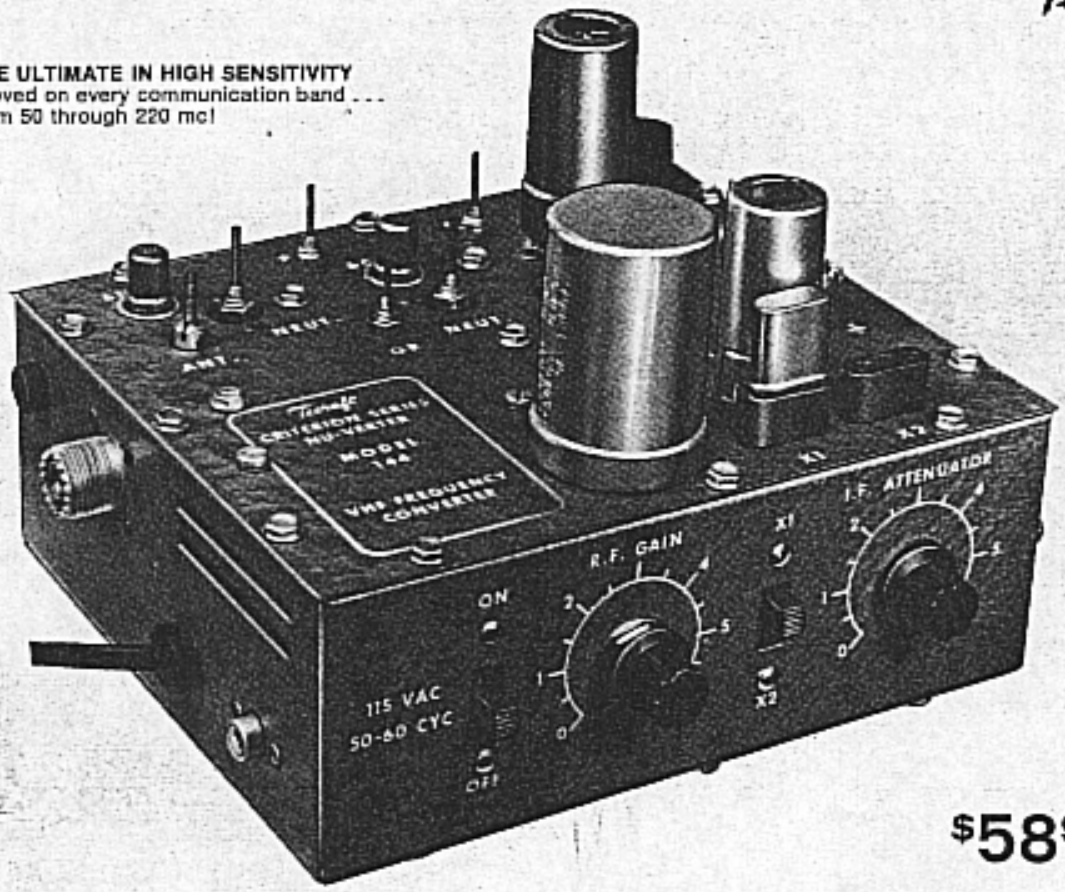
NUVISTOR CONVERTERS

BY Tecraft

THE ULTIMATE IN HIGH SENSITIVITY
Proved on every communication band . . .
from 50 through 220 mc!



$58.95

Model 50 — 50-54 mc (16 Meter Band)
Model 144 — 144-148 mc (2 Meter Band)
Modes 220 — 220-225 mc (1¼ Meter Band)
Other Ranges on Special Order

These NEW converters by TECRAFT fill a need for quality equipment which will allow your present communications receiver to function on the VHF and UHF bands.

A TECRAFT converter, connected to the antenna terminals of such a receiver, provides the finest reception and control of the signals. The resulting receiving system is ideal from the point of view of LOW NOISE, EXTREME SENSITIVITY, HIGH GAIN AND MAXIMUM STABILITY.

Virtually any make or model of receiver may be used, since TECRAFT Converters allow the use of any IF frequency.

FOR AMATEUR, COMMERCIAL, CIVIL DEFENSE, CAP AND SPECIAL SERVICES

OUTSTANDING PERFORMANCE

The finest engineering, skillfully integrated with the best design techniques—PLUS many years of experience in the manufacture of electronic devices — assures you that TECRAFT's performance is superior!

