



OWNER'S MANUAL

Model
243
REMOTE UFO

GENERAL

The TEN-TEC Model 243 Remote VFO is an accessory to the OMNI transceiving system which allows two frequencies of operation. A MODE switch with LED indicators provides selection of any one of six modes of operation: OMNI transmit and receive; REMOTE transmit and receive; OMNI transmit-REMOTE receive; REMOTE transmit-OMNI receive; OMNI transmit-both receive; and REMOTE transmit-both receive. Full, instant break-in is retained no matter what mode is selected, and because of the broadband design in the OMNI, frequencies, even though far removed from one another but on the same band, will be processed equally and under optimum conditions in the transmitter without adjustment.

In addition to the remote capability, a four position crystal oscillator may be selected as the remote generator for fixed frequency operation, such as for MARS or net operation. Out-of-band crystals within limits outlined below may be selected, as well as in-band frequencies.

Model 243 covers all amateur HF frequencies between 1.8 and 30.0 MHz.

INSTALLATION

To install the Model 243 into the early model OMNI system:

- 1.) Remove the bottom cover of the OMNI according to the instructions on Page 3-1 of the OMNI manual. Remove jumper wire soldered between the center contacts of the VFO IN and VFO OUT phono jacks on the OMNI rear panel. On later models, simply remove external jumper plug.
- 2.) Insert the 9 pin MOLEX plug on the end of the multi-conductor cable on the rear of the Model 243 into the OMNI ACCESSORIES socket. DO NOT FORCE THE CONNECTOR.
- 3.) Turn the OMNI on. The dial lights of the Model 243 should light. Insert the red-banded phono plug from the Model 243 into the VFO IN jack on the OMNI. Switch to position 2 on the Model 243 MODE switch (EXT BOTH). The OMNI should transceive from the Model 243. Insert the second phono plug from the Model 243 into the VFO OUT jack of the OMNI. If the coax leads are inadvertently reversed, the system will be inoperative.

OPERATION

- 1.) Select desired switching mode with the MODE switch. Determination of the mode selected is by means of the four small LEDs located to the right of the dial scale. The two red LEDs in the TX column indicate which unit determines the transmitted frequency (XCVR or REMOTE), and the two yellow LEDs in the RX column indicate the receiver frequency.
- 2.) If crystal control is desired, position the REMOTE switch to X-1 through X-4. The LED indicators on either side of the main tuning dial will indicate the change from VFO to XTAL control.
- 3.) If VFO control is desired, position the REMOTE switch to VFO position.
- 4.) The OFFSET control on the OMNI will only affect the VFO in the OMNI and not the remote VFO.
- 5.) The REVERSE pushbutton is intended to prevent the common "cockpit error" of transmitting on top of an out-of-band DX station. It is used when the MODE switch is in position 3 through 6 (split operation). When pushed, it reverses the receiver functions only. For example, in position 3 of the MODE switch (TX on OMNI, RX on REMOTE), depressing the REVERSE pushbutton will cause the functions to reverse, ie. RX on OMNI, TX on REMOTE, without having to switch the MODE switch to position 4. However, if the OMNI is put into transmit, system operation will be as indicated on the indicator LEDs and MODE switch. RESULT: If you use the REVERSE pushbutton to spot your transmit frequency in split operation, and you happen to transmit, you will not transmit on your intended receive frequency.

- 6.) When the Model 243 is not connected, jumper VFO IN and VFO OUT on the rear apron of your OMNI to restore normal operation with cable supplied.
- 7.) When using Model 244 Digital Readout with Model 243, use the two phono jacks on the rear apron of the Model 243 to access the mixed local oscillator and +12 VDC.

CRYSTAL INSTALLATION

- 1.) Remove Model 243 bottom cover.
- 2.) Sockets (4) are located on the CRYSTAL OSCILLATOR/SWITCH Board with a trimmer capacitor for each socket. The socket on the outboard side is for X-1.
- 3.) The trimmer capacitors allow for a slight trimming of each crystal frequency. The amount of frequency deviation depends on the crystal's cut, frequency, case capacitance, and other characteristics, but nominally is about ± 1.5 kHz.
- 4.) After frequency is trimmed, replace bottom.

