impr; one side stenciled w/ 5/32″ std characters; R-414, R-413, R-411, R-412; spec JAN-P-13	Supports Resistors and Capacitors		N17-B-78138-9408	1	P-741611-503	E-401	1		0		0	2		0		0
E-402	BOARD, TERMINAL: general purpose term board strip; 40 brass, solder dipped term; 2 rows, 20 ea; no 2 term closer than ¼″ c to c; 1/16″ thk lam phenolic sheet; 5⅞″ lg x 1 1/16″ wd x 5/16″ d o/a; ten 0.147″ diam mtg holes; 6 mtg holes on 2¾″ x ⅝″ mtg/c; 4 mtg holes down ctr of board on 1″ mtg/c; wax impr; one side stenciled w/ 5/32″ std characters; R-401, R-402, R-416, C-408, C-407, R-415, R-423, R-410, R-407, R-409, R-408, C-402, C-401, R-406, R-405, R-404, R-422; spec JAN-P-13	Supports Resistors and Capacitors		N17-B-78272-5254	1	P-741611-501	E-402	1		0		0	2		0		0
E-403	BOARD, TERMINAL: general purpose term board strip; 6 brass, solder lug term; term spaced 9/32″ c to c in rows, rows spaced 13/32″ apart; 1/16″ thk lam phenolic sheet; 1½″ lg x 1 1/16″ wd x ⅜″ h o/a; 3 mtg holes 0.147″ diam, 2 spaced ⅝″ c to c in one end, other hole in ctr of other end of board; stencilled "C", "O", "C", "O"; board in accordance w/ JAN-P-13	Supports Links O-401, and O-402		N17-B-77734-7955	1	P-741611-519	E-403	1		0		0	2		0		0
E-404	BOARD, TERMINAL: general purpose term board strip; 8 brass solder lug term; term in 4 pairs of 2 ea spaced ¼″ c to c; 1/16″ thk lam phenolic sheet; 1 1/16″ lg x 1 1/16″ wd x 5/16″ d o/a; 2 mtg holes 0.147″ diam on 1″ mtg/c; stencilled R-419, R-420, R-418, R-417; board in accordance w/ JAN-P-13	Supports Resistors and Capacitors		N17-B-77834-9126	1	P-741611-510	E-404	1		0		0	2		0		0

E-405	BOARD, TERMINAL: general purpose term board strip; 12 brass solder lug term; term in 2 rows of 6 ea spaced ¼″ c to c, rows spaced ¾″ apart; 1/16″ thk lam phenolic sheet; 1⅜″ lg x 1 1/16″ wd x 5/16″ d o/a; 2 mtg holes 0.147″ diam on 1.0″ mtg/c; stencilled C-418, R-424; board in accordance w/ JAN-P-13	Supports Resistors and Capacitors		N17-B-77982-9601	1	P-741611-511	E-405	1		0		0	2		0		0
E-601	BOARD, TERMINAL: general purpose term board strip; 8 brass, solder dipped term; no two term closer than 0.312″ c to c; 1/16″ thk lam phenolic sheet; 1 3/16″ lg x 1 1/16″ wd x 5/16″ d o/a; 2 ctr mtg holes, 0.147″ diam on ⅝″ mtg/c; wax impr; marked R-605, R-610, R-607; same as 8896262-502 except for symbols; spec JAN-P-13	Supports Resistors		N-17B-77833-9721	1	A-8896262-501	E-601	1		0		0	3		0		0
E-602	BOARD, TERMINAL: general purpose term board strip; 8 brass, solder dipped term; no two term closer than 0.312″ c to c; 1/16″ thk lam phenolic sheet; 1 3/16″ lg x 1 1/16″ wd x 5/16″ d o/a; 2 ctr mtg holes, 0.147″ diam on ⅝″ mtg/c; wax impr; marked R-601, R-637, R-631, same as 8896262-501 except for symbols; spec JAN-P-13	Supports Resistors		N17-B-77833-9722	1	A-8896262-502	E-602	1		0		0	3		0		0
E-603	BOARD, TERMINAL: general purpose term board strip; 36 brass, single end solder lug term in 2 rows of 18 ea; no two term closer than 0.218″ c to c; ¾″ ctrs between rows; 1/16″ thk lam phenolic sheet; type LTS-E-3 in JAN-P-13; 4 1/32″ lg x 1 1/16″ wd x 19/32″ d o/a; three 0.147″ diam mtg holes in ctr of board on 1¼″ mtg/c; wax impr marked R-623, R-606, R-638, R-622, R-621, R-608, R-624, R-627, R-626, R-636, R-625, C-604, R-634, R-642, R-632; spec JAN-P-13	Supports Resistors and Capacitors		N17-B-78252-2101	1	A-8896264-501	E-603	1		0		0	3		0		0
E-604	BOARD, TERMINAL: general purpose; 24 solder lug term; term spaced 0.234″ c to c in 2 rows of 12 ea, ¾″ between rows; lam phenolic board 1/16″ thk; 3½″ lg x 1 1/16″ wd x 13/64″ h o/a; 4 mtg holes 0.147″ diam on 3.187″ x ⅝″ mtg/c; term hot solder dipped; board marked R-603, R-641, R-609, R-611, R-616, R-612, R-615, R-618, R-619, R-620, R-617, C-605	Supports Resistors and Capacitors		N17-B-78177-7712	1	A-8845468-501	E-604	1		0		0	3		0		0
E-605	BOARD, TERMINAL: general purpose; 24 solder lug term; term spaced 0.234″ c to c in 2 rows of 12 ea, ¾″ between rows; lam phenolic board 1/16″ thk; 3½″ lg x 1 1/16″ wd x 13/64″ h o/a; 4 mtg holes 0.147″ diam on 3.187″ x ⅝″ mtg/c; term hot solder dipped; board marked R-635, R-630, R-643, R-628, R-614, R-604, R-602, R-640, R-639	Supports Resistors		N17-B-78177-7714	1	A-8845468-502	E-605	1		0		0	3		0		0
E-606	BOARD, TERMINAL: general purpose term bd; 16 solder lug term in 2 rows of 8 ea; all term spaced 0.218″ c to c, rows spaced 7/16″ apart; lam phenolic bd 1/16″ thk; 2 19/32″ lg x ¾″ wd x 25/32″ h o/a; ea end has integral mtg bkt, one bkt has a #4-40 thd tap mtg nut, other bkt has a 0.120″ diam mtg hole, nut and hole spaced 2¼″; marked C-614, C-613, C-612, C-611, C-610, C-609, C-608, C-607	Supports Capacitors		N17-B-78083-1401	1	A-8846040-501	E-606	1		0		0	3		0		0
E-607 and E-608	Not Used																	
E-609	TERMINAL, STUD: (style #58) ins, standoff post type; melamine (arc and flame resistant, thermosetting plastic) ins body, metal post type solder lug term; one part undercut for #7 AWG wire, another part undercut for #11 AWG wire; 15/16″ lg x ¼″ across flats o/a; ins body 19/32″ lg; solder connects to wire; other end of body w/ #4-40 thd 7/32″ lg metal insert for mtg	Supports C-601		N17-T-28255-3576	846 Type 760	A-8890637-5	E-609, E-610, E-703	3		0		0	8		0		0
E-610	Same as E-609	Supports C-616																
E-701	BOARD, TERMINAL: general purpose term board strip; 34 brass, solder dipped term; no 2 term closer than ¼″ c to c; 3/16″ thk lam phenolic sheet; 5 3/8″ lg x 1 1/16″ wd x 5/16″ d o/a; six 0.147″ diam mtg holes; 1st pair of holes 5/32″ from edge of board on ⅝″ mtg/c, 2nd pair 2 15/32″ from the 1st pair, 3rd pair 2 21/32″ from the 2nd pair; wax impr; stenciled on one side w/ the following: R-703, C-702, C-703, R-706, R-707, R-708, R-709, R-710, R-711, R-712, R-716, R-714; other side marked R-703, R-714; spec JAN-P-13	Supports Resistors and Capacitors		N17-B-78242-2201	1	M-455694-501	E-701	1		0		0	2		0		0
E-702	Not Used																	
E-703	Same as E-609	Supports C-701																

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS									
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL				
										EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
E-801	BOARD, TERMINAL: general purpose term board strip; 16 brass, solder lug term; no 2 term closer than 0.218″ c to c; 8 per row two rows ¾″ apart; 1/16″ thk lam phenolic sheet; 2⅜″ lg x 1¼″ h x 1 1/16″ wd o/a; 2 bkt ea w/ 2 mtg holes, one bkt having 0.147″ diam holes on 5/16″ mtg/c, other bkt having 0.136″ diam holes on 5/16″ mtg/c; wax impr; mtg bkt riveted to board, 1 ea end; marked R-805, R-803, R-802, R-801, R-807, R-804, R-806; board according to spec JAN-P-13	Supports Resistors		N17-B-78083-1306	1	A-8898286-502	E-801	1		0		0	2		0		0
E-901	BOARD, TERMINAL: general purpose term board strip; 46 brass, solder dipped term; no 2 term closer than ¼″ c to c; 1/16″ thk lam phenolic sheet; 5⅞″ lg x 1 1/16″ wd x 5/16″ d o/a; three 0.147″ diam mtg holes on 1⅞″ mtg/c; wax impr; stenciled on 1 side w/ the following: C-901, C-902, R-909, R-906, C-903, R-907, R-947, R-902, R-935, R-933, R-934, R-928, R-904, C-908, C-910, R-941; spec JAN-P-13	Supports Resistors and Capacitors		N17-B-78302-5216	1	P-741611-505	E-901	0		0		0	1		0		0
E-902	BOARD, TERMINAL: general purpose term board strip; 30 brass, solder dipped term; no 2 term closer than ¼″ c to c; 1/16″ thk lam phenolic sheet; 5⅞″ lg x 1 1/16″ wd x 5/16″ d o/a; ten 0.147″ diam mtg holes; 1st pair of holes 3/16″ from edge of board on ⅝″ mtg/c, 2nd pair 3½″ from the 1st pair, 3rd pair 2⅜″ from the 2nd pair; 1st ctr mtg hole 1 1/16″ from edge of board, 2nd hole 1″ from the 1st, 3rd hole 1½″ from the 2nd, 4th hole 1″ from the 3rd; all c to c measurements; wax impr; stenciled on one side w/ the following: R-914, R-912, R-908, R-910, R-911, R-940, C-909, R-932, R-930, R-929, R-931, R-948, C-918, R-949, C-916; spec JAN-P-13	Supports Resistors and Capacitors		N17-B-78222-5216	1	P-741611-504	E-902	0		0		0	1		0		0
E-903	BOARD, TERMINAL: general purpose term board strip; 40 brass, solder dipped term; no 2 term closer than ¼″ c to c; 1/16″ thk lam phenolic sheet; 5⅞″ lg x 1 1/16″ wd x 5/16″ d o/a; ten 0.147″ diam mtg holes; 1st pair of holes 3/16″ from edge of board on ⅝″ mtg/c; 2nd pair 3½″ from the 1st pair; 3rd pair 2⅜″ from the 2nd pair; 1st ctr mtg hole 1 1/16″ from edge of board, 2nd hole 1″ from the 1st, 3rd hole 1½″ from the 2nd, 4th hole 1″ from the 3rd; all c to c measurements; wax impr; stenciled on one side w/ the following: R-922, R-944, R-943, R-924, R-915, R-917, R-918, R-925, R-913, R-916, R-901, R-942, R-936, R-937, R-939, R-920, R-919, R-938; spec JAN-P-13	Supports Resistors		N17-B-78272-5249	1	P-741611-502	E-903	0		0		0	1		0		0
E-904	BOARD, TERMINAL: general purpose term board strip; 12 brass, solder dipped term; no 2 term closer than ¼″ c to c; 1/16″ thk lam phenolic sheet; 1 1/16″ lg x 1 1/16″ wd x 5/16″ d o/a; two 0.147″ diam mtg holes on 1″ mtg/c; wax impr; stenciled on one side w/ following: R-946, R-921, R-926, R-945; spec JAN-P-13	Supports Resistors		N17-B-77982-9571	1	P-741611-507	E-904	0		0		0	1		0		0
E-905	BOARD, TERMINAL: general purpose term board strip; 12 brass, solder dipped term; no 2 term closer than ¼″ c to c; 1/16″ thk lam phenolic sheet; 1 1/16″ lg x 1 1/16″ wd x 5/16″ d o/a; two 0.147″ diam mtg holes on 1″ mtg/c; wax impr; marked R-903, R-927; spec JAN-P-13	Supports Resistors and Capacitors		N17-B-77834-9121	1	P-741611-508	E-905	0		0		0	1		0		0