FEATURES

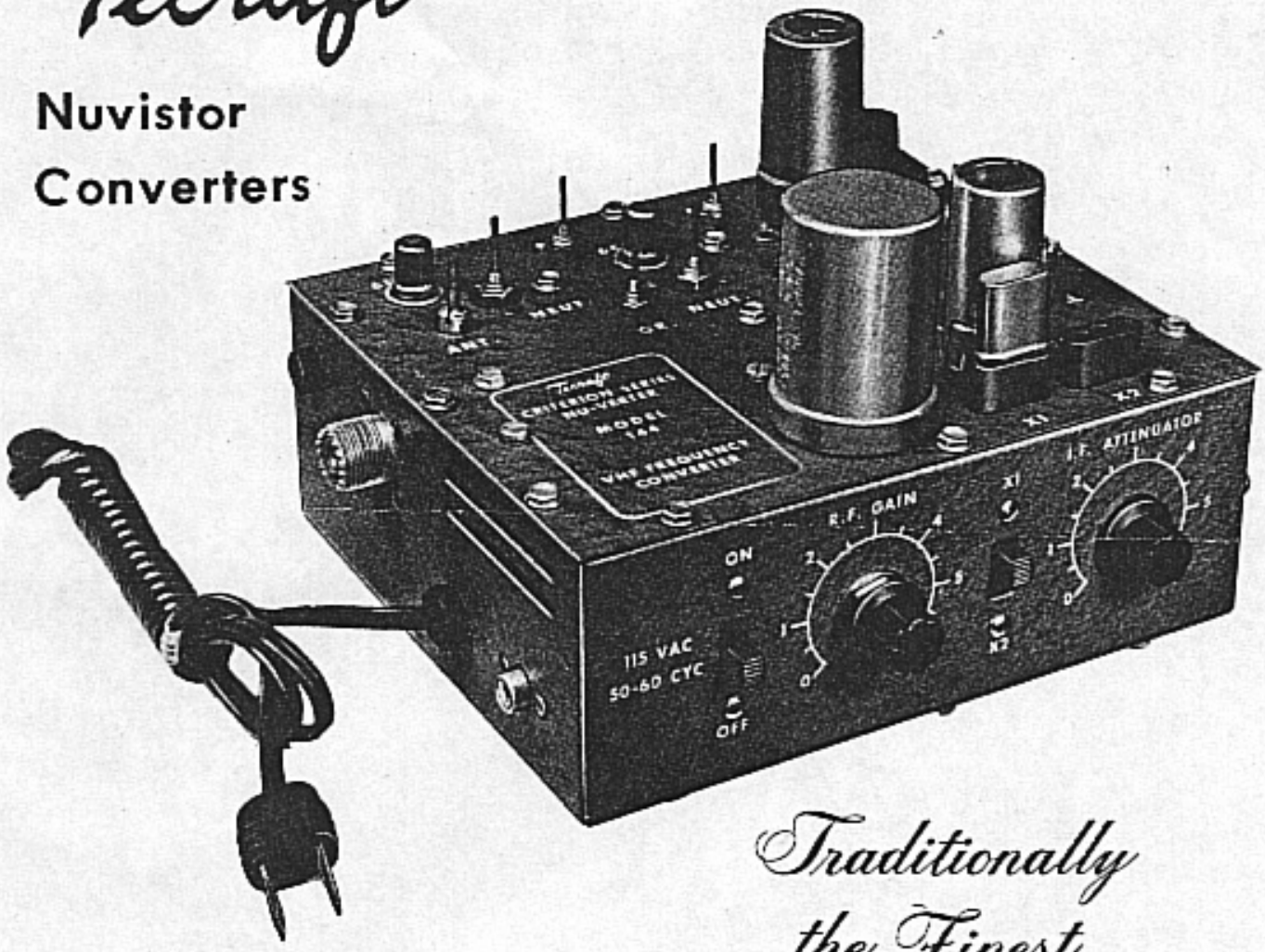
• Exceedingly low noise figure • High signal to noise ratio • Freedom from spurious responses • Minimum cross modulation • Maximum rejection of IF feed through • Sufficient output to operate several receivers simultaneously • Rugged construction to withstand extremes of shock, vibration or temperature • Completely stable — no drift, no microphonics • Case and chassis are beautifully finished in hammertone baked for durability. The chassis is copper plated to minimize circulating chassis current and provide low impedance RF returns • Best Dollar Value — Careful and critical comparison of technical features, constructional details, wiring and components, on a side by side basis, will reveal that Tecraft is your **best** buy!

TECRAFT DIVISION - SIRENO SIGNAL MFG. CORP. • 67 PASSAIC AVE. • KEARNY, N.J. 07032

PRICE.....$1.50

Tecraft

Nuvistor Converters



Traditionally the Finest

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Phone: 201—998—9007

NUVISTOR CONVERTERS by TECRAFT

GENERAL DESCRIPTION

NUVISTOR Converters employ highly stable crystal controlled oscillators for maximum calibration accuracy and built in power supplies permitting precise voltage control for idealized operation of the two neutrode nuvistor R. F. stages. The R. F. stages are, optionally AVC or manually gain controlled and are broad banded, have a very low noise figure, extremely high gain and excellent rejection of image and spurious responses.

The mixer stage employs one section of 12AT7 / 6JK8 low noise dual triode for optimum mixer performance. The remaining section is connected as a cathode follower, low impedance, I.F. output stage.

This stage incorporates a switching system to permit a choice of I. F. output frequencies and an attenuator to provide proper signal input level to the communications receiver employed.

A TECRAFT NUVISTOR Converter connected to the antenna terminals of a good communications receiver provides extreme sensitivity, low noise, high gain, maximum stability with complete control of signals within the frequency range of the converter.

SPECIFICATIONS

1. 1/10 uv input will provide an output signal at least 6 db above noise.
2. More than 30 db overall gain.
3. 1 microvolt input will provide 20 db thermal noise quieting.
4. Adjustable R. F. gain to minimize cross modulation.
5. Pass band: 4 Mc. Down 6 db at 6 Mc. May be peaked to favor any portion of band.
6. .005% crystals provide maximum calibration accuracy.
7. High frequency crystals permit low order of frequency multiplication resulting in greater freedom from spurious responses.
8. Extensive shielding and L/C-R/C isolation of power wiring prevents coupling to local R. F. fields and inteference therefrom.
9. 52 or 72 ohm input – 300 ohm with Balun.

WARNING

Do not attempt to use this converter with AC/DC type receivers, since damage to converter and/or receiver can occur. There is also considerable danger of severe electrical shock to the operator.

In the event that an AC / DC receiver must be employed, it is imperative that the receiver be connected to the line through an isolation transformer.

Do not attempt to use your converter until you have read and thoroughly understand the contents of this manual. Failure to employ the proper procedures can result in unsatisfactory operation.

It is imperative that the converter be thoroughly grounded using large area grounding conductors and in cases where local radio services set up strong R. F. fields, mutiple ground leads, varying in length, can be employed to advantage.

GENERAL INSTRUCTIONS

Tecraft Converters should be used with good quality communications receivers.

Connect a short length of co-axial cable between converter I.F. output and antenna terminals of receiver (Not over 3 feet). If undesired signals at the I.F. frequency are getting through, shorter cable should be employed. The receiver as well as the converter should be grounded, different grounds should be tried, antenna input terminals of receiver should be shielded or converted to co-ax type. Ideally, the cable between converter and receiver should be as short as possible. Be sure that the normal low frequency antenna feed line employed with the receiver be kept well clear of receiver and be sure to ground it, since coupling between it and the converter and/or receiver can occur, causing reception of unwanted signals and spurious responses.

ANTENNA REQUIREMENTS

Use any type of antenna, except long wire, cut accurately for the band. Use 50 or 72 ohm co=axial feed line to converter. If antenna uses 300 ohm line, a balun should be employed. This is less desirable than the use of a co-axial feed line which will provide least pickup of extraneous noise and unwanted signals.

SELECTION OF I.F. OUTPUT FREQUENCY

Both the 144Mc and 220Mc models provide a choice of I. F. output frequencies from 6Mc through 54Mc, thus permitting the use of the most convenient tuning range on the communications receiver.

The 50Mc model may be used at I. F. output frequencies from 6Mc through 35Mc.

The I. F. should be chosen so that the best tuning range and bandspread of the receiver are employed. Consideration should be given to maximum selectivity and freedom from images.

On general coverage receivers, 14-18Mc is usually the best band unless band switching breaks this range into two parts, in which case 10–14, 11–15, 12–16 or 16–20Mc etc. may be employed.