CRYSTAL OPERATION

TEN-TEC, Inc. does not supply crystals for fixed frequency operation since there are an infinite number of frequencies that may be selected. It is recommended that crystals for your desired operating frequencies be purchased from a reliable crystal manufacturer, to the specifications outlined below. It is not necessary that all four positions be filled with crystals.

Out-Of-Band Limits

<u>Band</u>	<u>Frequency Range</u>
160	1.7 to 2.10 MHz
80	3.4 to 4.10 MHz
40	6.9 to 7.40 MHz
20	13.8 to 14.55 MHz
15	20.8 to 21.65 MHz
10	27.8 to 30.00 MHz

Crystal Specifications

Case: HC-18/U.
 Terminals: .041" diameter on .188 centers.
 Mode: Fundamental only. Parallel resonance.
 Load Capacitance: 20 pF. (At 32 pF, frequency is slightly higher.)
 Frequency: For 160, 80, 40, and 20 meters, use a crystal cut for 5 MHz \pm kHz from lower band edge of segment. For 10 MHz, 15 and 10 meters, use a crystal cut for 5.01 MHz \pm kHz from lower band edge of segment. For example, a crystal cut for 5.050 MHz will operate at 1.850, 3.550, 7.050, 10.040, 14.050, 21.040, 28.040, 28.540, 29.040 and 29.540 MHz. A crystal cut for 4.960 MHz will operate at 1.760, 3.460, 6.960, 9.950, 13.960, 20.950, 27.950, 28.450, 28.950 and 29.450 MHz. Frequencies on or near the 10 MHz segment will operate in the receive mode only. Frequency so determined is the receive frequency in only the SB-N and CW positions. Refer to Page 2-10 of the OMNI Owner/Operator's Manual under Operating Hints, paragraphs 7 and 8 for further explanation.

DIAL POINTER ZERO SET

When calibrating at any 100 kHz point, the slide rule dial pointer may be set exactly to the scale marking for this frequency with the aid of the serrated disc knob protruding from the bottom of the case. It is located between the main tuning knob and the MODE switch. This adjustment need be made only occasionally as the string system ages, since the pointer is not intended for exact indications of frequency, but rather as a segment indicator telling in which 100 kHz segment you are tuned. Accurate frequency determination is made by the use of the 0-100 dial skirt.

THEORY OF OPERATION

The PTO subassembly in the Model 243 is identical to that used in the Θ MNI. In addition to this assembly, automatic and manual switching circuits for supplying the operating voltages, a crystal oscillator, buffer, and a switched amplifier are contained on three additional assemblies.

