OPERATION AND MAINTENANCE

SWAN MODEL TV-2C

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GENERAL DISCUSSION

The Swan Model TV-2C is a crystal controlled transmitting and receiving converter for the 2 meter band designed to operate with Swan Transceivers, Models 250, 250C, 350, 350C, 400, 500, 500C, and 500CX. The 20 meter band has been chosen as the standard intermediate frequency, (I.F.), since it will provide excellent stability and frequency readout. However, the TV-2C is also available with its I.F. range in the 15 meter, 10 meter, or 6 meter amateur bands. The various I.F. ranges may be ordered through Swan dealers, or when required, the TV-2C may be quite easily modified for a different I.F. range.

In the standard model TV-2C with 20 meter I.F., the 14 mc output from the Transceiver is heterodyned with a 130 mc. crystal controlled signal to produce a 144 mc. output from the TV-2C. As the Transceiver is tuned from 14 mc. up to 14.35 mc., the Transverter output moves upward in frequency, always 130 mc. plus the Transceiver frequency. In receiving mode, the incoming signal at 144 mc. is heterodyned with the 130 mc. crystal controlled signal, producing a difference frequency of 14 mc. The difference frequency, or I.F. signal, is received by the Transceiver the same way as any other 14 mc. signal. As the Transceiver is tuned from 14 to 14.35 mc., it will be monitoring signals coming in from 144 to 144.35 mc. In other words, the TV-2C Transverter simply converts the 144 to 144.35 mc. portion of the 2 meter band to cover the 14 to 14.35 mc. range, and as far as the Transceiver is concerned, it tunes and operates just as it does when being operated on 20 meters. It is only necessary that the crystal frequency, 130 mc., be added to the Transceiver dial reading. If the Transceiver will tune higher than 14.35 mc., then the frequency range on 2 meters will go correspondingly higher. For instance, the Model 500C Transceiver tunes to 14.45 mc., so the 2 meter range when using 130 mc. injection will go up to 144.45 mc.

A 3 position crystal selector switch on the TV-2C provides for selection of three conversion ranges. Thus, three segments of the 2 meter band may be covered. Normally, this will be three adjacent segments at the low end, for example: 144 to 144.45 mc., 144.45 to 144.9 mc., and 144.9 to 145.35 mc. These three ranges require crystal injection frequencies of 130, 130.45, and 130.9 mc., respectively.

15 METER I.F.:

If an I.F. range in the 15 meter amateur band is preferred, operation will be essentially the same as with 20 meter I.F., except that the crystal injection frequency will be 144 minus 21 mc., instead of 144 minus 14 mc. Tuning the Transceiver across the 15 meter band, from 21 to 21.45 mc. will tune an equivalent .45 mc. segment of the 2 meter band. A crystal injection frequency of 123 mc. will thus result in a range of 144 to 144.45 mc, etc.

10 METER I.F.:

If an I.F. range in the 10 meter amateur band is selected, a wider segment of the 2 meter band will be tuned with each crystal frequency. The 10 meter band tunes from 28 to 29.7 mc., or 1700 KC as compared to 450 KC on 15 meters and 350 KC on 20 meters. The Swan Transceivers tune the 10 meter band in one range. Thus, if the Transverter I.F. is on 10 meters, a crystal injection frequency of 116 mc. will result in an operating range of 144 to 145.7 mc. (116 plus 28 mc, and 116 plus 29.7 mc.). Thus, a larger portion of the 2 meter band can be covered by selecting a 10 meter I.F. range. In fact, by proper selection of the three

crystal frequencies, the entire 2 meter band, from 144 to 148 mc. may be covered. However, overall stability and frequency readout will not be quite as good as with a 20 meter I.F. Since most operating in the 2 meter band does not cover the entire 4 mc. band width, but is concentrated in small segments, the 20 meter I.F. range is generally recommended, and has been designated as standard.

6 METER I.F.:

When the Swan 250 or 250C Transceiver is used with the TV-2C Transverter, the I.F. range will be in the 6 meter band. The advantage in this case is that the entire 2 meter band will be covered with one crystal in the TV-2C. The crystal injection frequency will be 144 minus 50 mc., or 94 mc. In tuning the Transceiver from 50 to 54 mc., the operating frequency will tune from 144 to 148 mc. Since the vernier dial on the Transceiver covers .5 mc., (500 KC), frequency readout and stability will be good.

TECHNICAL SPECIFICATIONS

FREQUENCY RANGE: Output: 144-148 MC.
FREQUENCY RANGE: Input: 20 meter band standard. 15, 10, or 6 meter bands optional.
TRANSMITTER POWER RATING: 240 watts P.E.P. input with single sideband voice modulation, 180 watts CW input, 75 watts AM input. Power output in TUNE mode: 80 to 100 + watts.
TRANSMITTER OUTPUT IMPEDANCE: 50 to 75 ohm coaxial cable, series tuned link coupling.
TRANSMITTER DISTORTION PRODUCTS: Approximately 30 db. below rated output.
RECEIVING CONVERTER: 3 RCA 40673 FET's with Noise Figure less than 3 db.
METERING: P.A. Cathode Current, 0-400 ma. Relative Output, 0-10.
PANEL CONTROLS: P.A. Tune, P.A. Load, Driver Tune, Crystal Selector, Meter Switch, 144 mc. Transverter On-Off.
REAR PANEL CONTROLS AND CONNECTORS: P.A. Bias Adjust, Power Supply Connector, Relay Control Jack, I.F. Output Jack, Coaxial Antenna Connector, Low Frequency Antenna.
TUBE COMPLEMENT: 6JK6 Injection Amp., 12BY7 Transmit Mixer, 6360 Driver, 5894B/8737 Power Amplifier.
TRANSISTORS: RCA 40673 FET's in Rec. R.F. CASCADE, RCA 40673 FET Rec. Mixer, 2N706 Crystal Osc., 2N706 Freq. Multiplier.
POWER REQUIREMENTS: (Normally supplied by Swan 117XC power supply, operating both the Swan Transceiver and the TV-2C Transverter).
Filaments, 12.6 volts AC or DC, 2.04 amps.
Medium Voltage, 275 volts DC, 120 Ma.
High Voltage, 800 volts DC, 240 Ma.
Bias Voltage, 110 volts negative DC, 6.4 Ma.
Osc. Supply Voltage, 10 volts regulated negative DC, 9 Ma.
Relay Supply Voltage, 12 volts DC, 125 Ma.
DIMENSIONS: 13 in. wide, 5 1/2 in. high, 11 in. deep. Weight, 13 lbs.

CIRCUIT DESCRIPTION

RECEIVING MODE:

An incoming signal in the 144-148 MC. range is first amplified by the 2 stage R.F. Amplifier circuit which uses 40673 FET's, providing excellent sensitivity and low noise figure. The amplified signal is then heterodyned in a 40673 FET mixer with the crystal injection signal. The frequency difference or "I.F." is selected by a resonant circuit, and then coupled into the Transceiver where it is received exactly like any other received signal in the I.F. range. The crystal injection signal is generated by a transistorized crystal oscillator which drives a frequency tripling stage. Thus, the crystals are actually oscillating at one-third the required injection frequency.

TRANSMITTING MODE:

Transmitting output from the Transceiver is coupled into the cathode circuit of the 12BY7 transmit mixer stage in the TV-2C. Here it is heterodyned with the crystal injection signal. The sum of the two frequencies falls in the 2 meter band, and is amplified first by the 6360 tuned driver stage, and then by the 5894B Power Amplifier stage. Output is coupled into the 2 meter antenna system through a coaxial cable connector. The crystal injection signal is derived from the same crystal oscillator and frequency tripler circuit that is used in Receive mode, with further amplification by a 6JK6 pentode amplifier stage providing the necessary injection voltage.

