

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

PROJECT ENGINEER _____
ENGINEERING MANAGER _____
QUALITY ASSURANCE _____
MANUFACTURING _____

074 5225-050
NEXT ASSY :

FRO ☐ NFP ☐ REL ☐ REV ☐ TC ☐ CR ☐ NB ☐ DL ☐ TO ☐

1.0 SCOPE

THESE PRODUCTION TEST REQUIREMENTS APPLY TO THE COLLINS TYPE NUMBER 820D-2 AM BROADCAST TRANSMITTER, PART NO. 622-2017-001.

2.0 REFERENCE INFORMATION

2.1 SPECIFICATIONS

820D-2 EQUIPMENT SPECIFICATION, PART NO. 670-5186-001

2.2 PUBLICATIONS

820D-2 INSTRUCTION MANUAL
FCC TYPE ACCEPTANCE APPLICATION 820D-2

2.3 DRAWINGS

SCHEMATIC DIAGRAM, PART NO. 633-7590-001

2.4 PHOTOGRAPHS

SEE 820D-2 INSTRUCTION BOOK FOR PHOTOGRAPHS.

3.0 TEST EQUIPMENT

THE FOLLOWING EQUIPMENT OR EQUIVALENT IS REQUIRED TO PERFORM THE TESTS.

<u>ITEM</u>	<u>MANUFACTURER</u>	<u>QTY</u>
1. RF LOAD 50 OHM 2.5 KW	BIRD AIR COOLED	1
2. MULTIMETER	TRIPLETT MODEL 630N/A	1
3. AUDIO SIGNAL GENERATOR	HP 206A	1
4. DISTORTION AND NOISE ANALYZER	HP 334A OR 330D	1
5. MODULATION MONITOR	BELAR AMM-1	1
6. DC POWER SUPPLY	ELECTRO LAB MODEL EFB	1
7. VTVM	HP 412A OR 425A	1
8. DIGITAL VOLTMETER	HP 3430	1
9. OSCILLOSCOPE	TEKTRONIX 545	1
10. VECTOR IMPEDANCE METER	HP 4815A	1
11. FREQUENCY COUNTER	HP 5245	1
12. CALIBRATED DC VOLTMETER	WESTON	1
13. CALIBRATED DC AMMETER	WESTON	1
14. 0-6 AMP RF AMMETER	WESTON 743-60	1
15. REMOTE CONTROL TEST JIG	COLLINS	1
CONTROL PANEL 627-9798-001		
RELAY ASSY 627-9721-001		

SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 2

4.0

TEST CONDITIONS

UNLESS OTHERWISE SPECIFIED, ALL TESTS WILL BE PERFORMED UNDER THE FOLLOWING CONDITIONS:

4.1

POWER SUPPLY

208/230/240 VOLTS $\pm 5\%$ 50/60 HZ, SINGLE PHASE (TEST AT 240 V)

4.2

AMBIENT TEMPERATURE

NORMAL FACTORY AMBIENT

4.3

AMBIENT HUMIDITY

NORMAL FACTORY AMBIENT

4.4

AMBIENT ATMOSPHERIC PRESSURE

NORMAL FACTORY AMBIENT

4.5

SHIELDING AND ISOLATION

NONE

4.6

OPERATIONAL DUTY CYCLE

CONTINUOUS

4.7

WARM-UP

5 MINUTES

SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 3

5.0

PRELIMINARY TESTS

WARNING !

HIGH VOLTAGE

IS USED IN THIS EQUIPMENT.

DEATH ON CONTACT

MAY RESULT IF PERSONNEL
FAIL TO OBSERVE SAFETY REGULATIONS.

WHEN WORKING INSIDE THE EQUIPMENT, BE SURE THAT ALL BREAKERS ARE OPEN AND REMOVE POWER AT WALL DISCONNECT. ALWAYS SHORT ALL HIGH VOLTAGE TERMINALS TO GROUND WITH GROUNDING STICK PROVIDED.

5.1

VISUAL INSPECTION

ASCERTAIN THAT MAIN POWER INPUT LINE IS DISCONNECTED. INSPECT THE UNIT TO DETERMINE THAT ALL MATERIALS AND WORKMANSHIP ARE IN ACCORDANCE WITH COLLINS RADIO STANDARDS AND THAT THE UNIT IS CONSTRUCTED WITH THE LATEST DRAWINGS. INSPECT EQUIPMENT FOR LOOSE COMPONENTS AND/OR CONNECTIONS. CHECK ARC GAP ON T-2 FOR .075 INCHES. ADJUST ALL DOOR INTERLOCKS AND DOOR GROUNDING SWITCHES FOR PROPER OPERATION.

5.2

OHMMETER CHECKS

5.2.1

MEASURE THE DC RESISTANCE BETWEEN GROUND AND EACH OF THE BELOW LISTED POWER SUPPLY TERMINALS. A HIGH RESISTANCE SHOULD EXIST. OPEN EACH OF THE PANELS LISTED IN TURN TO SEE IF THE HIGH RESISTANCE GOES TO A SHORT CIRCUIT CONDITION. FINALLY, CHECK EACH POWER SUPPLY GROUND RETURN, ALSO LISTED BELOW FOR LOW RESISTANCE TO GROUND.

P.S. AND TERMINAL

HIGH VOLTAGE SUPPLY CR5 POS

SCREEN SUPPLY A2 E1

28 VOLT SUPPLY A2 C9 NEG

PANEL TO BE OPENED

LOWER FRONT PANEL, REAR COVER & TUBE
PANEL

LOWER FRONT PANEL, REAR COVER & TUBE
PANEL
NONE

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GROUND RETURN

PANELS TO BE OPENED

GROUND RETURN C1 NEG

NONE

GROUND RETURN CR8 NEG

NONE

GROUND RETURN R12

NONE

GROUND RETURN A2 CR1 NEG

NONE

5.2.2

FILAMENTS

INSPECT PA AND MOD FILAMENTS FOR CORRECT WIRING. CHECK EACH FILAMENT AT SOCKET OF TUBE FOR LOW RESISTANCE TO GROUND.

5.3

EQUIPMENT INTERCONNECTIONS

5.3.1

DUMMY LOAD CONNECTION

CONNECT DUMMY LOAD AND RF AMMETER TO TRANSMITTER OUTPUT.

5.3.2

POWER SUPPLY TRANSFORMER TAPS

CHECK EACH POWER SUPPLY TO SEE THAT THE CORRECT TRANSFORMER PRIMARY TAPS ARE CONNECTED FOR EXISTING LINE VOLTAGE (208/230/240).

TABLE IA
TRANSFORMER CONNECTIONS

TRANSFORMER	LINE VOLTAGE		
	<u>208</u>	<u>230</u>	<u>240</u>
28 VOLT - A2TB-1	8-9	7-9	7-9
* BIAS - A2TB-1	5-6	4-6	4-6
SCRN - A2TB-1	2-1	3-1	3-1
* PA FIL A1TB-2	1	2	3
* MOD FIL A1TB-1	33-34	33-35	33-36

*NOTE: IF FILAMENT REGULATOR OPTION IS SELECTED, USE 230 V CONNECTIONS FOR BIAS AND FIL.

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SCALE	REV	SHEET 5

TABLE 1B
HIGH VOLTAGE
TRANSFORMER CONNECTIONS

<u>POWER</u>	<u>LINE VOLTAGE</u>		
	<u>208</u>	<u>230</u>	<u>240</u>
500 WATTS	A5T-3 A5T-5	A5T-2 A5T-6	A5T-1 A5T-7
250 WATTS	A5T-3 A5T-8	A5T-2 A5T-9	A5T-1 A5T-10
1000 WATTS	A5T-3 A5T-4	A5T-2 A5T-4	A5T-1 A5T-4

5.3.4 FREQUENCY DEPENDENT CONNECTIONS

CHECK FOR INSTALLATION OF CORRECT FREQUENCY DEPENDENT COMPONENTS AS INDICATED IN TABLE 2 ON SHEET 7 AND TABLE 3 ON SHEET 8.

5.3.5 GROUNDING

CONNECT BUILDING POWER LINE GROUND TO TRANSMITTER GROUND TERMINAL A3E1.

5.4 CONTROL CIRCUIT OPERATION

OPEN ALL CIRCUIT BREAKERS. CONNECT EXTERNAL SINGLE PHASE THREE WIRE POWER AT A3TB6-1, 2 AND 3 AND APPLY POWER (NEUTRAL IS TERM 3).

CHECK TO DETERMINE THAT THE VOLTAGE BETWEEN A3TB6-1 AND NEUTRAL (GROUND) IS APPROXIMATELY 115 VAC RMS BEFORE ENERGIZING CB1.

5.4.1 FILAMENT ON

CLOSE BREAKER CB1. FILAMENT OFF LAMP SHOULD ILLUMINATE. METER 28V D-C SUPPLY BETWEEN A2TB1-14 AND GROUND USING CALIBRATED TRIPLETT METER. VALUE READ SHOULD BE BETWEEN 26 AND 30 V D-C. COMPARE THIS VALUE WITH THAT READ ON TEST METER, S11, IN 28 V SUPPLY POSITION. DIFFERENCE IN READINGS SHOULD BE NO MORE THAN 10%.

SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 6

FIGURE 1
SIMPLIFIED SCHEMATIC
OUTPUT NETWORK

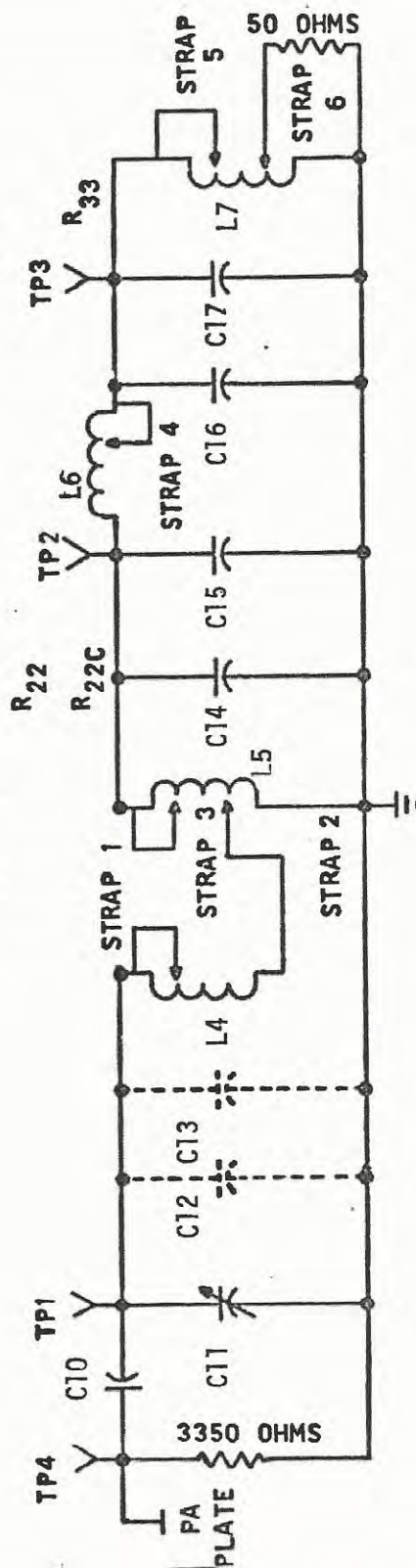


TABLE 2
OUTPUT NETWORK
CAPACITOR VALUES

FREQUENCY	C12	C13	C14	C15	C16	C17
540-700	390 or 430 PF	240 PF	3900 PF	3900 PF	3900 PF	3900 PF
710-920	430 PF	NONE	3000 PF	3000 PF	3000 PF	3000 PF
930-1150	240 PF	NONE	2400 PF	2400 PF	2400 PF	2400 PF
1160-1380	180 PF	NONE	2000 PF	2000 PF	2000 PF	2000 PF
1390-1600	NONE	NONE	1600 PF	1600 PF	1600 PF	1600 PF

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SCALE	REV	SHEET 7

TABLE 3
RF DRIVER CAPACITORS

X DENOTES ACTIVE CAPACITORS

FREQUENCY	C12	C13	C14	C15	C16
540 - 550	X				X
560 - 580	X	X	X	X	
590 - 600		X	X	X	
610 - 625	X		X	X	
635 - 645			X	X	
655 - 675	X	X		X	
685 - 710		X		X	
720 - 735	X			X	
745 - 780				X	
790 - 850		X	X		
860 - 890	X		X		
900 - 965			X		
975 - 1100	X	X			
1110 - 1250		X			
1260 - 1360	X				
1370 - 1600					

SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 8

STRAP ACROSS
TO PLACE
COMPONENT IN
CIRCUIT

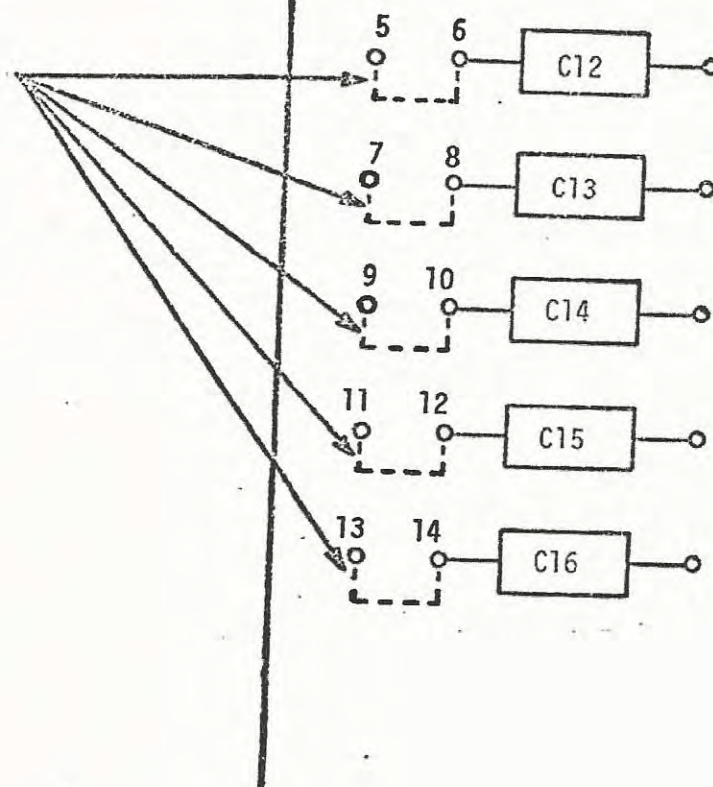


FIGURE 2
RF DRIVER COMPONENT BOARD

SIZE	CODE IDENT	DWG NO.
A	13499	669-7723
SCALE	REV	SHEET
		9

DEPRESS FILAMENT ON BUTTON OBSERVING THAT BLOWER OPERATES. AFTER BLOWER COMES UP TO SPEED FILAMENT ON LAMP SHOULD ILLUMINATE AND K2 SHOULD OPERATE APPLYING FILAMENT POWER. FILAMENT OFF LAMP WILL EXTINGUISH AND PLATE-OFF LIGHT WILL COME ON. MANUALLY OPERATE THE BLOWER AIR SWITCH TO SEE THAT K2 DEENERGIZES, FILAMENT ON LAMP EXTINGUISHES AND FILAMENT OFF LAMP ILLUMINATES.

WARNING

TURN OFF ALL POWER AND ATTACH A STRING TO THE AIR SWITCH BEFORE MAKING THE ABOVE TEST TO PREVENT THE HAND FROM MAKING CONTACT WITH THE PRIMARY POWER.

REMOVE THE TUBE COMPARTMENT COVER AND EACH PANEL IN TURN, OBSERVING THAT EACH EXTINGUISHED THE PLATE OFF LAMP.

5.4.2 PLATE ON

CAUTION: INSURE THAT CB2 IS OPEN BEFORE PERFORMING THE FOLLOWING.

CHECKING ALL INTERLOCKS TO BE SURE THEY ARE CLOSED, DEPRESS THE FIL ON SWITCH THEN LOW POWER ON. OBSERVE THE FILAMENT OFF AND PLATE OFF LAMPS EXTINGUISH AND THE FILAMENT ON AND LOW POWER ON LAMPS ILLUMINATE. DEPRESS FILAMENT OFF SWITCH AND OBSERVE THE LOW POWER ON AND FILAMENT ON LAMPS EXTINGUISH. THE FILAMENT OFF LAMP SHOULD ILLUMINATE.

DEPRESS FIL ON SWITCH, THEN DEPRESS THE HIGH POWER ON SWITCH. OBSERVE THE FILAMENT OFF AND PLATE OFF LAMPS EXTINGUISH AND THE FILAMENT ON AND HIGH POWER ON LAMPS ILLUMINATE. DEPRESS THE FILAMENT OFF SWITCH AND OBSERVE THE HIGH POWER ON AND FILAMENT ON LAMPS EXTINGUISH. THE FILAMENT OFF LAMP SHOULD ILLUMINATE.

5.4.3 OVERLOAD CIRCUITS

CONNECT AN ADJUSTABLE LAB POWER SUPPLY NEGATIVE TO GROUND A3E1 AND POSITIVE TO MODULATOR FILAMENT TRANSFORMER CENTER TAP. SET THE SUPPLY TO 0.83A AND TURN ON THE TRANSMITTER FILAMENTS. ADJUST A3A1R-13 SO THAT A3A1K2 PULLS IN. RECHECK BY TURNING THE LAB SUPPLY ON AND OFF SEVERAL TIMES. VERIFY THAT THE "MOD" OVERLOAD LAMP ILLUMINATES. CONNECT THE POSITIVE LEAD OF THE LAB SUPPLY TO THE PA FILAMENT TRANSFORMER CENTER TAP AND ADJUST THE SUPPLY TO 0.75A. TURN ON THE FILAMENTS AND ADJUST A3A1-R6 UNTIL A3A1K1 PULLS IN. RECHECK BY TURNING THE LAB SUPPLY ON AND OFF SEVERAL TIMES. VERIFY THAT THE "PA" OVERLOAD LAMP ILLUMINATES.

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SCALE	REV	SHEET 10

5.4.4

REMOTE CONTROL(OPTIONAL)

ALTHOUGH THE REMOTE CONTROL FEATURE IS OPTIONAL, THE OPERATION OF THE REMOTE CONTROL SHOULD NEVERTHELESS BE CHECKED. IF THE OPTION HAS BEEN SELECTED, THE REMOTE CONTROL ASSY WILL PREVIOUSLY HAVE BEEN INSTALLED AND THE STRAPS BETWEEN PINS A3TB-2 1-2, 5-6, 9-10, 7, 8 AND 21, 22 WILL HAVE BEEN REMOVED. CHECK TO BE SURE THESE STRAPS HAVE BEEN REMOVED. IF THE REMOTE CONTROL OPTION HAS NOT BEEN SELECTED, REMOVE THE PREVIOUSLY MENTIONED STRAPS FROM A3TB2 AND INSTALL THE TEST ASSY.

THE FOLLOWING STEPS REFER TO SWITCHES ON THE REMOTE CONTROL TEST ASSEMBLY:

- 1) CLOSE CIRCUIT BREAKER AND PERFORM THE FOLLOWING STEPS:
- 2) TURN FAIL SAFE SWITCH ON.
- 3) PRESS FIL OFF AND OBSERVE THE FILAMENT OFF LAMP ILLUMINATE.
- 4) PRESS FIL ON AND OBSERVE THE FILAMENT OFF LAMP EXTINGUISH. THE FIL ON LAMP SHOULD ILLUMINATE.
- 5) PRESS HP ON AND OBSERVE THE HIGH POWER ON LAMP ILLUMINATE AND THE PLATE OFF LAMP EXTINGUISH.
- 6) PRESS PLT OFF AND OBSERVE HIGH POWER ON LAMP EXTINGUISH AND THE PLATE OFF LAMP ILLUMINATE.
- 7) PRESS LP ON AND OBSERVE THE LOW POWER ON LAMP ILLUMINATE AND THE PLATE OFF LAMP EXTINGUISH.
- 8) AGAIN PRESS HP ON AND OBSERVE THE HIGH POWER LAMP ILLUMINATE AND LOW POWER ON LAMP EXTINGUISH.
- 9) PRESS POWER RAISE AND OBSERVE THE POWER INCREASE.
- 10) PRESS POWER LOWER AND OBSERVE THE POWER DECREASE.
- 11) TURN FAIL SAFE OFF AND OBSERVE THE HIGH POWER LAMP EXTINGUISH.

