Johnson

electronic equipment

OPERATING MANUAL

VIKING 6N2 TRANSMITTER

E. F. Johnson Company

WASECA MINNESOTA

JOHNSON VIKING 6N2 TRANSMITTER

Model 240-201-1 (Kit Form)
240-201-2 (Assembled and Tested)

The successful operation of any radio equipment is largely dependent upon the operator's understanding of the equipment. This operating manual is made up of several parts, each with the purpose of making the operator more familiar with the Viking 6N2. It is strongly recommended that this manual be carefully read prior to attempting operation of the equipment.

The Viking 6N2 should be given the good care usually accorded any other fine electronic instrument and in return will provide long trouble-free service. Periodic cleaning, dust removal, tube checking, etc., will maintain the appearance and performance of the equipment.

W A R N I N G

The voltages encountered in this piece of equipment are high enough to cause fatal injury. Practice safety rules until they are second nature. Always turn off the high voltage before making any adjustment inside the transmitter. Never depend on a bleeder resistor to discharge filter condensers. After the power is turned off, short circuit the high voltage circuit. Never operate the transmitter with any other than the recommended fuses in the primary circuit. The fuses will protect your equipment - in the case of accidental contact with the high voltage, they may save your life. If children have access to the open transmitter, always disable the primary circuit by removing the fuses, or the high voltage circuits by removing the rectifiers. Always remove the power cord plug from the power source when working inside the transmitter.

STANDARD WARRANTY

Adopted and Recommended by the

Radio - Electronics - Television Manufacturers Association

The E. F. Johnson Company warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part, except for electron tubes, in exchange for any part of any unit of its manufacturer which under normal installation, use and service disclosed such defect, provided the unit is delivered by the owner to us or to our authorized radio dealer or wholesaler from whom purchased, intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination disclosed, in our judgement, that it is thus defective.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith not of our own manufacture, nor to electron tubes.

Defective electron tubes and executed service report should be returned prepaid directly to the tube manufacturer for adjustment at the following addresses:

(a) RCA tubes to: Adjustment Service, RCA at the nearest of the following addresses:

34 Exchange Place Jersey City 2, N. J.	589 East Illinois Street Chicago 11, Illinois	420 So. San Pedro Street Los Angeles 13, California

(b) General Electric tubes to:

Adjustment Service
Owensboro Tube Works
General Electric Company
Owensboro, Kentucky

(c) Amperex tubes to:

Amperex Electronic Corp.
230 Duffy Avenue
Hickville, Long Island,
New York

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

OPERATING MANUAL CONTENTS

A. DESCRIPTION

1. GENERAL DESCRIPTION

The JOHNSON Viking 6N2 is a bandswitching VHF (Very High Frequency) transmitter designed for amateur service. It may be used for CW telegraphy, AM phone, and FM phone communications. Complete coverage of the 6 and the 2 meter amateur bands is provided.

The transmitter is 8 5/8" high, 13 1/8" wide and 9" deep. An aluminum cabinet and front panel result in a totally shielded enclosure with adequate ventilation. The recessed front panel produces a modern appearance and also protects the meter and knobs. All operating controls, as well as the meter and pilot light, are located on the front panel. The key jack, VFO input and power socket, RF output, antenna relay jack, power receptacle and the crystal socket are on the back panel.

The exciter section of the transmitter is mounted inside the main chassis with the exciter tubes and controls mounted horizontally. This provides convenient front panel controls as well as complete shielding between the exciter and the final amplifier. The final amplifier uses a type 5894 dual tetrode. The maximum ICAS input ratings of this tube are 100 watts AM phone and 150 watts CW telegraphy.

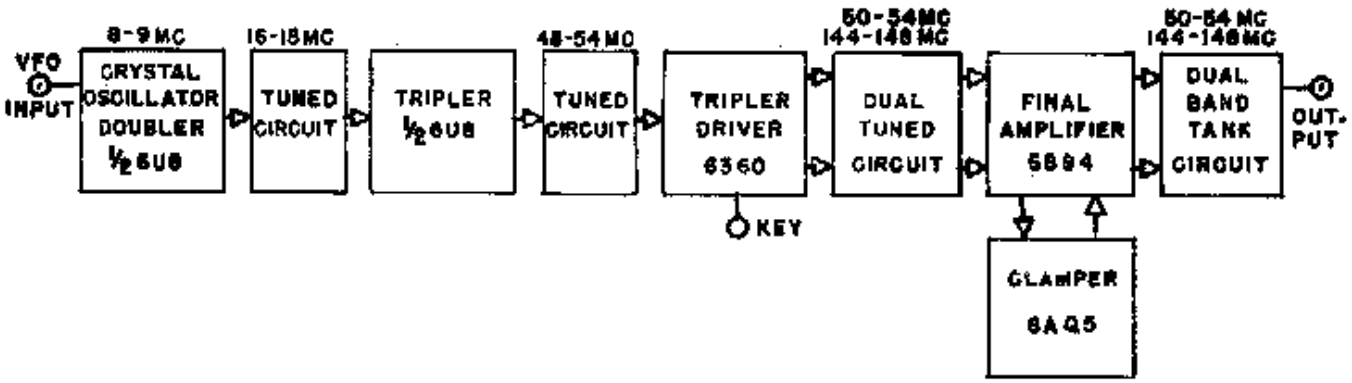
Electrically tight front panel and cabinet fastening aids in eliminating spurious radiation which might result in interference to other services such as television broadcasting. The meter is shielded and has individual RF filters in the meter leads. All external connections such as the power receptacle, relay jack, VFO socket and key jack are equipped with individual RF filters to maintain cabinet shielding.

Provision for VFO operation is designed into the 6N2. A front panel switch permits selection of either crystal controlled or VFO operation. An octal socket on the rear of the 6N2 controls and supplies power to the JOHNSON VHF VFO.

The 6N2 is designed for use with the JOHNSON RANGER, VIKING I OR II, VALIANT or equivalent power supply-modulator. The power requirements are:

Filiament - 6.3 volts at 3.5 amps
Low Voltage - 300 Volts at 75 milliamperes
High Voltage - 400 to 750 volts at 100 to 200 milliamperes
Audio (modulator) - 20 to 50 watts

2. DETAILED DESCRIPTION OF THE BASIC CIRCUITS WITH BLOCK DIAGRAM



A. CRYSTAL - VFO SWITCH

This switch selects either of the crystals, (which are shielded and submounted on the rear of the transmitter) or the VFO input (from an external VFO.) In the VFO position, the switch grounds the cathode of the VFO and shorts out the cathode choke of the crystal oscillator. These functions are interconnected with the OPERATE switch such that the VFO or crystal oscillator are off in the STANDBY position.

B. CRYSTAL OSCILLATOR - DOUBLE STAGE

The pentode section of the 6U8 is employed as a cathode - feedback oscillator-doubler in the crystal position and as a buffer doubler in the VFO position. The use of a pentode oscillator doubler permits output which is harmonically related to the crystal frequency and also prevents oscillation on overtones of the crystals. Cathode bias protects this stage under no-drive conditions.

C. TRIPLER STAGE

The triode half of the 6U8 performs as a frequency tripler with output in the range 48 to 54 megacycles. Cathode bias protection is used.

D. DRIVER - TRIPLER STAGE

A type 6360 dual tetrode functions as an amplifier-driver on 6 meters and as a push-pull tripler on 2 meters. Shaped cathode keying of this stage affords good keying waveform. Cathode bias protection is used.

E. BANDSWITCH

Bandswitching is accomplished by switching the coils in the 6360 plate circuit and the 5894 grid circuit. A section of this switch reduces the input to the 6360 on the 6 meter band (to reduce final amplifier grid drive) by connecting a resistor between the 6360 screen and ground.

F. FINAL AMPLIFIER

The use of the modern highly efficient type 5894 dual tetrode together with a heavily-silver plated dual band tank circuit assures maximum output at these frequencies.

The type 5894 is designed for VHF operation. Low tube capacities and internal shielding assure stable high frequency operation.

The final tank circuit is essentially two independent tank circuits. The 2 meter portion is a capacity shortened 1/2 wavelength parallel line. The 6 meter coil, L6, is placed at the "cold" point of the two meter line and is out of the active circuit on 2 meters.

The output coupling is also a two band device and performs as a one turn link on 6 meters and as a hairpin loop on 2 meters. The loading has both fine and coarse controls to provide for matching a wide range of load impedances.

G. CLAMPER

This stage employes a type 6AQ5 to furnish protection of the 5894 final

amplifier in case of excitation failure. During excitation failure, the 6AQ5, which is connected in shunt with the screen, conducts and lowers the screen potential and thereby keeps the plate dissipation well within ratings.

3. PANEL NOMENCLATURE AND CONTROL FUNCTIONS

A. FRONT PANEL

OPERATE SWITCH

This switch (SW2) which for operating convenience is located on the upper right hand side of the panel, provides the following functions:

TUNE POSITION

1. Applies low voltage to the exciter section.
2. Disables the final amplifier by grounding the screen.
3. Turns on the external VFO (grounds the cathode - only when the VFO-CRYSTAL switch is in the VFO position.)

STANDBY POSITION

1. Disables the final amplifier (grounds the screen)
2. Removes voltage from the exciter.
3. Opens the VFO cathode.

TRANSMIT POSITION

1. Turns on the exciter (applies low voltage)
2. Turns on the final amplifier (ungrounds the screen)
3. Turns on the TRANSMIT pilot light.
4. Operates the antenna relay.

METER SWITCH

Switch SW3 connects the meter to measure the various stage currents as follows:

SW3 Position	Stage	Scale
OFF	---	---
OSC	V1a-6U8 (Pentode)	0-25 ma.
MULT	V1b-6U8 (Triode)	0-25 ma.
DRIVER	V2-6360	0-100 ma.
GRID	V3-5894	0-10 ma.
FINAL	V3-5894	0-250 ma.

FINAL TUNING

C30, FINAL TUNING capacitor, tunes the plate circuit of the final amplifier.

FINE COUPLING

C31, FINE COUPLING capacitor, tunes the output coupling link.

AUX COUPLING

This control varies the position of (L6) the output coupling link.

CRYSTAL-VFO

SW1, the CRYSTAL-VFO switch, switches the grid of the crystal oscillator-doubler stage to either of two crystals or the VFO. It also shorts out the cathode choke of this stage so it may function as a buffer-doubler when used with a VFO.

OSCILLATOR

C8, the OSCILLATOR tuning capacitor, tunes the plate circuit of the pentode section of the 6U8 over the range of 16 to 18 megacycles.

MULTIPLIER

C14, the MULTIPLIER tuning capacitor, tunes the balanced grid circuit of the 6360 over the range of 48 to 54 megacycles.

GRID

This control has the dual function of 6360 Plate circuit tuning and of band-switching. A simple mechanical linkage drives the bandswitch. The plate circuit tunes two ranges - 50 to 54 MC and 144 to 148 MC.

B. BANK PANEL

ANTENNA RELAY JACK

J2, a two terminal jack, provides connection to the external control circuits, such as an antenna relay or other control.

KEY JACK

J1, a closed circuit jack, provides for CW telegraphy operation.

GROUND STUD

A ground stud connection provides protection from equipment potential differences and also provides for good RF grounding.

POWER RECEPTACLE

J4, a nine pin male receptacle, connects all the voltages needed by the 6N2 from the power supply unit.

VFO SOCKET

J5, an octal socket, furnishes all connections to an external VFO.

CRYSTAL SOCKET

J6, an octal socket which is recessed and shielded, functions as a dual crystal socket. Recessing assures good TVI suppression.

B. INSTALLATION AND ADJUSTMENTS

1. After unpacking the transmitter, inspect it thoroughly for possible damage or mars from shipping. Claims against the carrier delivering the equipment must be made to the carrier agent at the point of delivery. DO NOT SHIP DAMAGED EQUIPMENT BACK TO THE MANUFACTURER UNTIL NOTIFIED TO DO SO BY THE MANUFACTURER. NOTIFY THE SERVICE DIVISION THAT A CLAIM IS BEING MADE AGAINST THE CARRIER.