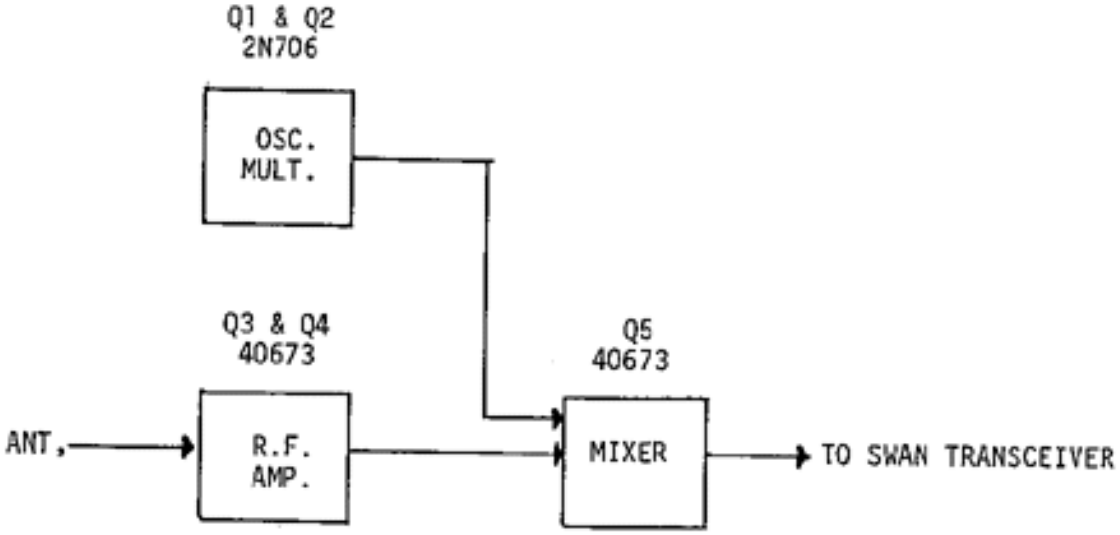
POWER SUPPLY REQUIREMENTS:

The same Swan Model 117XC power supply which provides operating voltages for the Swan Transceiver is used to power the TV-2C Transverter. The additional power requirements are adequately provided by the 117XC.

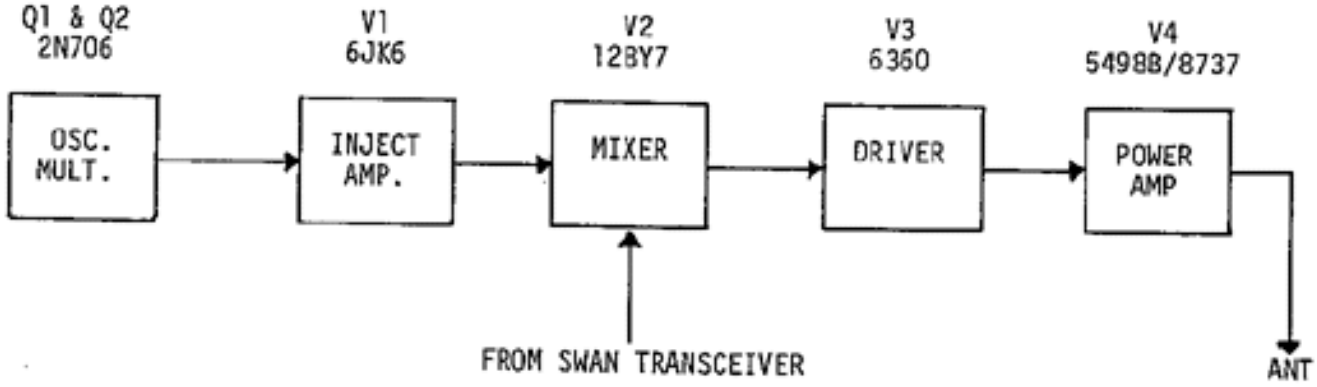
(a) 12.6 volts AC at 2.04 amps is required for filaments.
(b) 12 volts DC at 125 ma. for the T/R relay.
(c) 110 volts negative DC for Bias.
(d) 275 volts DC at 120 ma. medium voltage.
(e) 800 volts DC at 240 ma. high voltage.

NOTE

10 volts regulated negative DC at 9 ma. is required for the transistor oscillator and frequency tripler stage. This voltage is supplied by the Swan Transceiver, and is one on the interconnecting changes to be made in the Transceiver, and is described under "Installation, Transceiver Modifications."



RECEIVE BLOCK DIAGRAM



TRANSMITTER BLOCK DIAGRAM

CRYSTAL FREQUENCY SELECTION

The formula for calculating the crystal frequency to be used in the TV-2C is:

$$Fx = \frac{\text{Signal Frequency} - \text{I.F.}}{3}$$

Where Fx is the crystal frequency, Signal frequency is the desired operating frequency of the TV-2C, and I.F. is the operating frequency of the Transceiver. When ordering crystals, specify parallel resonant and 9 pico farad load.

For example: For a signal frequency of 144 mc., and an I.F. of 14 mc., the crystal frequency will be 155 minus 14, or 130, divided by 3, which calculates to 43.333 mc. This will normally be the crystal in position 1 of the crystal selector switch. With this crystal, the tuning range will extend from 144 mc. to 144.45 mc., as the Transceiver is tuned from 14 to 14.45 mc.

To calculate crystal number 2, subtract 14 from 144.45, and divide the difference by 3. The result is 43.483 mc., and with this crystal the tuning range will be from 144.45 to 144.9 mc., as the Transceiver is tuned from 14 to 14.45 mc.

This same method of calculation may be used to place the TV-2C operation in any desired portion of the 144-148 mc. band.

The following chart lists some of the various arrangements which may be selected for Swan Transceivers.

SWAN TRANSCEIVER	I.F. TUNING RANGE	TV-2C RANGE	CRYSTAL FREQ.
Swan 350C, 500C, and 500CX	14-14.45 mc.	144.00-144.45	43.333 mc.
		144.45-144.90	43.483
		144.90-145.35	43.633
		145.35-145.80	43.783
		145.80-146.25	43.933
		146.25-146.70	44.083
	21-21.45	144.00-144.45	41.000
		144.45-144.90	41.150
		144.90-145-35	41.300
		145.35-145.80	41.450
		145.80-146.25	41.600
		146.25-147.70	41.750
	28-29.7	144.00-145.70	38.666
		145.00-146.70	39.000
		146.50-148.20	39.500
Swan 350, and 500	14-14.35	144.00-144.35	43.333
		144.35-144.70	43.450
		144.70-145.05	43.566
	13.85-14.35	144.00-144.50	43.383
		144.50-145.00	43.550
		145.00-145.50	43.716
		145.50-146.00	43.883
	21-21.50	144.00-144.50	41.000
		144.50-145.00	41.166
		145.00-145.50	41.333
		145.50-146.00	41.500

TRANSCEIVER	I.F. TUNING RANGE	TV-2C RANGE	CRYSTAL FREQ.
Swan 350, and 500	28-29.7	144.00-145.70	38.666
		145.00-146.70	39.000
		146.50-148-20	39.500
Swan 250, 250C	50-54 mc.	144-148	31.333

INSTALLATION

Remove the TV-2C Cabinet, and then the P.A. top cover. Remove the protective packing from around the 5498B Power Amplifier tube. Make certain the 5498B is plugged all the way down in its socket, and that the plate connectors are secure. Replace P.A. top cover, and TV-2C cabinet cover.