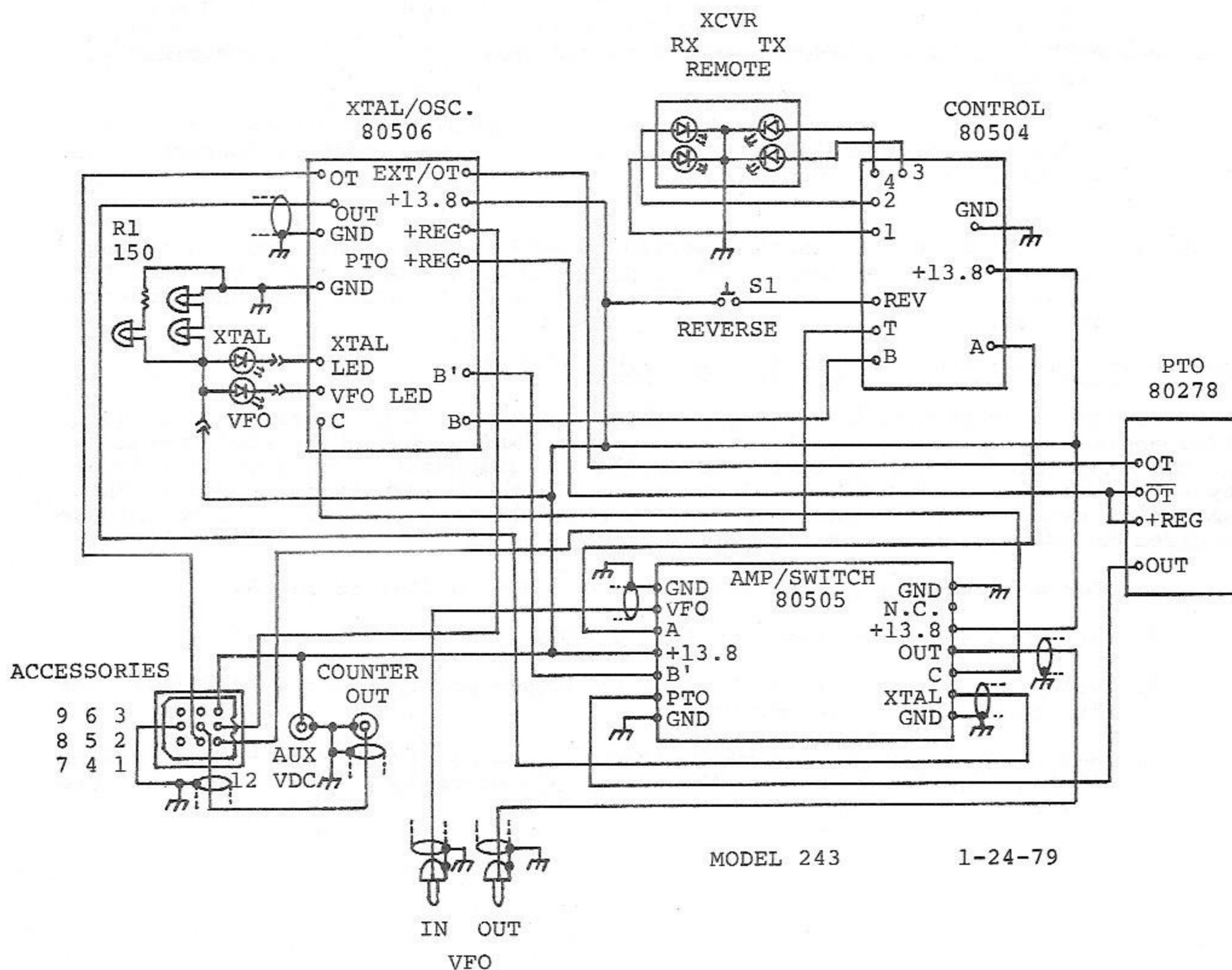
CONTROL ASSEMBLY 80504. This board provides a pair of secondary switched R and T voltages to determine which of two signal sources controls the frequency of the Θ MNI. T voltage from the Θ MNI is used to produce two control voltages A and B, which are routed through the MODE switch to select the desired mode of control. The MODE switch wafers are located on this board.

The signal buffering and switching are done on the AMP/SWITCH board 80505. The A and B voltages are used to switch the PIN diodes, D1 through D3, which do the actual signal switching in conjunction with controlled common base amplifiers Q1 and Q2. The selected signal is buffered by amplifier Q3 and routed to the Θ MNI.

When crystal control is desired, the XTAL/OSC board 80506 is used. This board contains all of the switch wafers associated with the REMOTE switch. When one of the XTAL positions is selected, the B control voltage is routed to PIN diode D3, the Model 243 PTO is turned off, and operating voltage is applied to the oscillator FET Q4. The four crystal sockets and their associated trimmer capacitors are located in the center of this board.

ALIGNMENT AND SERVICING

Please refer to the Θ MNI Owner's Manual for specific information on measuring voltages, removing plug-in assemblies, etc., which appears on Pages 3-1 through 3-4.



80278 PTO

The permeability tuned oscillator is exactly the same as the one used in the Θ MNI. It is housed in a sealed enclosure on top of the main chassis. The main coil, L3, is shunted with L2 and has L1 in series. Adjustment of these two slug tuned coils, which are on the same coil form, determines the linearity and band edge points. L2 is the top slug. L1 is the bottom slug.