On Ham band receivers, the maximum tuning range is usually found to be 28–30Mc. Some receivers also provide a special converter band at 30–35Mc. Others provide a 50–54Mc band. Use the band which will afford the tuning range you require.

Most 6 meter (50Mc) activity occurs in the 1Mc from 50.1 to 51.1Mc; thus permitting the use of any receiver tuning range which is 1Mc wide. On general coverage receivers a frequency near 14Mc should be selected. On the Ham band receivers, something near 28Mc will probably provide the range. The converter band or the 50–54Mc range could be used (See crystal – I.F. table).

Two meter activity is spread over the full 4Mc range, therefor 4Mc of tuning range must be found on the receiver, and again the 14–18Mc range should be chosen if possible, or the converter band or the 50–54Mc band may be used.

In those cases where a 4Mc tuning range is not available, the NUVISTOR converter will allow the use of 2 crystals so that the broadest tuning range of the receiver, usually from 28–30Mc, may be employed for full band coverage (See crystal – I.F. table).

CRYSTAL VS I.F. FREQUENCY TABLES

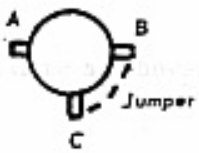
MODEL 50

RECEIVE FREQUENCY	I.F. OUTPUT FREQUENCY	CRYSTAL FREQUENCY
50–54 Mc.	6–10 Mc.	44 Mc. See Note "A"
50–54 Mc.	7–11 Mc.	43 Mc. " "A"
50–54 Mc.	10–14 Mc.	40 Mc. " "A"
50–54 Mc.	14–18 Mc.	36 Mc. " "A"
50–54 Mc.	26–30 Mc.	24 Mc. " "B"
50–54 Mc.	28–32 Mc.	22 Mc. " "B"
50–54 Mc.	30.5–34.5 Mc.	19.5 Mc. " "B"

Note "A" – Refer to oscillator coil drawing below. Connect jumper wire between lugs B and C.

Note "B" – Remove jumper wire between lugs B and C.

Osc. Coil Model 50 Viewed From bottom of converter



Crystal Formula: To find crystal frequency for various I.F. output frequencies, subtract desired I.F. frequency from 50Mc.

Example: For I.F. 14–18Mc.

$$\begin{array}{r} 50 \\ -14 \\ \hline \end{array}$$

36Mc crystal required

MODEL 144

RECEIVE FREQUENCY	I.F. OUTPUT FREQUENCY	CRYSTAL FREQUENCY	MULTIPLIER FREQUENCY
144–148 Mc.	6–10 Mc.	46 Mc.	138 Mc.
144–148 Mc.	7–11 Mc.	45.666 Mc.	137 Mc.
144–148 Mc.	10–14 Mc.	44.666 Mc.	134 Mc.
144–148 Mc.	14–18 Mc.	43.333 Mc.	130 Mc.
144–148 Mc.	26–30 Mc.	39.333 Mc.	118 Mc.
144–148 Mc.	28–32 Mc. Note "C"	38.666 Mc.	116 Mc.
144–148 Mc.	30.5–34.5 Mc.	37.833 Mc.	113.5 Mc.
144–148 Mc.	50–54 Mc.	47 Mc.	94 Mc.

Note "C" –With many Amateur Band only receiver, the 28–30Mc band can be used to provide complete coverage from 144–148Mc. Two crystals must be used. The crystal switch on front panel is used to select either crystal. The 38.666Mc crystal will give coverage from 144–146Mc and a 39.333Mc crystal will provide coverage from 146–148Mc. The oscillator should be adjusted with the 39.333Mc crystal, following the oscillator tuning instructions.

The same technique is followed, (see crystal formula) when other unusual I.F. frequencies are needed.

Crystal Formula: To find crystal frequency for various I.F. output frequencies, subtract desired I.F. frequency from 144Mc and divide by 3.

Example: For I.F. 14–18Mc.

$$\begin{array}{r} 144 \\ -\ 14 \\ \hline 130.000 \end{array} \qquad \frac{130.000}{3} = 43.333\text{Mc crystal required.}$$

ALIGNMENT PROCEDURE
OSCILLATOR ALIGNMENT

MODEL 144:

1a. Connect VTVM between test point and ground and set VTVM to read negative DC Volts on low scale. Turn converter on and with crystal in socket, tune oscillator coil L7 until VTVM indicates maximum and then drops sharply, then turn slug one turn counter-clockwise so that VTVM shows slightly less than maximum voltage.

1b. Tune multiplier coil L8 for maximum reading. When crystal is removed, voltage will drop to approximately .8 of a volt. Insert crystal and tune L7 counter-clockwise until meter reads no less than 1.6 volts and no more than 2.5 volts.

MODEL 50:

2a. As for MODEL 144, see 1a. above.

2b. Tune oscillator coil L7 counter-clockwise for the required voltage reading as above.

NEUTRALIZATION before R.F. ALIGNMENT

MODEL 144, MODEL 50, AND MODEL 220:

3a. Connect VTVM between test point and ground. Remove 6DS4 from socket and with R.F. Gain fully on, tune C 11 for minimum reading on VTVM. Insert 6DS4 and tune C4 for minimum reading on VTVM. (C9 and C3 for 220).

R.F. ALIGNMENT

MODEL 144 AND MODEL 220:

4a. Remove crystal from converter and turn converter R.F. Gain fully clockwise. Connect 50 ohm terminated signal generator to converter input. Set signal generator to 14Mc, tune C 10 and C 13 for maximum reading on VTVM. Set signal generator to 146Mc, tune C 2 for maximum reading on VTVM. Set signal generator to 144Mc, tune C 7 for maximum reading on VTVM.
(See NOTE below). Use 221Mc for 220, instead of 146. Tune C6–7–10–11 for max. on VTVM.

MODEL 50:

5a. Remove crystal from converter and turn converter R.F. Gain fully clockwise. Connect 50 ohm terminated signal generator to converter input. Set signal generator to 52Mc, adjust L4 and L5 for maximum VTVM reading. Set signal generator to 50Mc and adjust L2 and L3 for maximum reading on VTVM. Keep voltage on VTVM below 3 volts by reducing signal input from generator. (See NOTE below).

NOTE: This procedure should be performed twice or three times for maximum accuracy. If instability occurs during alignment it will be necessary to repeat neutralization procedure.

Your converter will now operate, but the response across the band may not be flat. To achieve maximum flatness of pass band these additional operations should be performed.