The following modifications must be made in your Swan Transceiver before connecting the TV-2C Transverter.

(a) Remove the bottom cover from the transceiver, and locate the 12 pin power supply connector. If you have a 500C or 500CX, it will be necessary to remove the brass cover plate from the TVI filter box.

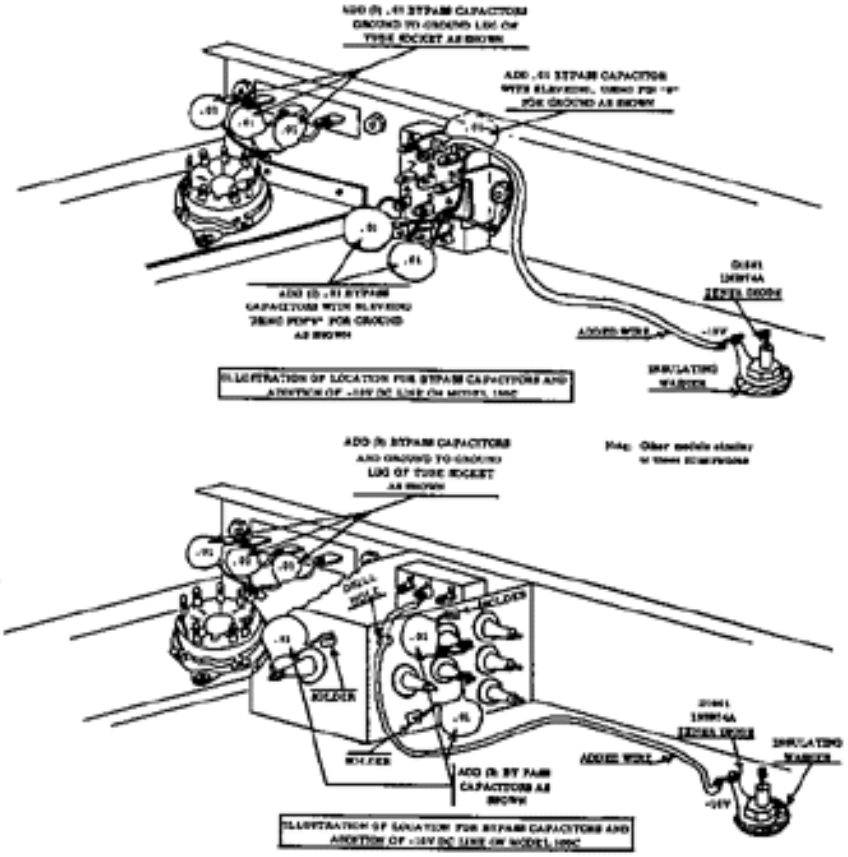
(b) Locate Pin 11 on the power supply connector. If there is a wire lead already connected to Pin 11, remove it. It will not be needed. Connect a wire lead from Pin 11 to the -10 volt terminal of the Zener diode, D1601. This is a stud type 10 watt diode mounted on the chassis near the accessory socket hole. Connect to the lug which comes from the main body of the diode. This is the -10 volt terminal, and will supply the regulated voltage to the crystal oscillator in the TV-2C.

(c) Connect three .01 mfd. ceramic disc bypass capacitor from each of the auxiliary relay terminals to a ground lug. These are the three terminals located on the back of the Transceiver chassis just behind the P.A. tubes. The three .01 bypass capacitors should have a 500 volt rating.

(d) Connect three .01 mfd. bypass capacitors from pins 4, 5, and 10 of the power supply connector to a ground lug. If you have the Model 500C or 500CX, these may be connected outside the brass TVI filter box. In this case, the .01 capacitors will connect from the feed-thru capacitor to ground, and will thus be in shunt with the .001 mfd. feed-thru.

(e) Replace the brass cover to the TVI filter box. Be sure and re-solder.

(f) The voltage dropping resistors for the Zener diode (D1601) should be changed so that both are 500 ohms, if FM is experienced on your SSB signal. The best way to check is to listen to the signal on CW while keying the transmitter. No chirping or frequency shift should take place.

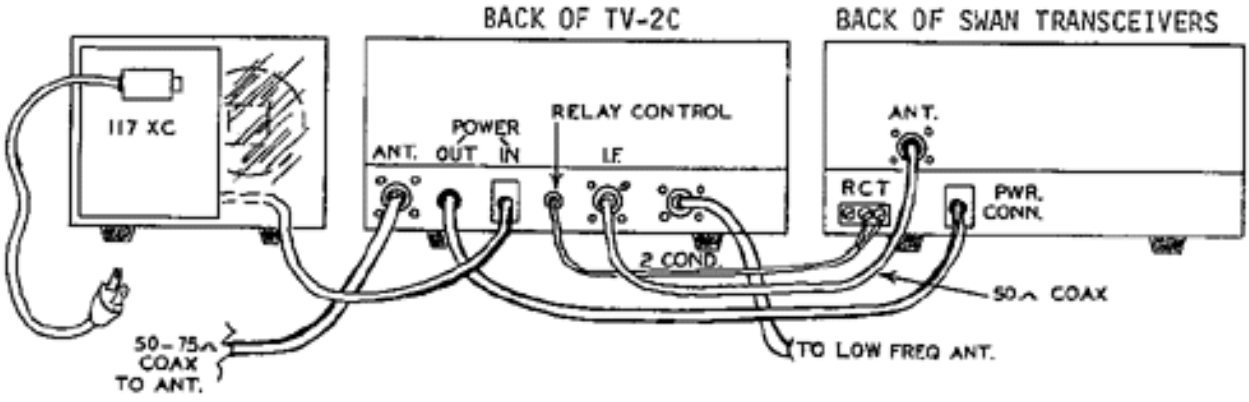


OTHER MODELS WILL BE APPROXIMATELY SIMILAR

Make all connections between the TV-2C, Transceiver, and Power Supply as illustrated below. Make certain that the relay control leads are properly connected as the TV-2C relay closes when the Transceiver is switched to Transmit mode. Otherwise, output from the Transceiver can damage the TV-2C receiver circuitry.

ANTENNA:

Any of the common antenna systems designed for use in the 2 meter amateur band may be used with the Swan Transverter provided the input impedance of the transmission line is not outside the capability of the matching network. The transmission line should be of the coaxial cable type. An antenna system should show a standing wave ratio of less than 2:1 when using 50 or 75 ohm coaxial transmission line. If open-wire or balanced type transmission line is used with the antenna, a suitable antenna tuner is recommended between the Transverter and the feedline. Various types of antennas are available from your dealer, and for the antenna builder, many are described in the amateur handbooks, also available from your dealer. Remember that even the most powerful transmitter is useless without a proper and efficient antenna system.



TV-2C CABLE CONNECTIONS, REAR VIEW

OPERATION

TRANSCEIVER TUNING:

Set the Transceiver to the proper band, corresponding to the one the TV-2C is set up for. Tune-up procedure on the Transceiver is generally the same as when operating it directly into an HF antenna on that band, except that meter readings will not be as high as normal, since plate voltage to the output stage of the Transceiver has been reduced to plus 275 volts. Note that P.A. Bias adjustment for the Transceiver should not be changed. Leave it at the same setting as when operating normally at full voltage. During Transceiver tuning, you may disregard the TV-2C meter, but remember to TUNE THE TRANSCEIVER QUICKLY, AND NOT MORE THAN 10 SECONDS AT A TIME!

(a) For HF Models 350, 350C, 400, 500, 500C, and 500CX: Adjust P.A. Load controls until P.A. PLATE dips to a cathode current reading of 150 ma. (Transceiver Meter).

