J-13A on Page 53 & 54

INSTRUCTION BOOK

for

A. R. C. TYPE 12 EQUIPMENT

with

UHF SUPPLEMENT

Manufactured by
AIRCRAFT RADIO CORPORATION
Boonton, New Jersey

ARCIB-12-3

JANUARY 1955
Revised November 1956

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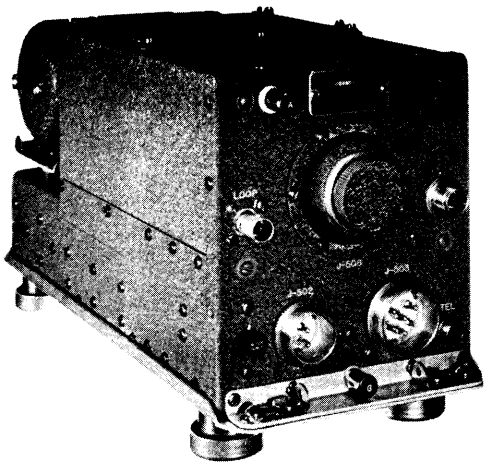
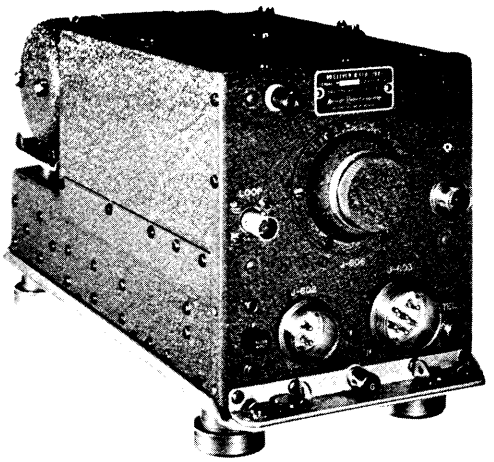
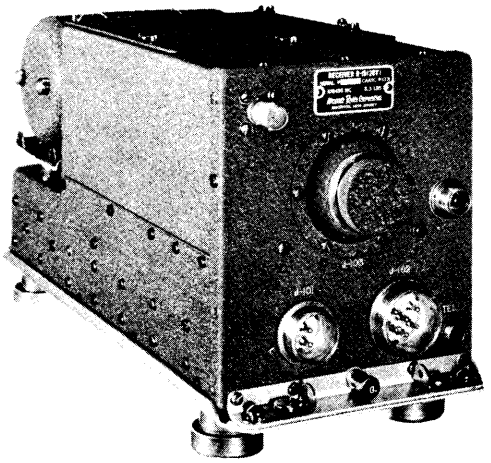


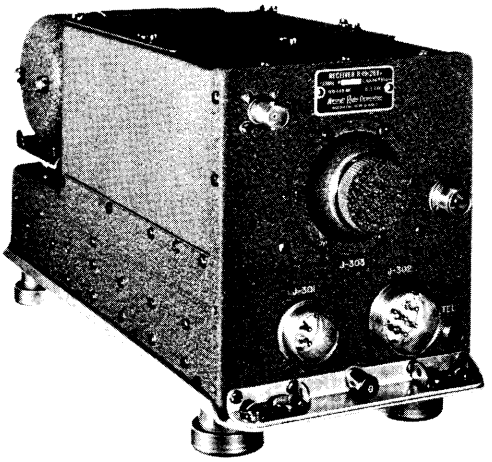
Type R-10A Receiver (520-1500 kc)
Shown with D-10A Dynamotor and M-12A Mounting



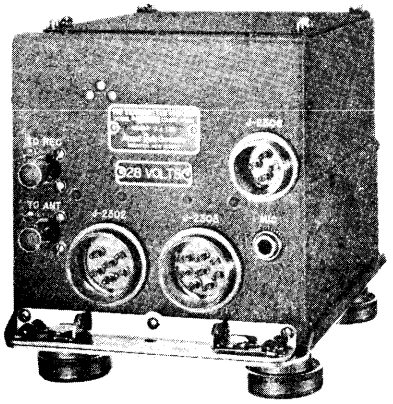
Type R-11A Receiver (190-550 kc)
Shown with D-10A Dynamotor and M-12A Mounting



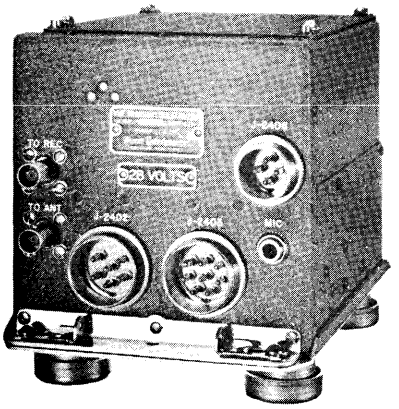
Type R-15 Receiver (108-135 mc)
Sh wn with D-10A Dynamotor and M-12A Mounting



Type R-19 Receiver (118-148 mc)
Shown with D-10A Dynamotor and M-12A Mounting



Type T-11B Transmitter (116-132 mc)
Shown with M-11A Mounting

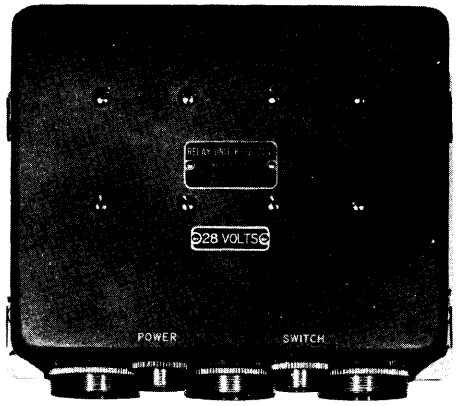


Type T-13A Transmitter (125-148 mc)
Shown with M-11A Mounting

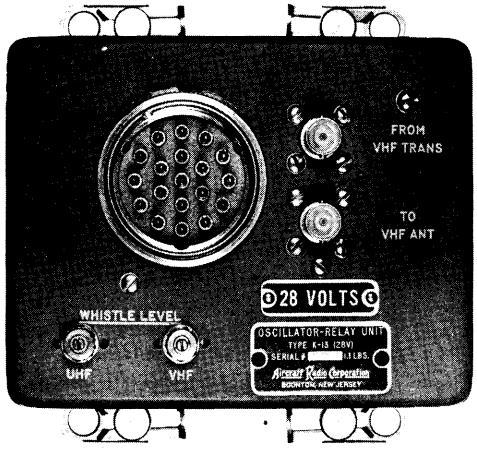
Figur 1—Principal Units f A.R.C. Typ 12 Equipment

Type R-20 Receiver (75 mc)
Shown with M-23 Mounting

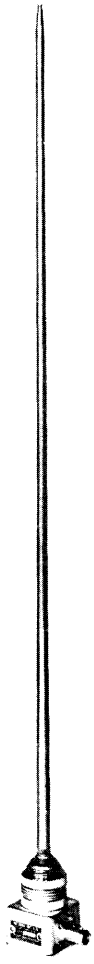
ARC-16950 Ten Channel Adapter shown
installed in Type T-11B Transmitter



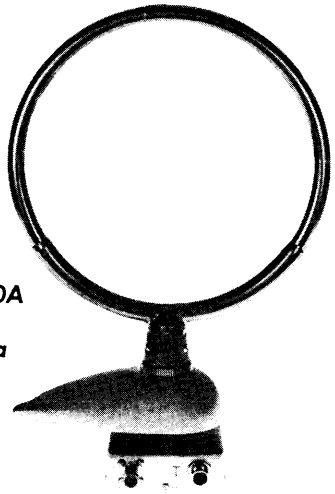
Type K-12 Relay Unit
Shown with M-20 Mounting



Type K-13 Oscillator Relay Unit
Shown with M-24 Mounting



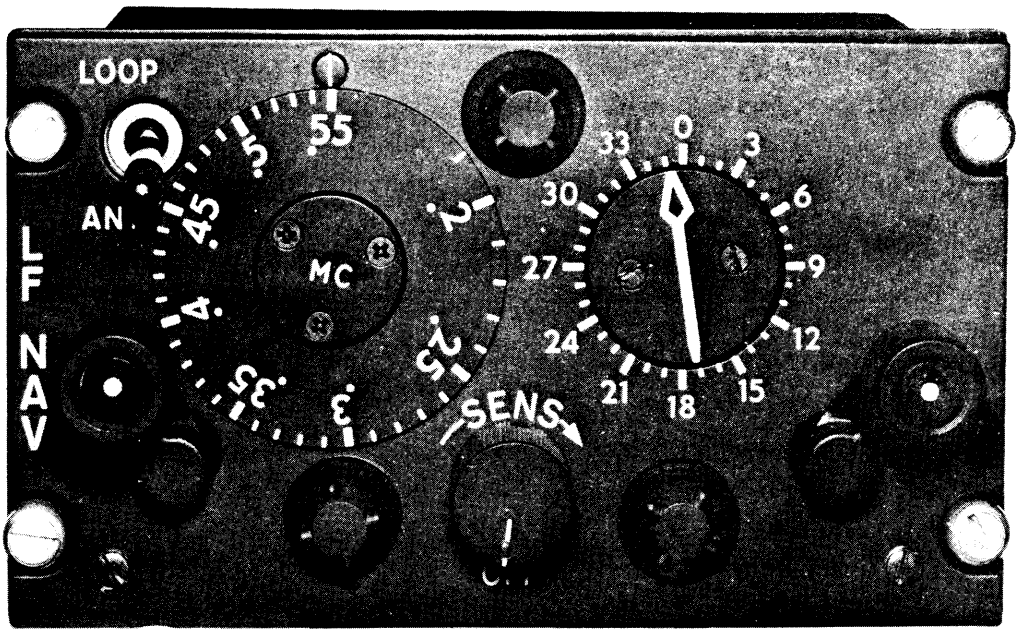
Type A-12
VHF
Antenna



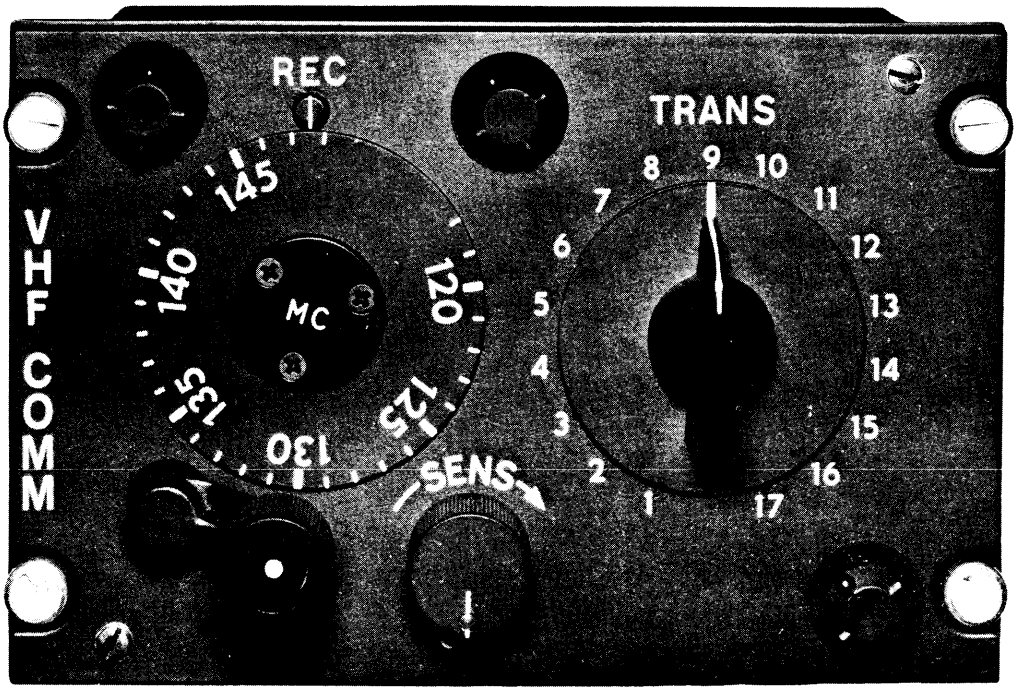
Type L-10A
Loop
Antenna

Type A-15
VHF
Antenna

Figur 1A—Principal Units of A.R.C. Type 12 Equipment



A.R.C. Type C-48 Control Unit
Military Designation C-1342/ARN
Controls an A.R.C. Type R-11A Navigation Receiver and an A.R.C. Type L-10A Loop Antenna.



A.R.C. Type C-49 Control Unit
Military Designation C-1341/ARC
Controls up to three A.R.C. VHF Transmitters (15 channels) and one A.R.C. Type R-19 VHF Receiver.

Figure 2—Typical Edg light d, Cons le Mounting Control Units

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A. R. C. TYPE 12 EQUIPMENT

SECTION I

GENERAL DESCRIPTION

A. INTRODUCTION

Aircraft Radio Corporation Type 12 Equipment consists of a group of radio components which may be employed in various combinations to provide communication and navigation systems suited to the individual requirements of the airplane installation.

B. MAJOR COMPONENTS AND THEIR PURPOSE

a. ARC Type R-10A Receiver provides reception of commercial broadcast stations in the frequency range of 520-1500 kc for homing and direction-finding with L-10A Loop Antenna.

b. ARC Type R-11A Receiver provides reception of communication and navigation signals in the frequency range of 190-550 kc. For homing or direction-finding, use the L-10A Loop Antenna. This band includes CAA towers and communications stations, military towers, and the 500 kc distress frequency.

c. ARC Type R-15 Receiver provides reception of vhf communications in the frequency range of 108-135 Mc.

d. ARC Type R-19 Receiver provides reception of vhf communications in the frequency range of 118-148 Mc. The bands covered by the R-15 and R-19 include all CAA and Air Force Towers; CAA and Air Force Communication Stations; CAA, Air Force, and Navy GCA; and the universal emergency frequencies.

e. ARC TYPE D-10A Dynamotor supplies high voltage to the individual receiver on which it is mounted and to any transmitters which may be included in the Type 12 equipment installed.

f. ARC Type R-20 Receiver provides visual and aural reception of 75 Mc Marker Beacons.

g. ARC Type T-11B Transmitter permits vhf transmission on five crystal-controlled frequencies in any 2 Mc band from 116-132 Mc.

h. ARC Type T-13A Transmitter permits vhf transmission on five crystal-controlled frequencies in any 2 Mc band from 132-148 Mc. This range can be extended downward to 125 Mc by the addition of a capacity plate (ARC #15900). The bands covered by the T-11B and T-13A Transmitters permit communication between aircraft and CAA Towers, communications stations, and military towers.

i. ARC Type L-10A Loop Antenna provides manual direction-finding or homing facilities and antistatic reception when used with either or both the R-10A or R-11A Receiver.

j. ARC Type A-12 VHF Antenna is used with R-15 and R-19 Receivers, and T-11B and T-13A Transmitters on aircraft where icing conditions will not be encountered.

k. ARC Type A-15 VHF Antenna is used with the same equipment as the Type A-12 and works satisfactorily under mild icing conditions.

l. ARC Antenna Kit provides all material required to make a fixed wire antenna for Type R-10A, R-11A or R-20 Receivers.

m. ARC control units as listed in Table I.

n. ARC Type K-12 Relay Unit is used in conjunction with C-44, C-47 and C-50 Control Units for control switching in dual control installations such as in military training aircraft.

o. ARC Type K-13 Oscillator-Relay Unit is used in conjunction with C-51 Control Unit for WHISTLE-THRU facility to make possible precise tuning of the vhf receiver to the crystal-controlled transmitter frequency.

C. ACCESSORIES

a. ARC Type J-13, J-13A, J-15 and J-15A Junction Boxes are used to interconnect the cabling of the various units which comprise a Type 12 System.

b. ARC Type J-10 Jack Box facilitates connection to the microphone and telephone lines of the receivers and transmitters.

c. ARC #14603 "Tee" Coupling for mechanical linkage is used in dual control installations. It permits mechanical interconnection between two control units and a receiver, or between two control units and a loop antenna.

d. ARC #6357 Right Angle Coupling for mechanical linkage is used where space limitations prevent the use of a straight coupling.

e. ARC #16887 (Male to Male) and ARC #16888 (Male to Female) Coupling Assemblies facilitat- A.R.C. Type MC-215 mechanical linkage intercone nection through firewalls, bulkheads, etc.

f. ARC #16950 Crystal Adapter plugs into the

TABLE I

A.R.C. CONTROL UNITS USED ON A.R.C. COMMUNICATION AND NAVIGATION EQUIPMENT

AIRCRAFT RADIO CORPORATION BOONTON, N. J.

A.R.C. TYPE NO.	A-N TYPE NO.	A.R.C. DWG. NO.	SCHEM. DIAG. DWG. NO.	WIRING DIAG. DWG. NO.	CONTROL FUNCTION	DIAGRAM	MTG. TYPE	MOUNTING REQUIRED: A.R.C TYPE NO.	MOUNTING REQUIRED: A-N TYPE NO	MOUNTING REQUIRED: A.R.C PART NO.	CONNECTORS REQUIRED ONE EACH A.R.C. PART NO.	OVERALL DIM. (INCHES APPROX) D	OVERALL DIM. W	OVERALL DIM. H	WT. LBS INCL. MOUNT.	AVAILABILITY: NORM STOCK'D. IN SMALL QUANT	AVAILABILITY: MADE ON QUANT. ORDER ONLY
C-10A		12701	16759	12717	ONE TYPE 12 TRANS + R-11A REC.		INST. PANEL MOUNTING				14050 14051	3 3/4	3 1/4	3 5/16	0.6		✓
C-11A		12402	16759	12563	ONE TYPE 12 TRANS + R-11A REC		BASE	M-17		12505	14050 14051	2 7/8	4 1/4	4 3/8	.75		✓
C-12		12020		12211	TYPE 15 VOR REC		BASE	M-13		6831	14050	2 7/8	6 1/2	5 1/2		OBSOLETE	
C-13		12410	16297	12490	ONE TYPE 12 TRANS		BASE	M-16		9451	14050	2 1/4	1 3/4	4 3/16	0.3		✓
C-14		12304		12399	R-13 REC. WITH REMOVABLE DIAL		BASE	M-14		7053	14050	2 7/8	3 3/8	5 1/2	.75		✓
C-15		12403	16779	12714	ONE TYPE 12 TRANS + R-15 REC		BASE	M-17		12505	14050 14051	2 7/8	4 1/4	4 3/8	.75		✓
C-16	C-1112/ARC	12702	16778	12745	R-11A REC		BASE	M-18		12705	14051	3	3 1/4	4 5/8	0.62	✓	
C-17		12703	16192	16191	R-15 REC		BASE	M-18		12705	14051	3	3 1/4	4 5/8	0.62	✓	
C-18	C-1113/ARC	12704			L-10A LOOP, CLOCKWISE ROTATION		BASE	M-18		12705		3	3 1/4	4 5/8	0.5	✓	
C-19		13005	16779		L F OMNI		PANEL									OBSOLETE	
C-20		12903		12988	ONE TYPE 12 TRANS + R-15 REC.		INST. PANEL MOUNTING				14050 14051	3 3/4	3 1/4	3 5/16	0.6		✓
C-21		13405		13565	L F VOR REC											OBSOLETE	
C-22		13901		13986	TYPE 15A VOR REC		BASE	M-18		12705	14050	2 13/16	3 1/4	4 5/8	0.6	OBSOLETE	
C-22A	C-984/ ARN-30	15601	15603	15601	TYPE 15C + 15D VOR REC		BASE	M-18	MT-1046/ ARN-30	12705	14050	3	3 1/4	4 5/8	0.62	✓	
	C-1254/* ARN-30	16280	16282	16281	AN ARN-30 + AN ARN-30A (V.O.R. RECEIVERS)		CONSOLE				14050	3 3/8	5 3/4	2 1/4	0.8	✓	
C-23		13902		14097	ONE TYPE 12 TRANS + R-15 + R-11A REC + L-10A LOOP		PANEL									OBSOLETE	
C-24	C-1114/ARC	13903	14122	14123	TWO TYPE 12 TRANS + R-10A + R-11A + R-15 REC + L-10A LOOP		PANEL				14320 14491	3 7/16	8	6 11/32	2.2		✓
C-25-14V C-25-28V	C-1115/ARC C-1116/ARC	14201	14496		TWO TYPE 12 TRANS + F M TRANS		BASE	M-19		7083	14320	3 1/8	4 1/4	4 3/16	0.8		✓
C-26		12702	16778	12745	R-10A REC		BASE	M-18		12705	14051	3	3 1/4	4 5/8	0.62	✓	
C-27		14502	14688	14696	TWO TYPE 12 TRANS + R-11A + R-13B REC + L-10A LOOP		PANEL				14320 14491	3 3/4	7 1/4	5 23/32	1.8		✓
C-28		12704			L-10A LOOP, COUNTERCLOCKWISE ROTATION		BASE	M-18		12705		3	3 1/4	4 5/8	0.5	✓	
C-29		14503	14689	14697	TWO TYPE 12 TRANS + R-10A + R-11A REC + L-10A LOOP		PANEL				14320 14491	3 3/4	7 1/4	5 23/32	1.8		✓
C-30		14504	14668	14652	TWO TYPE 12 TRANS + R-10A + R-11A + R-13B REC + L-10A LOOP		PANEL				14320 14491	3 3/4	8	6 11/32	2.2		✓
C-31		14505	14669	14653	TWO TYPE 12 TRANS + R-11A + R-15 + R-13B REC + L-10A LOOP		PANEL				14320 14491	3 3/4	8	6 11/32	2.2		✓
C-32		15402	15474	15498	TWO TYPE 12 TRANS + R-10A + R-11A + R-19 REC + L-10A LOOP		PANEL				14320 14050	3 3/4	8	6 11/32	2.5		✓
C-33		14900	14800	14700	TWO TYPE 12 TRANS + R-11A + R-15 REC + L-10A LOOP		PANEL				14320 14491	3 7/16	7 1/4	5 23/32	1.8		✓
C-34					TYPE 20 VOR REC		BASE	M-18		12705	14051	2 13/16	3 1/4	4 5/8	0.6	NEVER MADE	
C-35		15465		15495			BASE	M-13		6831		3 3/8	6 1/2	5 1/2		NEVER MADE	
C-36*		15501	15479	15481	TWO TYPE 12 TRANS + R-11A + R-19 REC + L-10A LOOP + F M TRANSM		PANEL				14320 14050	3 3/4	7 1/4	5 23/32			✓
C-37*	C-1117/ARC	15507	15587	15586	TWO TYPE 12 TRANS + F M TRANS + R-11A + R-19 REC		BASE	M-13		6831	14320 14050	3 3/8	6 1/2	5 1/2	1.9		✓
C-38*		15604	15587	15586	TWO TYPE 12 TRANS + F M TRANS + R-11A + R-19 REC		BASE	M-13		6831	14320 14050	3 3/8	6 1/2	5 1/2	1.9		✓
C-39		14507	14690	14677	TWO TYPE 12 TRANS + R-11A + R-19 REC + L-10A LOOP		PANEL				14320 14491	3 7/16	7 1/4	5 23/32	1.8		✓
C-40		15656	15698	15698	TWO AN/ARC 5 TRANS + F M TRANS + R-11A + R-19 + AN/ARC 5 REC, REMOVABLE DIAL + L-10A LOOP		PANEL				14320 14050	3 3/4	8	6 11/32	2.4		✓
C-41		15784	15000	15827	TWO TYPE 12 TRANS + R-10A + R-11A + R-19 REC + L-10A LOOP		PANEL				14320 14491	3 7/16	8	6 11/32	2.2		✓
C-42		12703	16192	16191	R-19 REC		BASE	M-18		12705	14051	3	3 1/4	4 5/8	0.62	✓	
C-43		16266	16277	16276	THREE TYPE 12 TRANS		BASE	M-19		7083	14320	3 1/8	4 1/4	4 3/16	0.8	✓	
C-44		16290	16292	16291	THREE TYPE 12 TRANS + R-11A + R-19 REC + DUAL CONTROL SWITCH		CONSOLE				14320 14050	3 3/8	5 3/4	6 3/4	2.3		✓
C-45		16295														NEVER MADE	
C-46		16300	16302	16301	TWO TYPE 12 TRANS + F M TRANS + R-11A + R-19 REC		PANEL				14320 14050	3 3/8	7 5/8	4 3/4	1.7		✓
C-47*		16430	16432	16431	DUAL CONTROL SELECTOR		BASE	M-16		9451	14051	2 1/4	1 3/4	4 3/16	0.3	✓	
C-48*	C-1342/ ARN	16410	16412	16411	R-11A REC + L-10A LOOP		CONSOLE				14050	3 3/8	5 3/4	3 3/8	1.2	✓	
C-49*	C-1341/ ARC	16440	16442	16441	THREE TYPE 12 TRANS + R-19 REC		CONSOLE				14320 16104	3 3/8	5 3/4	3 3/4	1.4	✓	
C-50*		16500	16502	16501	DUAL CONTROL SELECTOR		CONSOLE				14491	2 3/4	5 3/4	1 1/2	0.4	✓	
C-51		16690	16692	16691	"WHISTLE-THRU" CONTROL		BASE	M-16		9451	14052	2 5/16	1 3/4	4 3/16	0.2		
C-52		17090	17092	17091	TV-10 + R-19 REC (UHF ONLY)		CONSOLE				14320 16104	3 3/4	5 3/4	3 3/4			
C-53		16970	16972	16971	TV-10 + R-19 REC + I VHF TRANS (UHF-VHF)		CONSOLE				14320 16744 14491	3 3/4	5 3/4	3 3/4	1.52		
C-54		17180	17182	17181	R-15 REC + WHISTLE-THRU		BASE	M-18		12705	14051	3	3 1/4	4 5/8	0.6	✓	
C-55		17180	17182	17181	R-19 REC + WHISTLE-THRU		BASE	M-18		12705	14051	3	3 1/4	4 5/8	0.6	✓	
C-56*		17170	17172	17171	THREE TYPE 12 TRANS + R-19 REC + WHISTLE-THRU		CONSOLE				14320 16104	3 3/8	5 3/4	3 3/4	1.5	✓	

NOTES: 1. THE FOLLOWING CONNECTORS (PLUGS) ARE A.R.C GROMMET TYPE, KEY CENTER: *14050 HAS 8 TERMINALS; *14051-6 TERMINALS; *14320-19 TERMINALS; *14491-4 TERMINALS (3/4") AND 16104-4 TERMINALS (1 1/8")

2. IN BASE MOUNTING TYPE, THE UNIT FASTENS TO A MOUNTING PLATE BY MEANS OF SNAPSLIDE(S).

3. IN INSTRUMENT PANEL OR PANEL MOUNTING TYPE, THE UNIT IS FASTENED BY THE FRONT PANEL OF THE UNIT ITSELF.

4. IN CONSOLE MOUNTING TYPE, THE FRONT PANEL IS FASTENED TO A U.S. MILITARY STANDARD CONSOLE FRAMEWORK.

5. (#) VOLTAGE 14v OR 28v MUST BE SPECIFIED.

6.) INDICATES UNIT NOT USED WITH TYPE 12 EQUIPMENT.

12-2-54
7-20-54
AND 9-15-53

S-327-C

T-11B or T-13A Transmitter to provide VHF transmission on ten channels in any 2 mc band within the frequency range of the transmitter. See ARC-16950 Instruction Book for wiring diagrams and other pertinent data concerning this unit.

D. CHARACTERISTICS OF MAJOR COMPONENTS

1. ARC TYPE R-10A RECEIVER. This receiver is a six-tube superheterodyne, continuously tunable over the range of 520-1500 kc. A three-section gang capacitor is used to tune the rf oscillator and two tuned rf stages. The rf oscillator frequency is 239 kc above the signal frequency.

There are six tuned circuits in the if stages.

Delayed automatic volume control is provided to prevent receiver overload. For direction-finding, it is necessary to control the rf gain of the receiver manually in order to maintain the receiver output at a comfortable listening level and well below the range of automatic control. Therefore, the avc circuit employs two diodes, one to produce the avc bias voltage, and the other to delay its action until the af level is sufficiently high. This delaying diode also prevents sudden noise bursts from reducing the rf sensitivity or causing momentary receiver blocking. This automatic volume control is designed to permit accurate tuning of the receiver to a strong signal.

A series-diode noise limiter circuit is included to permit operation at a considerably higher static level than normally possible. It also limits the noise level when tuning between stations.

The output tube delivers power in excess of 0.8 watts, working into a nominal 300 ohm load.

An input of 3 amperes at 14 volts dc or 1.5 amperes at 28 volts dc is required for receiver operation. High voltage is supplied by ARC Type D-10A Dynamotor of the required input rating and an output rating of 85 ma at 250 volts dc. This dynamotor is mounted on the rear of the receiver chassis, and electrical connection is made through a plug-in connector secured to its base.

The R-10A contains no available operating controls, and hence must be remotely controlled by means of an ARC control unit of appropriate type. See Table I. The receiver may be installed in almost any convenient location, but reference should be made to Section II, B before any installation work is started.

2. ARC TYPE R-11A RECEIVER. This receiver is electrically and mechanically similar to the R-10A Receiver except that it covers the frequency range of 190-550 kc, and the rf oscillator frequency is 85 kc above the signal frequency.

3. ARC TYPE R-15 RECEIVER. This receiver is a nine-tube superheterodyne, continuously tunable over the range of 108-135 Mc. A four-section gang capacitor is used to tune the rf oscillator and three tuned rf stages. The rf oscillator frequency is 15 Mc below the signal frequency.

There are eight tuned circuits in the if stages.

Delayed automatic volume control and a triode noise limiter-af amplifier circuit are included. This automatic volume control is designed to permit accurate tuning of the receiver to a strong signal.

A HI-LO audio level switch, when provided on the control unit, permits a change in audio output level of approximately 10 to 1 by changing the biasing resistance in the cathode circuit of the final af amplifier.

Power output, from the knee of the avc at approximately 6 microvolts input to 100,000 microvolts input, rises from 170 to 360 milliwatts for signals modulated 30% at 400 cps. Normal output load is 300 ohms.

Input power requirements, dynamotor, mounting, location, and method of remote control are all the same as for the Type R-10A Receiver.

4. ARC TYPE R-19 RECEIVER. This receiver is electrically and mechanically similar to the Type R-15 Receiver, except that it covers the frequency range of 118-148 Mc.

5. ARC TYPE R-20 RECEIVER. This receiver is a four-tube tuned radio-frequency type receiver, fixed-tuned for operation at 75 Mc for use with standard airways and ILS marker facilities.

For complete information regarding characteristics, installation, circuit alignment, etc., see "Instruction Book for Aircraft Radio Corporation Type R-20, 75 Mc. Marker Beacon Receiver."

6. ARC TYPE T-11B TRANSMITTER. This transmitter is a four-tube, five channel, crystal-controlled unit designed to transmit amplitude-modulated voice signals in any 2 Mc band in the frequency range of 116-132 Mc.

The circuit consists of a Pierce crystal-controlled oscillator operating at either 1/12th or 1/18th of the output frequency. The four Type 5763 tubes function as oscillator-multiplier, frequency multiplier, output doubler, and modulator. The unmodulated carrier output power exceeds 2 watts.

Although there is no permanently connected meter in the transmitter, a crystal rectifier is incorporated in the output circuit to provide a convenient means for checking tuning with the aid of a dc voltmeter.

A low voltage input of 2 amperes at 14 volts dc or 1 ampere at 28 volts dc is required. The high voltage is

obtained from the receiver dynamotor. When the microphone button is pressed, a relay in the transmitter switches the high voltage from the receiver to the transmitter circuits. At the same time another relay in the transmitter switches the antenna connection from receiver to transmitter.

Since the T-11B contains no operating controls, it must be remotely controlled by means of an appropriate ARC control unit. See Table I. Reference should be made to Section II, B, before any installation work is started.

7. ARC TYPE T-13A TRANSMITTER. This transmitter is electrically and mechanically similar to the Type T-11B except that it operates in any two Mc band between 132-148 Mc. By the addition of the capacity plate ARC #15900, the frequency range may be lowered to cover the frequencies from 125 to 140 Mc. This plate, containing sleeves which fit over the rf tubes, is mounted on the modulation transformer, and is secured by two studs, washers, and nuts furnished therewith.

8. ARC TYPE L-10A LOOP ANTENNA. The L-10A Loop is a nine inch diameter rotatable antenna designed for remote control operation only. It requires the use of an ARC control unit of appropriate type which controls rotation through 360 degrees. In addition to the loop itself, the antenna consists of a streamlined aluminum mounting base and an aluminum box containing the worm drive and the electrical connections. This antenna is suitable for top or bottom mounting. Antenna inductance is 19 microhenries, distributed capacity of 67 $\mu\mu$f, Q of 46 at 400 kc.

9. ARC TYPE A-12 ANTENNA. The Type A-12 is a vertical, quarter-wave, base-fed antenna. It consists of a 21⅞ in. high, beryllium copper rod screwed into a small mounting base which contains a 2.2 megohm bleeder resistor and a BNC receptacle for a 52 ohm coaxial transmission line (RG-58/U).

The vswr is less than 2:1 in the frequency range of 116-148 Mc.

This antenna is satisfactory for use on aircraft with cruising speeds up to 200 mph and where icing conditions will not be encountered.

10. ARC TYPE A-15 ANTENNA. The Type A-15 is a quarter-wave, base-fed, bent antenna. It consists of a solid stainless steel "L" shaped rod flexibly mounted on a small aluminum box containing an impedance matching circuit and a BNC receptacle for a 52 ohm coaxial transmission line (RG-58/U).

This antenna is well suited for belly mounting because it extends only 8 inches from the aircraft skin. Good results are also obtained with top mounting.

The vswr is less than 3:1 in the frequency range of 116-148 Mc.

The Type A-15 works satisfactorily under icing conditions and may be used on aircraft with speeds up to approximately 250 mph.

11. ARC FIXED WIRE ANTENNA. Antenna Kit ARC #12296 is used to make fixed wire antenna installations. The kit consists of copper-clad steel wire, lead-in, wire, insulators, tension mounts, and other parts normally used for aircraft installation. See Section II, C, for a brief discussion of fixed wire antenna types, method of feed, preferred location, etc.

12. ARC CONTROL UNITS. See Table I, page 10 for description and characteristics of control units.

13. ARC TYPE J-12 JUNCTION BOX. This junction box is obsolete and has been replaced by ARC Type J-13, J-13A, J-15 or J-15A.

14. ARC TYPE J-13 JUNCTION BOX. Aluminum box with snapslide secured cover.

It contains 30 terminals, a spdt sidetone relay, and three fuse holders. Box has five rubber grommets with ⅜ inch opening, and four rubber grommets with ½ inch opening.

15. ARC TYPE J-13A JUNCTION BOX. Same as J-13 except fuseholders removed to make 3 additional terminals available. Obsoletes J-13.

16. ARC TYPE J-15 JUNCTION BOX. Aluminum box with snapslide secured cover. It contains 56 terminals, a spdt sidetone relay, and three fuse holders. Box has seven rubber grommets with ½ inch opening.

17. ARC TYPE J-15A JUNCTION BOX. Same as J-15 except fuseholders removed to make 3 additional terminals available. Obsoletes J-15.

18. K-12 RELAY UNIT. The relay unit consists of an aluminum box containing six control relays, three power relays, two keying relays and two supervisory and switching relays for switching electrical control of the radio equipment from a control unit in one cockpit to a duplicate control unit in the other cockpit.

19. ARC TYPE K-13 OSCILLATOR-RELAY UNIT. ARC Type K-13 Oscillator-Relay provides a means for using the crystal-controlled transmitter as an rf source for precise tuning of the VHF receiver. The K-13 is operated by means of the receiver tuning crank on those control units having "whistle-thru"

control. When the tuning crank is pushed for "whistle-thru," the K-13 performs the following functions:

a) connects high voltage to receiver and transmitter simultaneously.

b) reduces receiver sensitivity to a low value.

c) connects transmitter output to a 50 ohm dummy load.

d) switches microphone out of circuit.

e) turns on a relaxation-type tone oscillator; injects this af into the microphone input circuit to provide about 20% tone modulation.

f) connects headset (TEL) to output of the particular receiver being tuned, while disconnecting it from all other receivers.

The K-13 has two whistle-level controls; one for adjusting VHF whistle-level, and the other for UHF whistle-level. It obtains high voltage from the associated receiver, and low voltage from the same source as the rest of the radio equipment. LV current drain is 0.5 ampere at 28 volts DC.

20. J-10 JACK BOX. Aluminum box containing a MIC jack, one 4 terminal strip, and two threaded outlets for cable connection into the box and for connecting a second J-10 in parallel.

TABLE II

DIMENSIONS AND WEIGHTS OF MAJOR COMPONENTS

Unit	*Type of Mount Required*	**Overall Dimensions (inches)*			**Weight (lbs.)*
		Height	*Width*	*Length (Depth)*	
R-10A Receiver	M-12A	6 7/16	4 15/16	11 21/32	9.0 incl. Dynamotor
R-11A Receiver	M-12A	6 7/16	4 15/16	11 21/32	9.0 incl. Dynamotor
R-15 Receiver	M-12A	6 7/16	4 15/16	11 21/32	9.0 incl. Dynamotor
R-19 Receiver	M-12A	6 7/16	4 15/16	11 21/32	9.0 incl. Dynamotor
R-20 Receiver	M-23	5 3/4	4 15/16	6 15/16	2.6
T-11B Transmitter	M-11A	5 3/4	4 3/4	6 21/32	3.4
T-13A Transmitter	M-11A	5 3/4	4 3/4	6 21/32	3.4
L-10A Loop Antenna	—	13 1/2	3 1/4	9 (Loop Diam.)	1.5
A-12 Antenna	—	23 3/4	1 7/16	2	0.2
A-15 Antenna	—	9 1/2	1 7/16	15	0.5
K-12 Relay Unit	M-20	6 1/16	8 1/4	3 3/16	2.8
K-13 Oscillator-Relay Unit	M-24	5	5 1/16	2 3/4	1.1
J-13A Junction Box	—	4 3/4	7 3/8	1 5/8	1.5
J-15A Junction Box	—	7 1/4	11	2 1/4	2.5
J-10 Jack Box	—	2 3/4	2	1	0.17

See Table I for dimensions and weights of Control Units.
* Including mount.

SECTION II

SYSTEMS ENGINEERING

A. SYSTEM PLANNING

1. COMBINATIONS OF MAJOR COMPONENTS: There are numerous possible combinations of A.R.C. Type 12 Equipment. Reference to the listing in Section I-B should prove helpful in making a selection of those components needed to meet the requirements of a particular installation. Table I lists typical combinations of receiving and transmitting equipment as well as the proper control unit to be used with those combinations. Table VII lists the part numbers and quantity of plugs required for the fabrication of interconnecting cables. Figure 12, a functional schematic diagram of a typical installation, will serve as a guide in planning system interconnection.

2. INTERCHANGEABILITY:

a. The Type T-11A, T-11B, T-13 and T-13A Transmitters are all directly interchangeable with each other without affecting weight, mounting, cabling, antenna or control unit other than changing transmitter frequency tabs. T-11A and T-13 have been superseded by T-11B and T-13A respectively.

b. The Type R-10A and R-11A Receivers are mechanically interchangeable with each other without affecting power consumption, weight, mounting, cabling, or antennas. However, the tuning dial on the control unit must conform to the frequency range of the receiver used. This entails either replacement of the original control unit with another of appropriate type, or almost complete disassembly of the original control unit in order to change the tuning dial.

c. The Type R-15 and R-19 Receivers are mechanically interchangeable with each other and the comments of paragraph 2-b apply.

d. The Type A-12 and A-15 Antennas are functionally interchangeable, but the A-15 requires a slightly larger mounting hole. The A-15 is an "L" antenna, particularly useful for belly-mounting on helicopters and light aircraft.

B. SYSTEM INSTALLATION CONSIDERATIONS

1. Locate units so that—

a. They are accessible for inspection and replacement.

b. They are not subjected to excessive vibration.

c. There is a minimum of transmission line inside the airplane.

d. There will be a minimum of bends in the mechanical linkage. The length of linkage will be kept to a minimum.

e. There is sufficient clearance on all sides to prevent striking anything when units move on shock mounts.

2. Units may be stacked, but consideration should be given to proper heat dissipation.

3. Careful grouping of components reduces length. and weight of cables.

4. Good grounding is essential for proper operation. Two grounding straps are provided on the underside of receiver and transmitter mounts. The free end of each grounding strap should be bent down and secured under the adjacent mounting foot by means of the mounting screw. The mounting surface should be clean bare metal at the points where the mounts are secured.

5. Leave sufficient slack in cables and mechanical linkages at point of entry into units so that movement on shocks mounts will not be impeded.

6. Limitation on transmitters:

Three transmitters are the maximum number that can be operated from one antenna in a Type 12 System without serious degradation of performance. If four or more transmitters are to be installed, the following considerations should be kept in mind.

a. A fourth transmitter connected to the same antenna may reduce effective radiated power to about ½ of that obtained with just one transmitter connected to the antenna. This condition is caused by the vswr becoming too high due to a cumulative mismatching of impedances. Therefore, a second antenna is recommended to handle over three transmitters.

b. A control unit with sufficient switch positions to handle all of the transmitter channels will also be required.

c. High voltage for all transmitters should be obtained from the same receiver dynamotor to simplify switching.

C. ANTENNAS

In so far as possible, the preferred location and installation instructions for the following antennas will be discussed for each type in turn: Type L-10A, Type A-12, Type A-15, and fixed wire antenna. As mounting conditions vary so widely from one type of aircraft to another, and even between airplanes of the

same type, it is impossible to give more than a general indication as to the best location for any given antenna.

1. TYPE L-10A LOOP ANTENNA

a. Preferred location: This antenna is designed for either top or bottom mounting on aircraft. However, because of the possibility of damage to the antenna due to limited ground clearance, the top mounting position is generally favored.

A location as near as possible to the center-line of the aircraft should be selected. Check for adequate clearance inside and outside the aircraft before proceeding with the installation.

b. Installation: See L-10A Instruction Book for all details of mounting and operation.

2. TYPE A-12 VHF ANTENNA

a. Preferred location: This antenna should not be installed closer than 3 feet to a vertical fin or other metal object of comparable height, nor should it be installed within 5 feet of the engine if ignition noise exists. It must be installed over metal which serves as a ground plane, hence will not operate properly on a fabric covered airplane unless provision is made for a suitable ground plane of at least a yard square. A location near to the center-line of the aircraft should be selected, if possible.

The Type A-12 may be mounted on either the top or bottom of an airplane. If bottom mounted, consideration should be given to the possibility of damage due to limited ground clearance. See Figure 3 for overall dimensions.

b. Installation: Mounting the Antenna—

(1) Install stiffening doubler in skin of aircraft as required.

(2) Drill $\frac{7}{8}$ inch dia mounting hole.

(3) Remove antenna rod #12441, knurled nut #11910, and washer #11950.

(4) Leaving a suitable number of #11911 spacers in place, insert the box from the inside, orienting it to provide the most desirable routing of the coax cable.

(5) Replace washer and knurled nut from the outside, and tighten securely.

(6) Replace antenna rod and tighten securely. Connecting the Coaxial Cable—

(1) Determine the length of cable required to connect the antenna with the transmitter.

(2) Fabricate the coaxial cable assembly using ARC #11318 Cable and ARC #11337 Plugs in accordance with assembly specification #11345, Figure 55.

(3) Install the cable and clamp or tie it in place.

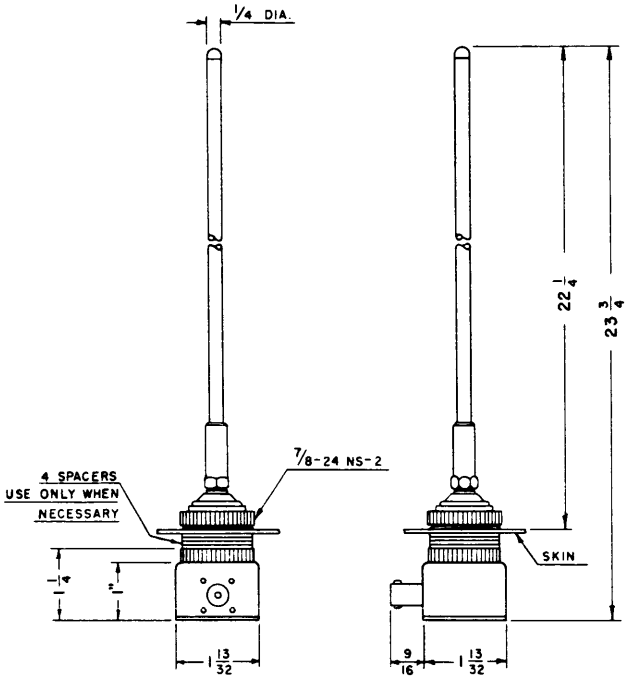


Figure 3—A.R.C. Type A-12 Antenna Dim nsions

3. TYPE A-15 VHF ANTENNA

a. Preferred location: This antenna is designed for either top or bottom mounting. Since the A-15 only extends about 8 inches from the mounting surface on the aircraft, belly mounting is practical. The best radiation pattern is generally obtained with bottom mounting. With top mounting the radiation pattern is about the same as for the Type A-12. The comments pertaining to the other installation requirements of the Type A-12 also apply to the Type A-15. See Figure 4 for overall dimensions.

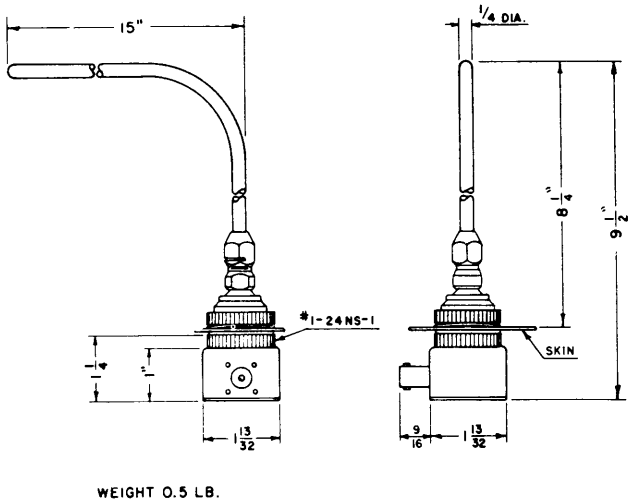


Figure 4—A.R.C. Type A-15 Antenna Dimensions

b. Installation: Mounting the Antenna—

(1) Install stiffening doubler in skin of aircraft as required.

(2) Drill one inch dia mounting hole.

(3) Remove antenna rod #16647, knurled nut #16626 and spring washer #16634. Care should be taken to hold the stud on the antenna with a wrench while turning the antenna rod locking nut to prevent damage to the flexible rubber antenna mount.

(4) Leaving spacer #16627 in place if required, insert the box from the inside, orienting it to provide the most favorable routing of the coax cable.

(5) Replace spring washer and knurled nut from the outside and tighten securely.

(6) Replace antenna rod with bent portion pointing aft, and securely tighten locking nut; again taking care to keep the stud on the antenna from turning while the locking nut is being turned.

Connecting the Coaxial Cable—

(1) Instructions are the same as for the Type A-12.

4. FIXED WIRE ANTENNA.

a. Preferred location: This type of antenna may be either top or bottom mounted. Bottom mounting is recommended because of reduced precipitation static; however, consideration must be given to adequate ground clearance as this location is somewhat more vulnerable than top mounting.

b. Installation: Specific installation instructions cannot be given because the details of installation vary with each job, but the following suggestions should prove helpful when installation of an antenna of this type is contemplated. For use with R-10A and R-11A Receivers, the antenna should be either a balanced "T" or an "L" type about 12 feet long. The lead-in should be at least 18 inches long and as nearly vertical in flight as possible. The portion of the lead-in which is inside the airplane should be as short as possible and kept well clear of metallic parts.

See "Instruction Book for ARC Type R-20, 75 Mc, Marker Beacon Receiver" for a description of the antenna best suited for use with that unit.

Figure 5 shows antenna fabrication details.

c. Precaution: Shielded wire should not be used for the lead-in.

D. MECHANICAL LINKAGES

The ARC #6151 Mechanical Linkage Assembly has been superseded by an improved version designated Type MC-215 (ARC #16158). Aircraft Radio Corporation will no longer supply the ARC #6151 Assembly or any components peculiar thereto, namely: Casing #3406, Sleeve #6585, or Nut #1167.

Henceforth, only Type MC-215 (ARC #16158) Mechanical Linkage Assemblies or components will be supplied. The MC-215 consists of:

Shafting	ARC #1174
Casing	ARC #8601
Spline	ARC #6788 (2 per assy)
Sleeve	ARC #11036 (2 per assy)
Nut	ARC #11035 (2 per assy)
Tag	ARC #16163

The A.R.C. Type W-10 Mechanical Linkage Tool is used to facilitate precision assembly of the MC-215 Mechanical Linkage. Existing Type A-7660A Assembly Tools (used with ARC #6151) may be altered for use with MC-215 by means of the conversion kit ARC #16267. This kit consists of the following:

Qty.	*Description*	*ARC Part No.*
1	Holder	16260
1	Die	16261
1	Pin	16262
2	Punch	15315
2	Set Screw	4140
1	Nameplate	16263

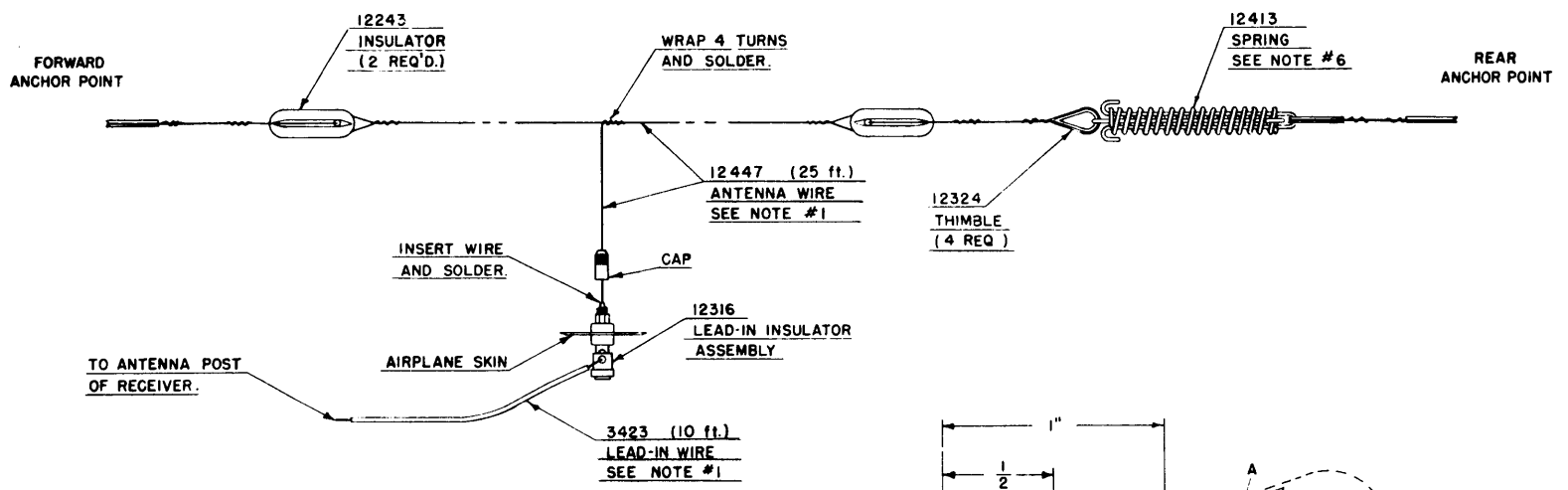
There is also a conversion kit available for those users of the W-10 Tool who have a supply of ARC #6151 components on hand and wish to adapt the W-10 for use with ARC #6151 Mechanical Linkage Assemblies. This conversion kit (ARC #16268) consists of the following:

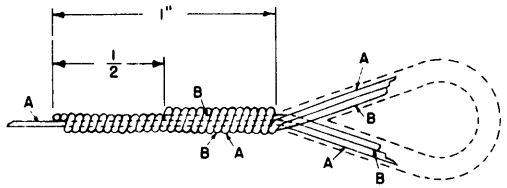
Qty.	*Description*	*ARC Part No.*
1	Holder	15314
2	Punch	15315
1	Die	15316
1	Pin	15319
2	Set Screw	4140
1	Nameplate	15322

A carefully prepared, properly installed mechanical linkage will rotate freely and smoothly. To obtain optimum results with mechanical linkages, the recommendations regarding storage, assembly, and installation should be observed.

FINAL INSPECTION FOR TORQUE ON TUNING CONTROLS

ARC Torque Indicator #16795, or equivalent, may be used to determine the torque required to turn a tuning control at a steady slow rate. Limits of inch-ounces of torque should be set up for every installation and rigidly adhered to. ARC will establish standards in conjunction with the engineering departments of aircraft companies installing the equipment. Runs of 6 feet with few bends, and a single tuning control, will probably





DETAIL OF WRAP AROUND THIMBLES AND INSULATORS.
USE AN ADDITIONAL SHORT WIRE "B" TO GIVE DOUBLE WRAPPING.

NOTES:

1. NOMINAL LENGTHS OF WIRE ARE FURNISHED WITH KIT, (ADDITIONAL WIRE MAY BE ORDERED SEPARATELY IN BULK).
2. ALL WIRES EXCEPT LEAD-IN WIRE TO BE #18 COPPER CLAD STEEL (SPEC. # 12447).
3. SEE DRAWING #12316 FOR INSULATOR ASSEMBLY NOTES. SCREW ON CAP AFTER SOLDERING.
4. LEAD-IN WIRE SHOULD BE AS SHORT AS POSSIBLE AND MUST BE SPACED AWAY FROM OTHER WIRES AND METAL OF AIRPLANE. (DO NOT USE VINYLITE COVERED WIRE FOR LEAD-IN.)
5. LOCATE VERTICAL SECTION OF ANTENNA AS NEAR THE CENTER OF THE HORIZONTAL SECTION AS POSSIBLE.
6. ADJUST TENSION FOR 3/4" SPRING DEFLECTION. (i.e. WHEN COMPRESSED COIL SPRING LENGTH IS 2 5/16")
7. THIS RANGE ANTENNA KIT IS TO CONSIST OF THE FOLLOWING:

ARC PART NO.	DESCRIPTION	QUANTITY
12243	INSULATOR	2
12324	THIMBLE	4
12413	SPRING	1
12447	ANTENNA WIRE	25 FT.
3423	LEAD-IN WIRE (BLACK)	10 FT.
12316	LEAD-IN INSULATOR ASSEM.	1

ANTENNA KIT, RANGE

MAT: | FINISH: | SCALE: ~

DIMENSION TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL DIMENSIONS ± .002 FRACTIONAL DIMENSIONS ± 1/64

CHANGE	DATE	APP	CHANGE	DATE	APP
(1) NOTE ONE ALTERED	12-16-46	[illegible]			
(2) NOTE 7 ADDED	6-15-50	LE			
(3) SHOWING OF CAP ADDED	5-15-50	LE			
(4) NOTE #3 ALTERED	5-15-50	LE			
(5) EYE BOLTS, STOP NUTS REM.	12-11-50	LE			

AIRCRAFT RADIO CORP.
BOONTON, N. J.