E-906	BOARD, TERMINAL: general purpose term board strip; 6 brass, nickel plated term w/ dual ends; one end solder lug; other end w/ #0-80 tap x 1/8" d hole for screw; no 2 term closer than 9/32" c to c; 1/16" thk lam phenolic sheet; 1 1/2" lg x 1 1/16" wd x 3/8" d o/a; three 0.147" diam mtg holes; 2 holes one end on 5/8" mtg/c; single hole other end in ctr and 3/16" from edge; wax impr; marked AF-IF, IF-AF; spec JAN-P-13	Supports Links O-901 and O-902		N17-B-77734-7950	1	P-741611-506	E-906	0	0	0	1	0	0
E-907	INSULATOR, FEEDTHRU: solder on term type; tinned copper term, HS in glass w/ tinned copper bushing; for #14 AWG wire; 13/16" max lg x 19/64" diam o/a; ea end of term w/ groove 3/32" wd x 0.015" max d and 1/16" from ends of term; solder connects to wire; glass ins 3/16" h, sealed in fl 19/64" diam x 0.020" thk w/ shank 0.185" diam; solder mtg; HS type thru term; spec JAN-I-9	Supports C-919		N17-I-59417-6691	1581 Cat #W-113	A-8893219-2	E-907, E-908, E-1203, E-1204, E-1303, E-1304	2	0	0	8	0	0
E-908	Same as E-907	Supports C-920											
E-1001	BOARD, TERMINAL: general purpose term board strip; 16 brass, solder dipped term; no 2 term closer than 0.218" c to c; 1/16" thk lam phenolic sheet; 2 3/16" lg x 1 1/4" wd x 1 1/16" d, o/a; 3 mtg holes on bkt; 1 bkt w/ 0.173" diam mtg hole; other bkt w/ two 0.147" diam mtg holes on 0.312" mtg/c; wax impr; mtg bkt riveted to board, 1 each end; stencil one side w/ 3/32" h characters, R-1006, R-1004, R-1007, R-1008, R-1001, R-1002, R-1003, R-1005; spec JAN-P-13	Supports Resistors		N17-B-78082-6767	1	A-8898286-501	E-1001	0	0	0	1	0	0
E-1201	FUSE HOLDER: extractor post type; single 3AG cartridge fuse 1/4" diam x 1 1/4" lg; black bakelite body w/ pl brass or copper cont; 250 v, 15 amp; 11/16" diam across flats x 2 9/64" lg o/a; mts by 1/2"-24 thd x 1/2" lg for panel hole mtg, incl nickel pl nut and lockwasher; 2 tinned solder lug term; finger tip fuse removal w/ quick lock shown by arrow on fuse cover; moisture and fp; requires mtg holes 0.505" diam flatted on one side to 0.473" diam; similar to Bussmann type HKP, except phenolic in accordance with JAN-P-14 type X latest spec; moisture and fp in accordance with JAN-T-152 spec	Supports F-1201		N17-F-74266-9227	768 Type HKP Modified	K-897868-3	E-1201, E-1202, E-1301, E-1302	2	0	0	6	0	0
E-1202	Same as E-1201	Supports F-1202											
E-1203	Same as E-907	Supports C-1201											
E-1204	Same as E-907	Supports C-1201											
E-1301	Same as E-1201	Supports F-1301											
E-1302	Same as E-1201	Supports F-1302											
E-1303	Same as E-907	Supports C-1301											
E-1304	Same as E-907	Supports C-1301											
F-1201	FUSE CARTRIDGE: 3 amp, blowing time for 110% load, none; for 135% load, 1 hr; 250 v; one-time; glass body; ferrule term; 1 1/4" lg x 1/4" diam o/a; mts by ferrule term; 1/4" diam ferrule term; type 3AG	AC Line	(−28032-3)	N17-F-16302-120	768 Type 3AG-3	K-55544-4	F-1201, F-1202, F-1301, F-1302	2	0	0	6	0	0
F-1202	Same as F-1201	AC Line											
F-1301	Same as F-1201	AC Line											
F-1302	Same as F-1201	AC Line											
H-1501	SCREW, MACHINE: RH; SS w/ passivating dip; 1/4"-20 thd; 5/8" lg; 3/8" lg thd; 1/8" thk x 5/8" diam head; 0.140" lg x 5/16" diam shoulder; head finished w/ steelblast and gray tinted synthetic; thd flat on one side	Fastens Handle to Front Panel		N43-S-99500-10	1	A-8897331-1	H-1501, H-1601	2	2	2	6	2	6
H-1502	SCALE: clear plastic; round shape; 2 7/64" diam x 0.125" thk o/a	Protects Scope Tube		N16-S-117101-278	1	A-8892351-1	H-1502	1	0	1	2	0	1
H-1601	Same as H-1501	Fastens Handle to Front Panel											
I-1501	LAMP, GLOW: 65 v AC, 90 v DC starting voltage; bulb T-3-1/4 clear, 13/32" diam; 1 3/16" lg o/a; miniature bayonet base; burn any position; 120 v requires series resistor of 200,000 ohms for current of 300 ua	Power On		17-L-6806-130	1377 Cat #NE-51	K-872291-9	I-1501, I-1601	1	0	0	3	0	0
I-1601	Same as I-1501	Power On											

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS								
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL			
									EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
J-1201	CONNECTOR, PLUG: 20 female cont, pol; straight type; $2\frac{11}{16}$″ lg x $1\frac{7}{32}$″ wd x $1\frac{5}{16}$″ d o/a; cont #8 to #12 ten amp min, cont #1 to #7 one amp min; rectangular; two 0.156″ diam holes x $2\frac{3}{8}$″ mtg/c; 50 hr salt spray test; marked #738961-1	Interconnects Filter and Frame		N17-C-73323-7100	1	P-738961-1	J-1201, J-1301	1		1		3	3		1		9
J-1202	CONNECTOR, RECEPTACLE: 1 round female high conductivity copper alloy cont; straight type; body $\frac{27}{32}$″ lg x $1\frac{1}{16}$″ OD, fl 1″ sq; nominal impedance 50 ohms, non-constant type; cylindrical die cast zinc body w/ sq mtg fl silver pl; low-loss mica-filled dielectric; accommodates solid dielectric coax cable of 0.41″ OD, 0.29″ dielectric insert; 4 mtg holes $\frac{1}{8}$″ diam on $\frac{23}{32}$″ x $\frac{23}{32}$″ mtg/c, has $\frac{5}{8}$″-24 thd male coupling thd $\frac{35}{64}$″ lg on 1 end only	Remote CR Tube Output	(—49104)	N17-C-73108-5890	30 Type 83-1R	P-255223-1	J-1202	1		0		0	2		0		0
J-1203	Not Used																
J-1204	CONNECTOR, RECEPTACLE: 3 round female cont; straight type; $1\frac{1}{16}$″ lg w/ mtg fl $1\frac{1}{16}$″ x $1\frac{1}{16}$″ sq o/a; 20 amp, 70 v DC or 50 v AC (RMS); cylindrical body, die cast aluminum, w/ sq mtg fl; molded black bakelite insert; 3 solder lugs in rear for #16 AWG wire; 4 mtg holes 0.120″ diam on $\frac{29}{32}$″ x $\frac{29}{32}$″ mtg/c; $\frac{1}{8}$″-20 male thd for coupling nut; Navy spec #AN-WC-591	Ext Tone Output	AN-3102-14S-7S	N17-C-72240-1516	30 AN-3102-14S-7S	M-253475-33	J-1204, J-1205, J-1211, J-1212, J-1302, J-1303, J-1306, J-1307	4		0		0	12		0		0
J-1205	Same as J-1204	Tone Output															
J-1206	CONNECTOR, RECEPTACLE: 2 round male cont; straight type; $1\frac{1}{16}$″ lg w/ mtg fl $1\frac{1}{16}$″ x $1\frac{1}{16}$″ sq o/a; 20 amp, 70 v DC or 50 v AC (RMS); cylindrical body, die cast aluminum, w/ sq mtg fl; molded black bakelite insert; 2 solder lugs in rear for #16 AWG wire; 4 mtg holes 0.120″ diam on $\frac{29}{32}$″ x $\frac{29}{32}$″ mtg/c; $\frac{1}{8}$″-20 male thd for coupling nut; Navy spec #AN-WC-591	Teletype Output	AN-3102-14S-9P	N17-C-72596-2880	30 AN-3102-14S-9P	M-253475-23	J-1206, J-1304	1		0		0	3		0		0
J-1207	CONNECTOR, RECEPTACLE: 2 rectangular female cont; straight type; $\frac{3}{4}$″ lg x $1\frac{5}{8}$″ sq fl o/a; 15 amp 115 v, 10 amp, 250 v; cylindrical aluminum body w/ sq mtg fl; phenolic insert; 4 mtg holes 0.120″ diam on $1\frac{1}{4}$″ x $1\frac{1}{4}$″ mtg/c; has $1\frac{3}{8}$″-18-NEF-2 thd male coupling on one end; for out-door use, thd to accept weatherproof cover	AC Outlet	(—49435)	N17-C-73139-7587	30 AN-97-4085	A-8890697-1	J-1207	1		0		0	2		0		0
J-1208	CONNECTOR, RECEPTACLE: 3 round male cont; straight type; $1\frac{1}{16}$″ lg w/ mtg fl $1\frac{1}{16}$″ x $1\frac{1}{16}$″ sq o/a; 20 amp, 70 v DC, or 50 v AC (RMS); cylindrical body, die cast aluminum, w/ sq mtg fl; molded black bakelite insert; 3 solder lugs in rear for #16 AWG wire; 4 mtg holes 0.120″ diam on $\frac{29}{32}$″ x $\frac{29}{32}$″ mtg/c; $\frac{1}{8}$″-20 male thd for coupling nut; Navy spec #AN-WC-591	AC Power Input	AN-3102-14S-7P	N17-C-72604-1516	30 AN-3102-14S-7P	M-253475-25	J-1208, J-1305	1		0		0	3		0		0
J-1209	CONNECTOR, RECEPTACLE: 1 round female cont; straight type; $1\frac{1}{32}$″ lg x 0.375″ OD, w/ mtg fl $1\frac{1}{16}$″ sq o/a; nominal RF impedance 50 ohms; cylindrical, brass, silver pl body, w/ sq mtg fl; thermosetting polymer insert; accommodates solid dielectric coax cable, 0.206″ OD w/ #20 inner cond; 4 mtg holes, #3-56 tap x 0.090″ d on $\frac{1}{2}$″ x $\frac{1}{2}$″ mtg/c; electrolytic protective coating on all silver surfaces; contains 2 locking studs for male connector; Navy dwg RE-49F331	40 KC Diversity Control Output	UG-290/U	N17-C-73108-1267	30 AN-UG-290/U	M-445813-1	J-1209, J-1210, J-1308, J-1309, J-1310, J-1311	2		0		0	8		0		0
J-1210	Same as J-1209	Diversity Signal Output															
J-1211	Same as J-1204	600 Ohm AF Input (Narrow)															

J-1212	Same as J-1204	600 Ohm AF Input (Wide)															
J-1301	Same as J-1201	Interconnects Filter and Frame															
J-1302	Same as J-1204	Ext Tone Input															
J-1303	Same as J-1204	Tone Diversity Output															
J-1304	Same as J-1206	Teletype Diversity Output															
J-1305	Same as J-1208	AC Power Input															
J-1306	Same as J-1204	AC Power Output															
J-1307	Same as J-1204	AC Power Output															
J-1308	Same as J-1209	40 KC Diversity Control Input															
J-1309	Same as J-1209	40 KC Diversity Control Input															
J-1310	Same as J-1209	Diversity Signal Input															
J-1311	Same as J-1209	Diversity Signal Input															
J-1501	JACK, TELEPHONE: for 2-cond 0.25″ diam plug; 1¼″ lg x 1¼″ wd x 1″ h o/a; J4 contact arrangement; includes brass nickel pl lock nut, and one steel nickel pl washer; ⅜″ mtg hole; ⅜″-32 NEF thd for mtg lock nut; small; adaptable to compact equip (Part of W-1501)	Teletype		N17-J-39108-2701	1685 Type 1J-102	K-7862660-6	J-1501, J-1502, J-1601, J-1602	2		0		0	6	0		0	
J-1502	Same as J-1501	Headset															
J-1503	CONNECTOR, RECEPTACLE: 14 female cont, pol; straight type; 2″ lg x ¾″ wd x 21/32″ d o/a; 1000 v min flashover between any cont, cont #1 to #7 ten amp min, cont #8 to #14 one amp min; rectangular; molded melamine insert; 2 holes 0.156″ diam, 1.687″ mtg/c; recessed connecting lugs; metal parts 50 hr salt spray corrosion test, marked #738962-2 (Part of W-1501)	Power Circuit		N17-C-73301-6068	1618 Cat #1637	P-738962-2	J-1503, J-1504, J-1505, J-1506, J-1603, J-1604, J-1605	4		1		8	11	3		20	
J-1504	Same as J-1503	Power Circuit															
J-1505	Same as J-1503	Power Circuit															
J-1506	Same as J-1503	Power Circuit															
J-1601	Same as J-1501 (Part of W-1601)	Teletype															
J-1602	Same as J-1501 (Part of W-1601)	Headset															
J-1603	Same as J-1503 (Part of W-1601)	Power Circuit															
J-1604	Same as J-1503 (Part of W-1601)	Power Circuit															
J-1605	Same as J-1503 (Part of W-1601)	Power Circuit															
L-601	REACTOR, AUDIO: audio reactor for tone osc; single sect w/ tap; approx 1.5 hy, 25 microamps; 2200 ohms, term 1-2; 2100 ohms, term 1-3; 120 ohms, term 2-3 all DC resistances; 500 vdct; HS enclosed metal case; 1⅜″ h x 1½″ wd x 1⅛″ lg less lugs; two #4-40 x ¼″ lg stud bolts; 1⅛″ c to c; three ⅜″ lg stud solder lug term on standoff ins; 2 term ⅛″ c to c, other term 25/64″ from c of other 2; w/ a 405 mmf capacitor connected across terms 1-3, reactor will tune to approx 1785 cps; w/ a 4700 mmf capacitor connected across terms 1-3, reactor will tune to approx 595 cps; term 1-2, entire wnd, term 3, tap	Tunes Tone Osc (V-605B) with C-607 to C-614 Incl		N16-R-29650-2901	1	B-453141-1	L-601	1		0		2	3	0		3	
L-801	REACTOR, FILTER: filter choke; single sect; inductance 4.5 hy, measured at 30 v, 60 cps, current 0.070 amp DC; 150 ohms DC resistance, p/m 10% at 25°C; 1000 v test; HS metal case; 2⅝″ h, less lugs, x 1½″ wd x 121/32″ lg; two #6-32 x ⅝″ lg stud bolts on 1¼″ mtg/c; two ⅜″ lg stud, solder lug term on standoff ins, ½″ c to c on bottom of case; additional mtg bkt on side of case, 2 mtg holes 0.173″ diam, ⅝″ mtg/c; max ambient temp of operation 85°C; shock resistant; RSW and humidity; BuShips 16T30	+B Filter Choke		N16-R-29070-5501	1	B-453147-1	L-801, L-1001	1		1		2	3	1		6	