(b) For 6 meter model 250 and 250C: Set the meter switch to output position, and adjust P.A. PLATE and P.A. LOAD controls for maximum meter reading. (Transceiver Meter).

TV-2C ADJUSTMENTS:

(a) Set the TV-2C Meter Switch to OUTPUT, and the TV-2C P.A. LOAD control to ten, (3 o'clock). Switch the Transceiver to TUNE position, and quickly adjust DRIVER TUNE and P.A. TUNE on the TV-2C for maximum meter reading (TV-2C Meter). Switch the Transceiver back to REC mode.

(b) Switch the Transceiver to TUNE position, and quickly adjust the P.A. LOAD control on the TV-2C for maximum output reading. Then reset the TV-2C P.A. TUNE control again for maximum output. Repeat peaking of P.A. LOAD and P.A. TUNE controls until maximum output reading is reached. Switch the Transceiver back to REC mode.

(c) TV-2C BIAS ADJUSTMENT: Switch the Transceiver to normal SSB mode. (By pressing the Push-to-Talk button on the mic on most models), adjust the Carrier Balance control for Carrier Null, (minimum carrier). Then set the P.A. BIAS control on back of the TV-2C for 60 ma. reading on the TV-2C meter. Note that the TV-2C meter switch must be in CATHODE position for this adjustment.

(d) TV-2C CATHODE CURRENT: After both the Transceiver and the TV-2C have been properly adjusted, normal cathode current reading on the TV-2C meter will be between 180 and 200 ma. in TUNE position. In SSB Transmit mode, adjust the Transceiver MIC. GAIN for an average TV-2C Cathode Meter reading of about 125 ma. MIC. GAIN setting will normally be about 9 to 10 o'clock.

I.F. LEAK-THROUGH:

Very strong signals in the I.F. range may leak-through, giving the impression that you are hearing a weak 2 meter signal when in fact it is a very strong signal coming through at the Transceiver frequency. Be sure to connect the three .01 mfd. bypass capacitors to the Auxiliary Relay Switching terminals inside the Transceiver, as described before.

If signals in the I.F. range are still leaking through, connect a short ground strap from the transceiver chassis to the Transverter chassis. This may be copper braid or strap, about 1/2 inch wide. Also connect a good ground line to the chassis from a ground rod or water pipe. Refer to the alignment section for adjustment of the I.F. trap.

CIRCUIT MODIFICATIONS WHEN CHANGING I.F. RANGE:

The following chart indicates what changes must be made in the TV-2C when converting to a different I.F. range.

I.F. RANGE	CRYSTAL FREQ. See chart pg. 5	C108 (Across L802)	C109 (Across L101)	C707 (Across L708
14 mc. (STD)	43 approx.	None	None	20 pf
21 mc.	41 approx.	None	None	None
28 mc.	39 approx.	5 pf	None	None
50 mc.	31.333	20 pf	5 pf	None(connect jumper across half of coil L702)

After making the circuit changes when changing I.F. range, it will be necessary to adjust each of the changed circuits; that is: permeability tune coils L802, L101 and L702. Refer to the alignment section for instructions.

ALIGNMENT

An accurately calibrated Grid Dip Oscillator covering the necessary frequencies may be used to align the Transverter using the Grid Dip only. The procedure is the same except that you couple to the appropriate coil and tune the circuits for maximum indication on the Grid Dip Oscillator. For those without Grid Dip Oscillators, alignment can be accomplished with a meter as follows.

CAUTION

Dangerous High Voltages are used in this unit. All safety precautions must be used at all times. Particularly when adjusting coupling to final tank circuit. Never touch anything inside the final tank circuit shielded compartment with the power supply energized. Short tank circuit to ground after turning power supply off to bleed off filter capacitors before touching anything connected with the P.A. tank circuit.

EQUIPMENT:

The following equipment will be necessary to properly align the Transverter.

1. VTVM - Hewlett Packard 410B or equivalent.

2. Watt meter with a non-inductive load. Must be capable of handling 125 watts or more at 144 to 148 mc. You may use a dummy load and the Output meter on the Transverter.

The following equipment is desirable but not necessary.

1. Grid Dip Oscillator (GDO) - Measurements Corporation Model 59 or equivalent.

2. Electronic Counter, or accurate receiver, to check actual frequencies from 30 mc. to 148 mc.

ALIGNMENT:

1. Disconnect screen voltage line from final P.A. at V4 Pin 3, and V3 Pin 7.

2. Insert Hi, Low, and Mid range crystals in crystal sockets on top of the chassis.

   OSCILLATOR Q1:

   a. Set Transverter crystal switch to Low frequency crystal. Set VTVM on -1 volt DC scale. Connect ground lead to Transverter chassis. Connect probe to Pin 1 of V1. Set core of L801 even with top of coil form, except for 50 mc. I.F. Set core 1/4" in winding for 50 mc. Adjust C805 for maximum indication on VTVM. Switch voltage off and on to see that crystal comes on every time. If available, check frequency to see if crystal is in fact on proper overtone, using counter, receiver, or GDO.

b. Make same connections as in (a) above, except switch Transverter crystal switch to Hi frequency crystal.

c. While switching between Hi and Low crystals, adjust C805 for same voltage indication on VTVM with either crystal. Peak L802 on Low crystal, then while switching between Hi and Low crystals, readjust as necessary for same voltage indication on VTVM with either crystal. If necessary slightly adjust C805 for best balance.

I.F. RANGES AT 14, 21, and 28 MC.:

a. Set VTVM to -10 volt DC scale, and move probe to Pin 2 of V2. Set 4 gang tuning condenser (Driver Tune) 1/4 open. Adjust core of L101 for maximum indication on VTVM. If equipment is available check to see that frequency is 3 times crystal overtone.

b. Repeat (a) above, with 4 gang tuning condenser 3/4 open, crystal switch on Hi crystal, and adjust C104 instead of L101.

c. Switch between (a) and (b) adjustments until no further improvement in tracking can be achieved.

d. Since the 50 mc. I.F. requires only one crystal, proceed as follows. Completely close C104, then back off 1 1/4 turns. Set 4 gang condenser to 1/2 open. Adjust L101 for maximum indication on VTVM.

TRANSMITTER MIXER:

It is necessary to provide drive from the Transceiver for the follwing STEP See Transceiver operating instructions, and set for CW output.

a. Set Transceiver and Transverter for 144 mc. Set 4 gang condenser 1/4 open. Connect probe on VTVM to Pin 1 or 3 of V3. Leave VTVM on -10 volt DC scale. Energize transmitter and adjust core of L202 for maximum indication on VTVM. If equipment is available, check to see that frequency is 144 mc.

b. Repeat (a) above, except that 4 gang condenser is set to 3/4 open, and transmitter and Transverter set to 148 mc. Tune C207 instead of L202, for maximum indication on VTVM.

c. Switch Transceiver and Transverter from Low to Hi ends of band, and repeat (a) and (b) adjustments until proper tracking is achieved.