DWN. BY A.M.B. DATE 10-23-46
CHK. BY H.C. DATE 10-25-46
APP. BY [illegible] DATE 10-28-46

DWG. 12296-2-E

Figure 5—Rang Antenna Assembly Details

have a limit of about 7 inch-ounces. If a dual control is used with similar lengths, the limits will probably be about 10 inch-ounces. *Torque requirements above 15 inch-ounces will result in unacceptabl operation of the radio equipment and must be avoided at all costs.* In most installations, considerably lower torque standards will be set. A torque measurement must be made on every control before acceptance of the equipment.

1. STORAGE: Care must be exercised in the handling of bulk lengths of casing and shafting if properly operating mechanical linkages are to be obtained. They should be stored coiled in loose loops in a box, or on an 18" to 24" dia. spool. They must never be hung on hooks or laid on open shelves where there is a possibility of kinking, twisting or other distortion.

2. ASSEMBLY:

TOOLS REQUIRED: ARC Type W-10 Tool, 1½ to 2 pound hammer, hacksaw, side cutters, and file.

a. Determine required length of Shafting.

b. Swage shafting approximately 1.5 inches centered at the proposed cut-off point using "Swage Shafting" position on tool. Shafting must be held concentric with axis of die for at least 1½" on either side of the die to prevent kinks. Never cut shafting until it has been swaged to prevent unwrapping. See Figure 6a. Use a hammer blow only sufficiently heavy to drive the two halves of tool together. Repeat hammer blows if necessary to swage shafting properly.

c. Cut shafting at cut-off point using "Cut Shafting" position on tool and a hammer blow *only heavy enough to effect the cut-off.* See Figure 6b.

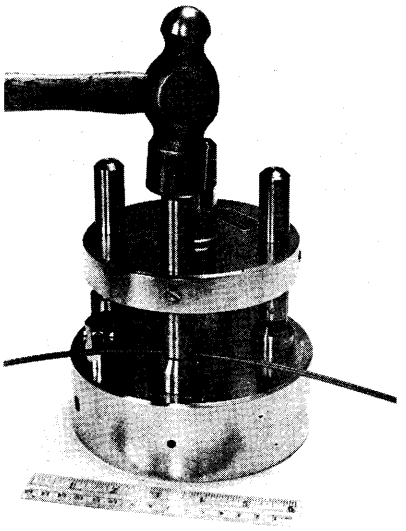


Figure 6a

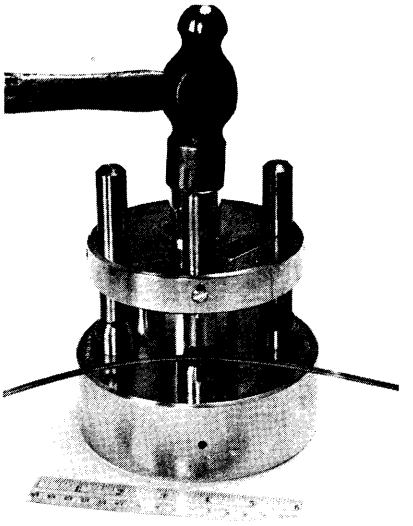
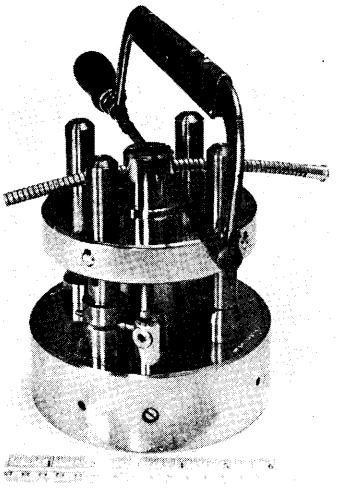


Figure 6b

d. If casing other than that supplied by A.R.C. is used, collapse (push back) a 1.5 foot portion of the casing to be used in the assembly. Mark off *exactly* one foot on the collapsed casing. Now stretch this one foot portion with about a 15 pound pull with the hands and measure the increase in length between marks. Next stretch with a 15 pound force somewhat more casing than will be used and mark the *stretched out* casing longer than the shaft length by one-half the increase measured above, for each foot of shaft length. From the length thus determined, subtract one inch and saw casing as in Figure 6c. The above method of determining casing length is made necessary by varying amounts of "accordion" action in the different manufacturing lots. If casing supplied by A.R.C. is used, it is only necessary to stretch casing with a 15



Figur 6c

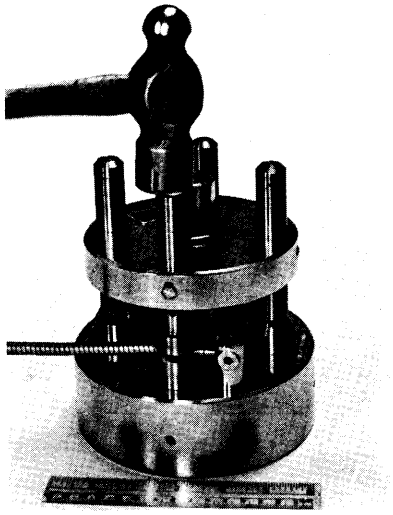


Figure 6d

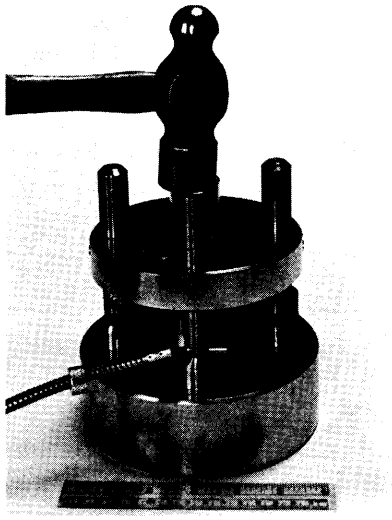


Figure 6e

pound pull; then cut casing longer than shafting by ¼ inch per foot less 1 inch. See Figure 7 (Mechanical Linkage Assembly Drawing #16158).

e. Trim burrs from end of casing using side cutters and file.

f. Place Nut over casing with threads toward end of casing.

g. Place Sleeve over end of casing inserting casing into sleeve as far as possible. (Be sure it butts against inner end of sleeve). Shove sleeve and casing onto guide pin at "Stake Casing" position until end of sleeve is against post. Figure 6d. Swing sleeve and pin into position for staking and strike blow only hard enough to drive the two halves of the tool together. Rotate casing 90 degrees and stake sleeve to the casing again. Continue this procedure for the remaining two 90 degree positions. Repeat for the other end of casing.

h. Push Spline over swaged end of shafting as far as it will go. Center hub of spline (with shafting inserted) in "Crimp Spline" position on tool and crimp spline to shafting using a fairly sharp hammer blow. Figure 6e. Again, strike tool only hard enough to drive the two halves of tool together or repeat hammer blow to accomplish this result. Make certain that flats crimped on shafting are parallel to flats on the tool.

i. Lubrication:

For shafting: Standard Oil Co. "Univis #40" or equivalent. For threads of nuts: anti-seize compound (zinc dust and vaseline).

j. Insert shafting into casing. Push back (or collapse) casing as required to expose swaged end of shafting. Use thin wrapping of tape to prevent shafting from sliding back into casing.

k. Repeat Step (h) to complete linkage.

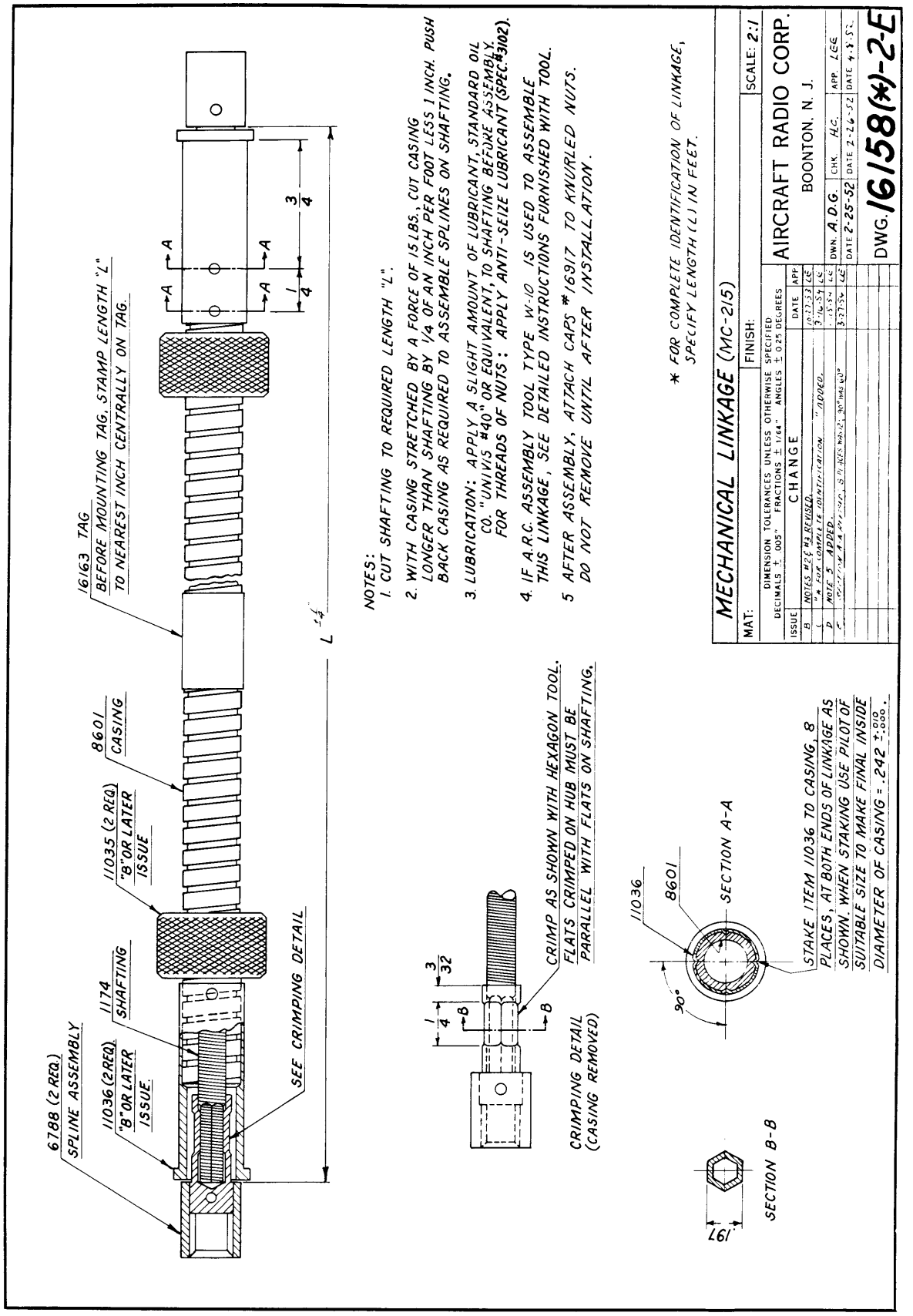
3. INSTALLATION: Properly assembled mechanical linkages will work smoothly over distances as long as 25 feet provided correct installation procedure is observed. The following considerations should be kept in mind when installing mechanical linkages:

a. The linkage route should be planned with a minimum of bends.

b. In order to reduce the number of bends in some installations, it may be desirable to use a right angle coupling, ARC part #6357, instead of the usual straight connection.

c. All bends must be on as large a radius as practicable. The minimum radius permissable is 5 inches.

d. The mechanical linkage should not be laced in with cables, but should be secured to the airframe (in as few places as possible); only enough to hold it securely in place.



Figur 7—Typ MC-215 M chanical Linkage D tails

SECTION III

EQUIPMENT OPERATION

A. R-10A AND R-11A RECEIVERS

1. FINAL ADJUSTMENTS AFTER INSTALLATION

a. Align tuning dial with receiver as follows:

(1) Connect mechanical linkage to receiver and control unit.

(2) Rotate tuning control counter-clockwise to bring the receiver gang condenser to its minimum-capacitance mechanical stop. (Do not force beyond this point.)

(3) Disengage mechanical linkage and turn tuning control until the dot about ⅛ inch beyond the high frequency end of the dial calibration comes directly under the fiducial mark.

(4) Replace mechanical linkage being careful not to change the relative position of the shafting or tuning dial.

(5) Check the accuracy of tuning dial positioning by tuning in several stations of known frequency.

b. Align input trimmer as follows:

(1) ANT-LOOP switch in "ANT" position.

(2) Turn receiver ON to maximum sensitivity.

(3) Tune receiver near to high frequency end of the dial to a place where there is no signal.

(4) Adjust ALIGN INPUT control for maximum background noise.

(5) Tune in stations across the band to check sensitivity.

(6) This alignment will be correct for loop operation, as well as antenna, over the entire frequency range of the receiver.

2. TO OPERATE RECEIVER ON THE RANGE ANTENNA

a. Turn combined power switch and sensitivity control full clockwise.

b. Set ANT-LOOP switch to the "ANT" position.

c. Tune to desired station frequency.

d. Reduce sensitivity until the audio output drops sharply and substantially.

e. Check station identification.

The receiver should never be operated at full sensitivity on a range signal unless the signal is very weak because course broadening may result. In passing, note that the audio output level is adjusted by manually varying receiver sensitivity rather than by using some means of varying volume in the af stage. This method is used so that the incoming signal level may be kept below the range of avc action. AVC action is desirable when receiving ground-to-air communications, but its presence is highly undesirable in an application where determination of relative signal strength is a requirement.

3. TO OPERATE RECEIVER ON THE LOOP ANTENNA

a. Proceed exactly as in 2a, b, c, d, and e above.

b. Then set ANT-LOOP switch to "LOOP" position.

c. Rotate L-10A Loop and adjust sensitivity for sharpest minimum signal. Alternately readjust the loop position and sensitivity control until this sharply defined null is obtained.

d. Read the bearing on the loop control dial.

This is the bearing from the airplane heading. Two such nulls, 180 degrees apart, will be found. This ambiguity must be resolved by knowing one's general position with respect to the transmitting station. If this position is not known, a simple method to determine it is to reduce the volume of the received signal to the weakest that can be heard and fly directly toward (or away) from the station. If the signal increases, the airplane is heading toward the station. If the signal fades out permanently the airplane is headed away from the station.

An alternate method is as follows:

a. Set the Loop Control Unit to 0 degrees.

b. Head the airplane into a null signal and note the gyro compass reading "G_1."

c. Fly for about 5 minutes at $G_1 + 90$ degrees.

d. Head the airplane into the null signal, turning back toward the G_1 heading, and note the gyro reading G_2.

e. If G_2 is less than G_1, the heading G_1 is TOWARD the transmitting station; if G_2 is greater than G_1, the heading G_1 is AWAY from the station.

Note:

In some installations more than one low frequency receiver may be installed. Care should be taken that only one low frequency receiver is used on "LOOP" at a time. Optimum results are obtained only when one receiver is operated on "LOOP."

B. R-15 AND R-19 RECEIVERS

1. ADJUSTMENT AFTER INSTALLATION

a. Align tuning dial with receiver in the same manner as outlined in paragraph A.1.a, page 21.

b. With vol. control full on, adjust squelch potentiometer (if provided) until receiver hiss just disappears.

2. TO OPERATE RECEIVER

a. Turn combined power switch and volume control full clockwise.

b. Set the LO-HI switch (if provided) to "LO." Ordinarily the "LO" position will provide a strong enough signal. For outputs that cannot be sufficiently increased by means of the volume control, use the "HI" position.

c. Tune in the desired station, reducing the volume so that the signal is weak as the station is tuned in.

d. When the station is tuned in accurately, increase the volume to the desired level.

e. If the installation contains a K-13 Osc.-Relay Unit for "whistle-through" tuning then the receiver may be tuned precisely to any of the transmitter crystal frequencies by pressing the receiver tuning crank while tuning for maximum "whistle."

C. K-13 OSCILLATOR-RELAY UNIT

1. ADJUSTMENT AFTER INSTALLATION

a. With Receiver VOL control set at maximum and a Ballantine Model 300 VTVM, or equivalent, connected across a 300 ohm load on TEL, set TRANS switch to any operable VHF position and adjust VHF WHISTLE LEVEL control for 1 volt output.

2. TO OPERATE K-13

a. Press receiver tuning crank while tuning for maximum "whistle."

D. T-11A, T-11B, T-13 AND T-13A TRANSMITTERS

1. ADJUSTMENT AFTER INSTALLATION

a. When the transmitter is installed in an airplane, it is possible that the antenna tuned circuit may be slightly off resonance. This condition may be checked as follows:

(1) See that the antenna is connected normally.

(2) Connect dc voltmeter from "Test Point" to ground.

(3) Set "TRANS" switch to the frequency nearest to the center of the band employed.

(4) Depress microphone button and check antenna circuit for maximum meter indication.

2. TRANSMITTER CRYSTALS

Transmitter crystals are located inside the transmitter as shown in Figure 11. Crystals are ordinarily installed in ascending order of frequency starting with the lowest frequency in position #1. Crystals supplied are ARC #14958. These are accurate to .01% and are hermetically sealed inside bakelite housings. Crystals are normally ground for 1/12 operating frequency, but crystals ground for 1/18 operating frequency may be used alone or in combination with "1/12" crystals.

CAUTION:

OPERATING FREQUENCIES SHOULD BE KEPT WITHIN A 2 MC SPREAD; A GREATER SPREAD WILL RESULT IN A LOSS OF POWER OUTPUT AT THE EXTREMES OF THE BAND. For the T-11A or T-11B Transmitter, the 2 Mc may be anywhere from 116-132 Mc. For the T-13 or T-13A Transmitter, the 2 Mc spread may be anywhere from 125-148 Mc. For frequencies below 132 Mc in the T-13 or T-13A Transmitter, a capacity plate (ARC #15392 for the T-13 and ARC #15900 for the T-13A) must be installed. Whenever a capacity plate is installed or removed, the transmitter must be realigned for maximum rf output.

2. TO OPERATE TRANSMITTER

a. Turn vhf receiver on.

b. Set "TRANS" switch to desired frequency channel or, if interphone is desired, to "INT" position.

c. Depress microphone button, and speak directly into microphone.

d. Release microphone button to receive.

NOTE

It is unlawful to operate a radio transmitter without an operator's license and a station license. Aircraft Radio Corporation assists each owner of Type 12 Communication Equipment to obtain an operator's and a station license by including application forms for both licenses. Fill out the "Application for Non-Scheduled Aircraft Radio Station License," Form 404A, under paragraphs 2 and 11 as follows:

Manufacturer: Aircraft Radio Corp.
Type: T-11B (or Type T-13A) VHF Transmitter
Model Number: None

Satisfactory information for paragraphs 12 to 16 on the same form is as follows:

"All technical data is on file with FCC."

SECTION IV

ALIGNMENT AND TEST PROCEDURE

A. INTRODUCTION

The purpose of these instructions is to provide a standardized procedure for alignment and test of the radio receivers and transmitters which are a part of the A.R.C. Type 12 Equipment. The conditions under which the aligning and testing are to be done are specified herein. These conditions must be carefully observed if proper results are to be obtained. The "Test Range" or "Average" figures appearing in Tables V and VI characterize the performance of new equipment as it leaves the factory. Since some variation from the nominal values of the electrical components is to be expected through age and use, it is possible that a change in "Test Range" values will be found after the equipment has been in service for some time.

B. TEST EQUIPMENT REQUIRED

The following is a list of apparatus required to align and test the ARC Type 12 Equipment:

1. Standard Signal Generator, frequency range 85 kc-15 Mc, accurately calibrated and free of fm.
2. Audio Oscillator, Hewlett-Packard Model 200-B, or equivalent.
3. Signal Generator, Boonton Radio Type 202-B, or equivalent (for vhf receivers only).
4. R-F Wattmeter, such as Bird Termaline Model 61.
5. Vacuum Tube Voltmeter, Ballantine Model 300, or equivalent.
6. Multimeter, 20,000 ohm-per-volt type.
7. ARC Type 12 Bench Test Kit.
8. Headset (High Impedance).
9. Microphone (carbon).
10. DC power source adjustable between the limits of 12-14 volts or 26-28 volts depending on equipment voltage rating.
11. Test Crystal Units, (ARC #14958 or ARC #10714) one each for frequencies specified in Table IV.

Note:

Signal generator calibration should be frequently checked by means of a crystal calibrator or other standard signal source to assure the signal generator accuracy required in the alignment and calibration checks.

C. SENSE AND PREFERRED SETTING OF TRIMMER CAPACITORS

When a receiver leaves the factory, all trimmer capacitors are left in such a position that further rotation clockwise will increase capacity. Maximum capacitance position is indicated when the top of the cross (or line) on the rotor shaft is aligned with the fiducial line.

D. BEFORE STARTING RECEIVER ALIGNMENT

Connect up equipment as shown in Figure 8. Turn on, set SENS control on Test Unit for maximum gain, and warm up for 15 minutes at rated supply voltage. The following conditions, unless otherwise specified, are used throughout the alignment procedures:

1. Input supply voltage: 13v dc (for 14 volt receivers) or 27v dc (for 28 volt receivers) measured at pin 2 on dynamotor receptacle with dynamotor in place.
2. Telephone output load: 300 ohms.
3. Modulation: 30% at 400 cps.
4. Sensitivity control: Set at maximum sensitivity.

The terms "High Dial," "Mid Dial," and "Low Dial" refer to the frequencies so listed at the top of Tables V and VI.

E. RECEIVER ALIGNMENT PROCEDURE

1. IF ALIGNMENT FOR ARC TYPE R-10A AND R-11A RECEIVERS

a. Remove top cover plate.

b. Connect 5-ohm signal generator source in series with a .006 μf capacitor to mixer-grid test jack. (See Figure 9 for test jack location.)

c. Set signal generator frequency to receiver if ± .01%, modulation on. R-10A if is 239 kc. R-11A if is 85 kc.

d. Remove knurled caps from if coupling units and pull up the variable coupling rods to their full extension.

e. Adjust the if trimming capacitors of the third if coupling unit for greatest possible receiver output, but see *g.* below. Read output voltage on ac electronic voltmeter connected as shown in Figure 8.

f. Adjust the capacitors of the second if coupling unit and then those of the first if coupling unit in the same manner.

g. Keep the maximum receiver output below 1 volt by appropriate readjustment of signal generator output level during the trimming process.

h. Increase signal generator output so that the cathode current is reduced to approximately 5 ma and adjust the #2 trimmer of the third if coupling unit for maximum output.

Note:

In cases where noise output interferes with proper alignment, the percent modulation may be increased provided the signal generator output level is such as to produce less than 1 volt output in 300 ohms with 30% modulation.

2. RF ALIGNMENT FOR ARC TYPE R-10A AND R-11A RECEIVERS

(This alignment should not be done until the if alignment above is completed.)

a. Remove top dust shield.

b. Leave the if coupling rods up.

c. Connect 5-ohm signal generator source to "A" antenna post. (Connect to "L" antenna post on those receivers having 2 antenna posts, one marked "A" and one marked "L.")

d. Set signal generator to "High Dial" frequency, modulation on.

e. Tune receiver to "High Dial" frequency as accurately as possible.

f. Set oscillator series trimmer capacitor C-516 (C-616 on R-11A) to about mid-capacity. This adjustment is made through access hole on extreme right of metal enclosure under dust shield (viewed from front of receiver). See Figure 9.

g. Adjust the oscillator shunt trimmer C-504F (C-604F on R-11A) for maximum receiver output voltage. This adjustment is made through center access hole. See Figure 9.

h. Adjust the rf amplifier shunt trimmer C-504C (C-604C on R-11A) for maximum receiver output voltage. This adjustment is made through access hole on the left. See Figure 9.

i. Trim the ALIGN INPUT control on the receiver panel for maximum output.

j. Keep maximum receiver output voltage below 1 volt by appropriate adjustment of signal generator output level during the preceding trimming processes.

k. Set signal generator to "Low Dial" frequency ± .1%, modulation on.

l. Tune receiver for maximum output in the "Low Dial" region.

m. Adjust the oscillator series trimmer C-516 (C-616 on R-11A) for maximum output while slightly rocking the receiver gang capacitor within the "Low Dial" region.

n. Maximum receiver output must be kept below 1 volt by adjusting signal generator output level during this process.

o. Set signal generator and receiver to "High Dial" frequency.

p. Adjust oscillator shunt trimmer C-504F (C-604F on R-11A) for maximum output.

q. Use no greater signal generator output level than is required for this final adjustment.

r. Push variable if coupling rods down, and replace knurled caps.

3. IF ALIGNMENT FOR ARC TYPE R-15 AND R-19 RECEIVERS

a. Connect 5-ohm signal generator source through test probe to mixer-grid test jack and to adjacent ground. (See Figure 10 for test jack location.)

b. Set signal generator frequency to receiver if ± .01%, modulation on. R-15 and R-19 if is 15 Mc.

c. Tune receiver to "High Dial" frequency.

d. Set Function Switch on Test Unit to "HI" position.

e. Remove knurled cap from each if coupling unit.

f. Beginning with the fourth if coupling unit, make a preliminary alignment of all eight if trimming capacitors by adjusting each one for maximum receiver output voltage.

g. Throughout this procedure keep the maximum receiver output below 1 volt by appropriate readjustment of the signal generator output level.

h. For final if alignment, detune the #1 trimmer of the fourth if coupling unit in whichever direction gives the maximum detuning, and then adjust the #2 trimmer of the same unit for maximum output. Then, without any readjustment of #2 trimmer, adjust #1 trimmer for maximum output. During this procedure, keep the maximum receiver output below 1 volt by appropriate adjustment of signal generator output.

i. Repeat this final alignment process successively on the third, second, and first if coupling units.

j. Replace knurled caps.

4. RF ALIGNMENT FOR ARC TYPE R-15 AND R-19 RECEIVERS

a. Set Test Unit Function Switch to "HI" position.

b. Connect 25 ohm signal generator source to the antenna receptacle.

c. Set signal generator to "High Dial" frequency, modulation on.

d. Tune receiver to "High Dial" frequency as accurately as possible.

e. Using the special capacitor alignment tool, ARC #10307, adjust the rf oscillator trimmer capacitor. See Figure 10 for trimmer location. Adjust for maximum receiver output. This adjustment is extremely critical and should be rechecked several times to be sure that the point of maximum output has actually been obtained.

f. In the order listed, adjust the second rf amplifier trimmer, the first rf amplifier trimmer, and the antenna trimmer for maximum output voltage.

g. The receiver output must be kept below 2 volts during this procedure by appropriate adjustment of signal generator output level.

Note:

The rf oscillator trimmer will require readjustment each time the rf oscillator tube is replaced.

F. BEFORE STARTING TRANSMITTER ALIGNMENT

1. Interconnect equipment as shown in Figure 8.
2. Connect 20,000 ohm per volt meter across V + and G on Test Unit.
3. Insert crystals in transmitter. It is recommended that the crystals be installed in ascending order of frequency, starting with the lowest frequency in crystal position #1. See Figure 11.
4. Turn equipment on and warm up for 15 minutes at rated supply voltage.

Note:

a. Antenna output load is provided by OUTPUT CIRCUIT in Test Unit.

b. Sidetone load is provided by 300 ohm headset plugged in TEL jack.

c. The T-13 and T-13A Transmitters must have a capacity plate installed for operation on frequencies below 132 Mc; capacity plate ARC #15392 for the T-13, and capacity plate ARC #15900 for the T-13A. Whenever a capacity plate is installed or removed, the transmitter must be realigned for maximum rf output.

G. TRANSMITTER ALIGNMENT PROCEDURE

1. Set Function Switch on Test Unit to the middle frequency position.
2. With microphone button depressed, adjust first multiplier tuned circuit (marked #1 on schematic diagram and on chassis) for maximum indication on 20,000 ohm per volt meter.
3. Adjust tripler tuned circuit (marked #2) for maximum meter indication.
4. Adjust antenna tuned circuit (marked #3) for maximum meter indication.
5. Repeat steps (2), (3) and (4).

Note:

Tuning Slug Positions.

Table III shows normal positions of tuning slugs. Abnormal slug tuning positions may

TABLE III

Frequency (Mc)	*Slug turns up from bottom**			*Slug turns up from bottom*		
	Slug #1	*Slug #2*	*Slug #3*	*Slug #1*	*Slug #2*	*Slug #3*
	T-11A Transmitter			*T-11B Transmitter*		
116	2 ± ¾	1¼ ± ½	12 ± 1	3 ± ½	4 ± 1	12½ ± 1½
124	6½ ± ¾	4½ ± ¾	8½ ± 1¼	6¾ ± 1	7 ± 1¼	9 ± 1
132	12 ± 1¼	7 ± ¼	6½ ± 1¼	13 ± 1½	9¾ ± 1¼	5 ± 1¼
	T-13 Transmitter			*T-13A Transmitter*		
132	3½ ± ½	4 ± ¾	12 ± 1½	3¾ ± ½	4¼ ± 1	13½ ± 1½
140	7¾ ± 1	6½ ± ½	8½ ± 1	7 ± ¾	7 ± 1	10¼ ± 1
148	13 ± 1½	8½ ± 1¼	4½ ± 1¼	11½ ± 1½	10¼ ± 1¼	7¼ ± 1¼

* 17 turns total excursion available on each slug.

result from any of the three following conditions:

a. Alignment of tuned circuit on an undesired harmonic of the crystal frequency.

b. Incorrect crystal frequency.

c. Incorrect LC value of tuned circuit.

Note:

When the transmitter is installed in an airplane, it is possible that the antenna tuned circuit may be slightly off resonance. In many instances the change in output may be negligible; however, it is well to make a quick check. Connect a dc voltmeter from Test Point in transmitter to ground, depress microphone button, and check antenna circuit (marked #3) for maximum meter indication.

H. TEST PROCEDURE

1. TEST CONDITIONS

Before the following tests are made on a receiver, the receiver must have been completely aligned and connected to Test Unit as shown in Figure 8. Just preceding these tests, it should be warmed up for 15 minutes at rated supply voltage. The following conditions, unless otherwise specified, are used throughout the tests and apply to all receivers:

a. Input supply voltage: 13v dc (for 14 volt receivers) or 27v dc (for 28 volt receivers) measured at pin 2 on dynamotor receptacle with dynamotor in place.

b. Telephone output load: 300-ohms pure resistance.

c. Modulation: 30% at 400 cps.

d. Audio fidelity reference frequency: 400 cps.

. Sensftivity control: Set at maximum sensitivity.

f. Function Switch set on "HI" position when testing Type R-15 and R-19 Receivers.

g. Signal source:

(1) Type R-10A and R-11A Receivers—To "Antenna" post (5 ohm signal generator output resistance). To "Loop" post (5 ohm signal generator output resistance) through "Loop Circuit" on Test Unit. To mixer-grid test jack (5-ohm signal generator output resistance) through .006 μf capacitor.

(2) Type R-15 and R-19 Receivers—To "Antenna" receptacle (25-ohm signal generator output resistance). To mixer-grid test jack (5-ohm signal generator output resistance) through Test Probe ARC #16139. Test Probe ground connection must be adjacent to test jack.

h. The ALIGN INPUT control is to be trimmed only at "High Dial," with maximum sensitivity, and with signal generator connected to antenna post. It must not be readjusted at other frequencies, or with loop input.

2. DEFINITIONS

a. The terms "High Dial," "Mid Dial," and "Low Dial" refer to the frequencies so listed at the top of Tables V and VI.

b. The column headed "Test No." in Tables V and VI serves to correlate the test data with the directions for testing given in subsections 3, 4, 5, 6 and 7 under corresponding numerical headings.

c. Sensitivity is defined as the signal input (in microvolts) required to produce an output of 10 milliwatts into 300 ohm resistive load (1.73 volts across 300 ohms) with receiver tuned to resonance, and the signal generator rf modulated 30% at 400 cps.

3. TESTING ARC TYPE R-10A RECEIVER

Test 1. Meters: With 0 signal input and maximum sensitivity, (a) measure high voltage between "HV+" and "G" on Test Unit with 20,000 ohm/volt dc voltmeter. (b) Measure cathode current at "CATHODE CURRENT" test jack on Test Unit with 0-20 ma. dc milliammeter.

Test 2. "High Dial" (H) *Sensitivity:* Connect signal generator to antenna post. Set signal generator at (H) frequency, modulation on at low output (insufficient to operate avc). Tune receiver to resonance at (H) frequency. Adjust signal generator output until receiver output is 1.73 volts (10 milliwatts into 300 ohm load) and measure sensitivity.

Test 3. Sensitivity at Mixer Grid: Connect signal generator to mixer grid test jack.

a. Measure if sensitivity by tuning signal generator to if frequency using low output (insufficient to operate avc).

b. Measure mixer-grid rf sensitivity as in (a) but with signal generator tuned to (H) frequency and keeping receiver tuned to resonance.

Test 4. Sensitivity Control: Connect signal generator to antenna post and set signal generator to (H). Tune receiver to resonance at (H). Increase signal generator output 50,000 times (H) sensitivity, increase resistance of SENS control on Test Unit, and measure ohms required for 10 milliwatts output.

Test 5a. Electrical Instability: At (H), remove modulation, increase signal generator output to 0.5 volt and test receiver for instability by tuning the frequency control and simultaneously exploring the sensitivity control range. Instability will be evidenced

by motorboating, substantially constant pitch tones, or other unnatural noises, excluding "tweets."

Test 5b. Mechanical Instability: Check for microphonic tubes or evidence of other mechanical instability.

Test 6. AVC Knee Output: At (H), keeping receiver tuned to resonance, increase signal generator output until cathode current is reduced by 1 ma. Measure receiver output.

Test 7. AVC: Increase signal generator output to 0.1 volt. Measure receiver output keeping receiver tuned to resonance.

Test 8. Overload: Increase signal generator output to 0.5 volt. Measure receiver output keeping receiver tuned to resonance.

Test 9. Selectivity: At (H), set signal generator output to 50 microvolts, reduce SENS control until receiver output is 1 volt at resonance. Increase signal generator output to 500 microvolts. Keeping receiver frequency at (H), raise signal generator frequency to a point above (H) where the receiver output is again 1 volt. Record signal generator dial setting. Then lower signal generator frequency to a point below (H) where the receiver output is again 1 volt. Record signal generator dial setting. Selectivity for 10:1 down is the difference between the recorded signal generator dial settings expressed in kc.

Test 10. Loop Sensitivity: Adjust sensitivity control to give 3 microvolt sensitivity at (H). Connect signal generator through LOOP CIRCUIT on Test Unit to loop receptacle on receiver. Switch Test Unit function switch to LOOP position and measure sensitivity (1/10 of indicated signal generator microvolts, due to loop circuit attenuation). e.g. Assume that for a certain receiver a signal generator output of 18 microvolts is required to produce the standard receiver output of 10 milliwatts into a 300 ohm load under the conditions of Test 10. Then 1/10 of 18μv = 1.8μv. Therefore, the receiver under test would meet the Loop Sensitivity requirement specified in Table V.

Test 11. Audio Fidelity: Set signal generator to 50 microvolts output. Keep receiver tuned to resonance. Adjust SENS control to give 2 volts output. Use this receiver output as reference. Change modulation frequency to 200 and 2000 cps and measure the 200 and 2000 cps fidelity. Fidelity is defined as the ratio of output voltage at any specified modulation frequency to output voltage at the reference modulation frequency expressed in percent.

Test 12. "Mid Dial" (M) Calibration: Set SENS control to give 3 microvolt sensitivity at (H), set receiver to exact (M) frequency and adjust signal generator to frequency at which receiver is resonant. Keep receiver output below 2 volts by appropriate adjustment of signal generator output level. The difference between the signal generator dial frequency and (M) frequency (expressed in kc) is the calibration error.

Test 13. "Mid Dial" (M) Sensitivity: Set SENS control to give 3 microvolts sensitivity at (H), set signal generator at (M) frequency, modulation on at low output (insufficient to operate avc). Tune receiver to resonance at (M) frequency. Adjust signal generator output until receiver output is 1.73 volts (10 milliwatts into 300 ohm load) and measure sensitivity.

Test 14. Noise:

a. No Signal: Set SENS to maximum sensitivity, signal generator output to minimum and detune signal generator at least 10 kc from (L). Measure receiver output at (L).

b. Radio (Antenna): Adjust SENS control for 3 microvolts sensitivity at (H) and with 3 microvolts input applied to receiver, remove modulation. Measure receiver output.

c. Audio: Modulation on. Reduce SENS control to minimum sensitivity and measure receiver output.

Test 15. "Low Dial" (L) Calibration: Set SENS control to give 3 microvolt sensitivity at (H), set receiver to exact (L) frequency and adjust signal generator to frequency at which receiver is resonant. Keep receiver output below 2 volts by appropriate adjustment of signal generator output level—the difference between the signal generator dial frequency and (L) frequency (expressed in kc) is the calibration error.

Test 16. "Low Dial" (L) Sensitivity: Set SENS control to give 3 microvolts sensitivity at (H), set signal generator at (L) frequency, modulation on at low output (insufficient to operate avc). Tune receiver to resonance at (L) frequency. Adjust signal generator output until receiver output is 1.73 volts (10 milliwatts into 300 ohm load) and measure sensitivity.

Test 17. Selectivity: At (L), set signal generator output to 50 microvolts, reduce SENS control until receiver output is 1 volt at resonance. Increase signal generator output to 100 microvolts. Keeping receiver frequency at (L), raise signal generator frequency to a point above (L) where the receiver output is again 1 volt. Record signal generator dial setting. Then lower signal generator frequency to a point below (L) where the receiver output is again 1 volt. Record signal generator dial setting. Selectivity for 2:1 down is the difference between the recorded signal generator dial settings expressed in kc.

4. TESTING ARC TYPE R-11A RECEIVER

Directions for testing are the same as for Type R-10A except the following:

Test 11. Audio Fidelity: Measure 200 and 1000

cps fidelity in the same manner as in subsection 3, Test 11.

5. TESTING ARC TYPE R-15 AND R-19 RECEIVERS

T st 1. M ters: Read meters with 0 signal input and maximum sensitivity.

Test 2. "High Dial" Sensitivity: Connect signal generator to antenna receptacle. Set signal generator at (H) frequency, modulation on at low output (insufficient to operate avc). Tune receiver to resonance at (H) frequency. Adjust signal generator output until receiver output is 1.73 volts (10 milliwatts into 300 ohm load) and measure sensitivity.

T st 3. IF Sensitivity at Mixer-Grid: Connect signal generator through test probe to mixer-grid test jack. Measure if sensitivity by tuning signal generator to if frequency using low output (insufficient to operate avc).

Test 4. S nsitivity Control: Connect signal generator to antenna receptacle and set signal generator to (H). Tune receiver to resonance at (H). Increase signal generator output 50,000 times (H) sensitivity, increase resistance of SENS control on Test Unit, and measure ohms required for 10 milliwatts output.

Test 5a. Electrical Instability: At (H) remove modulation, increase signal generator output to 0.2 volts and test receiver for instability by tuning the frequency control and simultaneously exploring the sensitivity control range. Instability will be evidenced by motorboating, substantially constant pitch tones, or other unnatural noises, excluding "tweets."

Test 5b. Mechanical Instability: Check for microphonic tubes or evidence of other mechanical instability.

Test 6. AVC Knee Output: At (H) keeping receiver tuned to resonance, increase signal generator output until cathode current is reduced by 1 ma. Measure receiver output.

T st 7. AVC: Increase signal generator output to 0.1 volts. Measure receiver output keeping receiver tuned to resonance.

T st 8. Ov rload: Increase signal generator output to 0.2 volts and measure receiver output keeping receiver tuned to resonance.

Test 9. Selectivity: To determine band width at 1000:1 down, at (H) set signal generator level to produce 2 volts receiver output at resonance. Increase signal generator output voltage 1000 times. Keeping receiver frequency at (H), raise signal generator frequency to a point above (H) where the receiver output is again 2 volts. Record signal generator dial setting. Then lower signal generator frequency to a point below (H) where the receiver output is again 2 volts. Record signal generator dial setting. Selectivity for 1000:1 down is the difference between the recorded signal generator dial settings expressed in kc. Determine band width at 2:1 down in a like manner except that signal generator output voltage is increased 2 times instead of 1000 times.

Test 10. Not applicable.

Test 11. Audio Fidelity: Set signal generator to 50 microvolts output. Keep receiver tuned to resonance. Adjust SENS control to give 2 volts output. Use this receiver output as reference. Change modulation frequency to 200 and 5000 cps and measure the 200 and 5000 cps fidelity. Fidelity is defined as the ratio of output voltage at any specified modulation frequency to the output voltage at the reference modulation frequency expressed in percent.

Test 12. "Mid Dial" (M) Calibration: Set receiver to exact (M) frequency and adjust signal generator to frequency at which receiver is resonant. Keep receiver output below 2 volts by appropriate adjustment of signal generator output level. The difference between the signal generator dial frequency and (M) frequency (expressed in kc) is the calibration error.

Test 13. "Mid Dial" (M) Sensitivity: Connect signal generator to antenna receptacle. Set signal generator at (M) frequency, modulation on at low output (insufficient to operate avc). Tune receiver to resonance at (M) frequency. Adjust signal generator output until receiver output is 1.73 volts (10 milliwatts into 300 ohm load) and measure sensitivity.

Test 14. Noise:

a. Radio: Set receiver to (H) and adjust signal generator output to produce 10 milliwatts at resonance; switch off modulation. Measure receiver output.

b. Audio: Reduce SENS control to minimum sensitivity and measure receiver output.

Test 15. "Low Dial" (L) Calibration: Set receiver to exact (L) frequency and adjust signal generator to frequency at which receiver is resonant. Keep receiver output below 2 volts by appropriate adjustment of signal generator output level. The difference between the signal generator dial frequency and (L) frequency (expressed in kc) is the calibration error.

Test 16. "Low Dial" (L) Sensitivity: Connect signal generator to antenna receptacle. Set signal generator at (L) frequency, modulation on at low output (insufficient to operate avc). Tune receiver to resonance at (L). Adjust signal generator output until receiver output is 1.73 volts (10 milliwatts in 300 ohm load) and measure sensitivity.

6. SUPPLEMENTARY RECEIVER TEST DATA

Table V—Supplement lists the approximate values of microvolts input required to produce the standard

output referenced in subsection 2., c. The test conditions set forth in subsection 1. apply.

Variations of 2 to 1 in the values shown from the antenna through the mixer-grid at rf may be expected, but variations of less than 2 to 1 for all if measurements should be observed. A .006 μf mica capacitor should be inserted in series with the signal generator lead to prevent upsetting biases for all measurements except at:

a. Grid test jack on the R-15 and R-19 Receivers.

b. Antenna receptacles on all receivers.

7. TESTING ARC TYPE T-11A, T-11B, T-13 AND T-13A TRANSMITTERS

The following conditions, unless otherwise specified, are used throughout the transmitter tests:

a. DC low voltage: 13v dc (for 14 volt transmitters) or 27v dc (for 28 volt transmitters) measured at pin 2 on dynamotor receptacle with dynamotor in place.

b. Antenna output load: 50 ohms (provided by output circuit in Test Unit).

c. Modulation: None.

d. Sidetone load: 300 ohms resistance (provided by headset plugged in TEL jack).

e. Transmitter dust shield and base in place and making good electrical contact to chassis.

f. Equipment connected as shown in Figure 8.

g. Test crystals inserted in crystal holders as specified in Table IV.

h. Transmitter aligned in accordance with instructions contained in Section IV, G.

Test 1. Meter: Measure high voltage between "HV+" and "G" on Test Unit with 20,000 ohm/volt dc meter under the following conditions: TRANS CRYSTAL position #3, power on, transmitter tuned to resonance, cw (no modulation).

Test 2. Crystal Relays: With no crystals in transmitter and with oscillator-multiplier tube removed, set function switch on test unit to TRANS CRYSTAL position #1. See Figure 11 for tube location.

Crystal Output Frequency (Mc)	*Crystal Position*	
	T-11A T-11B	*T-13 T-13A*
116	2	—
124	3	—
132	4	2
140	—	3
148	—	4

Table IV—Transmitter Test Crystal Frequencies

Check continuity between ungrounded (front) terminal of crystal holder #1 and terminal #7 oscillator tube socket on T-11A or T-13 Transmitters (terminal #8 of oscillator tube socket on T-11B or T-13A). There should be 0 resistance between these points. Repeat this test for relays 2, 3, 4, and 5 by switching to TRANS CRYSTAL positions 2, 3, 4, and 5. Check continuity to ground from the rear terminal of each crystal holder. Reinsert oscillator-multiplier tube.

Test 3. Power Relay: With function switch in OFF position, remove dynamotor from receptacle and cable connector from J-204 on T-11A (J404 on T-13, J2302 on T-11B, J2402 on T-13A). Check for 0 resistance between pins A and E. Replace cable connector, remove modulator tube, and set function switch to TRANS CRYSTAL position #1. See Figure 11 for tube location. Check for 0 resistance between pin #6 of modulator tube socket and HV test point on Test Unit when microphone button is depressed. Turn function switch OFF and reinsert dynamotor and modulator tube.

Test 4. Antenna Relay: Set function switch to ANT. position and remove antenna cable from ANT. receptacle. Use ohmmeter method to check for 0 resistance between the center conductor of the ANT. receptacle and the center conductor of the REC receptacle. Depress microphone button and check for 0 resistance between the center conductor of the ANT. receptacle and chassis ground.

Test 5. RF Output at (L): Reinsert test crystals. Set function switch to TRANS CRYSTAL position #2, and align transmitter as in Section IV, G. Connect antenna cable from ANT. receptacle to rf wattmeter, depress microphone button, and measure output power.

Test 6. RF Output at (H): Set function switch to TRANS CRYSTAL position #4, and proceed as in Test 5.

Test 7. RF Output at (M): Set function switch to TRANS CRYSTAL position #3, and proceed as in Test 5.

Test 8. DC Test Volts: Under resonance conditions as in Test 7, measure dc voltage at TEST POINT in transmitter using 20,000 ohm per volt meter.

Test 9. No RF without Crystal: Set switch to TRANS CRYSTAL position #1 (no crystal) and check that no output is indicated by dc test meter at TEST POINT in transmitter.

Test 10. Sidetone Output: Leaving dc test meter connected as in Test 9, set function switch to TRANS CRYSTAL position #3. Depress microphone button and speak into microphone. A rise of 10-20% in voltmeter reading indicates that microphone and modulation circuits are functioning normally.

TEST CONDITIONS AND AVERAGE TEST RANGES

		R-10A	R-11A	R-15	R-19
DC SUPPLY VOLTAGE (AT PIN 2 ON DYNAMOTOR)	V	13/27	13/27	13/27	13/27
FREQUENCY BAND	MC	.52-1.5	.19-.55	108-135	118-148
INTERMEDIATE FREQUENCY	MC	.239	.085	15	15
HIGH DIAL FREQUENCY (H)	MC	1.400	.520	131	144
MID DIAL FREQUENCY (M)	MC	.900	.330	121	133
LOW DIAL FREQUENCY (L)	MC	.570	.210	111	122

TEST NO.	NAME OF TEST			DIAL	NOTE	TEST RANGE	NOTE	TEST RANGE	NOTE	TEST RANGE	NOTE	TEST RANGE
1.	METERS	A. HV	V	H	A	250-270	A	250-270	A	250-270	A	250-270
		B. CATHODE CURRENT	MA	H	A	15-20	A	15-20	A	12-16	A	12-16
2.	SENSITIVITY		μV	H	A	<1	A	<1	A	<3	A	<7
3.	SENSITIVITY AT MIXER GRID	A. IF	μV	H	A	30-100	A	30-100	A	100-400	A	100-400
		B. RF	μV	H	A	80-160	A	50-130	A	75-300	A	75-300
4.	SENSITIVITY CONTROL (50,000:1)		OHMS	H	A	20K-45K	A	20K-45K	A	18K-40K	A	18K-40K
6.	AVC KNEE OUTPUT		V	H	A	6-10	A	7-11	A	5-10	A	5-10
7.	AVC (0.1 V INPUT)		V	H	A	10-16	A	12-17	A	8-13	A	8-13
8.	OVERLOAD		V	H	A,J,F	<21	A,J,F	<21	A,I,F	<16	A,I,F	<16
9.	SELECTIVITY	A. 10:1 DOWN	KC	H	C	<10	C	<6	—	—	—	—
		B. 1000:1 DOWN	KC	H	—	—	—	—	A	<370	A	<380
		C. 2:1 DOWN	KC	H	—	—	—	—	A	>60	A	>60
10.	LOOP SENSITIVITY		μV	H	B	<2	B	<1	—	—	—	—
11.	AUDIO FIDELITY	A. 200 CPS	%	H	E	40-60	E	40-60	E	30-60	E	30-60
		B. 2000 CPS	%	H	E	90-145	-	—	—	—	—	—
		C. 1000 CPS	%	H	-	—	E	130-170	—	—	—	—
		D. 5000 CPS	%	H	—	—	—	—	E	40-60	E	40-60
12.	CALIBRATION ACCURACY		± KC	M	B	<4	B	<2	A	<200	A	<200
13.	SENSITIVITY		μV	M	B	2-4	B	2-5	A	<4	A	<7
14.	NOISE	A. NO SIGNAL	V	L	A	<3	A	<5	—	—	—	—
		B. RADIO (ANTENNA)	V	L	D	<2	D	<2	A,H	<2	A,H	<2
		C. AUDIO	V	L	G	<.01	G	<.01	G,H	<.01	G,H	<.01
15.	CALIBRATION ACCURACY		±KC	L	B	<2	B	<.74	A	<130	A	<150
16.	SENSITIVITY		μV	L	B	2-4	B	2-4	A	<3	A	<9
17.	SELECTIVITY (2:1 DOWN)		KC	L	C	>4	C	>2	—	—	—	—

TABLE V SUPPLEMENT

TEST POINT		DIAL	NOTE	AV. VALUE	NOTE	AV. VALUE	NOTE	AV. VALUE	NOTE	AV. VALUE
ANTENNA RECEPTACLE	μV	H	A	1	A	1	A	1	A	1
1 ST RF GRID	μV	H	A	10	A	10	A	5	A	5
2 ND RF GRID	μV	H	—	—	—	—	A	25	A	25
MIXER GRID (RF)	μV	H	A	100	A	100	A	150	A	150
MIXER GRID (IF)	μV	—	A	100	A	100	A	250	A	250
1 ST IF GRID	μV	—	A	5000	A	5000	A	2500	A	2500
2 ND IF GRID	μV	—	—	500,000	—	500,000	—	30,000	—	30,000
3 RD IF GRID	μV	—	—	—	—	—	—	400,000	—	400,000
DETECTOR ANODE	V	—	K	2	K	2	K	2	K	2

NOTES:

A. MAXIMUM SENSITIVITY.
B. 3 μV SENSITIVITY AT (H).
C. 50 μV IN; 1 VOLT OUT.
D. 3 μV SENSITIVITY AT (L).
E. 50 μV IN; 2 VOLTS OUT.
F. NOT LESS THAN VALUE OBTAINED WITH SAME RECEIVER IN TEST 7.
G. MINIMUM SENSITIVITY.
H. HIGH DIAL (H).
I. 0.2 VOLT INPUT.
J. 0.5 VOLT INPUT.
K. MODULATION 60% AT 400 CPS.

Tabl V—R c iv r T st Data

TEST CONDITIONS AND AVERAGE TEST VALUES

TRANSMITTERS		T-11A	T-11B	T-13	T-13A
DC SUPPLY VOLTAGE (AT PIN 2 ON DYNAMOTOR)	V	13/27	13/27	13/27	13/27
FREQUENCY BAND	MC	116-132	116-132	125-148	125-148
HIGH FREQUENCY (H)	MC	132	132	148	148
MID FREQUENCY (M)	MC	124	124	140	140
LOW FREQUENCY (L)	MC	116	116	132	132

TEST NO.	NAME OF TEST		NOTE	FREQ.	AVERAGE TEST VALUE	AVERAGE TEST VALUE	AVERAGE TEST VALUE	AVERAGE TEST VALUE
1	HV OUTPUT (14/28 V SOURCE)	V	A	M	240	230	240	230
5	RF OUTPUT AT (L)	WATTS	A	L	2	>2	2	>2
6	RF OUTPUT AT (H)	WATTS	A	H	2	>2	2	>2
7	RF OUTPUT AT (M)	WATTS	A	M	2	>2	2	>2
8	DC TEST VOLTS	V	A	M	9-15	$\frac{9\text{-}15}{2\text{-}5}$ *	9-15	$\frac{9\text{-}15}{2\text{-}5}$ *

NOTE:

A. POWER ON, CW (NO MODULATION), 52 OHM ANTENNA LOAD.

(*) DUE TO A CHANGE IN TEST CIRCUIT, DC TEST VOLTS MEASURED AT TEST POINT ON TRANSMITTERS WITH SERIAL NUMBERS HIGHER THAN THOSE LISTED BELOW SHOULD READ 2-5 V.D.C.

T-11B (14V) #304 T-13A (14V) #214
T-11B (28V) #6323 T-13A (28V) #5902

9-15 V.D.C. SHOULD BE MEASURED AT TEST POINT ON TRANSMITTERS WITH SERIAL NUMBERS LOWER THAN THOSE LISTED, AND ON ALL TRANSMITTERS REGARDLESS OF SERIAL NUMBER WHEN MEASURED AT OUTPUT CIRCUIT TERMINALS ON #15990 TEST UNIT.