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TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS									
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL				
									EQUIP		STOCK			EQUIP		STOCK		
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
L-1001	Same as L-801	+B Filter Choke																
M-1601	METER, AMMETER: dc type (special) range 0-200 ua; round, phenolic flush mtg case; 2.695″ diam fl x 2.21″ diam body x 1.60″ d behind fl less term, fl 0.38″ d; accuracy p/m 2%; D'Arsonval movement; 250 p/m 2 mv drop max; calibrated for non-magnetic panel; 0 to 200 scale division; black markings and pointer on white background; self-contained; 3 mtg holes 0.125″ diam on 1.218″ rad spaced 120 deg apart on fl; 2 stud term ¼″-28 thd x 0.75″ lg spaced 1″ c to c; has adj resistance range; spec JAN-I-6	Tuning and Diversity Indicator	MR25W107 Spec	N-17-M [illegible] 9051-9600		M-456883-51	M-1601	0		0		0	1		0		0
O-401	ARM (NON-INK RECORDING): brass body dull white nickel finish; rectangular; 25/32″ lg x 3/16″ wd x 0.032″ h o/a; 1 end contains encl ctr slot ¼″ lg x ⅛″ rads; slot 1/16″ from edge of body; other end w/ open slot ⅛″ lg x 0.063″ wd	Freq Operation Adj		N16-A-700001-181	1	A-8898385-2	O-401, O-402, O-901, O-902	2		0		0	6		0		0
O-402	Same as O-401	Freq Operation Adj																
O-901	Same as O-401	Freq Operation Adj																
O-902	Same as O-401	Freq Operation Adj																
O-1501	GASKET: for cabinet edges; neoprene; elliptical hole through piece; long angular bar shape; 44″ lg x ¼″ wd x ¼″ h o/a; for panel to case seal; matl formed and cemented around open cabinet edges	Seal Between Front Panel and Cage		N17-G-169757-750	1	A-8844138-1	O-1501, O-1601	1		0		1	3		0		3
O-1502	SLIDE, SET: chassis slide assem; c/o 1 main mtg bkt plate, 1 track plate, 1 detent plate, 1 spring, 3 levers; main assem, aluminum; small parts, brass and SS; rectangular shape approx; 10″ lg x 4⅛″ h x 1⅜″ wd o/a approx; mtd by welding rear bkt plate to cabinet sides; mtg plate, 8⅞″ lg x 4⅛″ wd x 1⅜″ h; bolts w/ Quintlock nuts are used on bkt plate for additional support, detent plate for chassis tilting, contains 4 slots; 3 tapered slots 0.187″ d 1 large slot ¼″ d w/ ⅛″ rad finish; all slots mtd 45 deg apart	Slide Out Chassis For Accessibility		N16-S-480001-102	1669 Cat #C-780 Right Hand	P-741634-1	O-1502, O-1602	1		0		1	3		0		1
O-1503	SLIDE, SET: chassis slide assem; c/o 1 main mtg bkt plate, 1 track plate, 1 detent plate, 1 spring, 3 levers; main assem, aluminum; small parts, brass and SS; rectangular shape approx; 10″ lg x 4⅛″ h x 1¼″ wd o/a approx; mtd by welding rear bkt plate to cabinet sides; mtg plate 8⅞″ lg x 4⅛″ wd x 0.04″ thk; bolts w/ Quintlock nuts are used on bkt plate for additional support; detent plate for chassis tilting, contains 4 slots; 3 tapered slots 0.187″ d; 1 large slot ¼″ d w/ ⅛″ rad finish; all slots mtd 45 deg apart; RSW	Slide Out Chassis For Accessibility		N16-S-480001-103	1669 Cat #C-780 Left Hand	P-741634-2	O-1503, O-1603	1		0		1	3		0		1
O-1504	GASKET: soft rubber; round shape; 2¼″ diam x 5/16″ thk o/a; Navy spec 33R4	Seal Between Front Panel and Scope Tube		N17-G-161779-101	1	A-8892349-1	O-1504	1		0		1	2		0		2

O-1505	CLEANER, AIR: panel type; aluminum frame; 4″ lg x 3 31/32″ +0.000″ −0.031″ wd x ½″ thk o/a; non-replaceable, cloth covered screen mesh viscous coated filter; 5 mtg holes on front edges of frame, one 0.375″ diam hole located 2 29/32″ in from left side of frame 5/16″ down from top edge; 2 holes 0.147″ diam located ¼″ down from top edge 1 7/32″ in from left side 2 7/8″ apart and 2 holes 0.147″ diam located 3/16″ in from left and right sides 2 5/8″ down from top edge; RSW	Air Filter		N17-C-793001-125	788 Type P-4A	M-455603-1	O-1505, O-1605	1		0		1	3		0		1
O-1506	Bezel SCALE: for mtg window over CR tube face; assem c/o 1 window, RCA part/dwg #8892351-1, 1 gasket, RCA part/dwg #8892-349-1, 3 Phillip's head captive screws, #8-32 thd, RCA part/dwg #8840884-1, three #8 bronze lockwashers, RCA part/dwg #59048-18; black enamel finish, outside and edges; bezel only; irregular shape; w/ 1 mtg hole in fl on 90° index; 2 holes on large fl; 2 1/16″ h x 2 5/16″ wd x 1 1/32″ d o/a; three 0.240″ diam mtg holes w/ ⅜″ diam ctb 1/32″ d; 1 hole 2 1/32″ from ctrs of other 2; 2 holes on large fl on 2.062″ mtg/c; made from aluminum alloy; 3 straight lines engraved on window 1/16″ apart, 1¼″ lg	Fastens Buffer and Window to Front Panel		N16-S-117101-277	1	P-739045-501	O-1506	1		0		1	2		0		1
O-1507	PROPELLER: propeller blades; electric motor operated; 4 metal blades, 2¼″ diam; portable; unguarded; 2¼″ diam x 1 1/32″ d o/a; two #4-40 tapped radial holes spaced 120 deg in hub; direct drive; mts on shaft 0.124″ diam; fan blades and hub are brass w/ black enamel finish; direction of rotation, counterclockwise facing air discharge	Equipment Cooling		N17-P-87208-3501	1	M-454892-2	O-1507, O-1607	1		0		1	3		0		1
O-1601	Same as O-1501	Seal Between Front Panel and Case																
O-1602	Same as O-1502	Slide Out Chassis for Accessibility																
O-1603	Same as O-1503	Slide Out Chassis for Accessibility																
O-1604	Not Used																	
O-1605	Same as O-1505	Air Filter																
O-1606	Not Used																	
O-1607	Same as O-1507	Equipment Cooling																
P-401	CONNECTOR, RECEPTACLE: 14 male cont, pol; straight type; 2″ lg x ¾″ wd x 2 25/32″ d o/a; 1000 v min flashover between any cont, cont #1 to #7 ten amp min, #8 to #14 one amp min; rectangular; molded melamine insert; 2 holes, 0.156″ diam, 1.687″ mtg/c; recessed connecting lugs; metal parts 50 hr salt spray corrosion test; marked #738962-1	Power Circuit		N17-C-73588-4094	1	P-738962-1	P-401, P-601, P-701, P-801, P-901, P-1001	4		1		8	11		3		20
P-601	Same as P-401	Power Circuit																
P-701	Same as P-401	Power Circuit																
P-801	Same as P-401	Power Circuit																
P-901	Same as P-401	Power Circuit																
P-1001	Same as P-401	Power Circuit																
P-1201	Not Used																	
P-1202	CONNECTOR, PLUG: single male coax cont; straight type; 1 3/16″ lg x 1 1/16″ OD o/a; nom RF impedance 52 ohms; cylindrical brass body, silver pl; insert may be, dielectene, BM10553, durez 11863; or copolymer of styrene; cable opening ½″ diam; 24 thd coupling sleeve; insert assem w/ polystyrene to seal connector air spaces; entire unit tropicalized	Remote CR Tube Line	(—49195)	N17-C-71414-2800	30 83-1SPN	P-255223-9	P-1202	1		0		0	2		0		0
P-1203	Not Used																	
P-1204	CONNECTOR, PLUG: 3 round male cont; straight type; 1 1/32″ lg x 1⅛″ OD max; 20 amp, 70 v DC, or 50 v AC (RMS); cylindrical die cast aluminum body; molded melamine insert; one end w/ ¾″-20 thd, other end w/ ⅞″-20 thd; one end w/ ¾″-20 outside thd for cable clamp coupling; tropicalized; Army-Navy spec #AN-WC-591	Ext Tone Line	AN-3106-14S-7P	N17-C-70588-1524	30 AN-3106-14S-7P	M-253476-30	P-1204, P-1205, P-1211, P-1212, P-1302, P-1303, P-1735, P-1736	4		0		0	12		0		0
P-1205	Same as P-1204	Tone Output Line																

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS							
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL				
									EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
P-1206	CONNECTOR, PLUG: 2 round female cont; straight type; $1\frac{1}{32}$" lg x $1\frac{1}{8}$" max OD o/a; 20 amp, 70 v DC, or 50 v AC (RMS); cylindrical die cast aluminum body; molded melamine insert; one end w/ $\frac{3}{4}$"-20 thd, other end w/ $\frac{7}{8}$"-20 thd; one end w/ $\frac{3}{4}$"-20 outside thd for cable clamp coupling; tropicalized; Army-Navy spec #AN-WC-591	Teletype Line	AN-3106-14S-9S	N17-C-70320-2882	30 AN-3106-14S-9S	M-253476-26	P-1206, P-1304	1		0		0	3		0		0
P-1207	Not Used																
P-1208	CONNECTOR, PLUG: 3 round female cont; straight type; $1\frac{1}{32}$" lg x $1\frac{1}{16}$" OD o/a; 20 amp, 70 v DC, or 50 v AC (RMS); cylindrical die cast aluminum body; molded bakelite insert; one end w/ $\frac{3}{4}$"-20 thd, other end w/ $\frac{7}{8}$"-20 thd; one end w/ $\frac{3}{4}$"-20 outside thd for cable clamp coupling; Army-Navy spec #AN-WC-591	AC Power Line	AN-3106-14S-7S	N17-C-70328-1524	30 AN-3106-14S-7S	M-253476-27	P-1208, P-1305, P-1729, P-1730	1		0		0	5		0		0
P-1209 and P-1210	Not Used																
P-1211	Same as P-1204	AF Input Line															
P-1212	Same as P-1204	AF Input Line															
P-1301	Not Used																
P-1302	Same as P-1204	Ext Tone Line															
P-1303	Same as P-1204	Tone Diversity Line															
P-1304	Same as P-1206	Teletype Diversity Line															
P-1305	Same as P-1208	AC Power Line															
P-1501	CONNECTOR, PLUG: 20 male cont, pol; straight type; $2\frac{11}{16}$" lg x $\frac{5}{8}$" wd x $\frac{15}{16}$" d, less cont and pol pins; cont #8 to #12 ten amp min, cont #1 to #7 one amp min; rectangular; molded melamine insert; two 0.156" diam holes, $2\frac{3}{8}$" mtg/c; 50 hr salt spray test; marked #738961-2 (Part of W-1501)	Interconnects Filter and Frame		N17-C-73617-2350	1	P-738961-2	P-1501, P-1601	1		1		5	3		1		12
P-1601	Same as P-1501 (Part of W-1601)	Interconnects Filter and Frame															
P-1701 to P-1704	Not Used																
P-1705	CONNECTOR, PLUG: single male coax cont; straight type; $1\frac{1}{64}$" lg x $\frac{3}{16}$" diam; 52 ohms impedance; cylindrical brass silver pl; Teflon (poly-P-114); 0.212" diam cable opening; mts by thd on integral nut (outer shield of coax cable is locked by thd); in accordance w/ Navy dwg RE49F246	Part of W-1705		N17-C-71408-5333	1	A-8898625-501	P-1705, P-1706, P-1711, P-1712, P-1717, P-1718, P-1723, P-1724	0		0		0	4		0		0
P-1706	Same as P-1705	Part of W-1706															
P-1707 to P-1710	Not Used																

P-1711	Same as P-1705	Part of W-1711															
P-1712	Same as P-1705	Part of W-1712															
P-1713 to P-1716	Not Used																
P-1717	Same as P-1705	Part of W-1705															
P-1718	Same as P-1705	Part of W-1706															
P-1719 to P-1722	Not Used																
P-1723	Same as P-1705	Part of W-1711															
P-1724	Same as P-1705	Part of W-1712															
P-1725 to P-1728	Not Used																
P-1729	Same as P-1208	Part of W-1717															
P-1730	Same as P-1208	Part of W-1718															
P-1731 to P-1734	Not Used																
P-1735	Same as P-1204	Part of W-1717															
P-1736	Same as P-1204	Part of W-1718															
R-401	RESISTOR, FIXED: comp; 22,000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	Z-403 Matching	*RC20BF223K	N16-R-50372-811		A-8897969-78	R-401, R-402, R-423, R-608, R-640, R-901	5		0		0	13		0		0
R-402	Same as R-401	Z-404 Matching															
R-403	RESISTOR, VARIABLE: comp; 100,000 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 1⁵⁄₁₆" max diam x 0.451" max d; SS or brass nickel pl shaft 0.250" diam x 1¹⁄₁₆" max lg w/ scdr slot; lin taper; ins cont arm w/o off position; high torque; w/ locking device; bushing ⅜"-32 thd x ½" max lg w/ 4 slots 90 deg apart ¼" lg x ⅛₂" wd; non-turn device on ⅞₁₆" radius at 9 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to 100°C; bushing SS or brass nickel pl; supplied w/ ⅜"-32 thd hex locking nut ⁵⁄₃₂" thk x ½" across flats; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-401 Grid Input Control		N16-R-88010-9591	786 Type 45	B-453560-17	R-403, R-705	2		0		0	4		0		0
R-404	RESISTOR, FIXED: comp; 1000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-401 Cathode Bias	*RC20BF102K	N16-R-49922-811		A-8897969-62	R-404	1		0		0	2		0		0
R-405	RESISTOR, FIXED: comp; 47,000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-401 Plate Load	*RC20BF473K	N16-R-50480-811		A-8897969-82	R-405, R-424, R-634	3		0		0	7		0		0
R-406	RESISTOR, FIXED: comp; 100,000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-402 Grid Leak	*RC20BF104K	N16-R-50633-811		A-8897969-86	R-406, R-412, R-414	3		0		0	6		0		0
R-407	RESISTOR, FIXED: comp; 6800 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-402 Cathode Bias	*RC20BF682K	N16-R-50201-811		A-8897969-72	R-407	1		0		0	2		0		0
R-408	RESISTOR, FIXED: comp; 27,000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-402 Plate Load	*RC20BF273K	N16-R-50399-811		A-8897969-79	R-408	1		0		0	2		0		0