2. In order to attach the knobs, install the tubes and remove the packing material, remove the transmitter from the cabinet as follows:

   a. Loosen and remove the front panel and the rear panel fastening screws. (Use a Phillips head screwdriver.)

   b. Slide the transmitter partially out of the cabinet until it stops, then lift the transmitter 1/2" and continue to slide it out of the cabinet.

   c. Remove the packing from around the final tank circuit and any additional packing inside the cabinet or chassis.

3. INSTALLATION OF TUBES AND KNOBS

   a. Carefully install the tubes as follows: (the tubes may already be installed).

      1. 6U8 in the socket between the OSCILLATOR and MULTIPLIER control shafts.

      2. 6360 in the socket between the MULTIPLIER and the GRID control shafts.

      3. 6AQ5 and its shield on the top of the chassis.

      4. 5894 (be especially careful with this tube as it represents a large part of the total cost of this transmitter) in the septar socket. Start a 6/32 headless setscrew into each plate connector. Carefully slip the connectors down over the 5894 plate pins. The flexible straps between the final tank circuit and the 5894 plate connectors should be bent until the plate connectors are floating on the 5894 plate pins with no side or up and down stress on the plate pins. It is very important not to impose any stress on the glass-to-metal seal of the 5894. Allow 1/16" clearance between the top of the 5894 and the bottom of the plate connectors. Very carefully tighten the set screws as follows: Hold a connector in one hand and tighten the set screws with the other hand. Be sure not to place any twisting or bending stress on the glass-to-metal seal.

   b. Install the knobs as follows (set screws for all knobs are packaged separately and are installed at the time of mounting):

      1. Install the 1 5/8" knob on the FINAL TUNING shaft, using a 10-32 setscrew, with the index on "1" for full mesh position. Install the six single marker phenolic knobs as follows, using 8-32 setscrews:

      2. Turn the METER switch (SW3) to the maximum counter-clockwise position. Install one of the single marker knobs, with the marker on the OFF position. Tighten the set screw.

3. Turn the OPERATE switch (SW2) to the counter-clockwise position and install one of the single marker phenolic knobs with the marker on the TUNE position. Tighten the set screw.

4. Turn the FINE COUPLING capacitor (C31) to the fully meshed position. Install one of the single marker phenolic knobs with the marker on the "0" position. Tighten the set screw.

5. Turn the AUX COUPLING to the clockwise position and install one of the single marker phenolic knobs, with the marker on numeral "10". Tighten the set screw.

6. Turn the CRYSTAL-VFO switch (SW1) to the counter-clockwise position and install one of the single marker phenolic knobs with the marker on the "C1" position. Tighten the set screw.

7. Turn the GRID shaft counter-clockwise (this will switch the band-switch to the 6 meter position.) Turn the shaft until the capacitor is fully meshed and install one of the single marker phenolic knobs with the marker on "1". Tighten the setscrew.

8. Turn the OSCILLATOR capacitor (C8) to the full mesh position and install a 0-100 dial phenolic knob with the index at "0". Tighten the setscrew.

9. Turn the MULTIPLIER capacitor (C14) to the full mesh position and install a 0-100 dial phenolic knob with the index at "0". Tighten the setscrew.

4. INITIAL TESTS AND ADJUSTMENTS

Caution: The final amplifier tank circuit and meter terminals have Dangerous High Voltage on them at all times. Use extreme care.

a. INITIAL TESTS

1. Turn the OPERATE switch to STANDBY and plug the power cable into the power source. Refer to Section C3, Power and Accessory Connections.

2. Turn on the low voltage and filament supplies as follows:

RANGER to STANDBY position
VIKING I or II - turn on the FILAMENT switch
VALIANT - turn on the FILAMENT switch.
OTHERS - as required

3. Check the filaments of all the tubes. Note: The 5894 and 6360 are slow heating tubes and require several minutes warm-up.

4. Turn the OPERATE switch to the TUNE position and check the meter readings against the following table. If any reading does not agree within 25%, turn off the power and check the appropriate circuit for trouble.

Bandswitch Position	Meter Position	Approximate meter readings Ranger, Viking, Valiant
6 meter	Final	0-50 ma.
	Grid	0 ma.
	Driver	25 ma.
	Mult	10 ma.
	Osc	10 ma.
2 meter	Driver	50 ma.

b. Tuning Range Adjustment. (This adjustment is for kits only). Read Sections A and C of this Operating Manual before proceeding. This adjustment is preformed with the OPERATE switch in the TUNE position. If the dial setting is higher than that shown in the table below, remove the power and carefully spread the appropriate coil slightly. If the dial setting is lower squeeze the coil slightly. Be sure the knobs on the OSC, MULT, GRID, and FINAL TUNING indicate 0, 0, 1 and 1 respectively when C8, C14, C20, and C30 are all fully meshed.

Typical DIAL SETTINGS vs. FREQUENCY

Frequency		OSCILLATOR (C8-L1)	MULTIPLIER (C14-L2)	GRID (C20-L3-L4)
Crystal	Output	(0-100)	(0-50)	(1-5)
8.00 mc	144 mc	20 ± 5	10 ± 3	3.5 ± .5
8.22 mc	148 mc	30 ± 5	17 ± 3	4.5 ± .5
8.33 mc	50 mc	35 ± 5	20 ± 3	1.5 ± .5
9.00 mc	54 mc	60 ± 5	40 ± 3	4.5 ± .5

Normal grid current on both bands should be approximately 3 to 5 milliamperes.

The approximate coil lengths are:

L1 - 1 3/16" - (22 turns)
L2 - 3/4" - (8 turns)
L4 - 1/4" - (2 1/2 turns)
L3 - 5/8" - (6 1/2 turns)
L5 - 1/8" - (1 1/2 turns)

Adjust the exciter coils as follows: Always remove power before adjustments.

L1 - no adjustment normally needed

L2 - Switch the GRID to the "2" meter position and place an 8.0 megacycle crystal in the crystal socket. The MULT should tune at about "10". Carefully spread or squeeze L2 as necessary.

L4 - In the above step the GRID control should tune at approximately 3.5. Spread or squeeze L4 as necessary.

L3 - Place an 8.33 megacycle crystal in the "6N2" and turn the GRID to the "6" meter position. The GRID should tune at 1.5. Carefully spread or squeeze L3 as necessary.

L5 - should be parallel to and in axial alignment with L4. The spacing between L4 and L5 should be 3/8". Spacing between the turns of L5

should be 1/2 of the wire diameter.

L6 - (output link) should be very carefully positioned as follows: With the AUX COUPLING at "10" the coil portion of L6 should be in axial alignment with the 6 meter plate coil. At the same position the minimum clearance between any part of L6 and the plate tank circuit should be 1/16".

Vary the AUX COUPLING and check clearance at all points. It is permissable for L6 to barely touch the chassis in the "1" position.

c. FINAL SCREEN VOLTAGE ADJUSTMENT

Set the slide on R16 to the value needed for the particular power supply to be used as follows:

RANGER - 15,000 ohms
VIKING I OR II - 30,000 ohms
VALIANT - 30,000 ohms

For other values of high voltage use the following formula:

$$R16 = \frac{\text{Supply voltage} - 250}{.016}$$

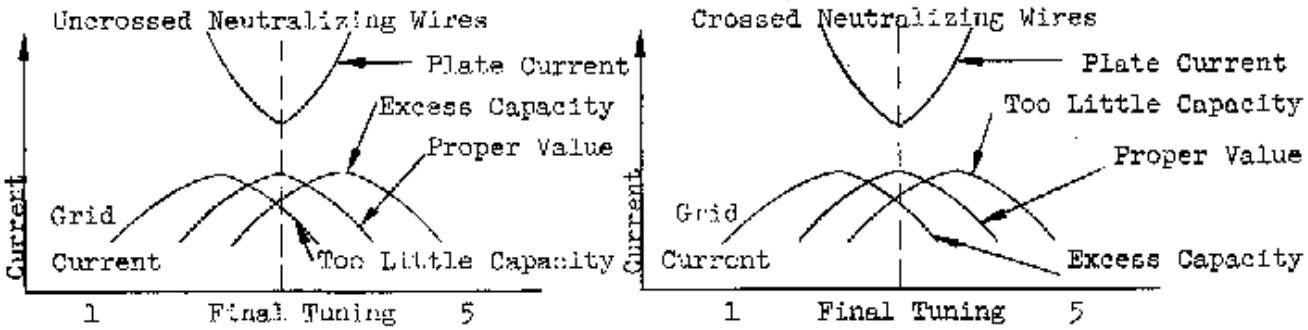
After setting R16 at values determined above, readjust R16 so that screen voltage will be 250 volts with transmitter fully loaded.

d. NEUTRALIZATION: (Kits only) (Read thoroughly before proceeding)

The type 5894 is internally neutralized. However, exact neutralization requires the addition of a small external neutralizing capacity. This capacity is obtained by bringing wires from the grids up near the plates of the 5894. These wires may be crossed and brought up near the opposite plates or they may extend straight up depending on the setting of the internal tube neutralization.

Final neutralizing adjustment must be made with the transmitter in the cabinet. This is a cut and try process. Place the transmitter in the cabinet, check the neutralization, remove from the cabinet and adjust the wires. Repeat this procedure until properly neutralized. When properly adjusted on 6 meters no further adjustment is necessary.

The amplifier is neutralized when detuning the FINAL TUNING causes little or no change in grid current or when detuning the FINAL TUNING in either direction from resonance causes the grid current to fall off as shown below.



Caution: Always remove the power when making any adjustments as Dangerous Voltages are present on the Final Amplifier at all times.

The neutralizing capacity is adjusted by the length and the position of the neutralizing wires. Keep the two wires of equal length and cut off only 1/16" or less at a time. Final adjustment is made by bending the wires toward or away from the plates of the 5894.

Tune up the transmitter at any convenient frequency in the 6 meter band, and load the Final to about 150 ma. into a dummy load (100 watt light bulb on a 36" length of RG8/U coaxial cable). Tune the FINAL TUNING exactly to dip in plate current and then turn the METER switch to the GRID position. Detune the FINAL TUNING in the direction which causes the grid current to increase. (Don't move the FINAL TUNING far nor leave the amplifier out of resonance very long as the plate dissipation increases rapidly).

At this point the neutralizing leads are crossed over each other and should extend about 1" above the chassis. The grid current will increase when the FINAL TUNING is detuned toward "1".

Cut 1/16" off each wire, check the neutralization and repeat as necessary. Should the wires get cut off flush with the chassis and the final still not be neutralized, it will be necessary to uncross the wires and extend them thru the near holes (ie, lead from pin 2 thru the hole adjacent to pin 1 of XV4). They should extend about 1" above the chassis. The grid current will now increase when the FINAL TUNING is detuned toward "5". Proceed to shorten the leads as necessary until the 6N2 is properly neutralized.

e. Operation of the CLAMPER tube may be checked as follows: Tune up the transmitter to normal ratings and turn the CRYSTAL-VFO switch to an unused position (ie. Turn to the VFO position with no VFO plugged in). The FINAL Plate current should drop to a value of approximately 50 ma. or less.

5. Read Section A (DESCRIPTION) and Section C (OPERATION) in order to gain familiarity with the equipment before continuing the tune-up.

Tune the transmitter up on both bands following the procedure outlined in Section C checking for adequate grid drive, proper loading and operation on both bands.

6. After completing the initial tests and adjustments of the transmitter, place it in the cabinet as follows:

a. Pre-tap the holes in the flange of the cabinet using 6-32 self tapping screws. Be sure to tap the holes straight.

b. Carefully slide the transmitter into the cabinet.

c. Fasten the front panel with Phillips head 6-32 self-tapping screws.

d. Fasten the back panel with 6-32 self-tapping screws.