Table VI—Transmitter Test Data

PLUGS REQUIRED TO MAKE INTERCONNECTING CABLES

COMPONENTS		ARC PLUG NUMBERS AND QUANTITY REQUIRED									
ARC TYPE	NAME	11337	14050	14051	14052	14320	14321	14491	16104	16115	16206
A-12	VHF ANTENNA	1									
A-15	" "	1									
C-10A	CONTROL UNIT		1	1							
C-11A	" "		1	1							
C-13	" "		1								
C-15	" "		1	1							
C-16	" "			1							
C-17, C-54	" "			1							
C-20	" "		1	1							
C-24	" "					1		1			
C-25	" "					1					
C-26	" "			1							
C-27	" "					1		1			
C-29	" "					1		1			
C-30	" "					1		1			
C-31	" "					1		1			
C-32	" "		1			1					
C-33	" "					1		1			
C-36	" "		1			1					
C-37	" "		1			1					
C-38	" "		1			1					
C-39	" "					1		1			
C-40	" "		1			1					
C-41	" "					1		1			
C-42, C-55	" "			1							
C-43	" "					1					
C-44	" "		1			1					
C-46	" "		1			1					
C-47	" "			1							
C-48	" "		1								
C-49, C-56	" "					1			1		
C-50	" "							1			
C-51	" "				1						
K-12	RELAY UNIT					3		1			1
K-13	OSCILLATOR-RELAY UNIT	2								1	
L-10A	LOOP ANTENNA	1									
R-10A	RECEIVER	1		2			1				
R-11A	"	1		2			1				
R-15	"	1		2			1				
R-19	"	1		2			1				
T-11A	TRANSMITTER	2	1	1	1						
T-11B	"	2	1	1	1						
T-13	"	2	1	1	1						
T-13A	"	2	1	1	1						

Table VII—Plugs Required to Make Interconnecting Cables

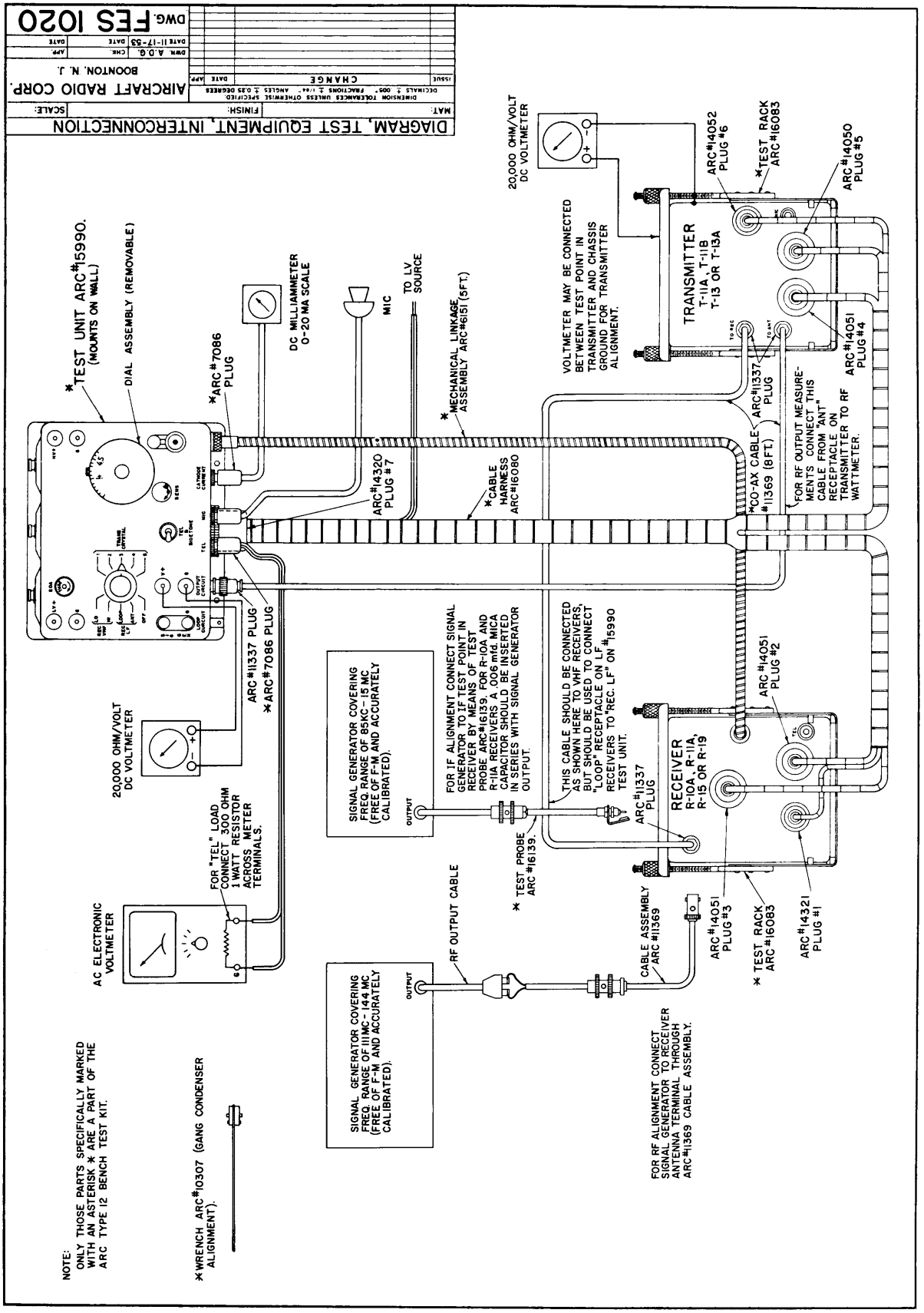


Figure 8—Test Equipment Interconnection Diagram

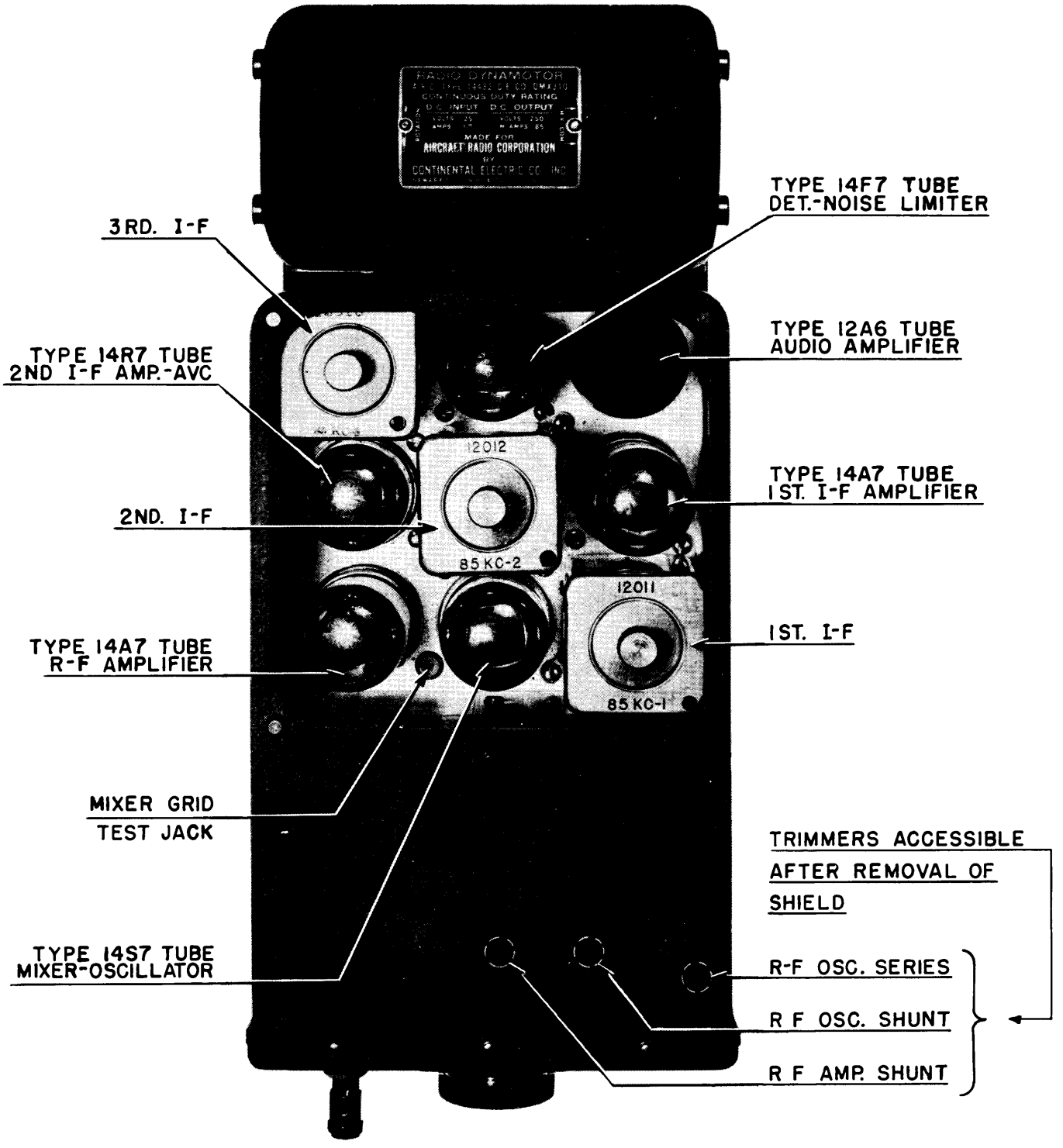


Figure 9—Top View of Type R-11A Receiver, Tube Cover Removed

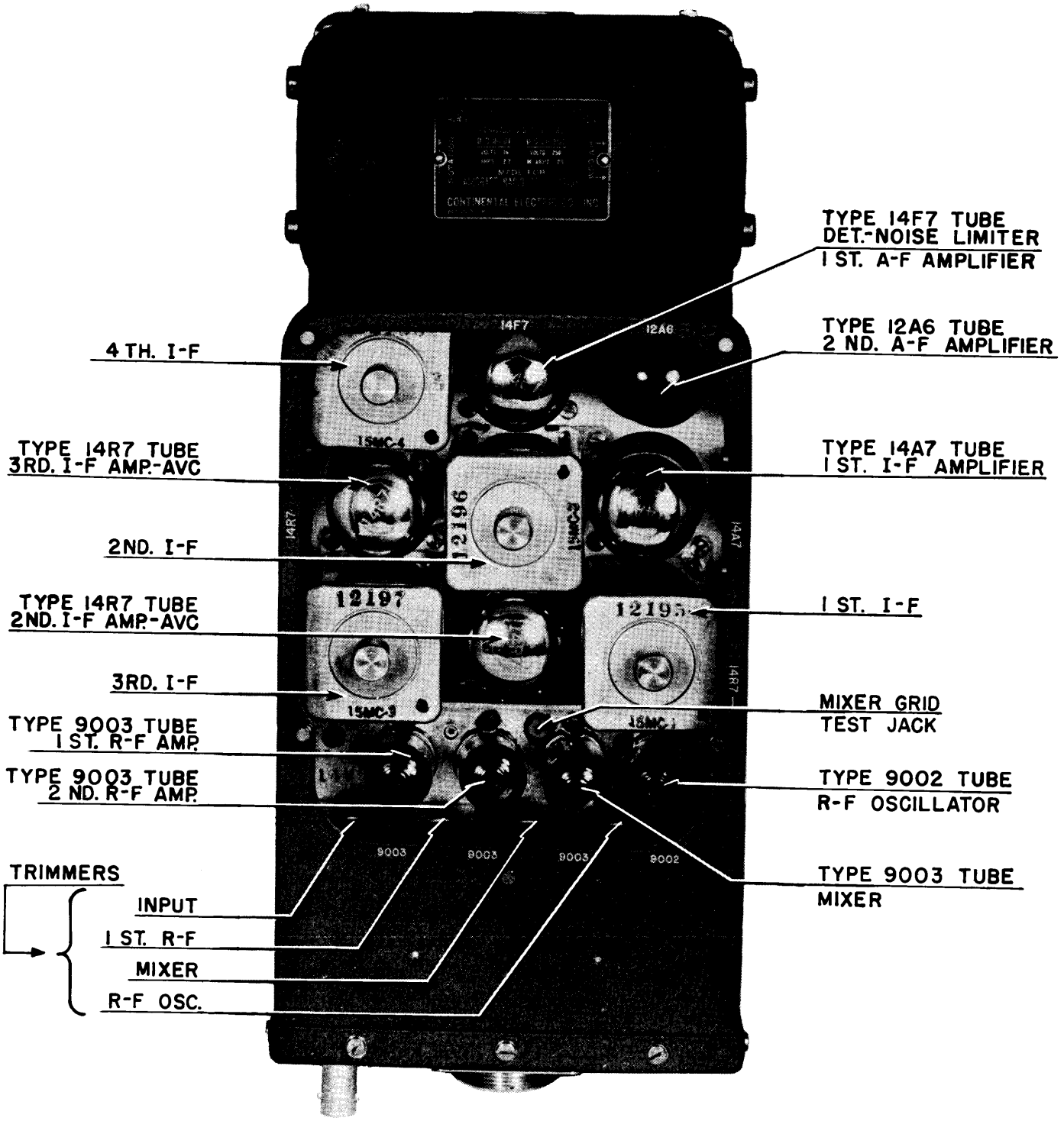


Figure 10—Top View of Type R-15 Receiver, Tube Cover Removed

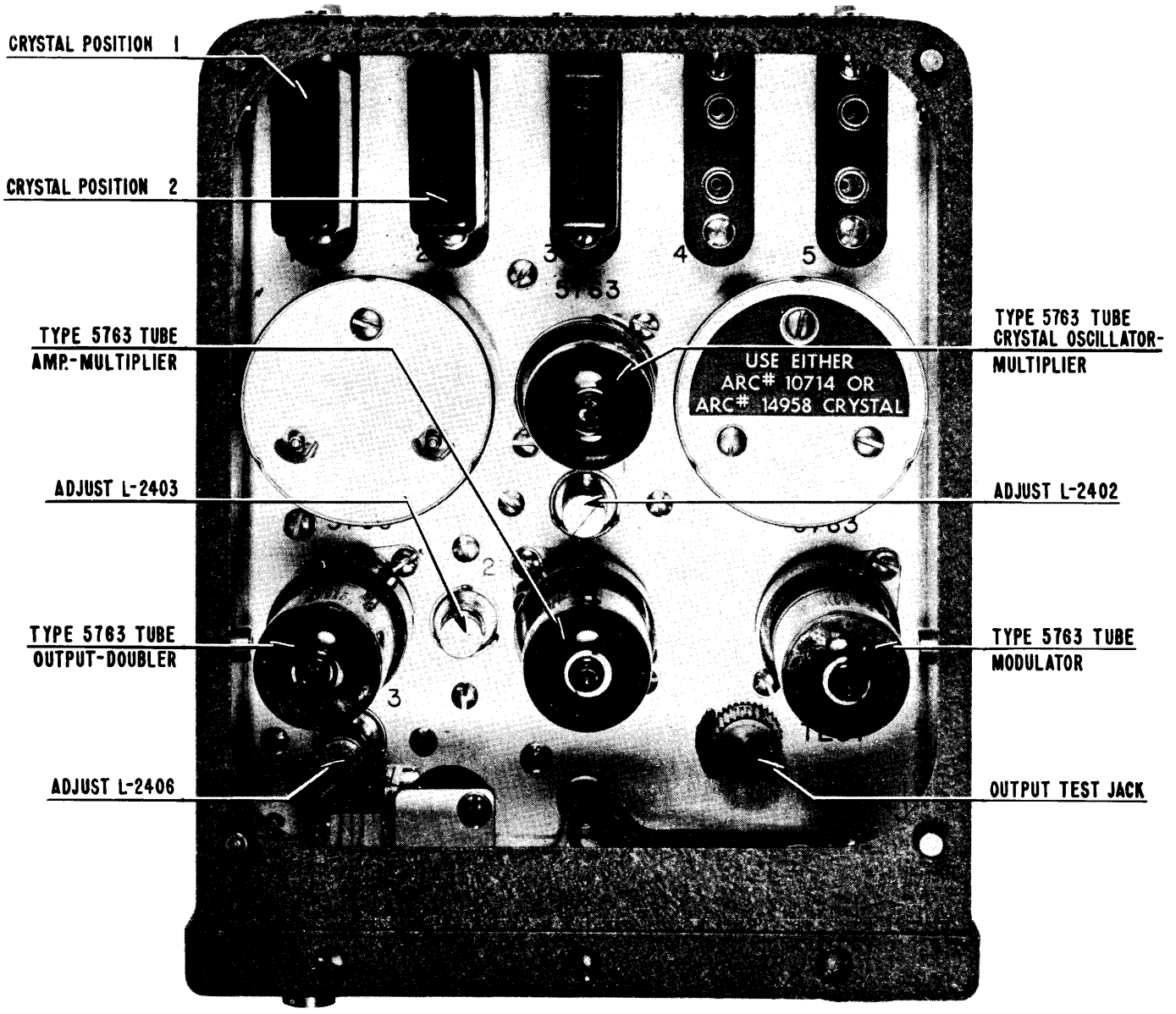


Figure 11—Top View of Type T-13A Transmitter, Tube Cover Removed

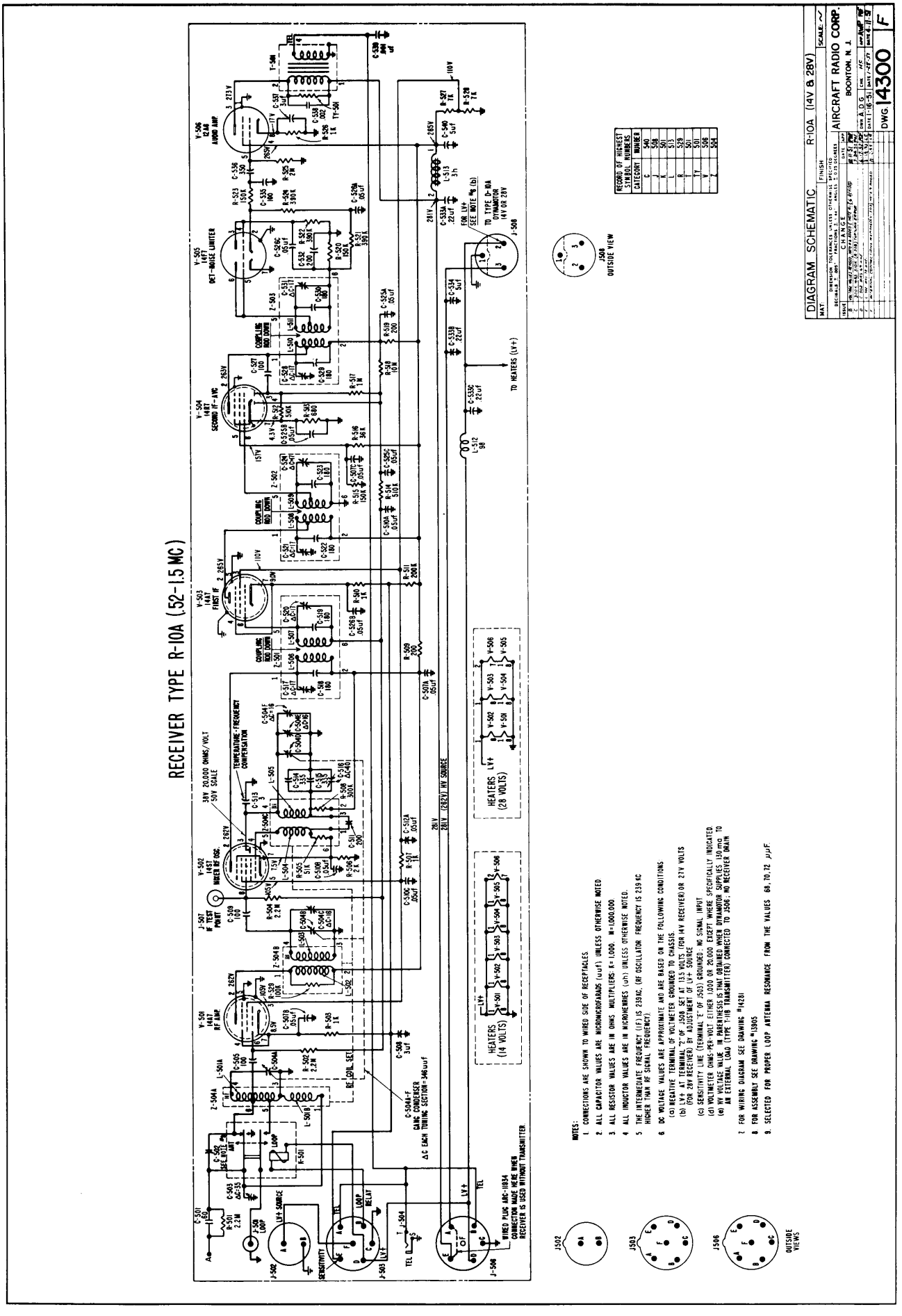
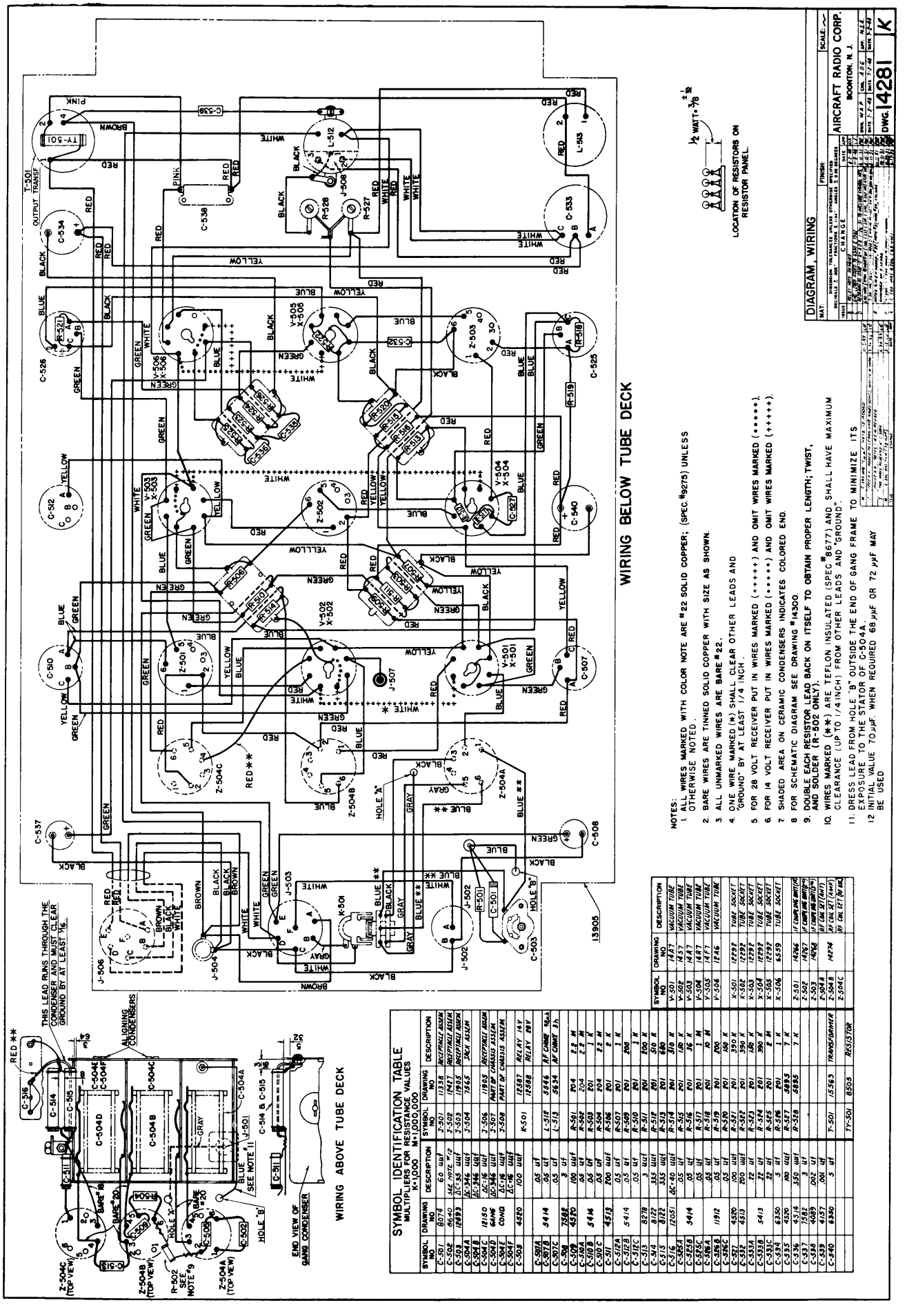


Figure 13—A.R.C. Type R-10A Receiver Schematic Diagram



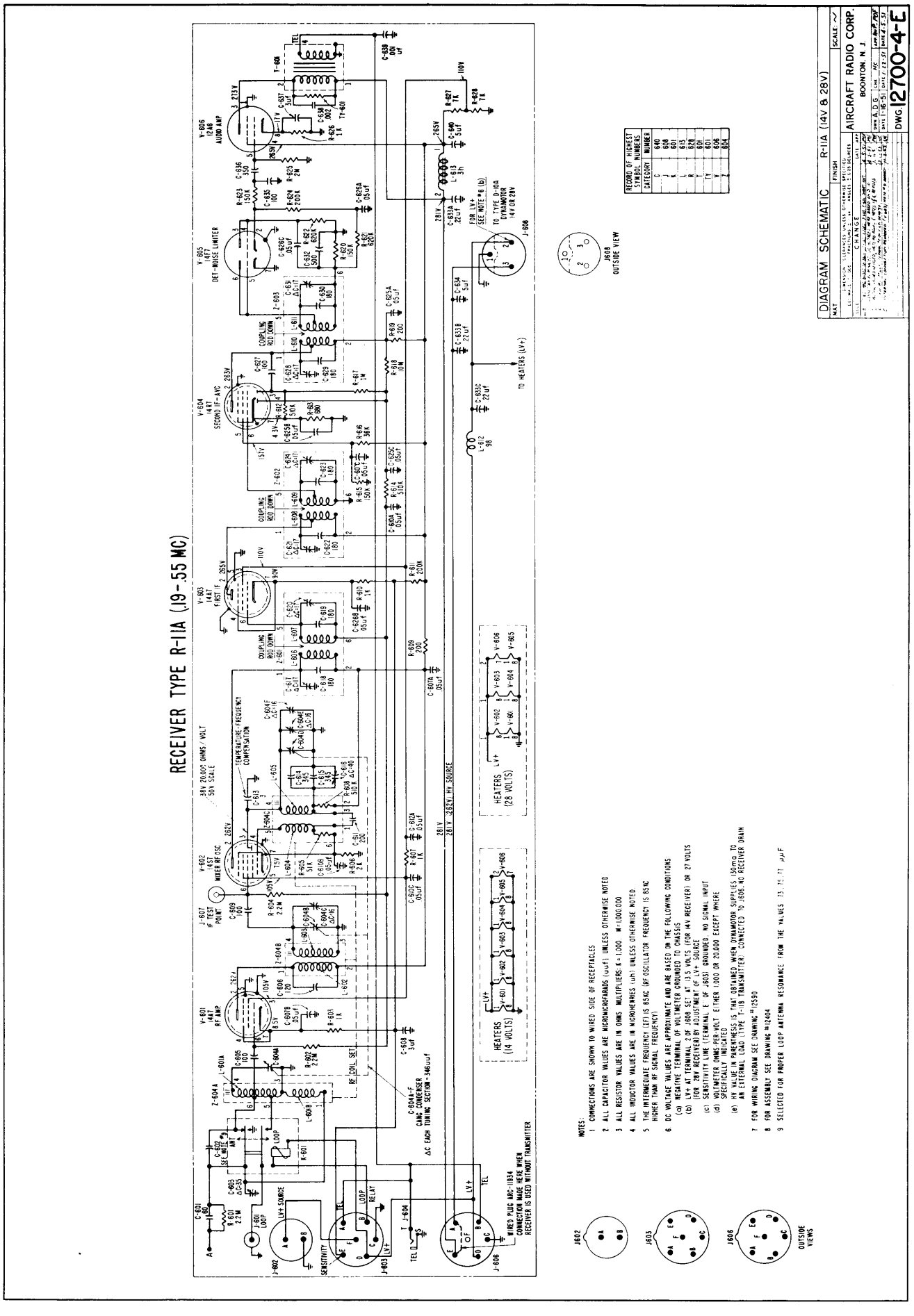
SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES K=1,000 M=1,000,000

SYMBOL NO	DRAWING NO	DESCRIPTION
C-501	8074	6.0 μμf
C-502	8640	344 MMFD +/-2
C-503	12693	ΔC-345 μμf
C-504A		ΔC-346 μμf
C-504B	12150 GANG CONDENSER	ΔC-346 μμf
C-504C		ΔC-16 μμf
C-504D		ΔC-346 μμf
C-504E		ΔC-16 μμf
C-504F		ΔC-16 μμf
C-505	4520	700 μμf
C-507A	5414	.05 μf
C-507C		.05 μf
C-508	7582	3 μf
C-509	4520	100 μμf
C-510A	5414	.05 μf
C-510B		.05 μf
C-510C		.05 μf
C-511	4513	200 μμf
C-512A	5414	.05 μf
C-512B		.05 μf
C-512C		.05 μf
C-513	8278	.3 μf
C-514	8122	.335 μμf
C-516	12051	ΔC-345 μμf
C-518A	5414	.05 μf
C-518B		.05 μf
C-518C		.05 μf
C-536A	11912	.05 μf
C-536B		.05 μf
C-536C		.05 μf
C-537	4520	100 μμf
C-538	4513	200 μμf
C-539A	5413	.22 μf
C-539B		.22 μf
C-539C		.22 μf
C-535	6350	100 μμf
C-536	4516	350 μμf
C-537	7582	3 μf
C-538	4089	.002 μf
C-539	4157	.001 μf
C-540	6340	5 μf

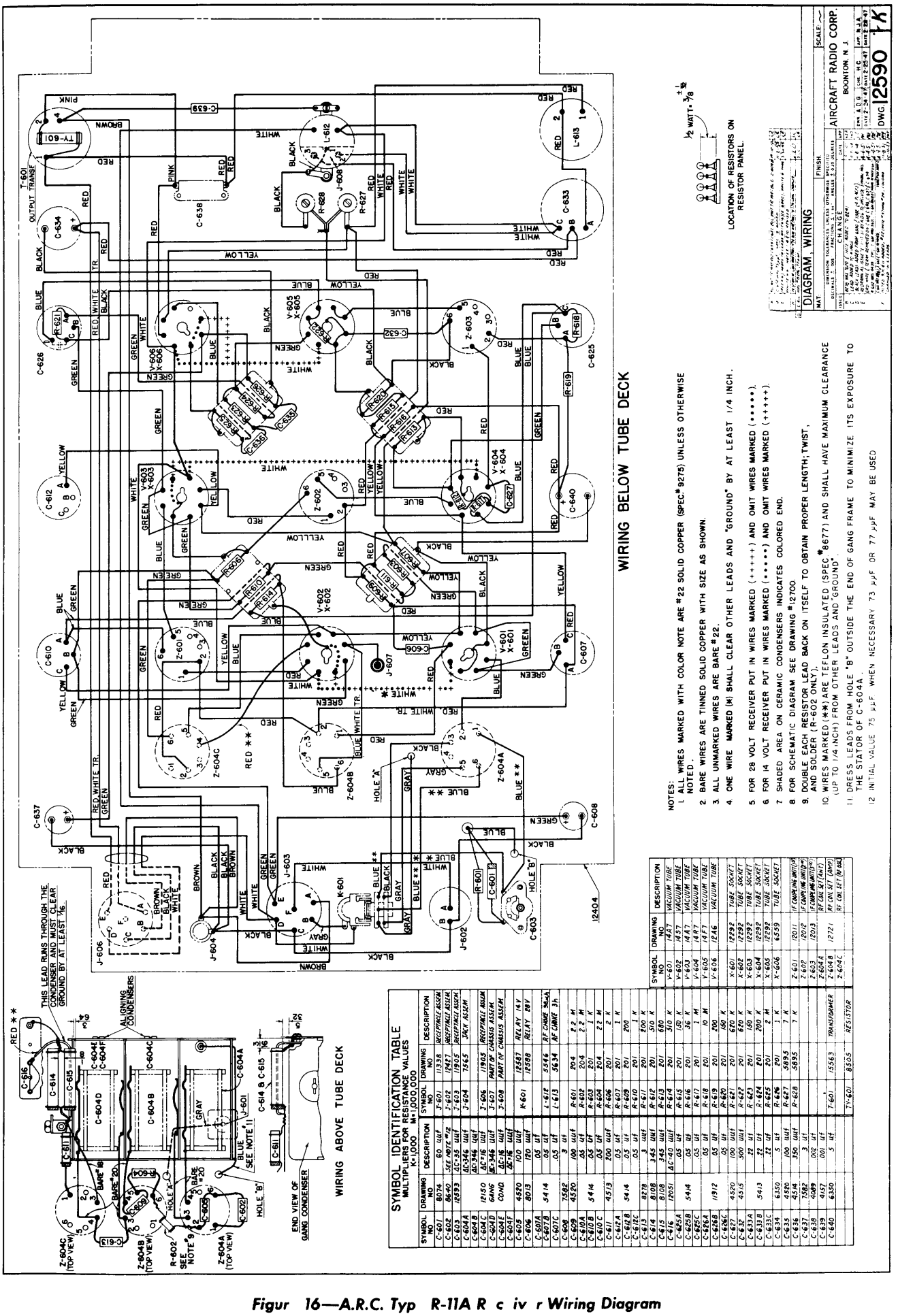
SYMBOL NO	DRAWING NO	DESCRIPTION
R-501	204	2.2 M
R-502	204	2.2 M
R-503	201	1 K
R-504	204	2.2 M
R-506	201	2 K
R-507	201	1 K
R-509	201	200
R-510	201	1 K
R-511	201	10 M
R-512	201	100 K
R-513	201	330 K
R-514	201	470 K
R-515	201	100 K
R-516	201	36 K
R-517	201	1 M
R-518	201	10 M
R-519	201	200
R-520	201	150 K
R-521	201	330 K
R-522	201	390 K
R-523	201	100 K
R-524	201	390 K
R-525	201	2 M
R-526	201	1 K
R-528	6885	1 K
T-501	15763	TRANSFORMER
TY-501	8505	RESISTOR

SYMBOL NO	DRAWING NO	DESCRIPTION
V-501	14471	VACUUM TUBE
V-502	14471	VACUUM TUBE
V-503	14471	VACUUM TUBE
V-504	14471	VACUUM TUBE
V-505	14471	VACUUM TUBE
V-506	1246	VACUUM TUBE
X-501	12292	TUBE SOCKET
X-502	12292	TUBE SOCKET
X-503	12292	TUBE SOCKET
X-504	12292	TUBE SOCKET
X-505	12292	TUBE SOCKET
X-506	6659	TUBE SOCKET
Z-501	14266	I.F. CHOKE UNIT (4 MH)
Z-502	14267	I.F. CHOKE UNIT (2 MH)
Z-503	14268	I.F. CHOKE UNIT (1 MH)
Z-504A	14274	R.F. COIL SET (AM)
Z-504B		R.F. COIL SET (AM)
Z-504C		R.F. COIL SET (FM)

Figure 14—A.R.C. Type R-10A R c iver Wiring Diagram



Figur 15—A.R.C. Typ R-11A R c iv r Sch matic Diagram

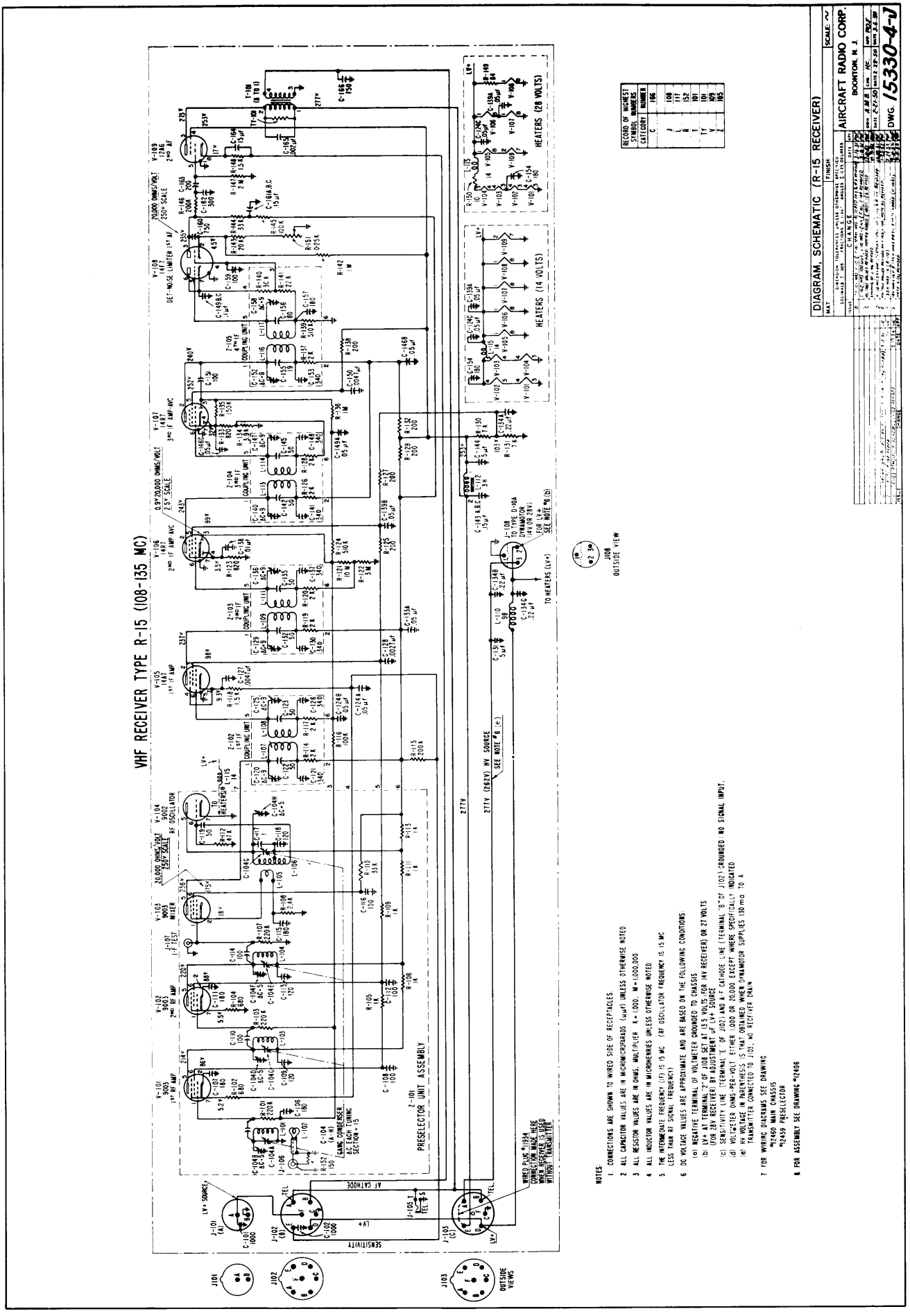


SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES K=1,000 M=1,000,000

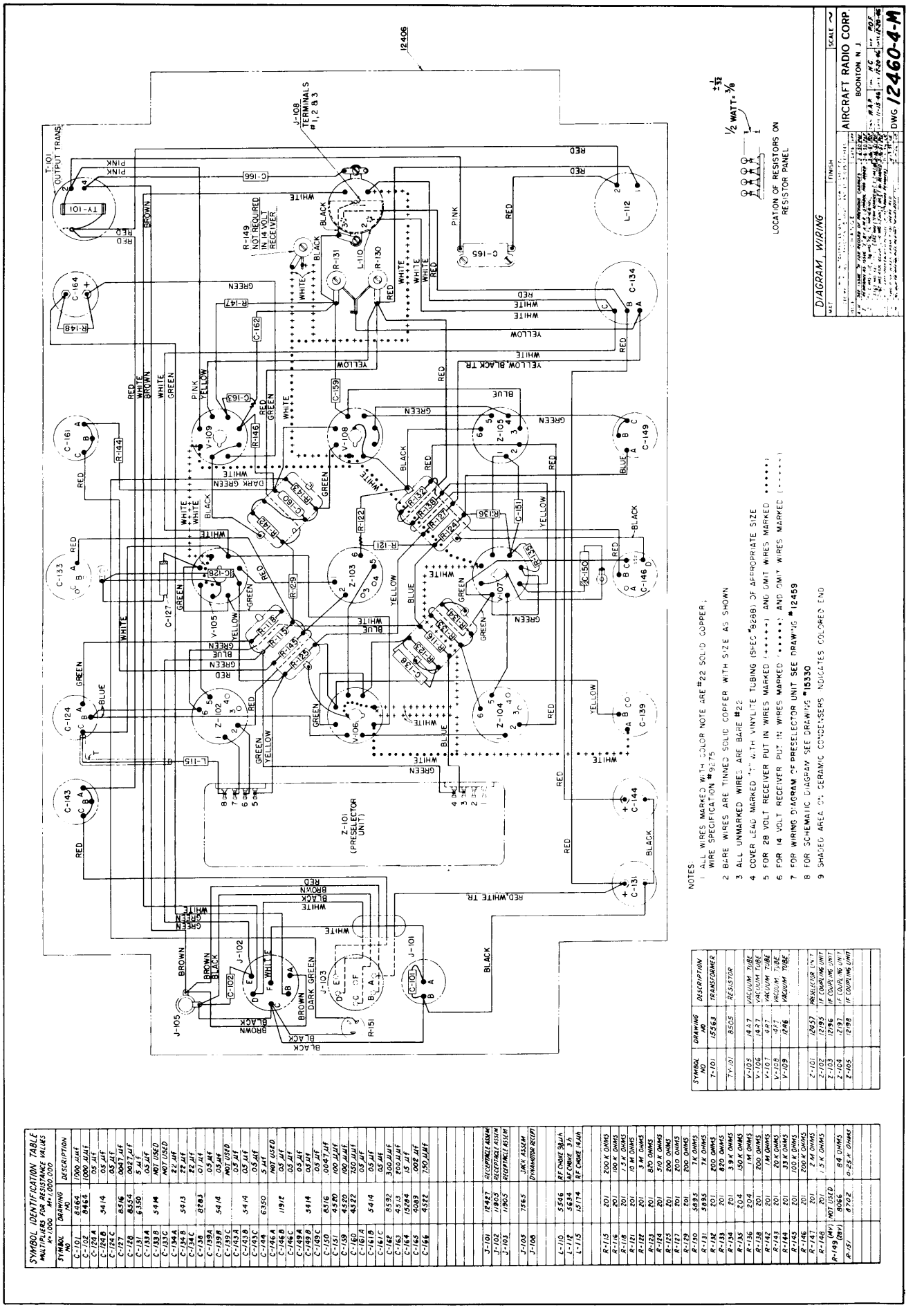
SYMBOL NO.	DRAWING NO.	DESCRIPTION	SYMBOL NO.	DRAWING NO.	DESCRIPTION
C-601	8074	60 uuf	T-601	11338	RECEPTACLE ASSM.
C-602	8640	SEE NOTE #12	J-602	12421	RECEPTACLE ASSM.
C-603	18593	ΔC-35 uuf	J-603	11905	RECEPTACLE ASSM.
C-604A		ΔC-346 uuf	J-604	7565	JACK ASSM.
C-604B		ΔC-346 uuf			
C-604C	12150	ΔC-16 uuf	J-606	11905	RECEPTACLE ASSM.
C-604D	GANG	ΔC-346 uuf	J-607		PART OF CHASSIS ASSEM.
C-604E	COND.	ΔC-16 uuf	J-608		PART OF CHASSIS ASSEM.
C-604F		ΔC-16 uuf			
C-605	4520	100 uuf	K-601	12587	RELAY, 14V
C-606	8013	120 uuf		12588	RELAY, 28V
C-607A		.05 uf	L-612	5546	RF CHOKE 3MA.
C-607B	5414	.05 uf	L-613	5634	AF CHOKE 3H.
C-607C		.05 uf			
C-608	7582	3 uuf	R-601	204	2.2 M
C-609	4520	100 uuf	R-602	204	2.2 M
C-610A		.05 uf	R-603	201	1 K
C-610B	5414	.05 uf	R-604	204	2.2 M
C-610C		.05 uf	R-606	201	2 K
C-611	4513	200 uuf	R-607	201	1 K
C-612A		.05 uf	R-609	201	200
C-612B	5414	.05 uf	R-610	201	1 K
C-612C		.05 uf	R-611	201	200 K
C-613	8278	3 uuf	R-612	201	310 K
C-614	8108	345 uuf	R-613	201	680
C-615	8108	345 uuf	R-614	201	310 K
C-616	12051	ΔC-40 uuf	R-615	201	150 K
C-625A	5414	.05 uf	R-616	201	36 K
C-625B		.05 uf	R-617	201	1 M
C-626		.05 uf	R-618	201	10 M
C-627	4520	100 uuf	R-619	201	200
C-632	4515	500 uuf	R-620	201	150 K
C-633A		.22 uf	R-621	201	620 K
C-633B	5413	.22 uf	R-622	201	620 K
C-633C		.22 uf	R-623	201	150 K
C-634	6350	.5 uf	R-624	201	200 K
C-635	4520	100 uuf	R-625	201	2 M
C-636	4514	350 uuf	R-626	201	1 K
C-637	7582	3 uuf	R-627	5895	7 K
C-638	4089	.002 uf	R-628	5895	7 K
C-639	4057	.001 uf			
C-640	6350	.5 uf	T-601	15563	TRANSFORMER
			TY-601	8505	RESISTOR

SYMBOL NO.	DRAWING NO.	DESCRIPTION
V-601	12417	VACUUM TUBE
V-602	12417	VACUUM TUBE
V-603	12417	VACUUM TUBE
V-604	12417	VACUUM TUBE
V-605	12417	VACUUM TUBE
V-606	12246	VACUUM TUBE
X-601	12292	TUBE SOCKET
X-602	12292	TUBE SOCKET
X-603	12292	TUBE SOCKET
X-604	12292	TUBE SOCKET
X-605	12292	TUBE SOCKET
X-606	6559	TUBE SOCKET
Z-601	12011	IF COUPLING UNIT #1
Z-602	12012	IF COUPLING UNIT #2
Z-603	12013	IF COUPLING UNIT #3
Z-604A	12721	RF CPL. SET (AMP.)
Z-604B		RF CPL. SET (MIX.)
Z-604C		

Figur 16—A.R.C. Typ R-11A R c iv r Wiring Diagram



Figur 17—A.R.C. Typ R-15 R c iv r Sch matic Diagram



SYMBOL NO	DRAWING NO	DESCRIPTION
T-101	15963	TRANSFORMER
TX-101	8505	RESISTOR
V-105	14477	VACUUM TUBE
V-106	14477	VACUUM TUBE
V-107	6AF7	VACUUM TUBE
V-108	6AF7	VACUUM TUBE
V-109	1246	VACUUM TUBE
Z-101	12457	PRESELECTOR UNIT
Z-102	12195	RF COUPLING UNIT
Z-103	12196	RF COUPLING UNIT
Z-104	12197	RF COUPLING UNIT
Z-105	12198	RF COUPLING UNIT

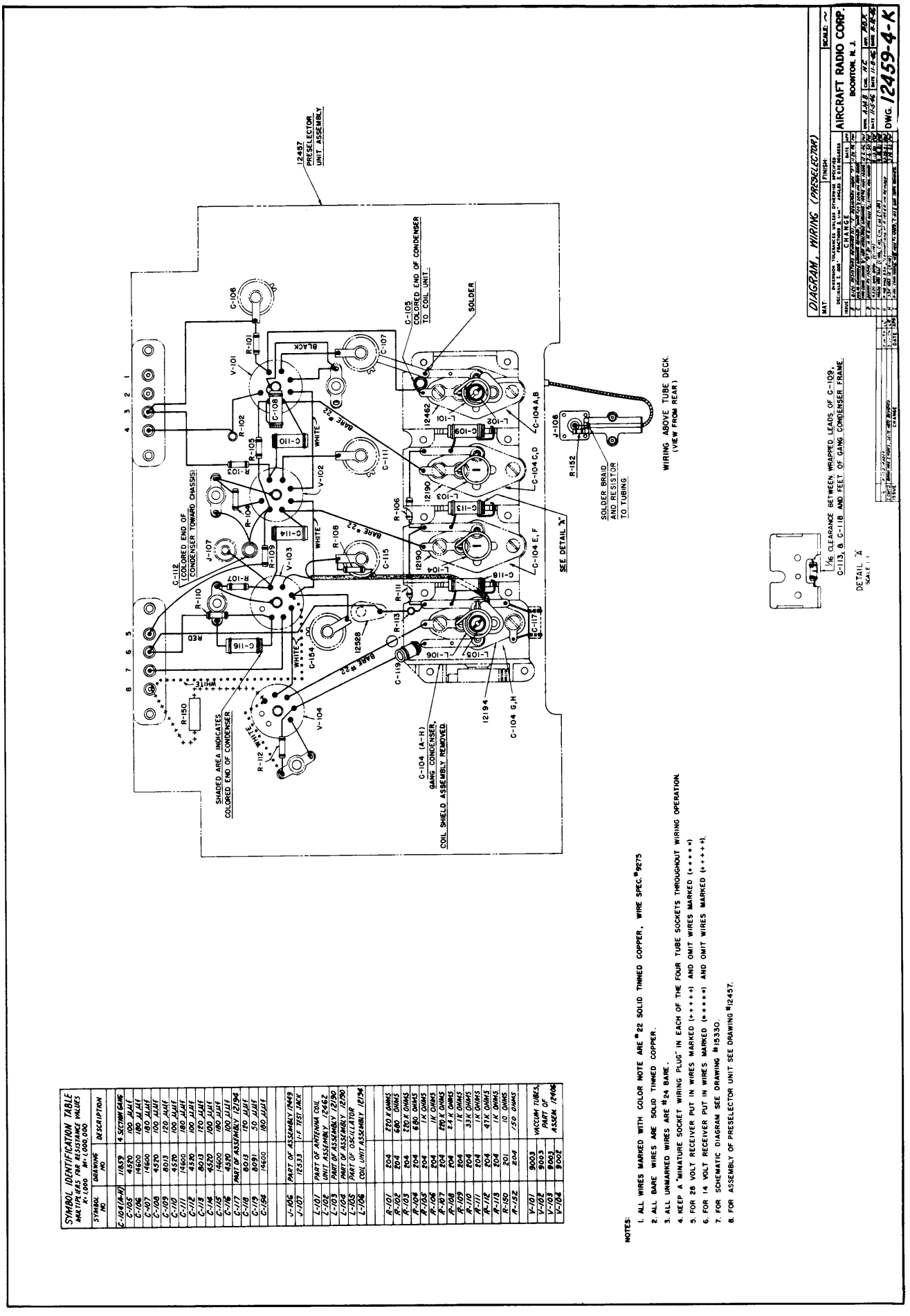
SYMBOL NO	DRAWING NO	DESCRIPTION
J-101	12427	RECEPTACLE ASSM
J-102	11805	RECEPTACLE ASSM
J-103	11805	RECEPTACLE ASSM
J-105	7565	JACK ASSM
J-108	7565	DYNAMOTOR RECEPT
L-110	5546	RF CHOKE 58uh
L-112	5634	AF CHOKE 3h
L-115	15174	RF CHOKE 140h

SYMBOL NO	DRAWING NO	DESCRIPTION
C-101	8464	1000 MMF
C-102	8464	1000 MMF
C-124A	54/4	.05 MF
C-124B	54/4	.05 MF
C-124C	54/4	.05 MF
C-127	8516	.0047 MF
C-128	8554	.0027 MF
C-131	6350	.5 MF
C-133A	54/4	.05 MF
C-133B	54/4	NOT USED
C-133C		NOT USED
C-134A	54/3	.25 MF
C-134B		.25 MF
C-134C	8583	.01 MF
C-138	54/4	.05 MF
C-139A		.05 MF
C-139B	54/4	NOT USED
C-139C		.05 MF
C-143A	54/4	.05 MF
C-143B		.05 MF
C-143C	54/4	.05 MF
C-144	6350	.5 MF
C-146A	11912	NOT USED
C-146B		.05 MF
C-146C		.05 MF
C-149A	54/4	.05 MF
C-149B		.05 MF
C-149C	8516	.0047 MF
C-150	4520	.100 MMF
C-151	4520	.100 MMF
C-160	4522	250 MMF
C-161A	54/4	.05 MF
C-161B		.05 MF
C-161C		.05 MF
C-162	8592	300 MMF
C-163	4513	200 MMF
C-164	15284	.15 MF
C-165	9089	.002 MF
C-166	4522	750 MMF

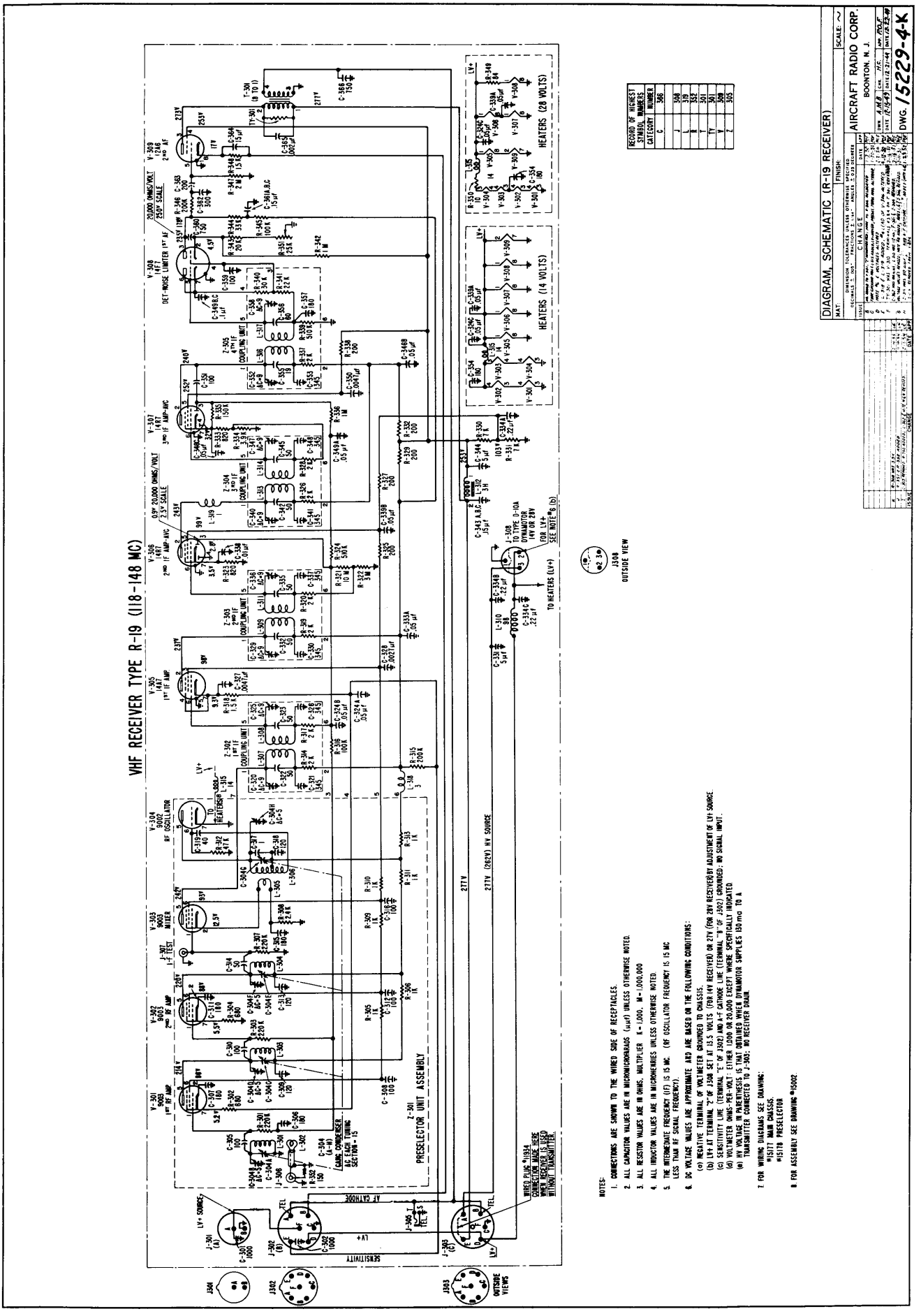
SYMBOL NO	DRAWING NO	DESCRIPTION
R-115	201	200 K OHMS
R-116	201	100 K OHMS
R-118	201	1.5 K OHMS
R-121	201	10 M OHMS
R-122	201	3 M OHMS
R-123	201	820 OHMS
R-124	201	510 K OHMS
R-125	201	200 OHMS
R-127	201	200 OHMS
R-129	201	200 OHMS
R-130	3895	1K OHMS
R-131	3895	1K OHMS
R-132	201	820 OHMS
R-134	201	820 OHMS
R-135	204	150 K OHMS
R-136	204	1M OHMS
R-138	201	200 OHMS
R-142	201	1M OHMS
R-143	201	20 K OHMS
R-144	201	33 K OHMS
R-145	201	100 K OHMS
R-146	201	200 K OHMS
R-147	201	2 M OHMS
R-148	201	1.5 K OHMS
R-149 (14V)	NOT USED	
R-149 (28V)	8566	68 OHMS
R-151	8702	0-25 K OHMS

SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES
K=1,000 M=1,000,000

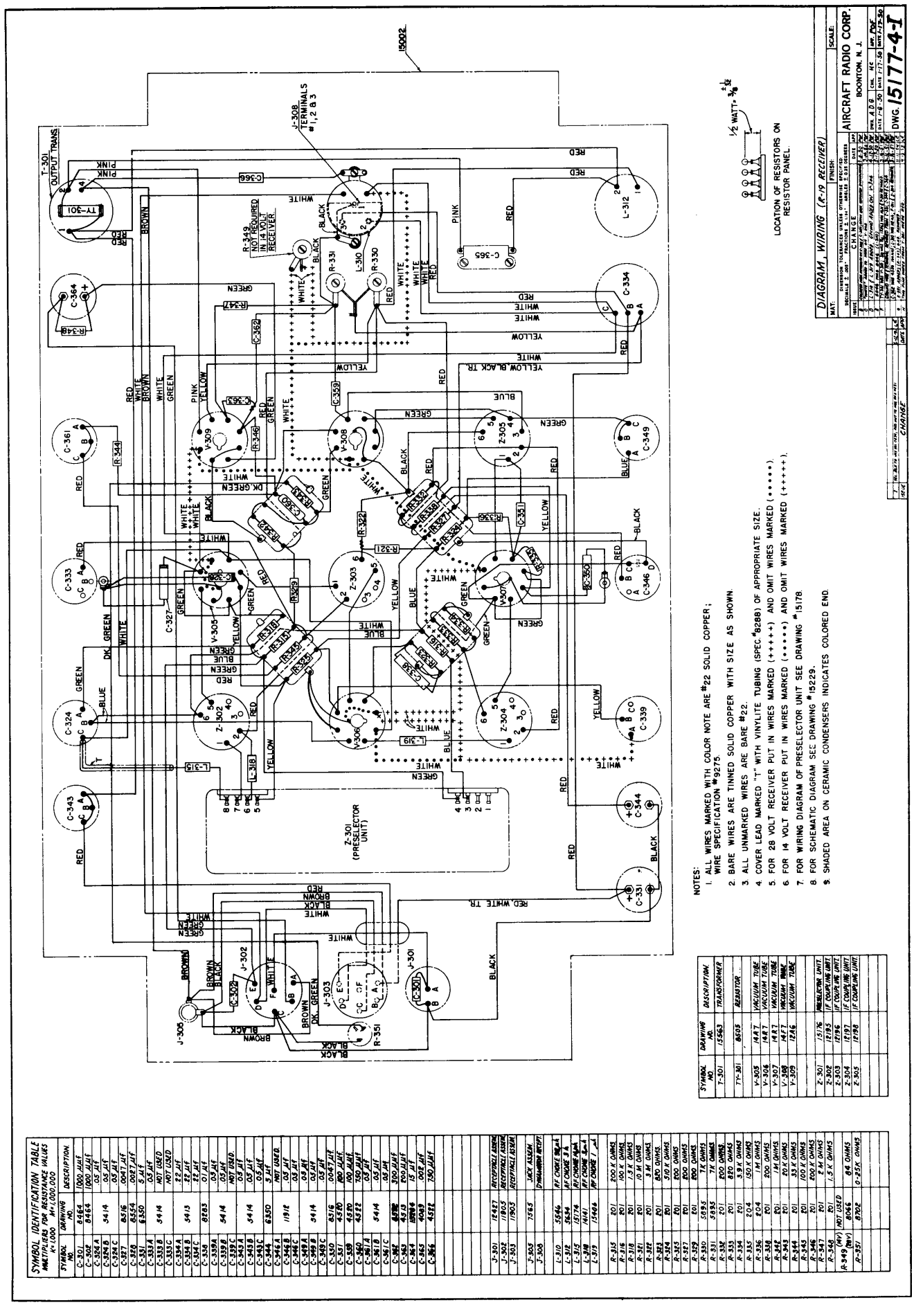
Figur 18—A.R.C. Typ R-15 Receiver Wiring Diagram



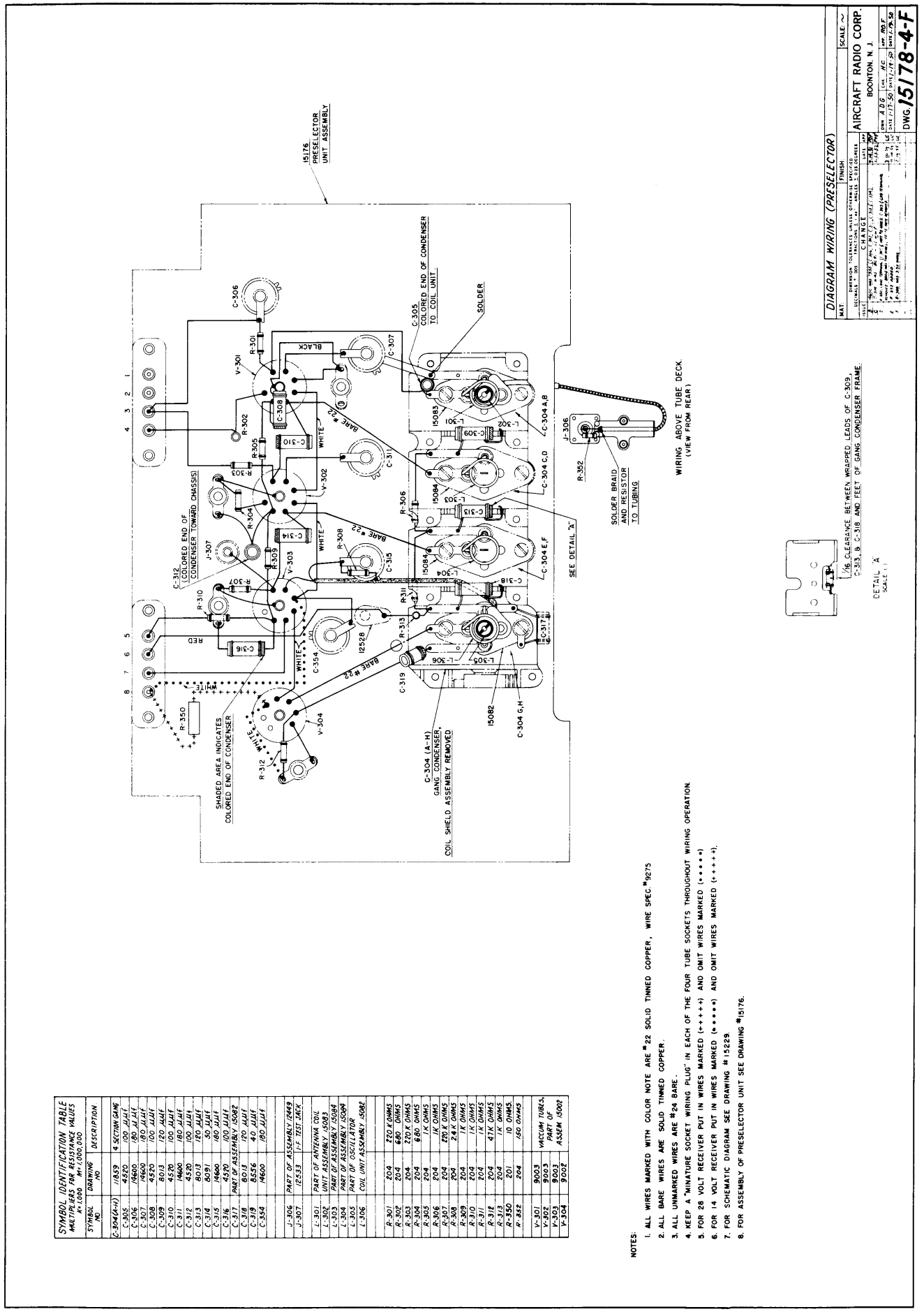
Figur 19—A.R.C. Type R-15 R c iv r Pres l ct r Wiring Diagram



Figur 20—A.R.C. Type R-19 Rec iver Sch matic Diagram



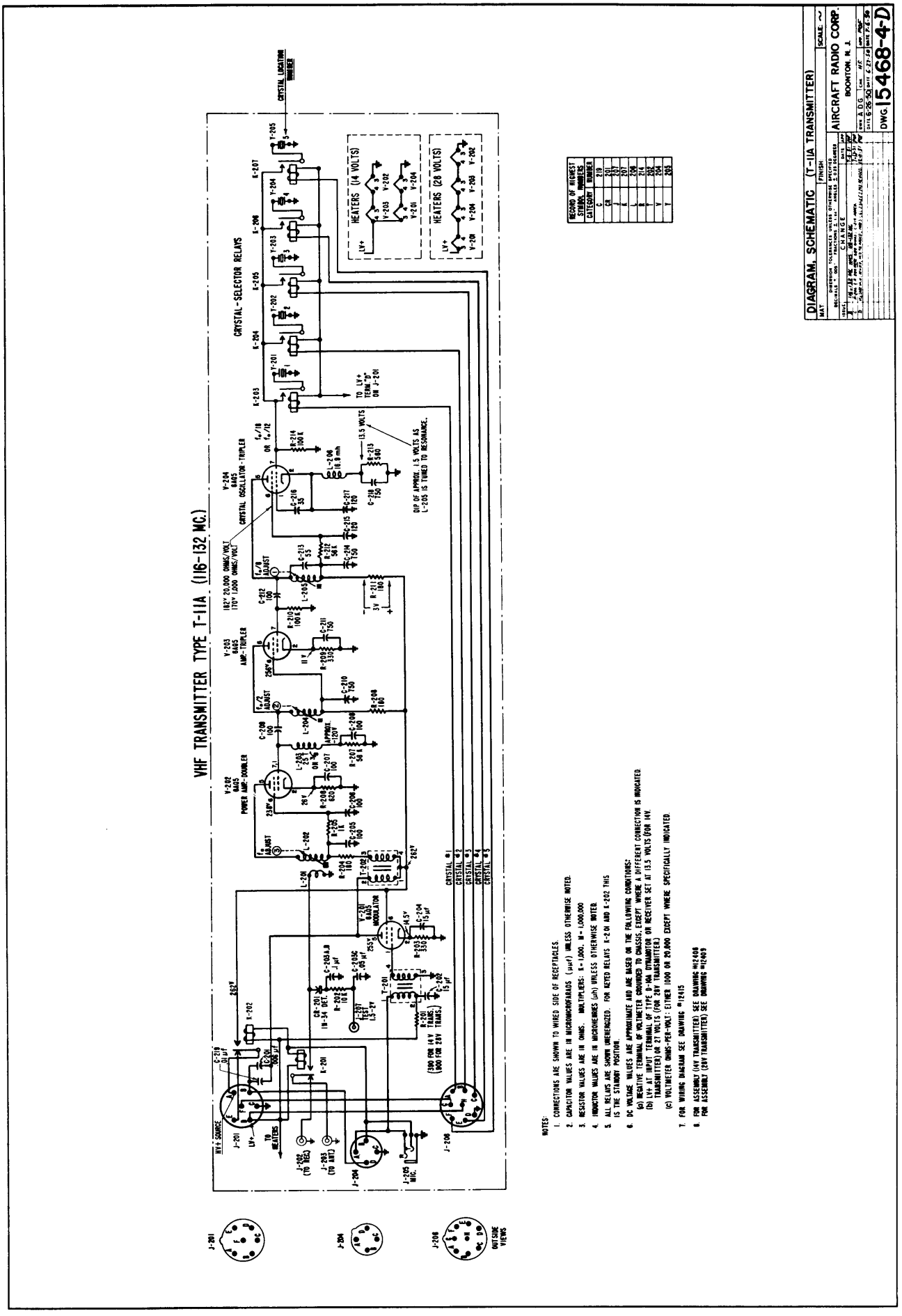
Figur 21—A.R.C. Typ R-19 R c iv r Wiring Diagram



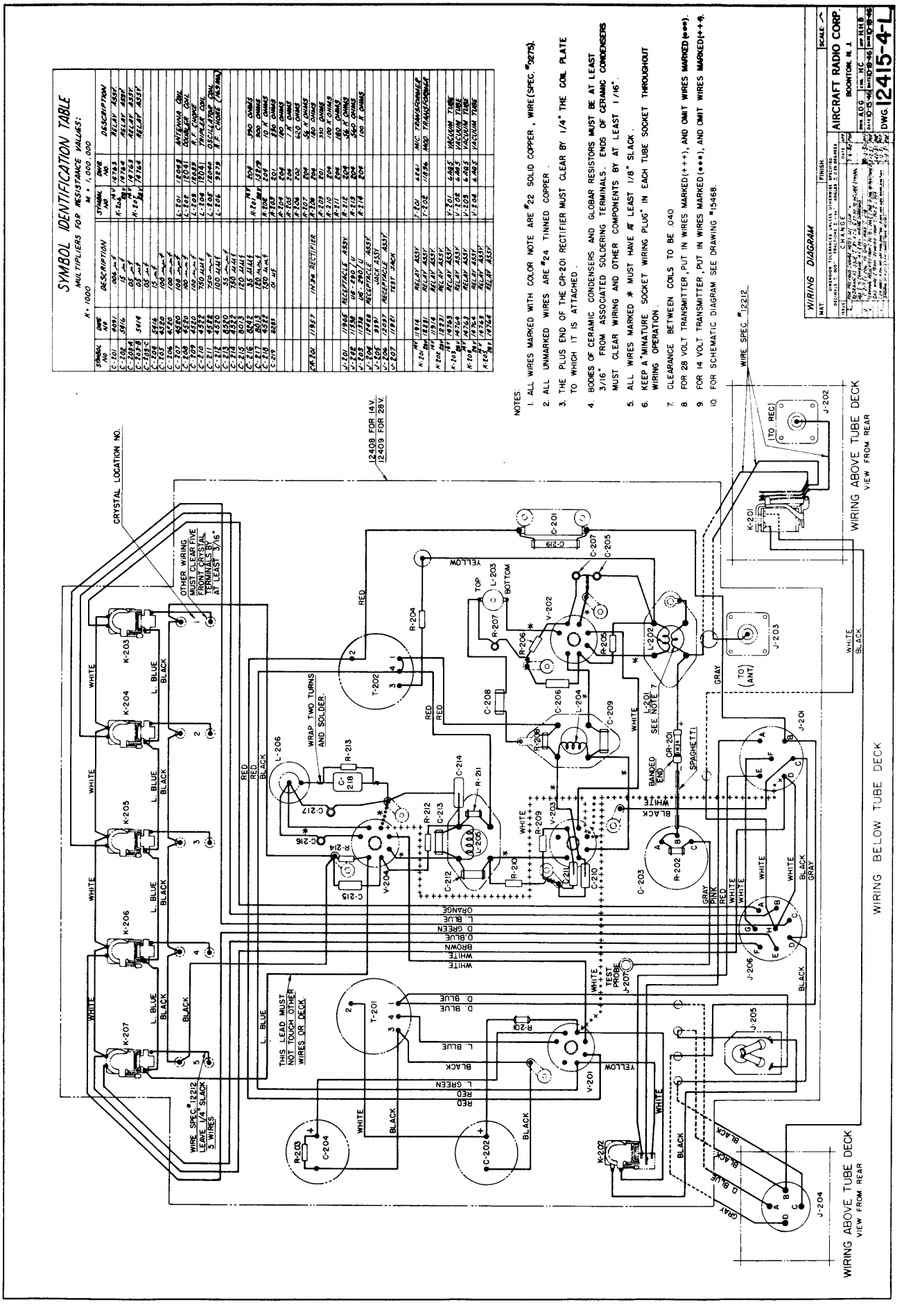
SYMBOL IDENTIFICATION TABLE MULTIPLIERS FOR RESISTANCE VALUES K=1,000 M=1,000,000		
SYMBOL NO.	DRAWING NO.	DESCRIPTION
C-304(A-H)	1859	4 SECTION GANG
C-305	4520	100 µµf
C-306	14600	180 µµf
C-307	14600	180 µµf
C-308	4520	100 µµf
C-309	8013	120 µµf
C-310	4520	100 µµf
C-311	14600	180 µµf
C-312	4520	100 µµf
C-313	8013	120 µµf
C-314	8091	50 µµf
C-315	14600	180 µµf
C-316	4520	100 µµf
C-317	PART OF ASSEMBLY 15082	
C-318	8013	120 µµf
C-319	8536	40 µµf
C-354	14600	180 µµf
J-306	PART OF ASSEMBLY 12449	
J-307	12533	I/F TEST JACK
L-301	PART OF ANTENNA COIL UNIT ASSEMBLY 15083	
L-302		
L-303	PART OF ASSEMBLY 15084	
L-304	PART OF ASSEMBLY 15084	
L-305	PART OF OSCILLATOR COIL UNIT ASSEMBLY 15082	
L-306		
R-301	204	220 K OHMS
R-302	204	680 OHMS
R-303	204	220 K OHMS
R-304	204	680 OHMS
R-305	204	1K OHMS
R-306	204	1K OHMS
R-307	204	220 K OHMS
R-308	204	2.4 K OHMS
R-309	204	1K OHMS
R-310	204	1K OHMS
R-311	204	1K OHMS
R-312	204	47K OHMS
R-313	204	1K OHMS
R-350	201	10 OHMS
R-352	204	180 OHMS
V-301	9003	VACUUM TUBES, TYPE 6BA6
V-302	9003	
V-303	9003	PART OF ASSEM 15002
V-304	9002	

NOTES:
1. ALL WIRES MARKED WITH COLOR NOTE ARE #22 SOLID TINNED COPPER, WIRE SPEC #9275
2. ALL BARE WIRES ARE SOLID TINNED COPPER.
3. ALL UNMARKED WIRES ARE #24 BARE.
4. KEEP A "MINATURE SOCKET WIRING PLUG" IN EACH OF THE FOUR TUBE SOCKETS THROUGHOUT WIRING OPERATION.
5. FOR 28 VOLT RECEIVER PUT IN WIRES MARKED (+++++) AND OMIT WIRES MARKED (•••••)
6. FOR 14 VOLT RECEIVER PUT IN WIRES MARKED (•••••) AND OMIT WIRES MARKED (+++++).
7. FOR SCHEMATIC DIAGRAM SEE DRAWING #15229.
8. FOR ASSEMBLY OF PRESELECTOR UNIT SEE DRAWING #15176.

Figur 22—A.R.C. Typ R-19 Receiv r Presel ctor Wiring Diagram



Figur 23—A.R.C. Typ T-11A Transmitter Schematic Diagram



Figur 24—A.R.C. Type T-11A Transmitt r Wiring Diagram

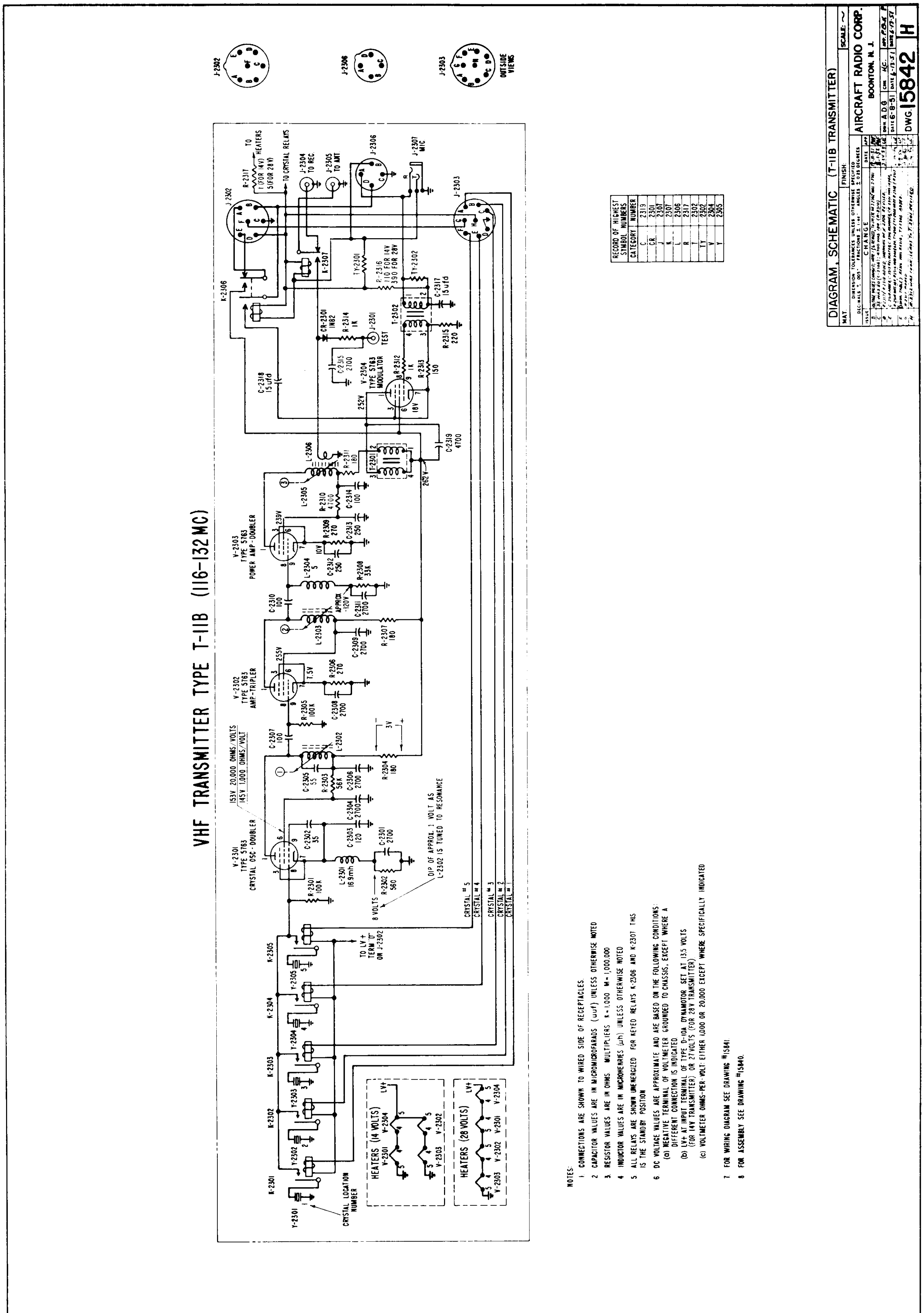
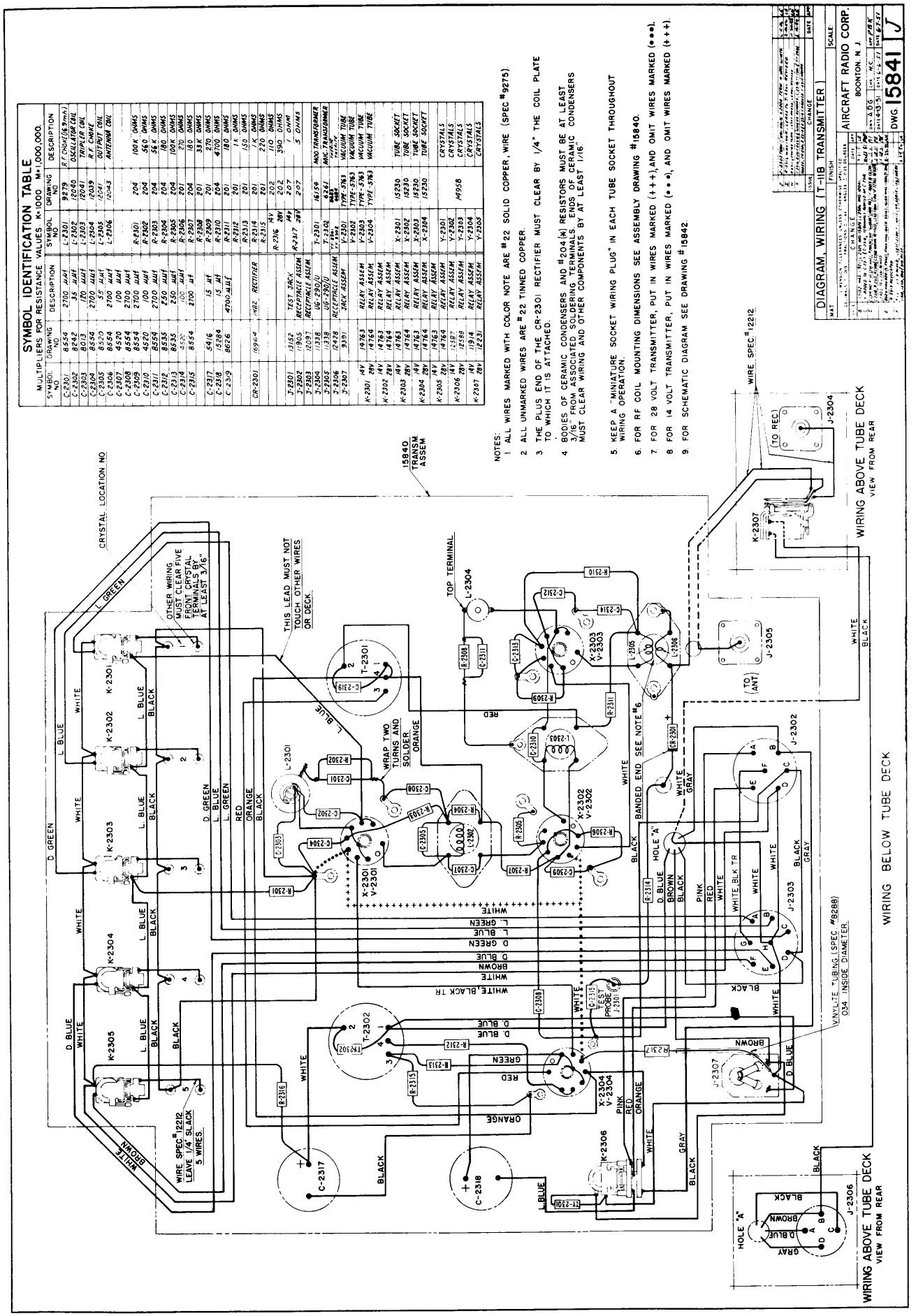
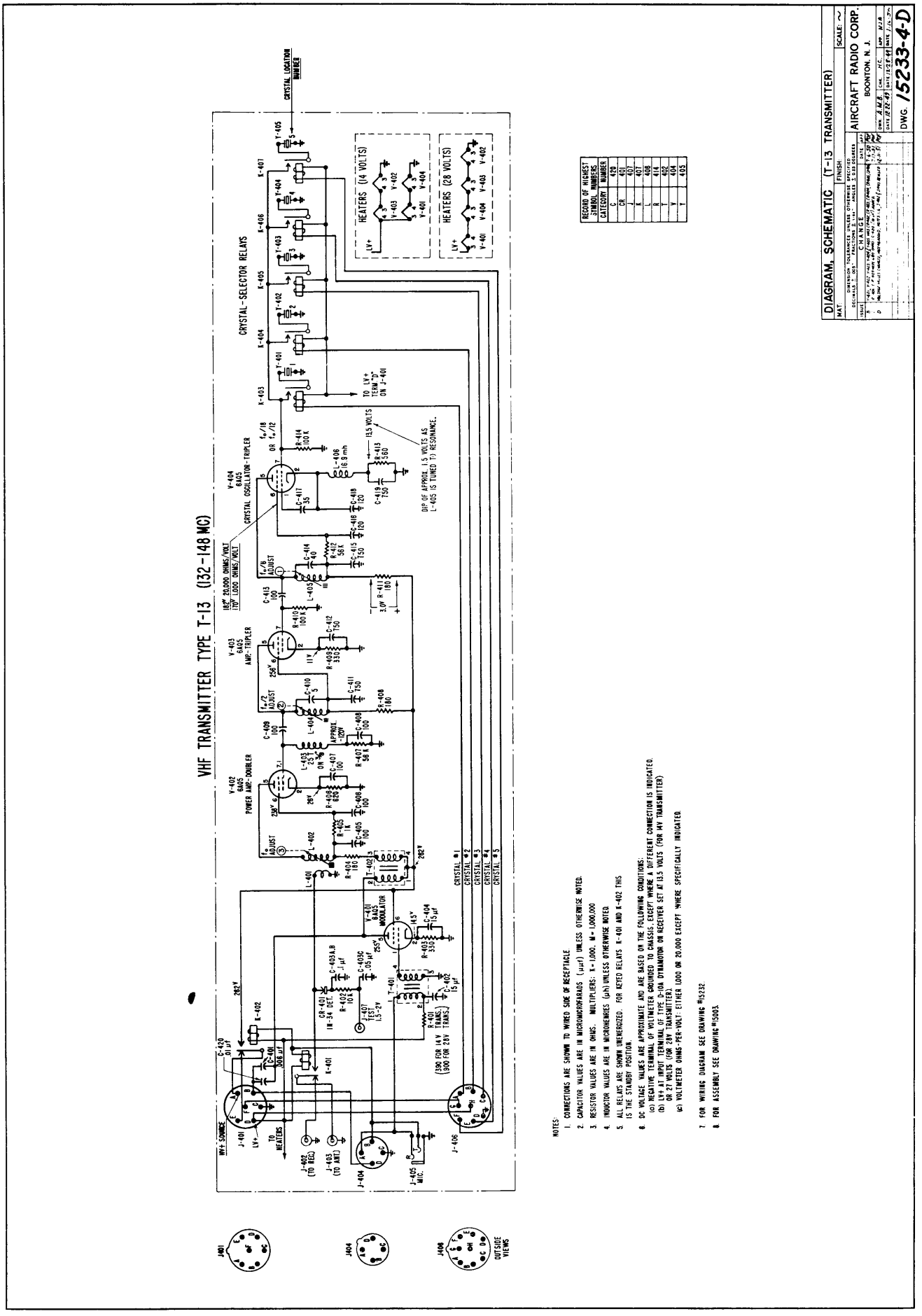


Figure 25—A.R.C. Type T-11B Transmitter Schematic Diagram

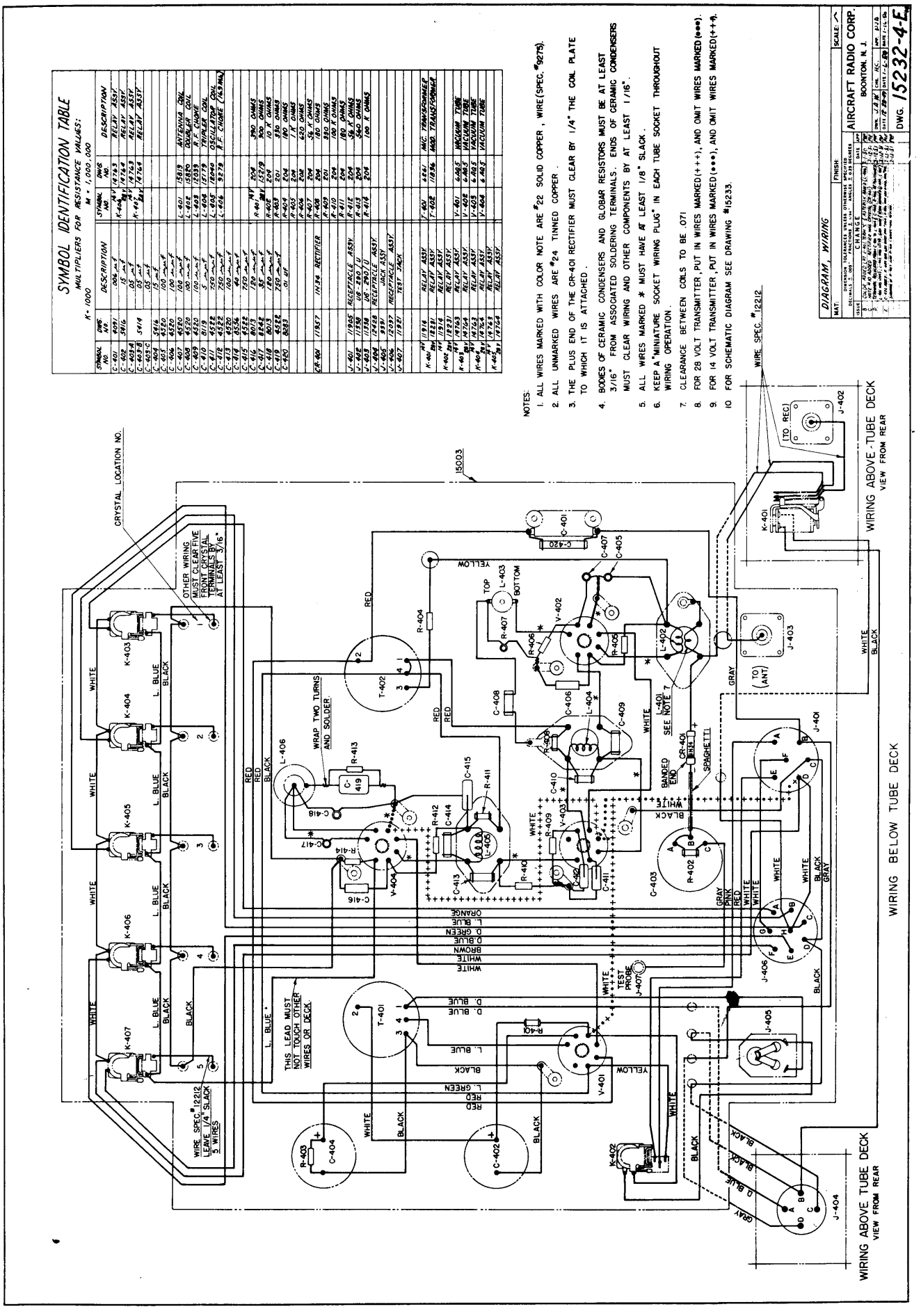


SYMBOL NO	DRAWING NO	DESCRIPTION	SYMBOL NO	DRAWING NO	DESCRIPTION
C-2301	8554	2700 MMF	L-2301	9279	R.F. CHOKE (16.3 mh)
C-2302	8242	35 MMF	L-2302	12040	OSCILLATOR COIL
C-2303	8013	170 MMF	L-2303	12041	TRIPLER COIL
C-2304	8554	2700 MMF	L-2304	12039	BUFFER COIL
C-2305	8553	1700 MMF	L-2305	12042	OUTPUT COIL
C-2306	8553	1700 MMF	L-2306	12043	ANTENNA COIL
C-2307	4520	100 MMF			
C-2308	8554	2700 MMF	R-2301	204	100K OHMS
C-2309	8554	2700 MMF	R-2302	204	560 OHMS
C-2310	4520	100 MMF			
C-2311	8554	2700 MMF	R-2303	204	56K OHMS
C-2312	8535	250 MMF	R-2304	204	180 OHMS
C-2313	8535	250 MMF	R-2305	204	100K OHMS
C-2314	4520	100 MMF	R-2306	201	270 OHMS
C-2315	8554	2700 MMF	R-2307	204	180 OHMS
			R-2308	201	33K OHMS
C-2317	5416	15 MF	R-2309	204	4700 OHMS
C-2318	15284	15 MF	R-2310	201	470 OHMS
C-2319	8626	4700 MMF	R-2312	201	1K OHMS
			R-2313	201	150 OHMS
CR-2301	16964	RECTIFIER	R-2314	201	1K OHMS
			R-2315	201	220 OHMS
			R-2316	202	110 OHMS
J-2301	13152	TEST JACK	K-2317	207	390 OHMS
J-2302	11905	RECEPTACLE ASSEM			1 OHM
J-2303	12097	RECEPTACLE ASSEM			5 OHMS
J-2304	11338	UG-290/U	T-2301	16156	MOD TRANSFORMER
J-2305	11338	UG-290/U	T-2302	16157	MOD TRANSFORMER
J-2306	12098	RECEPTACLE ASSEM	T-2303	16158	MOD TRANSFORMER
J-2307	9391	JACK ASSEM			
K-2301	14763	RELAY ASSEM	V-2301	TYPE-5763	VACUUM TUBE
K-2302	14764	RELAY ASSEM	V-2302	TYPE-5763	VACUUM TUBE
K-2303	14764	RELAY ASSEM	V-2303	TYPE-5763	VACUUM TUBE
K-2304	14763	RELAY ASSEM	V-2304	TYPE-5763	VACUUM TUBE
K-2305	14764	RELAY ASSEM	X-2301	15230	TUBE SOCKET
K-2306	14764	RELAY ASSEM	X-2302	15230	TUBE SOCKET
K-2307	14763	RELAY ASSEM	X-2303	15230	TUBE SOCKET
			X-2304	15230	TUBE SOCKET
			Y-2301	14958	CRYSTALS
			Y-2302		CRYSTALS
			Y-2303		CRYSTALS
			Y-2304		CRYSTALS
			Y-2305		CRYSTALS

Figur 26—A.R.C. Typ T-11B Transmitt r Wiring Diagram



Figur 27—A.R.C. Typ T-13 Transmitt r Sch matic Diagram



Figur 28—A.R.C. Typ T-13 Transmitt r Wiring Diagram

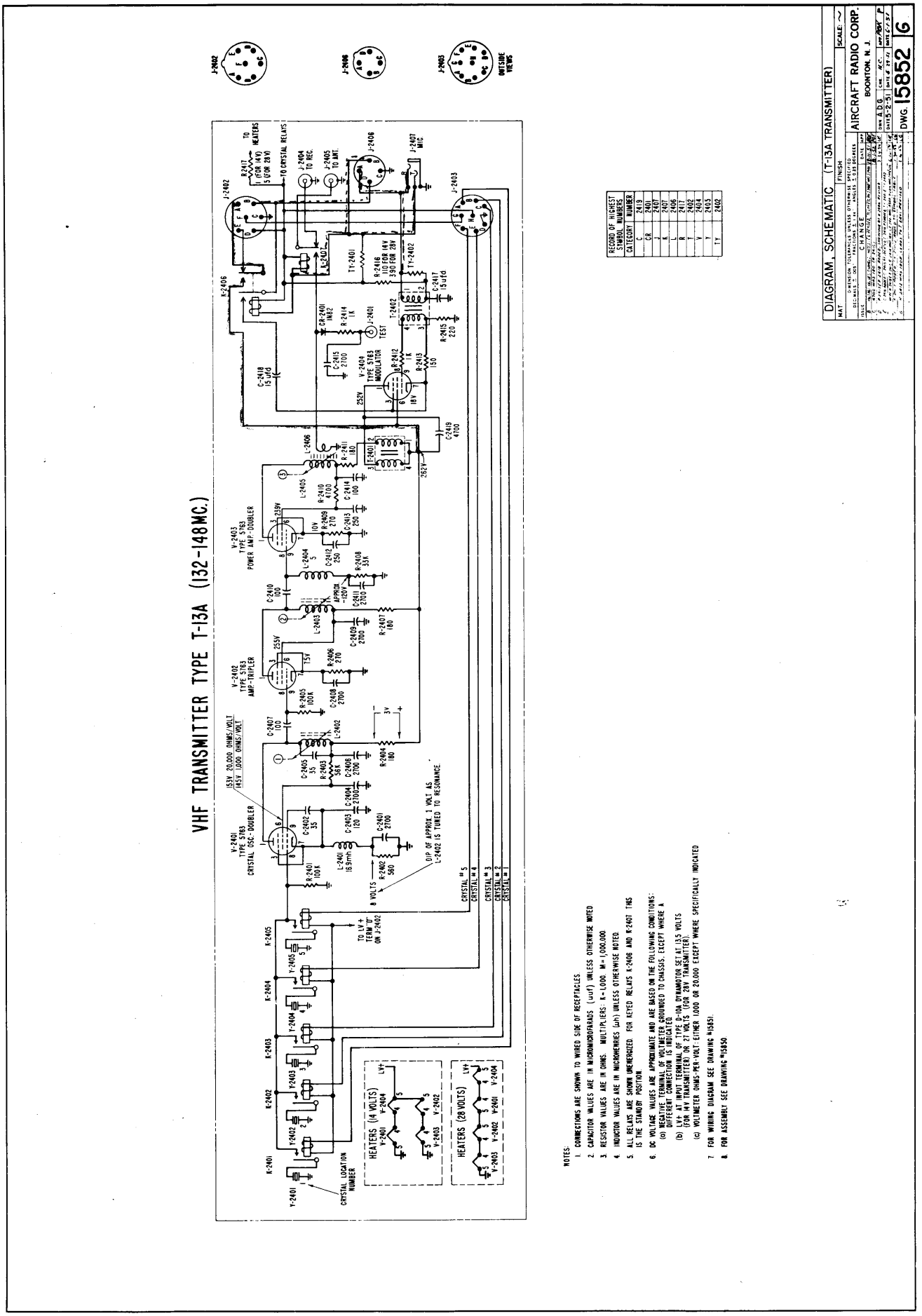
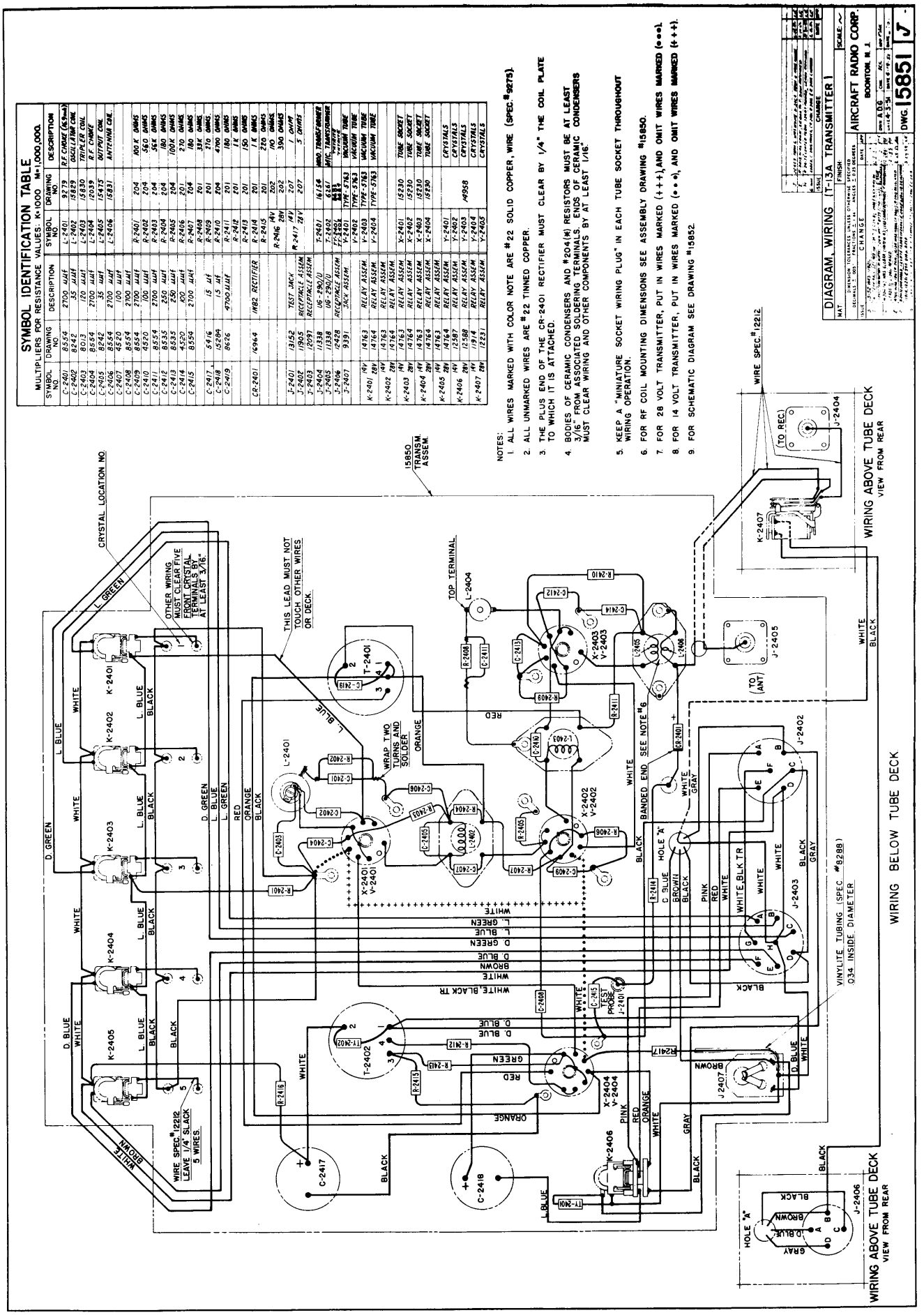


Figure 29—A.R.C. Type T-13A Transmitt r Schematic Diagram



SYMBOL NO.	DRAWING NO.	DESCRIPTION	SYMBOL NO.	DRAWING NO.	DESCRIPTION
C-2401	8554	2700 MMF	L-2401	9279	R.F. CHOKE (K5mh)
C-2402	8242	35 MMF	L-2402	15859	OSCILLATOR COIL
C-2403	8013	120 MMF	L-2403	15830	TRIPLER COIL
C-2404	8554	2700 MMF	L-2404	12039	R.F. CHOKE
C-2405	8242	35 MMF	L-2405	15415	OUTPUT COIL
C-2406	8554	2700 MMF	L-2406	15851	ANTENNA COIL
C-2407	8554	2700 MMF			
C-2408	8554	2700 MMF	R-2401	204	100 K OHMS
C-2409	8554	2700 MMF	R-2402	204	560 OHMS
C-2410	4520	100 MMF	R-2403	204	5K OHMS
C-2411	8554	2700 MMF	R-2404	204	180 OHMS
C-2412	8535	250 MMF	R-2405	204	100K OHMS
C-2413	8535	250 MMF	R-2406	201	270 OHMS
C-2414	4520	100 MMF	R-2407	204	180 OHMS
C-2415	8554	2700 MMF	R-2408	201	33K OHMS
C-2417	5916	15 MF	R-2409	201	270 OHMS
C-2418	15284	15 MF	R-2410	204	4700 OHMS
C-2419	8626	4700 MMF	R-2411	201	100 OHMS
			R-2412	201	1K OHMS
CR-2401	14964	HR2 RECTIFIER	R-2413	201	150 OHMS
			R-2414	201	1K OHMS
			R-2415	201	220 OHMS
			R-2416	202	100 OHMS
J-2401	13152	TEST JACK	R-2417	207	1 OHM
J-2402	11905	RECEPTACLE ASSEM.			
J-2403	12097	RECEPTACLE ASSEM.			
J-2404	11338	UG-290/U	T-2401	14158	MOD. TRANSFORMER
J-2405	11338	UG-290/U	T-2402	6161	MTC. TRANSFORMER
J-2406	12428	RECEPTACLE ASSEM.	TT-2401	14151	TRANSMITTER
J-2407	9391	JACK ASSEM.	V-2401	TYPE-5763	VACUUM TUBE
			V-2402	TYPE-5763	VACUUM TUBE
K-2401	14763	RELAY ASSEM.	V-2403	TYPE-5763	VACUUM TUBE
	14764	RELAY ASSEM.	V-2404	TYPE-5763	VACUUM TUBE
K-2402	14763	RELAY ASSEM.			
	14764	RELAY ASSEM.			
K-2403	14763	RELAY ASSEM.	X-2401	15230	TUBE SOCKET
	14764	RELAY ASSEM.	X-2402	15230	TUBE SOCKET
K-2404	14763	RELAY ASSEM.	X-2403	15230	TUBE SOCKET
	14764	RELAY ASSEM.	X-2404	15230	TUBE SOCKET
K-2405	14763	RELAY ASSEM.			
	14764	RELAY ASSEM.	Y-2401		CRYSTALS
K-2406	12387	RELAY ASSEM.	Y-2402		CRYSTALS
	12588	RELAY ASSEM.	Y-2403	14958	CRYSTALS
K-2407	11914	RELAY ASSEM.	Y-2404		CRYSTALS
	12231	RELAY ASSEM.	Y-2405		CRYSTALS

Figure 30—A.R.C. Typ T-13A Transmitt r Wiring Diagram

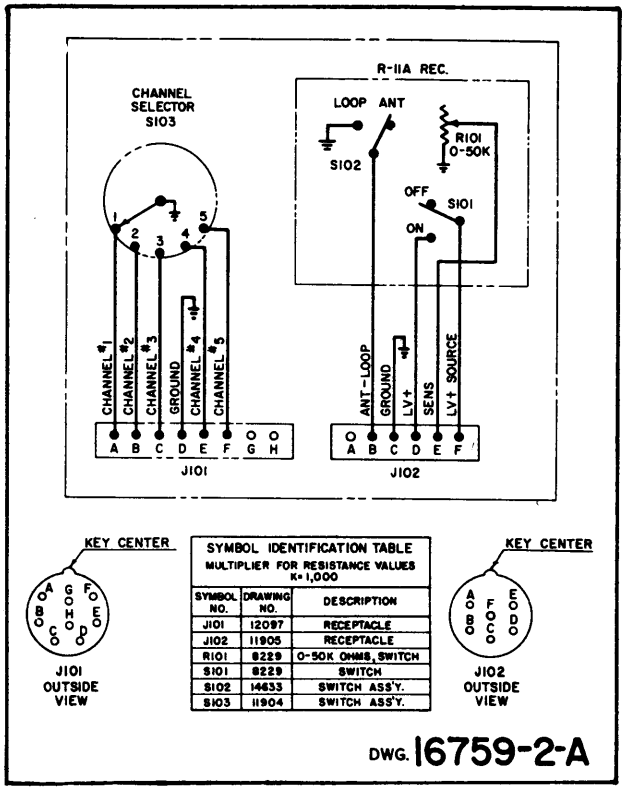


Figure 31—A.R.C. Type C-10A and C-11A Control Unit Schematic Diagram

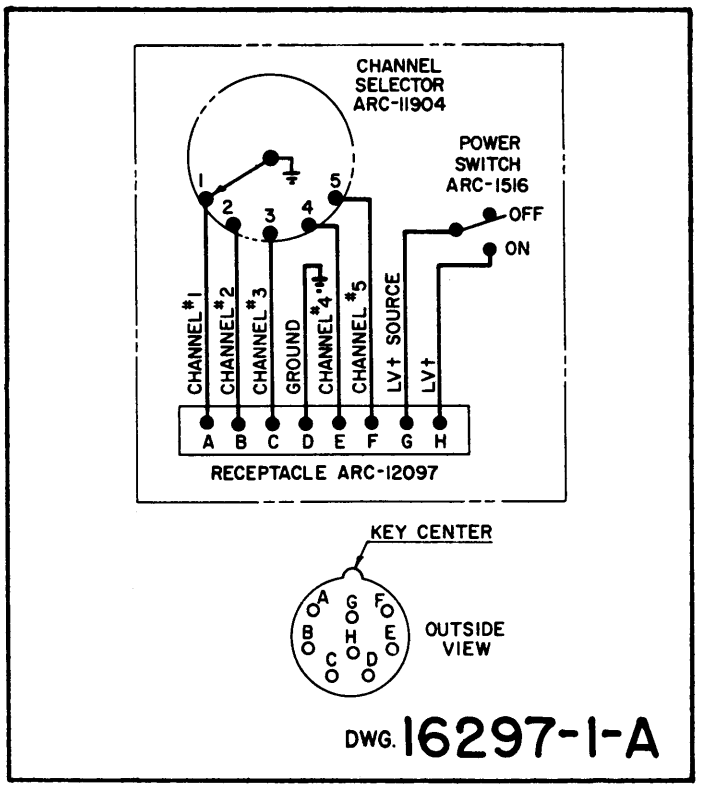


Figure 32—A.R.C. Type C-13 Control Unit Schematic Diagram

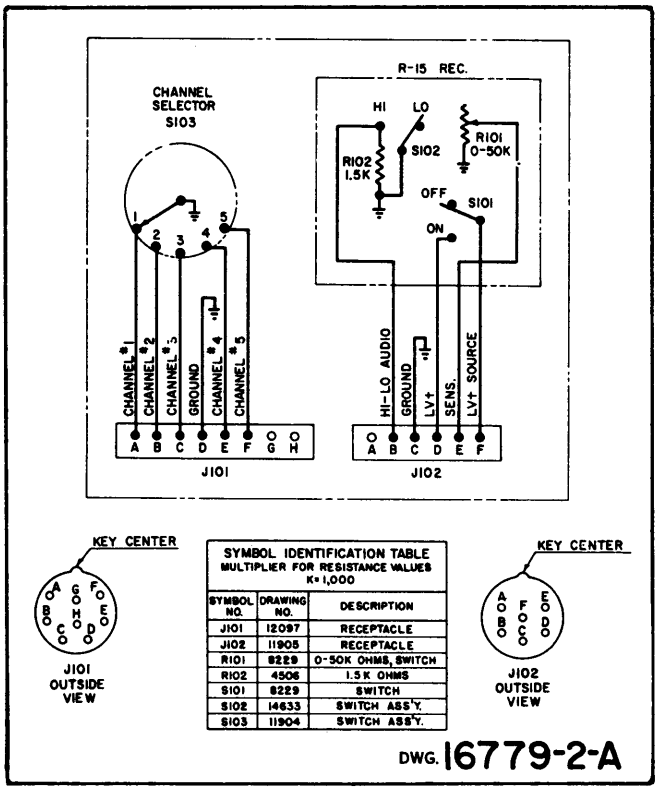


Figure 33—A.R.C. Typ C-15 and C-20 Control Unit Sch matic Diagram

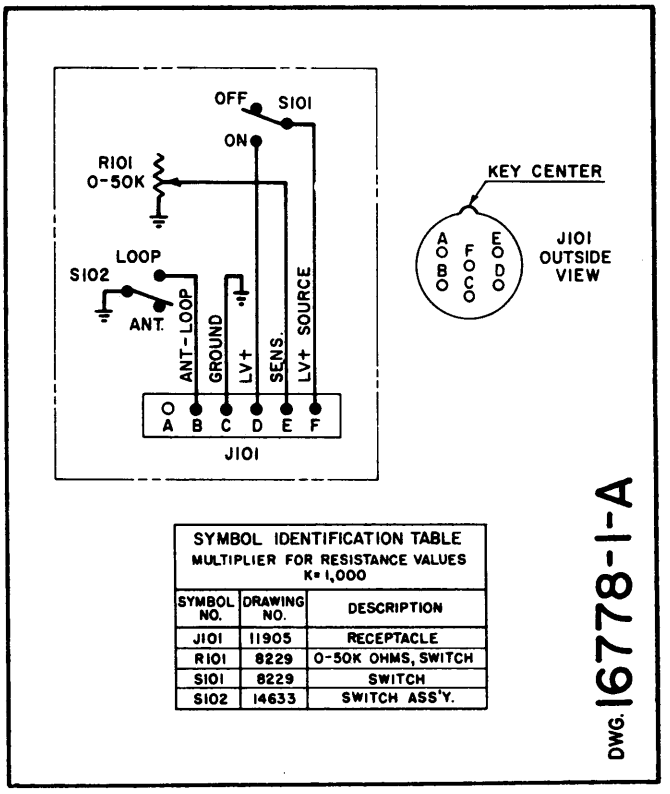
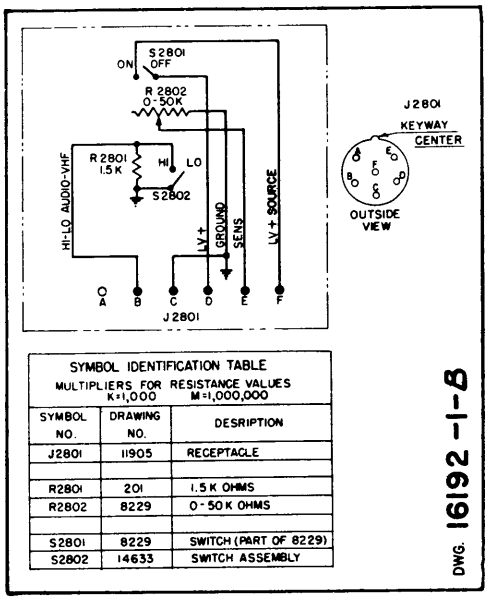