*When ordering replacements specify "max dimensions not to exceed ⁵⁄₃₂" diam x ¹³⁄₃₂" lg"

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS									
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL				
									EQUIP		STOCK			EQUIP		STOCK		
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
R-409	RESISTOR, FIXED: comp; 1.0 megohm p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-403 Grid Leak	*RC20BF105K	N16-R-50975-811		A-8897969-98	R-409, R-422, R-610, R-902, R-924, R-925, R-941, R-942	3		0		0	12		0		0
R-410	RESISTOR, FIXED: comp; 470 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-403 Cathode Bias	*RC20BF471K	N16-R-49769-811		A-8897969-58	R-410	1		0		0	2		0		0
R-411	RESISTOR, FIXED: comp; 18,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	T-403 Seed Load	*RC20BF183K	N16-R-50354-811		A-8897969-77	R-411, R-413, R-630	3		0		0	7		0		0
R-412	Same as R-406	T-403 Seed Load																
R-413	Same as R-411	T-403 Seed Load																
R-414	Same as R-406	T-403 Seed Load																
R-415	RESISTOR, FIXED: comp; 150,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-404 Cathode Load	*RC20BF154K	N16-R-50678-811		A-8897969-88	R-415, R-416, R-635, R-807, R-1008	4		0		0	10		0		0
R-416	Same as R-415	V-404 Cathode Load																
R-417	RESISTOR, FIXED: comp; 270,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-404 Output Filter	*RC20BF274J	N16-R-50740-431		A-8897969-217	R-417, R-927, R-928, R-948, R-949	1		0		0	6		0		0
R-418	RESISTOR, FIXED: comp; 300,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-404 Output Filter	*RC20BF304J	N16-R-50749-431		A-8897969-218	R-418, R-419	2		0		0	4		0		0
R-419	Same as R-418	V-404 Output Filter																
R-420	RESISTOR, FIXED: comp; 15,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-404 Output Filter	*RC20BF153J	N16-R-50335-431		A-8897969-187	R-420	1		0		0	2		0		0
R-421	RESISTOR, VARIABLE: comp; 1.0 megohm p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 13/16″ max diam x 0.451″ max d; SS or brass nickel pl shaft 0.250″ diam x ½″ max lg; at 50% rotation not more than 10% resistance in use; at 60% rotation 22% resistance in use, then the value is linear to 95% rotation and 100% resistance in use; CTS "A" taper; ins contact arm w/o off position; high torque; no locking device; bushing ⅜″-32 thd x ¼″ lg; non-turn device on 1/16″ radius at 9 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-404 Discr Output Control		N16-R-88340-9355	786 Type 45	B-453560-15	R-421	1		0		0	2		0		0
R-422	Same as R-409	V-404 Discr Output Divider																

R-423	Same as R-401	V-403 Screen Dropping															
R-424	Same as R-405	V-401 Grid Limiting															
R-601	RESISTOR, FIXED: comp; 1.8 megohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-601A Grid Leak	*RC20BF185K	N16-R-51038-811		A-8897969-101	R-601; R-607; R-714	3		0		0	8		0		0
R-602	RESISTOR, FIXED: comp; 390 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-601A Cathode Bias	*RC20BF391K	N16-R-49733-811		A-8897969-57	R-602, R-614	2		0		0	6		0		0
R-603	RESISTOR, FIXED: comp; 10,000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-601A Plate Load	*RC20BF103K	N16-R-50282-811		A-8897969-74	R-603, R-638	2		0		0	6		0		0
R-604	RESISTOR, FIXED: comp; 1800 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-601B Cathode Bias	*RC20BF182K	N16-R-49985-811		A-8897969-65	R-604	1		0		0	3		0		0
R-605	RESISTOR, FIXED: comp; 220,000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-602B Grid Limiting	*RC20BF224K	N16-R-50714-811		A-8897969-90	R-605	1		0		0	3		0		0
R-606	RESISTOR, FIXED: comp; 7500 ohms p/m 5%; 1 w; F characteristic; 0.562" lg x 0.225" diam; ins, salt water immersion resistant; 2 axial wire lead term; color coded; spec JAN-R-11	V-607 and V-608 Screen Dropping	**RC30BF752J	N16-R-50218-751		A-8897970-180	R-606, R-623	2		0		0	6		0		0
R-607	Same as R-601	V-601B Grid Leak															
R-608	Same as R-401	Z-601 Output Matching															
R-609	RESISTOR, FIXED: comp; 5600 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-606 Cathode Voltage Divider	*RC20BF562J	N16-R-50164-431		A-8897969-177	R-609	1		0		0	3		0		0
R-610	Same as R-409	V-602B Grid Leak															
R-611	RESISTOR, FIXED: comp; 240,000 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, RSW and humidity; 2 axial wire lead term; color coded; spec JAN-R-11	V-606 Cathode Voltage Divider	*RC20BF244J	N16-R-50722-431		A-8897969-216	R-611	1		0		0	3		0		0
R-612	RESISTOR, FIXED: comp; 4700 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-602B Cathode Bias	*RC20BF472K	N16-R-50129-811		A-8897969-70	R-612	1		0		0	3		0		0
R-613	RESISTOR, VARIABLE: comp; 750 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16" max diam x 0.451" max d; SS or brass nickel pl shaft 0.250" diam x 11/16" max lg w/ scdr slot; lin taper; ins contact arm w/o off position; high torque; no locking device; mtg bushing ⅜"-32 thd x ¼" lg; non-turn device on 1/16" radius at 9 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg	V-602B Bias Control		N16-R-87305-5521	786 Type 45	B-453560-3	R-613	1		0		0	3		0		0
R-614	Same as R-602	V-602B Bias															
R-615	RESISTOR, FIXED: comp; 100,000 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-603A Grid Voltage Divider	*RC30BF104J	N16-R-50632-431		A-8897969-207	R-615, R-621, R-622, R-624, R-625, R-912, R-917, R-918, R-937	5		0		0	19		0		0
R-616	RESISTOR, FIXED: comp; 18,000 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-603 Cathode Bias	*RC20BF183J	N16-R-50353-431		A-8897969-189	R-616, R-907	1		0		0	4		0		0
R-617	RESISTOR, FIXED: comp; 150,000 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-603B Grid Voltage Divider	*RC20BF154J	N16-R-50677-431		A-8897969-211	R-617, R-618, R-805, R-908, R-909, R-1005	3		0		0	11		0		0

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*When ordering replacements specify "max dimensions not to exceed 5/32" diam x 13/32" lg"
**When ordering replacements specify "max dimensions not to exceed 15/64" diam x 19/32" lg"

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS								SPARE PARTS							
								CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL				
								EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
R-618	Same as R-617	V-603A Grid Voltage Divider															
R-619	RESISTOR, FIXED: comp; 10,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-603B Plate Load	*RC20BF103J	N16-R-50281-431		A-8897969-183	R-619, R-620, R-910, R-911, R-940	2		0		0	9		0		0
R-620	Same as R-619	V-603A Plate Load															
R-621	Same as R-615	V-604A Plate Load															
R-622	Same as R-615	V-604B Plate Load															
R-623	Same as R-606	V-607 and V-608 Screen Dropping															
R-624	Same as R-615	V-604B Grid Voltage Divider															
R-625	Same as R-615	V-604A Grid Voltage Divider															
R-626	RESISTOR, FIXED: comp; 56,000 ohms p/m 5%; ½ w; F characteristic; 0.400″ lg x 0.175″ diam; ins, moisture resistant; 2 axial wire leads; color coded	V-604A Grid Voltage Divider	*RC20BF563J	N16-R-50515-406		A-8897969-201	R-626, R-627, R-643 R-1003	3		0		0	10		0		0
R-627	Same as R-626	V-604B Grid Voltage Divider															
R-628	RESISTOR, FIXED: comp; 1000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-604 Cathode Bias	*RC20BF102J	N16-R-49921-431		A-8897969-159	R-628	1		0		0	3		0		0
R-629	RESISTOR, VARIABLE: comp; 150,000 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 1 5/16″ max diam x 0.451″ max d; SS or nickel pl round shaft 0.250″ diam x ½″ lg; lin taper; ins contact arm w/o off position; high torque; no locking device; mtg bushing ⅜″-32 thd x ¼″ lg; non-turn device on 7/16″ radius at 9 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-605A Grid Voltage Control		N16-R-88040-8526	786 Type 45	B-453560-5	R-629	1		0		0	3		0		0
R-630	Same as R-411	V-608 Grid Limiting															
R-631	RESISTOR, FIXED: comp; 1.2 megohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-605B Grid Isolating	*RC20BF125K	N16-R-50993-811		A-8897969-99	R-631	1		0		0	3		0		0
R-632	RESISTOR, FIXED: carbon film; 12,000 ohms p/m 1%; ½ w; temp coef not to exceed −0.0003 per °C over temp range of −40°C to 60°C; ⅛″ diam x 5/8″ max lg; glyptal ins; 2 axial wire leads	V-605B Cathode Bias		N16-R-73097-6558	1727 Type CP-½ Carbo-film	K-984059-185	R-632	1		0		1	3		0		3

R-633	RESISTOR, VARIABLE: comp; 1500 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16″ max diam x 0.451″ max d; SS or brass nickel pl shaft 0.250″ diam x 1 1/16″ max lg w/ scdr slot; lin taper; ins contact arm w/o off position; high torque; no locking device; mtg bushing ⅜″-32 thd x ¼″ lg; non-turn device on 1/16″ radius at 9 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-602A Cathode Bias Control		N16-R-87380-9401	786 Type 45	B-453560-10	R-633	1	0	0	3	0	0
R-634	Same as R-405	V-605B Plate Dropping												
R-635	Same as R-415	V-602A Grid Limiting												
R-636	RESISTOR, FIXED: comp; 15,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axia wire leads; marked w/ JAN std color code; spec JAN-R-11	V-605A +B Filter	*RC20BF153K	N16-R-50336-811		A-8897969-76	R-636	1	0	0	3	0	0
R-637	RESISTOR, FIXED: comp; 1200 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	Ext Tone Load	*RC20BF122K	N16-R-49940-811		A-8897969-63	R-637	1	0	0	3	0	0
R-638	Same as R-603	V-603 Plate Dropping												
R-639	RESISTOR, FIXED: comp; 39,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	AC Voltage Dividing	*RC20BF393K	N16-R-50444-811		A-8897969-81	R-639	1	0	0	3	0	0
R-640	Same as R-401	AC Voltage Dividing												
R-641	RESISTOR, FIXED: comp; 68,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-601B Plate Load	*RC20BF683K	N16-R-50552-811		A-8897969-84	R-641	1	0	0	3	0	0
R-642	RESISTOR, FIXED: comp; 560 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-605A Cathode Bias	*RC20BF561K	N16-R-49805-811		A-8897969-59	R-642	1	0	0	3	0	0
R-643	Same as R-626	V-607 Plate Dropping												
R-701	RESISTOR, VARIABLE: comp; 1.0 megohm p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16″ max diam x 0.451″ max d; SS or brass nickel pl shaft 0.250″ diam x 1 1/16″ max lg; lin taper; ins contact arm w/o off position; high torque; no locking device; mtg bushing ⅜″-32 thd x ⅜″ lg; non-turn device on 1/16″ radius at 3 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-701A Grid Input Control		N16-R-88340-9477	786 Type 45	B-453560-13	R-701	1	0	0	2	0	0
R-702	RESISTOR, VARIABLE: comp; 500,000 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16″ max diam x 0.451″ max d; SS or brass nickel pl shaft 0.250″ diam x 3½″ max lg; w/ scdr slot; lin taper; ins cont arm w/o off position; high torque; no locking device; mtg bushing ⅜″-32 thd x ¼″ lg; non-turn device on 7/16″ radius at 9 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to −100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-701B Grid Input Control		N16-R-88180-9430	786 Type 45	B-453560-1	R-702	1	0	0	2	0	0
R-703	RESISTOR, FIXED: comp; 470,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-701B Plate Load	*RC20BF474K	N16-R-50822-811		K-8897969-94	R-703	1	0	0	2	0	0
R-704	Not Used													
R-705	Same as R-403	V-702 Vert Plate Voltage Control												
R-706	RESISTOR, FIXED: comp; 180,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-702 Vert Plate Voltage Divider	*RC20BF184K	N16-R-50696-811		K-8897969-89	R-706	1	0	0	2	0	0

*When ordering replacements specify "max dimensions not to exceed 5/32″ diam x 13/32″ lg"