PTO ALIGNMENT

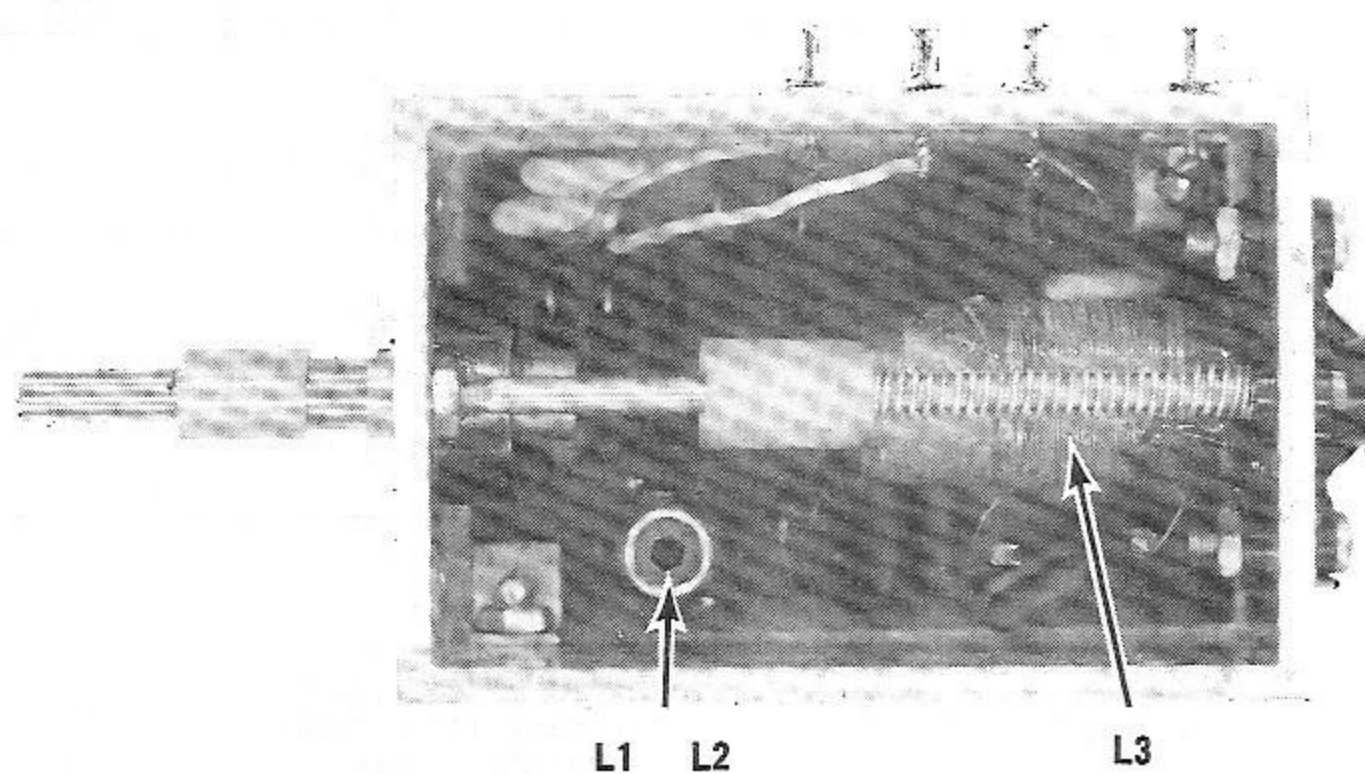
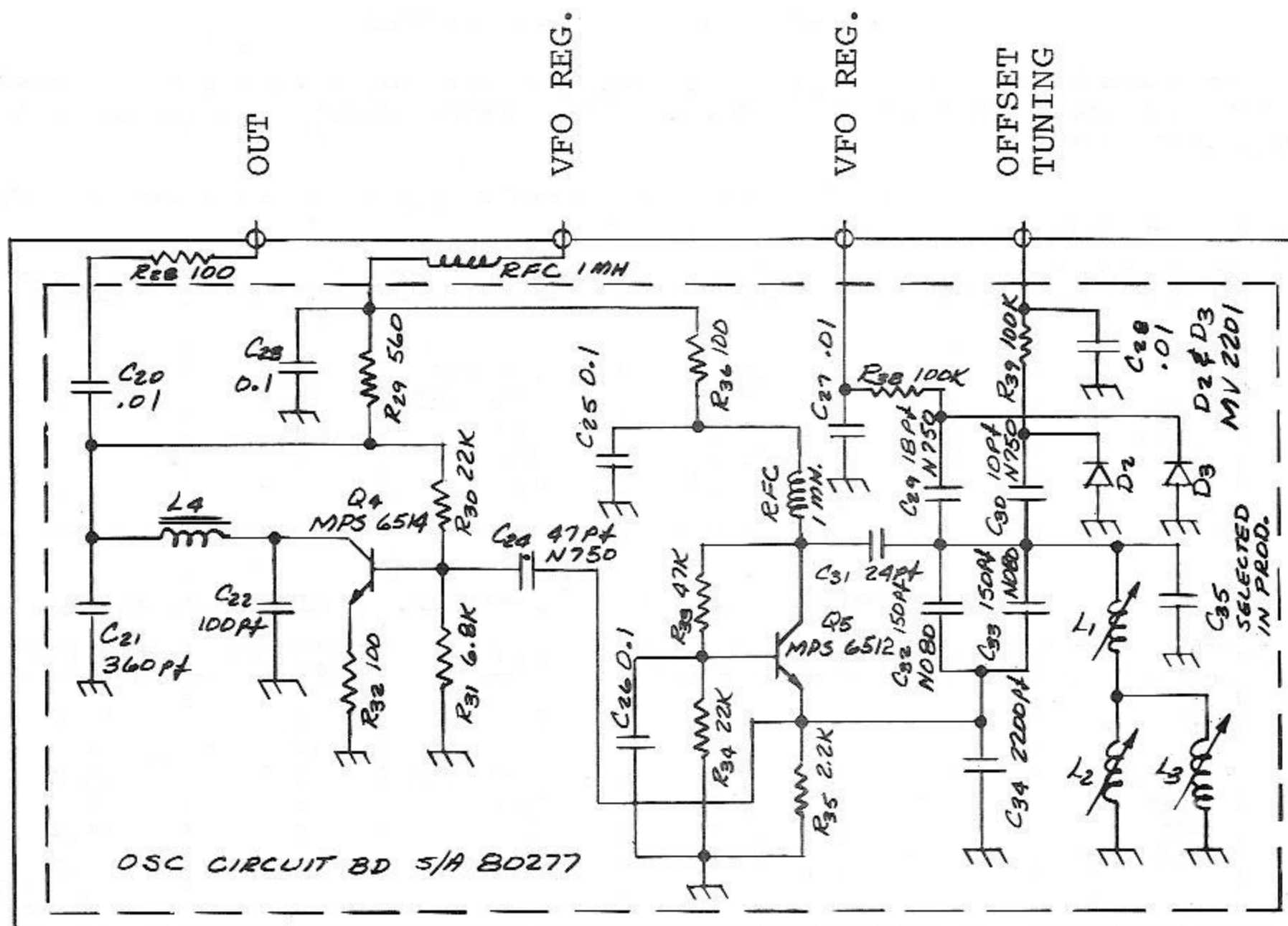
1. Connect frequency counter to VFO output plug. It is marked with a red band. Counter should have input sensitivity rating of at least 100 mV.
2. Set tuning shaft 25 kHz up from full counterclockwise position as indicated on dial skirt. Dial skirt should be zeroed and dial pointer should indicate close to left index scale mark, and within range of being set to index with serrated zero-set knob.
3. Observe counter reading and if it is not 5.000 MHz, slightly touch up L2 slug. Slug position in the coil should be such that a clockwise rotation of the slug decreases frequency.
4. Run tuning knob up scale and note counter readings at each 100 kHz of increase. If readings are within ± 5 kHz, linearity is within specifications. However, in most cases, linearity may be improved, especially if frequency reading at 5.500 MHz is not exactly aligned, or if all deviations from the first setting are in the same direction.
5. If VFO range is compressed, i.e. reading on the counter at what should be 5.5 MHz is less than this, reset tuning to 5.0 position, turn L2 slug a fraction of a turn clockwise and then compensate for this decrease in frequency by turning L1* slug also clockwise for a 5.0 MHz counter reading. Repeat step 4 to see if correction was sufficient or too much.
6. If range of VFO is expanded instead of compressed, compensation in the opposite direction is indicated. This is accomplished by turning slugs in opposite direction.