Be sure to place a paint protecting flatwasher under each screwhead.

C. OPERATION

NOTICE. The regulations of the FEDERAL COMMUNICATIONS COMMISSION requires a suitable license for operation of this equipment. Refer to publications of the Federal

Communications Commission or the American Radio Relay League for the latest rules governing station and operator licensing.

Be sure to return the enclosed warranty registration card. This will register your transmitter at the factory. If it becomes necessary to write the factory regarding your transmitter, refer to it by serial number.

1. TUNING PROCEDURE

The tuning procedure of the Viking 6N2 is identical on both bands of operation. Therefore, the discussion of tuning on one band will apply to the other. Only the dial and switch settings will change when going from one band to the other. A 100 watt light bulb on the end of a 36" length of coaxial line should be used as a dummy load for 6 meter checks. A 19" whip antenna may be used for initial checks on two meters. Make sure R16 is adjusted as described in step B4c.

Set all knobs on the settings given below:

OPERATE - Standby position
CRYSTAL-VFO - C1 position
GRID - "6" position
AUX COUPLING - "5" position
FINE COUPLING - "0" position
METER - OSC position

Attach an adequate ground lead (Section C4) to the transmitter. Plug a 6 meter crystal into the recessed crystal socket. (ie. 8.333 thru 9 megacycles). Plug in the power cable between the 6N2 and the power source. Turn ON the power source as follows:

RANGER - Standby position
VIKING I or II - FILAMENT switch ON
VALIANT - FILAMENT switch ON
OTHERS - as required

Tuning on 6 meters is accomplished as follows:

a. Turn the 6N2 OPERATE switch to the TUNE position.
b. Turn the OSCILLATOR tuning for minimum current ("dip"). If no dip, turn the CRYSTAL-VFO switch to C2.
c. Turn the METER switch to MULT position and tune the MULTIPLIER tuning to current "dip".
d. Turn the METER switch to the GRID position and tune the GRID tuning to current peak. Normal grid current is between 3 and 5 milliamperes. If the peak is over 5 ma., detune to 4 ma.
e. Tune the METER switch to FINAL position, turn the OPERATE switch to TRANSMIT and quickly tune the FINAL TUNING to plate current dip (resonance).

NOTE: The final tank circuit is a dual band device and it is possible to triple in the final. However, this condition is easily recognized as it will occur with the FINAL TUNING at "5". Normal 6 meter FINAL TUNING is below "4

f. Turn the METER switch to GRID position and repeak the GRID.
g. Return the METER switch to FINAL position and increase the loading as follows Adjust the FINE COUPLING control first for maximum loading and immediately re-dip the FINAL TUNING control. Successively adjust the Coupling controls (always re-dip the FINAL TUNING last) until the desired plate current is obtained.

MAXIMUM RATINGS (CW or FM OPERATION)

The following table shows maximum ICAS values of plate current which may be run.

Never exceed these values as tube life will suffer.

Power Supply	Maximum Final Current		Maximum Input (Watts)	
	Phone	CW	Phone	CW
Ranger	120	140	65	75
Viking I or II	150	200	100	150
Valiant	150	200	100	150

Due to variations in tubes, voltages and loads it may not be possible to load the 6N2 to a full 150 watts input when used with the Viking I or II or Valiant. However, a minimum loading of 120 watts should be possible with a 50 ohm resistive load and a Viking I or II or Valiant as a power supply.

2 METER NOVICE OPERATION

	Maximum Plate Current		Maximum Input (Watts)	
	Phone	CW	Phone	CW
Ranger	120	140	65	75
Viking	110	110	75	75
Valiant	110	110	75	75

Crystals used for Novice operation should be between 8055 kc and 8166 kc. When the 6N2 is used with a power supply other than the above, care should be taken not to exceed the Maximum Ratings. Tube life and efficiency will suffer if any of the maximum ratings are exceeded.

This completes the tuning and loading of the transmitter on the 6 meter band. Operation on either 6 or 2 meters merely requires switching the bandswitch and Crystal-VFO switch and retuning.

2. MODES OF OPERATION:

A. AM (Amplitude Modulated) Phone

When the 6N2 is used with the Ranger, Viking I and II, or the Valiant it is merely necessary to turn the Ranger, Viking or Valiant to the PHONE position, connect a microphone to the Ranger, Viking or Valiant and advance the AUDIO gain control until the peak modulator current (voice peaks) corresponds to the value shown in the following table. When the modulator current peaks at the value shown, the 6N2 is being 100 % modulated. If a power supply modulator other than those mentioned is used, it will be necessary to use an oscilloscope to adjust for 100 % modulation.

NOTE: In order to view the modulated waveform at these very high frequencies great care must be exercised to prevent phase shift and distortion due to stray coupling. A shielded coupling coil which has proven effective may be made as follows: A short length of RG59/U coaxial cable may be formed into a 2" diameter long with the center conductor soldered to the outside shield at the junction point of the loop. This shielded pickup loop should be connected directly to the deflection plates of an oscilloscope.

MAXIMUM ICAS RATINGS

Power Supply Unit	I plate 6N2	I modulator (voice peak for 100 % mod) (approximate)
Ranger	120 ma.	130 ma.
Viking	150 ma.	160 ma.
Valiant	150 ma.	160 ma.
NOVICE OPERATION		
Ranger	120 ma.	130 ma.
Viking	110 ma.	135 ma.
Valiant	110 ma.	135 ma.

PTT (Push-To-Talk) operation is recommended and is discussed in Section C3.

If PTT is not to be used, it is recommended that the control of the 6N2 be performed at the RANGER, VIKING or VALIANT.

Control of the 6N2 may be performed with the OPERATE switch. However, this leaves the modulator of the RANGER, VIKING, or VALIANT running and care must be exercised in keeping the microphone away from the speaker as high peak voltages may be developed across the modulation transformer. Should this type of operation be used and arcing occur, it would be desirable to install a protective spark gap (approximately 1/32" ball gap) across the modulation transformer in the Viking, Valiant or Ranger.

b. CW TELEGRAPHY

CW telegraphy operation requires only plugging a key into the Key jack (J1) on the back of the 6N2. Caution: One side of the key will be hot with about 150 volts. Connect the hot side to the least exposed portion of the key. Maximum ratings are given in section C1.

c. FM PHONE OPERATION

FM operation would require an external FM-VFO.

3. POWER AND ACCESSORY CONNECTIONS

a. OPERATION WITH VIKING I OR II TRANSMITTER

It is necessary to modify the VFO plug on the rear of the Viking in order to use it as a power supply modulator.

Three things are done in this modification:

1. The octal VFO socket is replaced with a noval socket such as is used in the Viking Ranger.

2. Modulated high voltage is brought out to this socket.

3. The filaments of the Viking are separated into two separate strings. One is the audio string and the other the transmitter string. Normal operation is obtained by plugging in a jumper plug to connect the strings together.

A Viking I or II modified as above may be used with the Johnson VFO or 6N2 simply by plugging the appropriate unit into the noval plug.

The Johnson 250-36 (Viking I and II Power Supply Modification for the 6N2 Transmitter) contains the following parts. Send to the factory for this kit.

PARTS LIST

Item No.	Qty.	Description
CA	1	.002 ufd 1500 volts disc ceramic capacitor
	2	.005 mfd 600 volt disc ceramic capacitor
Lf	1	4.7 uhy RF Choke
12A	1	9 pin mica filled socket
12B	1	9 pin mica filled plug and cover
12C	1	Socket support shell
XA, B, C,	3	2 point terminal strip
	6	6-32 NP nut
	8	#6 internal tooth lockwasher
	6	6-32 x 1/2 NPB rd. hd. screws
	3	#8 double soldering terminal
	4 ft.	#20 green plastic covered wire
	1 ft.	#16 bare tinned copper wire
	2 ft.	#20 white-green plastic covered wire
	1/2 ft.	.051 I.D. varnished tubing

The letter (S) appearing in the instructions means "solder". The letters (NS) "do not solder".

Modification of the Johnson Viking II for Use as Power Supply-Modulator for the Johnson Viking 6N2.

The following is for a Viking II which has the 6AQ5 clamper. If yours does not, see step 15 before proceeding.

1. Remove bottom cover of the Viking transmitter and tip the transmitter on end with the crystal end down.

2. (a) See Figure 4 for layout.

   (b) Carefully disconnect L14, L15, L16 (Figure 10d Viking II manual) from X24 and X12 (these are to be reconnected later.)

3. Remove X12 (ceramic VFO socket) and shield.

4. Prepare and mount X12A in the following steps:

   a. Cut off all of the pin terminals of the 9 pin octal style socket just below the upper hole (socket viewed from bottom).

   b. Cut eight 1" pieces of #16 tinned wire. Form a 1/8 " long hook on the end of each.

   c. Hook, crimp, and solder the short pieces of wire to the pins, except pin 9, extending the straight ends directly away from the terminals.

   d. Form a 1/8" hook on a 2" #16 tinned lead. Hook, crimp and solder the lead to pin 9 of X12A with the lead extending directly away from the

terminal.

e. Mount X12A and the shield, X12C, (with pin #9 toward the chassis top) passing the X12A leads through the shield holes which cause the least bending of the leads as X12C is brought into position. Secure X12A and X12C at each lip with the following sequence, starting from the outside: 1/2" 6-32 round screwhead - X12A lip - chassis - X12C lip - #6 shakeproof - #8 double solder terminal - #6 shakeproof - 6-32 nut. Bend the teardrops up away from the X12C lips. Note: pin 9 toward chassis top.

f. Bend and connect the long lead (from pin 9 of X12A) to the teardrop (pointing toward the chassis top) on the screw toward the outside of the chassis. Train against X12C (S).

g. Cut and push 7/16" lengths of the .051 I.D. varnished tubing over the remaining 8 leads from X12A, insulating them from X12C.

5. Connect the by-pass condensers to the auxiliary socket, X12, in the following order, making the connections to the X12A extensions by looping the condenser leads around the extensions near the varnished tubing and soldering lightly to hold the leads in position. Maintain 1/16" of clearance between the condenser bodies and the X12C shield.

a. C50 (.005 mfd 600 volt disc ceramic) 7/8" leads, oriented between X12C and the chassis, between pin 1 extension of X12A and the teardrop pointed toward top of chassis, which is mounted under X12 mounting screw nearest the center of chassis.

b. C51 (.005 mfd 600 volt disc ceramic) 3/4" leads, between pin 4 (NS) of X12 and to other teardrop (NS) mounted under same nut as in part a.

c. CA (.002 mfd 1500 volt disc ceramic) 3/4" leads, between the pin 5 (NS) and the teardrop (S) used in part b.

d. CB (.005 mfd 600 volt disc ceramic) 3/4" leads, between pin 7 (NS) of X12 and to teardrop under X12 (NS) mounting screw toward outside of Chassis.

e. C49 (.005 mfd 600 volt disc ceramic) 3/4" leads, between pin 8 (NS) of X12 and to teardrop used in d. (S).

6. Disconnect 14B (one of two green leads connected to pin 1 of X3) and reconnect to pin 3 of X28 (S). Cut out jumper between pin 3 of X28 and pin 1 of X3.

7. Cut 12" length of green wire, strip 5/16" each end and connect to pin 1 of X3 (S). Train lead along cable down to 3 point terminal strip X25. Connect to center terminal of X25 (NS).

8. Disconnect transformer filament wire (heavy green cloth covered wire) from top terminal of X25 and re-connect to center terminal of X25 (NS). Resolder top terminal of X25.

9. Cut 3" length of green wire, strip 5/16" each end and connect center terminal of X25 (S) and pin 3 of X11 (S).

10. Three additional 2 point terminal strips must be mounted in holes used during original construction to mount wooden legs. Note the four empty 7/32 diameter holes on side panel of chassis (crystal end). Mount a terminal strip in each hole except the front-bottom one. See Figure 4 for orientation of strips. Mount with following sequence: 1/2" 6-32 screwhead - terminal strip mounting foot - chassis - #6 shakeproof - 6-32 nut.