IF THE REMOTE CONTROL OPTION WAS NOT SELECTED, REMOVE THE TEST ASSEMBLY FROM THE CONTROL CHASSIS AND REPLACE STRAPS REMOVED FROM A3TB2.

NOTE: 1. WHEN PLATE POWER IS TURNED ON REMOTELY THE TRANSMITTER WILL BE IN AUTOMATIC POWER CONTROL. OPERATING REMOTE RAISE OR LOWER WILL PUT TRANSMITTER IN MANUAL CONTROL. IT CAN BE RETURNED TO AUTOMATIC BY PRESSING PLATE ON (HP OR LP).

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SCALE	REV	SHEET 11

NOTES (CONT.)

2. REMOTE WIRING MAY BE CHECKED WHEN REMOTE OPTION IS NOT INSTALLED.
 - A. HV BREAKER A4DB2 OFF
 - B. LEAVE JUMPERS IN PLACE ON A3TB2.
 - C. APPLY 28 V DC (MOMENTARY) TO A3TB2-12 FOR LOW POWER ON.
 - D. APPLY 28 V DC MOMENTARY TO A3TB2-13 FOR HIGH POWER ON.
 - E. JUMPER A3TB2-14 AND 15, THEN CONNECT A3TB2-16 AND 17 FOR POWER LOWER OR 16 AND 18 FOR POWER RAISE. (REMOVE POWER CONTROL FUSE AND JUMPER REAR CONNECTION OF FUSE HOLDER TO CB1-LDA TO PROVIDE AC VOLTAGE TO MOTOR A5B1.) BE SURE PRIMARY POWER IS OFF WHEN MAKING THIS JUMPER.
 - F. RESTORE NORMAL CONDITIONS AFTER TESTS.

SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 11A

5.4.5 OUTPUT NETWORK TUNING

5.4.5.1 ADJUSTMENT OF THE OUTPUT NETWORK USING THE R.F. VECTOR IMPEDANCE METER

THE OUTPUT NETWORK MUST BE ADJUSTED TO PRESENT THE PROPER IMPEDANCE TO THE PA TUBE PLATES, TO OBTAIN THE REQUIRED PASSBAND AND TO PROVIDE THE NECESSARY HARMONIC ATTENUATION. TO ACCOMPLISH THIS, THE NETWORK SHOULD BE ADJUSTED BY MEASURING AND ADJUSTING THE NODE IMPEDANCE TO SPECIFIED VALUES AT EACH OF THE NODES OF THE NETWORK.

PRELIMINARY ADJUSTMENT OF THE NETWORK TAPS SHOULD BE MADE AS INDICATED IN FIGURES 1, 3, 4, 5, 6, 7, AND 8. THIS PROVIDES A ROUGH ADJUSTMENT. THE PROCEDURE FOR FINE ADJUSTMENT REQUIRES THE USE OF THE VECTOR IMPEDANCE METER.

DISCONNECT THE STRAP FROM C11 TO L4 AND THEN MEASURE THE IMPEDANCE FROM TP1 TO GROUND. ADJUST THE VARIABLE CAPACITOR C11 TO GIVE A TOTAL TUNING CAPACITOR IMPEDANCE OF $265/-90^\circ$ OHMS. THIS INCLUDES THE PADDING CAPACITORS C12 AND C13 IF USED. RECONNECT STRAP TO C11 AND L4.

MEASURE THE IMPEDANCE OF THE DUMMY LOAD FOR VERIFICATION OF ITS IMPEDANCE ($50/0^\circ$ OHMS) AND CONNECT IT TO THE OUTPUT CONNECTION OF THE NETWORK.

CONNECT A SHORT CLIP LEAD FROM TP2 TO GROUND, SHORTING OUT NODE 2 AND MEASURE IMPEDANCE OF NODE 3 AT TP3. ADJUST THIS IMPEDANCE TO THE VALUE SHOWN FOR R33 (SEE FIGURE 9) WITH A ZERO PHASE ANGLE. ADJUST THE RESISTIVE COMPONENT BY VARYING THE POSITION OF STRAP 6 AND ADJUST THE PHASE ANGLE TO 0 DEGREE BY VARYING THE POSITION OF STRAP 5.

MOVE THE SHORTING CLIP LEAD FROM TP2 AND GROUND TO TP1 AND GROUND. CONNECT THE VECTOR IMPEDANCE METER BETWEEN TP2 AND GROUND. ADJUST THE IMPEDANCE AT THIS POINT TO THE VALUE SHOWN FOR R22 (SEE FIGURE 10) WITH ZERO PHASE ANGLE.

ADJUST STRAP 4 TO VARY THE IMPEDANCE MAGNITUDE AND STRAP 3 TO ADJUST THE PHASE ANGLE TO ZERO. SOME INTERACTION WILL BE NOTED. REMOVE THE SHORTING CLIP LEAD.

THE FOLLOWING MEASUREMENTS MUST BE MADE WITH THE COVER PANEL INSTALLED ON THE OUTPUT NETWORK. CONNECT THE VECTOR IMPEDANCE METER TO TP4 AT THE PLATE OF THE PA TUBE.

ADJUST STRAP 1 AND STRAP 2 TO YIELD AN IMPEDANCE OF $3350/0^\circ$ OHMS AT TP4. STRAP 2 WILL AFFECT THE MAGNITUDE AND STRAP 1 THE PHASE ANGLE. HOWEVER, SOME INTERACTION WILL BE NOTED.

REPEAT THE PRECEDING ADJUSTMENTS FROM THE BEGINNING TO CORRECT FOR INTERACTION OF ADJUSTMENTS MADE IN ONE NODE TO THE IMPEDANCE MEASURED IN THE ADJACENT NODE. FINAL ADJUSTMENT SHOULD YIELD VALUES FOR R33, R22, AND THE IMPEDANCE AT THE PLATES OF THE PA TUBES AS SHOWN IN FIGURES 9 AND 10 AND THE PRECEDING PARAGRAPHS.

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SCALE	REV	SHEET 12

CHECK THE LOAD IMPEDANCE OVER A BANDWIDTH ± 10 KHZ FROM CARRIER FREQUENCY. USE THE FREQUENCY COUNTER TO DETERMINE THE EXACT FREQUENCIES. THE LOAD IMPEDANCE SHOULD NOT DEVIATE MORE THAN $300\Omega \pm 20^\circ$ FROM THAT AT CARRIER FREQUENCY.

REMOVE ALL TEST CLIPS AND INSTRUMENTS.

5.4.5.2 OPTIONAL OUTPUT NETWORK ADJUSTMENT PROCEDURE

THE FOLLOWING PROCEDURE USES THE GR 1606 RF BRIDGE.

IN ORDER TO PROPERLY TUNE THE OUTPUT NETWORK, IT IS NECESSARY TO BRIDGE THE NETWORK AT VARIOUS POINTS IN THE CIRCUIT AND TO MAKE FINE ADJUSTMENTS OF THE NETWORK COMPONENTS TO GIVE CORRECT IMPEDANCE VALUES, ONCE THE PRELIMINARY ADJUSTMENTS HAVE BEEN MADE.

BEGIN BY MAKING THE PRELIMINARY ADJUSTMENTS INDICATED IN FIGURES 1, 3, 4, 5, 6, 7, AND 8. DISCONNECT THE STRAP FROM C11 TO L4 AND THEN BRIDGE FROM TP1 TO GROUND. ADJUST THE VARIABLE CAPACITOR SO AS TO RENDER 265 OHMS REACTANCE. RECONNECT STRAP C11 TO L4.

PLACE SHORTING CLIP LEAD FROM TP2 TO GROUND AND BRIDGE FROM TP3 TO GROUND. VARYING RESISTANCE WITH STRAP 6 AND REACTANCE WITH STRAP 5, ADJUST STRAP 5 AND STRAP 6 FOR A BRIDGE READING OF ZERO OHMS REACTANCE AND A RESISTANCE R33 (SEE FIGURE 9).

MOVE SHORTING CLIP LEAD FROM TP2 AND GROUND TO TP1 AND GROUND. PLACE BRIDGE FROM TP2 TO GROUND. VARYING RESISTANCE WITH STRAP 4 AND REACTANCE WITH STRAP 3, ADJUST STRAP 3 AND STRAP 4 FOR A BRIDGE READING OF ZERO OHMS REACTANCE AND A RESISTANCE R22 (SEE FIGURE 10).

NOTE: THE FOLLOWING MEASUREMENT MUST BE MADE WITH THE COVER PANEL IN PLACE ON THE OUTPUT NETWORK.

MOVE SHORTING CLIP LEAD FROM TP1 TO TP3 AND GROUND AND INSTALL A 3350 OHM RESISTOR FROM TP4 TO GROUND. VARYING RESISTANCE WITH STRAP 2 AND REACTANCE WITH STRAP 1, ADJUST STRAP 2 AND STRAP 1 FOR A BRIDGE READING OF ZERO OHMS REACTANCE AND A RESISTANCE VALUE R22C (SEE FIGURE 10).