TRANSMITTER DRIVER:

a. Re-connect screen wire to V3, Pin 7. Set VTVM to -100 volts DC scale, and connect probe to swinger on bias pot at rear of Transverter,(R403). With voltages on, but Transmitter not keyed, adjust bias pot for -30 volts DC.

b. Adjust Transceiver and Transverter for 144 mc. Key transmitter and adjust core of L302 for maximum rise on VTVM. (Approximately 8 volts)

c. Adjust Transceiver and Transverter for 148 mc. Key transmitter and adjust C303 for maximum rise on on VTVM.

d. Switching between Hi and Low end of band, adjust as in (b) and (c) above, until tracking is achieved

P.A. FINAL:

a. Re-connect screen wire to V4, Pin 3. Connect 50 Ohm load and watt meter to antenna jack on rear of Transverter. If watt meter is not available, use the output meter on the Transverter as a relative indication. With no crystal in Oscillator circuit, key transmitter and adjust Bias control on rear of Transverter chassis (R403) for 60 ma. of cathode current as indicated by the cathode current switch position on the Transverter. Replace crystal.

b. Adjust Transceiver and Transverter for 148 mc. Key transmitter and resonate final tank circuit. Load final tank circuit (Final plate and load interact, so re-peak several times until no further improvementis noted).

If unable to fully load final, (at least 180 ma. of cathode current), it may be necessary to adjust coupling between L402 and L403.

CAUTION

REMOVE VOLTAGES AND DISCHARGE FILTER CAPACITORS BEFORE TOUCHING FINAL TANK CIRCUIT, AS 800 VOLTS DC IS CONNECTED TO FINAL TANK CIRCUIT.

Do not overcouple as poor signal may result.

c. Adjust coupling between L303 and L401, re-resonating C303 until maximum output is achieved as indicated by watt meter.

d. Re-peak all trimmer condensers for maximum output on watt meter.

e. Set all controls for Low end of band, 144 mc. Resonate final load and P.A. Tune. Adjust core in L302 for maximum output on watt meter. Peak output on watt meter by slight adjustment of cores in L101, L202, and L302.

f. At this point, it may be necessary to slightly adjust L801 to balance maximum output at both ends of band. Do not adjust for maximum output at either end, but for similar output as near as possible, unless all operation is intended at one end of band only.

g. Check output in middle of band. It should equal or exceed band edges.

h. Check carrier balance. If signal will not null, set is taking off, is mal-adjusted, or there is excessive carrier leak thru.

RECEIVER ALIGNMENT:

The following equipment is necessary for alignment of receiver circuits.

1. Signal Generator, Measurements Corp Model 80 or equivalent. Generator must be capable of covering 14 mc. to 148 mc.

2. AC VTVM, Hewlett Packard 410B or equivalent.

a. Since the Oscillator has already been adjusted in the Transmitter alignment section, no further adjustment or alignment is necessary.

b. During alignment of receiver, keep P.A. Plate of Transceiver and Driver Tune of Transverter peaked at the frequency being used for adjustment.

CAUTION

DURING ALIGNMENT OF THE RECEIVER, DO NOT KEY TRANSMITTER, AS DAMAGE MAY RESULT TO THE TEST EQUIPMENT.

c. Inject a 144 mc. signal into the 144 mc. antenna input connector. Increase level until signal is heard in Transceiver at the proper frequency. Adjust core in L702 (I.F. output coil in receiver section of TV-2C) for maximum audio or "S" Meter level. Reduce signal generator level in all following adjustments, as necessary.

d. Adjust Potentiomenters R503 and R504 for maximum response to a weak signal.

e. Adjust variable capacitors C604 and C702 for maximum response. Repeat adjustments 3 or 3 times as they interact slightly due to close coupling.

f. Coils L501 and L502 should never need adjustment unless damaged or replaced. These are factory adjusted by spreading or squeezing the coils for response at 146 mc. These coils are broad enough that peaking at low or high end of band will not effect sensitivity or noise figure enough to be noticable.

g. Recommended proceedure for best noise figure is to run the audio volume control 3/4 to full on, and adjust level by reducing the R.F. Gain control. The only inconvience is the lack of "S" Meter readings in this condition.

TV-2C VOLTAGE CHART

		E	B	C	
Q1	T	*-5.9	*-8.0	0	Transistors Q1 Pin 1, and Q2 Pin 1, measured with A200 uHY choke is series with meter lead.
	R	*-5.9	*-8.0	0	
Q2	T	*-6.5	*-9.8	0	
	R	*-6.6	*-9.9	0	

PIN #		1	2	3	4	5	6	7	8	9
V1	T	*-2.38	.35	5.3AC	12.6AC	213	74	0		
	R	*-2.12	.41	5.3AC	12.6AC	241	83	0		
V2	T	*1.29	-7.12	0	12.6AC	13.9AC	5.3AC	237	181	0
V3	T	-19	0	-19	12.6AC	0	250	190	250	NC
V4	T	12.6AC	*-33.3	258	.23	Fil CT	*-33.3	0	Plates	+800VDC
Q3		+9	+5.4	+1.5	+1.52					
Q4		+8.8	+5.6	+1.5	+1.54					
Q5		+11.8	+.7	0	+.7					

All measurements are ± 10%

Measurements made with 20,000 Ohms per volt meter. From point indicated to chassis ground. Use 1.8 uHY choke on all RF points except those noted above.

* These points greatly effected by crystal activity and proximity of test lead, etc. May vary by as much as 30% under different conditions.

PARTS LIST

CAPACITORS

C1A/C1B/C1C	15 Var.	074-019
C101	50, DM15	088-002
C102	.001, 20% 500V Disc	072-006
C103	.001, 20% 500V Disc	072-006
C104	20, Mica Comp. Trimmer	089-003
C105	.01, +80-20%, 500V Disc	072-023
C106	.001, 20% 500V Disc	072-006
C107	.001, 20% 500V Disc	072-006
C108	Factory Selectable	
C109	Factory Selectable	
C201	50, DM15	088-002
C202	75, DM15	088-003
C203	75, DM15	088-003
C204	1000, DM20F	088-022
C205	12, DM15	088-035
C206	.001, 20% 500V Disc	072-006
C207	20, Mica Comp. Trimmer	089-003
C208	.001, 20% 500V Disc	072-006
C301	100, DM15	088-004
C302	.01, +80-20%, 500V Disc	072-023
C303	60, Mica Comp. Trimmer	089-006
C304	.01, +80-20%, 500V Disc	072-023
C305	.001, 20% 500V Disc	072-006
C401	.01, +80-20%, 500V Disc	072-023
C402	10 MF, 150V Electrolytic	073-011
C403	1000, Feedthru	077-001
C404	1000, Feedthru	077-001
C405	.001, 20% 500V Disc	072-006
C406	10/10 Variable	074-031
C407	1000, Feedthru	077-002
C408	35, APC	074-032
C409	50, 6KV, N1500, Disc	084-013
C410	.001, 20% 500V Disc	072-006
C411	30, DM15	088-001
C412	27, DM15	088-023
C413	50, DM15	088-002
C414	100, Mica Comp. Trimmer	089-005
C415	1000 Feedthru	077-001
C416	.01, +80-20%, 500V Disc	072-023
C501	100, DM15	088-004
C502	50, DM15	088-002
C503	1000, Feedthru	077-001
C504	.01, +80-20%, 500V Disc	072-023
C505	.01, +80-20%, 500V Disc	072-023
C506	1000, Feedthru	077-001
C601	270, DM15	088-014
C602	1000, Feedthru	077-001
C603	.01, +80-20%, 500V Disc	072-023
C604	11.6, Variable	075-016
C605	1000, Feedthru	077-001
C606	.01, +80-20%, 500V Disc	072-023
C607	1000, Feedthru	077-001
C701	50, DM15	088-002
C702	11.6, Variable	075-016
C703	.01, +80-20%, 500V Disc	072-023
C704	.001, 20% 500V Disc	072-006
C705	1000, Feedthru	077-001
C706	.002, 20% 500V Disc	072-018
C707	Factory Selectable	
C801	.001, 20% 500V Disc	072-006
C802	12, DM15	088-035
C803	.01, +80-20%, 500V Disc	072-023
C804	470, DM15	088-045
C805	115, Mica Comp. Trimmer	089-007
C806	75, DM15	088-003
C807	100, DM15	088-004
C808	100, DM15	088-004