Depending on converter model, feed signal generator into antenna input at either 50 or 144Mc. (VTVM connected as before, crystal out of socket.)

Increase signal generator output until VTVM reads negative 2 volts (See schematic). Unsolder B+ lead from C6 feed-thru capacitor, adjust C4 neutralizing capacitor for minimum reading on VTVM. Resolder lead to C–6. Unsolder lead at C 12 feed-thru capacitor. Adjust C11 neutralizing capacitor for minimum VTVM reading. Resolder lead to C 12. Insert crystal. Alignment is now complete.

The use of a scope and sweep generator will greatly simplify alignment. The technique to be employed is outlined in sweep generator literature.

I. F. ALIGNMENT

To determine proper I. F. switch position for the I. F. chosen, connect converter to receiver (receiver AVC off). Connect signal source (generator or strong on the air signal) to converter input. Set receiver to chosen tuning range (approximately 51Mc or 146Mc). Set generator or tune signal to same frequency. Rotate I. F. switch for greatest receiver noise or audio output (converter attenuator fully clockwise). Then peak up Mixer Plate Coil slug on converter for maximum increase in noise or audio. Be sure you have inserted proper crystal.

Communications receivers are seldom flat over any given tuning range, therefor the "S" meter response to noise will not be uniform throughout the tuning range. This does **NOT** mean that the converter response is faulty. The converter response can be made flat when examined at the mixer grid (T.P.). In practical field use, it is generally desirable to adjust the converter for maximum output at the low frequency end of the band. This is especially true at 50 & 220Mc, since most activity occurs at the low end of these bands. Alignment of the converters as shipped, takes this fact into consideration. DO NOT INTERPRET "S" METER READINGS TO BE AN EXPRESSION OF SENSITIVITY. Actually, the "S" meter is indicating variations in gain occasioned by possible mismatch between converter and receiver, and/or actual change within the tuning range of the receiver.

TO ADJUST ANTENNA COIL

As shipped, this adjustment is made to provide best noise figure with 50 ohm feed line at optimum VSWR.

To match to **your** antenna, antenna slug should be adjusted for best signal to noise ratio. Tuning will be broad. If tuning is critical, or oscillation occurs, your antenna system is **not** flat, has a high VSWR and is not terminating in the 50–72 ohm range. The cure is to correct your antenna system.

TO USE ATTENUATOR

The output attenuator is provided so that the companion receiver may be properly operated without overload and/or excessive systemic noise, and/or improper "S" meter indications. Generally, the receiver should be operated with AVC on, R. F. Gain control full on and the Attenuator set so that noise shows about S 1 on the "S" meter. Actually this recommendation will not hold for all receivers. A few hours of experimental operation will determine the optimum settings in your case.

AVC CONTROL OF CONVERTER

In some cases it will be found beneficial to employ the AVC voltage of the receiver to control converter gain.

The Tip Jack on left end of converter is for the insertion of not over 10 Volts negative control voltage.

A lead brought from the AVC bus of your receiver may be plugged in.

When this is done, the short circuit jumper, internally wired from the junction of two 100KΩ resistors to ground (2-100KΩ resistors in series from pin 4 of 6DS4 to Tip Jack) should be removed. See schematic.

To restore normal operation without AVC this jumper should be reinserted.

SPURIOUS RESPONSES

In some areas, due to extremely strong local signals from police and similar services, beats may develop. These undesireable responses may be eliminated or greatly attenuated by inserting a small variable condensor to 30mmf in the antenna feed line to the converter. A re-entrant cavity may also be employed.

The performance of electronic equipment is related to the skill of the user and the adequacy of installation. Proper choice of antennae and care in establishing precise operating frequencies will play the largest part in securing satisfactory service from your system .

The purchaser must assume responsibility for proper installation, operating conditions and accessory equipment. Our responsibility is outlined by the following warranty.

OWNER'S WARRANTY

The Tecraft electronic equipment which you have just purchased was carefully tested and inspected before leaving our factory. If properly installed and operated in accordance with instructions furnished, it should give excellent performance and reliable operation.

Tecraft equipment is guaranteed against all defects in material and workmanship for one year from date of sale to the original purchaser. Any part of the equipment which, with normal installation and use, becomes defective will be repaired or replaced by us provided it is returned for our examination, transportation prepaid, to our factory (or authorized service station). This warranty does not apply to equipment which has been subjected to abuse or accident or which has been altered in any way; nor does this warranty extend to tubes, vibrators or accessories, etc not of our own manufacture which are separately covered by the producing manufacturer's warranty.

There is no other warranty, expressed or implied and no agent or agency has the authority to extend, modify or in any way alter the terms and/or conditions of this warranty.

Fill out and return the enclosed registry card as soon as equipment is received, in order to validate the warranty.

Notify us if failure occurs. We will advise with regard to handling for service.

All shipments to us or our agencies should be made via Railway Express, Motor Freight, or Parcel Post, pre-paid and fully insured.

Pack equipment in sturdy carton and provide a minimum of 2" of shock absorbing material.

PARTS LIST

CRITERION CONVERTERS by TECRAFT

MODEL 144

C1,14, 15, 25	47 mmf capacitor
C2, 4, 7, 10, 11, 13	1–8 mmf trimmer cap.
C3, 9	33 mmf capacitor
C5, 18, 24, 26	.005 mmf capacitor
C6, 12	500 mmf feed thru cap.
C8, 27	.0015 mmf capacitor
C16	.02 mmf capacitor
C17, 28	.01 mmf capacitor
C29, 30, 31	470 mmf capacitor
C20, 21, 22	5/20/100 mfd elect. cap.
C19	gimmick
C23	omitted

R1, 2, 17, 18	100k ohm resistor
R3, 4, 7, 16, 19	1K ohm resistor
R5	10K ohm potentiometer
R6	100 ohm resistor
R8	1 meg. ohm resistor
R9	220 ohm resistor
R10	500K ohm resistor
R11	2K ohm potentiometer
R12	1K ohm 2 watt resistor
R13	390 ohm 1 watt resistor
R14	200 ohm 1 watt resistor
R15	47K ohm 1 watt resistor
R20	3.3K ohm resistor
R21	10K ohm resistor

L1 antenna coil	V1 6DS4
L2 6DS4 plate coil	V2 6CW4
L3 6CW4 grid coil	V3 6JK8
L4 6CW4 plate coil	V4 6J6
L5 mixer grid coil	
L6 mixer plate coil	
L7 oscillator coil	
L8 multiplier coil	