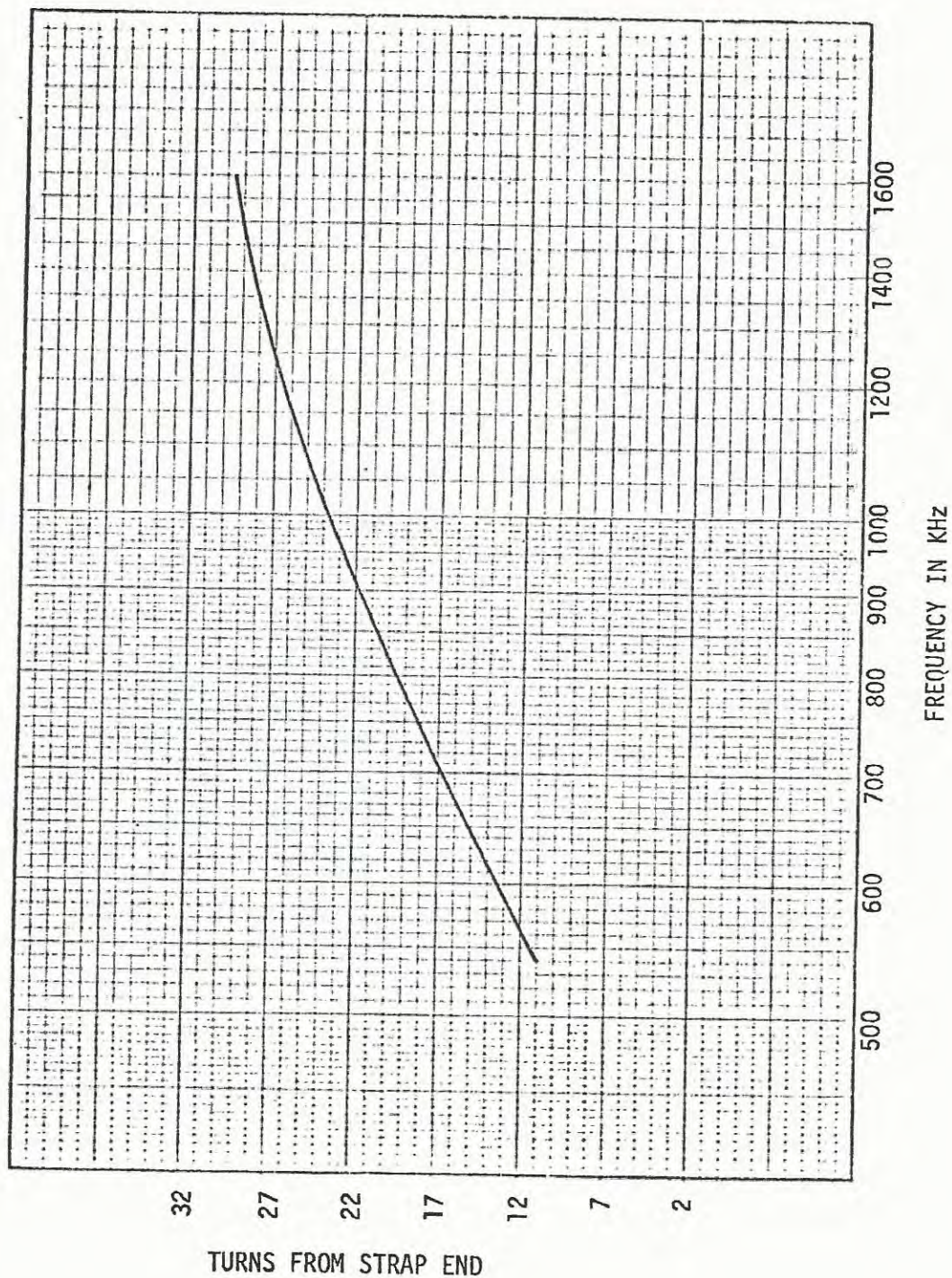
REMOVE THE 3350 OHM RESISTOR, SHORTING CLIP LEAD, AND BRIDGE FROM THE RADIO.

5.4.6 POWER SUPPLIES

NOTE: CAUTION SHOULD BE EXERCISED WHEN METERING ACROSS POWER SUPPLIES WITH EXTERNAL METER. OPEN ALL CIRCUIT BREAKERS AND MOMENTARILY GROUND POINTS ACROSS WHICH METER IS TO BE PLACED BEFORE CONNECTING METER LEADS.

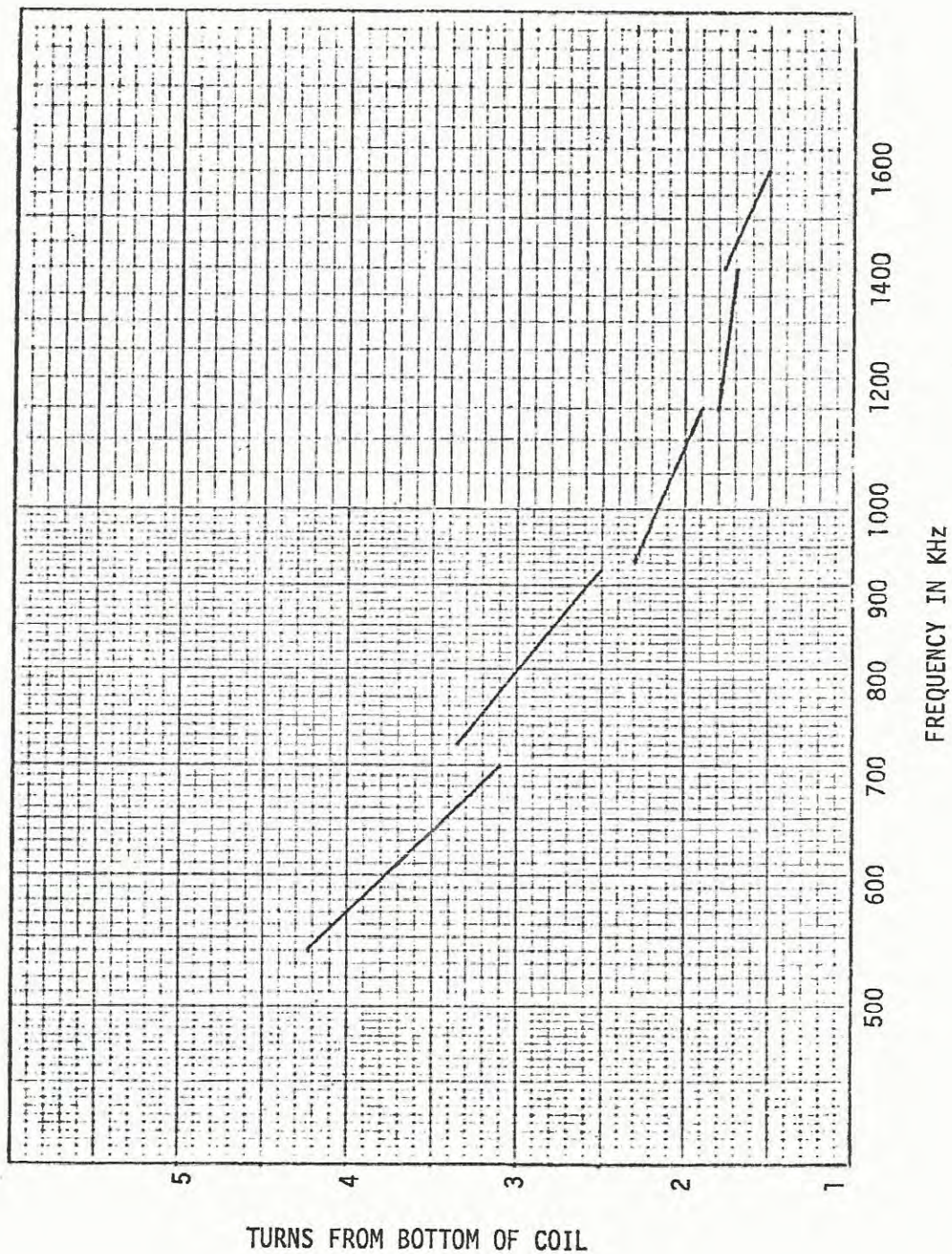
SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 13

FIGURE 3
APPROXIMATE SETTINGS
FOR STRAP 1



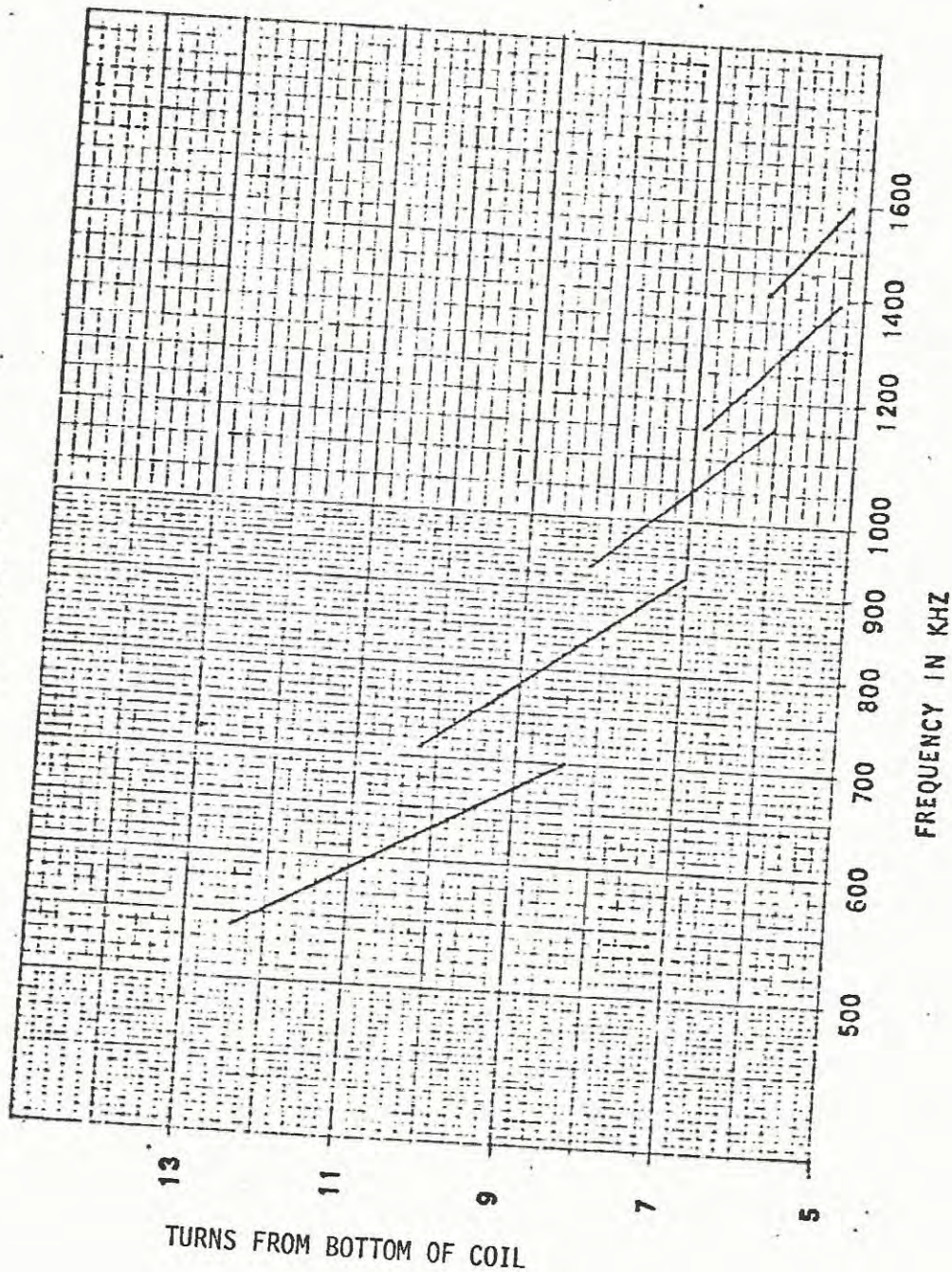
SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 13A