RESISTORS

R101	27K	042-273
R102	56 Ohms	042-560
R103	150K	042-154
R104	10K 2W	044-103
R105	47 Ohm 1W	043-470
R106	47 Ohm 1W	043-470
R201	47K	042-473
R202	220 Ohm 2W	044-221
R203	220 Ohm 2W	044-221
R204	220 Ohm 2W	044-221
R205	56 Ohm 2W	044-560
R206	18K	042-183
R207	1K	042-102
R301	150K	042-154
R302	27K	042-273
R303	12K 2W	044-123
R401	1K	042-102
R402	4.7K	042-472
R403	25K Pot.	052-038
R404	1 Ohm 5% 2W	049-019
R405	360 Ohm 5%	046-361
R406	100 Ohm	042-101
R407	15K	042-153
R501	1M	042-105
R502	2.2M	042-225
R503	250K Pot.	052-045

RESISTORS

R504	330 Ohms	042-331
R505	180 5%	046-181
R601	1M	042-105
R602	2.2M	042-225
R603	180 5%	046-181
R604	250K Pot.	052-045
R605	10K 10W	049-003
R606	330	042-331
R701	680	042-681
R702	100K	042-104
R703	470	042-471
R704	47 Ohms	042-472
R801	3.3K	042-332
R802	8.2K	042-822
R803	470 Ohms	042-471
R804	4.7K	042-472
R805	33K	042-333
R806	470 Ohms	042-471

VACUUM TUBES

V1	6JK6	Injection Amp.	472-043
V2	12BY7	Transmit Mixer	472-002
V3	6360	Driver	472-050
V4	5894B	Power Amplifier	472-036

TRANSISTORS

Q1	2N706	Oscillator	476-001
Q2	2N706	Tripler	476-001
Q3	40673	First R.F Amp.	476-012
Q4	40673	Second R.F. Amp.	476-012
Q5	40673	Rec. Mixer	476-012

LAMP

GE1815	471-005

METER

M1	112-008

DIODES

D401	1N34A	475-008
D601	12V 2W Zener	475-020

SWITCHES

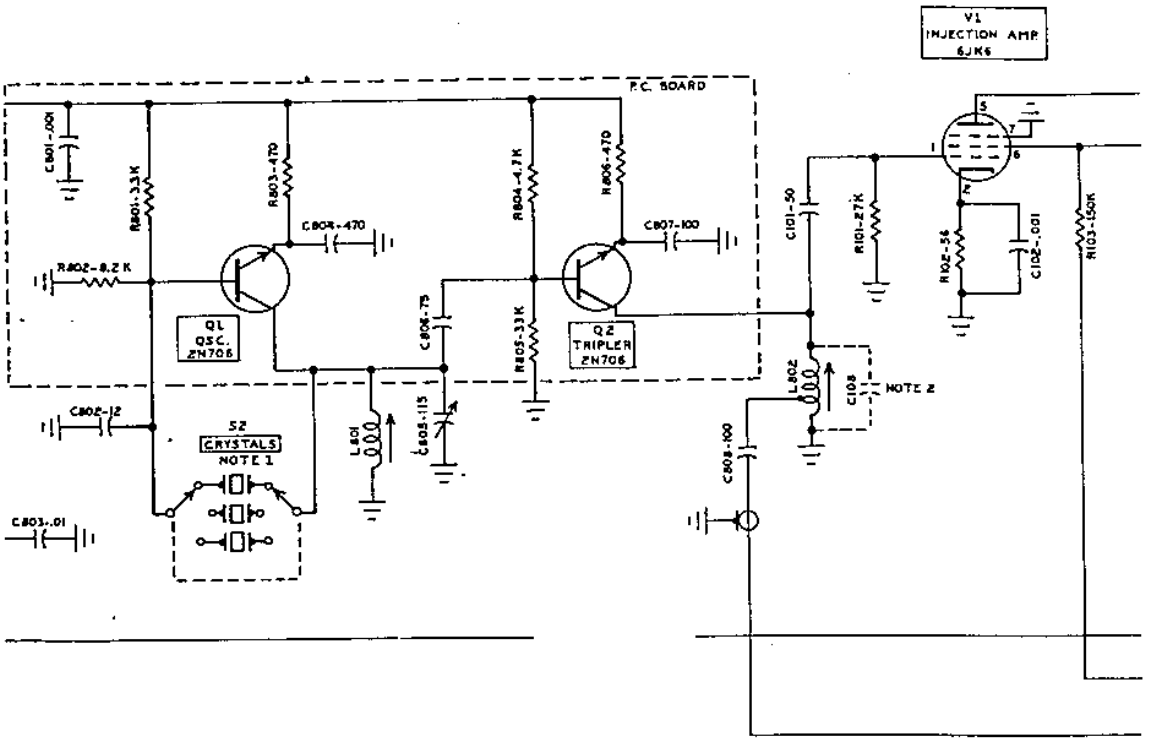
S1	Meter Switch	171-058
S2	Crystal Selector	171-059
S3	ON-OFF	171-075