Figure 34—A.R.C. Typ C-16 and C-26 C ntr l Unit Schematic Diagram



Figur 35—A.R.C. Type C-17 and C-42 Control Unit Schematic Diagram

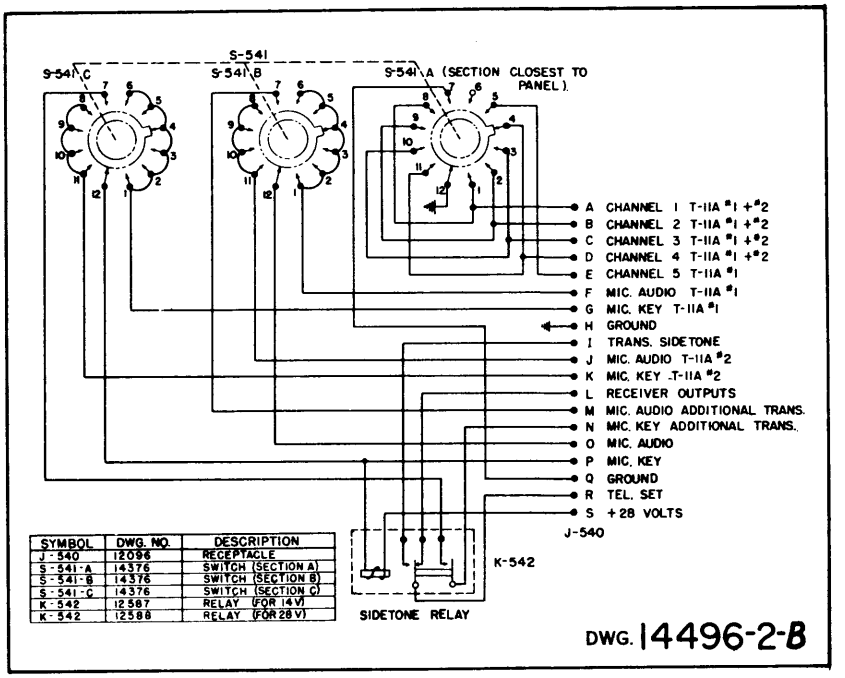


Figure 37—A.R.C. Type C-25 Control Unit Schematic Diagram

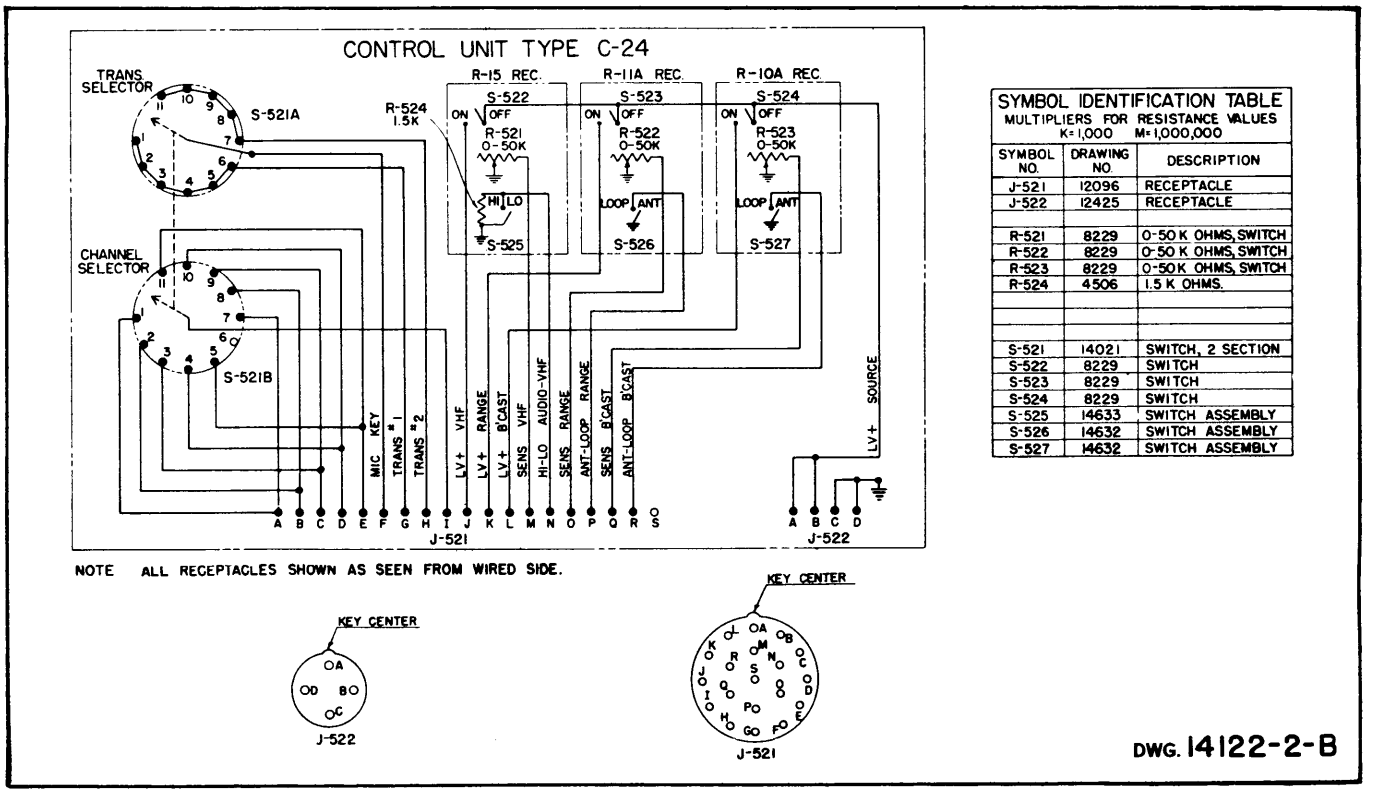
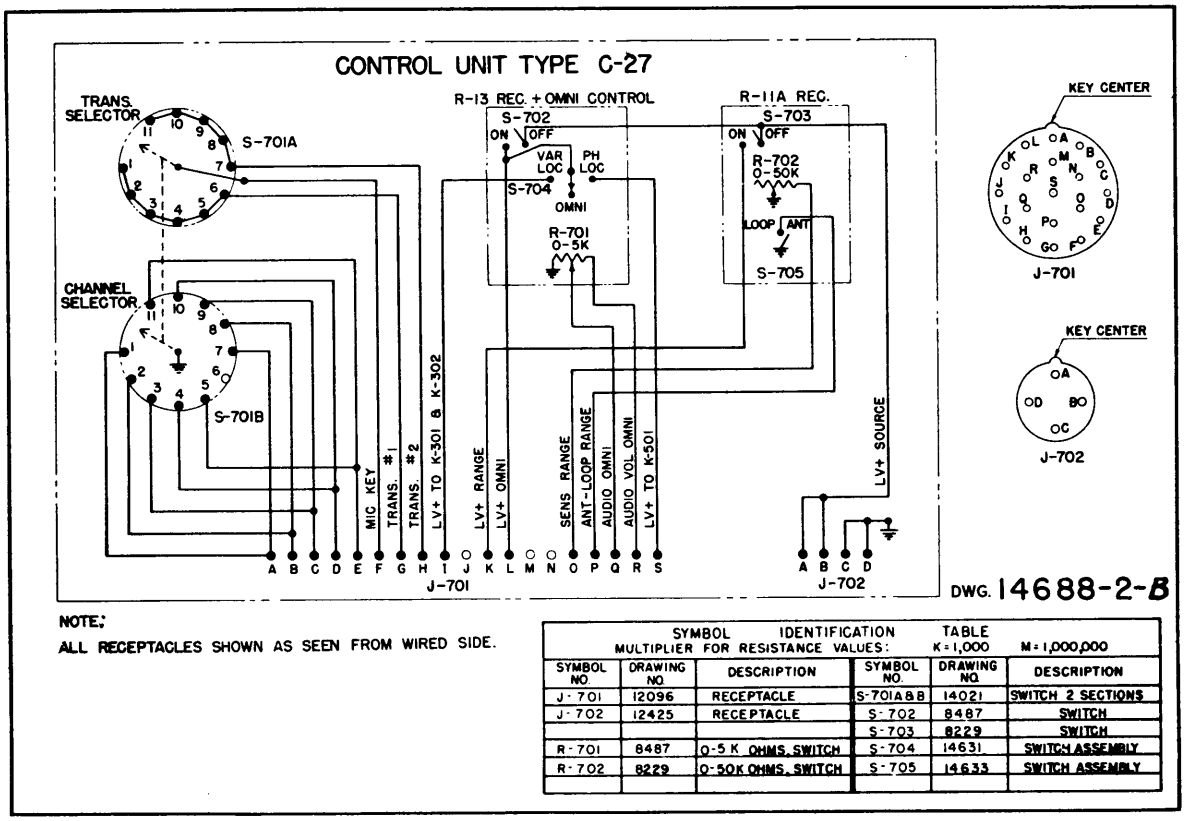


Figure 36—A.R.C. Type C-24 Control Unit Schematic Diagram

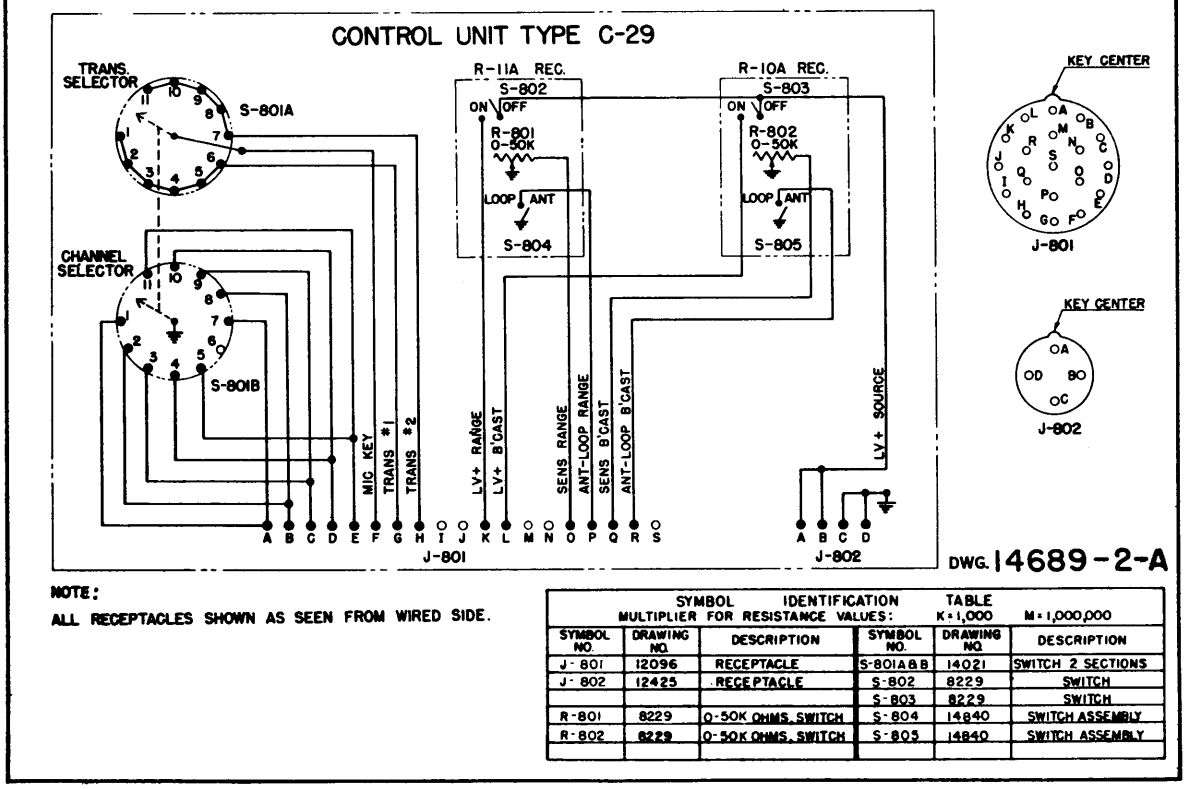


NOTE:
ALL RECEPTACLES SHOWN AS SEEN FROM WIRED SIDE.

SYMBOL IDENTIFICATION TABLE
MULTIPLIER FOR RESISTANCE VALUES: K = 1,000 M = 1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION	SYMBOL NO.	DRAWING NO.	DESCRIPTION
J-701	12096	RECEPTACLE	S-701A&B	14021	SWITCH 2 SECTIONS
J-702	12425	RECEPTACLE	S-702	8487	SWITCH
			S-703	8229	SWITCH
R-701	8487	0-5 K OHMS, SWITCH	S-704	14631	SWITCH ASSEMBLY
R-702	8229	0-50K OHMS, SWITCH	S-705	14633	SWITCH ASSEMBLY

Figure 38—A.R.C. Type C-27 Control Unit Schematic Diagram

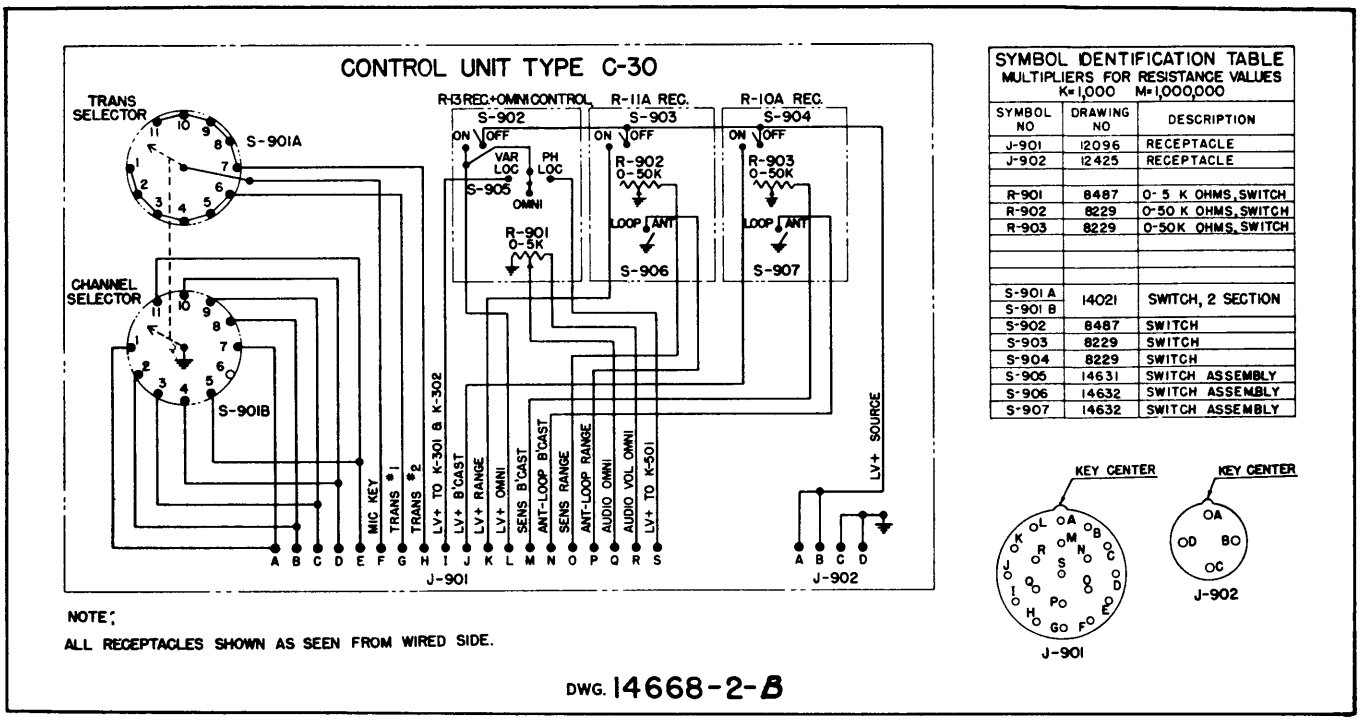


NOTE:
ALL RECEPTACLES SHOWN AS SEEN FROM WIRED SIDE.

SYMBOL IDENTIFICATION TABLE
MULTIPLIER FOR RESISTANCE VALUES: K = 1,000 M = 1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION	SYMBOL NO.	DRAWING NO.	DESCRIPTION
J-801	12096	RECEPTACLE	S-801A&B	14021	SWITCH 2 SECTIONS
J-802	12425	RECEPTACLE	S-802	8229	SWITCH
			S-803	8229	SWITCH
R-801	8229	0-50K OHMS, SWITCH	S-804	14840	SWITCH ASSEMBLY
R-802	8229	0-50K OHMS, SWITCH	S-805	14840	SWITCH ASSEMBLY

Figure 39—A.R.C. Type C-29 Contr l Unit Schematic Diagram

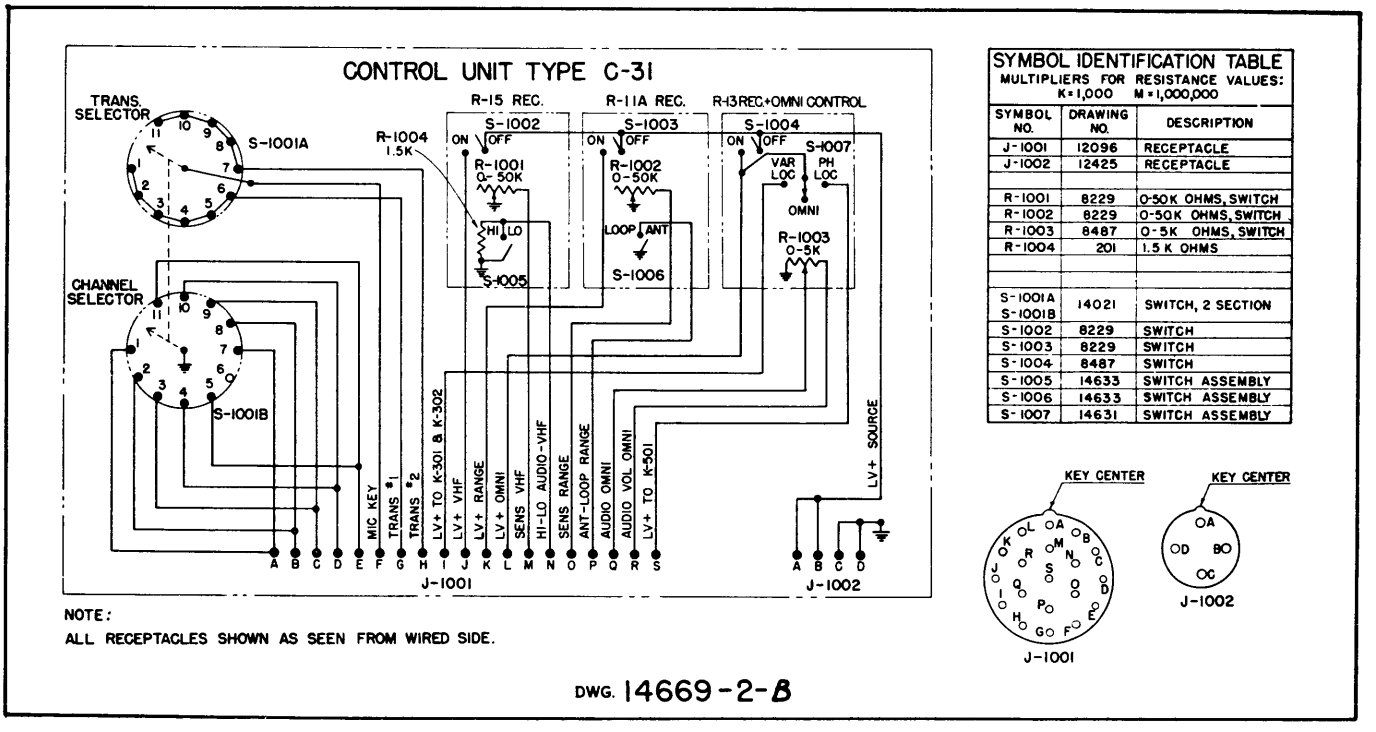


SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES
K=1,000 M=1,000,000

SYMBOL NO	DRAWING NO	DESCRIPTION
J-901	12096	RECEPTACLE
J-902	12425	RECEPTACLE
R-901	8487	0-5 K OHMS, SWITCH
R-902	8229	0-50 K OHMS, SWITCH
R-903	8229	0-50K OHMS, SWITCH
S-901 A S-901 B	14021	SWITCH, 2 SECTION
S-902	8487	SWITCH
S-903	8229	SWITCH
S-904	8229	SWITCH
S-905	14631	SWITCH ASSEMBLY
S-906	14632	SWITCH ASSEMBLY
S-907	14632	SWITCH ASSEMBLY

DWG. 14668-2-B

Figure 40—A.R.C. Type C-30 Control Unit Schematic Diagram

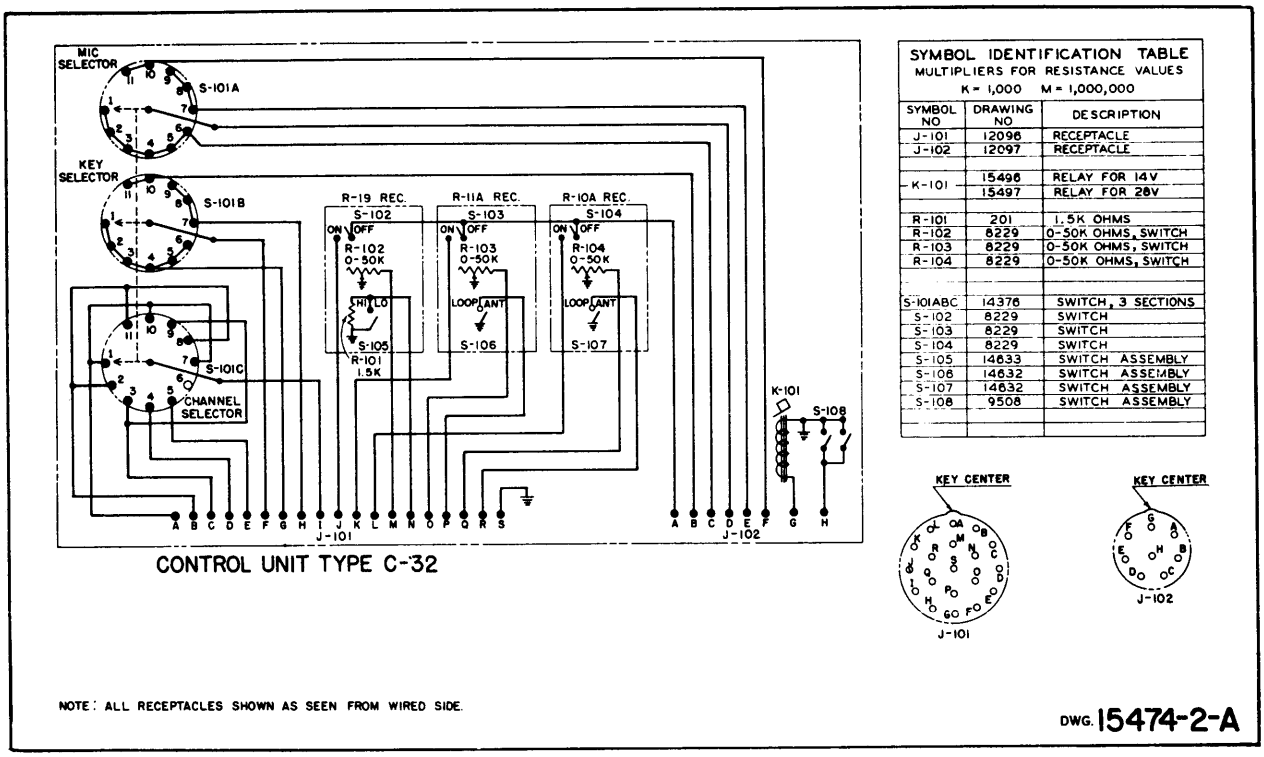


SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES:
K=1,000 M=1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION
J-1001	12096	RECEPTACLE
J-1002	12425	RECEPTACLE
R-1001	8229	0-50K OHMS, SWITCH
R-1002	8229	0-50K OHMS, SWITCH
R-1003	8487	0-5K OHMS, SWITCH
R-1004	201	1.5 K OHMS
S-1001A S-1001B	14021	SWITCH, 2 SECTION
S-1002	8229	SWITCH
S-1003	8229	SWITCH
S-1004	8487	SWITCH
S-1005	14633	SWITCH ASSEMBLY
S-1006	14633	SWITCH ASSEMBLY
S-1007	14631	SWITCH ASSEMBLY

DWG. 14669-2-B

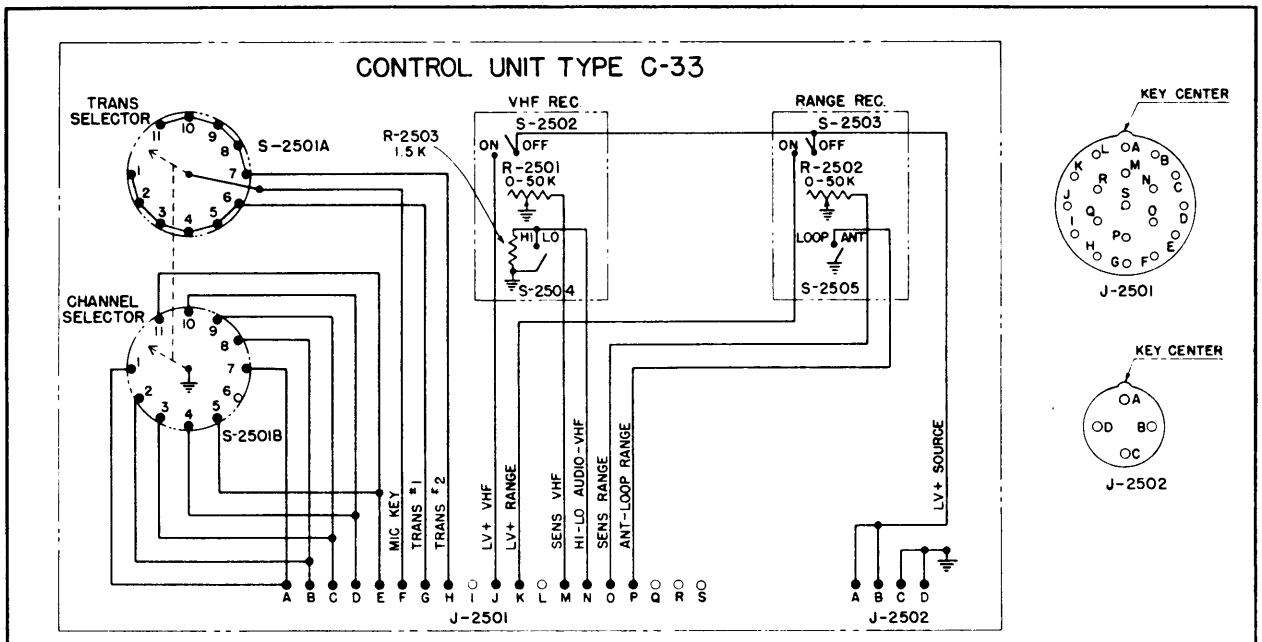
Figur 41—A.R.C. Typ C-31 C ntr l Unit Sch matic Diagram



SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES
K = 1,000 M = 1,000,000

SYMBOL NO	DRAWING NO	DESCRIPTION
J-101	12096	RECEPTACLE
J-102	12097	RECEPTACLE
K-101	15496	RELAY FOR 14V
	15497	RELAY FOR 28V
R-101	201	1.5K OHMS
R-102	8229	0-50K OHMS, SWITCH
R-103	8229	0-50K OHMS, SWITCH
R-104	8229	0-50K OHMS, SWITCH
S-101ABC	14376	SWITCH, 3 SECTIONS
S-102	8229	SWITCH
S-103	8229	SWITCH
S-104	8229	SWITCH
S-105	14633	SWITCH ASSEMBLY
S-106	14632	SWITCH ASSEMBLY
S-107	14632	SWITCH ASSEMBLY
S-108	9508	SWITCH ASSEMBLY

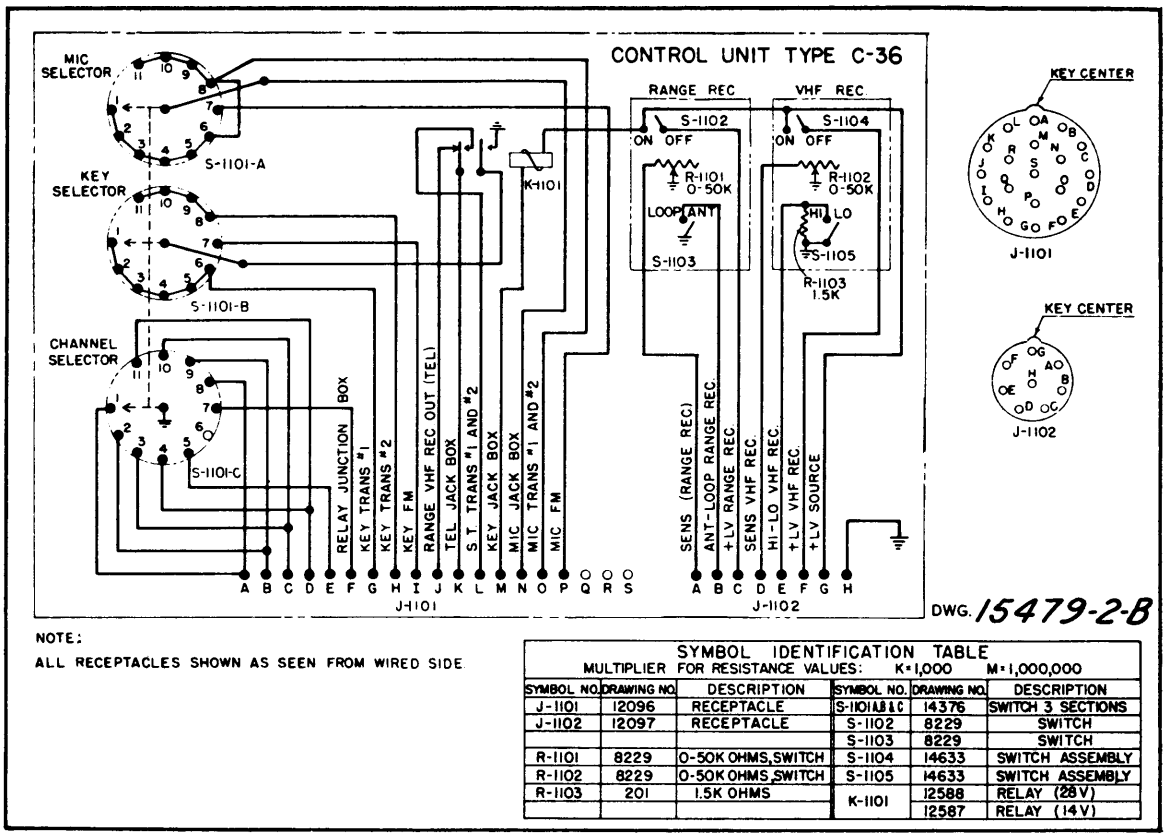
Figure 42—A.R.C. Type C-32 Control Unit Schematic Diagram



SYMBOL IDENTIFICATION TABLE
MULTIPLIER FOR RESISTANCE VALUES: K = 1,000 M = 1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION	SYMBOL NO.	DRAWING NO.	DESCRIPTION
J-2501	12096	RECEPTACLE	S-2501A&B	14021	SWITCH 2 SECTIONS
J-2502	12425	RECEPTACLE	S-2502	8229	SWITCH
			S-2503	8229	SWITCH
R-2501	8229	0-50K OHMS, SWITCH	S-2504	14633	SWITCH ASSEMBLY
R-2502	8229	0-50K OHMS, SWITCH	S-2505	14633	SWITCH ASSEMBLY
R-2503	201	1.5K OHMS			

Figur 43—A.R.C. Typ C-33 Contr l Unit Sch matic Diagram

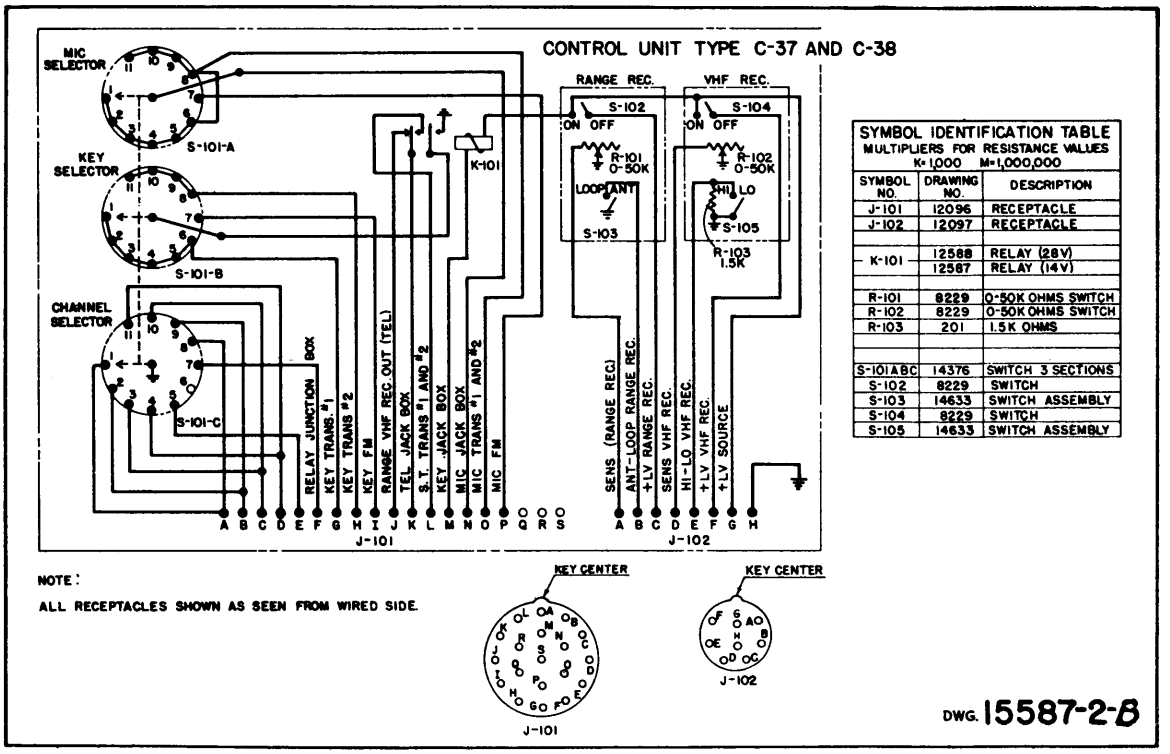


NOTE:
ALL RECEPTACLES SHOWN AS SEEN FROM WIRED SIDE.

SYMBOL IDENTIFICATION TABLE
MULTIPLIER FOR RESISTANCE VALUES: K=1,000 M=1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION	SYMBOL NO.	DRAWING NO.	DESCRIPTION
J-1101	12096	RECEPTACLE	S-1101A,B & C	14376	SWITCH 3 SECTIONS
J-1102	12097	RECEPTACLE	S-1102	8229	SWITCH
			S-1103	8229	SWITCH
R-1101	8229	0-50K OHMS, SWITCH	S-1104	14633	SWITCH ASSEMBLY
R-1102	8229	0-50K OHMS, SWITCH	S-1105	14633	SWITCH ASSEMBLY
R-1103	201	1.5K OHMS	K-1101	12588	RELAY (28V)
				12587	RELAY (14V)

Figure 44—A.R.C. Type C-36 Control Unit Schematic Diagram

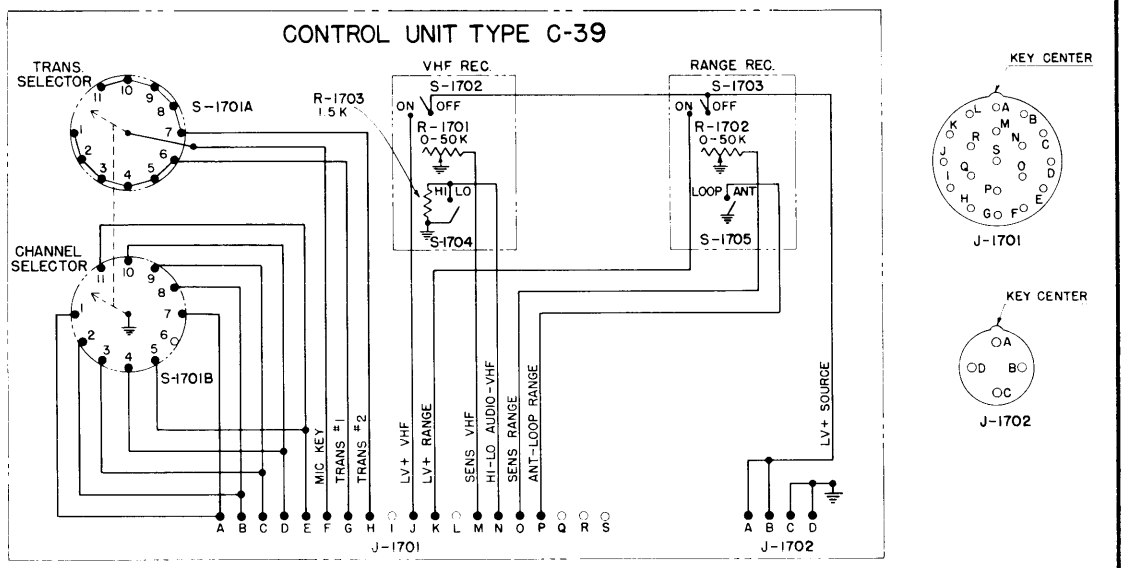


NOTE:
ALL RECEPTACLES SHOWN AS SEEN FROM WIRED SIDE.

SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES
K=1,000 M=1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION
J-101	12096	RECEPTACLE
J-102	12097	RECEPTACLE
K-101	12588	RELAY (28V)
	12587	RELAY (14V)
R-101	8229	0-50K OHMS SWITCH
R-102	8229	0-50K OHMS SWITCH
R-103	201	1.5K OHMS
S-101ABC	14376	SWITCH 3 SECTIONS
S-102	8229	SWITCH
S-103	14633	SWITCH ASSEMBLY
S-104	8229	SWITCH
S-105	14633	SWITCH ASSEMBLY

Figure 45—A.R.C. Type C-37 and C-38 Control Unit Schematic Diagram



NOTES:

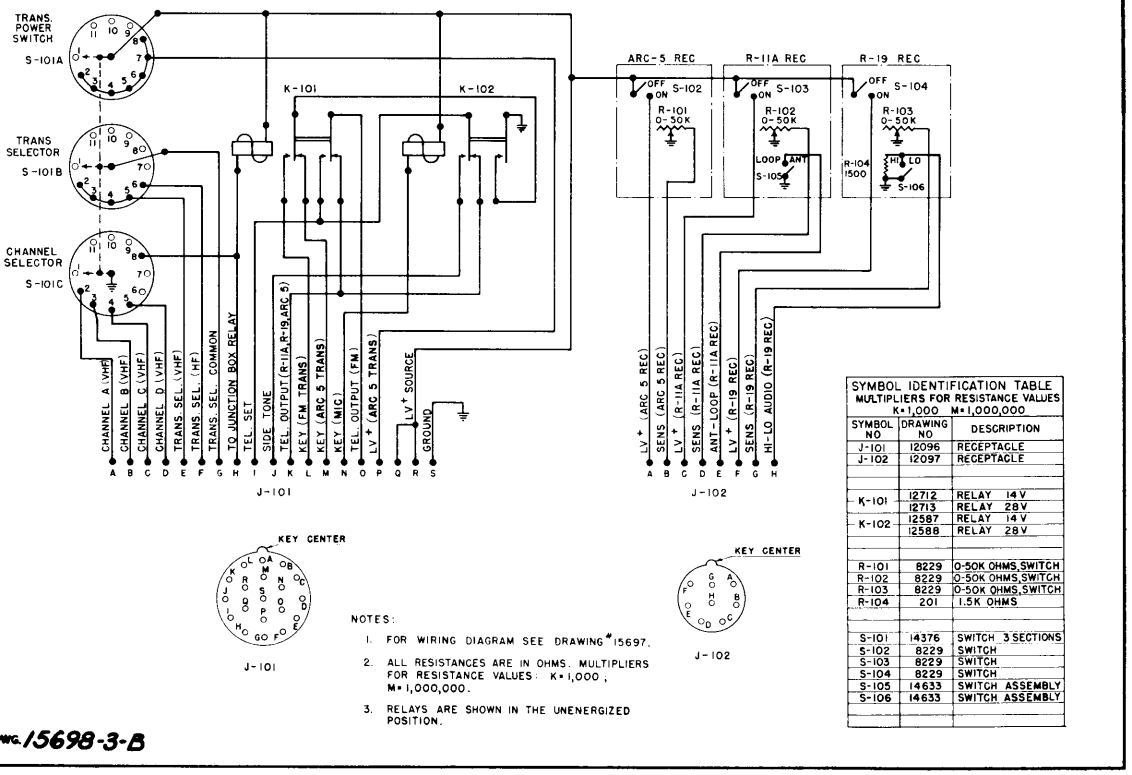
1. FOR WIRING DIAGRAM SEE DRAWING #14677
2. ALL RECEPTACLES SHOWN AS SEEN FROM WIRED SIDE.
3. ALL RESISTANCES ARE IN OHMS. MULTIPLIERS FOR RESISTANCE VALUES: K = 1,000 M = 1,000,000

DWG. 14690-2-C

SYMBOL IDENTIFICATION TABLE
MULTIPLIER FOR RESISTANCE VALUES: K = 1,000 M = 1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION	SYMBOL NO.	DRAWING NO.	DESCRIPTION
J-1701	12096	RECEPTACLE	S-1701A & B	14021	SWITCH 2 SECTIONS
J-1702	12425	RECEPTACLE	S-1702	8229	SWITCH
			S-1703	8229	SWITCH
R-1701	8229	0-50K OHMS, SWITCH	S-1704	14633	SWITCH ASSEMBLY
R-1702	8229	0-50K OHMS, SWITCH	S-1705	14633	SWITCH ASSEMBLY
R-1703	201	1.5K OHMS			

Figure 46—A.R.C. Type C-39 Control Unit Schematic Diagram



NOTES:

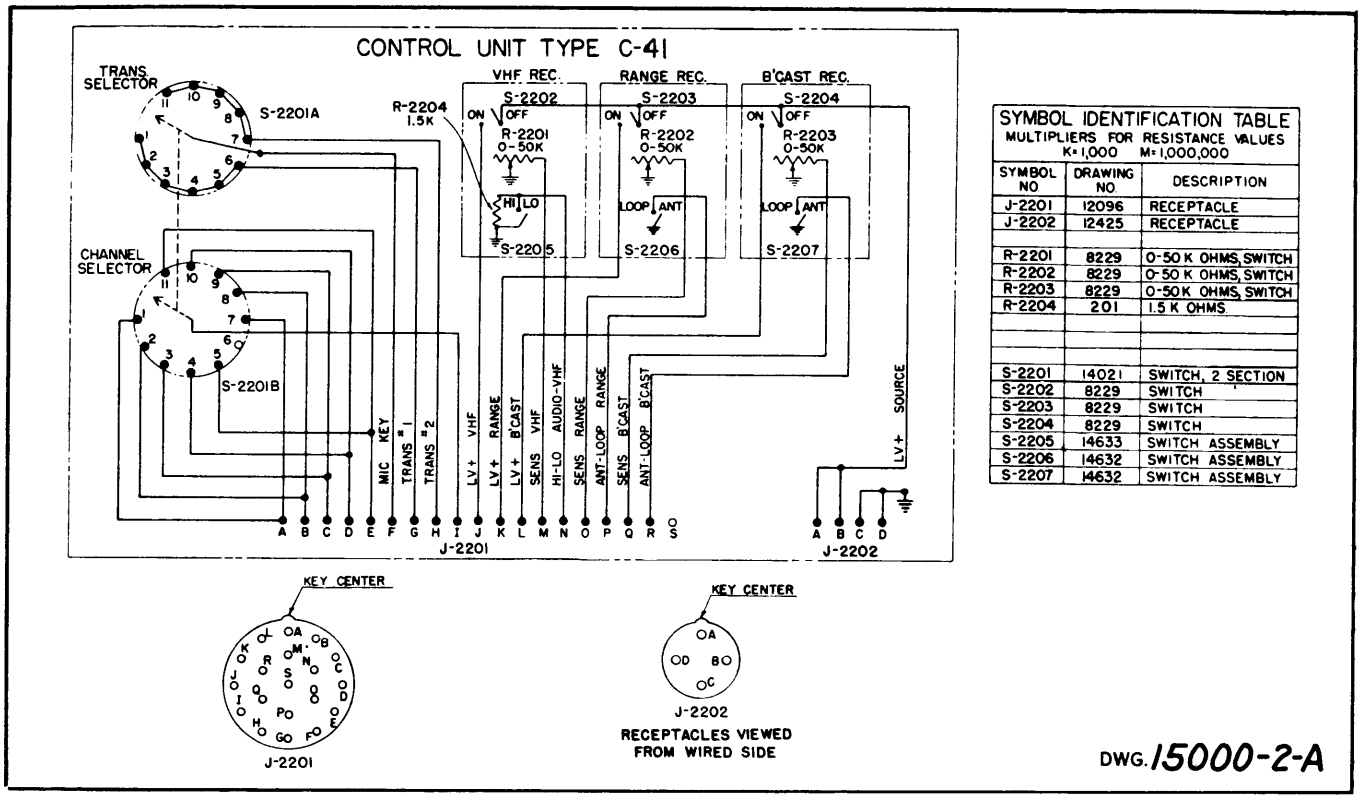
1. FOR WIRING DIAGRAM SEE DRAWING #15697.
2. ALL RESISTANCES ARE IN OHMS. MULTIPLIERS FOR RESISTANCE VALUES: K = 1,000 ; M = 1,000,000.
3. RELAYS ARE SHOWN IN THE UNENERGIZED POSITION.

DWG. 15698-3-B

SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES
K = 1,000 M = 1,000,000

SYMBOL NO	DRAWING NO	DESCRIPTION
J-101	12096	RECEPTACLE
J-102	12097	RECEPTACLE
K-101	12712	RELAY 14 V
	12713	RELAY 28 V
K-102	12587	RELAY 14 V
	12588	RELAY 28 V
R-101	8229	0-50K OHMS, SWITCH
R-102	8229	0-50K OHMS, SWITCH
R-103	8229	0-50K OHMS, SWITCH
R-104	201	1.5K OHMS
S-101	14376	SWITCH 3 SECTIONS
S-102	8229	SWITCH
S-103	8229	SWITCH
S-104	8229	SWITCH
S-105	14633	SWITCH ASSEMBLY
S-106	14633	SWITCH ASSEMBLY

Figure 47—A.R.C. Type C-40 Control Unit Schematic Diagram



SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES K=1,000 M=1,000,000

SYMBOL NO	DRAWING NO	DESCRIPTION
J-2201	12096	RECEPTACLE
J-2202	12425	RECEPTACLE
R-2201	8229	0-50 K OHMS, SWITCH
R-2202	8229	0-50 K OHMS, SWITCH
R-2203	8229	0-50 K OHMS, SWITCH
R-2204	201	1.5 K OHMS
S-2201	14021	SWITCH, 2 SECTION
S-2202	8229	SWITCH
S-2203	8229	SWITCH
S-2204	8229	SWITCH
S-2205	14633	SWITCH ASSEMBLY
S-2206	14632	SWITCH ASSEMBLY
S-2207	14632	SWITCH ASSEMBLY

Figure 48—A.R.C. Type C-41 Control Unit Schematic Diagram

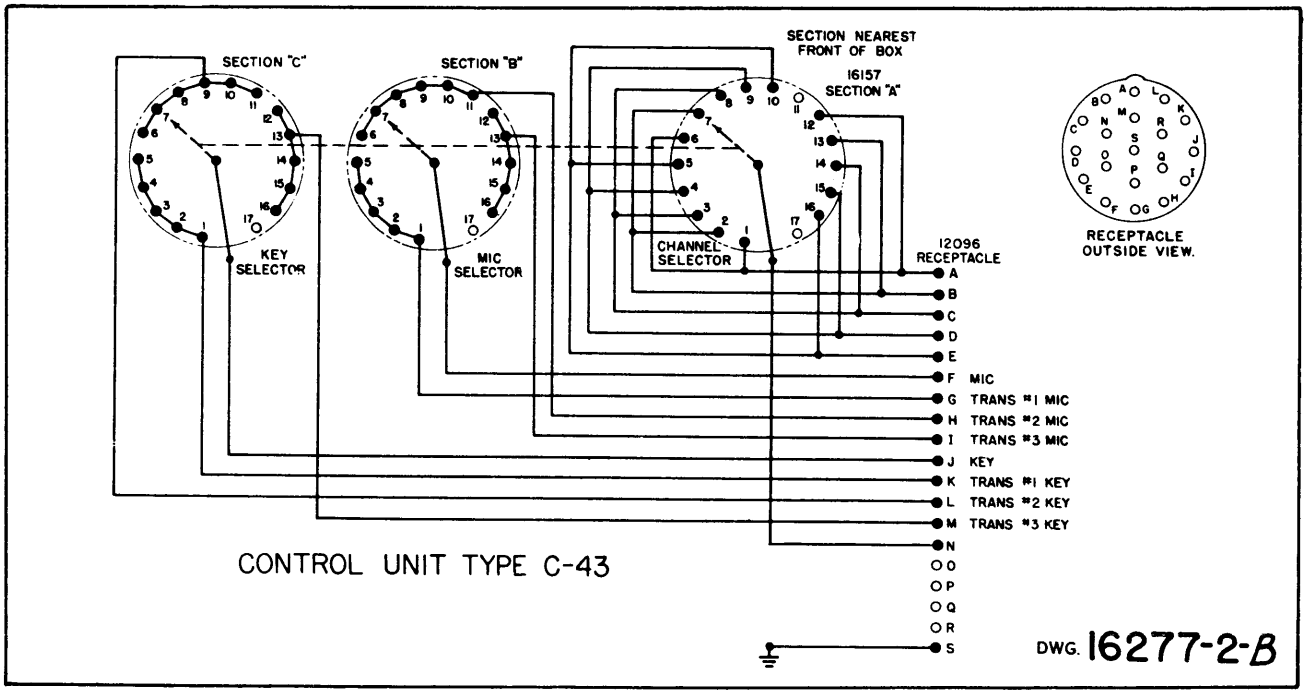
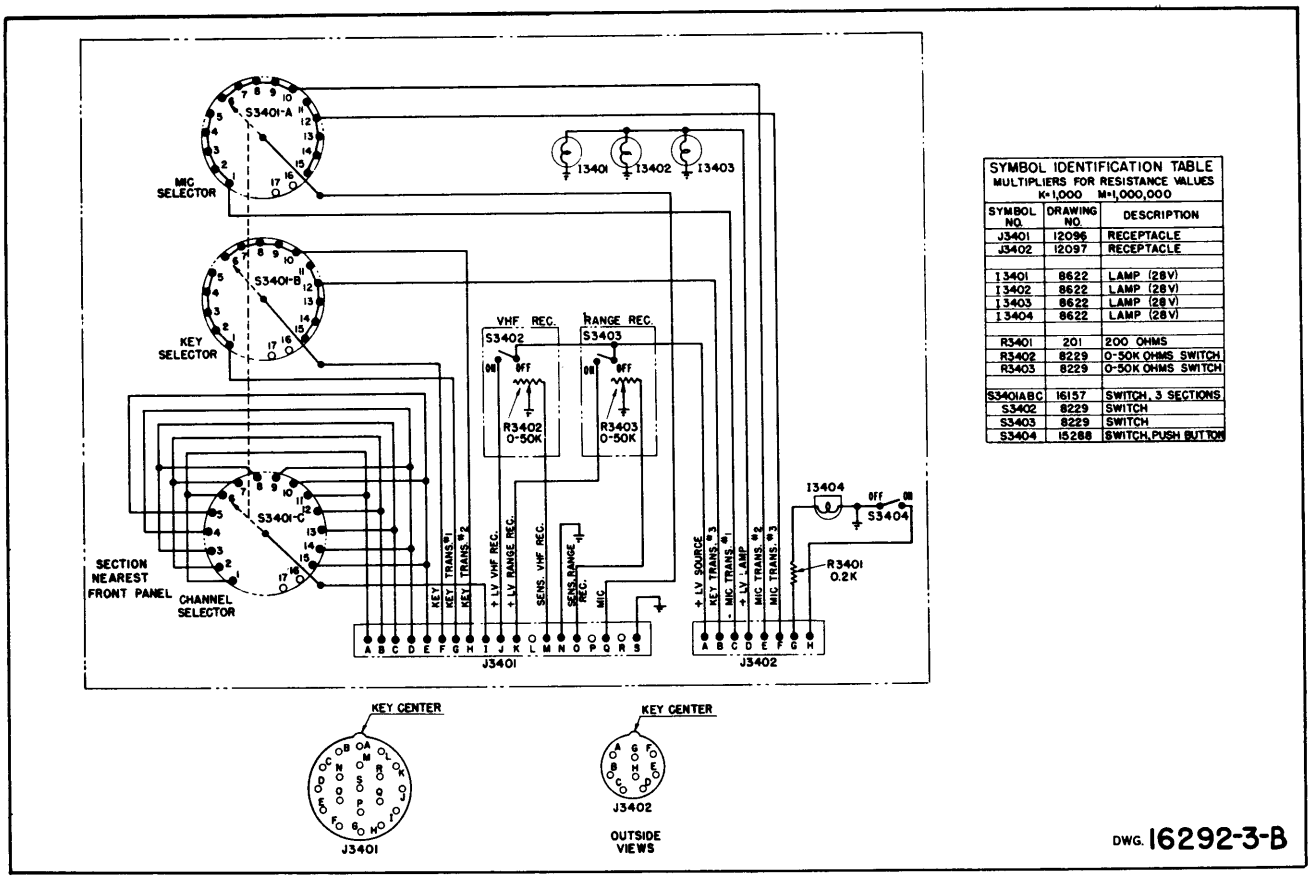


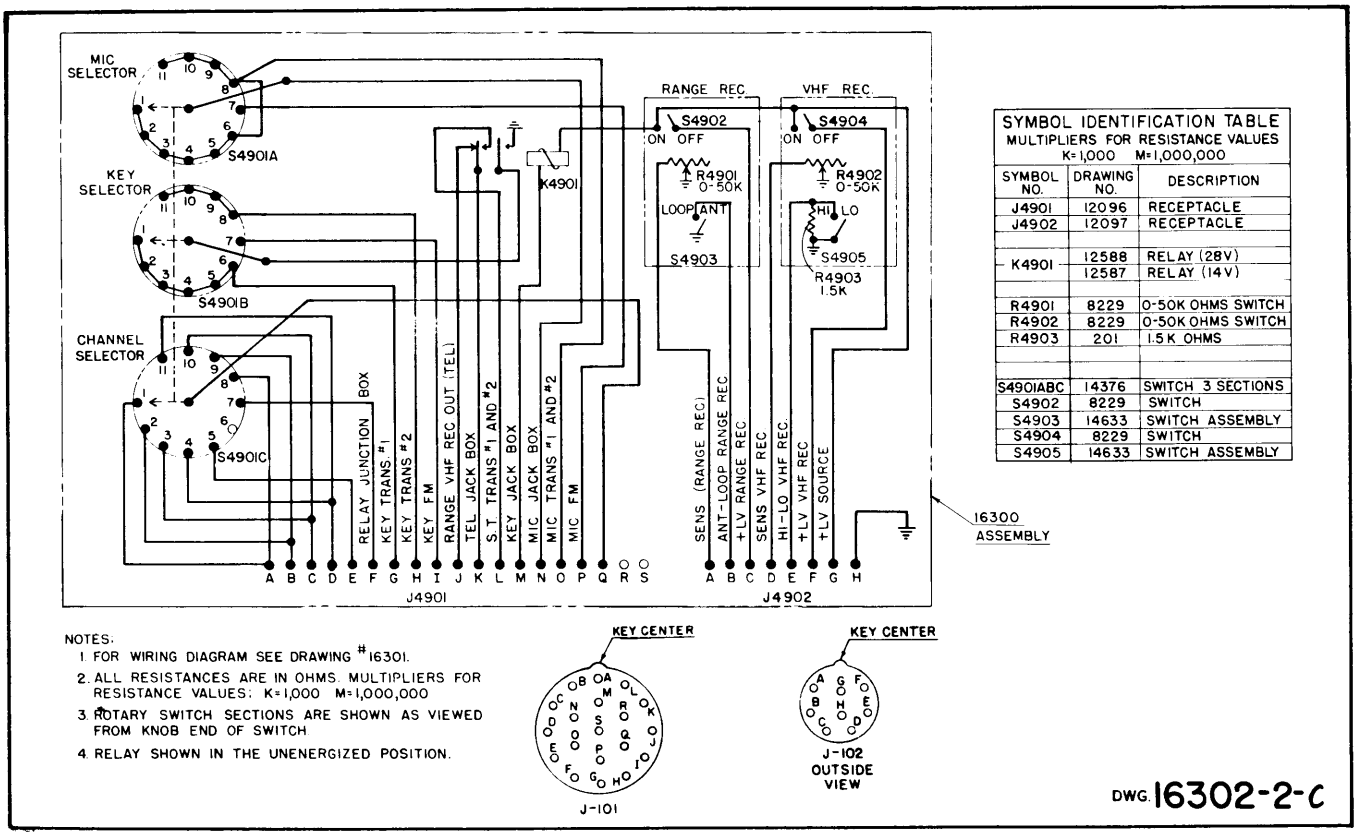
Figure 49—A.R.C. Type C-43 Control Unit Sch matic Diagram



SYMBOL IDENTIFICATION TABLE MULTIPLIERS FOR RESISTANCE VALUES K=1,000 M=1,000,000		
SYMBOL NO.	DRAWING NO.	DESCRIPTION
J3401	12096	RECEPTACLE
J3402	12097	RECEPTACLE
13401	8622	LAMP (28V)
13402	8622	LAMP (28V)
13403	8622	LAMP (28V)
13404	8622	LAMP (28V)
R3401	201	200 OHMS
R3402	8229	0-50K OHMS SWITCH
R3403	8229	0-50K OHMS SWITCH
S3401ABC	16157	SWITCH, 3 SECTIONS
S3402	8229	SWITCH
S3403	8229	SWITCH
S3404	15268	SWITCH, PUSH BUTTON

DWG. 16292-3-B

Figure 50—A.R.C. Type C-44 Control Unit Schematic Diagram

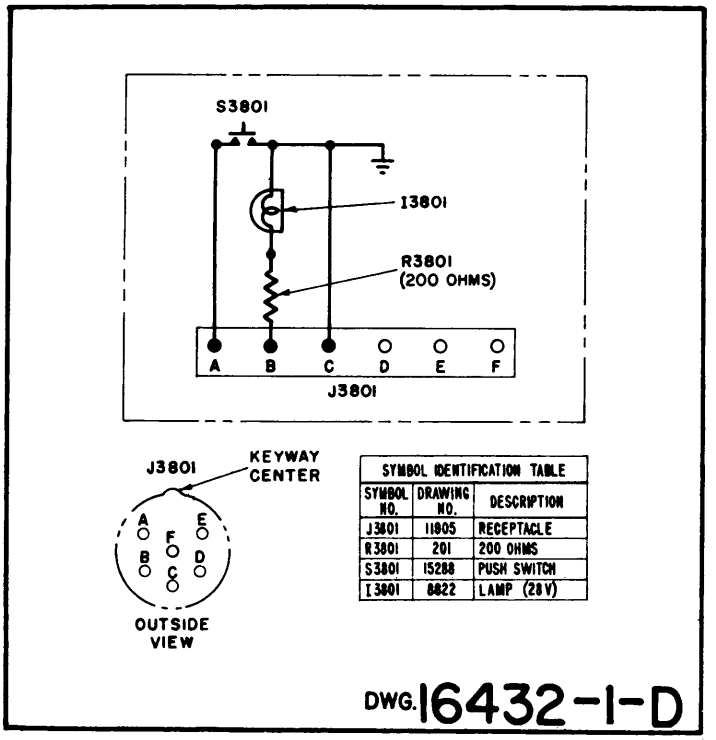


SYMBOL IDENTIFICATION TABLE MULTIPLIERS FOR RESISTANCE VALUES K=1,000 M=1,000,000		
SYMBOL NO.	DRAWING NO.	DESCRIPTION
J4901	12096	RECEPTACLE
J4902	12097	RECEPTACLE
K4901	12588	RELAY (28V)
	12587	RELAY (14V)
R4901	8229	0-50K OHMS SWITCH
R4902	8229	0-50K OHMS SWITCH
R4903	201	1.5K OHMS
S4901ABC	14376	SWITCH 3 SECTIONS
S4902	8229	SWITCH
S4903	14633	SWITCH ASSEMBLY
S4904	8229	SWITCH
S4905	14633	SWITCH ASSEMBLY

NOTES:
1. FOR WIRING DIAGRAM SEE DRAWING #16301.
2. ALL RESISTANCES ARE IN OHMS. MULTIPLIERS FOR RESISTANCE VALUES: K=1,000 M=1,000,000
3. ROTARY SWITCH SECTIONS ARE SHOWN AS VIEWED FROM KNOB END OF SWITCH
4. RELAY SHOWN IN THE UNENERGIZED POSITION.