FIGURE 4
APPROXIMATE SETTINGS
FOR STRAP 2



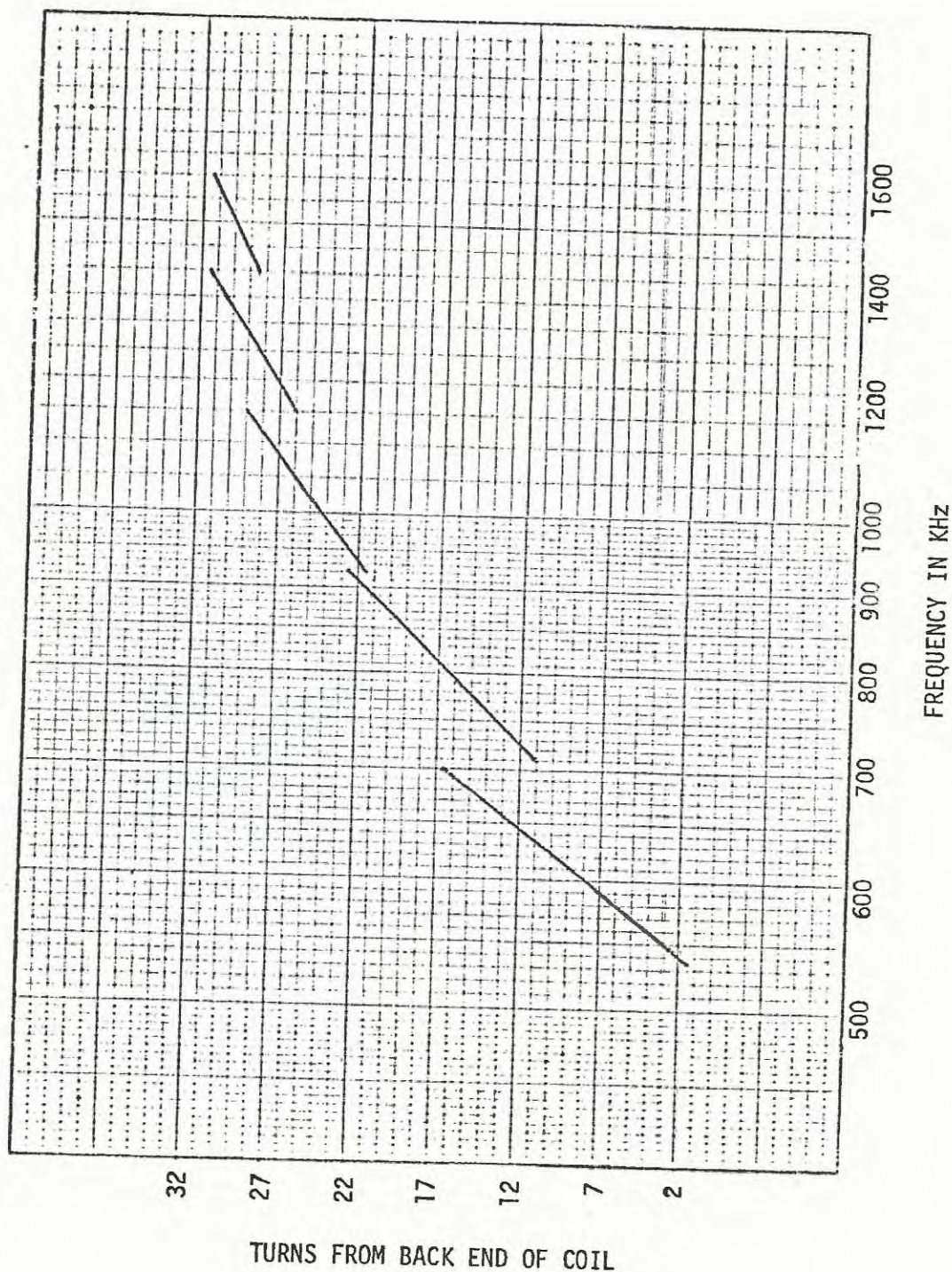
SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 14

FIGURE 5
APPROXIMATE SETTINGS
FOR STRAP 3



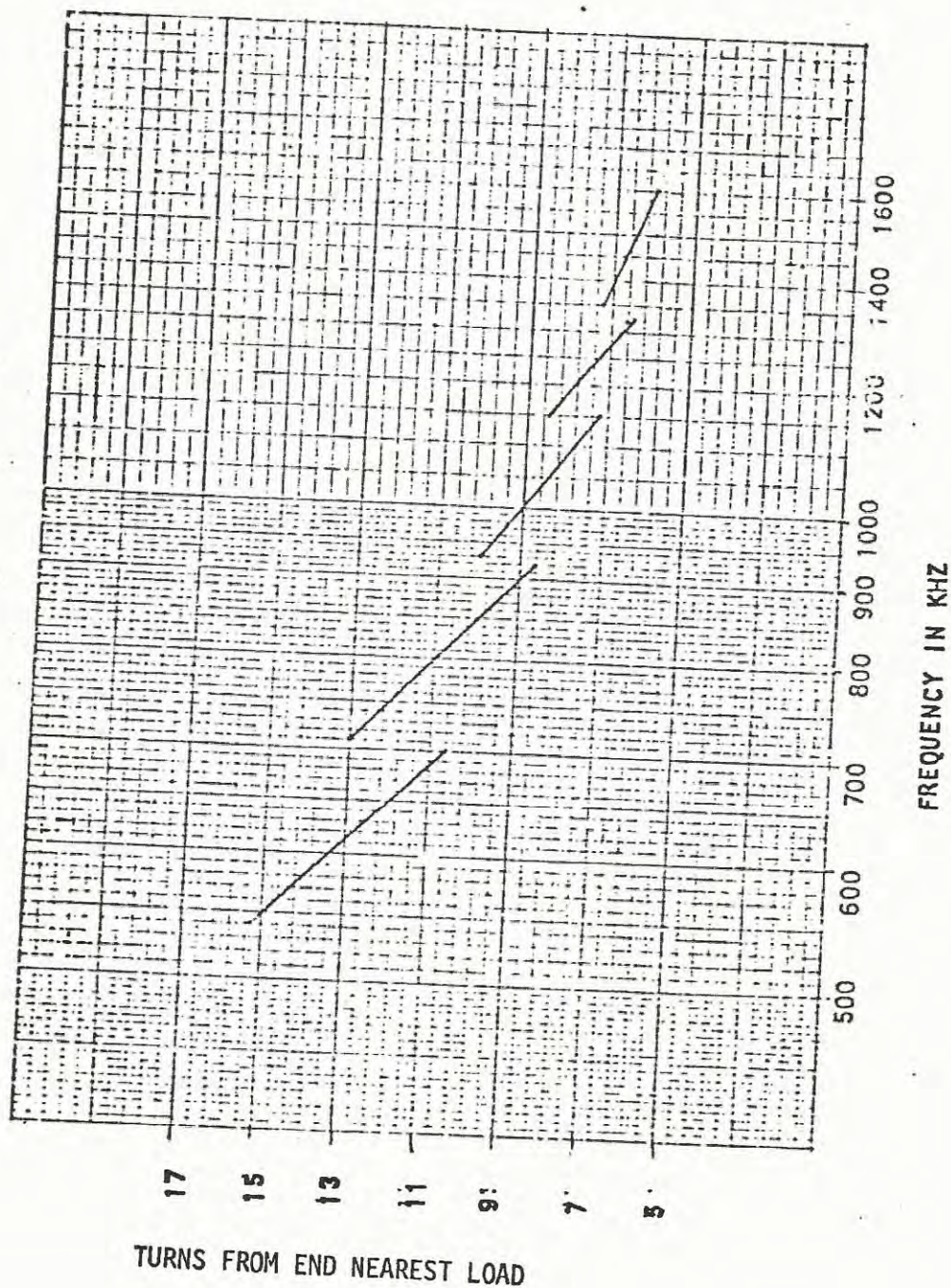
SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 15