11. Disconnect 18A (green lead) from pin 3 of X5 (resolder X5) and connect to the tie point on XA (NS).

12. Cut a 12" length of green wire, strip 5/16" each end, and connect between tie point of XA (S) and XB (NS). Train lead along the cable.

13. (a) Locate X24 (3 point terminal strip). Disconnect the three green leads from the top terminal of X24.

(b) Turn on filaments of Viking and locate the green lead (24A) which has 6.3 volts AC on it (use A.C. voltmeter). Turn off the power.

(c) Connect above located green lead (24A) to the tie point on XB (NS).

(d) Reconnect the remaining two green leads (13B, 16A) to the top terminal of X24 (NS).

14. (a) Connect L15 (15 turn 1/4" inside diameter plastic wire RFC) between pin 8 (S) of X12 and top terminal of X24 (S).

(b) Connect L16 (4.7 uhy RFC) between pin 1 of X12 (S) and center terminal of X24 (S).

(c) Connect L14 (4.7 uhy RFC) between pin 4 of X12 (S) and bottom terminal of X24 (S).

(d) 1. Wind choke Ld like L15 (19 inches green plastic wire close wound around pencil or other 1/4" diameter form).

(d) 2. Connect Ld between pin 7 of X12 (S) and tie point XB (S).

(e) Connect Lf (4.7 uhy RFC) between pin 5 of X12 (S) and XC (NS).

(f) Cut a 24" length of green white plastic wire, strip 5/16" each end, and connect to XC (S).

(g) Train along cable and connect to SW3 at the connection of 48A (white green wire) (S).

(h) Lace the added wires into the cable.

15. If the Viking II does not have a clamp tube (X28) several changes in the above instructions are necessary.

Step 6 - disregard

Step 7 - disregard

Step 8a - disconnect 14A from the top terminal of X25 and reconnect to the center terminal of X25 (S).

If a Johnson Viking Model 122 VFO is used with the Viking transmitter it is necessary to replace the VFO plug with the 9 pin plug (X12B).

Connect to X12B as follows:

1. White lead (filament lead) to pins 7 and 8 (S).

2. Red-white lead (low voltage lead) to pin 4 (S).

3. Braid (ground lead) to pin 9 (S).

4. Black-white lead (cathode lead) to pin 1 (S).

If no VFO is used, simply connect a jumper between pins 7 and 8 (S) of X12B and plug it into X12A for normal operation of the Viking transmitter.

Modification of Johnson Viking I for Use as Power Supply-Modulator for the Johnson Viking 6N2.

The following is for a Viking I which has the 250-21 TVI Kit installed. If yours does not, see step 13 before proceeding.

1. Remove the Viking transmitter from its cabinet and tip the transmitter on end with the crystal end down.

2. (a) See Figure 4 for layout.

   (b) Carefully disconnect the three 4.7 uhy RF chokes that are connected (Figure 10 Viking I manual) between X24 (X24 is the 3 terminal strip near X12) and X12 (these are to be reconnected later).

3. Remove X12 (ceramic VFO socket) and shield.

4. Prepare and mount X12A in the following steps:

   a. Cut off all of the pin terminals of the 9 pin octal style socket just below the upper hole (socket viewed from bottom).

   b. Cut eight 1" pieces of #16 tinned wire. Form a 1/8" long hook on the end of each.

   c. Hook crimp, and solder the short pieces of wire to the pins, except pin 9, extending the straight ends directly away from the terminals.

   d. Form a 1/8" hook on a 2" #16 tinned lead. Hook, crimp and solder the lead to pin 9 of X12A with the lead extending directly away from the terminal.

   e. Mount X12A and the shield, X12C, (with pin #9 toward the chassis top) passing the X12A leads through the shield holes which cause the least bending of the leads as X12C is brought into position. Secure X12A and X12C at each lip with the following sequence, starting from the outside: 1/2" 6-32 round screwhead - X12A lip - chassis - X12C lip - #6 shakeproof - #8 double solder terminal - #6 shakeproof - 6-32 nut. Bend the teardrop up away from the X12C lips. Note: Pin 9 is toward the chassis top.

f. Bend and connect the long lead (from pin 9 of X12A) to the teardrop (pointing toward the chassis top) on the screw toward the outside of the chassis. Train against X12C (S).

g. Cut and push 7/16" lengths of the .051 I.D. varnished tubing over the remaining 8 leads from X12A, insulating them from X12C.

5. Connect the by-pass condensers to the auxiliary socket, X12A, in the following order, making the connections to the X12 extensions by looping the condenser leads around the extensions near the varnished tubing and soldering lightly to hold the leads in position. Maintain 1/16" of clearance between the condenser bodies and the X12C shield.

Note: X12A is numbered clockwise from the rear.

a. C50 (.005 mfd 600 volt disc ceramic) 7/8" leads, oriented between X12C and the chassis between pin 1 extension of X12A and the teardrop pointed toward top of chassis, (which is mounted under X12 mounting screw nearest the center of chassis.)

b. C51 (.005 mfd 600 volt disc ceramic) 3/4" leads, between pin 4 (NS) of X12 and to other teardrop (NS) mounted under same nut as in part a.

c. CA (.002 mfd 1500 volt disc ceramic) 3/4" leads, between the pin 5 (NS) and the teardrop (S) used in part b.

d. CB (.005 mfd 600 volt disc ceramic) 3/4" leads, between pin 7 (NS) of X12 and to teardrop under X12 (NS) mounting screw toward outside of Chassis.

e. C49 (.005 mfd 600 volt disc ceramic) 3/4" leads, between pin 8 (NS) of X12 and to teardrop used in d. (S).

6. Disconnect the 14A, 13A and the heavy green transformer wire from the 2 terminal strip near the X7 socket. Twist 14A, 13A and the transformer lead together (S) and tape carefully.

7. Cut a12" length of green wire, strip 5/16" each end and connect to the insulated terminal of the 2 terminal strip (S). Train lead along cable down to the 3 terminal strip X24. Do not connect at this time.

8. Three additional 2 point terminal strips must be mounted in holes used during original construction to mount wooden legs. Note the four empty 7/32 diameter holes on side panel of chassis (crystal end). Mount a terminal strip in each hole except the front-bottom one. See Figure 4 for orientation of strips. Mount with the following sequence: 1/2" 6-32 screwhead chassis - terminal strip mounting foot - #6 shakeproof - 6-32 nut.

9. Disconnect 18A (green lead) from pin 4 of X5 (resolder X5) and connect to the tie point on XA (NS).

10. Cut a 12" length of green wire, strip 5/16" each end, and connect between the tie point of XA (S) and XB (NS). Train the lead along the cable.

11. (a) Locate X24 (3 point terminal strip). Carefully disconnect the two green and the black lead from the top terminal of X24.

(b) Turn on the filaments of Viking and locate the green lead (13B) which has 6.3 volts AC on it (use A.C. voltmeter). Turn off the power.

(c) Connect the above located green lead (13B) and the black lead to the tie point on XB (NS).

(d) Reconnect the remaining green lead (16A) and the new green lead from X7 to the top terminal of X24 (NS).

12. (a) Connect L15 (19 inches of green plastic wire close wound around a pencil) between pin 8 (S) of X12 and the top terminal of X24 (S).

(b) Connect L16 (4.7 uhy RFC) between pin 1 of X12 (S) and the center terminal of X24 (S).

(c) Connect L14 (4.7 uhy RFC) between pin 4 of X12 (S) and bottom terminal of X24 (S).

(d) 1. Wind choke Ld like L15 (19 inches green plastic wire close wound around a pencil or other 1/4" diameter form).

(d) 2. Connect Ld between pin 7 of X12 (S) and tie point XB (S).

(e) Connect Lf (4.7 uhy RFC) between pin 5 of X12 (S) and XC (NS).

(f) Cut a 24" length of green-white plastic wire, strip 5/16" each end, and connect to XC (S).

(g) Train along the cable and connect to SW3 at the connection of 48A (white green wire) (S).

(h) Lace the added wires into the cable.

13. If the Viking I does not have a 250-21 TVI kit installed, the following changes in this modification are necessary:

Step 2b - disregard
Step 2c - Carefully disconnect the wires from X12.
Step 5a - disregard
Step 5b - disregard
Step 5c - disregard
Step 6 - disregard
Step 6a - Disconnect 13A, 14A (green leads) and the heavy green cloth covered lead from pin 1 of X7. Twist 13A, 14A and the heavy lead together (S) and tape carefully.
Step 7 - disregard
Step 7a - Cut a 12" length of green wire, strip 5/16" each end and connect to pin 1 of X7 (S). Train the lead along the cable and connect to pin 8 of X12 (NS).
Step 11a- disregard
Step 11d- Reconnect the remaining green lead (16A) to pin 8 of X12 (S).
Step 12a- disregard
Step 12b- disregard
Step 12c- disregard

Note: Figure 4 shows correct wiring but has terminal strips, condensers, and chokes shown which do not apply.

If a Johnson Viking Model 122 VFO is used with the Viking transmitter it is necessary to replace the VFO plug with the 9 pin plug (X12B).

Connect to X12B as follows:

1. White lead (filament lead) to pins 7 and 8 (S).

2. Red-white lead (low voltage lead) to pin 4 (S).

3. Braid (ground lead) to pin 9 (S).

4. Black-white lead (cathode lead) to pin 1 (S).

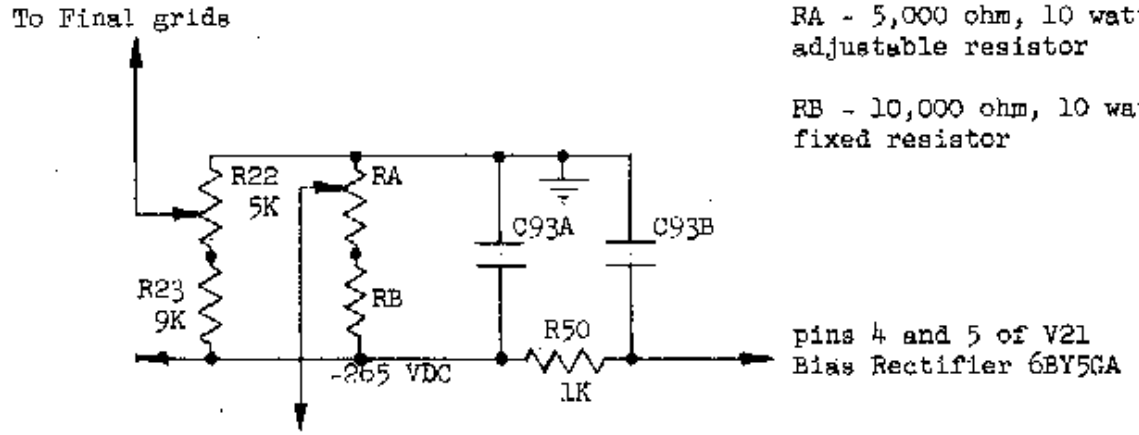
If no VFO is used, simply connect a jumper between pins 7 and 8 (S) of X12B and plug it into X12A for normal operation of the Viking transmitter.

b. OPERATION WITH THE JOHNSON VIKING RANGER.

No modification is necessary for use with the Ranger. The 6N2 may be plugged into the Ranger and controlled from the Ranger or by the 6N2 OPERATE switch.