DWG. 16302-2-C

Figur 51—A.R.C. Type C-46 C ntr l Unit Sch matic Diagram



Figur 52—A.R.C. Type C-47 Control Unit Schematic Diagram

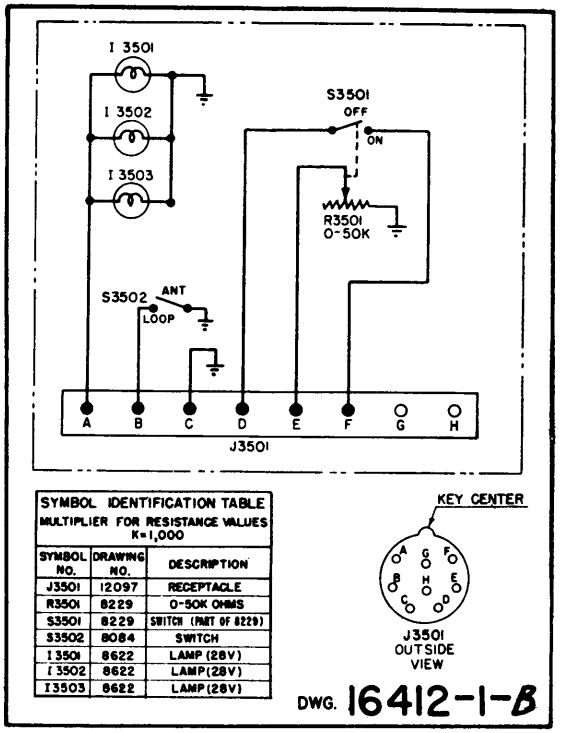
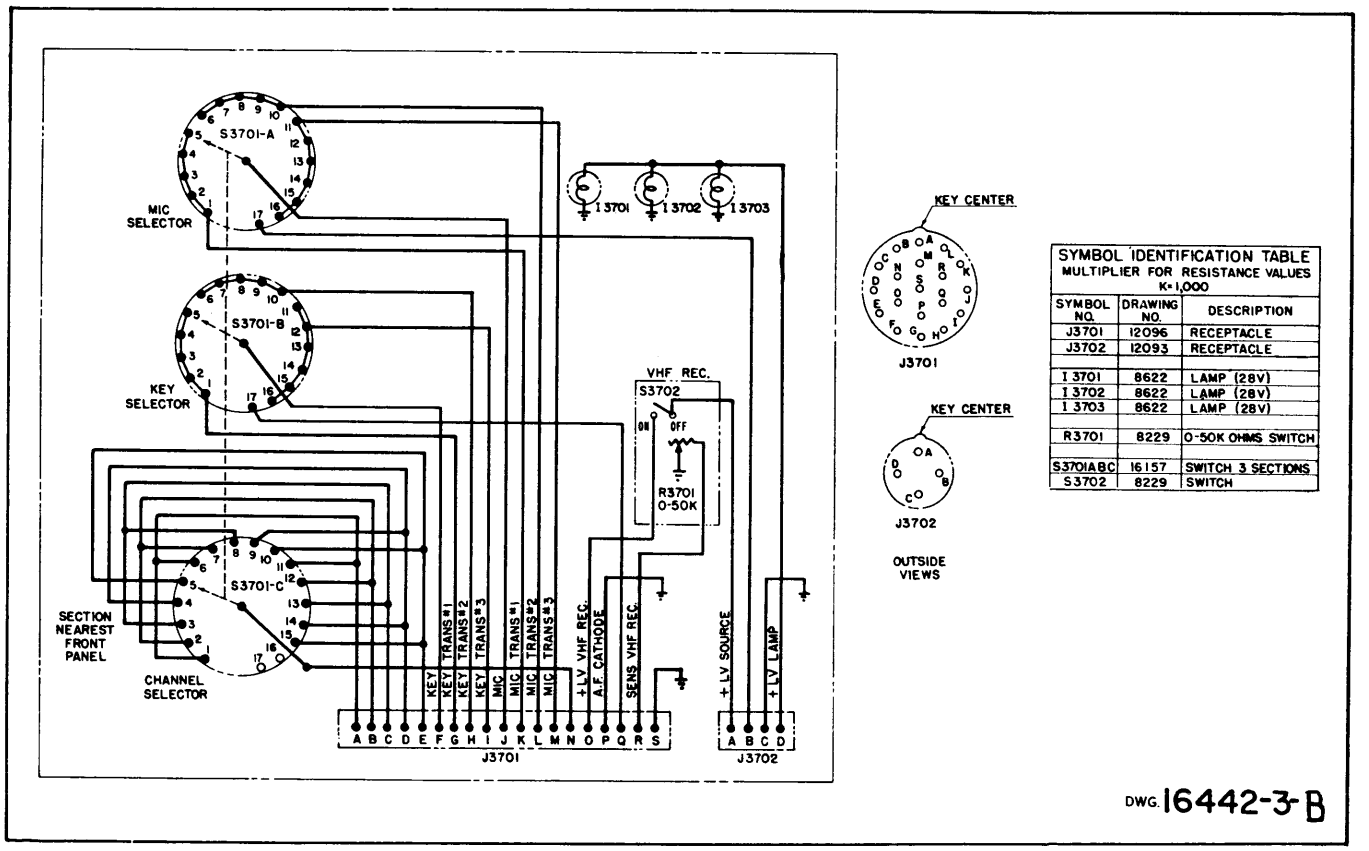
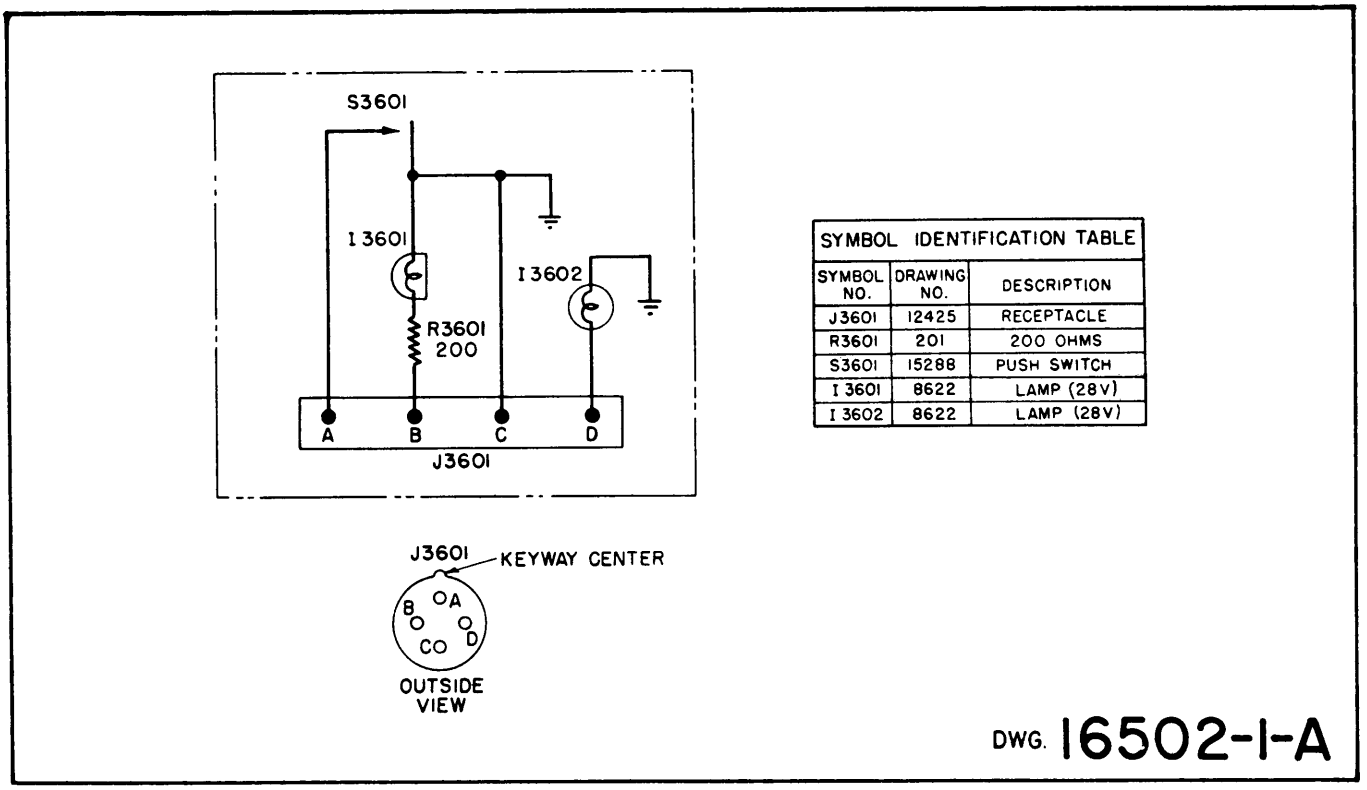


Figure 53—A.R.C. Type C-48 Control Unit Schematic Diagram

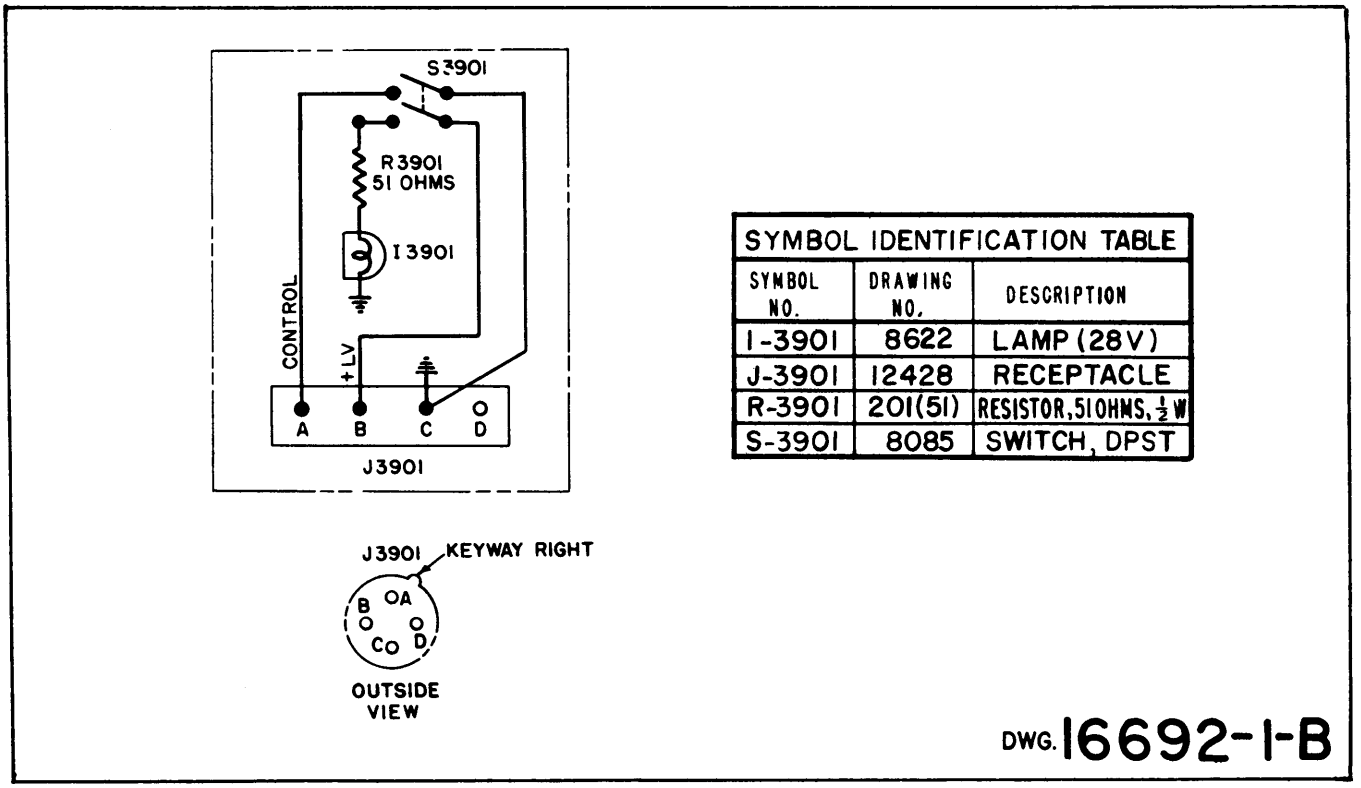


Figur 54—A.R.C. Type C-49 Control Unit Schematic Diagram



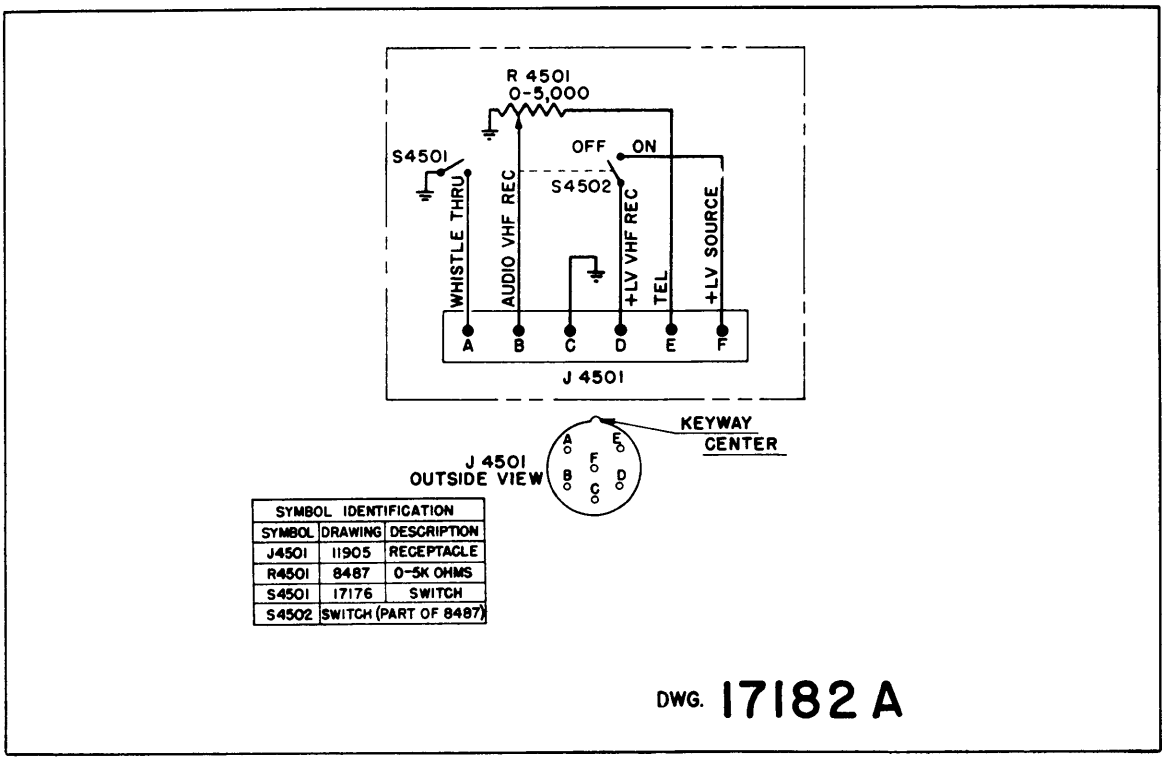
SYMBOL IDENTIFICATION TABLE		
SYMBOL NO.	DRAWING NO.	DESCRIPTION
J3601	12425	RECEPTACLE
R3601	201	200 OHMS
S3601	15288	PUSH SWITCH
I 3601	8622	LAMP (28V)
I 3602	8622	LAMP (28V)

Figure 55—A.R.C. Type C-50 Control Unit Schematic Diagram



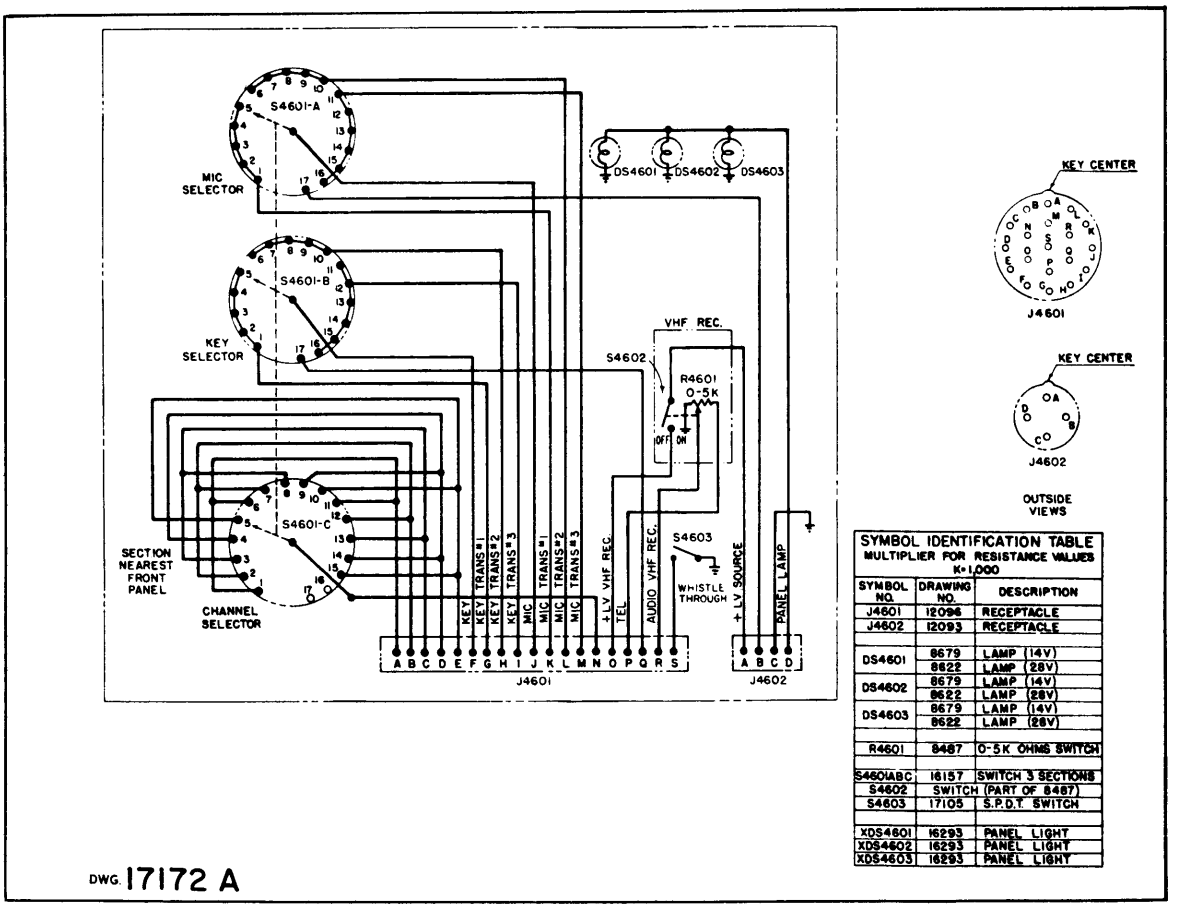
SYMBOL IDENTIFICATION TABLE		
SYMBOL NO.	DRAWING NO.	DESCRIPTION
I-3901	8622	LAMP (28V)
J-3901	12428	RECEPTACLE
R-3901	201(51)	RESISTOR, 51 OHMS, ½ W
S-3901	8085	SWITCH, DPST

Figur 56—A.R.C. Type C-51 Control Unit Schematic Diagram



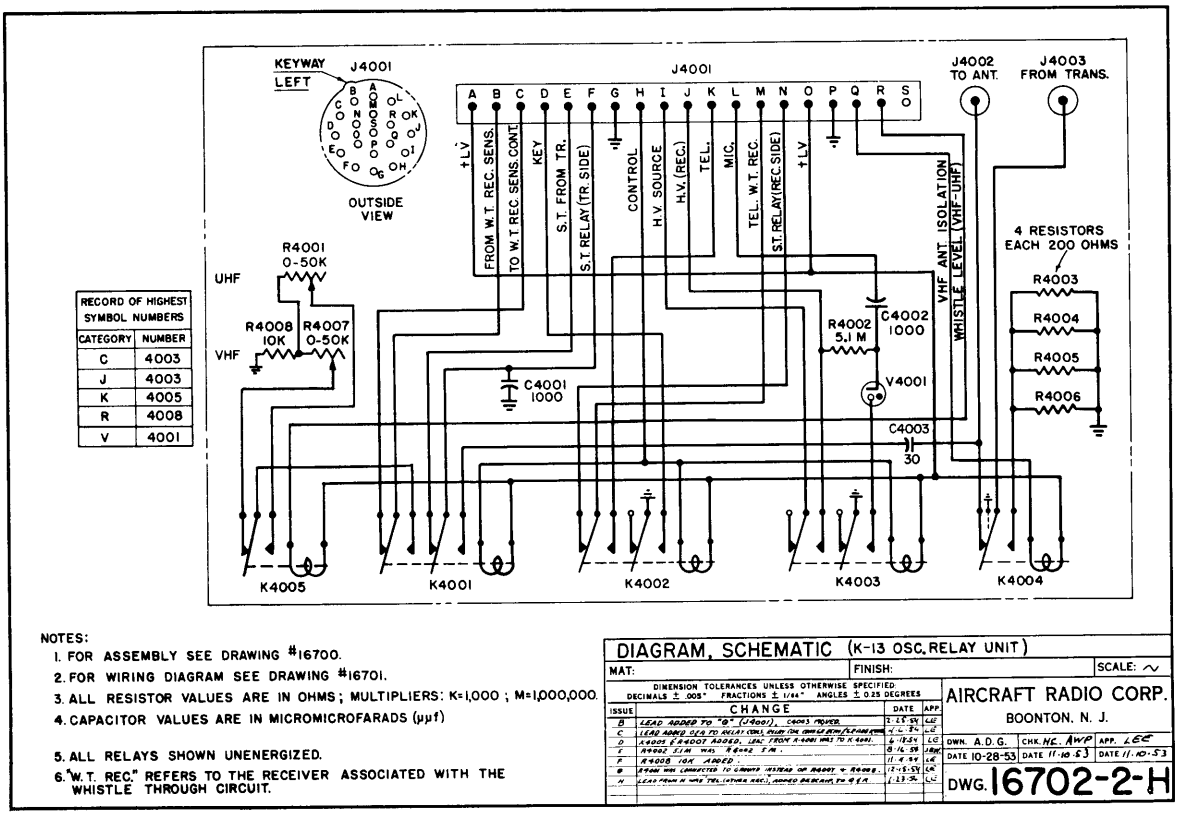
SYMBOL IDENTIFICATION		
SYMBOL	DRAWING	DESCRIPTION
J4501	11905	RECEPTACLE
R4501	8487	0-5K OHMS
S4501	17176	SWITCH
S4502	SWITCH (PART OF 8487)	

Figure 57—A.R.C. Type C-54 and C-55 Control Unit Schematic Diagram



SYMBOL IDENTIFICATION TABLE MULTIPLIER FOR RESISTANCE VALUES K=1,000		
SYMBOL NO.	DRAWING NO.	DESCRIPTION
J4601	12096	RECEPTACLE
J4602	12093	RECEPTACLE
DS4601	8679	LAMP (14V)
	8622	LAMP (28V)
DS4602	8679	LAMP (14V)
	8622	LAMP (28V)
DS4603	8679	LAMP (14V)
	8622	LAMP (28V)
R4601	8487	0-5K OHMS SWITCH
S4601ABC	16157	SWITCH 3 SECTIONS
S4602	SWITCH (PART OF 8487)	
S4603	17105	S.P.D.T. SWITCH
XDS4601	16293	PANEL LIGHT
XDS4602	16293	PANEL LIGHT
XDS4603	16293	PANEL LIGHT

Figur 58—A.R.C. Typ C-56 Contr l Unit Sch matic Diagram



RECORD OF HIGHEST SYMBOL NUMBERS	
CATEGORY	NUMBER
C	4003
J	4003
K	4005
R	4008
V	4001

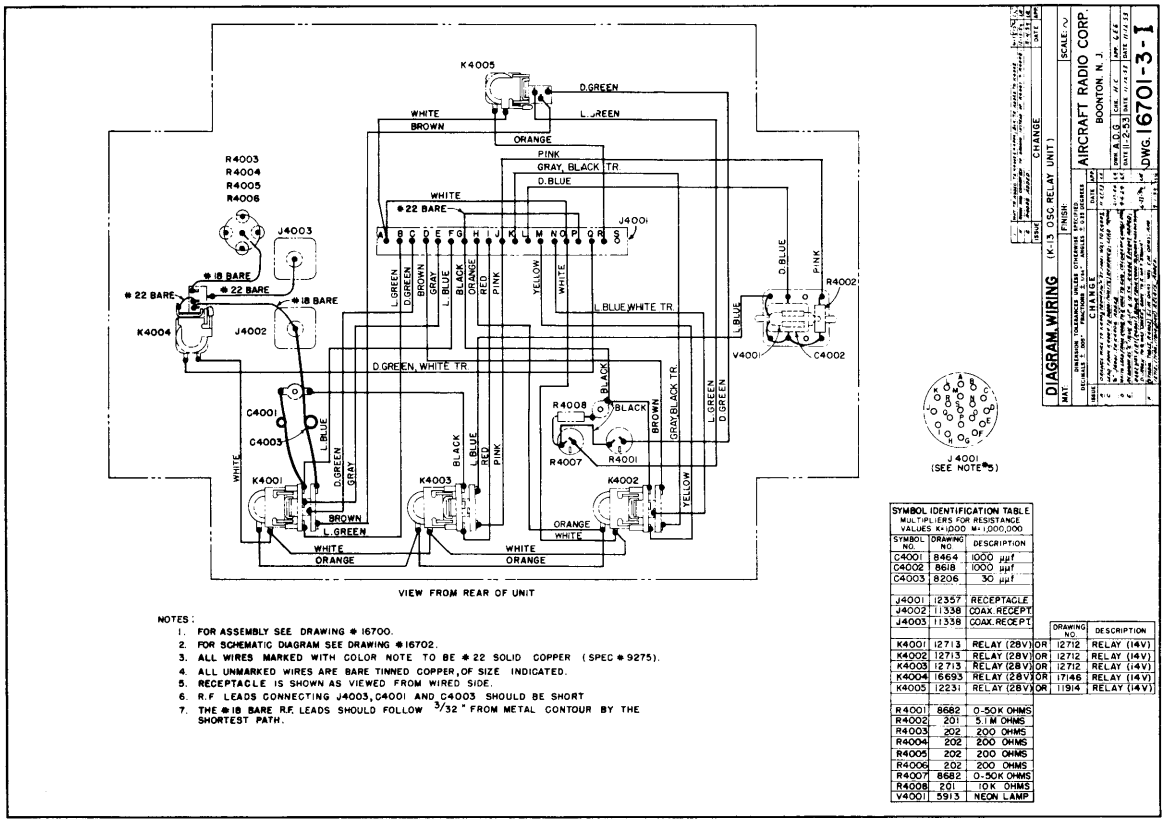
NOTES:
1. FOR ASSEMBLY SEE DRAWING #16700.
2. FOR WIRING DIAGRAM SEE DRAWING #16701.
3. ALL RESISTOR VALUES ARE IN OHMS; MULTIPLIERS: K=1,000 ; M=1,000,000.
4. CAPACITOR VALUES ARE IN MICROMICROFARADS (μμf)
5. ALL RELAYS SHOWN UNENERGIZED.
6. "W.T. REC." REFERS TO THE RECEIVER ASSOCIATED WITH THE WHISTLE THROUGH CIRCUIT.

DIAGRAM, SCHEMATIC (K-13 OSC. RELAY UNIT)
MAT: FINISH: SCALE: ~
DIMENSION TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMALS ± .005" FRACTIONS ± 1/64" ANGLES ± 0.25 DEGREES

ISSUE	CHANGE	DATE	APP.
B	LEAD ADDED TO "Q" (J4001), CABLE MOVED	2-25-54	LEE
C	LEAD ADDED CLO TO RELAY COIL, RELAY (THE CHASSIS BOTH) LEAD ADDED	4-6-54	LEE
D	X4005 & R4007 ADDED, LEAD FROM R4001 WAS TO K4001	6-17-54	LEE
E	R4002 5.1 M. WAS R4002 5 M.	8-16-54	LEE
F	R4008 10K ADDED	11-4-54	LEE
G	R4001 WAS CONNECTED TO CHASSIS INSTEAD OF R4007 & R4008.	12-15-54	LEE
H	LEAD FROM H VHF TEL. (ATHOL REC.) ADDED BREAKING TO G.F.	1-13-55	LEE

AIRCRAFT RADIO CORP.
BOONTON, N. J.
DWN. A.D.G. CHK. H.C. APP. LEE
DATE 10-28-53 DATE 11-10-53 DATE 11-10-53
DWG. 16702-2-H

Figure 59—A.R.C. Type K-13 Oscillator-Relay Unit Schematic Diagram



NOTES:
1. FOR ASSEMBLY SEE DRAWING # 16700.
2. FOR SCHEMATIC DIAGRAM SEE DRAWING # 16702.
3. ALL WIRES MARKED WITH COLOR NOTE TO BE # 22 SOLID COPPER (SPEC # 9275).
4. ALL UNMARKED WIRES ARE BARE TINNED COPPER, OF SIZE INDICATED.
5. RECEPTACLE IS SHOWN AS VIEWED FROM WIRED SIDE.
6. R.F. LEADS CONNECTING J4003, C4001 AND C4003 SHOULD BE SHORT
7. THE # 18 BARE R.F. LEADS SHOULD FOLLOW 3/32" FROM METAL CONTOUR BY THE SHORTEST PATH.

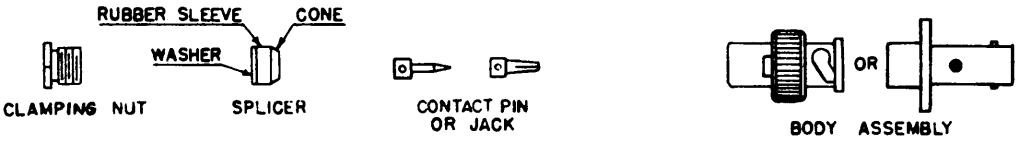
SYMBOL IDENTIFICATION TABLE
MULTIPLIERS FOR RESISTANCE VALUES K=1,000 M=1,000,000

SYMBOL NO.	DRAWING NO.	DESCRIPTION
C4001	8464	1000 μμf
C4002	8618	1000 μμf
C4003	8206	30 μμf
J4001	12357	RECEPTACLE
J4002	11338	COAX. RECEPT.
J4003	11338	COAX. RECEPT.
K4001	12713	RELAY (28V) OR 12712 RELAY (14V)
K4002	12713	RELAY (28V) OR 12712 RELAY (14V)
K4003	12713	RELAY (28V) OR 12712 RELAY (14V)
K4004	16693	RELAY (28V) OR 17146 RELAY (14V)
K4005	12231	RELAY (28V) OR 11914 RELAY (14V)
R4001	8682	0-50K OHMS
R4002	201	5.1 M OHMS
R4003	202	200 OHMS
R4004	202	200 OHMS
R4005	202	200 OHMS
R4006	202	200 OHMS
R4007	8682	0-50K OHMS
R4008	201	10K OHMS
V4001	5913	NEON LAMP

Figure 60—A.R.C. Typ K-13 Oscillat r-R lay Unit Wiring Diagram

ASSEMBLY INSTRUCTIONS

FOR BNC FITTINGS & SHIELDED CABLES



EQUIPMENT	STEP	OPERATION
CLAMPING NUT, CUT SHARP & EVEN	1	A- CUT END OF CABLE EVEN B- SLIDE CLAMPING NUT OVER CABLE.
VINYL JACKET, 1"	2	CUT OFF VINYL JACKET 1" FROM END OF CABLE EXPOSING BRAID, BEING CAREFUL NOT TO NICK BRAID.
OUTER BRAID, 17/32, CUT OFF	3	FAN BRAID OUT. CUT OFF INSULATION AND CENTER CONDUCTOR (PURPOSE OF THIS IS TO LEAVE SHARP END.)
INNER INSULATION, TAPERED OUTER BRAID	4	TAPER END OF BRAID (AS SHOWN). PURPOSE OF THIS IS TO SLIP SPLICER OVER BRAID & AGAINST VINYL JACKET.
SPLICER, NOTE TAPER	5	SLIDE SPLICER OVER TAPERED BRAID AND FORCE OVER & AGAINST OUTER VINYL JACKET.
CONE IN PLACE AGAINST VINYL JACKET, SEE NOTE, 1/8 APPROX.	6	WITH CONE IN PLACE, TRIM BRAID APPROX. 1/8" NOTE: IF CABLE IS DOUBLE SHIELDED TRIM OFF OUTER BRAID CLOSE TO CONE.
	7	FOLD BRAID BACK OVER CONE AND SMOOTH.
CENTER CONDUCTOR INSULATION, APPROX. 3/32, 1/8 APPROX.	8	A-CUT INNER INSULATION APPROX. TO 3/32. B-REMOVE INNER INSULATION. CUT CENTER CONDUCTOR TO INDICATED DIMENSION. C-TIN CENTER CONDUCTOR.
CONTACT PIN	9	HOLD CONTACT PIN WITH PLIERS AND INSERT CENTER CONDUCTOR INTO PIN. FILL HOLE WITH SOLDER.
SPLICER	10	REMOVE EXCESS SOLDER.
	11	BODY ASSEMBLY (ILLUSTRATED). SLIDE CABLE INTO BODY ASS'Y. TIGHTEN CLAMPING NUT. DO NOT TURN BODY WHILE TIGHTENING NUT AS THIS TWISTS THE RUBBER WASHER MAKING THE PLUG NON-WATERPROOF.
7/32	12	COMPLETED ASS'Y. SHOWN IN SECTION.

CHANGE	DATE	APP.
STEPS 5&8	10-5-45	LEE
TITLE	2-4-48	LEE
3 PART ORDER	7-7-48	WWH

ASSEMBLY SPECIFICATION

AIRCRAFT RADIO CORP.

DWN.	CHK.	APP.	DWG. NO.
A.D.G. 9-7-45	MC 9-19-45	LEE 9-19-45	11345-1-D

Figur 61—C ax Cable Ass mbly Instructi ns

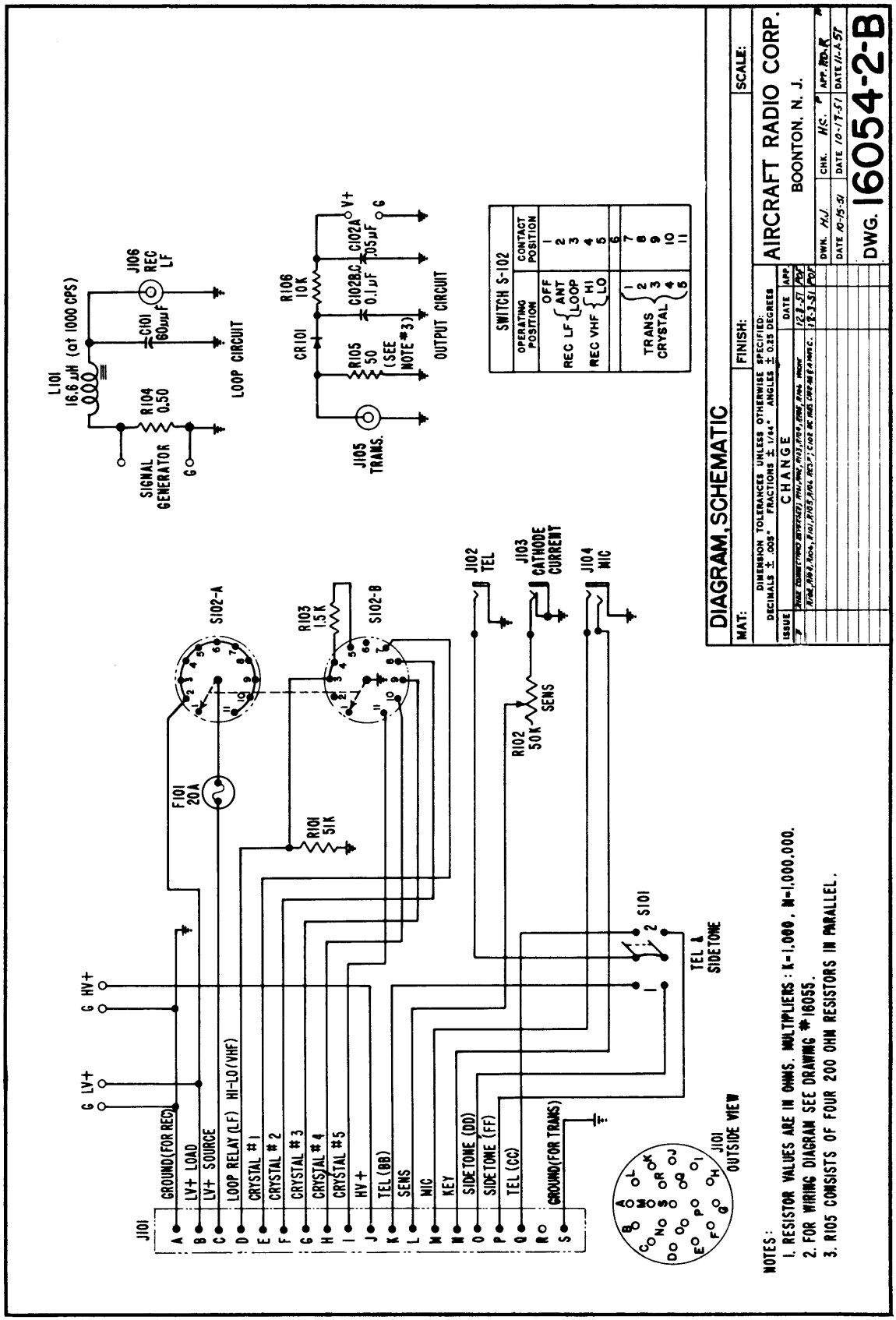


Figure 62—A.R.C. 15990 T st Unit Schematic Diagram

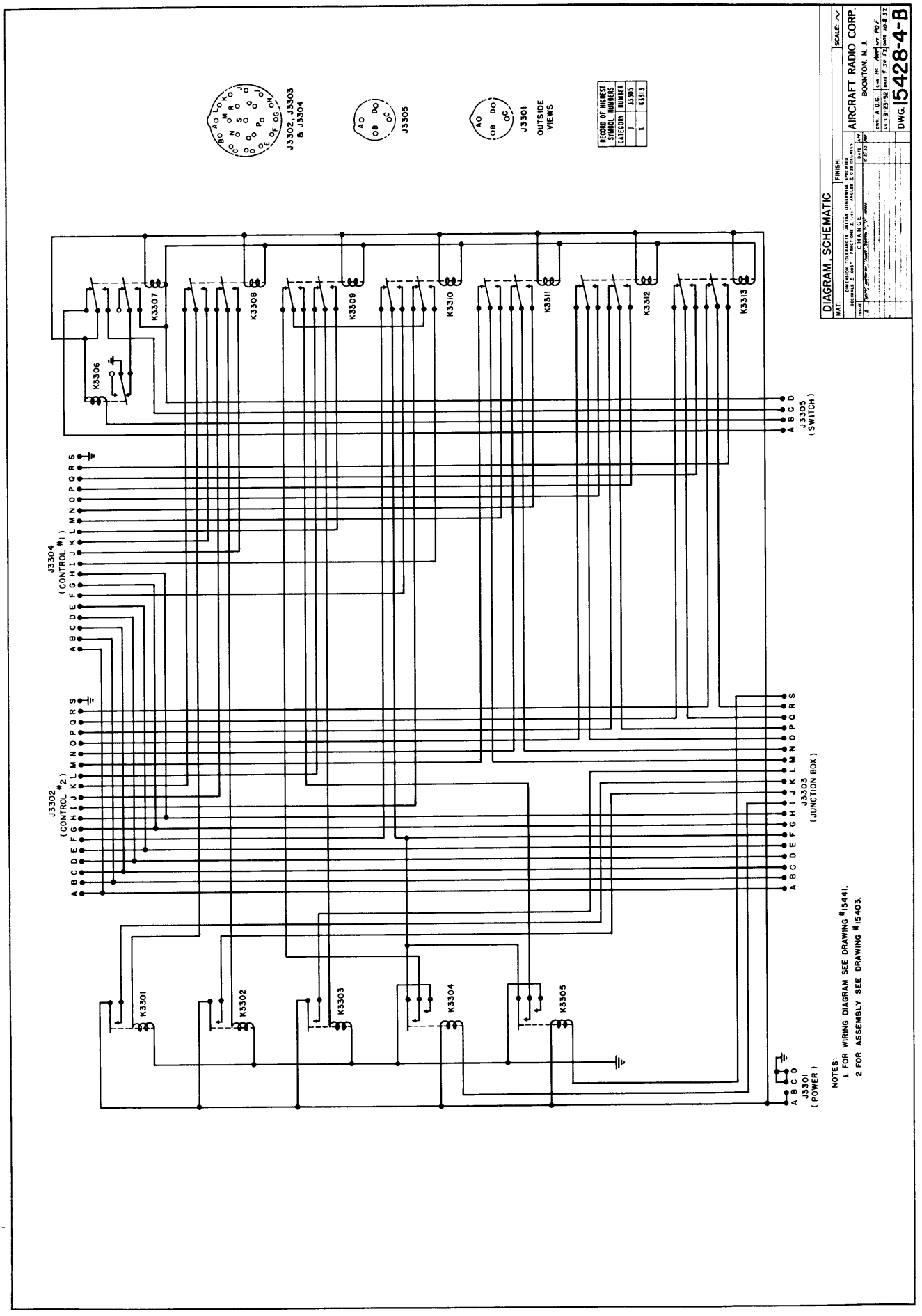


Figure 63—A.R.C. Typ K-12 R lay Unit Sch matic Diagram

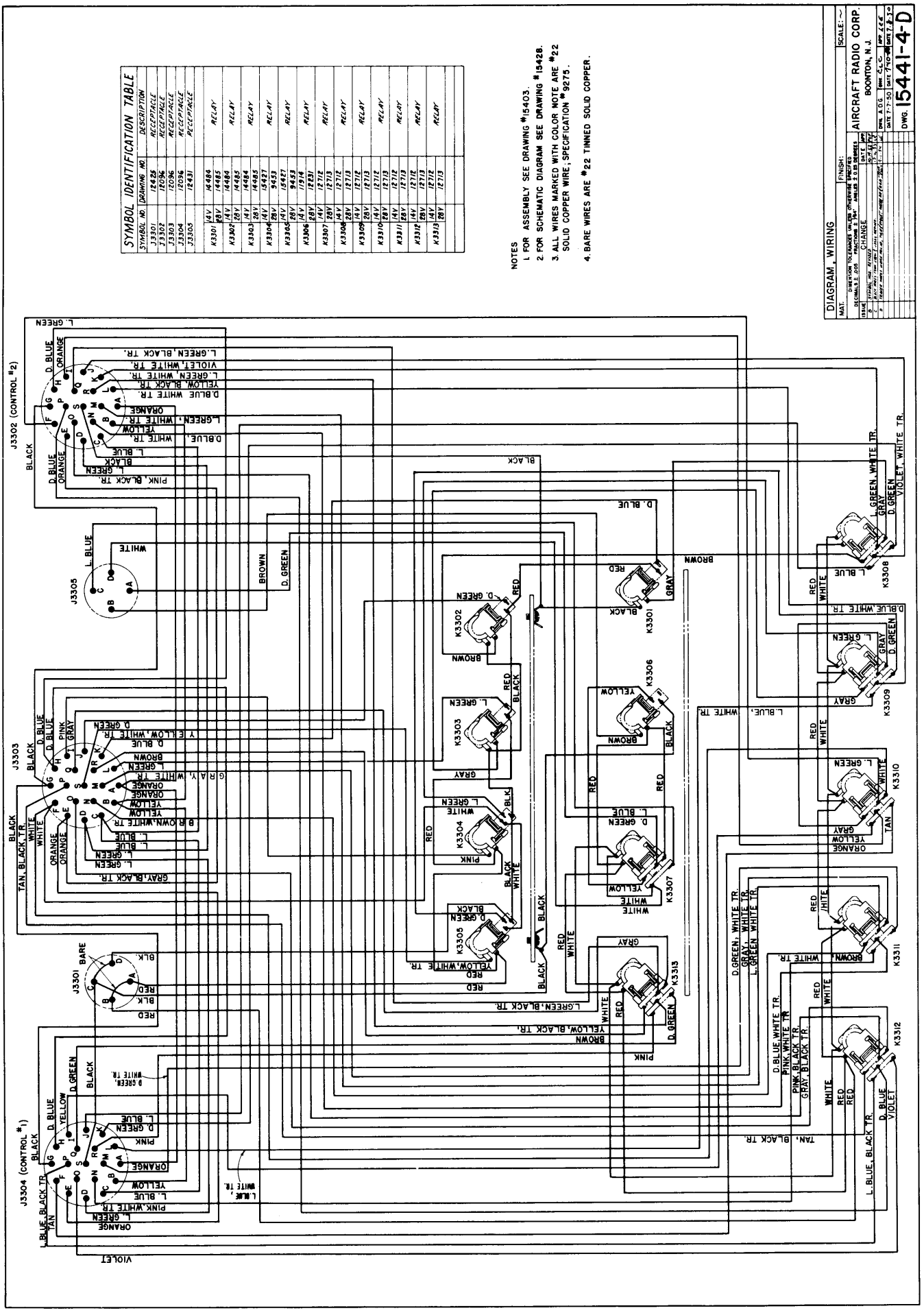


Figure 64—A.R.C. Type K-12 R lay Unit Wiring Diagram

A. R. C. TYPE 12

UHF and UHF-VHF EQUIPMENT

SUPPLEMENT TO INSTRUCTION BOOK FOR

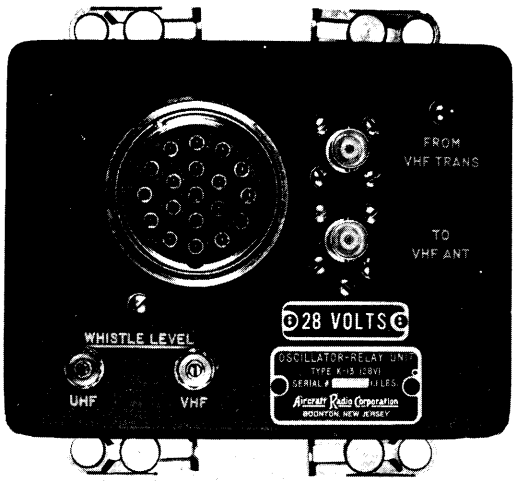
A. R. C. TYPE 12 EQUIPMENT

Manufactured by

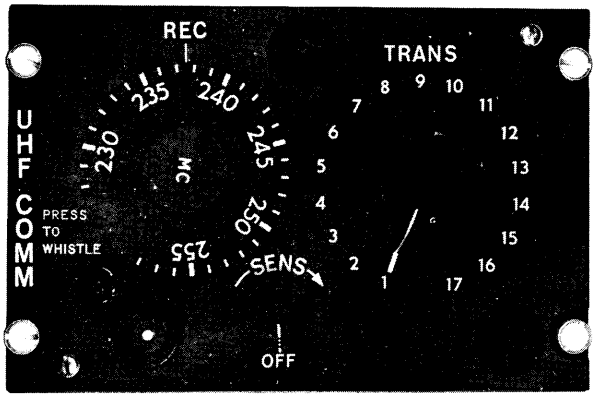
AIRCRAFT RADIO CORPORATION

Boonton, New Jersey

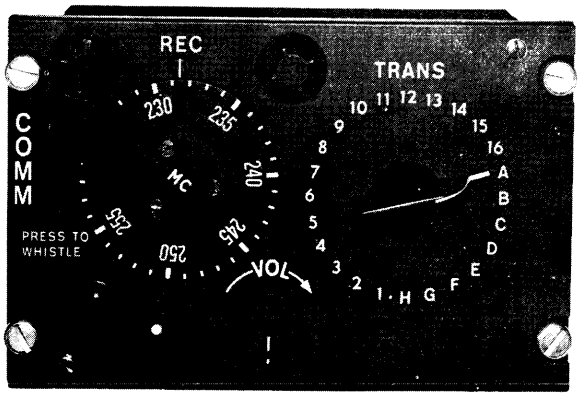
A.R.C. Typ TV-10 Transverter (228-258 mc.) Sh wn with M-12A Mounting Item 1.