FIGURE 6
APPROXIMATE SETTINGS
FOR STRAP 4



SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 16

FIGURE 7
APPROXIMATE SETTINGS
FOR STRAP 5



SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 17

FIGURE 8
APPROXIMATE SETTINGS
FOR STRAP 6

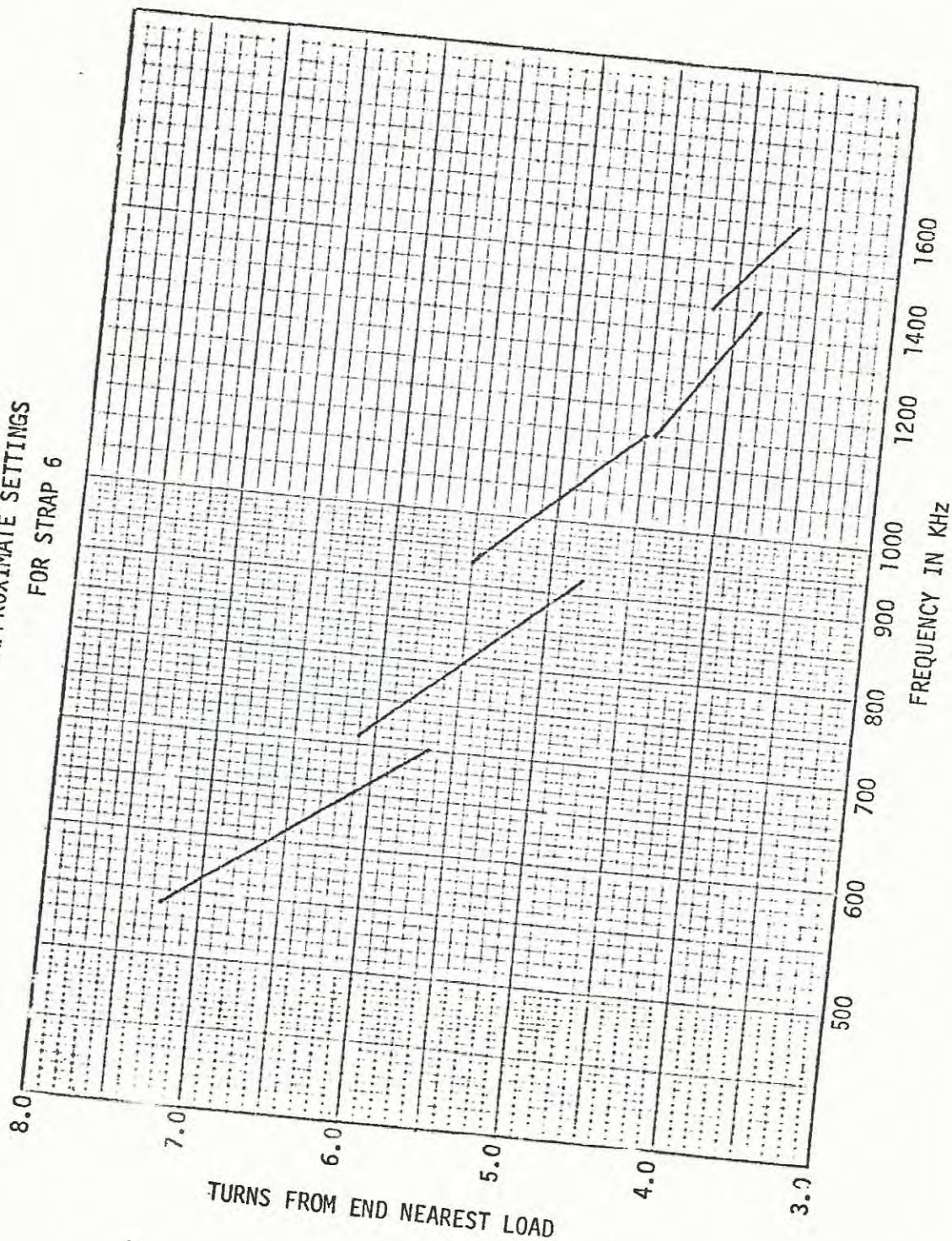
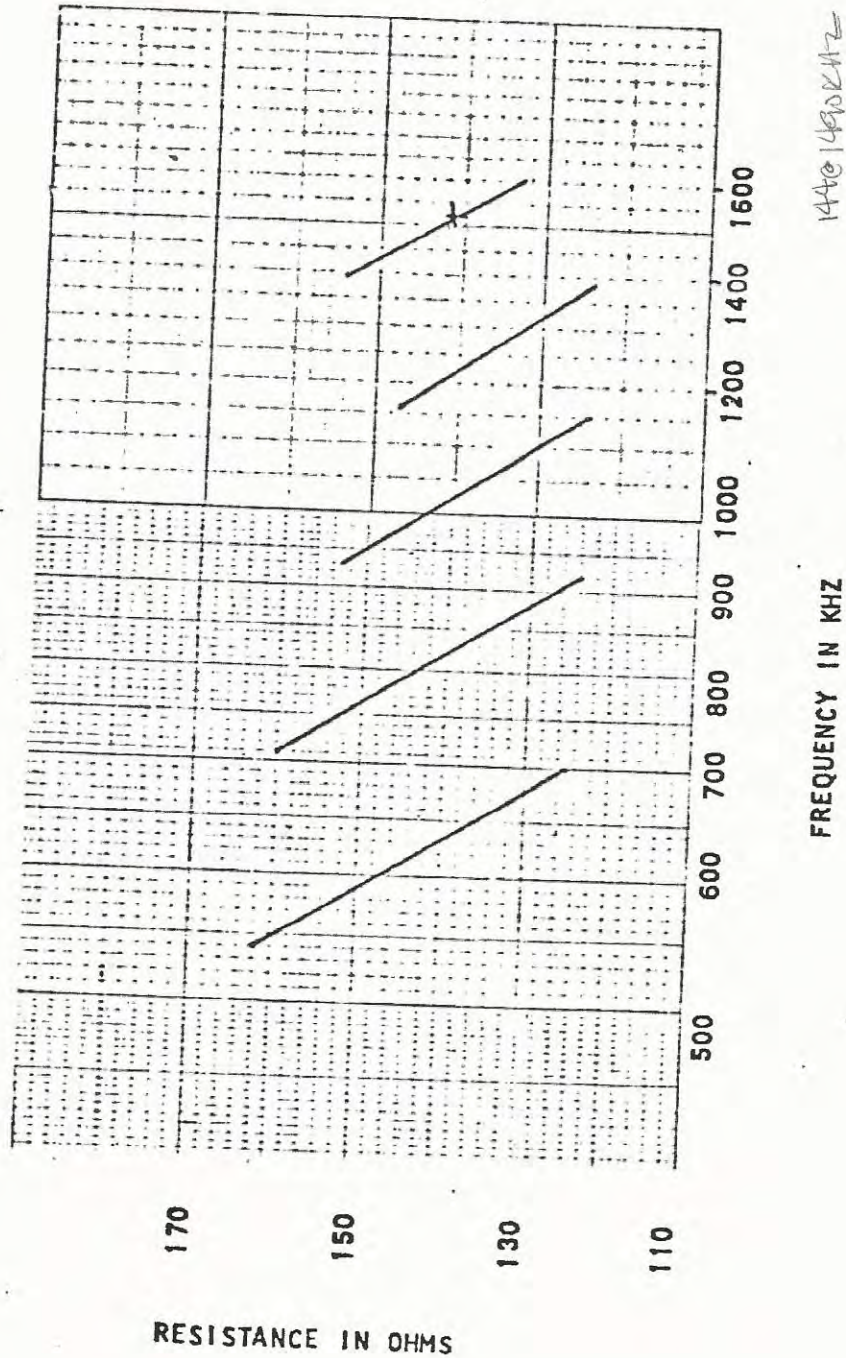
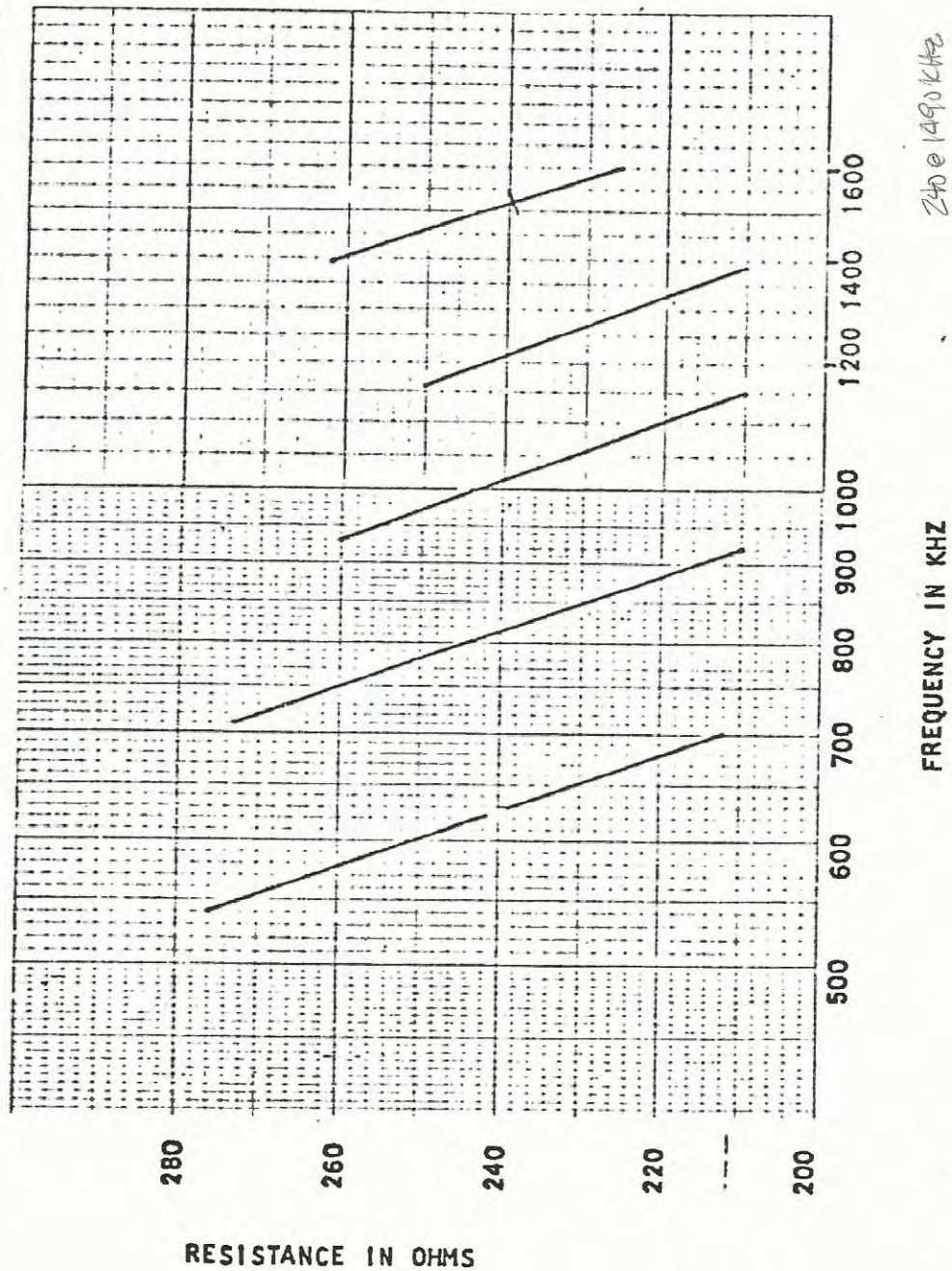


FIGURE 9
R₃₃ VALUES



SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 19

FIGURE 10
R22 VALUES
R22 = R22C



SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 20

5.4.6.1

PLATE SUPPLY

THE PLATE AND SCREEN POWER SUPPLIES SHOULD BE TESTED WITH THE PA AND MODULATOR TUBES REMOVED. SET PA RHEOSTAT TO MIDSCALE IN MANUAL POSITION. CLOSE BOTH CIRCUIT BREAKERS, CB1 AND CB2. DEPRESS LOW POWER ON SWITCH AND OBSERVE THE PLATE VOLTAGE METER ON THE CONTROL PANEL. METER SHOULD INDICATE APPROXIMATELY 2900 VOLTS FOR THE 500 WATT CUTBACK VERSION AND APPROXIMATELY 2500 VOLTS FOR THE 250 WATT CUTBACK VERSION. DEPRESS THE HIGH POWER ON SWITCH; THE METER SHOULD READ APPROXIMATELY 4000 VOLTS.