CR1, CR2 500 ma. 500 PIV Silicon Rectifiers

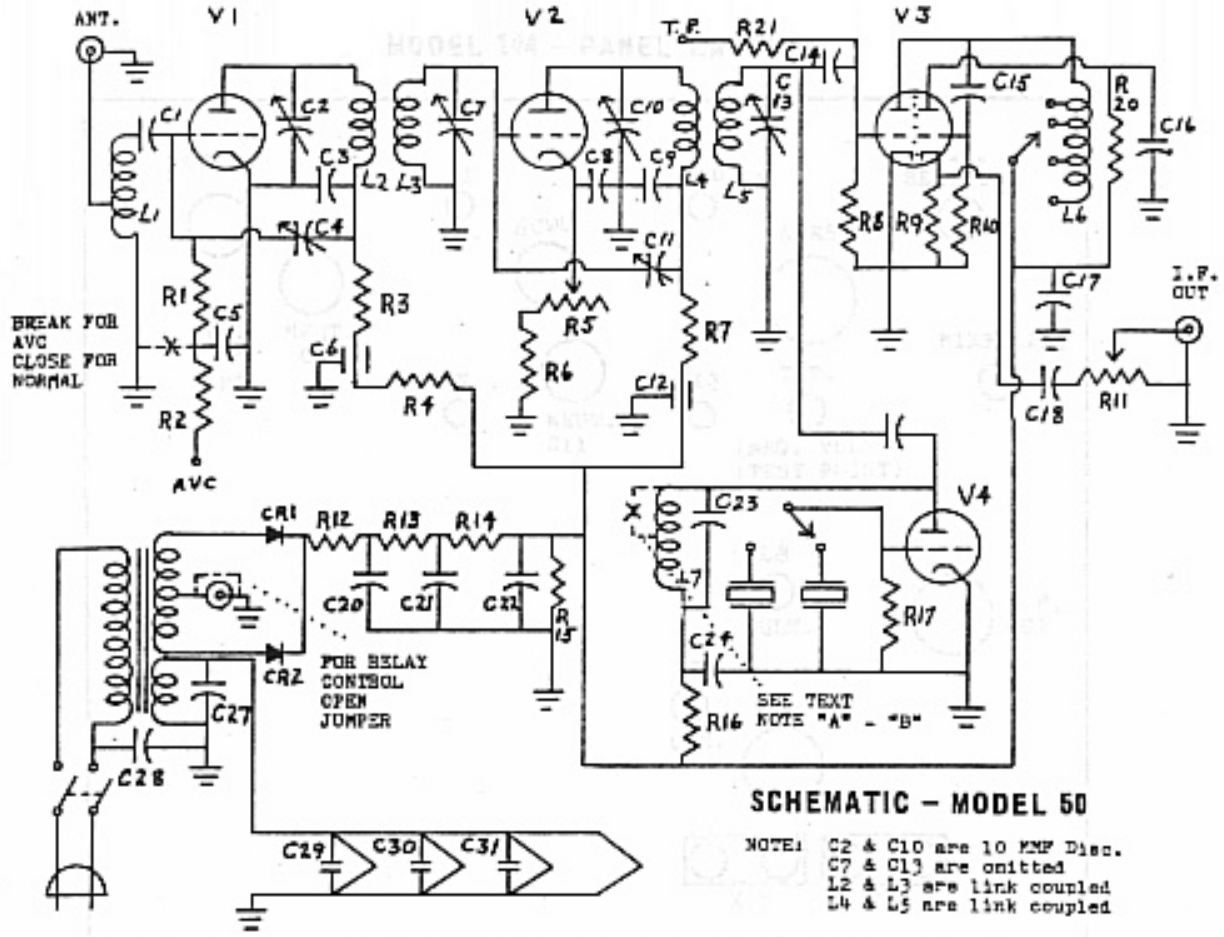
MODEL 50

C1, 14, 15	47 mmf capacitor
C2, 10	10 mmf capacitor
C3, 9	33 mmf capacitor
C4, 11	1-8 mmf trimmer cap.
C5, 8, 18, 24	.005 mmf capacitor
C6, 12	500 mmf feed thru cap.
C16	.02 mmf capacitor
C17	.01 mmf capacitor
C23	5 mmf capacitor
C20, 21, 22	5/20/100 mfd. elect. cap.
C19	gimmick
C7, 13	omitted

R1, 2, 17	100K ohm resistor
R3, 7	6.8K ohm resistor
R4, 16	1K ohm resistor
R5	10K ohm potentiometer
R6	100 ohm resistor
R8	1 meg ohm resistor
R9	220 ohm resistor
R10	500K ohm resistor
R11	2K ohm potentiometer
R12	1K ohm 2 watt resistor
R13	390 ohm 1 watt resistor
R14	200 ohm 1 watt resistor
R15	47K ohm 1 watt resistor
R20	3.3K ohm resistor
R21	10K ohm resistor
R18, 19	omitted