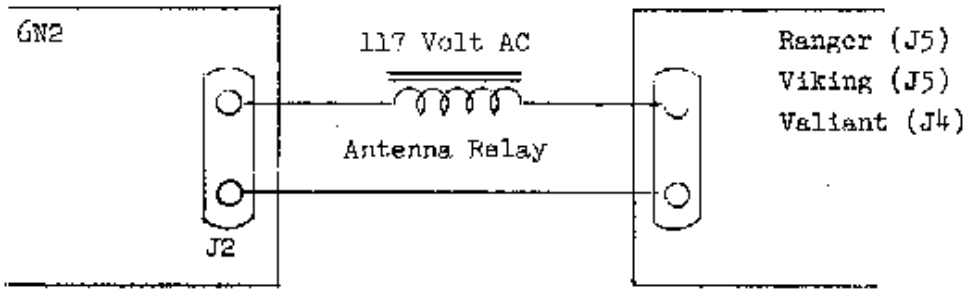
c. OPERATION WITH THE JOHNSON VIKING VALIANT

One simple modification of the Valiant is necessary for use as a power supply modulator. It is necessary to remove the modulator bias tap from R22 (brown lead to R22) and connect this lead to a separate voltage divider in parallel to R22 and R23. This modification produces a modulator bias which is nearly independent of the final grid drive and therefore holds the modulator static plate input within rated dissipation. Adjust RA for a modulator current of 60 ma. as described in the Valiant Operating Manual.

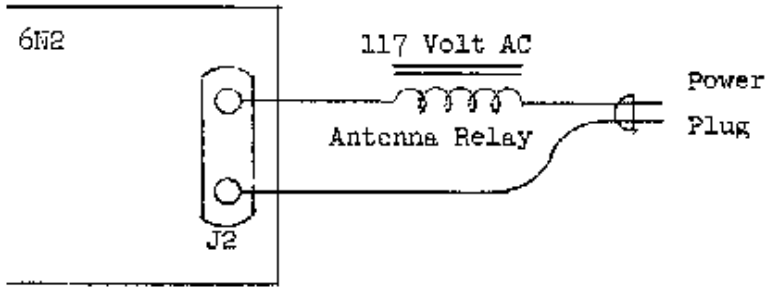


d. ANTENNA RELAY CONNECTIONS

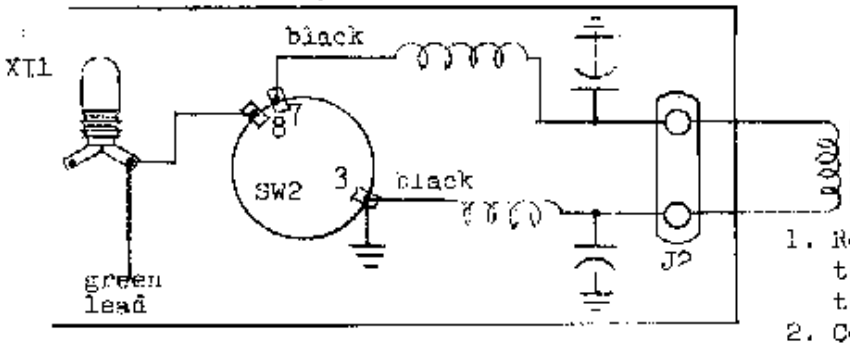
The following connections of the antenna relay permits relay control either by the OPERATE switch on the 6N2 or by the MODE switch on the Ranger, Viking, or Valiant. When controlled at the 6N2, the other equipment switch must be turned ON and vice versa.



The following connections allow control of the 6N2 by the 6N2 OPERATE switch only.



If a 6 volt AC relay is to be used the following wiring changes are necessary.



1. Remove the black lead from terminal 8 and reconnect to terminal 3 of SW2. (S)
2. Connect a jumper between terminal 8 and the inside terminal of XI1.(S)

e. Push-to-Talk Operation:

Push-to-Talk (PTT) operation requires the use of a coaxial antenna relay with a set of external contacts.

1. RANGER

The Ranger when modified for PTT as per the Ranger Operating Manual may be connected as shown below.

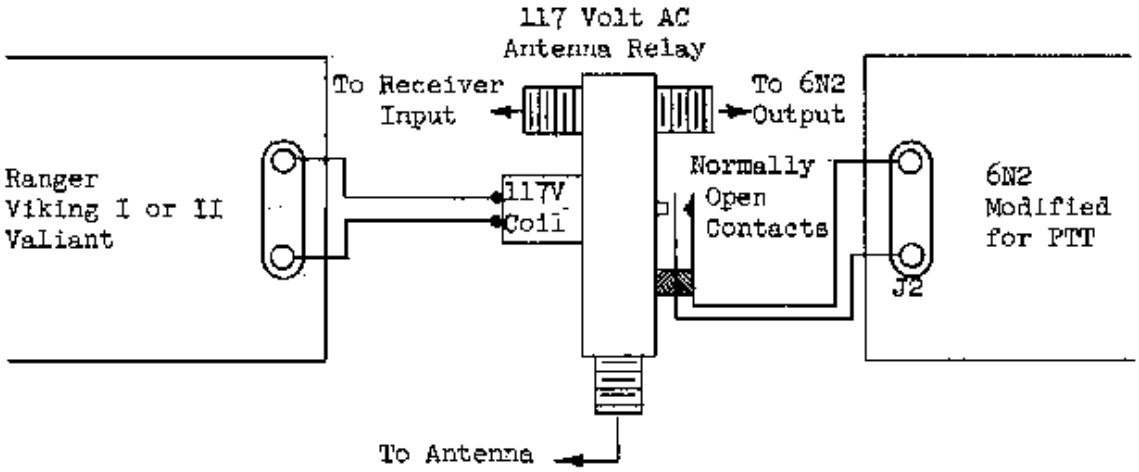
2. VIKING I OR II

The Viking transmitter when modified for PTT may be connected as shown below. To modify the Viking for PTT it is necessary to install a double contact mike connector and a DPDT relay with the contacts of the relay

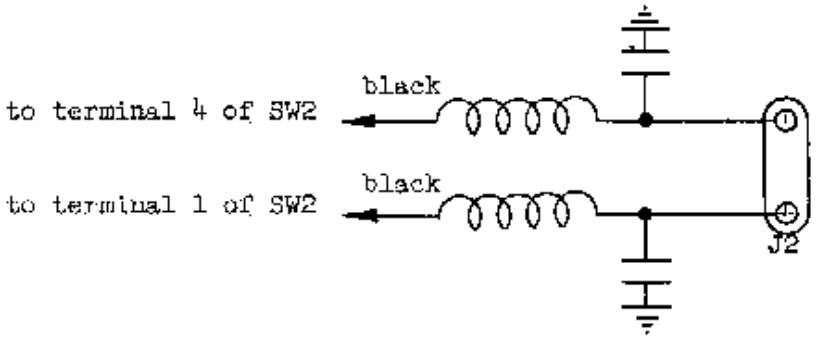
paralleled across SW2 (Plate switch).

3. VALIANT

The Valiant transmitter has PTT built in and the following set-up may be used with the 6N2 as modified for PTT operations.



4. 6N2 MODIFICATION FOR PTT OPERATION



Step 1: Remove the jumper wire between pin 1 and pin 4 of SW2.

Step 2: Remove the two black leads from terminals 7 and 8 of SW2.

Step 3: Connect one black lead to terminal 1 (solder) and the other to terminal 4 (solder) of SW2.

5. VFO CONNECTION

The Johnson 2 meter VFO or an equivalent VFO with output in the range 8.0 to 8.22 megacycles for 2 meters and 8.33 to 9.0 megacycles for 6 meter operation may be plugged into the octal power socket on the rear of the 6N2. The VFO is controlled (turned on and off) by the Crystal-VFO switch on the front panel. Refer to the 6N2 schematic for connections.

6. CRYSTAL SOCKET

The 6N2 has a recessed and shielded crystal socket into which two crystals may be plugged. The front panel CRYSTAL-VFO switch selects either of the two crystals or the VFO input.

The crystal socket is wired so that the crystals may be plugged into the socket at any angle. In order to make removal of the crystals easy, loop a 3 1/2" x 1/2" piece of friction, masking, or plastic tape around each crystal to form a pull tab.

The crystals are covered by a cover with a knob on it. This cover must be on the transmitter when it is in the cabinet to insure good harmonic suppression. Bend the fingers of the cover outward until good electrical contact is made between the cover fingers and the hole. When adjusted properly, the cover can be installed and removed relatively easily and still provide good electrical contact.

4. ANTENNAS AND GROUNDING

a. The Viking 6N2 is designed for use with a 50 to 75 ohm load. However, the output link which is series tuned and variable, will match a wide range of impedances.

Simple antennas such as a 1/4 wavelength ground plane or a dipole will give good results for local work. However, there is no simple substitute for a good high beam antenna. The use of a beam or folded dipole will necessitate the use of a balum or antenna coupler, to transform the feedline from the unbalanced to balanced case.

Refer to the Radio Amateur's Handbook and/or the Amateur periodicals for construction and adjustment of antennas.

b. IMPORTANCE OF GROUNDING

To obtain proper tuning, coupling and harmonic suppression with any transmitter antenna coupling system, the part of the circuit designed to operate at RF ground potential must be at RF ground potential. A "room full of RF" is evidence that a high RF potential exists on something in or near the room. In many cases the source of RF is the transmitter's chassis and power cord. This condition is very undesirable for several reasons. The power cord is very closely coupled to the chassis by the electrostatic shields of the power transformers. Three objectional factors which obviously affect the loading of the transmitter when poor grounds are involved are:

1. The impedance that the output terminal of the transmitter looks into includes not only the true antenna to ground impedance as presented by the antenna feedline but also the transmitter chassis to ground impedance. This additional impedance in some cases will raise the apparent antenna impedance to such a high value that it cannot be loaded by the coupling network.

2. Part of the transmitter's power is lost in the ground system due to radiation of the ground lead, power cord or cabinet. This power is quickly dissipated in surrounding objects and contributes nothing to effect radiated power except to distort the antenna's normal field pattern.

3. It is conventional, in designing a transmitter, to bypass harmonics or any possible sources of stray high frequency currents to the chassis on the assumption the chassis will be kept as near ground potential as possible. When a high impedance is presented to

these currents at the chassis they are able to radiate to some extent rather than be passed harmlessly to ground.

c. HOW TO OBTAIN A GOOD GROUND

What may appear to be a good ground at one frequency may prove to be a poor ground at another. A single ground lead may have "standing waves" on it due to its length. While it may seem difficult to obtain a good ground over a wide range of frequencies, it can be done and will be well worth the trouble when increased radiation efficiency, ease of antenna loading, and reduced TVI and BCI result. There is also reduced danger of damaging microphones, receivers, and other associated equipment with excessive RF fields.

Avoid using the power line, power line conduit or gas lines for RF grounding. Some suggestions which may help to obtain a good ground are:

1. Water pipes or metal building structural members are usually good sources of earth grounds.

2. Use heavy conductors (#14 or larger) between the connection at the ground point and the transmitter. Copper ribbon is excellent for this purpose.

3. The use of several ground leads, each of a different length and selected at random may be helpful in keeping grounding impedance low at the transmitter, even though the transmitter is some distance from a true earth ground. The possibility of obtaining an effective ground at any frequency throughout the transmitter's range is quite good. If at any one frequency, one of the ground leads presents a low impedance at the chassis, the chassis is effectively grounded. By changing the length of one of the ground leads experimentally, a good ground can often be obtained at a frequency which has been troublesome. In bringing several leads to the transmitter, small closed loops near the transmitter or antenna feed line should be avoided. Induction fields will tend to raise the impedance of the ground leads.

4. In cases where it is impossible to obtain a good earth ground, connecting the transmitter chassis to some system of conductors having a very low effective impedance to ground compared to the antenna impedance may be helpful. Usually this artificial "ground" takes the form of a system of radial wires spread horizontally on the floor, a gridwork of wires, or a large metal sheet on the floor below the transmitter. To be most effective, the minimum area covered by the metal conductors should be roughly equivalent to a square, the length of one side of which approaches a quarter wave length. This system of "grounding" should be experimented with before committing the location of any permanent installation.