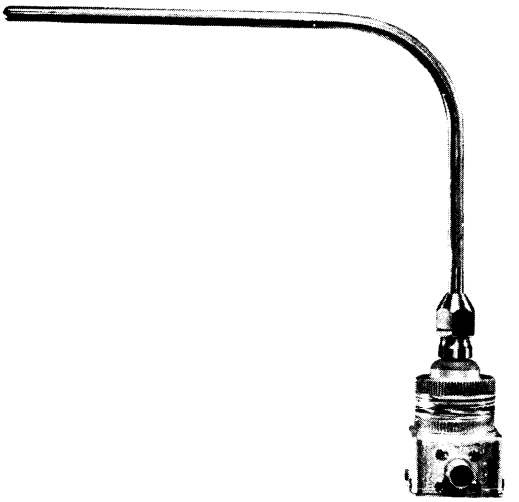
A.R.C. Type K-13 Oscillator-Relay Unit Shown with M-24 Mounting Item 2.



A.R.C. Type C-52 Edgelighted UHF Control Unit Item 3.



A.R.C. Typ C-53 Edgelight d UHF-VHF Control Unit Item 4.



A.R.C. Type A-16 UHF Ant nna It m 5.

Figur 1-1. UHF and UHF-VHF Compon nts f A.R.C. Typ 12 Equipm nt

TABLE OF CONTENTS

A. R. C. TYPE 12
UHF and UHF-VHF EQUIPMENT

SECTION I
GENERAL DESCRIPTION

1-1. INTRODUCTION

1-2. Radio Set ARC Type 12 is the designation assigned to a group of radio components which may be employed in various combinations to form a variety of LF, VHF and UHF communication and navigation systems. The specific components used will depend upon the particular requirements of the individual aircraft installation.

1-3. APPLICABLE HANDBOOKS

1-4. The LF and VHF components of ARC Type 12 have been covered in detail in the handbooks listed in Table 1-1 and, therefore, will not be discussed in this book except where they appear as part of a typical UHF-VHF communication system.

1-5. This instruction book pertains to the UHF components of ARC Type 12 and their application in several typical UHF and UHF-VHF installations. It is published for use by Military aircraft manufacturers until such time as the Military books covering the equipment are available.

1-6. PURPOSE OF EQUIPMENT

1-7. ARC Type 12 UHF and UHF-VHF communication equipment provides crystal-controlled amplitude-modulated voice transmission and continuously tunable reception in the UHF band of 228-258 mc or in the VHF band of 118-148 mc, or in both bands, as required.

1-8. COMPONENTS SUPPLIED

1-9. Table 1-2 lists the major units and accessories required to form complete UHF and UHF-VHF equipments for several typical installations.

1-10. COMPONENTS REQUIRED BUT NOT SUPPLIED

1-11. A suitable 28 volt d-c primary power source is required for operation of the equipment. A 20 ampere circuit breaker (in the + side of the primary power between the source and the equipment) is also required.

1-12. DESCRIPTION OF MAJOR UNITS

1-13. ARC TYPE TV-10 TRANSVERTER. (See Figure 1-1, Item 1). ARC Type TV-10 Transverter is a combination of an 8-channel, crystal-controlled UHF transmitter, 228-258 mc, and a receiver converter to convert incoming 228-258 mc signals to 118-148 mc after mixing with a 110 mc crystal oscillator. The converted signal is fed into the R-19 VHF Receiver, which is tunable from 118-148 mc. The converter portion of the TV-10 contains a 228-258 mc band pass network between the UHF antenna connection and a 1N82 crystal mixer. The output from the crystal mixer feeds into a 118-148 mc band pass coupling network whose output feeds into the R-19 Receiver input.

1-14. LEADING PARTICULARS

a) Frequency range: 228-258 mc.

b) Number of Transmitting Channels: Eight

TABLE 1-1. APPLICABLE ADDITIONAL HANDBOOKS

Handbook Title	*Designation*
Handbook of Operating Instructions	AN16-45-121 (12R2-4-1-1)
Handbook of Maintenance Instructions	AN16-45-122 (12R2-4-1-2)
Parts Catalog	T.O.16-45-123 (12R2-4-1-4)
A.R.C. Type 12 Equipment	Commercial

TABLE 1-2. COMPONENTS SUPPLIED

Quantity p r Installation				*Description*
UHF (1 TV-10)	*UHF (2 TV-10's)*	*UHF-VHF (1 VHF Trans.)*	*UHF-VHF (2 VHF Trans.)*	
1	2	1	1	TV-10(28v) Transverter with 8 crystals specified below
1	1	1	1	R-19(28v) Receiver
1	1	1	1	D-10A(28v) Dynamotor
2	3	2	2	M-12A Mounting
1	1	1	1	K-13(28v) Oscillator-Relay Unit
1	1	1	1	M-24 Mounting
1	1	—	—	C-52(28v) Control Unit
—	—	1	1	C-53(28v) Control Unit
—	—	1	1	A-15 VHF Antenna
1	2	1	1	A-16 UHF Antenna
—	—	1	1	T-11B(28v) Transmitter with 5 crystals specified below
		or	and	
—	—	1	1	T-13A(28v) Transmitter with 5 crystals specified below
1	1	1	1	J-13A(28v) Junction Box
2	2	2	2	J-10 Jack Box
—	—	1	2	M-11A Mounting
1	1	1	1	ARC-16158 Mechanical Linkage (Length as required)
2	3	5	6	ARC-11318 Coax Cable (Length as required)
4	6	10	12	ARC-11337 Connector
2	2	3	4	ARC-14051 Connector
1	2	1	1	ARC-16743 Connector
1	2	2	2	ARC-16744 Connector
1	1	1	1	ARC-16115 Connector
1	1	1	1	ARC-14320 Connector
1	1	1	2	ARC-14050 Connector
—	—	1	1	ARC-14491 Connector
—	—	1	2	ARC-14052 Connector
2	2	2	2	ARC-11935 Headset
2	2	2	2	ARC-11937 Microphone
2	2	2	2	ARC-11938 Headset Bracket
2	2	2	2	ARC-11936 Microphone Bracket
1	1	1	1	ARC-14589 Receptacle Cap
8	16	8	8	ARC-17142 Crystal Unit, UHF
—	—	5	10	ARC-14958 Crystal Unit, VHF

(may be all in one band 4 mc wide, or divided up between two bands, each 4 mc wide).

c) Crystals: Requires eight ARC-17142 crystals, or equivalent.

d) Transmitter Power Output: 0.5 watt.

e) Distance Range: Transmitting,—55-60 miles at 5000 feet altitude. Receiving,—line-of-sight distances.

f) Sensitivity over the UHF band (TV-10 with R-19): Approximately 7 microvolts to produce 10 mw into 300 ohms, with 30% mod, 400 cps signal, signal to signal + noise ratio of 10 db.

g) Tube Complement: (4) Type 5763, (2) Type 6201.

h) Power Input Requirements:
HV—obtained from R-19 Receiver.
LV—1.65 a. at 28 v. dc.

i) Mounting: Type M-12A, shockproof.

j) Weight: 5.9 pounds including Mounting.

k) Overall Dimensions, including Mounting:
4¾" wide, 11 21/32" long, 5¾" high.

1-15. ARC TYPE K-13 OSCILLATOR-RELAY UNIT. (See Figure 1-1, Item 2). ARC Type K-13 Oscillator-Relay provides a means for using the crystal-controlled transmitter as an rf source for precise tuning of the VHF receiver. The K-13 is operated by means of the receiver tuning crank on the C-52 or C-53 Control Unit. When the tuning crank is pushed for "whistle-thru," the K-13 performs the following functions:

a) connects high voltage to receiver and transmitter simultaneously.

b) reduces receiver sensitivity to a low value.

c) connects transmitter output to a 50 ohm dummy load.

d) switches microphone out of circuit.

e) turns on a relaxation-type tone oscillator; injects this af into the microphone input circuit to provide more than 20% tone modulation.

f) connects headset (TEL) to output of the particular receiver being tuned, while disconnecting it from all other receivers.

1-16. LEADING PARTICULARS

a) External Adjustments:
UHF whistle level.
VHF whistle level.

b) Power Input Requirements:
HV—obtained from R-19 Receiver.
LV—0.5a. at 28 v. dc.

c) Mounting: Type M-24.

d) Weight: 1.2 pounds including Mounting.

e) Overall Dimensions, including Mounting:
5 1/16" wide, 5" high, 2¾" deep.

1-17. ARC TYPE C-52 CONTROL UNIT. (See Figure 1-1, Item 3). ARC Type C-52 Control Unit is edgelighted and designed for standard AN console type mounting. It contains all controls required for the remote operation of one R-19 Receiver, one K-13 Oscillator-Relay Unit and one or two TV-10 Transverters.

1-18. The controls consist of—

a) Combination power switch and volume control.

b) Combination receiver tuning control and "whistle-thru" control.

c) Transmitter channel-selector switch for selection of interphone and up to 16 UHF channels.

1-19. All electrical and mechanical connections are brought out through the rear of the unit. An external 28 volt dc source and a panel light control are required for edgelighting.

1-20. LEADING PARTICULARS

a) Dial Frequency Range: 228-258 mc.

b) Power Input Requirements, panel lighted: 0.12a. at 28 v. dc.

c) Weight: 1.4 pounds.

d) Overall Dimensions:
5¾" wide, 3¾" high, 3¾" deep.

1-21. ARC TYPE C-53 CONTROL UNIT (See Figure 1, Item 4). ARC Type C-53 Control Unit is an edgelighted, AN console mounted unit designed for the remote operation of one R-19 Receiver, one, two or three VHF transmitters, one K-13 Oscillator-Relay Unit and one TV-10 Transverter.

1-22. The controls consist of—

a) Combination power switch and volume control.

b) Combination receiver tuning control and "whistle-thru" control.

c) Transmitter channel-selector switch for selection of up to 15 VHF channels, interphone, and 8 UHF channels.

1-23. When the channel-selector switch is changed from VHF band to UHF band, the UHF transmitter is made ready for operation, the UHF converter is turned on and connected to the R-19 Receiver, the receiver tuning-dial numerals shift to the UHF band, and the UHF antenna replaces the VHF antenna.

1-24. All electrical and mechanical connections are brought out and through the rear of the unit. An external 28 volt dc source and a panel light control are required for edgelighting.

TABLE 1-3. 28v DC SYSTEM POWER REQUIREMENTS

System Components	*Approx. Maximum Current Drain**
UHF System with One Transverter, consisting of: (1) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-52 and (1) J-13A	5.2 amps
UHF System with Two Transverters, consisting of: (2) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-52 and (1) J-13A	6.4 amps
UHF-VHF System with One VHF Transmitter, consisting of: (1) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-53, (1) T-11B or T-13A, and (1) J-13A	6.0 amps
UHF-VHF System with Two VHF Transmitters, consisting of: (1) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-53, (2) T-11B's or T-13A's or 1 of each, and (1) J-13A	6.8 amps

*Current drain measured with all components connected normally to a stable 28v DC supply, and operating in the "WHISTLE-THRU" position with TRANS selector switch set on UHF high band.

1-25. LEADING PARTICULARS

a) Dial Frequency Ranges:
VHF 118-148 mc.
UHF 228-258 mc.

b) Power Input Requirements:
VHF positions, panel lighted—0.12 a. at 28 v. dc.
UHF positions, panel lighted—0.23 a. at 28 v. dc.

c) Weight: 1.5 pounds.

d) Overall dimensions:
5¾" wide, 3¾" high, 3¾" deep.

1-26. ARC TYPE A-16 ANTENNA. (See Figure 1-1, Item 5). ARC Type A-16 Antenna is a quarter-wave, base fed, inverted "L" type designed to operate in the UHF band. It consists of a ¼" diameter, stainless steel, "L" shaped rod mounted on a small aluminum box containing broadbanding circuitry and a BNC receptacle for coupling to 52 ohm coaxial transmission line such as RG-58/U. This antenna works satisfactorily under mild icing conditions and has been used successfully on aircraft with speeds in excess of 500 mph. It is particularly suitable for belly-mounting on low ground clearance aircraft.

1-27. LEADING PARTICULARS

a) VSWR: Less than 2:1 in the frequency range of 228-258 mc.

b) Dimensions: 6" vertical, 7" horizontal.

c) Weight: 0.37 pound.

d) Mounting: Single hole, 1 inch diameter.

1-28. SYSTEM POWER REQUIREMENTS

1-29. Table 1-3 lists the combined power requirements of the major units of ARC Type 12 that may be used in UHF and UHF-VHF systems.

1-30. SYSTEM WEIGHTS

1-31. Table 1-4 lists the total weights of several typical ARC Type 12 UHF and UHF-VHF systems.

1-32. OPERATING LIMITATIONS

1-33. Normal operation should be obtained from —55°C to + 71°C. Under extreme hot weather operating conditions, precautions should be taken to ensure adequate circulation of air around the equipment.

1-34. ARC Type 12 Equipment may be operated up to 50,000 feet altitude.

TABLE 1-4. SYSTEM WEIGHTS

System Components	**Approx. Total Weight (Lbs.)*
UHF System with One Transverter, consisting of: (1) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-52, (1) J-13A, (1) M-24, (2) M-12A, (1) A-16, (2) J-10, all required plugs	19.3
UHF System with Two Transverters, consisting of: (2) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-52, (1) J-13A, (1) M-24, (3) M-12A, (2) A-16, (2) J-10, all required plugs	25.4
UHF-VHF System with One VHF Transmitter, consisting of: (1) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-53, (1) T-11B or T-13A, (1) J-13A, (1) M-24, (2) M-12A, (1) M-11A, (1) A-15, (1) A-16, (2) J-10, all required plugs	24.0
UHF-VHF System with Two VHF Transmitters, consisting of: (1) TV-10, (1) R-19 with Dynamotor, (1) K-13, (1) C-53, (2) T-11B's or T-13A's or 1 of each, (1) J-13A, (1) M-24, (3) M-12A, (2) M-11A, (1) A-15, (1) A-16, (2) J-10, all required plugs	27.5

*System weight does not include headsets, microphones, mechanical linkage, or external wiring.

SECTION II

PREPARATION FOR USE

2-1. PREPARING THE EQUIPMENT

2-2. No special procedures are required to prepare the equipment for use. However, visually inspect the electron tubes and other readily visible parts of the components for possible damage incurred during shipment.

2-3. Check that transmitter crystals are properly installed in ascending order of frequency starting with crystal position number one (crystal "A" in TV-10).

2-4. INSTALLING THE EQUIPMENT

2-5. The location and installation of the equipment will depend on the aircraft in which it is to be installed. See the Type 12 Commercial Handbook referenced in Table 1-1 for general installation considerations.

2-6. CABLE FABRICATION

2-7. No cable assemblies are supplied with the equipment, however, all the necessary parts, except wire, are supplied. The actual wiring and length of the cable assemblies will depend upon the components used and the location of the equipment in the aircraft. Cable fabrication instructions will be found in the appropriate handbooks referenced in Table 1-1. External wiring and cabling diagrams of typical UHF and UHF-VHF installations will be found in Section V of this supplement.

2-8. MECHANICAL LINKAGE FABRICATION

2-9. Mechanical Linkage fabrication instructions are covered in detail in the Type 12 Commercial Handbook.

2-10. FINAL ADJUSTMENTS AFTER INSTALLATION

2-11. TUNING DIAL ALIGNMENT. Align tuning dial with receiver as follows:

a) Connect mechanical linkage to R-19 Receiver and C-52 or C-53 Control Unit.

b) Connect up all cables and turn equipment ON.

c) Set transmitter selector switch to a frequency near the high end of the band.

d) Rotate the tuning control in "whistle-thru" position, and tune for maximum whistle.

) Disengage mechanical linkage at either end, and rotate tuning control until the dial reads the exact frequency to which the TRANS switch has been set.

f) Reconnect the mechanical linkage; being careful not to change the relative position of the shafting and tuning dial.

g) Check alignment at several other crystal frequencies.

2-12. WHISTLE LEVEL ADJUSTMENT. Separate controls for UHF and VHF whistle level adjustment will be found on the front of the K-13 Oscillator-Relay Unit. With VOL control set at maximum and a Ballantine Model 300 VTVM, or equivalent, connected across a 300 ohm load on TEL, set TRANS switch to any operable UHF position and adjust UHF whistle-level for 1 volt output. Then set TRANS switch to any operable VHF position and adjust VHF whistle level for 1 volt output.

2-13. VHF TRANSMITTER ADJUSTMENTS FOR MAXIMUM RF OUTPUT. Adjustment procedure is covered in detail in the applicable handbooks referenced in Table 1-1.

2-14. UHF TRANSMITTER ADJUSTMENTS FOR MAXIMUM RF OUTPUT.

a) Check that antennas are connected normally.

b) With crystals properly installed, turn equipment ON and set TRANS switch to the UHF frequency nearest to the center of the upper 4 mc spread employed.

c) Connect a 1000 ohm/volt or 20,000 ohm/volt meter (3 volt scale) between TEST jack on front panel and ground.

d) Depress microphone button and check tuned circuits numbered HI 1, 2, 3, 4 for maximum output. Note that the #4 HI band trimmer tunes in an opposite sense from all the other trimmers; i.e., clockwise rotation raises frequency.

e) Set TRANS switch to the UHF frequency nearest to the center of the lower 4 mc spread employed, and, with microphone button depressed, check tuned circuits numbered LO 1, 2, 3, 4 for maximum output.

SECTION III

OPERATING PROCEDURES

3-1. DESCRIPTION OF OPERATING CONTROLS

3-2. All controls for the operation of the components of Type 12 UHF and UHF-VHF equipments are contained in the C-52 and C-53 control units respectively. The OFF-VOL control, tuning crank—"whistle-thru" control, and channel selector switch are all clearly marked and their functions are self-evident.

3-3. OPERATION, PREFLIGHT

3-4. *a*) Switch aircraft electrical system ON.

b) Turn OFF-VOL control full clockwise and allow equipment to warm up for 2 or 3 minutes.

c) Set TRANS selector switch to position 1 and tune receiver to exact crystal frequency by pressing the receiver tuning knob while tuning for maximum "whistle."

d) Press microphone button and check for presence of sidetone.

e) Make a two-way radio check on each crystal frequency if facilities are available.

f) Check interphone operation.

g) Check operation of any other microphones and headsets.

h) Turn OFF-VOL control full counterclockwise.

i) Switch aircraft electrical system OFF.

3-5. OPERATION, AIRBORNE

3-6. *a*) Turn OFF-VOL control full clockwise and allow equipment to warm-up for 2 or 3 minutes.

b) Set TRANS switch to desired transmitting frequency.

c) Tune receiver to desired receiving frequency (using whistle-thru facility for precise tuning if reception is desired on one of the crystal frequencies).

d) Press microphone button and speak directly into the microphone.

e) Release microphone button to receive.

3-7. OPERATION, SECURE

3-8. *a*) Turn OFF-VOL control full counterclockwise.

b) Switch airplane electrical system OFF.

SECTION IV

MAINTENANCE

4-1. TEST EQUIPMENT AND TOOLS REQUIRED

4-2. In addition to the test equipment listed in the commercial instruction book for A.R.C. Type 12 Equipment, the following items will be required to bench test and tune up the equipment covered in this supplement:

a) Hewlett-Packard Model 608A, B, C or D Signal Generator (10mc-500 mc), or equivalent.

b) Hewlett-Packard Model 410B VTVM or equivalent.

c) Bench Test Harness wired per External Wiring Diagram 17264.

d) A complete UHF-VHF equipment with 1 VHF transmitter excepting only mountings and connectors (See column 3 of Table 1-2 for the complete list of components and the quantity required).

4-3. ALIGNMENT AND ADJUSTMENT PROCEDURES

4-4. Paragraphs 2-10 through 2-14 cover various final adjustments after installation.

4-5. UHF transmitter output power may be checked by means of the Bird Termaline Model 61 RF Wattmeter when the transmitter is keyed. An alternate method is to measure the voltage drop across the 50 ohm dummy load in the TV-10 with the Hewlett-Packard VTVM, or similar instrument under "whistle-thru" conditions. A voltage reading of about 5 volts may be considered normal.

4-6. It will be necessary to check the tuning of the 110 mc crystal oscillator tank circuit (C4235 and L4212 on drawing 16922) whenever the 110 mc oscillator tube (V4206) is changed. This may be accomplished by connecting a Weston Model 301 1 ma. meter between J4205 and ground. Adjust L4212 tuning slug for maximum crystal current then turn slug further into coil until crystal current is reduced to 80% of its maximum value.

4-7. Use of a bench test harness will facilitate bench testing, adjusting, and trouble-shooting all units. Initial trouble-shooting is usually accomplished by replacing one unit of a normally operative installation by a unit suspected of being faulty.

4-8. Refer to Table 1-1 for applicable handbooks containing test details, voltages and component values for Type 12 VHF Equipment.

SECTION V

SEQUENCE OF DIAGRAMS

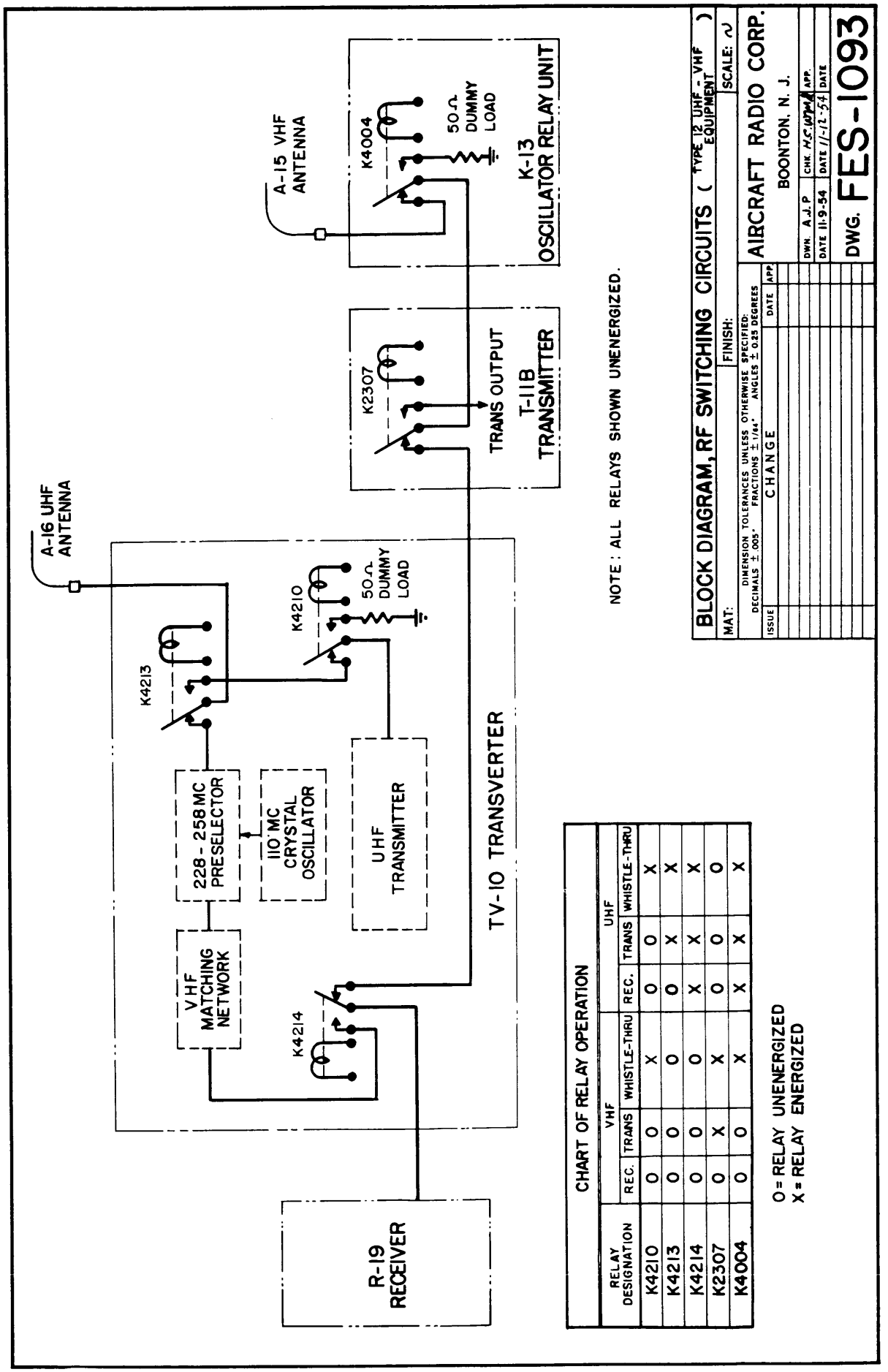
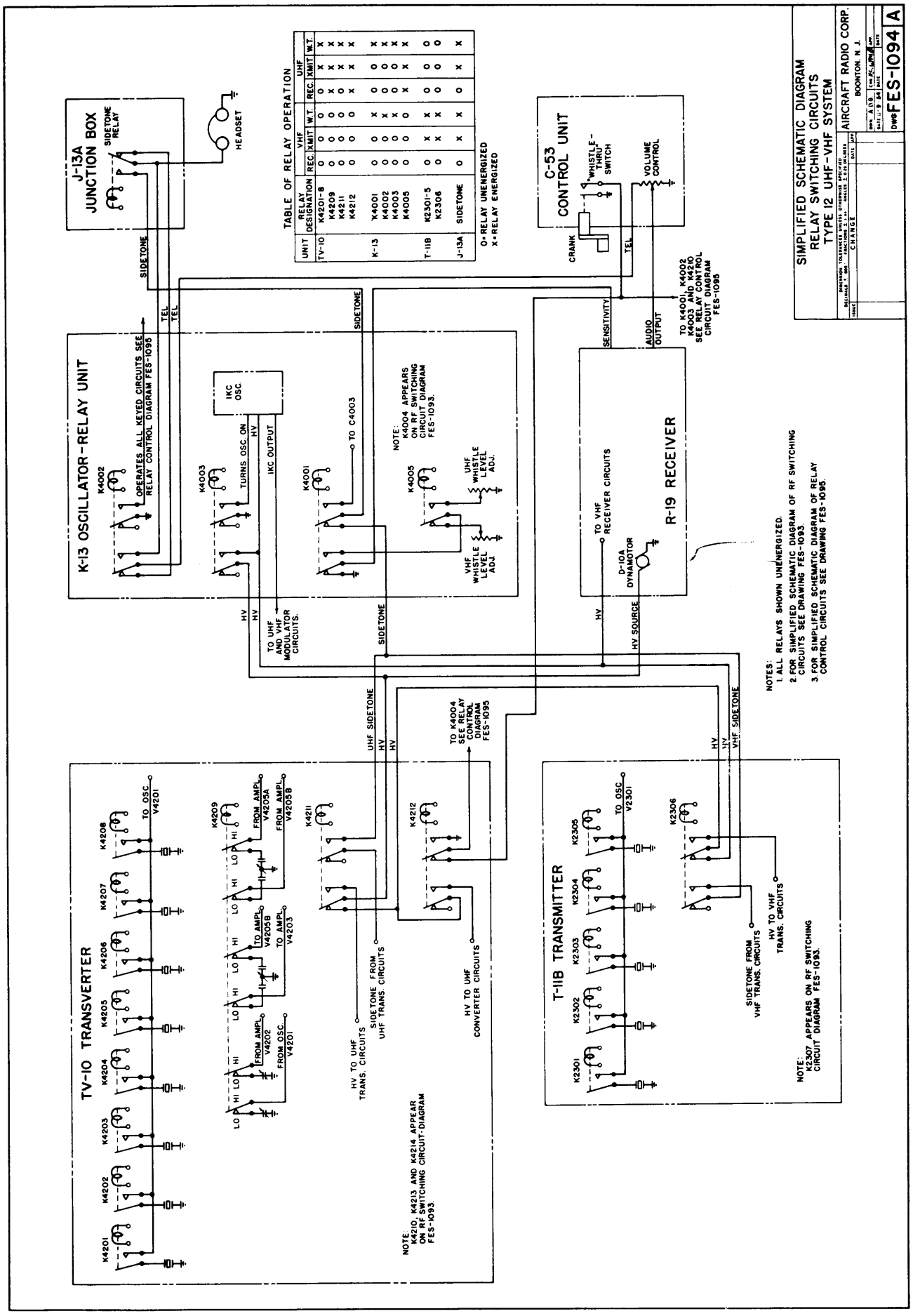


CHART OF RELAY OPERATION

RELAY DESIGNATION	VHF REC.	VHF TRANS	VHF WHISTLE-THRU	UHF REC.	UHF TRANS	UHF WHISTLE-THRU
K4210	0	0	X	0	0	X
K4213	0	0	0	0	X	X
K4214	0	0	0	X	X	X
K2307	0	X	X	0	0	0
K4004	0	0	X	X	X	X

O = RELAY UNENERGIZED
X = RELAY ENERGIZED

Figur 5-1—Simplifi d Sch matic Diagram f RF Switching Circuits



Figur 5-2—Simplifi d Sch matic Diagram f R lay Switching Circuits

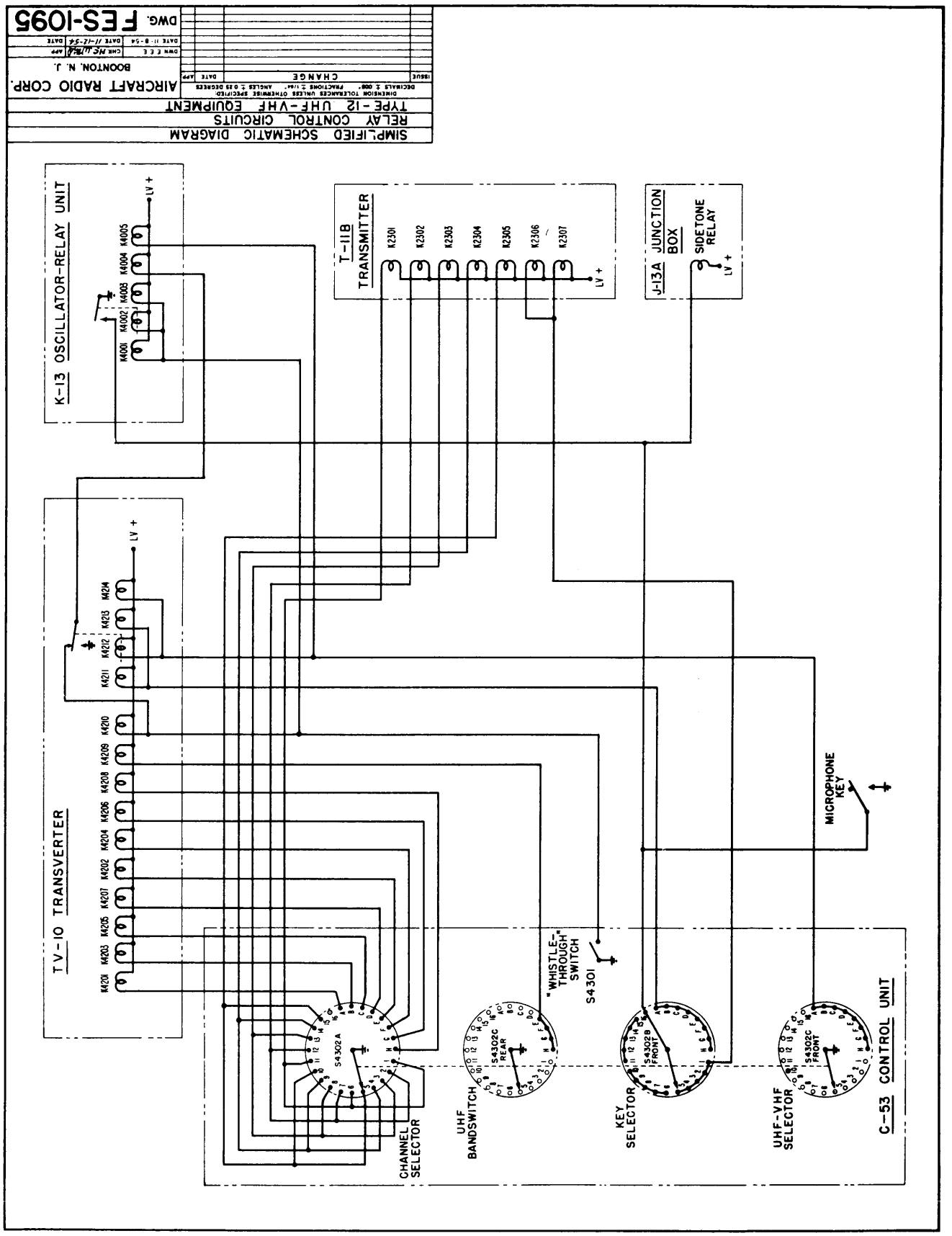
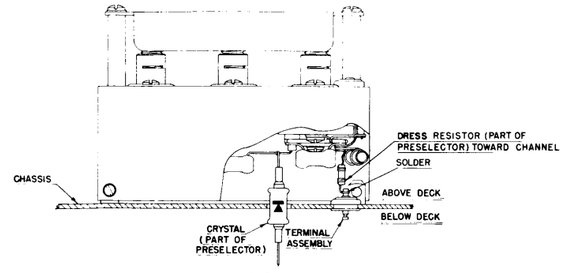
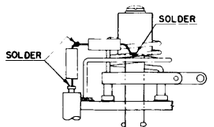


Figure 5-3—Simplified Schematic Diagram of Relay Control Circuits

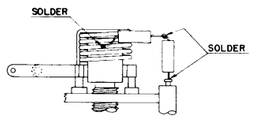
WIRING ABOVE TUBE DECK



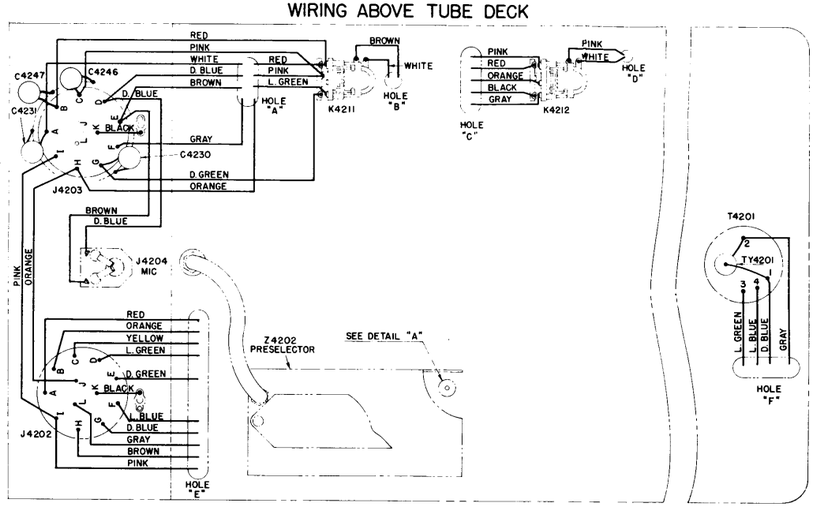
DETAIL "A"



DETAIL "B"
VIEWED TOWARD FRONT OF SET



DETAIL "C"
VIEWED TOWARD BACK OF SET

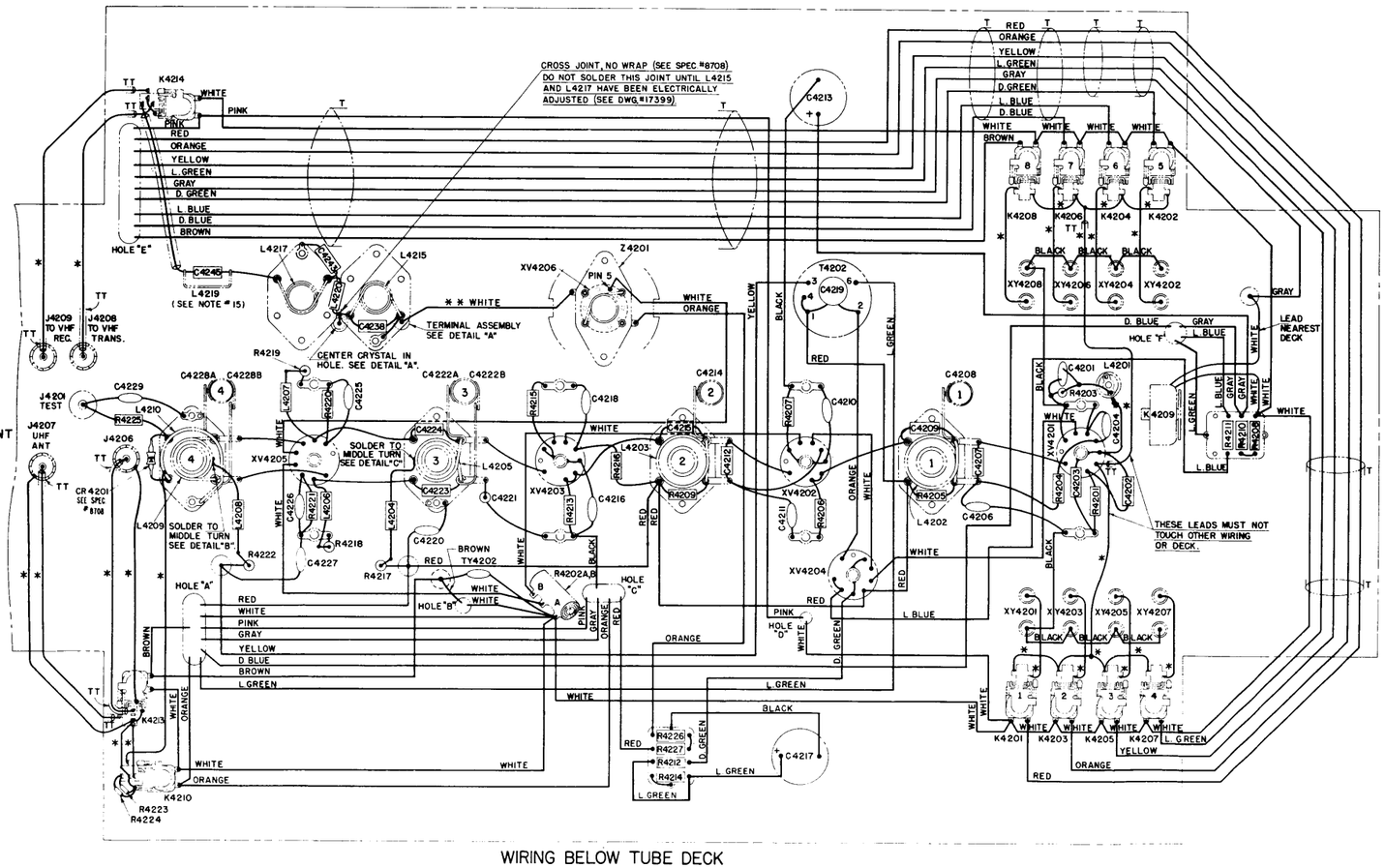


SYMBOL IDENTIFICATION TABLE

MULTIPLIER FOR RESISTANCE VALUE K=1,000

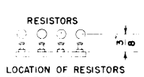
SYMBOL NO.	DWG. NO.	DESCRIPTION	SYMBOL NO.	DWG. NO.	DESCRIPTION	SYMBOL NO.	DWG. NO.	DESCRIPTON
C 4201	8625	.0022 μF	K 4204	14764	RELAY ASSEMBLY			
C 4202	8242	35 μμF	K 4205	14764	RELAY ASSEMBLY			
C 4203	8013	120 μμF	K 4206	14764	RELAY ASSEMBLY			
C 4204	8625	.0022 μF	K 4207	14764	RELAY ASSEMBLY			
C 4206	8625	.0022 μF	K 4208	14764	RELAY ASSEMBLY			
C 4207	8240	57 μμF	K 4209	17039	SOLENOID			
C 4208	17121	ΔC = 18 μμF	K 4210	16693	RELAY ASSEMBLY			
C 4209	4520	100 μμF	K 4211	12713	RELAY ASSEMBLY			
C 4210	8625	.0022 μF	K 4212	12713	RELAY ASSEMBLY	T 4201	6861	MIC TRANSFORMER
C 4211	8625	.0022 μF	K 4213	17022	RELAY ASSEMBLY	T 4202	19015	MOD TRANSFORMER
C 4212	8697	13 μμF	K 4214	16693	RELAY ASSEMBLY			
C 4213	5416	15 μF						
C 4214	17122	ΔC = 11 μμF				TY 4201	8684	RESISTOR, THYRITE
C 4215	4520	100 μμF				TY 4202	8683	RESISTOR, THYRITE
C 4216	8625	.0022 μF	L 4201	14528	RF CHOKE .84 MH			
C 4217	5416	15 μF	L 4202	12040	COIL (POSITION # 1)			
C 4218	8625	.0022 μF	L 4203	17157	COIL (POSITION # 2)	V 4201	TYPE 5763	VACUUM TUBE
C 4219	8626	.0047 μF	L 4204	15174	RF CHOKE 14 μH	V 4202	TYPE 5763	VACUUM TUBE
C 4220	8625	.0022 μF	L 4205	17158	COIL (POSITION #3)	V 4203	TYPE 5763	VACUUM TUBE
C 4221	8701	8.0 μμF	L 4206	15174	RF CHOKE 14 μH	V 4204	TYPE 5763	VACUUM TUBE
C 4222 A	17123	ΔC = 5 μμF	L 4207	15174	RF CHOKE 14 μH	V 4205	TYPE 6L6GA	VACUUM TUBE
C 4222 B		ΔC = 5 μμF	L 4208	14141	RF CHOKE 5 μH	V 4206	TYPE 6L6GA	VACUUM TUBE
C 4223	4520	100 μμF	L 4209	19011	COIL (POSITION #4)			
C 4224	4520	100 μμF	L 4210	17164	COIL (COUPLING #4)			
C 4225	8624	680 μμF	L 4215	PART OF COUPLING UNIT ASSEM. #17565		XV 4201	15830	SOCKET, 9 PIN
C 4226	8624	680 μμF	L 4217	PART OF COUPLING UNIT ASSEM. #17566		XV 4202	15230	SOCKET, 9 PIN
C 4227	8624	680 μμF	L 4219	PART OF BRACKET ASSEMBLY #17144		XV 4203	15230	SOCKET, 9 PIN
C 4228 A	17124	ΔC = 2.8 μμF	L 4220	17567	COIL 0.41 μH	XV 4204	15230	SOCKET, 9 PIN
C 4228 B		ΔC = 2.8 μμF				XV 4205	15230	SOCKET, 9 PIN
C 4229	8624	680 μμF	R 4201	204- 8700	100K OHMS	XV 4206	PART OF OSCILLATOR ASSEM. #17038	
C 4230	8625	.0022 μF	R 4202 A		2.6 OHMS			
C 4231	8625	.0022 μF	R 4202 B		1.6 OHMS			
C 4238	PART OF COUPLING UNIT ASSEM. #17565		R 4203	204	560 OHMS	XY 4201	16946	CRYSTAL SOCKET
			R 4204	201	300K OHMS	XY 4202	16946	CRYSTAL SOCKET
C 4243	PART OF COUPLING UNIT ASSEM. #17566.		R 4205	204	180 OHMS	XY 4203	16946	CRYSTAL SOCKET
C 4245	PART OF BRACKET ASSEM. #17144.		R 4206	204	100K OHMS	XY 4204	16946	CRYSTAL SOCKET
C 4246	8625	.0022 μF	R 4207	204	270 OHMS	XY 4205	16946	CRYSTAL SOCKET
C 4247	8625	.0022 μF	R 4208	201	200 OHMS	XY 4206	16946	CRYSTAL SOCKET
			R 4209	204	180 OHMS	XY 4207	16946	CRYSTAL SOCKET
			R 4210	201	200 OHMS	XY 4208	16946	CRYSTAL SOCKET
			R 4211	201	1K OHMS			
CR 4201	16964	1N82 CRYSTAL RECTIFIER	R 4212	201	51 OHMS			
			R 4213	202	33K OHMS	Y 4201	17142	CRYSTAL
			R 4214	201	130 OHMS	Y 4202	17142	CRYSTAL
J 4201	13152	TEST JACK	R 4215	201	270 OHMS	Y 4203	17142	CRYSTAL
J 4202	16715	RECEPTACLE ASSEMBLY.	R 4216	204	4.7K OHMS	Y 4204	17142	CRYSTAL
J 4203	16714	RECEPTACLE ASSEMBLY.	R 4217	201	51 OHMS	Y 4205	17142	CRYSTAL
J 4204	9391	JACK ASSEMBLY (MIC)	R 4218	201	33K OHMS	Y 4206	17142	CRYSTAL
J 4206	15185	UG-625/U	R 4219	201	33K OHMS	Y 4207	17142	CRYSTAL
J 4207	15185	UG-625/U	R 4220	204	220 OHMS	Y 4208	17142	CRYSTAL
J 4208	15185	UG-625/U	R 4221	204	220 OHMS			
J 4209	15185	UG-625/U	R 4222	201	51 OHMS			
			R 4223	204	100 OHMS	Z 4201	17038	OSCILLATOR ASSEM. (1.0 MC)
			R 4224	204	100 OHMS	Z 4202	17040	PRESELECTOR ASSEM. U.H.F.
K 4201	14764	RELAY ASSEMBLY	R 4225	204	470 OHMS			
K 4202	14764	RELAY ASSEMBLY	R 4226	201	10 K OHMS			
K 4203	14764	RELAY ASSEMBLY	R 4227	201	10 K OHMS			

WIRING BELOW TUBE DECK



NOTES:

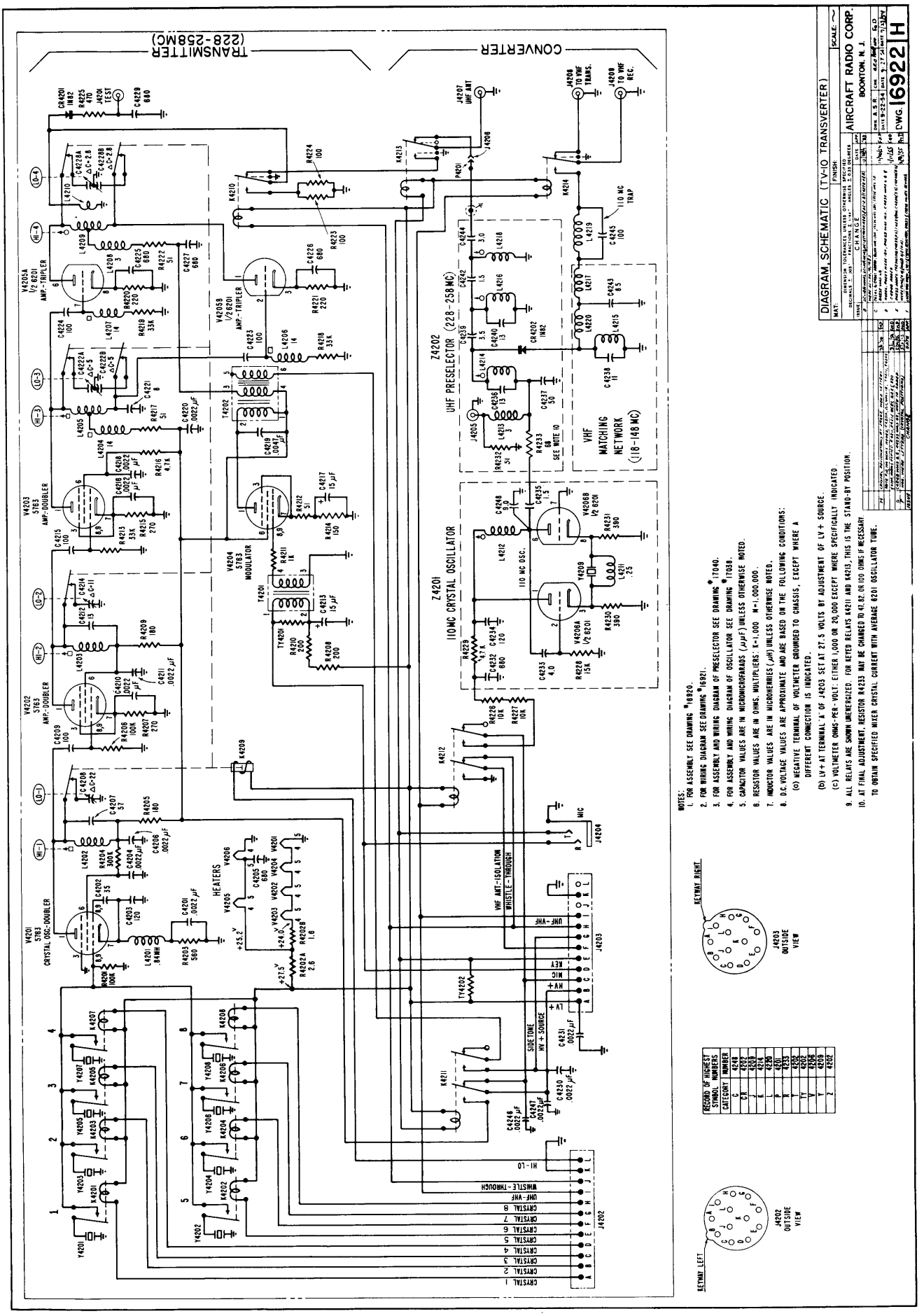
1. FOR MAIN ASSEMBLY SEE DRAWING # 16920 .
2. FOR SCHEMATIC DIAGRAM SEE DRAWING # 16922 .
3. FOR ASSEMBLY AND WIRING DIAGRAM OF PRESELECTOR SEE DRAWING # 17040 .
4. FOR ASSEMBLY AND WIRING DIAGRAM OF OSCILLATOR SEE DRAWING # 17038 .
5. FOR ASSEMBLY DETAILS OF L4202, L4203, L4205, L4209 AND L4210 AND POSITION OF ASSOCIATED COMPONENTS, SEE MAIN ASSEMBLY DRAWING # 16920 .
6. ALL WIRES MARKED WITH COLOR NOTE ARE # 24 SOLID COPPER (SPEC. # 12499) .
7. ALL UNMARKED WIRES ARE BARE # 24 TINNED SOLID COPPER .
8. ALL WIRES MARKED (*) ARE BARE BRAIDED # 24 TINNED COPPER (SPEC. # 12212) .
9. ALL WIRES MARKED (**) WITH COLOR NOTE ARE TEFLON INSULATED # 22 SOLID COPPER (SPEC. # 8677) .
10. INSTALL TUBING (SPEC. # 8288) OF .034" I.D. OVER WIRES MARKED "TT" .
11. INSTALL TUBING (SPEC. # 8288) OF APPROPRIATE SIZE OVER GROUPS OF WIRES MARKED "T" .
12. KEEP "MINIATURE SOCKET WIRING PLUGS" IN ALL MINIATURE SOCKETS THROUGHOUT WIRING OPERATION .
13. THE SOLDERED TERMINALS AND CONTACT ARMS OF RELAYS K4211 AND K4212 MUST CLEAR THE INSIDE OF THE ASSOCIATED CHANNEL COVER BY AT LEAST .035" .
14. DO NOT SOLDER CLOSER THAN 3/16" TO ANY R.F. CHOKE OR RESISTOR ; DO NOT SHORTEN LEADS ON ANY CRYSTAL RECTIFIER.
15. MOUNT BRACKET (L4219) PARALLEL TO DECK OF CHASSIS WITH CLEARANCE TO DECK OF $\frac{7}{32}$" ($\pm \frac{1}{32}$").