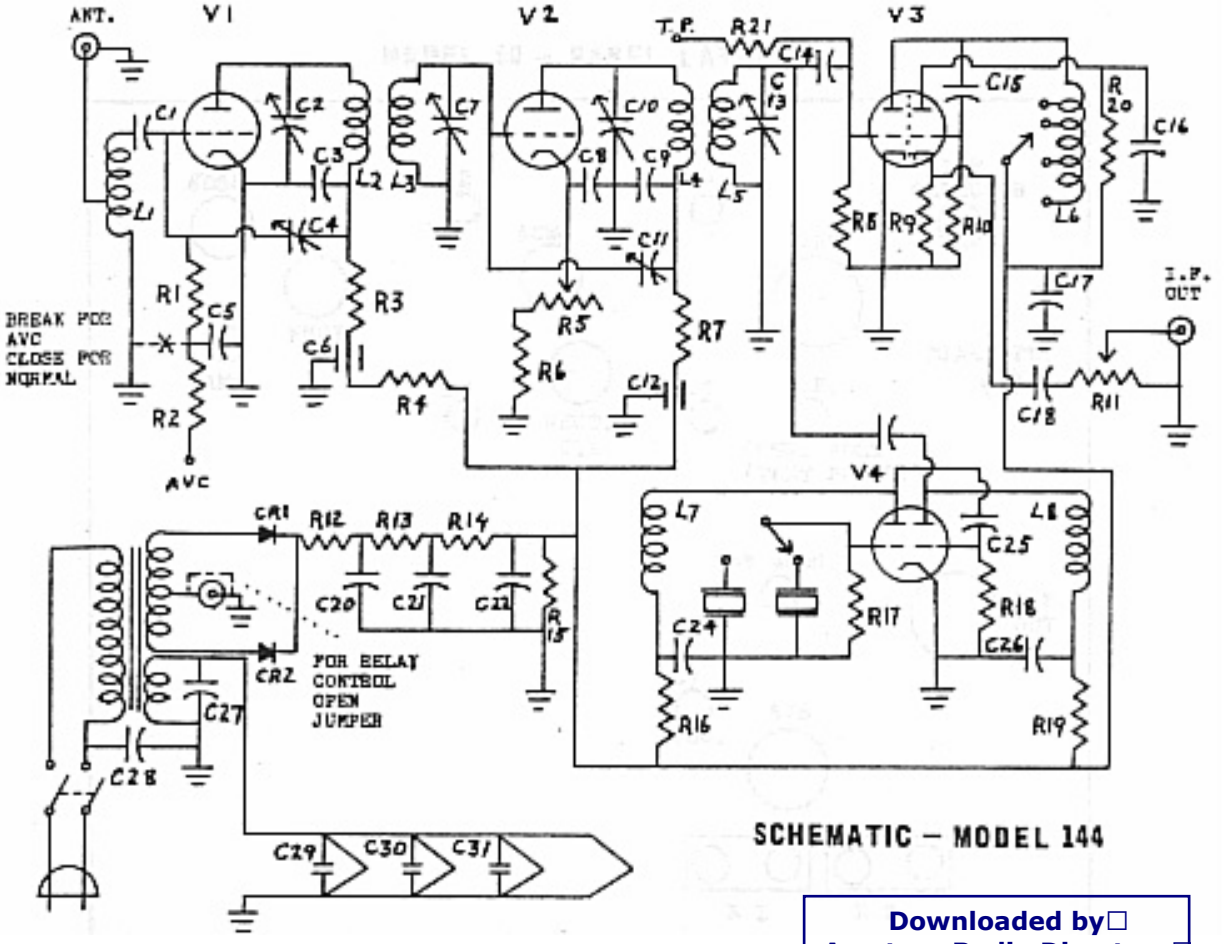
L1 antenna coil	V1 6DS4
L2 6DS4 plate coil	V2 6CW4
L3 6CW4 grid coil	V3 6JK8/12AT7
L4 6CW4 plate coil	V4 6J6
L5 mixer grid coil	
L6 mixer plate coil	
L7 oscillator coil	

CR1, CR2 500 ma. 500 PIV Silicon Rectifiers



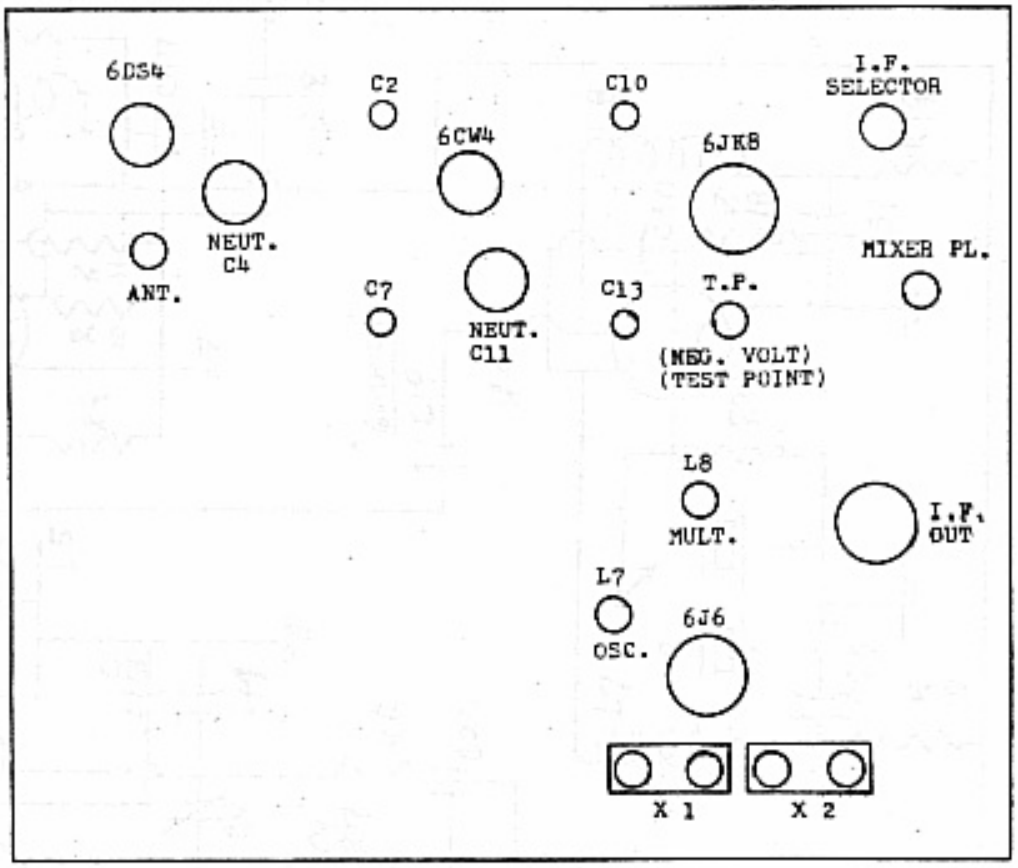
SCHEMATIC – MODEL 50

NOTE: C2 & C10 are 10 MMF Disc.
C7 & C13 are omitted
L2 & L3 are link coupled
L4 & L5 are link coupled