5.4.6.2

BIAS SUPPLY

CHECK FOR PROPER INSTALLATION OF F2, A 1/2 AMPERE FUSE LOCATED ON THE CONTROL PANEL. CLOSE BOTH BREAKERS AND DEPRESS FILAMENT ON SWITCH. AFTER THE BLOWER AND FILAMENTS COME ON, READ BIAS SUPPLY VOLTAGE ON M3 OF CONTROL PANEL WITH S11 IN BIAS SUPPLY POSITION. COMPARE WITH READINGS TAKEN ACROSS SUPPLY OUTPUT A2TB1-10(-) AND 17(+) USING CALIBRATED TRIPLET. READINGS SHOULD BE WITHIN 5%. READING ON TRIPLET SHOULD BE APPROXIMATELY -55 VOLTS.

5.4.6.3

SCREEN SUPPLY

CHECK FOR PROPER INSTALLATION OF F-3, 2.0 AMPERE SLOW BLOW FUSE. CONNECT TRIPLET METER BETWEEN (+) A2E1 AND A3E1 AND SET TO 1200 VDC SCALE. CLOSE BOTH BREAKERS AND DEPRESS LOW POWER ON SWITCH. TEST METER, M3, WITH S11 IN POSITION SCREEN V AND TRIPLET SHOULD READ APPROXIMATELY 810 VOLTS. READINGS SHOULD BE WITHIN 5%. DEPRESS HIGH POWER ON SWITCH AND OBSERVE NO CHANGE IN SCREEN VOLTAGE READINGS. OPEN ALL BREAKERS.

5.5

AUDIO DRIVER CARD

5.5.1

CONNECT E2 - E3 FOR 600 OHM INPUT.

5.5.2

SELECT AND INSTALL R6, R7, R8 FROM FOLLOWING TABLE ACCORDING TO LOW POWER LEVEL SPECIFIED ON SALES ORDER:

<u>POWER</u>	<u>R6</u>	<u>R7</u>	<u>R8</u>
500 WATTS	100Ω	100Ω	1.8K
250 WATTS	160Ω	160Ω	680
ALL ARE 1/4 W, 5% TOL.			

5.6

INSTALL TUBES V1 - V4 IN THEIR SOCKETS.

5.6.1

FILAMENT VOLTAGE ADJUSTMENT

METER FILAMENT VOLTAGE WITH CALIBRATED TRIPLET METER. MEASURE MODULATOR FILAMENT AT A1T2 SECONDARY; MEASURE PA FILAMENT AT A1T1 SECONDARY. ADJUST A1R7 AND A1R8 SO THAT THE MODULATOR AND PA FILAMENT VOLTAGES ARE BOTH 9.5 VAC. AS AN OPTION A SOLA CONSTANT VOLTAGE TRANSFORMER MAY BE OBTAINED

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SCALE	REV	SHEET

TO PROVIDE A REGULATED FILAMENT VOLTAGE. IF THIS OPTION HAS BEEN CHOSEN, THE OUTPUT OF THE SOLA IS A CONSTANT 236 VOLTS. THEREFORE THE TAPS ON THE FILAMENT TRANSFORMERS MUST BE SET FOR 230 VOLTS REGARDLESS OF THE LINE VOLTAGE. AGAIN THE FILAMENTS MUST BE ADJUSTED AS ABOVE.

6.0 INITIAL ADJUSTMENTS

6.1 OSCILLATOR CARD

6.1.1 OBTAIN CRYSTALS SPECIFIED IN SALES ORDER AND INSTALL THEM IN THE SOCKETS PROVIDED ON THE CARD. IF ONLY ONE IS ORDERED, INSTALL IT IN XY1.

6.1.1.1 CONNECT STRAPS FOR OPERATING FREQUENCY AS FOLLOWS:

FREQUENCY	STRAP	
540 - 720 KHZ	E5 - E6 - E7	} C23, C24, C25 TEST SELECT FOR OPTIMUM CURRENT PER PARA. 7.3.1.
730 - 1200 KHZ	E5 - E6	
1210 - 1600 KHZ	---	
540 - 1080 KHZ	E1-E2; E3-E4	
1090 - 1600 KHZ	E1 - E4	

6.1.2 PLACE CARD IN TEST JIG AND CONNECT 28V POWER SUPPLY TO INPUT, OSCILLOSCOPE TO OUTPUT AND FREQUENCY COUNTER TO OUTPUT.

6.1.2.1 SET POWER SUPPLY TO 25 VOLTS \pm 0.5 VOLTS. SET TEST JIG SWITCH TO OUTPUT 1. SET S1 ON OSCILLATOR CARD TO POSITION ONE. (TURN COUNTER CLOCKWISE ONE QUARTER TURN TO STOP.)

6.1.2.2 OBSERVE OUTPUT ON OSCILLOSCOPE. IT SHOULD BE A RECTANGULAR PULSE OF APPROXIMATELY 3.5 VP-P AMPLITUDE. CHECK OUTPUT 2 FOR 3.5 VP-P AMPLITUDE. SET SWITCH TO POSITION 1.

6.1.2.3 OBSERVE OUTPUT FREQUENCY ON COUNTER. ADJUST IT TO WITHIN \pm 1 HZ OF CUSTOMER SPECIFIED FREQUENCY USING C1 ON THE OSCILLATOR CARD.

6.1.2.4 SWITCH TO OSCILLATOR 2 BY PRESSING IN AND ROTATING SWITCH S1 CLOCKWISE ONE QUARTER TURN. SET FREQUENCY TO WITHIN \pm 1 HZ OF CUSTOMER SPECIFIED FREQUENCY USING C9.

6.1.2.5 OBSERVE OUTPUT PULSE ON THE OSCILLOSCOPE AND SET ONE CYCLE TO EQUAL EXACTLY SIX DIVISIONS ON THE SCOPE HORIZONTAL GRATICULE. THEN SET R-17 ON THE OSCILLATOR CARD SO THAT THE POSITIVE HALF OF THE PULSE IS EXACTLY TWO DIVISIONS (120°) WIDE.

6.1.2.6 OBSERVE OUTPUT POSITION 2 AND NOTE THE PULSE IS INVERTED FROM POSITION 1.

SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 22

6.2 RF DRIVER CARD

6.2.1 CONNECT CAPACITORS C12 - C16 ACCORDING TO THE FOLLOWING CHART.

FREQUENCY	C12	C13	C14	C15	C16
540 - 550	X				X
560 - 580	X	X	X	X	
590 - 600		X	X	X	
610 - 630	X		X	X	
640 - 650			X	X	
660 - 680	X	X		X	
690 - 710		X		X	
720 - 740	X			X	
750 - 780				X	
790 - 850		X	X		
860 - 890	X		X		
900 - 970			X		
980 - 1100	X	X			
1110 - 1250		X			
1260 - 1360	X				
1370 - 1600					

X = IN CIRCUIT

6.3 POTENTIOMETER ADJUSTMENTS

SET MOD 1 AND MOD 2 DRIVER POTENTIOMETERS FULLY CLOCKWISE.
SET MOD 1 AND MOD 2 BIAS POTENTIOMETERS FULLY COUNTER-CLOCKWISE.

SIZE A	CODE IDENT 13499	DWG NO. 669-7723-001
SCALE	REV	SHEET 23

7.0 TEST REQUIREMENTS

7.1 PRELIMINARY TESTS

AS DETAILED IN SECTION 5.

7.2 INITIAL ADJUSTMENTS

AS DETAILED IN SECTION 6.

7.3 RF TURN-ON AND TUNING

7.3.1 DEPRESS FIL ON. TUNE PA GRID BY ADJUSTING A1C-47 FOR A MAXIMUM GRID CURRENT. OBSERVE A1C-47 IS TUNED AT SOME POINT WITHIN ITS ADJUSTMENT RANGE AND NOT AT FULLY OPEN NOR FULLY CLOSED. ADJUST A1A3R17 FOR APPROXIMATELY 60 MA PA GRID CURRENT. RECORD DRIVER COLLECTOR CURRENT. LIMITS: 1.0 TO 1.5 A.

NOTE: CW ROTATION OF A1A3R17 SHOULD INCREASE ACTIVE PULSE WIDTH OTHERWISE LEADS ON T1 SECONDARY OF DRIVER SHOULD BE INTERCHANGED.

7.3.2 DEPRESS LOW POWER ON SWITCH AND OBSERVE R-F OUTPUT CURRENT. (ALSO NOTE CORRECT PLATE VOLTAGE. OBSERVE TOO THAT PLATE CURRENT IS NOT EXCESSIVE; NMT 360 MA/500 WATT, 260 MA/275 WATT.)

7.4 MODULATOR STATIC ADJUSTMENT

DEPRESS HIGH POWER ON SWITCH. ADJUST MOD 1 BIAS AND MOD 2 BIAS POTENTIOMETERS TO SET THE MODULATOR CATHODE CURRENT AT 100 MA PER TUBE.

THIS IS ACCOMPLISHED BY ADJUSTING BOTH TUBES TO AS NEAR CUT-OFF AS THE BIAS ADJUSTS WILL ALLOW. NOTE STATIC CURRENT I_0 AT THIS POINT. THEN INCREASE MOD 1 UNTIL A READING OF $100 \text{ MA} + I_0/\theta$ IS READ ON MOD CATHODE CURRENT METER. THEN ADJUST MOD 2 FOR A 200 MA CATHODE CURRENT READING. CURRENT MAY BE INCREASED TO 300 MA ($\approx 130 \mu\text{A/TUBE}$) IF NECESSARY TO REDUCE DISTORTION.