* NOTE: To reach L1 slug without upsetting position of L2 slug, use the tuning tool with reduced shank that is provided with Θ MNI. Also note that L2 is used to adjust spread of VFO range and L1 to bring frequency to correct value.

OFFSET ADJUSTMENT FOR 21.0 AND 28.0 MHz BANDS

To eliminate band edge birdies on these two bands, the crystal oscillator frequencies are chosen 10 kHz lower than what normally would be needed compared to the other bands. The variable PTO oscillator compensates for this deviation by switching in varactor diode, D3, by means of the OT line from the Θ MNI. The amount of varactor capacitance inserted is controlled by the amount of dc voltage applied through potentiometer, R1. To set this adjustment, proceed as follows:

1. Set Θ MNI BAND switch to 14.0 and frequency on dial to 14.000.
2. Set MODE switch to position 2 (EXT BOTH).
3. Using the calibrator (Θ MNI-A) or frequency counter display (Θ MNI-D), set tuning to exactly 14.000 MHz.
4. Set BAND switch to 21.0 band without changing either main tuning knob on Θ MNI or Model 243, adjust R1 on XTAL/OSC board for 21.000 0 MHz, or zero beat.



PTO 80278

80506 XTAL/OSC. SUBASSEMBLY

This assembly contains all of the switch wafers associated with the REMOTE switch, the transistor switching for the 15/10 meter offset, and the crystal oscillator/buffer.

(20 meter band. SB. REMOTE switch on VFO position. MODE switch on position 3.)
Pin Voltage Readings -

Pin	Transmit	Receive	Pin	Transmit	Receive
B'	0	11.9	C	0	0
B	0	11.9	VFO LED	12.2	12.2
PTO +REG	8.0	8.0	XTAL LED	12.6	12.6
+REG	8.0	8.0	GND	0	0
+13	13.8	13.8	OUT	0	0
EXT. OT	3.0*	3.0*	OT	3.5	3.5

(REMOTE switch on X-1 position. MODE switch on position 3.)

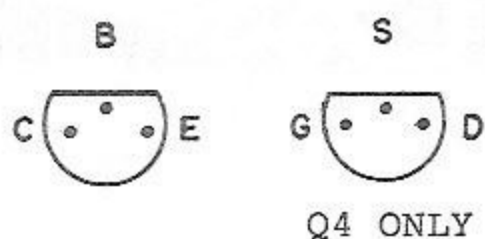
Pin	Transmit	Receive	Pin	Transmit	Receive
B'	0	12.0	C	0	12.0
B	0	0	VFO LED	12.6	12.6
PTO +REG	0	0	XTAL LED	12.2	12.2
+REG	8.0	8.0	GND	0	0
+13	13.8	13.8	OUT	0	11.6
EXT. OT	3.0*	3.0*	OT	3.5	3.5

* Depends on setting of R1.