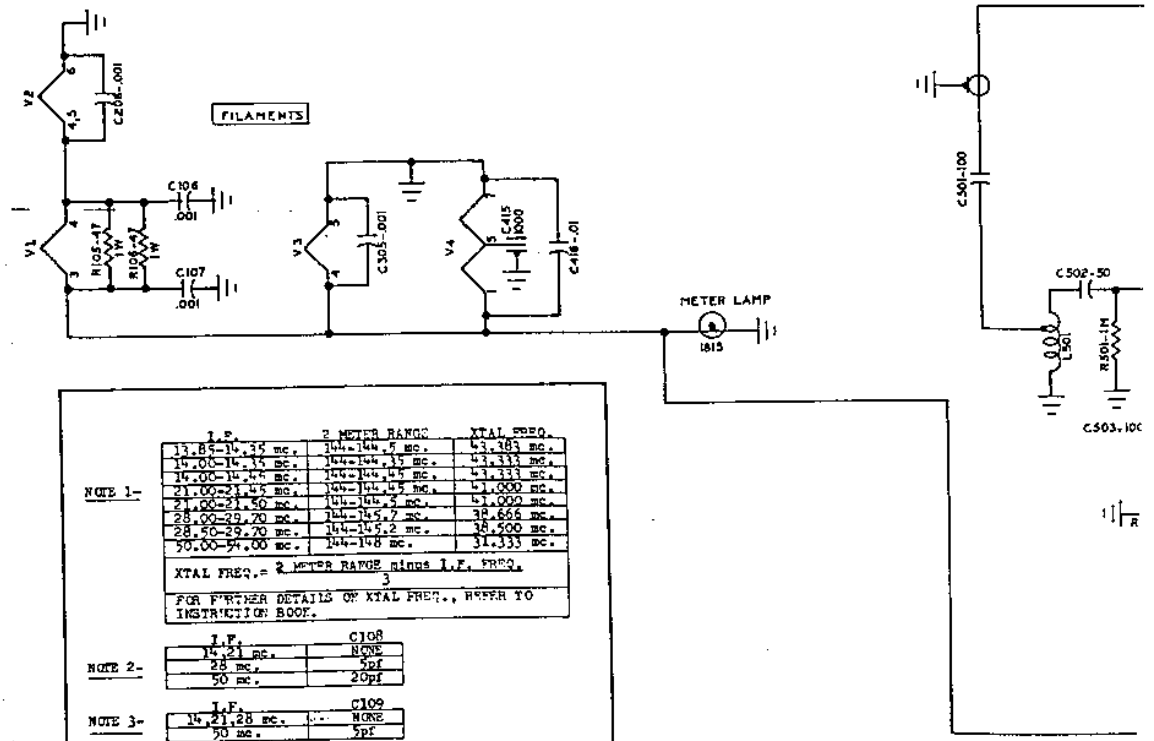
RELAY

K1	3P2T 12VDC	111-015

COILS/CHOKES

L101	Inj. Amp Plate Coil	012-091
L201	.2 UH	027-019
L202	Trans. Mixer Coil	012-092
L301	1.8 uh	027-018
L302	Driver Coil	SWAN
L401	Final Grid coil	SWAN
L402	Final Amp. Plate Coil	SWAN
L403	Antenna Pickup	SWAN
L404	.2 uh	027-019
L405	.2 uh	027-019
L406	1.5 uh	027-020
L501	First R.F. Input	SWAN
L502	First R.F. Output	SWAN
L601	1.8 uh	027-018
L602	Second R.F. Output	SWAN
L701	Rec. Mixer Input	SWAN
L702	Rec. Mixer Output	012-093
L801	Oscillator Coil	012-089
L802	Tripler Coil	012-090





NOTE 1-	I.F.	2 METER RANGE	XTAL FREQ.
	13.85-14.35 mc.	144-144.5 mc.	43.333 mc.
	14.05-14.55 mc.	144-144.13 mc.	43.333 mc.
	14.00-14.44 mc.	144-144.45 mc.	43.333 mc.
	21.00-21.45 mc.	144-144.45 mc.	41.000 mc.
	21.00-21.50 mc.	144-144.5 mc.	41.000 mc.
	28.00-28.70 mc.	144-145.7 mc.	38.666 mc.
	28.50-29.70 mc.	144-146.2 mc.	38.500 mc.
	50.00-54.00 mc.	144-148 mc.	31.333 mc.

XTAL FREQ.= 2 METER RANGE minus I.F. FREQ.
3

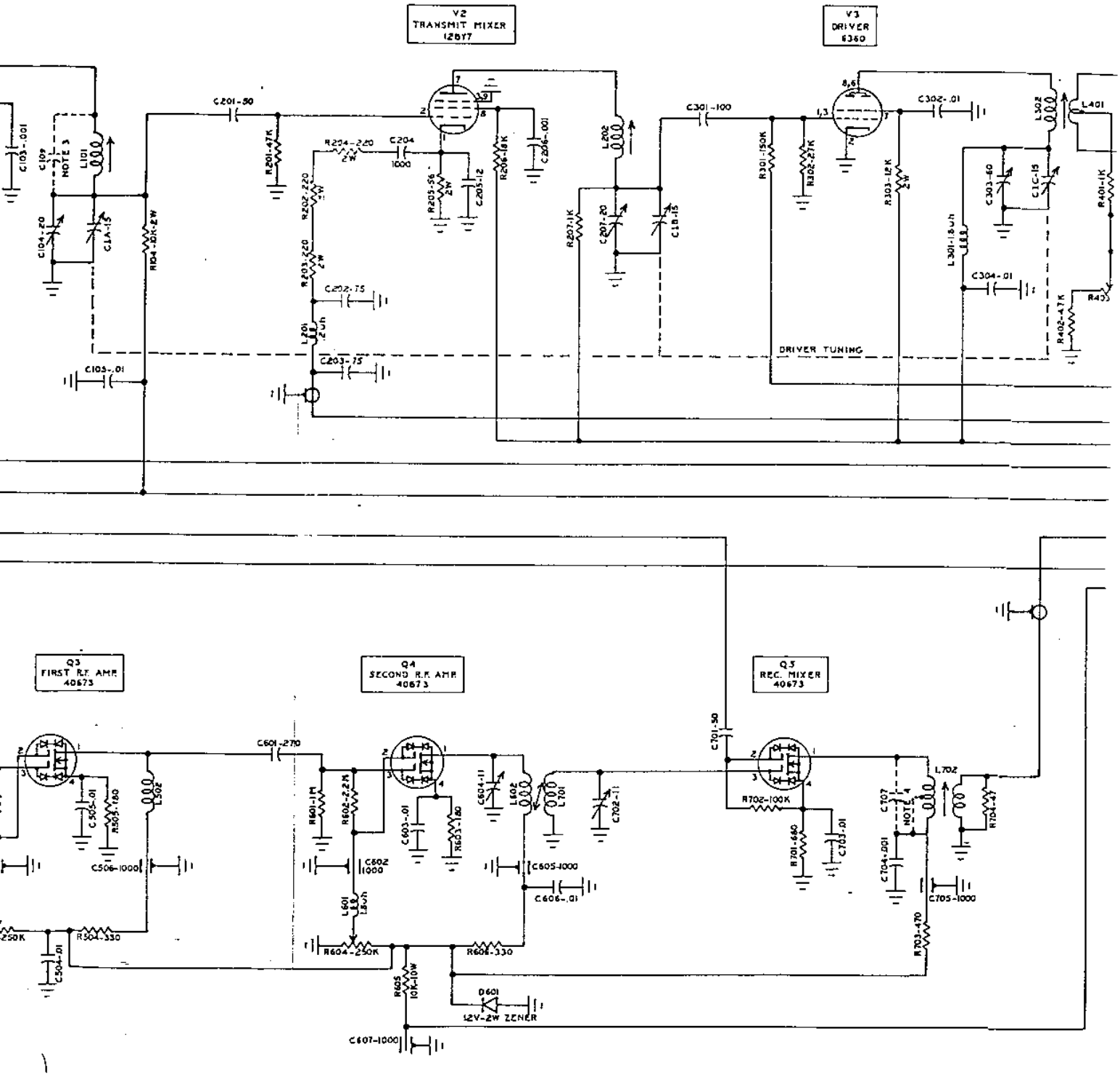
FOR FURTHER DETAILS OF XTAL FREQ., REFER TO INSTRUCTION BOOK.