5. A rough check on the effectiveness of the transmitter ground may be made by touching the chassis while watching the PA plate current and grid current with the transmitter operating into an antenna. A change in current upon touching the chassis is indicative of an ineffective ground. If a neon bulb, held between

the fingers, can be ignited by touching it to the chassis, the RF present is excessive and is another indication of an ineffective ground. In cases where the transmitter is feeding a low impedance antenna, the test by touching the chassis is more reliable since 50 to 60 volts is required to ignite the neon lamp.

d. HARMONIC AND TVI REDUCTION

The Viking 6N2 is completely shielded and TVI suppressed and will allow TVI free operation at most locations. However, in difficult locations, such as fringe areas and chanel 2 areas, it may be necessary to use a low pass filter (or band pass filter) on the transmitter and a high pass filter on close TV sets. Several commercial high pass filters designed for 6 meter rejection are available. In case of difficulty, refer to the Radio Amateur's Handbook and recent amateur periodicals for more complete discussions on TVI.

D. TYPICAL OPERATING DATA AND TROUBLE SHOOTING

1. TROUBLE SHOOTING

a. Schematics, photographs and charts aid greatly in trouble shooting and are furnished in this section for reference. Particularly useful are the typical operating voltages, current readings and resistance measurements. Use these charts to save time in locating trouble.

b. Some precautions to be observed are:

(1). Be careful while making High Voltage Measurements. Do Not Take Chances.

(2). Never depend on bleeder resistors to discharge capacitors. After turning equipment off, discharge each capacitor with a screw driver which has a well insulated handle.

(3). All power supplies must be off and discharged when making ohm meter measurements.

2. TYPICAL OPERATING DATA

a. TYPICAL RESISTANCE MEASUREMENTS (OHMS)

TUBE	SOCKET PIN								
	1	2	3	4	5	6	7	8	9
6U8	60K	100K *15K	93K	0	.3	60K	0 **470	1000	100K
6360	100K	300	100K	0	0	60K	12K	60K	.3
5894	0	22K	220	0	.3	22K	0	---	---
6AQ5	22K	0	0	.3	0	**70K	22K	---	---

* CRYSTAL-VFO switch in VFO position
** OPERATE switch in TUNE position
Measurements made with a 20,000 ohm/volt Multimeter.
Reading may vary ± 20% due to component tolerances.
6N2 disconnected from power source.
OPERATE switch in STANDY position.
L25 (2 henry iron core choke) = 68 ohms.

b. TYPICAL VOLTAGE MEASUREMENTS

TUBE	SOCKET PIN								
	1	2	3	4	5	6	7	8	9
V1 6U8	310	---	225	---	6.3AC	310	4.5	15	---
V2 6360	---	4	---	---	---	310	45(*170)	310	6.3AC
V3 5894	---	---	225	---	6.3AC	---	---	---	---
V4 6AQ5	-80	---	---	6.3AC	230	310 (**85)	-80	---	---

The above table shows typical values when the 6N2 is used either with a Ranger, Viking I or II, or Valiant transmitter.

Measurements made with a 20,000 ohm/volt Multimeter.

Readings may vary ± 20 % due to component tolerances.

	Plate Current	Grid Current	Plate Voltage
Ranger (Phone position)	140 ma.	3.7 ma.	500 volts
Viking I or II (Phone position)	150 ma.	3.7 ma.	670 volts
Valiant (Phone position)	150 ma.	3.7 ma.	670 volts

6 meter position - TRANSMIT position - crystal controlled - 50 ohm load

Line Voltage = 117 volts

* 2 meter position

** STANDBY position

c. TYPICAL DIAL READINGS

(Approximate)

FREQUENCY (megacycles)	OSCILLATOR Tuning (0-100)	MULTIPLIER Tuning (0-50)	GRID Tuning (1-5)	FINAL Tuning (1-5)	COUPLING FINE	COUPLING AUX
50	34	21	1.5	2.5	0	9
51	40	26	2.2	2.8	0	9
52	47	32	3.0	3.2	0	9
53	53	37	3.7	3.6	0	9
54	58	41	4.5	4.0	0	9
144	20	10	3.5	4.0	10	8
145	22	12	3.7	4.1	10	8
146	24	14	4.0	4.2	10	8
147	27	16	4.2	4.3	10	8
148	29	17	4.5	4.4	10	8

Line voltage = 117 volts AC to a Ranger - 52 ohm coaxial load.

IB = 125 ma.

It should be borne in mind that reactance at the feed point, or impedances different than the 52 ohms used in compiling the above chart will cause a change in the FINAL Tuning and Coupling settings.

Viking 6N2

Parts List

Part No. or Drawing No.	Item No.	Qty.	Description
16.1001-4	BKT1-8	8	1" component bracket
16.1001-8	BKT9	1	1" component bracket (extra .147 hole)
16.1001-7	BKT10	1	1" component bracket (1/2" dia. hole)
16.1300	BKT11	1	Output bracket
22.827	C1,5,6,7,9,12, 13,23,25,26,32, 33,34,36,37,38, 39,40,41,42,43, 44	22	.005 mfd 600 VW disc ceramic capacitor
22.1185-13	C18	1	5 mmfd ± 5% 500V Mica capacitor
22.1185-2	C3	1	10 mmfd ± 5% 500V Mica capacitor
22.1185-7	C4,10,15,17, 21,22	6	100 mmfd ± 5% 500 V Mica capacitor
160-107-50	C8	1	15M11 variable capacitor
160-211-50	C14	1	11MB11 variable capacitor
160-209-50	C20	1	160-209 variable capacitor
167-103-4	C31	1	50L15 variable capacitor
22.768	C19	1	.1 mfd 400 VW paper capacitor
22.956	C27,28,29,35,24	5	.002 GMV mfd 1500 VW disc ceramic capacitor
16.1293		1	Capacitor plate
17.1000	CH1	1	Chassis
17.1001	CH2	1	Exciter chassis
17.1002-3	CH3	1	Panel
23.1206-2	CH4	1	Cabinet
23.1154-11	CH5	1	Meter shield
22.1155-2	CH6	1	Meter Shield bracket
23.907-22	D1,2	2	0-100 dial knobs
23.1208	D3	1	Crystal socket cover
23.1007-5	D4-9	6	1 1/8" maroon knobs
13.123-12	D10-17	8	3/8" -32 panel bearing
23.1009-3	D18	1	6" bearing and shaft
14.31-40	D19	2	3" (crystal socket) spacer
104-264-3	D20-22	3	Insulated shaft coupler
23.1207	D23	1	Actuating arm assembly
104-14-11	D24	1	Insulated coupling (with set screws)
13.760-2	D25	1	Coupling
14.139-7	D26-28	3	3 3/8" extension shaft
115-253	D29	1	3" flexible shaft
115-256-28	D30	1	4" bearing and shaft
23.1009-2	D31	1	4" bearing and shaft (holes added)
23.1160-2	D32	1	Pulley assembly
16.1027-1	D33	2	Spring
22.1276-4	D34	4	Cable clamp
23.980-11	D35	1	1 5/8" maroon knob
10.55-3	E1,2	2	2 1/2" ceramic post
10.19-2	E3,4	2	1 1/2" ceramic cone insulator
13.869	E5,6	2	5894 plate connectors
10.156-2	E7	1	1" ceramic insulator
29.207-1	E8,9	2	Insulating washers
18.738-1	E10	1	Link mounting block

Part No. or Drawing No.	Item No.	Qty.	Description
18.36-7	E11	2	5/8" O.D. x 17/64" I.D. x 3/8" L. fiber shoulder bushings
16.1305-1	E12	1	2 1/4" flexible strap
16.1305-2	E13	1	1 13/16" flexible strap
22.113-1	G1	2	9/16" O.D. x 5/16" I.D. grommets
22.928-1	G2	4	Rubber mounting feet snap-in type
22.113-5	G3	1	5/16" O.D. rubber grommet
22.376	I1	1	#50 pilot lamp
22.1246	J1	1	Circuit closing jack
126-105	J2	1	Antenna relay jack
22.746	J3	1	83-1R coaxial receptacle
22.1326	J4	1	Noval mica filled male receptacle (with mounting plate)
22.849-2	J5,6	2	Octal mica filled female socket
16.1299-1	L1	1	Oscillator coil (22 turns)
16.1299-2	L2	1	Driver grid coil (8 turns)
16.1299-3	L3	1	Driver plate coil-6meters (6 1/2 turns)
16.1299-4	L4	1	Driver plate coil - 2 meters (2 1/2 turns)
16.1299-5	L5	1	Final grid coil (1 1/3 turns)
23.1243	L7,8,C30	1	Final line assembly - 6 & 2 meters
16.1295	L6	1	Output link
22.844-1	L9	1	200 uhy RF choke (single pie)
22.1318	L10-12	3	RF choke (3/4" X 3/16" green)
22.1317	L13	1	RF choke (1" x 9/32" red)
22.1333	L25	1	2 henry 50 ma. choke
22.1334	M	1	0-5 ma. 100 MV D.C.milliameter
23.1031	P1	1	Antenna relay plug
22.978	P3	1	Noval mica filled male plug with cover
22.1327	P4	1	Noval mica filled female plug with cover
22.5097-10	R1,5,8,9	4	100,000 + 10% ohm 1/2 W carbon resistor
22.5041-10	R2,4,7	3	470 + 10% ohm 1/2 W carbon resistor
22.5085-10	R3	1	33,000 + 10% 1/2 W carbon resistor
22.6033-10	R10,13,14	3	220 + 10% ohm 1 W carbon resistor
22.7089-10	R11	1	47,000 + 10% ohm 2 W carbon resistor
22.6081-10	R15	1	22,000 + 10% ohm 1 W carbon resistor
22.6075-10	R12	1	12,000 + 10% ohm 1 W carbon resistor
22.1322	R16	1	30,000 ohm 50 W adj. power resistor
22.8906-10	R17	1	12,000 + 10% ohm 10 W resistor
22.8042-5	R18,19	2	5.1 + 5% ohm 1/2 W WW resistor
22.8025-5	R20	1	1.0 + 5% ohm 1/2 W WW resistor
22.8056-5	R21	1	20 + 5% ohm 1/2 W resistor
23.914-2	R22	1	100 m.v. shunt for 250 ma.
22.5049-10	R6	1	1000 + 10% ohm 1/2 W carbon resistor
22.7017-10	R23,24	2	47 + 10% ohm 2 W carbon resistor
22.5077-10	R25	1	15,000 + 10% ohm 1/2 W resistor
22.948-2	SH1,2	2	Socket support shell
22.1218-3	SH3	1	Tube shield - 7 pin min.
17.1005	SH4	1	Driver shield
22.1313	SW1	1	VFO-crystal switch, 1 phen. wafer
22.1312	SW2	1	Operate switch - 1 phen. wafer