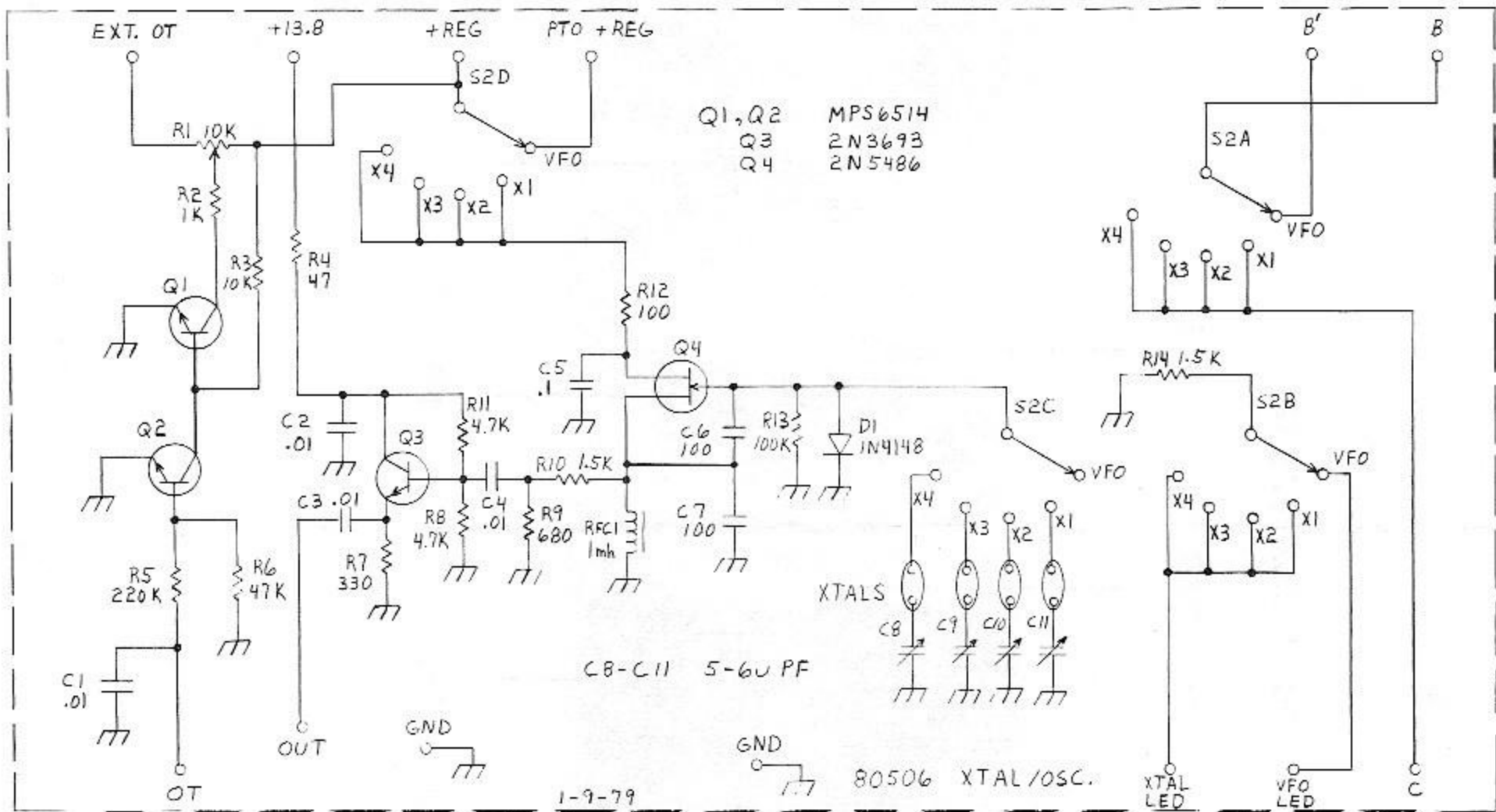
Semiconductor Voltage Readings - (Receive. MODE switch on position 3. Crystal installed in X-1 position.)