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS								
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL			
										EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
R-707	RESISTOR, FIXED: comp; 330,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-702 Vert Plate Voltage Divider	*RC20BF334K	N16-R-50759-811		K-8897969-92	R-707	1		0		0	2		0		0
R-708	RESISTOR, FIXED: comp; 2.2 megohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-701A Cathode Bias	*RC20BF225K	N16-R-51065-811		K-8897969-102	R-708, R-709	2		0		0	4		0		0
R-709	Same as R-708	V-701A Cathode Bias															
R-710	RESISTOR, FIXED: comp; 2.7 megohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	−B Voltage Divider	*RC20BF275K	N16-R-51092-811		A-8897969-103	R-710, R-711, R-712, R-716	4		0		0	8		0		0
R-711	Same as R-710	−B Voltage Divider															
R-712	Same as R-710	−B Voltage Divider															
R-713	RESISTOR, VARIABLE: comp; 500,000 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16″ max diam x 0.451″ max d; SS or nickel pl shaft 0.250″ diam x ¾″ max lg w/ scdr slot; lin taper; ins cont arm w/o off position; high torque; no locking device; bushing ⅜″-32 thd x ⅝″ lg; non-turn device on 7/16″ radius at 9 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-702 Grid #1 Voltage Control		N16-R-88180-9490	786 Type 45	B-453560-16	R-713	1		0		0	2		0		0
R-714	Same as R-601	−B Voltage Divider															
R-715	RESISTOR, VARIABLE: comp; 1.0 megohm p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16″ max diam x 0.451″ max d; SS or nickel pl shaft 0.250″ diam x 3½″ lg w/ scdr slot; lin taper; ins cont arm w/o off position; high torque; no locking device; mtg bushing ⅝″-32 thd x ⅝″ lg; non-turn device on 7/16″ radius at 3 o'clock; salt water spray corrosion resistant; ambient oper temp range −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, and RCA part/dwg #	V-702 Grid #3 Voltage Control		N16-R-88340-9385	786 Type 45	B-453560-14	R-715	1		0		0	2		0		0
R-716	Same as R-710	−B Voltage Divider															
R-801	RESISTOR, FIXED: comp; 27,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	−B Supply Filter	*RC20BF273J	N16-R-50398-431		A-8897969-193	R-801, R-802	2		0		0	4		0		0
R-802	Same as R-801	−B Supply Filter															
R-803	RESISTOR, FIXED: comp; 360,000 ohms p/m 5%; 1 w; F characteristic; 0.750″ lg x 0.280″ diam; ins, moisture resistant; 2 axial wire lead term; color coded	−B Voltage Divider	**RC30BF364J	N16-R-50776-726		K-8897970-220	R-803	1		0		0	2		0		0
R-804	RESISTOR, FIXED: comp; 3000 ohms p/m 5%; 2 w; F characteristic; 0.750″ max lg x 0.370″ max diam; ins, salt water immersion resistant; 2 axial wire lead term; color coded; spec JAN-R-11	V-803 Series Dropping	†RC42BF302J	N16-R-50048-131		A-8891493-170	R-804	1		0		0	2		0		0

R-805	Same as R-617	—B Voltage Divider														
R-806	RESISTOR, FIXED: comp; 560,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	+B Load	*RC20BF564K	N16-R-50858-811		K-8897969-95	R-806, R-1006	1	0	0	3	0	0		
R-807	Same as R-415	I-1501 Series Dropping														
R-901	Same as R-401	V-908 Screen Dropping														
R-902	Same as R-409	AVC Filter														
R-903	RESISTOR, FIXED: comp; 56,000 ohms p/m 10%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-901 Plate Load	*RC20BF563K	N16-R-50516-811		A-8897969-83	R-903, R-904, R-926	0	0	0	3	0	0		
R-904	Same as R-903	V-908 Plate Load														
R-905	RESISTOR, VARIABLE: comp; 5000 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16″ max diam x 0.451″ max d; SS or brass, nickel pl shaft 0.250″ diam x ½″ lg w/ scdr slot in end; lin taper; ins, cont arm w/o off position; high torque; no locking device; non-turn device at 9 o'clock; mtg bushing 3/8″-32 thd x ¼″ lg; salt water spray corrosion resistant; ambient oper temp range −60° to +100°C; bushing SS or brass nickel pl; marked w/ NT #, mfr prefix ltr, RCA part/dwg	V-903 Cathode Bias Control		N16-R-87520-9596	786 Type 45	B-453560-19	R-905	0	0	0	1	0	0		
R-906	RESISTOR, FIXED: comp; 2700 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-903 Cathode Bias	*RC20BF272J	N16-R-50038-431		A-8897969-169	R-906	0	0	0	1	0	0		
R-907	Same as R-616	V-904 Cathode Bias														
R-908	Same as R-617	V-904 Grid Voltage Divider														
R-909	Same as R-617	V-904 Grid Voltage Divider														
R-910	Same as R-619	V-904 Plate Load														
R-911	Same as R-619	V-904 Plate Load														
R-912	Same as R-615	V-904 Grid Voltage Divider														
R-913	RESISTOR, FIXED: comp; 1.0 megohm p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-905 Grid Isolating	*RC20BF105J	N16-R-50974-431		A-8897969-231	R-913, R-914, R-915, R-916, R-931, R-932	0	0	0	6	0	0		
R-914	Same as R-913	V-905 Grid Isolating														
R-915	Same as R-913	V-907 Grid Voltage Divider														
R-916	Same as R-913	V-906 Grid Voltage Divider														
R-917	Same as R-615	V-905 Plate Load														
R-918	Same as R-615	V-905 Plate Load														
R-919	RESISTOR, FIXED: comp; 680,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-907 Grid Voltage Divider	*RC20BF684J	N16-R-50893-431		A-8897969-227	R-919, R-920	0	0	0	2	0	0		
R-920	Same as R-919	V-906 Grid Voltage Divider														

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*When ordering replacements specify "max dimensions not to exceed 5/32″ diam x 13/32″ lg"
**When ordering replacements specify "max dimensions not to exceed 15/64″ diam x 19/32″ lg"
†When ordering replacements specify "max dimensions not to exceed 21/64″ diam x 25/32″ lg"

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS								SPARE PARTS							
								CV-60/URR AF INPUT SINGLE				AN/URA-8 AF INPUT DUAL			
								EQUIP		STOCK		EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
R-921	RESISTOR, FIXED: comp; 68,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	M-1601 Series	*RC20BF683J	N16-R-50551-431		A-8897969-203	R-921, R-922	0		0		0	2		0		0
R-922	Same as R-921	V-906 Cathode Bias															
R-923	RESISTOR, VARIABLE: comp; 10,000 ohms p/m 20%; ¼ w; 3 solder lug term; encl SS or brass nickel pl case 15/16″ max diam x 0.451″ d; SS or brass nickel pl shaft 0.250″ diam x ½″ lg, scdr slot; lin taper; ins cont arm w/o off position; high torque, no locking device; mtg bushing ⅜″-32 thd x ¼″ lg; salt water spray corrosion resistant; ambient oper temp −60 to +100°C; bushing SS or brass nickel pl; marked w/ NT ♯, mfr prefix ltr, RCA part/dwg ♯	V-906 Cathode Bias Control		N16-R-87680-9449	786 Type 45	B-453560-20	R-923	0		0		0	1		0		0
R-924	Same as R-409	V-907 Grid Leak															
R-925	Same as R-409	V-906 Grid Leak															
R-926	Same as R-903	V-906 and V-907 Cathode Load															
R-927	Same as R-417	V-902 Cathode Load															
R-928	Same as R-417	V-909 Plate Load															
R-929	RESISTOR, FIXED: comp; 470,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	V-902 Plate Load	*RC20BF474J	N16-R-50821-431		A-8897969-223	R-929, R-930	0		0		0	2		0		0
R-930	Same as R-929	V-909 Cathode Load															
R-931	Same as R-913	V-902 Plate Load															
R-932	Same as R-913	V-909 Cathode Load															
R-933	RESISTOR, FIXED: comp; 750,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	Output Filter of Differential Rect V-902 and V-909	*RC20BF754J	N16-R-50911-431		A-8897969-228	R-933, R-934, R-943	0		0		0	3		0		0
R-934	Same as R-933	Output Filter of Differential Rect V-902 and V-909															
R-935	RESISTOR, FIXED: comp; 39,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	Output Filter of Differential Rect V-902 and V-909	*RC20BF393J	N16-R-50443-431		A-8897969-197	R-935	0		0		0	1		0		0
R-936	RESISTOR, FIXED: comp; 82,000 ohms p/m 5%; ½ w; F characteristic; 0.375″ lg x 0.140″ diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire leads; marked w/ JAN std color code; spec JAN-R-11	−B Filter	*RC20BF823J	N16-R-50587-431		A-8897969-205	R-936, R-938	0		0		0	2		0		0
R-937	Same as R-615	−B Voltage Divider															

R-938	Same as R-936	−B Filter															
R-939	RESISTOR, FIXED: comp; 4700 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity, and salt water cycling resistant; 2 axial wire leads marked w/JAN color code; spec JAN-R-11	−B Voltage Divider	*RC20BF472J	N16-R-50128-431		A-8897969-175	R-939	0		0		0	1		0		0
R-940	Same as R-619	V-905 Plate Dropping															
R-941	Same as R-409	V-908 Grid Leak															
R-942	Same as R-409	V-901 Grid Leak															
R-943	Same as R-933	+B Voltage Divider															
R-944	RESISTOR, FIXED: comp; 1200 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, RSW and humidity; 2 axial wire lead term; color coded; spec JAN-R-11	+B Voltage Divider	*RC20BF122J	N16-R-49939-431		A-8897969-161	R-944	0		0		0	1		0		0
R-945	RESISTOR, FIXED: comp; 680 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam less leads; ins, humidity and RSW; 2 axial wire lead term; color coded; spec JAN-R-11	M-1601 Shunt	*RC20BF681J	N16-R-49840-431		A-8897969-155	R-945, R-946	0		0		0	2		0		0
R-946	Same as R-945	V-907 Cathode Bias															
R-947	RESISTOR, FIXED: comp; 270,000 ohms p/m 10%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, humidity and salt water immersion cycling resistant; 2 axial wire lead term; marked w/ JAN std color code; spec JAN-R-11	V-902 and V-909 Plate Load	*RC20BF274K	N16-R-50741-811		A-8897969-91	R-947	0		0		0	1		0		0
R-948	Same as R-417	V-902 Cathode Load															
R-949	Same as R-417	V-909 Cathode Load															
R-1001	RESISTOR, FIXED: comp; 12,000 ohms p/m 5%; ½ w; F characteristic; 0.375" lg x 0.140" diam; ins, RSW and humidity; 2 axial wire lead term; color coded; spec JAN-R-11	−B Supply Filter	*RC20BF123J	N16-R-50308-431		A-8897969-185	R-1001, R-1002	0		0		0	2		0		0
R-1002	Same as R-1001	−B Supply Filter															
R-1003	Same as R-626	−B Voltage Divider															
R-1004	RESISTOR, FIXED: comp; 910 ohms p/m 5%; 2 w; F characteristic; 0.750" lg x 0.370" diam; ins, moisture resistant; RSW; 2 axial wire leads; color coded; spec JAN-R-11	V-1003 Series Dropping	†RC40BF911J	N16-R-49904-121		A-8891493-158	R-1004	0		0		0	1		0		0
R-1005	Same as R-617	−B Voltage Divider															
R-1006	Same as R-806	+B Load															
R-1007	RESISTOR, FIXED: comp; 430 ohms p/m 5%; 1 w; F characteristic; 0.750" lg x 0.280" diam; ins, moisture resistant; 2 axial wire lead term; color coded	V-1003 Series Dropping	**RC30BF431J	N16-R-49750-726		A-8897970-150	R-1007	0		0		0	1		0		0
R-1008	Same as R-415	I-1601 Series Dropping															
R-1501 and R-1502	Not Used																

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*When ordering replacements specify "max dimensions not to exceed 5/32" diam x 13/32" lg"
**When ordering replacements specify "max dimensions not to exceed 15/64" diam x 19/32" lg"
†When ordering replacements specify "max dimensions not to exceed 21/64" diam x 23/32" lg"

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS									SPARE PARTS									
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL				
									EQUIP		STOCK			EQUIP		STOCK		
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
S-401	SWITCH, ROTARY: 2 sect ea having 2 poles 2 throws; 2 sects; 50 v; coin silver cont; molded bakelite body; body 1" diam x 1 1/16" lg less shaft and term; shorting type cont; detent locking action; solder lug term; 3/8"-32 thd x 1/4" lg mtg bushing w/ 0.250" diam x 1/2" lg shaft; flush mtg; 100 hr salt spray test, lam plastic according to JAN-P-13, type LTS-EM-2 or better, molded plastic according to JAN-P-14, type MTS-G-2 or better, humidity resistant, and 500 v RMS AC test, mechanical and electrical spec all in accordance with RCA spec dwg #8848967	Switches Seed Loads of T-403		N17-S-64977-8101	1	M-452280-2	S-401, S-603	2		1		7	5		2		7
S-401A	Part of S-401																	
S-401B	Part of S-491																	
S-402	SWITCH, ROTARY: 2 poles 2 throws; single sect; 50 v 5 ma; coil silver cont; molded bakelite body; body 3/4" diam x 15/16" lg less shaft and term; shorting type cont; detent locking action; solder lug term; 3/8"-32 thd x 1/4" lg mtg bushing w/ 0.250" diam x 1/2" lg shaft; flush mtg; 100 hr salt spray test; lam plastic according to JAN-P-13, type LTS-EM-2 or better, molded plastic according to JAN-P-14, type MTS-G-2 or better, humidity resistant, and 500 v RMS AC test, mechanical and electrical spec all in accordance with RCA spec dwg #8848967	Switches V-404 Output		N17-S-60907-8578	1	M-452280-1	S-402	1		1		7	2		1		7
S-601	SWITCH, ROTARY: total number of cont 8, 4 positions; single sect; 50 v; coin silver cont; molded bakelite body; body 3/4" diam x 15/16" lg less shaft and term; non-shorting type cont; locking action; solder lug term; 3/8"-32 thd x 1/4" lg mtg bushing w/ 0.250" diam x 1/2" lg shaft; flush mtg; 100 hr salt spray test, lam plastic according to JAN-P-13, type LTS-EM-2 or better, molded plastic according to JAN-P-14, type MTS-G-2 or better, humidity resistant, and 500 v RMS AC test, mechanical and electrical spec all in accordance with RCA spec dwg #8848967	Switches Filters of Z-601		N17-S-59292-2663	1	M-452280-5	S-601	1		1		7	3		2		6
S-602	SWITCH, ROTARY: single pole 9 throws 9 positions; single sect; 50 v; coin silver cont; molded bakelite body; body 3/4" diam x 15/16" lg less shaft and term; non-shorting type contacts; locking action; solder lug term; 3/8"-32 thd x 1/4" lg mtg bushing w/ 0.250" diam x 1/2" lg shaft; flush mtg; 100 hr salt spray test, lam plastic according to JAN-P-13, type LTS-EM-2 or better, molded plastic according to JAN-P-14, type MTS-G-2 or better, humidity resistant, and 500 v RMS AC test, mechanical and electrical spec all in accordance with RCA spec dwg #8848967	Switches Tuning Capacitors of V-605B		N17-S-60520-5078	1	M-452280-3	S-602	1		1		7	3		2		6
S-603	Same as S-401	Switches Mark Space Polarity																
S-603A	Part of S-603																	
S-603B	Part of S-603																	