Part No. or Drawing No.	Item No.	Qty.	Description
22.761-2	SW3	1	Meter switch, 6 pos., 1 steat. wafer
22.1314	SW4	1	Bandswitch, 1 steat. wafer
22.740-4	TS1,4	2	4 point terminal strip
22.740-3	TS2,3,5,6,7	5	3 point terminal strip
22.1323	V1	1	Tube - 6U8
22.1324	V2	1	Tube - 6360
22.1325	V3	1	Tube - 5894
22.781	V4	1	Tube - 6AQ5
			#4 Hardware envelope
			#6 Hardware envelope
			#8 Hardware envelope
			Misc. Hardware envelope
71.91-109	W17	1 1/4 ft.	#20 white plastic covered wire
71.91-100	W1	4 1/2 ft.	#20 black plastic covered wire
71.91-102	W2	2 1/2 ft.	#20 red plastic covered wire
71.91-103	W3	3 ft	#20 orange plastic covered wire
71.91-104	W4	1 ft.	#20 yellow plastic covered wire
71.91-105	W5	6 ft.	#20 green plastic covered wire
71.91-106	W6	1 ft.	#20 blue plastic covered wire
71.91-108	W7	1 1/4 ft.	#20 grey plastic covered wire
71.91-101	W8	1 1/2 ft.	#20 brown plastic covered wire
71.91-120	W9	3 ft.	#20 white-red plastic wire
71.13-125	W10	29 ft.	#18 Formex covered copper wire
71.27-115	W11	3 ft.	#16 bare tinned copper wire
42.24-050	W12	2 ft.	.053 I.D. varnished tubing
71.27-122	W15	1 1/4 ft.	#20 bare tinned copper wire
71.32-206	W14	5 ft.	3 cond. shielded cable
42.24-113	W16	1"	.208 I.D. black vinylite tubing
147-500-20	XI 1	1	3/8" open pilot lamp socket (red jewel)
120-199	XV1,2	2	9 pin miniature ceramic socket
122-105-11	XV3	1	Sceptar socket
22.1208	XV4	1	7 pin shielded min. mica filled socket
22.997		1	3/8" round wood dowel
42.49-140		3 ft.	Lacing cord
42.49-148		2 ft.	Dial cord

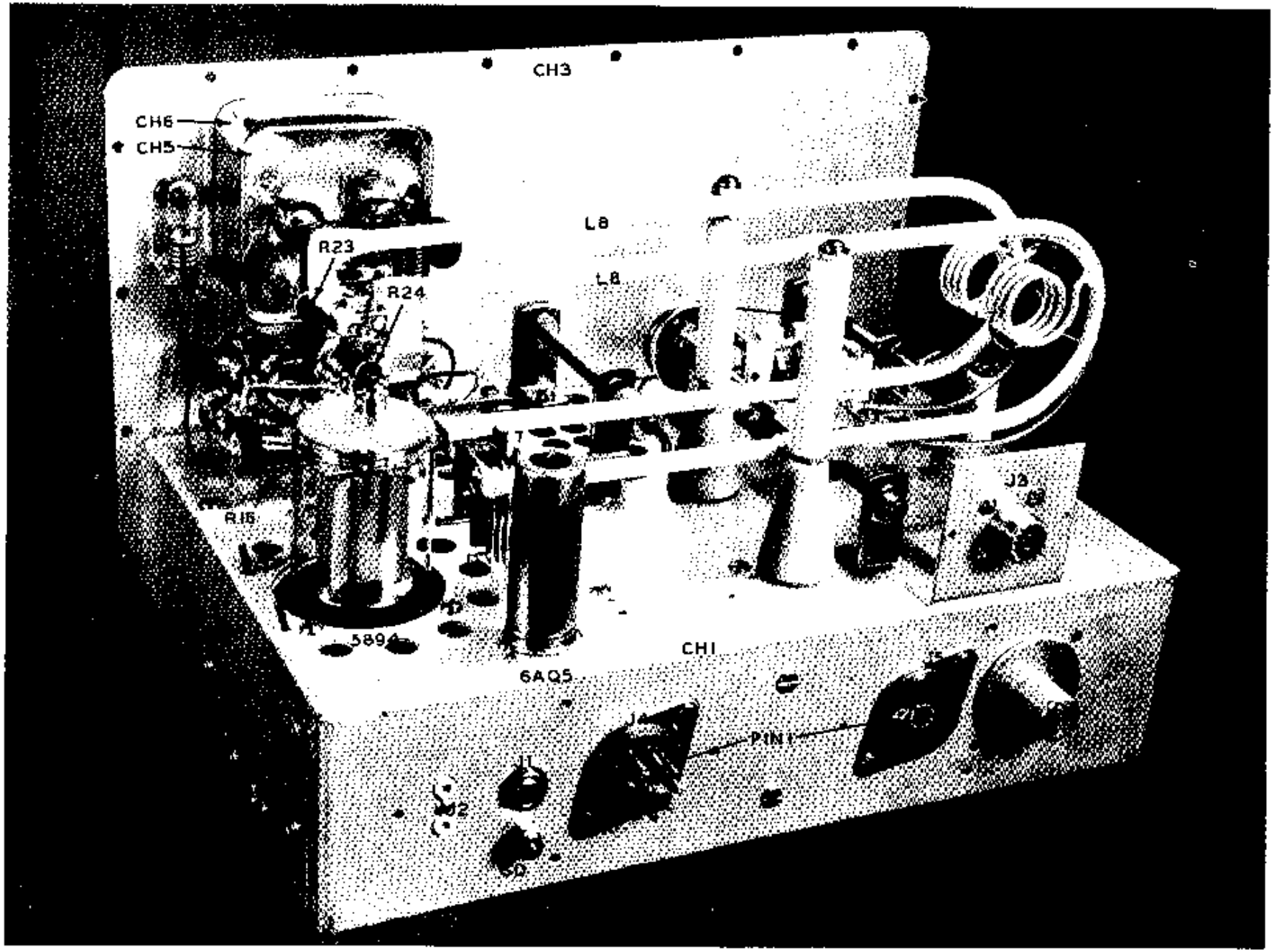


Figure 1 6N2, Rear View

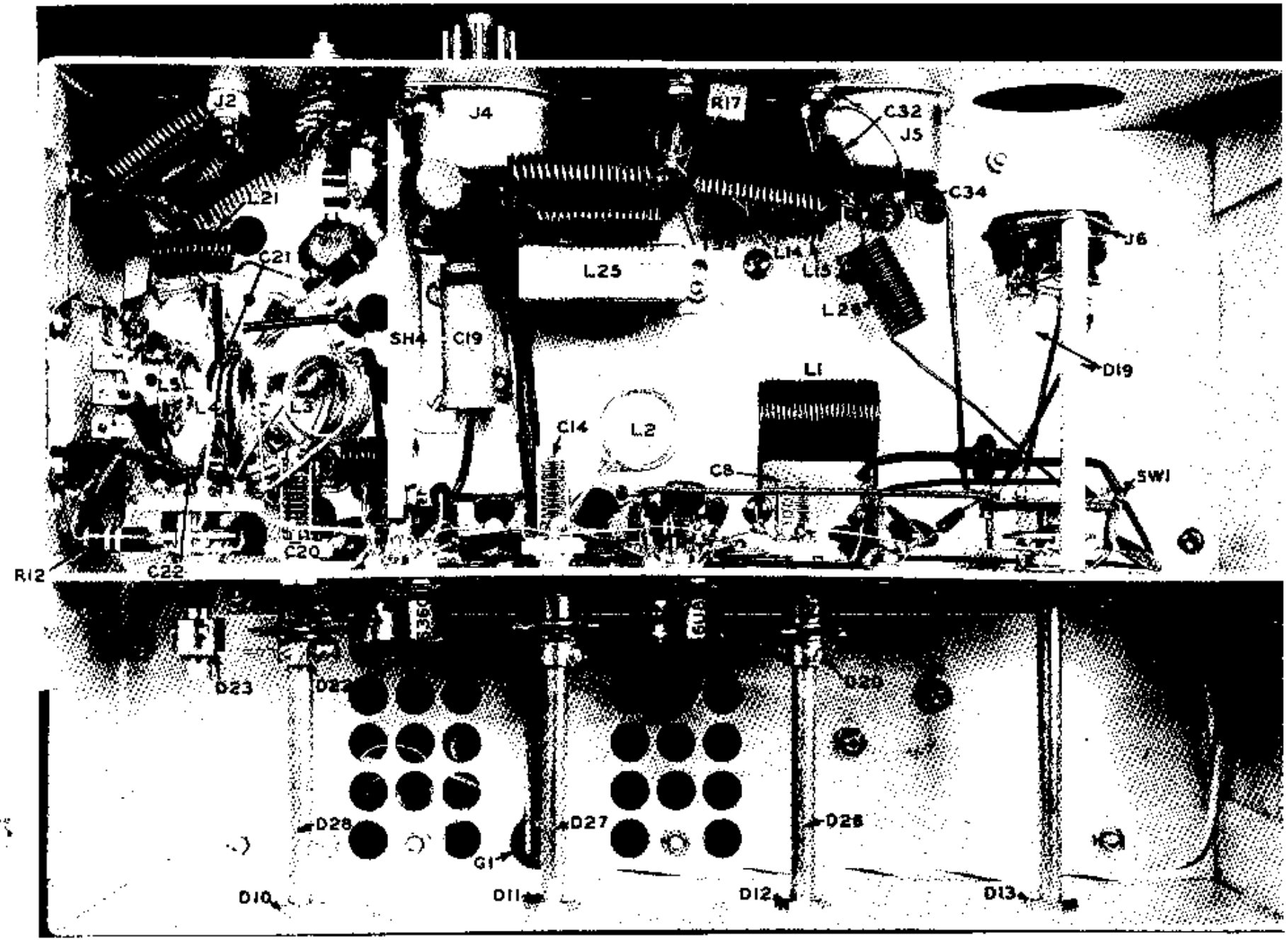
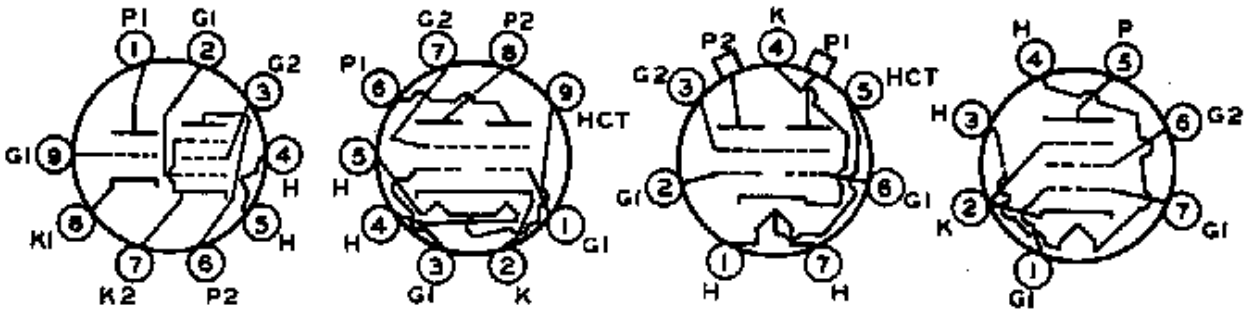


Figure 2: 6N2, Bottom View



P-PLATE
K-CATHODE

G1-CONTROL GRID
G2-SCREEN GRID

H-HEATER
HCT-HEATER CENTER TAP

TUBE SOCKET CONNECTIONS-BOTTOM VIEW

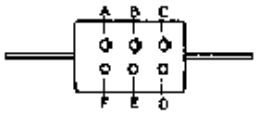
Figure 3a:

COLOR	SIGNIFICANT FIGURE	DECIMAL MULTIPLIER	TOLERANCE (%)	VOLTAGE RATING*
BLACK	0	1	—	—
BROWN	1	10	1	100
RED	2	100	2	200
ORANGE	3	1,000	3	300
YELLOW	4	10,000	4	400
GREEN	5	100,000	5	500
BLUE	6	1,000,000	6	600
VIOLET	7	10,000,000	7	700
GRAY	8	100,000,000	8	800
WHITE	9	1,000,000,000	9	900
GOLD	—	0.1	5	1,000
SILVER	—	0.01	10	2,000
NO COLOR	—	—	20	500

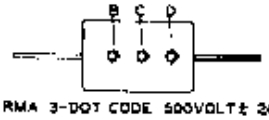
* APPLIES TO CONDENSERS ONLY

COLOR CODING OF FIXED RESISTORS

A-FIRST SIGNIFICANT FIGURE OF RESISTANCE IN OHMS
B-SECOND SIGNIFICANT FIGURE
C-DECIMAL MULTIPLIER
D-RESISTANCE TOLERANCE IN PERCENT. IF NO COLOR SHOWN TOLERANCE IS ± 20%.