NOTE 2-	I.F.	C108
	14,21 mc.	NONE
	28 mc.	5pf
	50 mc.	20pf

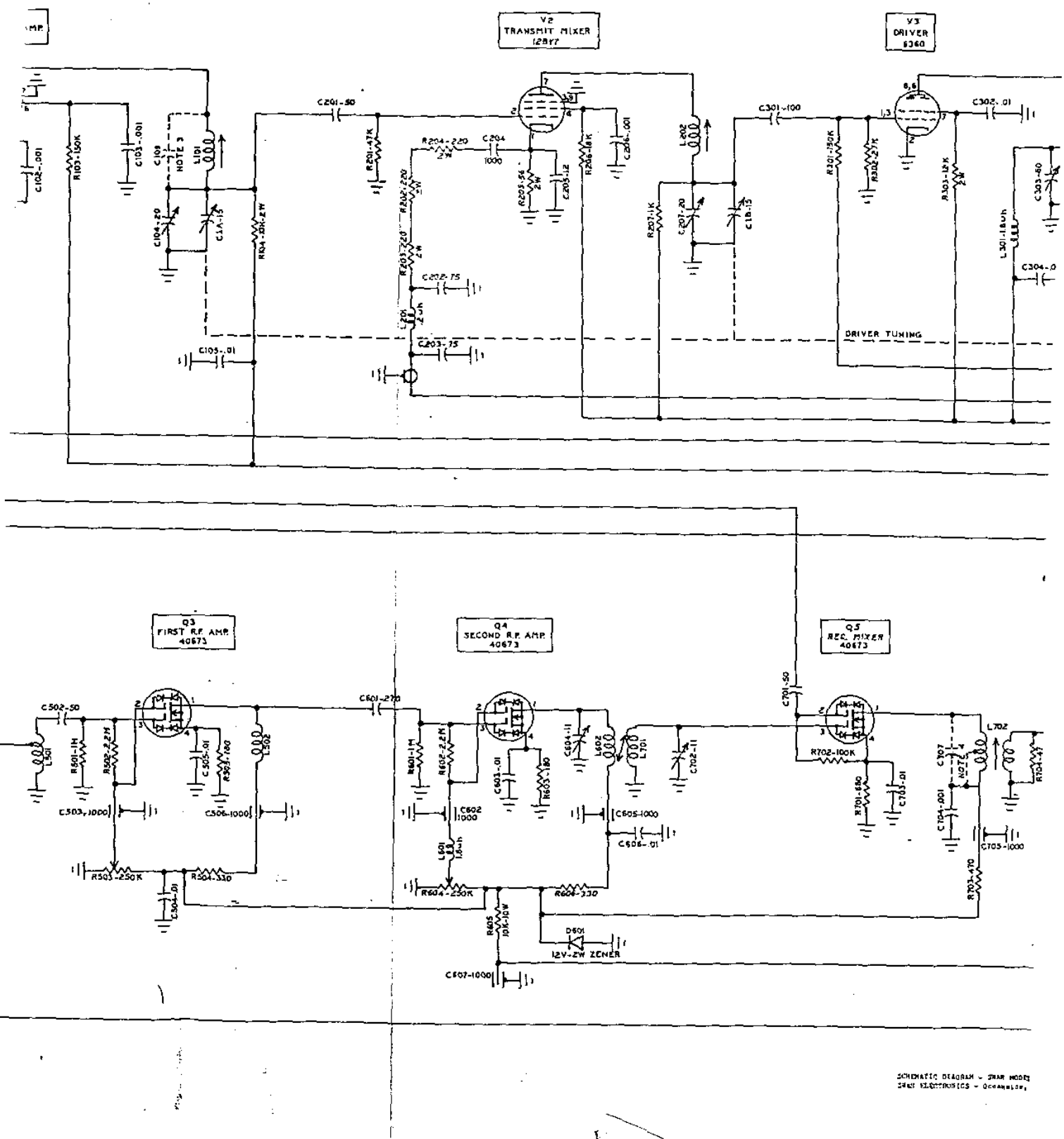
NOTE 3-	I.F.	C109
	14,21,28 mc.	NONE
	50 mc.	5pf

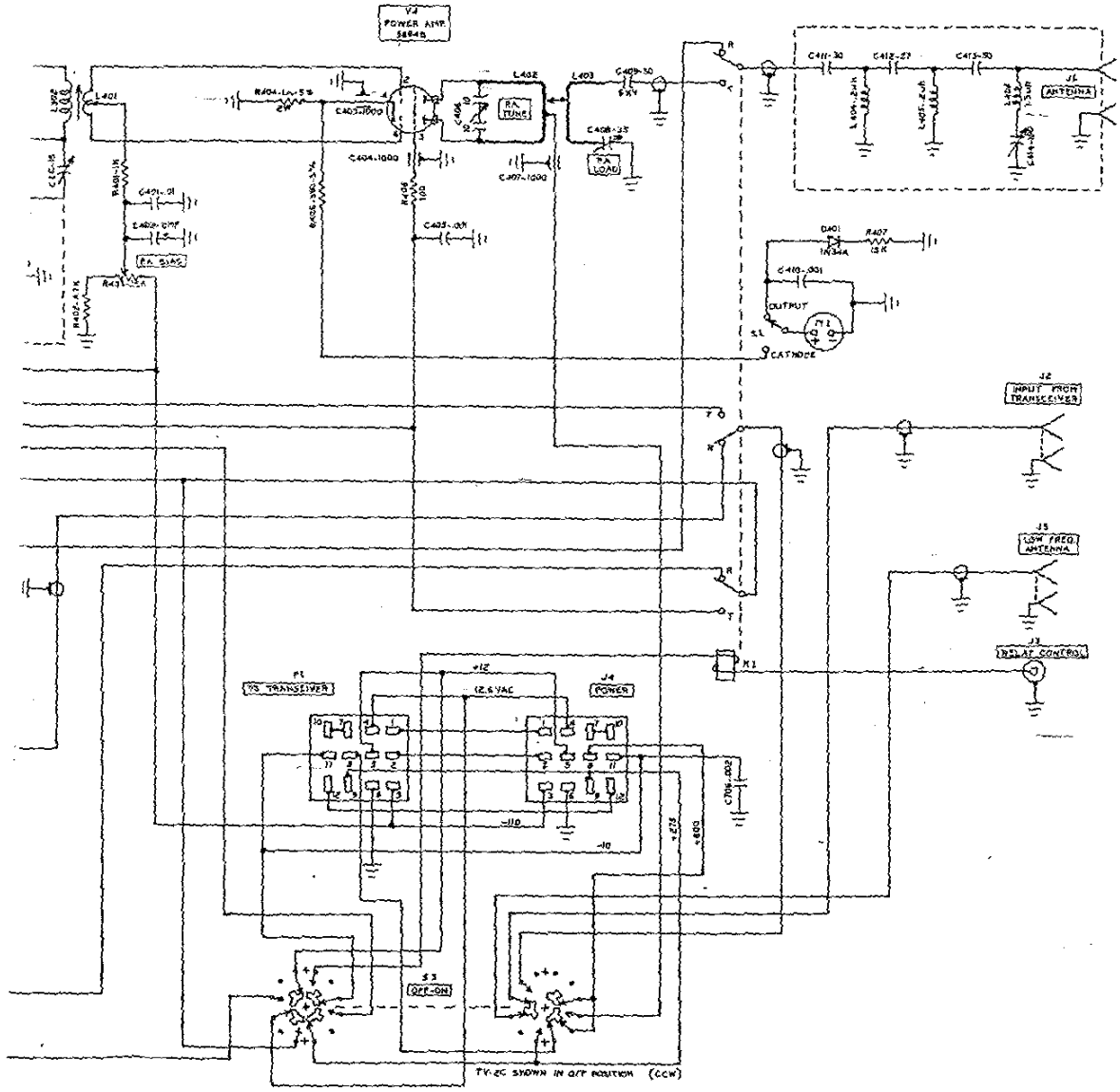
NOTE 4-	I.F.	C707
	14 mc.	20pf
	21,28 mc.	NONE
	50 mc.	NONE

CONNECT JUMPER ACROSS HALF OF L702



SCHEMATIC DIAGRAM - 5WM MODEL, TV-2C SINGLE SIDEBAND
CRAF ELECTRONICS - Oceanside, Calif.


V2
TRANSMIT MIXER
12BY7
V3
DRIVER
6360
DRIVER TUNING
Q3
FIRST R.F. AMP.
40673
Q4
SECOND R.F. AMP.
40673
Q5
REC. MIXER
40673
D601
12V-2W ZENER


V4
POWER AMP
6BQ6
L401
L402
L403
RA TUNE
RA LOAD
RA BIAS
C409-30
C411-30
C412-27
C413-30
J1
ANTENNA
D401
1N34A
R407
13K
C410-.001
OUTPUT
S1
CATHODE
J2
INPUT FROM TRANSCEIVER
J3
LOW FREQ ANTENNA
J5
RELAY CONTROL
K1
P1
TS TRANSCEIVER
J4
POWER
+12
12.6 VAC
-110
-10
+275
+600
C706-.002
S3
OFF-ON
TV-2C SHOWN IN OFF POSITION (CCW)