7.5 POWER OUTPUT

7.5.1 POWER ADJUST

DEPRESS HIGH POWER ON SWITCH. WITH POWER CONTROL SWITCH, S10, IN MANUAL POSITION, RUN POWER ADJUST THROUGH ITS ENTIRE RANGE AND RECORD OUTPUT POWER AT EACH EXTREME.

DEPRESS LOW POWER ON SWITCH AND RUN POWER ADJUST THROUGH ITS ENTIRE RANGE AND RECORD OUTPUT POWER AT EACH EXTREME.

SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 24

7.5.2

AUTOMATIC POWER CONTROL

CONNECT DIGITAL VOLTMETER OR HP-410C FROM A2TB2-17 TO A2TB2-16. TURN ON TRANSMITTER TO HIGH POWER OPERATION AND SET POWER CONTROL SWITCH TO MANUAL. SET POWER OUTPUT AT 1 kW. ADJUST A6A1R7 FULLY CCW. ADJUST A6A1R3 FOR APPROXIMATELY ZERO VOLTS. AS A6A1R3 IS ADJUSTED EACH WAY, A6A1K1 AND A6A1K2 WILL ALTERNATELY PULL IN AND DROP OUT. ADJUST A6A1R3 MIDWAY BETWEEN THOSE POINTS SO BOTH ARE DEENERGIZED. ADJUST A6A1R7 ABOUT 3/4 CLOCKWISE. THIS WILL NARROW THE "DEAD ZONE" BETWEEN THE POINT AT WHICH ONE RELAY DROPS OUT AND THE OTHER PULLS IN. THIS SHOULD BE ABOUT 1/4 TURN ON A6A1R3.

NOTE: WITH 51 OHM LOAD - RF LINE CURRENT IS:

1 kW = 4.42 A
0.5 kW = 3.13 A
0.25 kW = 2.15 A

SWITCH TO LOW POWER AND SET POWER OUTPUT TO 250 OR 500 WATTS AS CALLED FOR ON THE SALES ORDER. ADJUST A6A1R2 SO BOTH A6A1K1 AND A6A1K2 ARE DEENERGIZED.

SWITCH TO HIGH POWER AND NOTE RF LINE CURRENT. SET POWER CONTROL TO LOWER UNTIL POWER CONTROL RHEOSTAT IS AT THE MAXIMUM RESISTANCE POSITION. SET TO AUTOMATIC POWER CONTROL MODE AND NOTE THAT RF LINE CURRENT RETURNS TO WITHIN 2% OF ORIGINAL VALUE.

SWITCH TO MANUAL POWER CONTROL AND ADJUST POWER OUTPUT TO MAXIMUM. SWITCH TO AUTOMATIC POWER CONTROL AND NOTE THAT RF LINE CURRENT RETURNS TO WITHIN 2% OF ORIGINAL VALUE.

REPEAT THE ABOVE TWO STEPS FOR LOW POWER OPERATION.

7.6

PA EFFICIENCY

7.6.1

CONNECT STANDARD VOLTMETER FROM PA PLATE VOLTMETER MULTIPLIER CARD A1A4E3 TO GROUND A3E1. BE CAREFUL TO INSULATE AND PROPERLY ROUTE THE METER WIRES TO AVOID ACCIDENTAL SHORTS. PRESS "FIL ON" PUSHBUTTON FOLLOWING BY "HP ON" PUSHBUTTON. RECORD STANDARD VOLTMETER AND "PA PLATE" VOLTMETER READINGS AND CALCULATE DIFFERENCE IN PERCENT. TURN OFF THE TRANSMITTER AND REMOVE STANDARD VOLTMETER.

7.6.2

CONNECT STANDARD AMMETER IN SERIES WITH A5L2. CAREFULLY INSULATE LEADS TO AVOID SHORT CIRCUITS. PRESS "FIL ON" PUSHBUTTON AND "HP ON" PUSHBUTTON. RECORD STANDARD AMMETER AND "PA PLATE CURRENT" READINGS AND CALCULATE DIFFERENCE IN PERCENT. TURN OFF TRANSMITTER AND REMOVE STANDARD AMMETER.

7.6.3

OBTAIN PA INPUT POWER AS THE PRODUCT OF PLATE CURRENT AND PLATE VOLTAGE. EFFICIENCY SHOULD BE AT LEAST 72% AT BOTH HIGH AND LOW POWER OPERATION.

SIZE A	CODE IDENT 13499	DWG NO. 669-7723
SCALE	REV	SHEET 25

NOTE: TUNE C11 FOR A MINIMUM INDICATION OF PLATE CURRENT, THEN TURN THE PA TUNE ADJUSTMENT TOWARDS THE CCW DIRECTION TO INCREASE THE PLATE CURRENT APPROXIMATELY 20 MA. THIS WILL BE THE MOST EFFICIENT OPERATING POINT.

7.6.4 REMOTE PLATE VOLTAGE INDICATION: CONNECT TRIPLET 630 BETWEEN GROUND AND A1TB1-4. RECORD INDICATION FOR HIGH POWER.

REMOTE PLATE CURRENT INDICATION: CONNECT TRIPLET 630 BETWEEN GROUND AND A1TB1-6. RECORD INDICATION FOR HIGH POWER.

7.7 MODULATION CHARACTERISTICS

WITH POWER AT 1.1 kW (CARRIER COND) NOTE THE VOLTAGE AT A1J-2. IT SHOULD BE APPROXIMATELY 30 VP-P WHEN THE MONITOR IS CONNECTED. TO ADJUST MOVE PIN 4 ON L-8 AFTER REMOVING OUTPUT NETWORK COVER. REPEAT FOR THE LOWER POWER MODE, ADJUSTING PIN 3 FOR AN IDENTICAL OUTPUT.

7.7.1 AUDIO FREQUENCY DISTORTION

USING THE DISTORTION ANALYZER CONNECTED AT THE MODULATION MONITOR AUDIO OUTPUT, DETERMINE AUDIO DISTORTION OVER THE RANGE 50 Hz - 10 KHz AT 25%, 50% AND 95% MODULATION IN HIGH POWER OPERATION. SET MOD 1 AND MOD 2 DRIVE POTENTIOMETERS BY MODULATING 95% AT 7500 Hz AND ADJUSTING ONE OF THE POTENTIOMETERS TO YIELD MINIMUM DISTORTION. ONE OF THE POTENTIOMETERS WILL REMAIN FULL CLOCKWISE, ADJUSTMENT MAY BE MADE AT OTHER FREQUENCIES TO YIELD BEST OVERALL DISTORTION CHARACTERISTICS.

7.7.2 AUDIO FREQUENCY RESPONSE

MEASURE AUDIO FREQUENCY RESPONSE OVER THE RANGE 30 Hz TO 10 KHz at 25%, 50% AND 95% MODULATION FOR HIGH POWER OPERATION. THIS IS DONE BY MAINTAINING MODULATION AT SPECIFIED PERCENTAGES AT ALL FREQUENCIES AND OBSERVING THE VARIATION OF INPUT LEVEL WITH FREQUENCY. NORMALIZE INPUT LEVELS WITH REFERENCE TO 1 KHz. RESPONSE SHOULD BE MADE HOLDING MODULATION LEVEL CONSTANT AS INDICATED ON MODULATION MONITOR.

SHOULD RESPONSE BE SLIGHTLY OUT OF SPEC AT 10 KHz, ADD A SMALL CAPACITOR (LIKE 2200 pf) FROM A1A1TB1-1 TO 3 AND ANOTHER (SAME VALUE) FROM A1B1TB1-2 TO 3.

7.7.3 INPUT LEVEL

DETERMINE AUDIO INPUT LEVEL NECESSARY FOR 100% MODULATION AT 1000 Hz FOR HIGH POWER OPERATION.

7.7.4 LOW POWER OPERATION

REPEAT 7.7.1, 7.7.2 AND 7.7.3 AT LOW POWER.

SIZE A	CODE IDENT 13499	DWG NO. 66-7723
SCALE	REV	SHEET 26

7.7.5

NOISE LEVEL

DETERMINE NOISE LEVEL WITH 330D DISTORTION ANALYZER (REF TO 1 KHz, 100% MOD).

7.7.6

CARRIER SHIFT

AT HIGH POWER OPERATION, DETERMINE CARRIER SHIFT AT 100% MODULATION, 400 Hz.

7.7.7

LOW POWER OPERATION

REPEAT SECTIONS 7.7.5 AND 7.7.6 AT LOW POWER OPERATION.

7.8

METER INDICATIONS

7.8.1

FULL POWER METER READINGS

RECORD METER INDICATIONS FOR HIGH POWER, UNMODULATED OPERATION. ALSO RECORD MODULATOR CURRENT AND OUTPUT POWER INDICATIONS AT 1000 Hz, 100% MODULATION. NOTE THAT VALUES ARE WITHIN RANGE FOR NORMAL INDICATION.

7.8.2

REDUCED POWER METER READINGS

REPEAT MEASUREMENTS RECORDED ABOVE, EXCEPT FOR LOW POWER.

7.9

HEAT RUN

OPERATE TRANSMITTER OVER A MINIMUM EIGHT HOUR PERIOD AT FULL POWER OUTPUT AND WITH NORMAL PROGRAM MODULATION. AFTER 30 MINUTES OF OPERATION, REMOVE POWER AND CHECK ALL COMPONENTS FOR SIGNS OF OVERHEATING.

7.10

TUBE SERIAL NUMBERS

RECORD SERIAL NUMBERS OF TUBES V1, V2, V3 AND V4.

7.11

SPECIAL CHANGES

RECORD ANY SPECIAL CHANGES MADE IN THE TRANSMITTER WHICH DEVIATE FROM STANDARD DRAWING CONFIGURATION.

7.12

TEST DATA APPROVAL

OBTAIN SIGNATURE APPROVAL OF TEST SUPERVISOR OR COGNIZANT ENGINEER.

SIZE	CODE IDENT	DWG NO.
A	13499	669-7723
SCALE	REV	