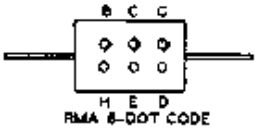


JAN FIXED CAPACITORS



RMA 3-DOT CODE 500VOLT ± 20%

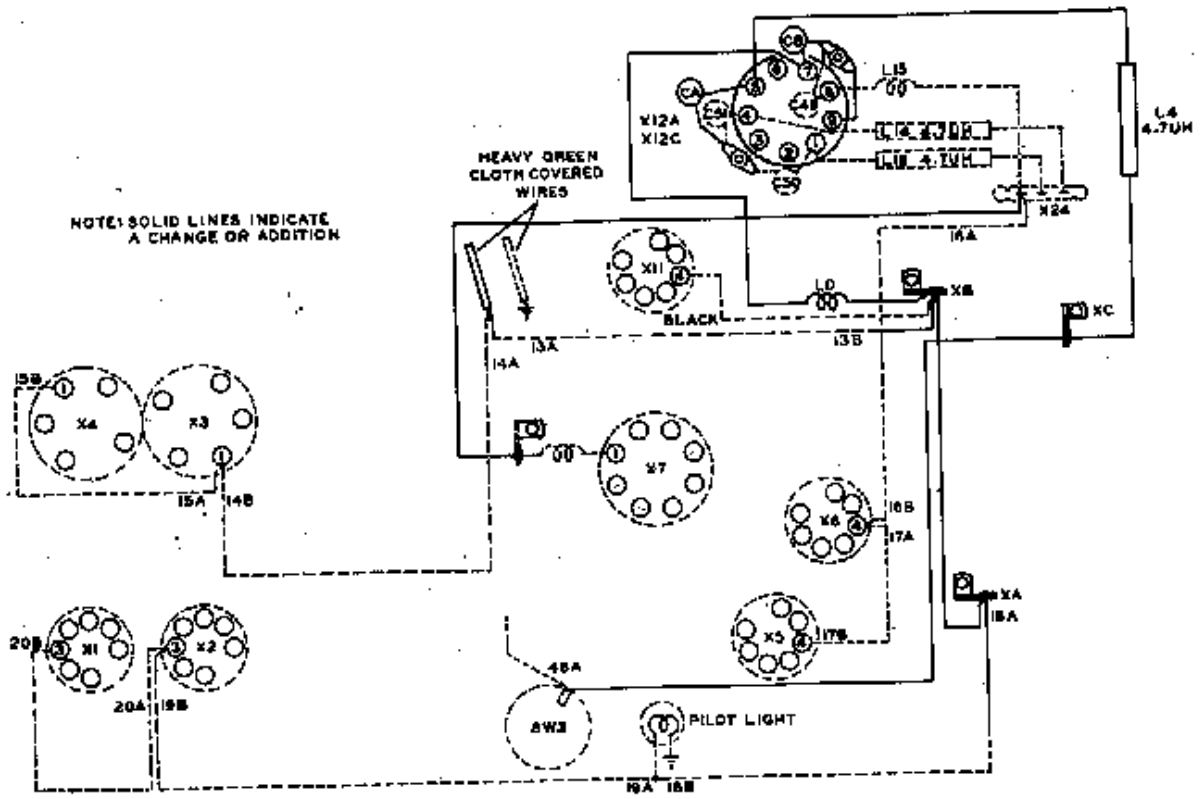
COLOR CODING OF FIXED CONDENSERS
A-TYPE: MICA BLACK, PAPER SILVER
B-FIRST SIGNIFICANT FIGURE OF CAPACITY
C-SECOND SIGNIFICANT FIGURE
D-DECIMAL MULTIPLIER
E-TOLERANCE
F-CHARACTERISTIC
G-THIRD SIGNIFICANT FIGURE
H-VOLTAGE RATING



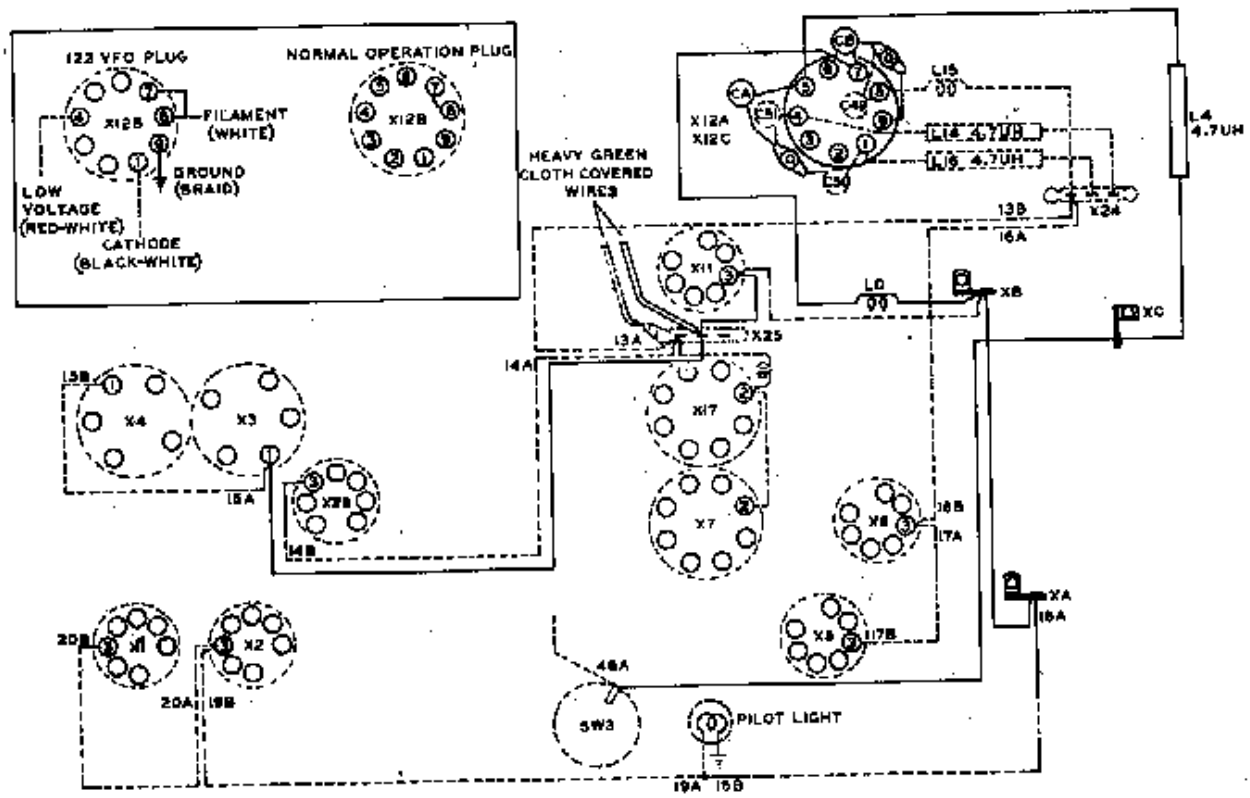
RMA 6-DOT CODE

CONDENSER-RESISTOR COLOR CODE

Figure 3b:

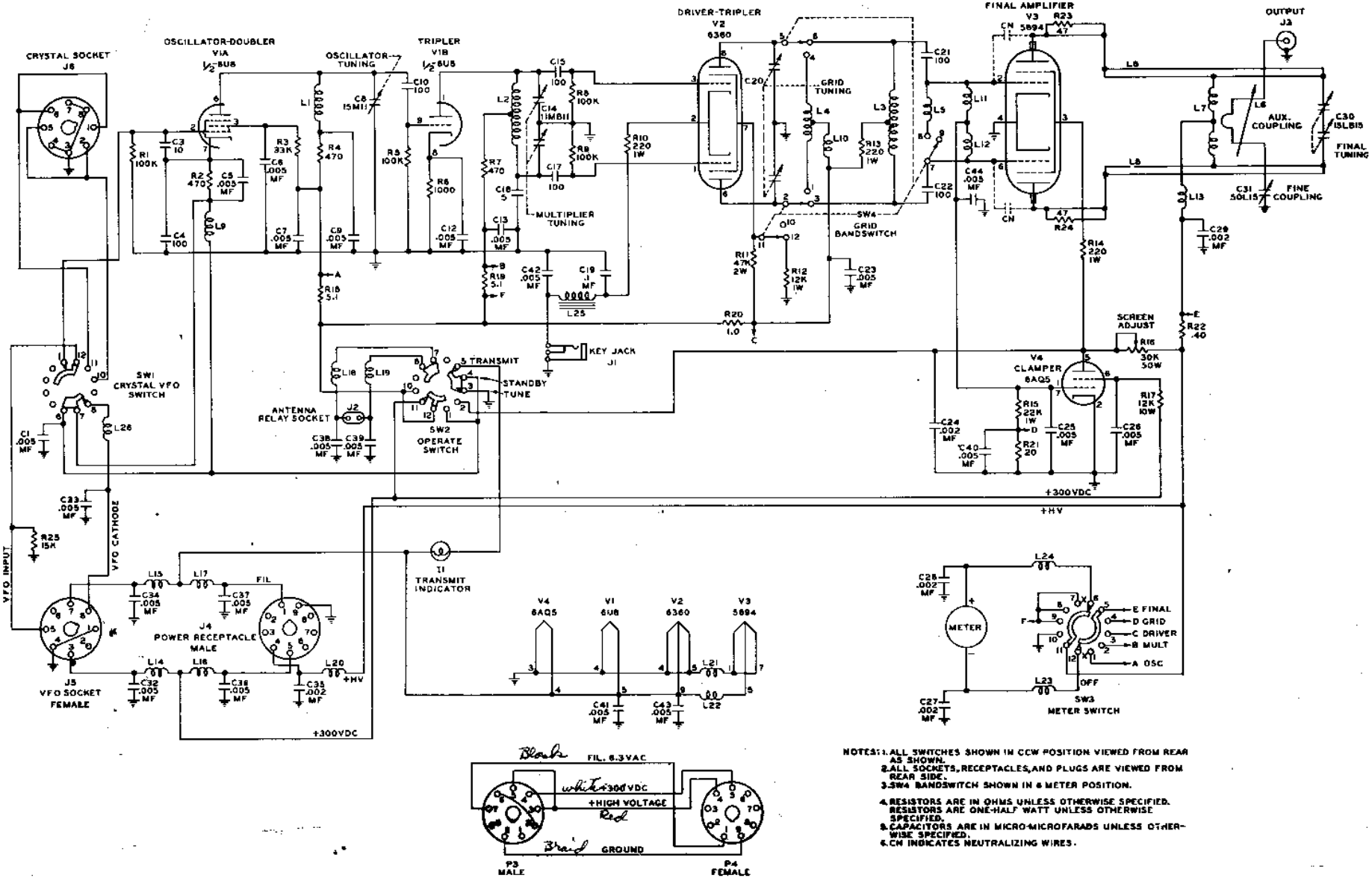


MODIFICATION OF VIKING I (WITH 250-21 TVI SUPPRESSION KIT)
FOR USE WITH VIKING 6N2



MODIFICATION OF VIKING II
FOR USE WITH VIKING 6N2

Figure 4:



NOTES: 1. ALL SWITCHES SHOWN IN CCW POSITION VIEWED FROM REAR AS SHOWN.
2. ALL SOCKETS, RECEPTACLES, AND PLUGS ARE VIEWED FROM REAR SIDE.
3. SW4 BANDSWITCH SHOWN IN 6 METER POSITION.
4. RESISTORS ARE IN OHMS UNLESS OTHERWISE SPECIFIED. RESISTORS ARE ONE-HALF WATT UNLESS OTHERWISE SPECIFIED.
5. CAPACITORS ARE IN MICRO-MICROFARADS UNLESS OTHERWISE SPECIFIED.
6. CN INDICATES NEUTRALIZING WIRES.

Figure 5: 6N2 Schematic Diagram