S-604	SWITCH, TOGGLE: DPST; 6 amp at 125 v DC, 3 amp at 250 v DC; phenolic body; 1½" max lg x 9/16" max wd x ½" h excluding lever and mtg bushing; bat type handle 5/8" lg; locking action; position 1 normally open, position 2 normally closed; 4 solder lug term; single hole mtg bushing 15/32"-32 thd x ¼" lg; bushing has keyway 0.068" +0.007" −0.000" wd x 0.035" +0.005" −0.000" d extending full length; term hot solder dipped (Part of W-1501)	Switches Screen Supply to V-607 and V-608		N17-S-73115-2931	248 Cat #1GA2B1	A-8898230-1	S-604, S-1501, S-1601	2		0		0	6		0		0
S-701	SWITCH, PUSH: 1C and 1C; 13/16" h x 1⅛" wd x 2 9/16" lg o/a; non-shorting cont; momentary action 2 cont normally open and 2 cont normally closed; 6 solder lug term; 3/8"-32 thd x ¼" lg mtg bushing; shaft 0.250" x 5/16" lg flush mtg; 200 hr salt spray, humidity, fungus, vibration and shock resistant in accordance w/ spec RCA dwg #8893265	Switches Signal and Calibration Voltages to V-702		N17-S-58904-2201	1	A-8845231-1	S-701	1		0		1	2		0		2

S-901	SWITCH, ROTARY: single pole 3 throws; 3 positions; single sect; 50 v; coin silver cont; molded bakelite body; body $\frac{3}{4}$" diam x $\frac{15}{32}$" lg less shaft and term; non-shorting type cont; locking action; solder lug term; $\frac{3}{8}$"-32 thd x $\frac{1}{4}$" lg mtg bushing w/ 0.250" diam x $\frac{1}{2}$" lg shaft; flush mtg; 100 hr salt spray test, lam phenolic plastic according to JAN-P-13, type LTS-EM-2 or better, molded plastic according to JAN-P-14, type MTS-G-2 or better, humidity resistant, and 500 v RMS AC test, mechanical and electrical spec all in accordance with RCA spec dwg #S8S8967	Switches Grid Inputs to V-903		N17-S-61164-9106	1	M-452280-4	S-901	0		0		0	1		1		2
S-1501	Same as S-604	Switches AC Power															
S-1601	Same as S-604 (Part of W-1601)	Switches AC Power															
S-1602	SWITCH, ROTARY: four pole, three position; single sect; 500 v flashover between cont and case, 100 ma rating ea cont; silver pl term; bakelite; $1\frac{1}{4}$" diam x $\frac{27}{64}$" lg; shorting type cont; solder lugs; nuts by $\frac{1}{4}$" lg bushing w/ $\frac{3}{8}$"-32 thd; shaft $\frac{1}{2}$" lg x 0.250" diam; stop at 3 o'clock position (Part of W-1601)	Switches M-1601 Positions		N17-S-62615-5896	1	K-259496-5	S-1602	0		0		0	1		1		1
T-401	Part of Z-401	Couples AF Input to Band Pass Filter Z-403															
T-402	Part of Z-401	Couples AF Input to High Pass Filter Z-404															
T-403	Part of Z-402	Couples V-403 to V-404															
T-404	Part of Z-402	Couples V-403 to V-404															
T-601	TRANSFORMER, AF: line type; pri 12,000 ohms impedance, secd 600 ohms impedance; HS, round metal case; $1\frac{19}{32}$" h x $1\frac{1}{32}$" wd x $1\frac{15}{32}$" lg less term; body 1" diam; 35 mw operating level; turns ratio pri to secd 4.47:1; freq response, flat within 0.5 db total variation from 500 to 2000 cyc; 4 solder lugs on bottom; two 0.136" diam mtg holes on 1.218" mtg/c; impr for tropical use; BuShips spec 16T30(NT)	Couples V-605A and V-602A to Tone Output		~~N17-T-62064-3800~~ N17-T-62669 5501	1	B-453142-1	T-601	1		1		2	3		0		3
T-801	TRANSFORMER, POWER: fil and pl type; pri taps, for input of 105.0, 115.0 and 125.0 v 50/60 cyc; single ph; 4 output wnd; secd #1, 6.3 v at 0.6 amp; secd #2, 1.25 v at 0.3 amp; secd #3, 210 v at 70 ma ea side CT; 70 ma total DC output; secd #4, 6.3 v at 6.0 amp; 35 vac from term 9 and 10; 625 v AC at 0.002 amp from term 9 and 11; these ratings hold when line filter RCA dwg #453146-1 is connected between input term and line voltages; term 13 and 14, 2000 v RMS test; all other wnd tested at 2 x RMS operating +1000 v; oil filled; HS metal case; 5" lg x $3\frac{17}{32}$" h x $2\frac{1}{16}$" d, less mtg studs and term; 14, $\frac{1}{2}$" lg solder lug term on standoff ins at bottom of case; four #10-32 thd x $\frac{11}{32}$" lg studs, on $1\frac{5}{16}$" x $4\frac{1}{4}$" mtg/c; schematic; 14 marked term on transformer, one term of secd #3 connected to one term of secd #2 (int connection); secd #4 CT connected to term 9 on secd #3; max ambient temp of oper 85°C, 200 hr salt spray test, pri wnd has electrostatic shield; Navy spec 17T30 (int) grade 1	Provides Plate Voltages to Rect V-801 and V-802 and All Fil Voltages		N17-T-73580-1101	1	B-453149-1	T-801	1		1		2	2		1		3
T-1001	TRANSFORMER, POWER: fil and pl type; pri taps for input of 105, 115 and 125 v 50/60 cyc; single ph; 3 output wnd; secd #1, 1.5 v at 0.300 amp, secd #2, 200 v at 70 ma ea side CT; 70 ma total DC output, secd #3, 6.3 v at 6.0 amp, these ratings hold when a line filter RCA dwg #453146-1 is connected between input term and line voltage; all wnd tested at 2 x RMS operating +1000 v; mineral oil; HS metal case; 5" lg x $3\frac{17}{32}$" h x $2\frac{1}{16}$" d less lugs; 10 solder lug term $\frac{1}{2}$" lg on standoff ins on bottom of case; four #10-32 studs, on $1\frac{5}{16}$" x $4\frac{1}{4}$" mtg/c; schematic; jumper is connected between term 6-7 (int) for use w/ directly heated bias rect, 1Z2; 24 hr cont oper temp at 85°C, pri has electrostatic shield; Navy Spec 17T30 (int) grade 1	Provides Plate Voltages to Rect V-1001 and V-1002 and All Fil Voltages		N17-T-73580-1001	1	B-453148-1	T-1001	1		0		0	1		1		5
V-401	TUBE, ELECTRON: high frequency power triode	AF Amplr	6C4	N16-T-56214			V-401, V-903	1		0		0	3		0		0

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TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS								SPARE PARTS							
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL			
									EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
V-402	TUBE, ELECTRON: high-mu twin triode	AF Limiter	12AX7	N16-T-58241-60			V-402, V-701	2		0		0	4		0		0
V-403	TUBE, ELECTRON: RF amplr pent, sharp cut-off	Driver	6AU6	N16-T-56203-50			V-403, V-901, V-90S	1		0		0	4		0		0
V-404	TUBE, ELECTRON: miniature type twin diode	AF Discr	6AL5	N16-T-56195			V-404, V-606, V-902, V-909	2		0		0	7		0		0
V-601	TUBE, ELECTRON: duotriode	AF Amplr I and II	12AU7	N16-T-58241			V-601, V-602, V-603, V-604, V-605, V-904, V-905, V-906, V-907	5		0		0	19		0		0
V-602	Same as V-601	Bal Mod and Trigger Driver															
V-603	Same as V-601	Trigger I															
V-604	Same as V-601	Trigger II															
V-605	Same as V-601	Tone Mod and Osc															
V-606	Same as V-404	DC Restorer															
V-607	TUBE, ELECTRON: beam power amplifier	Teletype Keyer	6AQ5	N16-T-56195			V-607, V-60S	2		0		0	6		0		0
V-608	Same as V-607	Teletype Keyer															
V-701	Same as V-402	DC Amplr															
V-702	TUBE, ELECTRON: cathode-ray, medium persistence	CR Tube for Tuning	2BP1	N16-T-52230			V-702	1		0		0	2		0		0
V-S01	TUBE, ELECTRON: HV half wave rectifier	−B Rect	1Z2	N16-T-51990			V-S01, V-1001	1		0		0	3		0		0
V-S02	TUBE, ELECTRON: miniature type high vacuum rectifier	+B Rect	6X4	N16-T-56840			V-802, V-1002	1		0		0	3		0		0
V-S03	TUBE, ELECTRON: voltage regulator, cold cathode type	+B Regulator	OA2	N16-T-52001			V-S03, V-1003	1		0		0	3		0		0
V-901	Same as V-403	Channel "A" Amplr															
V-902	Same as V-404	AVC and Differential Rect															
V-903	Same as V-401	DC Amplr															
V-904	Same as V-601	First Control Trigger															
V-905	Same as V-601	Seed Control Trigger															
V-906	Same as V-601	Gate B Control and Gate B															
V-907	Same as V-601	Gate A Control and Gate A															
V-908	Same as V-403	Channel "B" Amplr															
V-909	Same as V-404	AVC and Differential Rect															
V-1001	Same as V-S01	−B Rect															

V-1002	Same as V-802	+B Rect													
V-1003	Same as V-803	+B Regulator													
W-1501	WIRING, HARNESS: for interconnecting all units—AF; c/o Freq Shift Converter: c/o interconnecting wire harness and the following: 2 telephone jacks, J-1501, J-1502, RCA part/dwg #7862660-2; 4 connector receptacles, J-1503, J-1504, J-1505, J-1506, RCA part/dwg #738962-2; 1 connector plug P-1501, RCA part/dwg #738961-2; 1 switch, S-1501, RCA part/dwg #8898230-1; 3 solder lug terms, RCA part/dwg #67592-24; 26 cond; longest 84″ lg; next longest 60″ lg; harness assem occupies a space approx 14″ lg x 4″ wd in one direction and 11 3/16″ lg x 5″ wd in other direction; mtd by soldering to connectors, jacks and switch; color coded wire leads laced w/ nylon cord	Frame Power		N17-W-300912-427	1	E-312439-501	W-1501	1	0	0	2	0	0
W-1502	CABLE ASSEMBLY, SPECIAL PURPOSE: c/o 19 cond of #26 AWG ea 10 strands, (one of which is shielded) and 2 cond #24 AWG ea 16 strands; individual cond ins w/ thermoplastic synthetic compound; all cond rated at 150 vdcw; color coded; cable covered w/ Saran braid, 16 carriers 4 ends; round 1/2″ diam approx; 25 1/2″ lg, excluding terminations; one end terminated in connector plug RCA part/dwg #738961-3, other end terminated in connector plug RCA part/dwg #738961-4	Test Cable from J-1201 to P-1501		N17-C-48892-6585	1	P-740848-501	W-1502, W-1602	1	0	1	3	0	3
W-1601	WIRING, HARNESS: for Combiner Unit; c/o interconnecting wire harness (of 23 cond) and the following: 2 telephone jacks, J-1601, J-1602, RCA part/dwg #7862660-6; 3 connector receptacles, J-1603, J-1604, J-1605, RCA part/dwg #738962-2; 1 connector plug, P-1601, RCA part/dwg #738961-2; 1 switch, S-1601, RCA part/dwg #8898230-1; 1 rotary switch, S-1602, RCA part/dwg #259496-5; 4 solder lug terms, RCA part/dwg #67592-24; 2 solder lug terms, RCA part/dwg #818270-1; harness assem occupies a space approx 14″ lg x 4″ wd in one direction and 11 3/16″ lg x 5″ wd in other direction; 63″ lg to 3″ lg; mtd by connectors, jacks, and switches	Frame Power		N17-W-300081-101	1	E-312450-501	W-1601	0	0	0	1	0	0
W-1602	Same as W-1502	Test Cable from J-1301 to P-1601													
W-1701 to W-1704	Not Used														
W-1705	LINE, RF TRANSMISSION: 12″ lg less terminations; 14″ lg incl terminations; ea end has UG-88/U connector plug; marked W-1701 to W-1712 incl	Diversity Signal J-1209 to J-1308	CG-409/U (1′2″)	N16-C-11943-3834	1	M-454347-501	W-1705, W-1706, W-1711, W-1712	0	0	0	4	0	0
W-1706	Same as W-1705	Diversity Signal J-1209 to J-1309													
W-1707 to W-1710	Not Used														
W-1711	Same as W-1705	Diversity Signal J-1210 to J-1310													
W-1712	Same as W-1705	Diversity Signal J-1210 to J-1311													
W-1713 to W-1716	Not Used														
W-1717	CABLE ASSEMBLY, POWER: two #18 AWG stranded cond; synthetic rubber ins; 600 v RMS working; neoprene outer sheath; round 0.330″ max OD; 12 1/4″ lg less terminations; one end terminated in connector plug AN-3106-14S-7S and cable clamp AN-3057-6, other end terminated in connector plug AN-3106-14S-7P and cable clamp AN-3057-6; cable marked W-1713 to W-1718 incl; cable in accordance w/ Navy spec 15-C-1 DCOP-2	Power Output		N17-C-48193-6050	1	M-454352-501	W-1717, W-1718	0	0	0	2	0	0
W-1718	Same as W-1717	Power Output													