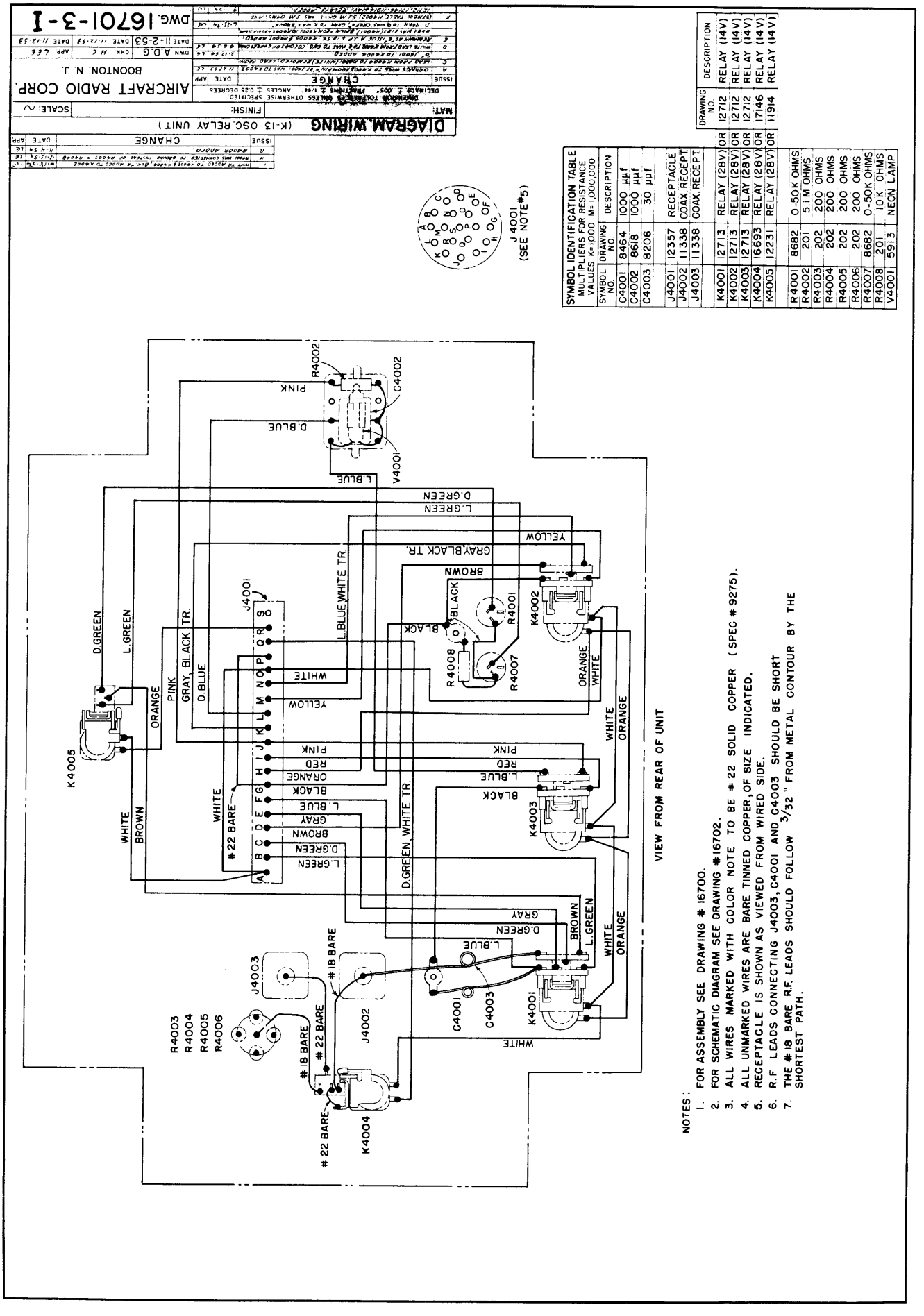
DIAGRAM, WIRING	(TV-10 TRANSVERTER)				
MAT:	FINISH:	SCALE:			
CHANGE	DATE	APP	AIRCRAFT RADIO CORP. BOONTON N.J.		
DWG. 16921	H				

TV-10

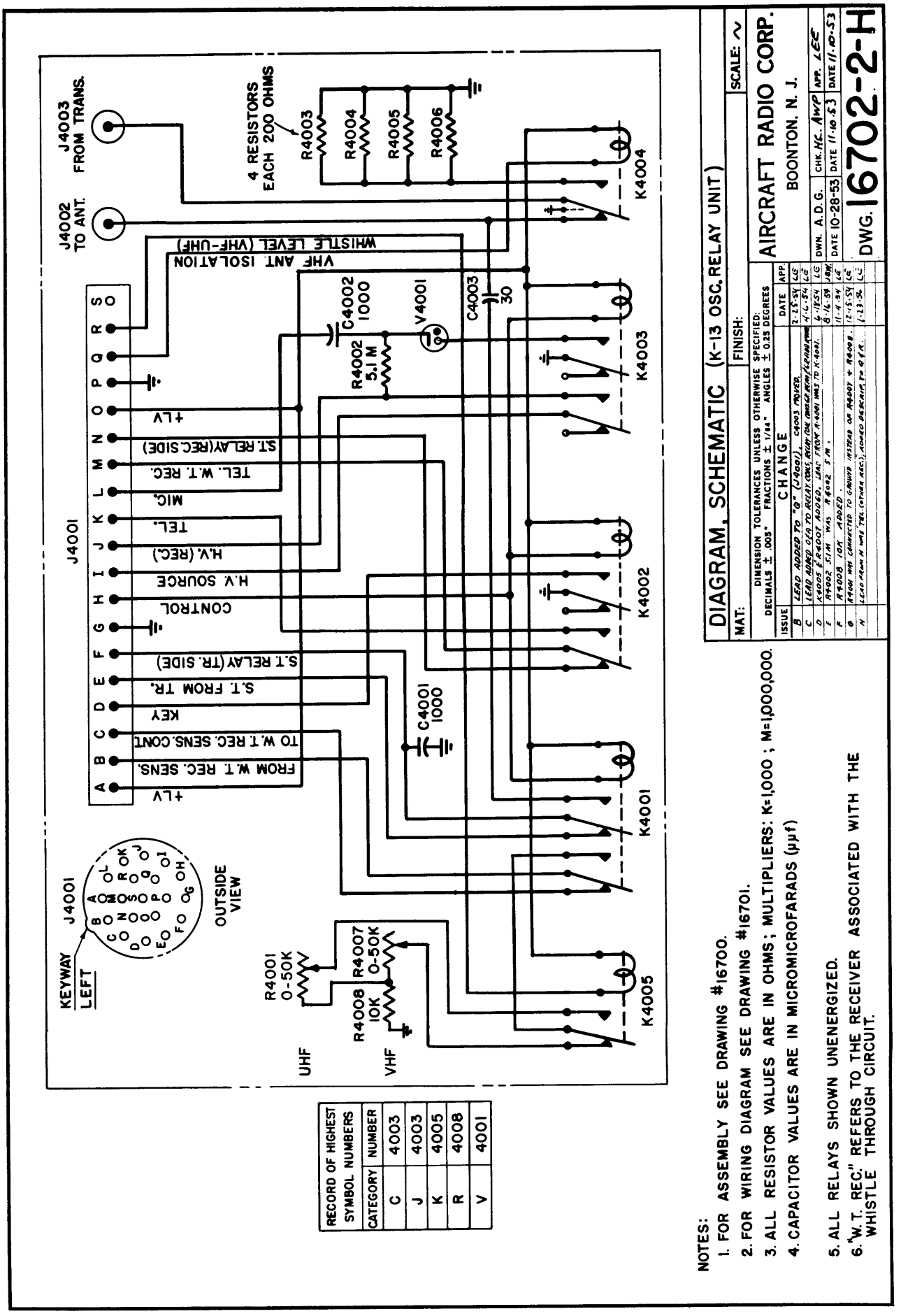
Figur 5-4—A.R.C. Type TV-10 Transverter Wiring Diagram



Figur 5-5—A.R.C. Typ TV-10 Transv rt r Sch matic Diagram



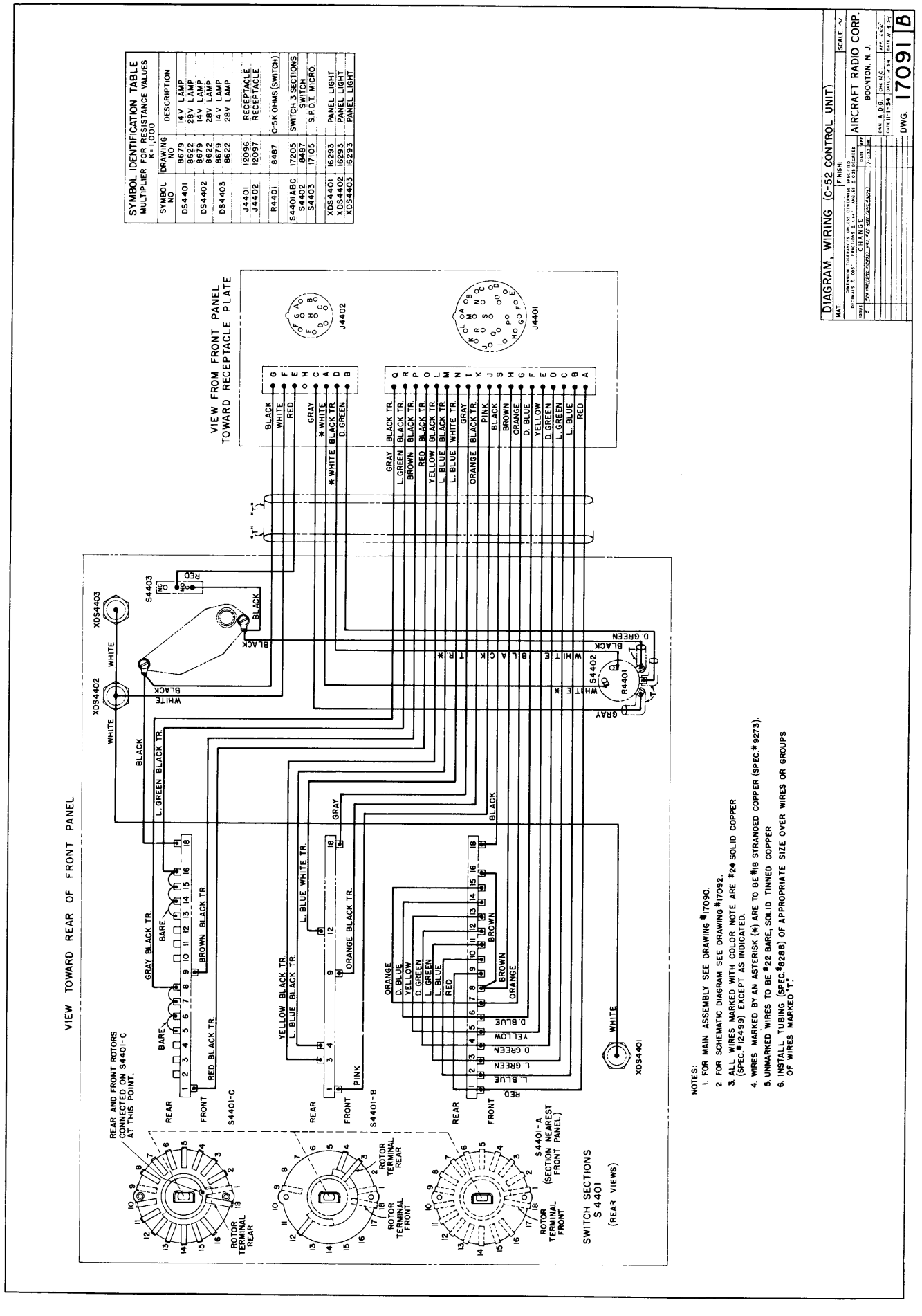
Figur 5-6—A.R.C. Typ K-13 Oscillat r-R lay Unit Wiring Diagram



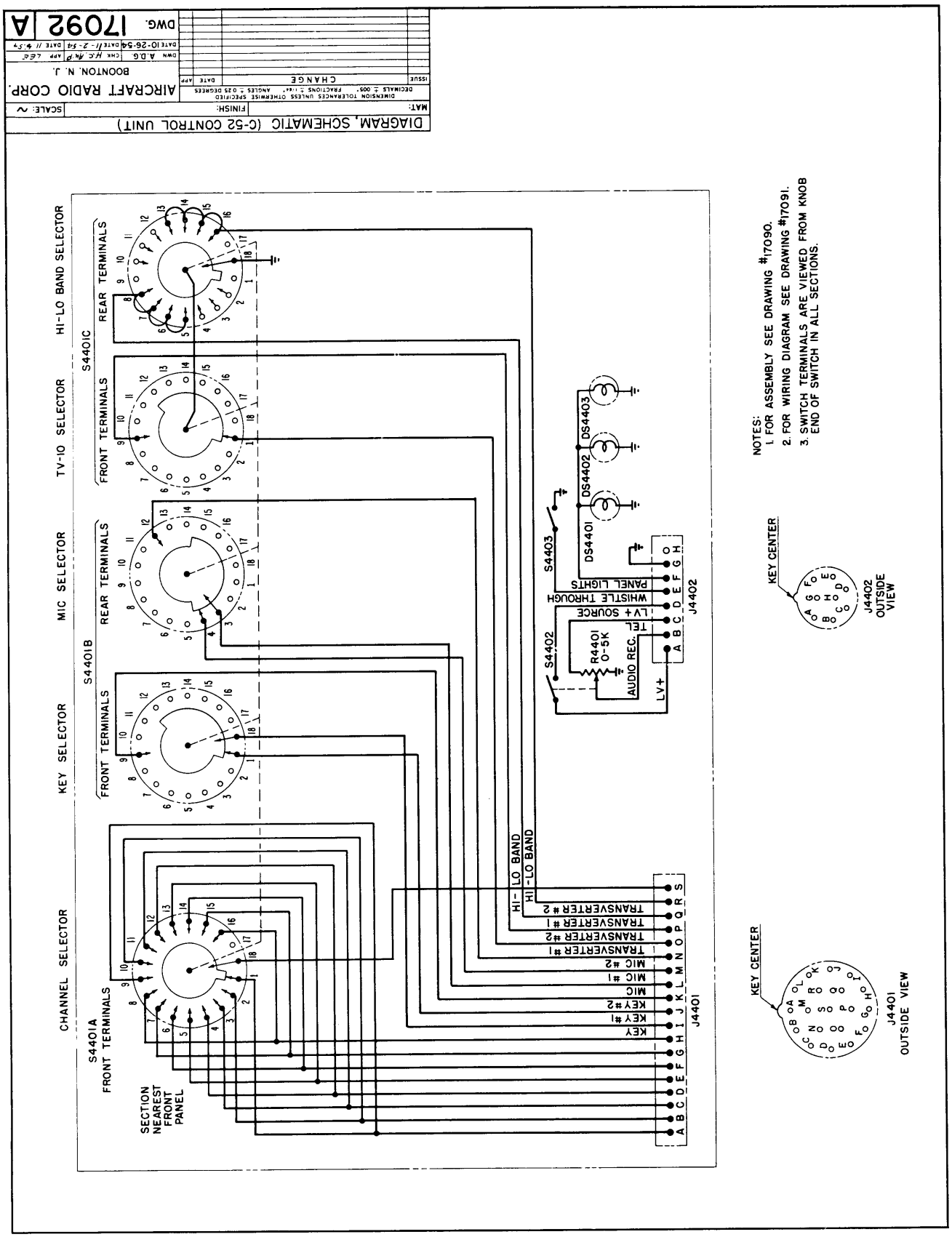
NOTES:
1. FOR ASSEMBLY SEE DRAWING #16700.
2. FOR WIRING DIAGRAM SEE DRAWING #16701.
3. ALL RESISTOR VALUES ARE IN OHMS; MULTIPLIERS: K=1,000; M=1,000,000.
4. CAPACITOR VALUES ARE IN MICROMICROFARADS (μμf)
5. ALL RELAYS SHOWN UNENERGIZED.
6. "W.T. REC." REFERS TO THE RECEIVER ASSOCIATED WITH THE WHISTLE THROUGH CIRCUIT.

RECORD OF HIGHEST SYMBOL NUMBERS	
CATEGORY	NUMBER
C	4003
J	4003
K	4005
R	4008
V	4001

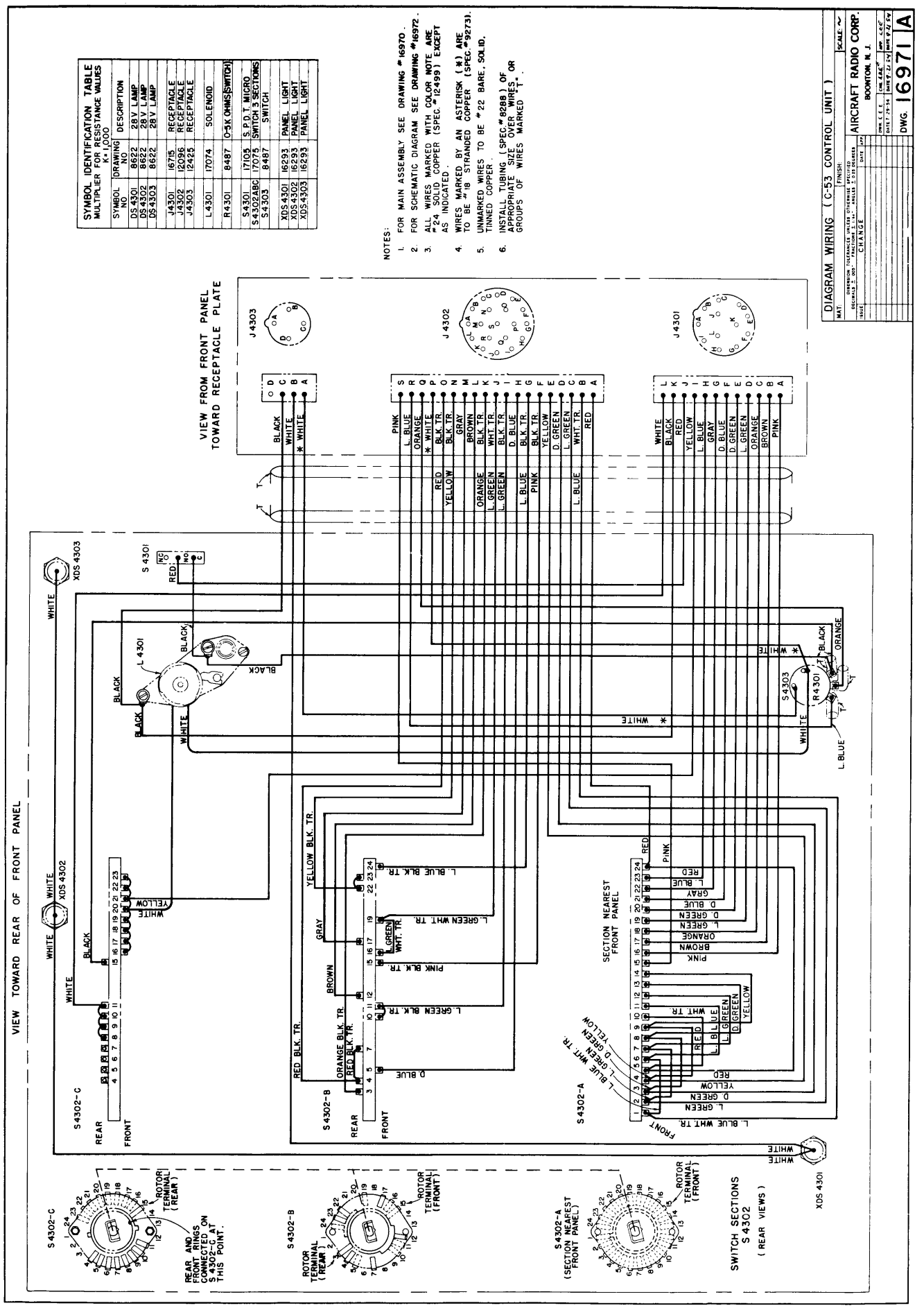
Figur 5-7—A.R.C. Typ K-13 Oscillat r-R lay Unit Sch matic Diagram



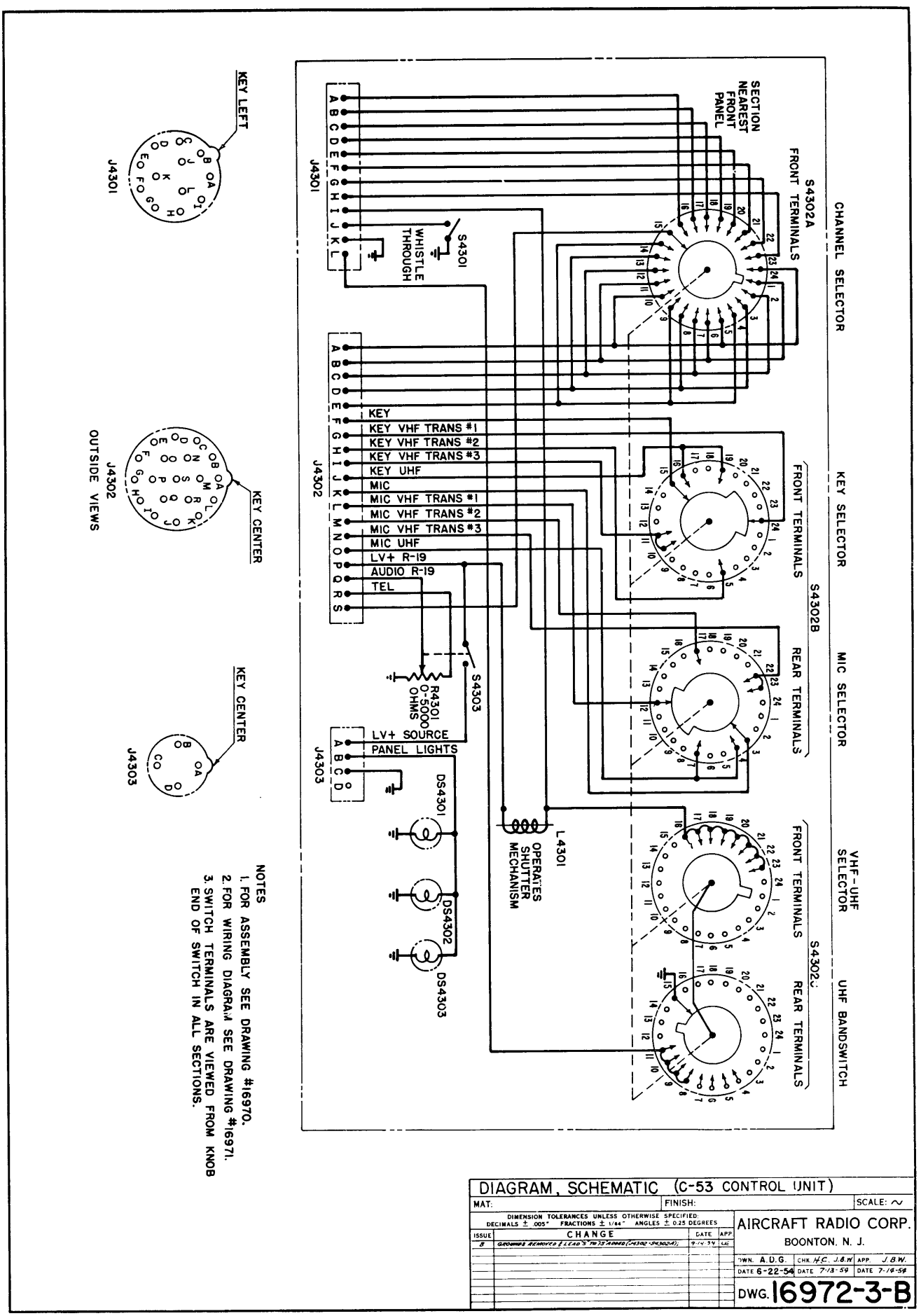
Figur 5-8—A.R.C. Type C-52 Control Unit Wiring Diagram



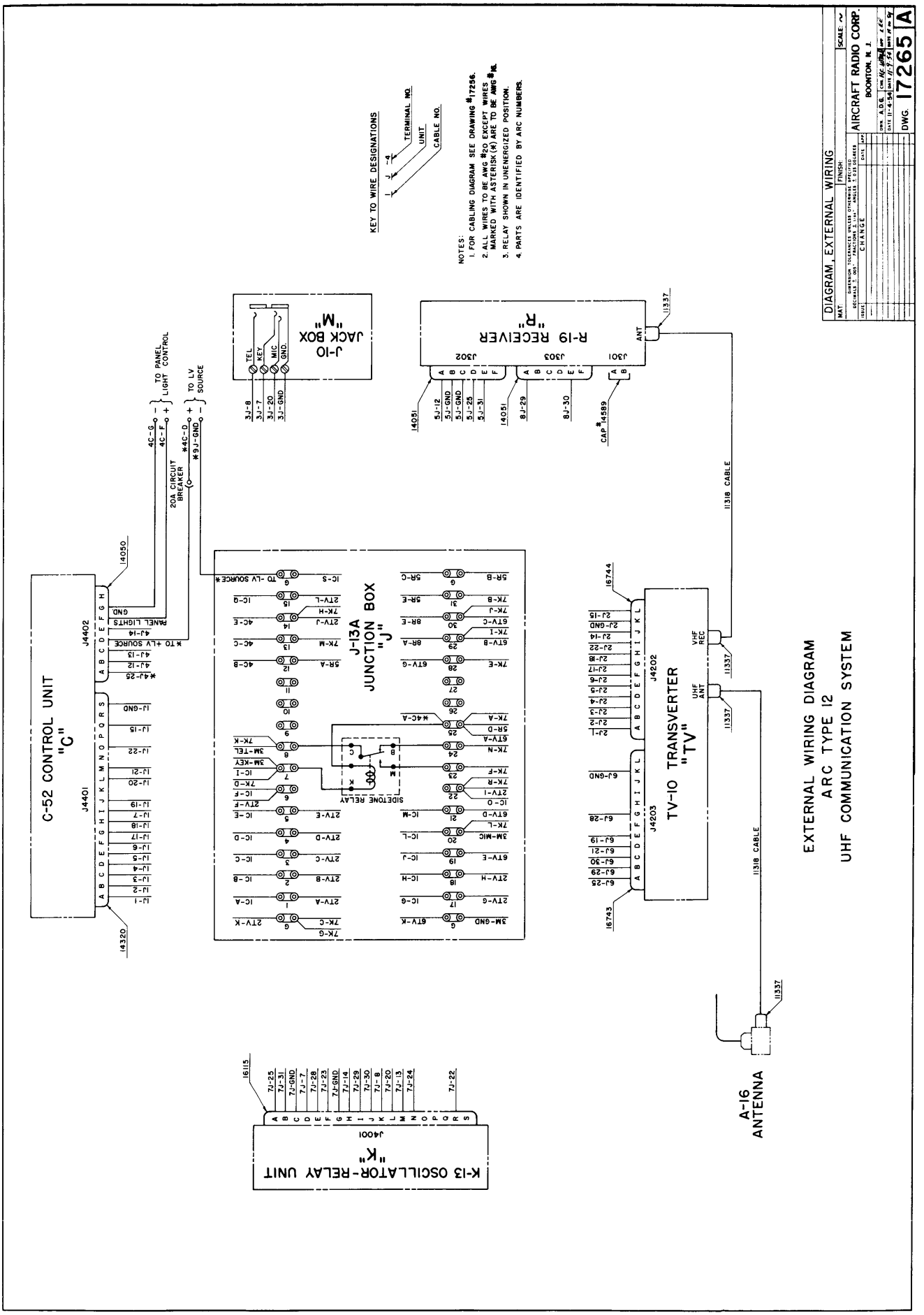
Figur 5-9—A.R.C. Typ C-52 C ntrol Unit Sch matic Diagram



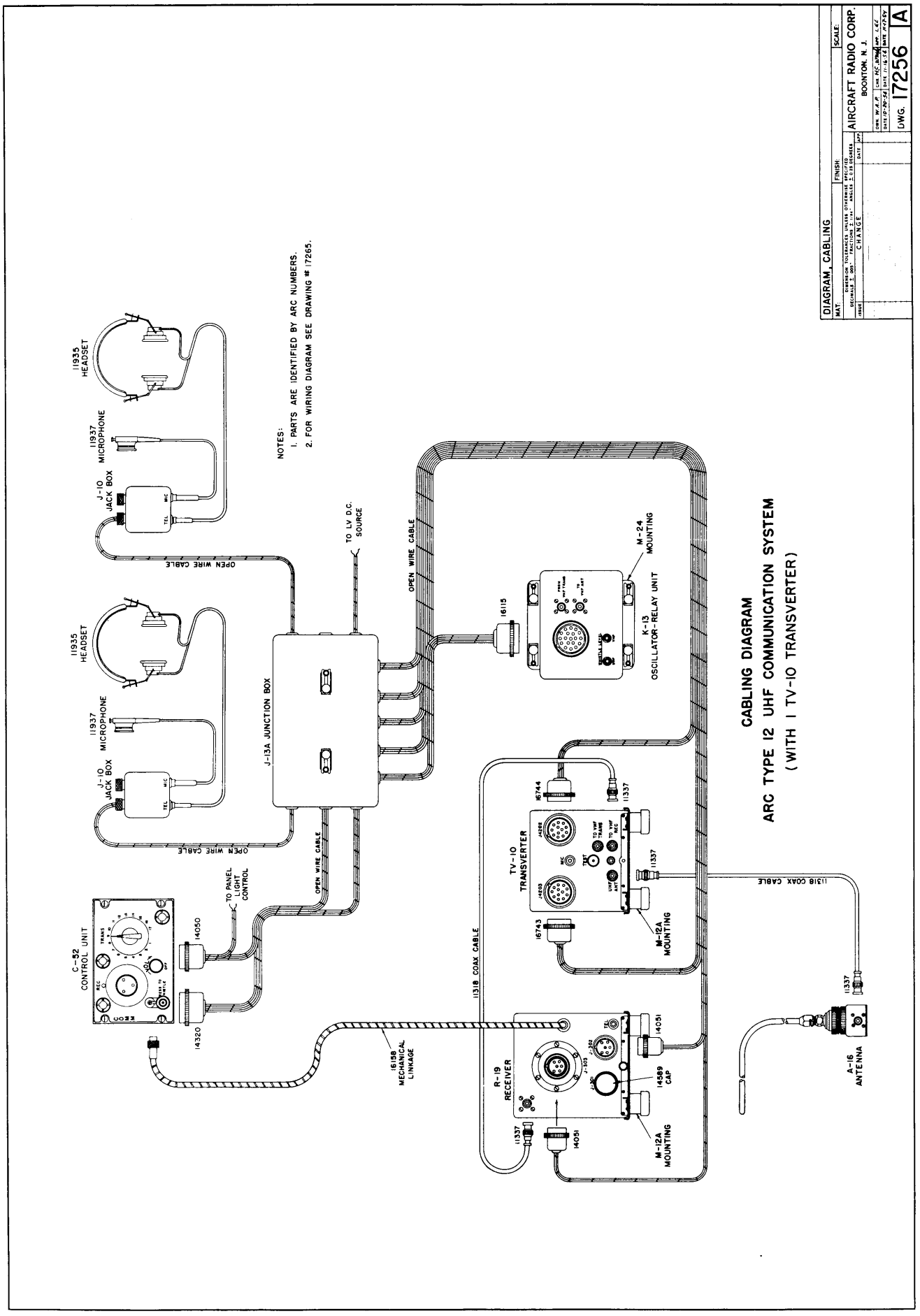
Figur 5-10—A.R.C. Typ C-53 C ntrol Unit Wiring Diagram



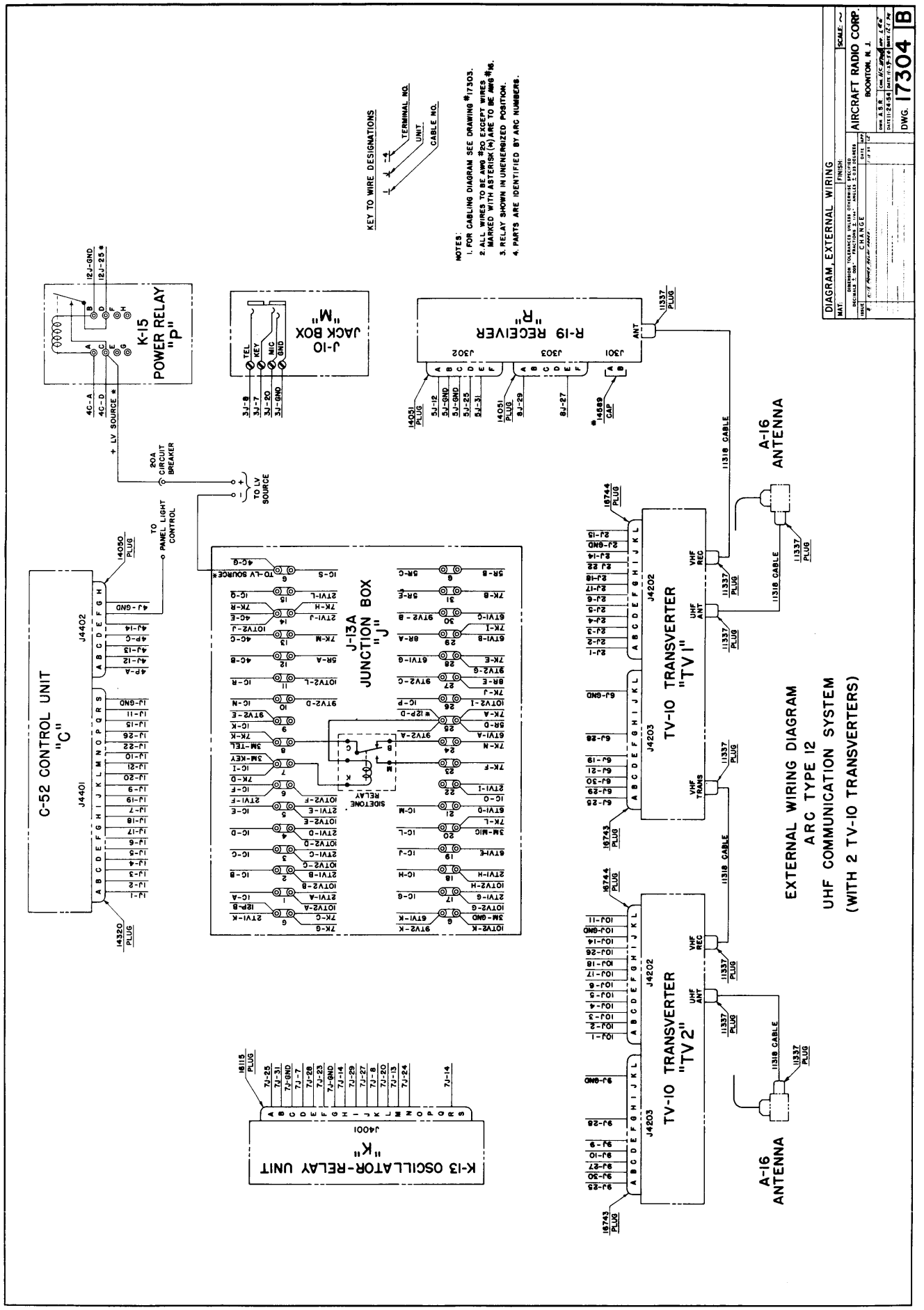
Figur 5-11—A.R.C. Typ C-53 C ntrol Unit Sch matic Diagram



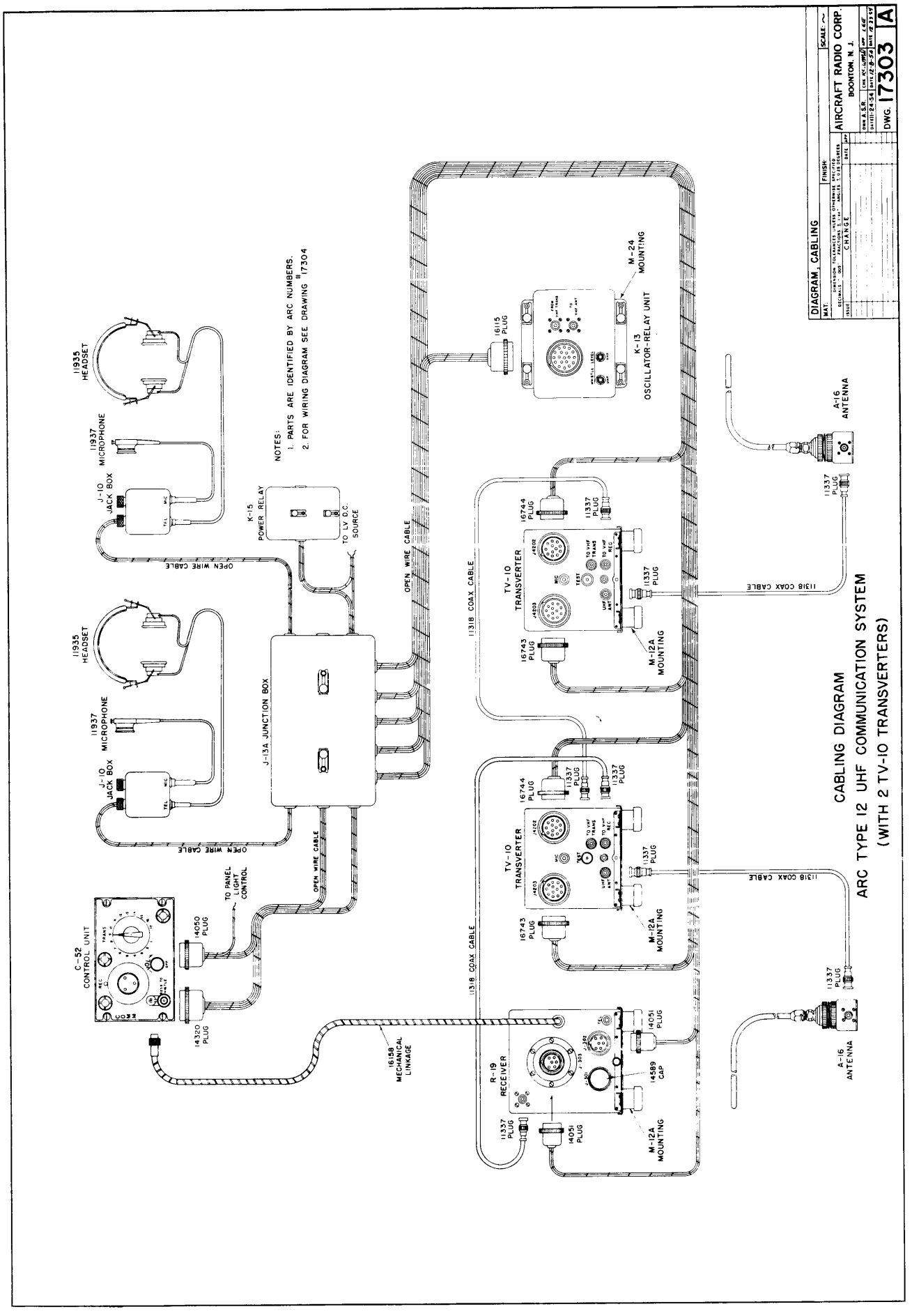
Figur 5-12—Ext rnal Wiring Diagram, UHF Communication Syst m with 1 TV-10 (8 Chann ls)



Figur 5-13—Cabling Diagram, UHF Communication Syst m with 1 TV-10 (8 Chann ls)



Figur 5-14—Ext rnal Wiring Diagram, UHF Communication Syst m with 2 TV-10's (16 Chann ls)



Figur 5-15—Cabling Diagram, UHF Communication Syst m with 2 TV-10's (16 Chann ls)

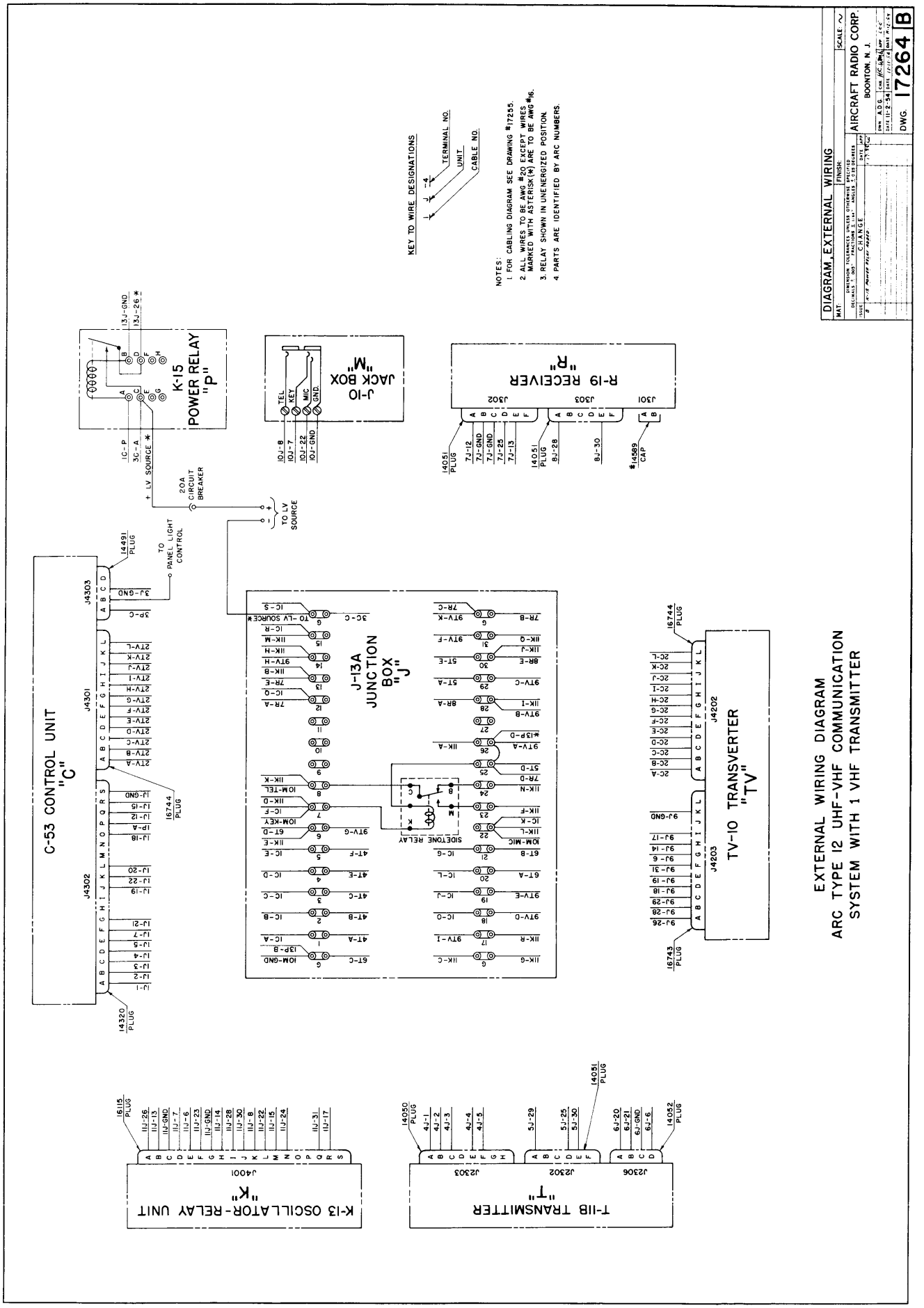


Figure 5-16—External Wiring Diagram, UHF-VHF Communication System with 1 VHF Transmitter

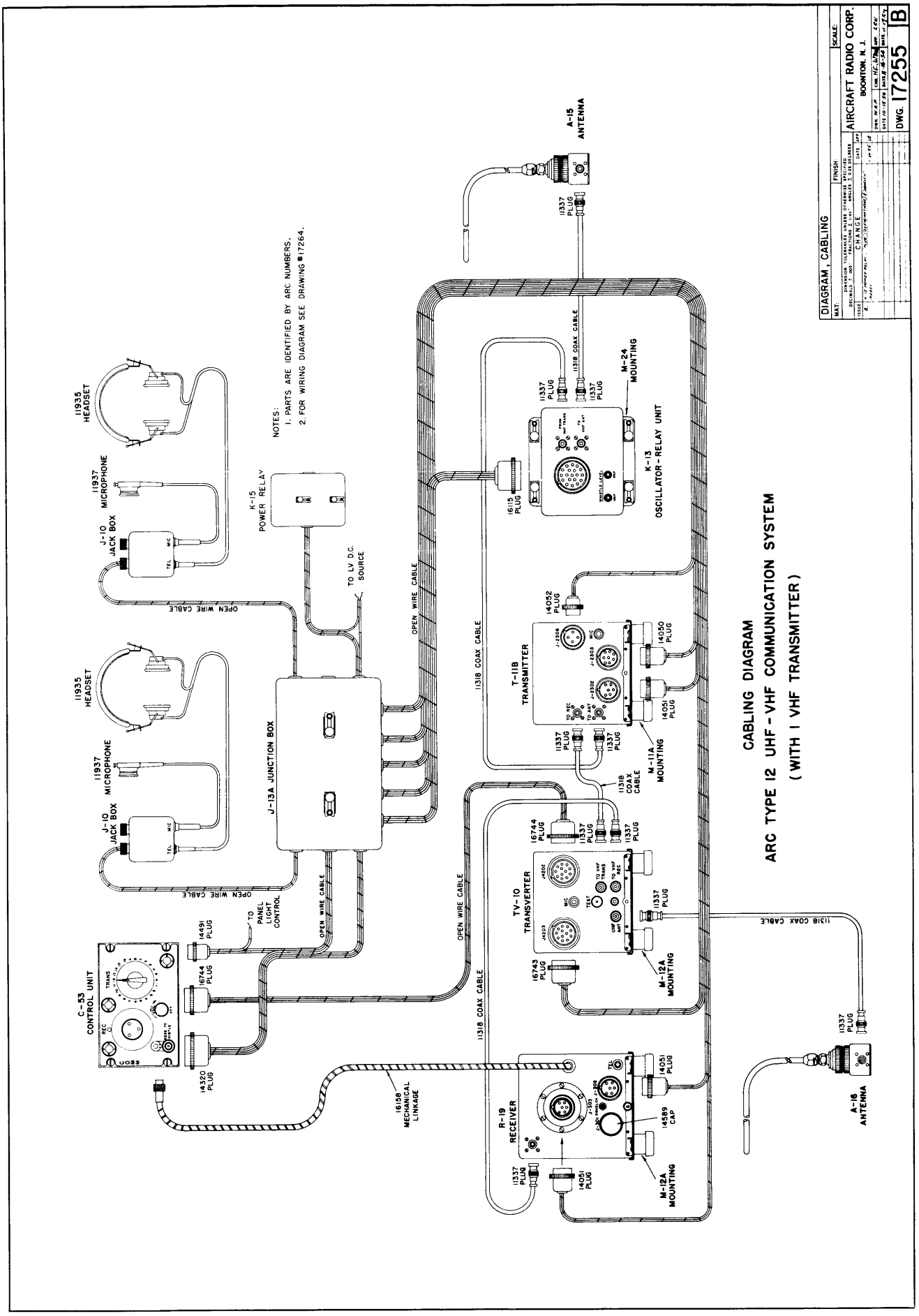
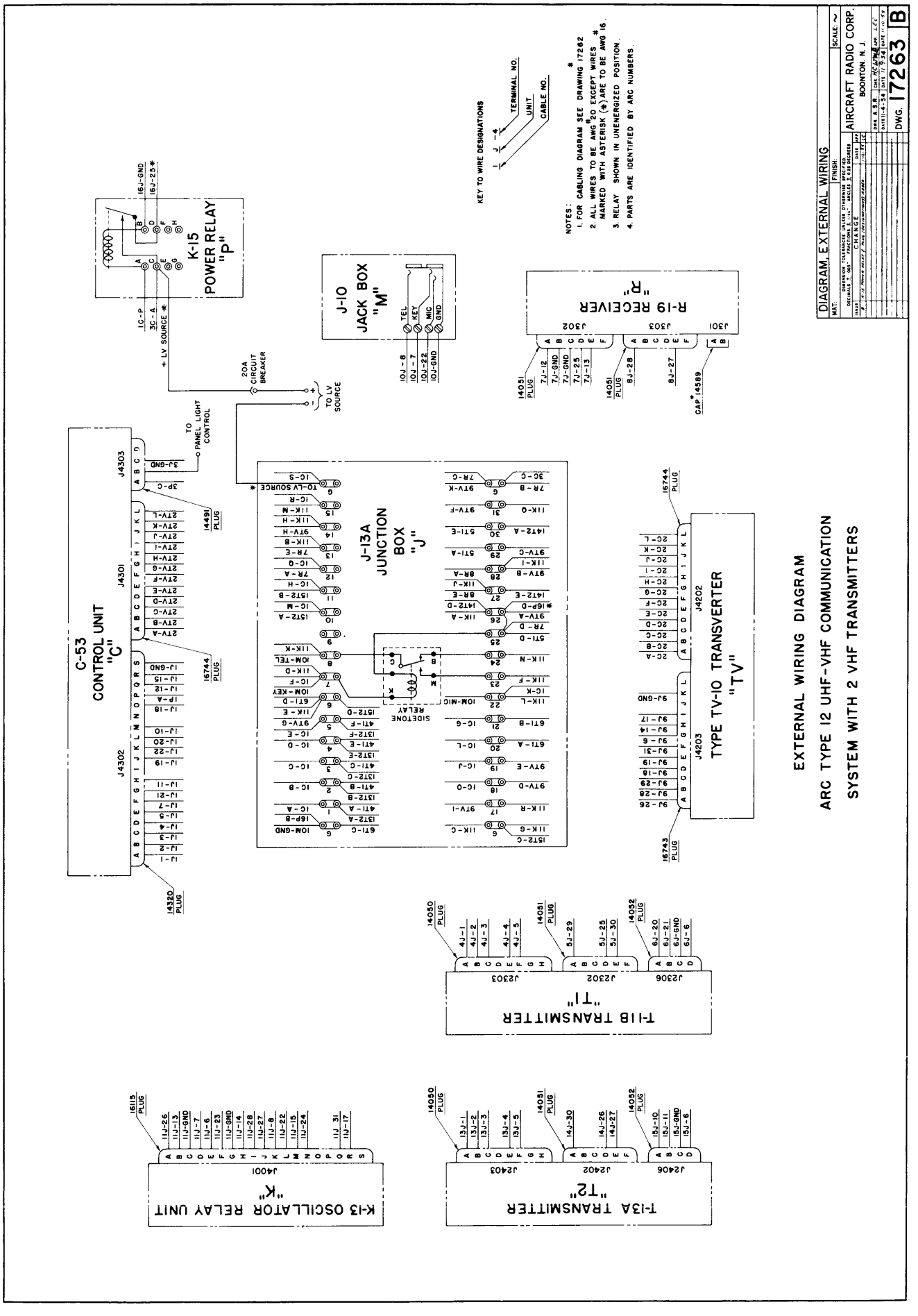


Figure 5-17—Cabling Diagram, UHF-VHF Communicati n Syst m with 1 VHF Transmitt r



Figur 5-18—Ext rnal Wiring Diagram, UHF-VHF C mmunicati n Syst m with 2 VHF Transmitt rs

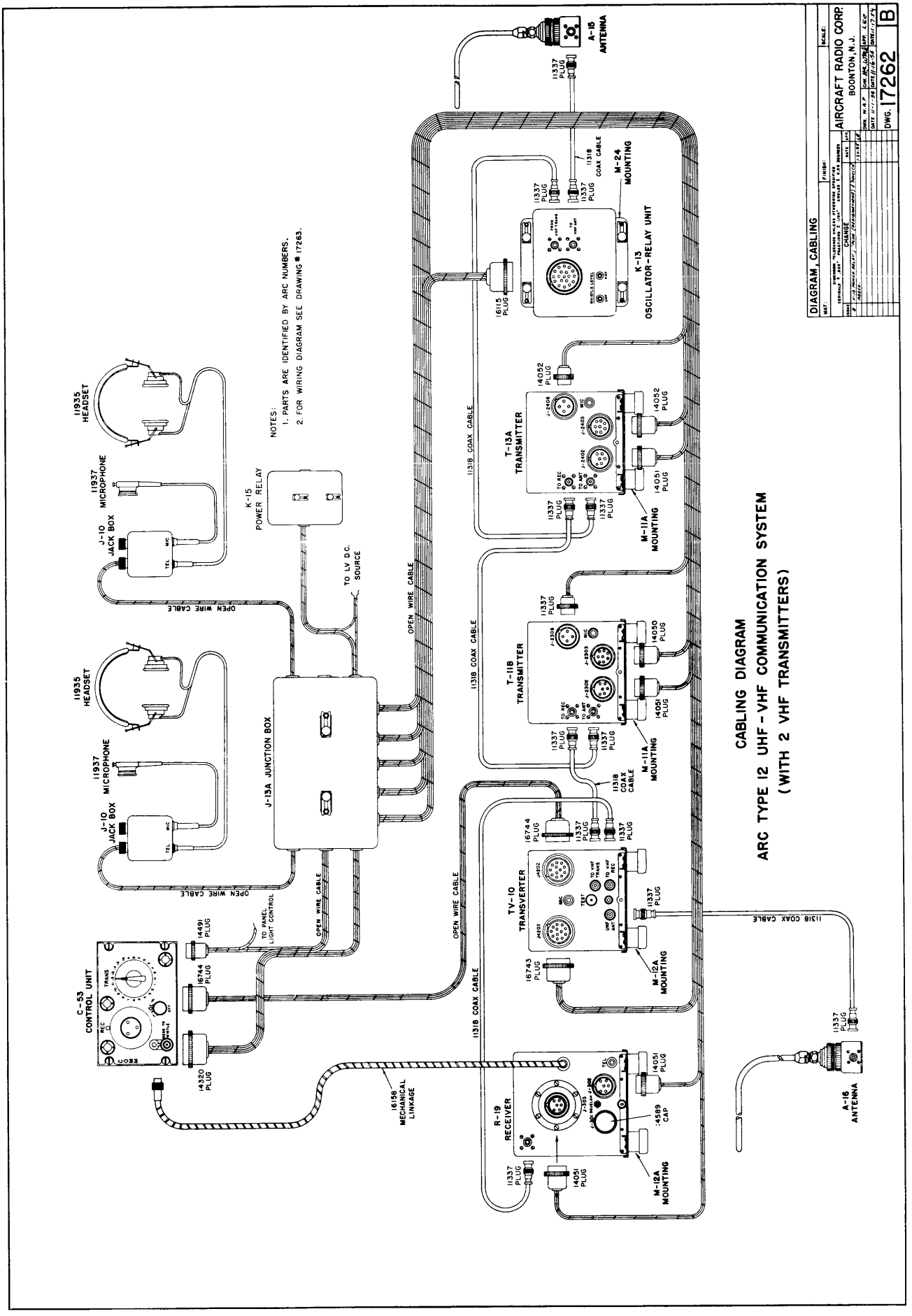
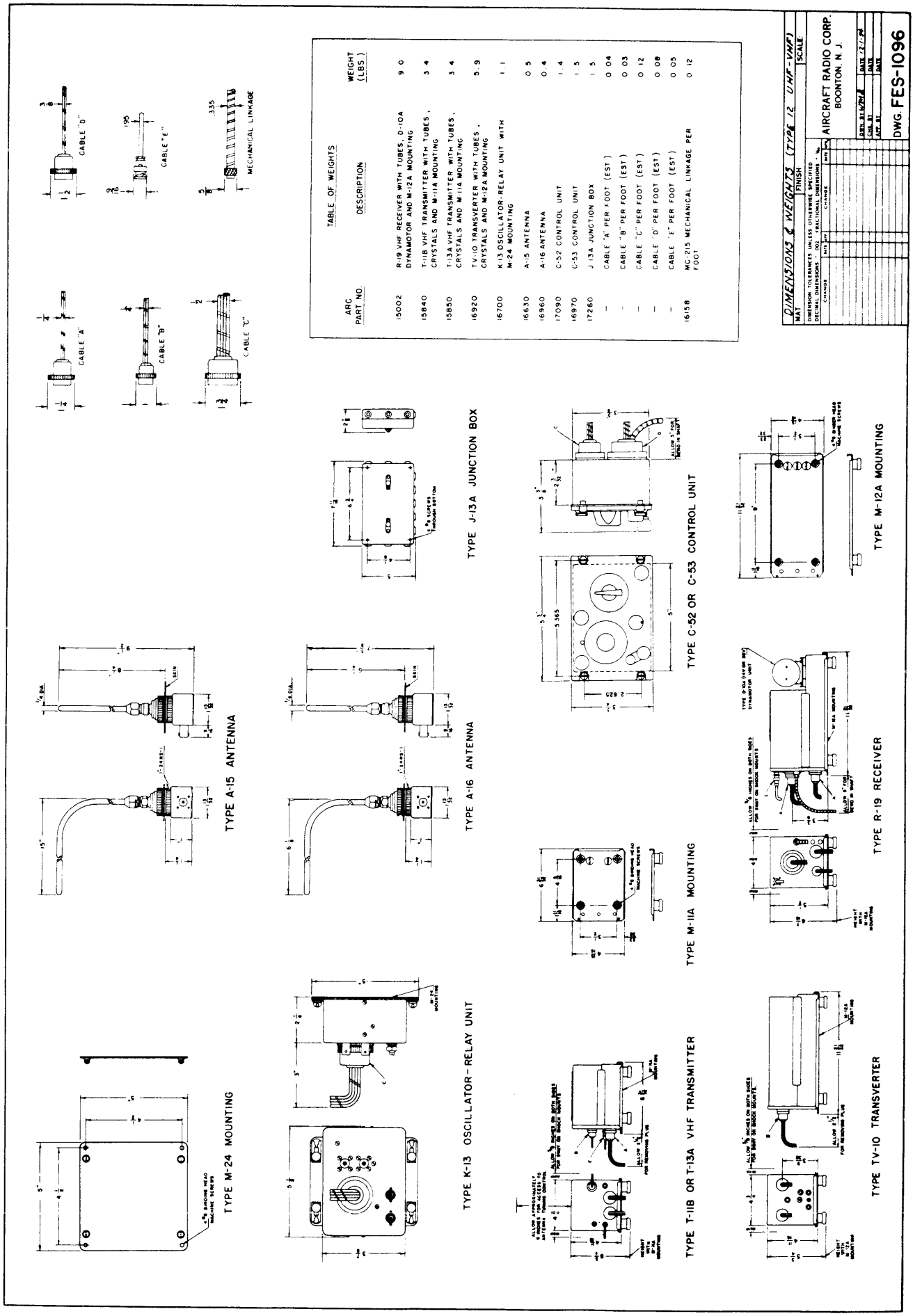


Figure 5-19—Cabling Diagram, UHF-VHF Communicati n System with 2 VHF Transmitters



Figur 5-20—Outlin and M unting Dimensions f r all UHF-VHF Compon nts