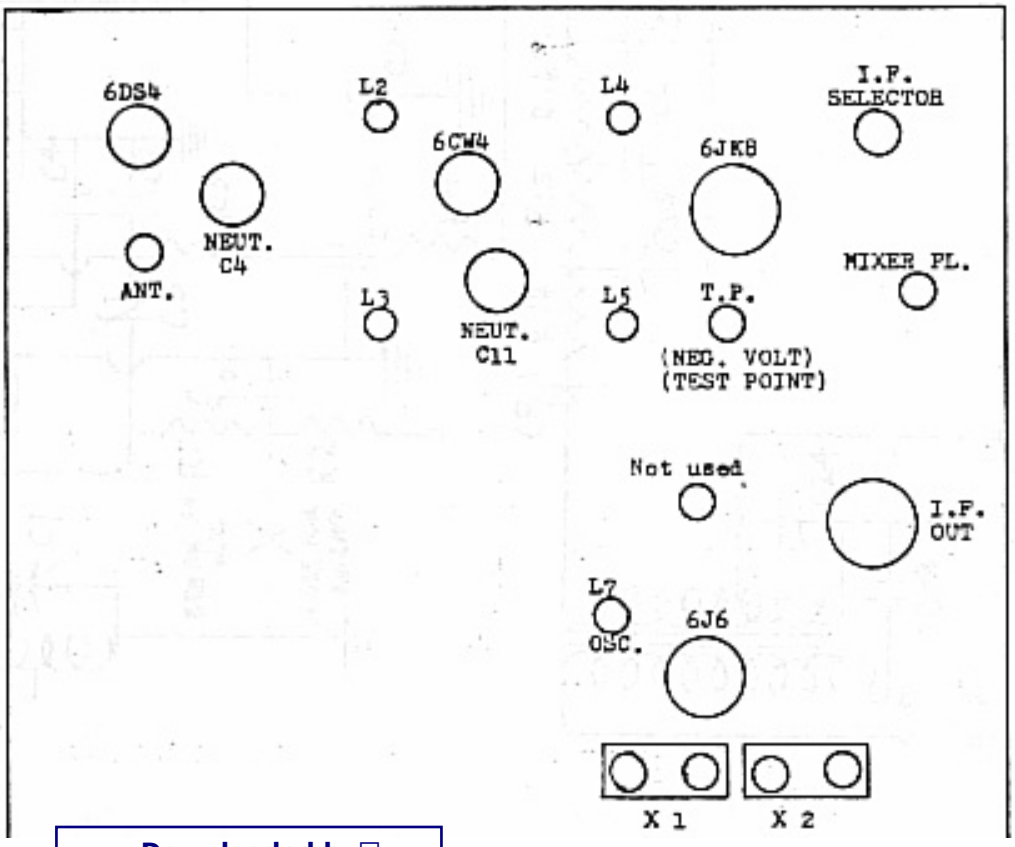


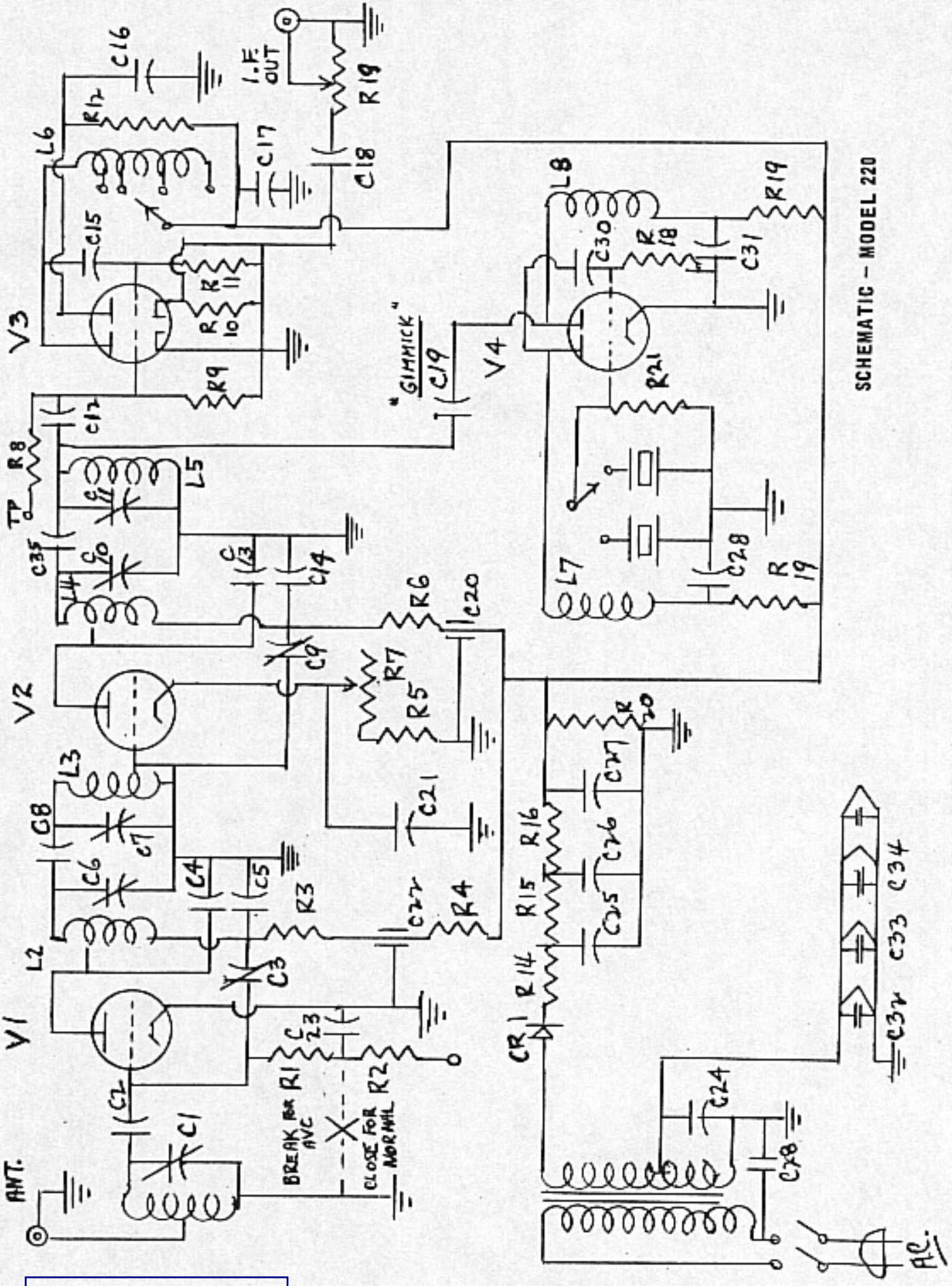
SCHEMATIC – MODEL 144

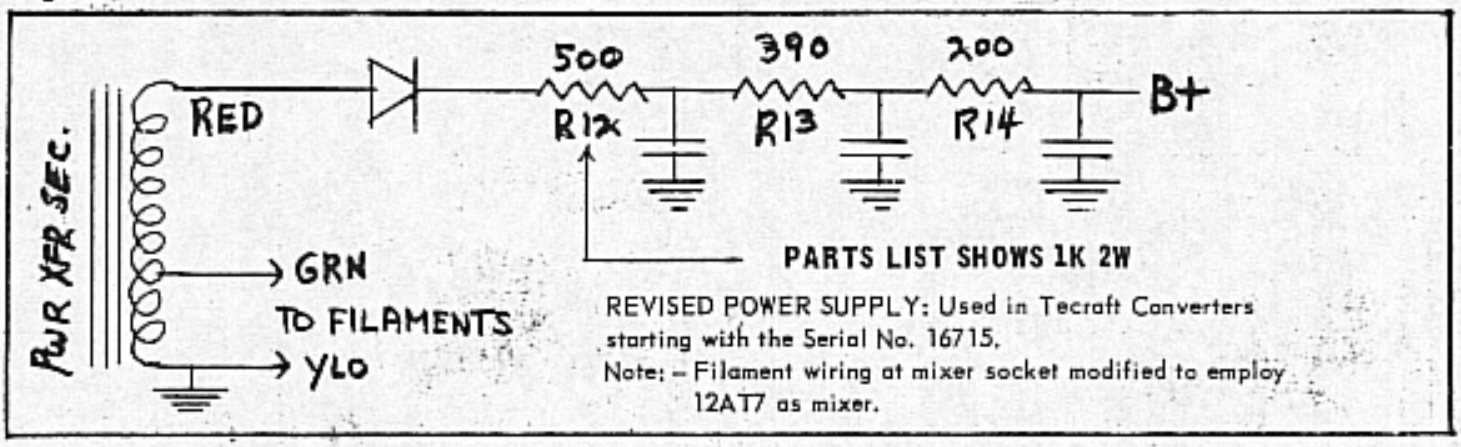
MODEL 144 – PANEL LAYOUT



MODEL 50 – PANEL LAYOUT

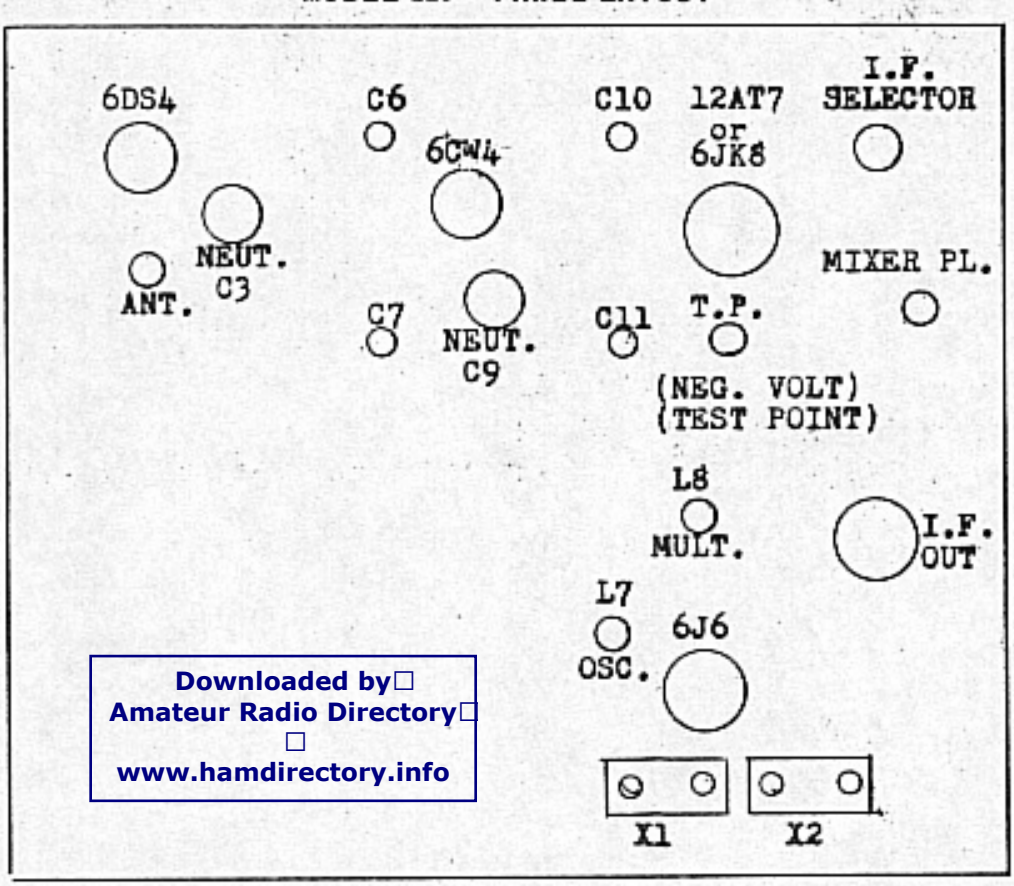






REVISED POWER SUPPLY: Used in Tecraft Converters starting with the Serial No. 16715.
Note: – Filament wiring at mixer socket modified to employ 12AT7 as mixer.

MODEL 220 – PANEL LAYOUT



PARTS LIST

C1, 3, 6, 7, 9, 10, 11	1–8 mmf trimmer cap.	L1	Antenna coil	R9	1 meg. resistor
C2, 12	15 mmf capacitor	L2	6DS4 plate coil	R10	220 ohm resistor
C4, 8, 13	5 mmf capacitor	L3	6CW4 grid coil	R11	500K resistor
C5	24mmf capacitor	L4	6CW4 plate coil	R12	3.3K resistor
C14	22 mmf capacitor	L5	mixer grid coil	R13	2K Pot.
C15, 30	47 mmf capacitor	L6	mixer plate coil	R14	1K 2W resistor
C16	.02 mfd. cap.	L7	oscillator coil	R15	390 ohm 1W res.
C17, 28	.01 mfd. cap.	L8	multiplier coil	R16	200 ohm 1W res.
C18, 23, 24, 29, 31	.005 mfd. cap.	CR1	500ma. 500 PIV Silicon Rectifiers	R20	47K 1W resistor
C19	gimmick	R1, 2, 18, 21	100K resistor	V1	6DS4
C20, 22	500 mmf feed thru	R3, 6	6.8K resistor	V2	6CW4
C21	.0015 mfd. Cap.	R4, 17, 19	1K resistor	V3	6JK8/12AT7
C25, 26, 27	5/20/100 mfd. elect.	R5	100 ohm resistor	V4	6J6
C32, 33, 34	470 mmf capacitor	R7	10K Pot.		
C35	1.5 mmf capacitor	R8	10K resistor		