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS								SPARE PARTS							
								CV-60/URR AF INPUT SINGLE				AN/URA-8 AF INPUT DUAL			
								EQUIP		STOCK		EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIGNATION	CONTRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
X-401	SOCKET, TUBE: 7 cont miniature, axial type; below chassis wafer mtg; two 1/8" diam mtg holes 7/8" c to c; oval mineral filled plastic body 1 1/8" lg x 3/4" wd x 21/32" h o/a excluding term; beryllium copper silver pl cont; no metal shock shield, has a 3/32" ID ctr shield; term ends of cont hot tinned dip	For V-401		N16-S-62603-6446	426 Type XOA-7	K-8890605-1	X-401, X-403, X-404, X-606, X-607, X-608, X-901, X-902, X-903, X-908, X-909	6		0		0	20		0		0
X-402	SOCKET, TUBE: 9 cont miniature, axial type; below chassis wafer mtg; 2 elongated mtg holes 0.145" lg x 0.125" wd, 1.125" c to c; oval ceramic body 1.438" lg x 0.859" wd x 23/32" h o/a excluding term; beryllium copper silver pl cont; no metal shock shield, has a 0.167" ID ctr shield; term ends of contacts hot tinned dip, wax impr	For V-402		N16-S-64063-6456	426 Type XOA-C-9	K-8890682-1	X-402, X-601, X-602, X-603, X-604, X-605, X-701, X-904, X-905, X-906, X-907	7		0		0	23		0		0
X-403	Same as X-401	For V-403															
X-404	Same as X-401	For V-404															
X-601	Same as X-402	For V-601															
X-602	Same as X-402	For V-602															
X-603	Same as X-402	For V-603															
X-604	Same as X-402	For V-604															
X-605	Same as X-402	For V-605															
X-606	Same as X-401	For V-606															
X-607	Same as X-401	For V-607															
X-608	Same as X-401	For V-608															
X-701	Same as X-402	For V-701															
X-702	SOCKET, TUBE: 12 cont medium axial type; tube mtd; round mineral filled plastic body 2 1/16" diam x 29/32" thk o/a excluding wire leads; 1 7/8" diam socket; beryllium copper silver pl cont; no metal shock shield or ear shield; duo decal, positions #1 and #3 wired together, positions #5 and #11 unused, all other positions wired w/ ext leads keyway between positions #1 and #12 contacts Wire Table Position / Length in Inches / Color 1 / Connects to #3 / Buss 2 / 6 1/2 / Red/blk tr 3 / 6 / Wht/grn tr 4 / 7 1/2 / Orange 5 / ... / ..... 6 / 6 3/8 / Wht/blu tr 7 / 6 1/8 / Gray 8 / 3 7/8 / Red/grn tr 9 / 2 3/4 / Black 10 / 4 1/4 / White 11 / ... / ..... 12 / 3 7/8 / Wht/grn tr RSW	For V-702		N16-S-64286-3950	1	B-449643-1	X-702	1		0		0	2		0		0

X-801	SOCKET, TUBE: 7 cont miniature; above chassis base mtg; 2 mtg holes 0.125" diam on 0.875" mtg/c; oval ceramic body 1.144" lg x 0.75" wd x 0.217" h less term; cont beryllium copper, silver pl; cont term ends hot tin dipped; body wax impr	For V-801		N16-S-62603-6461	426 Type XOA-C-7	K-8898606-1	X-801, X-802, X-803	3	0	0	6	0	0
X-802	Same as X-801	For V-802											
X-803	Same as X-801	For V-803											
X-804	SOCKET, TUBE: octal; one piece saddle mtg; two 0.156" diam mtg holes on 1 1/2" mtg/c; round molded mica filled body 1 7/64" diam x 15/32" h, less terms; copper or phosphor bronze silver pl conts	For Capacitor C-802		N16-S-63515-6651	133 Cat #9857	K-886972-1	X-804	1	0	0	2	0	0
X-901	Same as X-401	For V-901											
X-902	Same as X-401	For V-902											
X-903	Same as X-401	For V-903											
X-904	Same as X-402	For V-904											
X-905	Same as X-402	For V-905											
X-906	Same as X-402	For V-906											
X-907	Same as X-402	For V-907											
X-908	Same as X-401	For V-908											
X-909	Same as X-401	For V-909											
X-1501	LIGHT, INDICATOR: w/ lens; 21/32" diam x 11/16" h white translucent lens; for miniature bayonet, T3 1/4 bulb; enclosed shell; brass shell suitably finished to be corrosion resistant; 1 5/8" lg x 15/16" diam o/a; 0.718" diam mtg hole required, 5/16" max panel thk; horizontally mtd, lamp replaceable from front of panel; screw type lens; 2 solder lug term located on opposite sides of base of socket; outside of bezel to be finished black nickel followed by black lacquer	Lamp I-1501		N17-L-76909-4827	780 Cat # 91410XP2-935	A-8898229-2	X-1501, X-1601	1	0	2	3	0	3
X-1601	Same as X-1501	Lamp I-1601											
Z-401	FILTER, BAND PASS-HIGH PASS: high pass filter, attenuation below 425 cps, not less than 40 db down; band pass filter, mid-pass freq 2550 cps p/m 50 cps, 900 to 4500 cps bandwidth; 4 9/16" lg x 2 1/16" wd x 3 5/32" h o/a; high pass filter, 600 ohms input impedance, nom at 1000 cps, 22,000 ohms output impedance; band pass filter, 600 ohms input impedance, nom at 2550 cps, 22,000 ohms output impedance; HS rectangular metal case; four #8-32 thd x 5/16" studs on 1 3/8" x 4" mtg/c; 9 solder type term; max power input, both filters, 60 mw; pri wnd of input transf electrostatically shielded; filter contains 9 marked term, term 8 common to both; band pass filter input terms 1-2-3, output 8-9; high pass filter input terms 4-5-6, output 7-8	Suppresses Unwanted Freq		N16-F-33402-9213	1	B-453143-1	Z-401	1	0	2	2	0	4
Z-402	TRANSFORMER, DISCRIMINATOR: freq range 550 cyc to 3600 cyc; AF discriminator for Freq Shift Converter AN/URA-6-7-8; shielded; 2 7/8" h x 1 13/32" wd x 1 5/32" d less term; powdered iron core; seed is ext tuned; mts by two #6-32 x 5/16" lg studs, on 31/32" mtg/c; 5 solder lugs protruding from bottom; HS metal case, 2 units mtd in single case term on bottom of case marked 1 to 5	Couples V-403 to V-404		N17-T-67101-1901	1	B-453145-1	Z-402	1	0	2	2	0	4
Z-403	Part of Z-401												
Z-404	Part of Z-401												
Z-601	FILTER, LOW PASS: low speed attenuation 80 to 140 cps flat within 6 db, 240 cps and above-down not less than 40 db, high speed attenuation 80 to 300 cps flat within 6 db, 500 cps and above-down not less than 40 db; 2 7/8" h x 1 13/16" wd x 1 1/4" d less term; impedance 20,000 ohms, insertion loss not greater than 8 db; HS rectangular metal case; four #6-32 x 1/4" studs, on 13/16" x 1 3/8" mtg/c; 5 solder type term protruding from bottom; max DC cur 0.5 ma at 150 v; RSW and humidity; 500 vdc test; max ambient temp of oper 85 deg C	Suppresses Unwanted Harmonics		N16-F-44012-8428	1	B-453144-1	Z-601	1	0	2	3	0	3

TABLE 8–4. COMBINED PARTS AND SPARE PARTS LIST (Continued)

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

PARTS								SPARE PARTS							
									CV-60/URR AF INPUT SINGLE					AN/URA-8 AF INPUT DUAL			
									EQUIP		STOCK			EQUIP		STOCK	
SYMBOL DESIG.	DESCRIPTION	FUNCTION	JAN AND (NAVY) TYPE NO.	SIGNAL CORPS AND STANDARD NAVY STOCK NO.	MFGR AND MFGR'S DESIG-NATION	CON-TRACTOR DRAWING AND PART NO.	ALL SYMBOL DESIG. INVOLVED	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.	TOTAL NO. PER EQUIP.	BOX	QUAN.	BOX	QUAN.
Z-1201	FILTER, LOW PASS: begins to cut off at 2000 cyc reaching max cutoff at 14,000 cyc; 3⅛" lg x 2⅛" wd x 1⅜" h o/a; 600 ohm input and 600 ohm output impedance; HS rectangular metal case; six 0.173" diam mtg holes, 3 holes per fl on 2⅛" mtg/c between fl and 1" mtg/c between holes on fl; 5 solder lug type term; input term 1-2, output term 3-4-5, term 5 CT; 500 vdct; max ambient temp of oper 85°C; insertion loss less than 3 db and uniform within 1 db between 500 and 2000 cyc, 200 hr salt spray test and humidity, shock and vibration resistant; BuShips spec 16T30 (int) grade 1, class A	Suppresses Unwanted Harmonics in tone output circuit of Cable Filter		N16-F-44039-5266	1	B-453539-1	Z-1201, Z-1301	1		0		1	3		0		3
Z-1202	FILTER, LOW PASS: begins cutoff at 14 kc reaching max at 30 mc; 5⅛" lg x 2⅝" wd x 1⅞" h o/a; input impedance 20 ohms; output impedance 140 ohms; HS rectangular metal case; eight 0.173" diam holes, 4 holes per fl on 1¼" mtg/c, 2 fl spaced 2⅛"; 4 solder type term; approx 75 w output for use on AC power supply line from 105 to 125 v 50/60 cps single ph, and the line voltage drop incurred by the filter will be not more than 1.5 v at 65 amp load; power loss not to exceed 1.5 w; max ambient temp of operations 85 deg C; 200 hr salt spray test; shock and vibration resistant; Navy spec 16T30	Suppresses Unwanted Harmonics in power line circuit of Cable Filter		N16-F-44150-1001	1	B-453146-1	Z-1202, Z-1302	1		0		1	3		0		3
Z-1301	Same as Z-1201	Suppresses Unwanted Harmonics in tone output circuit of Cable Filter															
Z-1302	Same as Z-1202	Suppresses Unwanted Harmonics in power line circuit of Cable Filter															
	CASE: for spare parts; steel, Navy gray enamel finish; empty; 12" lg x 12" wd x 6" h o/a; under surface of lid has card holder; 2 folding type handles on end; has hasp and staple for padlock; BuShips spec 42-B-9	Storage case for equipment spares			1	T-618947-504		1		0		0	1		0		0

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TABLE 8—5. CROSS REFERENCE PARTS LIST

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

JAN (OR AWS) DESIGNATION	KEY SYMBOL
CE52F350N	C-802
CM20C131J	C-904
CM20C361J	C-410
CM20D391G	C-607
CM25B681J	C-905
CM30C182J	C-409
CM30C302G	C-404
CM30E122G	C-611
CM30E182G	C-612
CM30E272G	C-613
CM30E511G	C-608
CM30E681G	C-609
CM30E911G	C-610
CM35C472G	C-406
CM35C512G	C-413
CM35E472G	C-614
CM40C103G	C-403
CP69B5FF254V	C-1001
CP69B5FG104V	C-801
MR25W107 Spec	M-1601
RC20BF102J	R-628
RC20BF102K	R-404
RC20BF103J	R-619
RC20BF103K	R-603
RC20BF104J	R-615
RC20BF104K	R-406
RC20BF105J	R-913
RC20BF105K	R-409
RC20BF122J	R-944
RC20BF122K	R-637
RC20BF123J	R-1001
RC20BF125K	R-631
RC20BF153J	R-420
RC20BF153K	R-636
RC20BF154J	R-617
RC20BF154K	R-415
RC20BF182K	R-604
RC20BF183J	R-616
RC20BF183K	R-411
RC20BF184K	R-706
RC20BF185K	R-601
RC20BF223K	R-401
RC20BF224K	R-605
RC20BF225K	R-708
RC20BF244J	R-611
RC20BF272J	R-906
RC20BF273J	R-801
RC20BF273K	R-408
RC20BF274J	R-417
RC20BF274K	R-947
RC20BF275K	R-710
RC20BF304J	R-418
RC20BF334K	R-707
RC20BF391K	R-602
RC20BF393J	R-935
RC20BF393K	R-639
RC20BF470J	R-945
RC20BF471K	R-410
RC20BF472J	R-939
RC20BF472K	R-612
RC20BF473K	R-405
RC20BF474J	R-929
RC20BF474K	R-703
RC20BF561K	R-642
RC20BF562J	R-609
RC20BF563J	R-626
RC20BF563K	R-903
RC20BF564K	R-806
RC20BF681J	R-945
RC20BF683J	R-921

JAN (OR AWS) DESIGNATION	KEY SYMBOL
RC20BF682K	R-407
RC20BF683K	R-641
RC20BF684J	R-919
RC20BF754J	R-933
RC20BF823J	R-936
RC30BF364J	R-803
RC30BF431J	R-1007
RC30BF752J	R-606
RC40BF911J	R-1004
RC42BF302J	R-804
NAVY TYPE	**KEY SYMBOL**
-28032-3	F-1201
-49194	J-1202
-49195	P-1202
-49435	J-1207
ARMY-NAVY TYPE	**KEY SYMBOL**
AN-3102-14S-7P	J-1208
AN-3102-14S-7S	J-1204
AN-3102-14S-9P	J-1206
AN-3106-14S-7P	P-1204
AN-3106-14S-7S	P-1208
AN-3106-14S-9S	P-1206
CG-409/U(1'2")	W-1705
UG-290/U	J-1109
STANDARD NAVY STOCK NO.	**KEY SYMBOL**
N16-A-700001-181	O-401
N16-C-11943-3834	W-1705
N16-C-18049-8437	C-604
N16-C-18401-8451	C-909
N16-C-18657-8451	C-703
N16-C-18785-8460	C-702
N16-C-21941-1255	C-802
N16-C-28816-8201	C-904
N16-C-29819-2401	C-410
N16-C-29893-2126	C-607
N16-C-30183-3619	C-608
N16-C-30531-4592	C-905
N16-C-30526-2819	C-609
N16-C-30921-8819	C-610
N16-C-31264-8019	C-611
N16-C-31660-5019	C-612
N16-C-31665-6489	C-409
N16-C-32135-3219	C-613
N16-C-32188-1009	C-404
N16-C-32636-4583	C-406
N16-C-32636-4863	C-614
N16-C-32715-6053	C-413
N16-C-33612-3634	C-403
N16-C-42733-5951	C-401

STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-C-42761-8675	C-615
N16-C-45801-8800	C-602
N16-C-45814-8985	C-416
N16-C-46200-9900	C-616
N16-C-47147-9001	C-1201
N16-C-47148-1001	C-701
N16-C-48841-9390	C-601
N16-C-48841-9485	C-919
N16-C-48841-9486	C-912
N16-C-48841-9487	C-603
N16-C-54460-6510	C-801
N16-C-54535-8505	C-1001
N16-F-33402-9213	Z-401
N16-F-44012-8428	Z-601
N16-F-44039-5266	Z-1201
N16-F-44150-1001	Z-1202
N16-R-29070-5501	L-801
N16-R-29650-2901	L-601
N16-R-49733-811	R-602
N16-R-49750-726	R-1007
N16-R-49769-811	R-410
N16-R-49805-811	R-642
N16-R-49840-431	R-945
N16-R-49841-121	R-1502
N16-R-49904-121	R-1004
N16-R-49921-431	R-628
N16-R-49922-811	R-404
N16-R-49939-431	R-944
N16-R-49940-811	R-637
N16-R-49985-811	R-604
N16-R-50038-431	R-906
N16-R-50048-131	R-804
N16-R-50129-811	R-612
N16-R-50128-431	R-939
N16-R-50164-431	R-609
N16-R-50201-811	R-407
N16-R-50218-751	R-606
N16-R-50281-431	R-619
N16-R-50308-431	R-1001
N16-R-50335-431	R-420
N16-R-50336-811	R-636
N16-R-50353-431	R-616
N16-R-50354-811	R-411
N16-R-50372-811	R-401
N16-R-50398-431	R-801
N16-R-50399-811	R-408
N16-R-50443-431	R-935
N16-R-50444-811	R-639
N16-R-50480-811	R-405
N16-R-50515-406	R-626
N16-R-50516-811	R-903
N16-R-50551-431	R-921
N16-R-50552-811	R-641
N16-R-50587-431	R-936
N16-R-50632-431	R-615
N16-R-50633-811	R-406
N16-R-50677-431	R-617
N16-R-50678-811	R-415
N16-R-50696-811	R-706
N16-R-50714-811	R-605
N16-R-50722-431	R-611
N16-R-50740-431	R-417
N16-R-50741-811	R-947
N16-R-50749-431	R-418
N16-R-50759-811	R-707
N16-R-50776-726	R-803
N16-R-50821-431	R-929
N16-R-50822-811	R-703
N16-R-50858-811	R-806
N16-R-50893-431	R-919

STANDARD NAVY STOCK NO.	KEY SYMBOL
N16-R-50911-431	R-933
N16-R-50974-431	R-913
N16-R-50975-811	R-409
N16-R-50993-811	R-631
N16-R-51038-811	R-601
N16-R-51065-811	R-708
N16-R-51092-811	R-710
N16-R-68305-4706	R-945
N16-R-73097-6558	R-632
N16-R-87305-5521	R-613
N16-R-87380-9401	R-633
N16-R-87520-9596	R-905
N16-R-87680-9449	R-823
N16-R-87680-9449	R-923
N16-R-88010-9591	R-403
N16-R-88040-8526	R-629
N16-R-88180-9430	R-702
N16-R-88180-9490	R-713
N16-R-88340-9355	R-421
N16-R-88340-9385	R-715
N16-R-88340-9477	R-701
N16-S-117101-277	O-1506
N16-S-80001-102	O-1502
N16-S-80001-103	O-1503
N16-S-62603-6446	X-401
N16-S-62603-6461	X-801
N16-S-63515-6651	X-804
N16-S-64063-6456	X-402
N16-S-64286-3950	X-702
N16-T-51990	V-801
N16-T-52001	V-803
N16-T-52230	V-702
N16-T-56195	V-404
N16-T-56198	V-607
N16-T-56203-50	V-403
N16-T-56214	V-401
N16-T-56840	V-802
N16-T-58241	V-601
N16-T-58241-6	V-402
N17-B-77734-7950	E-906
N17-B-77734-7955	E-403
N17-B-77833-9721	E-601
N17-B-77833-9722	E-602
N17-B-77834-9121	E-905
N17-B-77834-9126	E-404
N17-B-77982-9571	E-904
N17-B-77982-9601	E-405
N17-B-78082-6767	E-1001
N17-B-78083-1306	E-801
N17-B-78083-1401	E-606
N17-B-78138-9408	E-401
N17-B-78177-7712	E-604
N17-B-78177-7714	E-605
N17-B-78197-2101	E-302
N17-B-78207-1610	E-301
N17-B-78222-5216	E-902
N17-B-78242-2201	E-701
N17-B-78252-2101	E-603
N17-B-78272-5249	E-903
N17-B-78272-5254	E-402
N17-B-78302-5216	E-901
N17-C-48193-6050	W-1717
N17-C-70320-2882	P-1206
N17-C-70328-1524	P-1208
N17-C-70588-1524	P-1204
N17-C-71408-5333	P-1705
N17-C-71414-2800	P-1202
N17-C-72240-1516	J-1204
N17-C-72596-2880	J-1206
N17-C-72604-1516	J-1208

STANDARD NAVY STOCK NO.	KEY SYMBOL
N17-C-73108-1267	J-1209
N17-C-73108-5890	J-1202
N17-C-73139-7587	J-1207
N17-C-73301-6068	J-1503
N17-C-73323-7100	J-1201
N17-C-73588-4094	P-401
N17-C-73617-2350	P-1501
N17-C-793001-125	O-1505
N17-F-74266-9227	E-1201
N17-G-161779-101	O-1504
N17-G-169757-750	O-1501
N17-I-59417-6691	E-907
N17-J-39108-2701	J-1501
N17-L-6806-130	I-1501
N17-L-76909-4827	X-1501
N17-M-54301-8001	B-1201
N17-M-19051-9600	M-1601
N17-P-87208-3501	O-1507
N17-S-58904-2201	S-701
N17-S-60520-5078	S-602
N17-S-60907-8578	S-402
N17-S-61164-9106	S-901
N17-S-59292-2663	S-601
N17-S-62615-5896	S-1602
N17-S-64977-8101	S-401
N17-S-73115-2931	S-604
N17-T-28255-3576	E-609
N17-T-62664-5501	T-601
N17-T-67101-1901	Z-402
N17-T-73579-9701	T-1001
N17-T-73580-1101	T-801
N17-W-300081-101	W-1601
N43-S-99500-10	H-1501

STANDARD NAVY STOCK NO.	NAVY TYPE
F16-C-83571-1005	CM-14/URR
F16-C-83659-1001	AN/URA-8
F16-C-90906-3001	CV-60/URR

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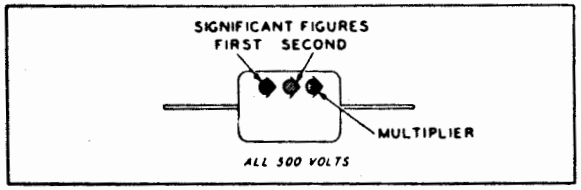
IB-38483-V1

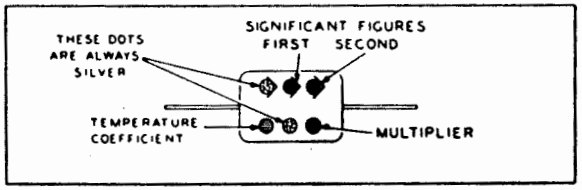
TABLE 8-6. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

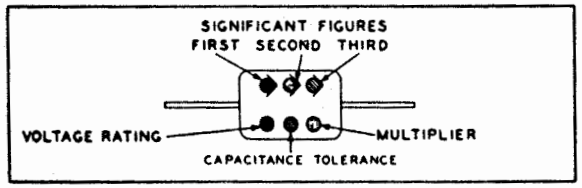
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



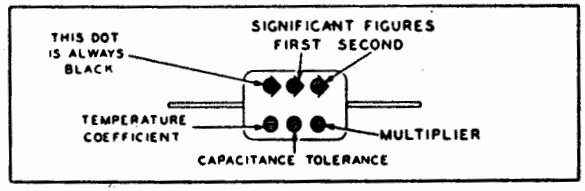
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



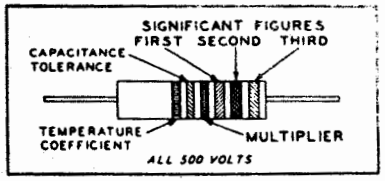
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

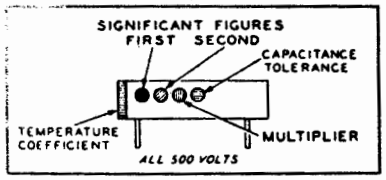


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

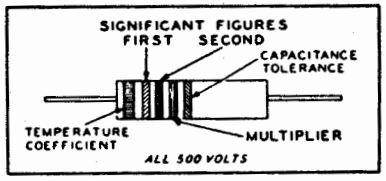


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



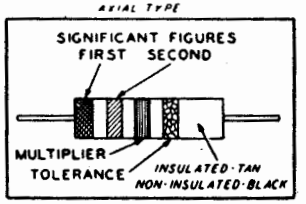
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS		CAPACITORS						
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

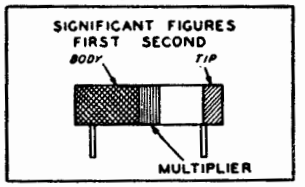
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

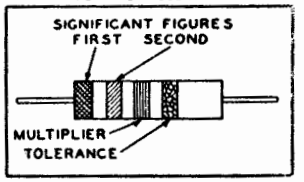


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

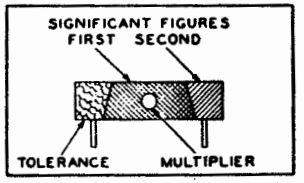


TABLE 8–7. LIST OF MANUFACTURERS

FREQUENCY SHIFT CONVERTER-COMPARATOR GROUP AN/URA-8 and FREQUENCY SHIFT CONVERTER CV-60/URR

CODE NUMBER	MFR. PREFIX	NAME	ADDRESS
1	CRV	Radio Corp. of America Victor Division	Front and Cooper Streets Camden, N. J.
30	CPH	American Phenolic Corp.	1830 S. 54th Street Cicero, Ill.
133	CMG	Cinch Mfg. Co.	2339 W. Van Buren Street Chicago, Ill.
216	CBV	John E. Fast Co.	3123 N. Crawford Avenue Chicago, Ill.
248	CG	General Electric Supply Corp.	429 N. 7th Street Philadelphia, Pa.
426	CNA	National Company Inc.	61 Sherman Street Malden, Mass.
590	CSF	Sprague Electric Mfg. Co.	N. Adams, Mass.
768	CFA	Bussman Mfg. Co.	2538 W. University Street St. Louis, Mo.
780	CAYZ	Dial Light Corp.	900 Broadway New York, N. Y.
784	CLF	Littelfuse Laboratories Inc.	4757 Ravenswood Avenue Chicago, Ill.
786	CTC	Chicago Telephone and Supply Co.	Elkhart, Ind.
788	CBEN	Air-Maze Corp.	5200 Harvard Avenue Cleveland, Ohio
846		Winchester Electronics	New York, N. Y.
1377		Westinghouse Electric and Mfg. Co.	Mansfield, Ohio
1567	CBEL	Electro Engineering Products Co.	627 W. Alexandria Detroit, Mich.
1581	CYS	Speri, Inc.	Beach and Kenilworth Avenue Cincinnati, Ohio
1618	CBCB	H. H. Buggie and Co.	22nd and Madison Streets Toledo, Ohio
1669		Grant Pulley and Hardware	57th and Broadway Woodside, N. J.
1682	CAKD	Muter Co.	Chicago, Ill.
1685	CBIN	Carter Radio Division Precision Parts Co.	213 W. Institute Place Chicago, Ill.
1727	CBIQ	Wilkor Products Co.	3835 W. 150th Street Cleveland, Ohio

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