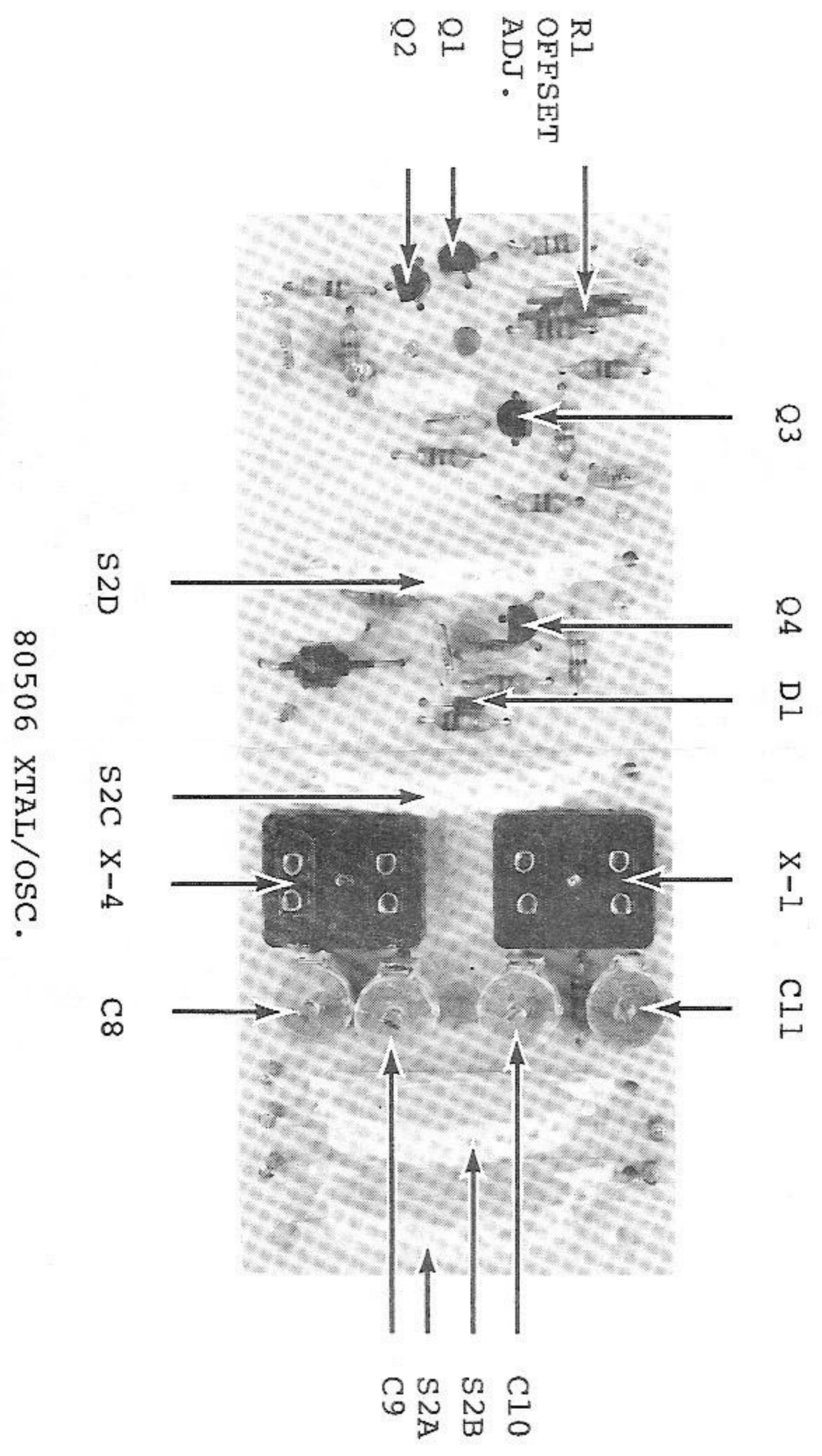
Transistor	Collector		Base		Emitter	
	VFO	X-1	VFO	X-1	VFO	X-1
Q1	0	0	0.7	0.7	0	0
Q2	0.7	0.7	0.6	0.6	0	0
Q3	13.0	13.0	6.0	6.0	5.3	5.3

Transistor	Drain		Gate		Source	
	VFO	X-1	VFO	X-1	VFO	X-1
Q4 JFET	0	7.9	0	-3.2	0	0



Transistor pins
viewed from top
of PC board





80505 AMP/SWITCH

The voltage applied to pin A, B, or C determines whether buffer amplifier Q3 amplifies the OMNI PTO, the Model 243 PTO or the XTAL oscillator. D1 through D3 are PIN diodes which are forward biased when the associated control line is set high. If A or B is high, Q1 or Q2 respectively is also turned on, allowing the signal to pass to Q3.

Pin Voltage Readings - (20 meter band. SB. REMOTE in VFO position. MODE switch in position 3.)

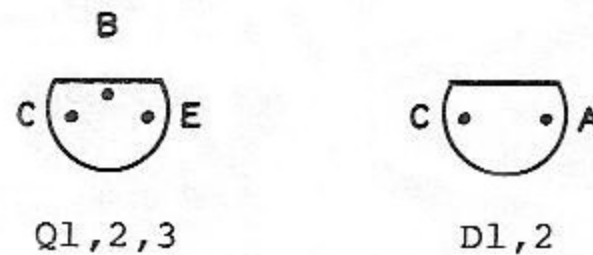
Pin	Transmit	Receive	Pin	Transmit	Receive
GND	0	0	GND	0	0
VFO	0	0	N.C.	-	-
A	12.0	0	+13	13.8	13.8
+13	13.8	13.8	OUT	0.8	0.8
B	0	11.9	C	0	0
PTO	0	0	XTAL	0	0
GND	0	0	GND	0	0

(REMOTE switch on X-1 position. MODE switch on position 3.)

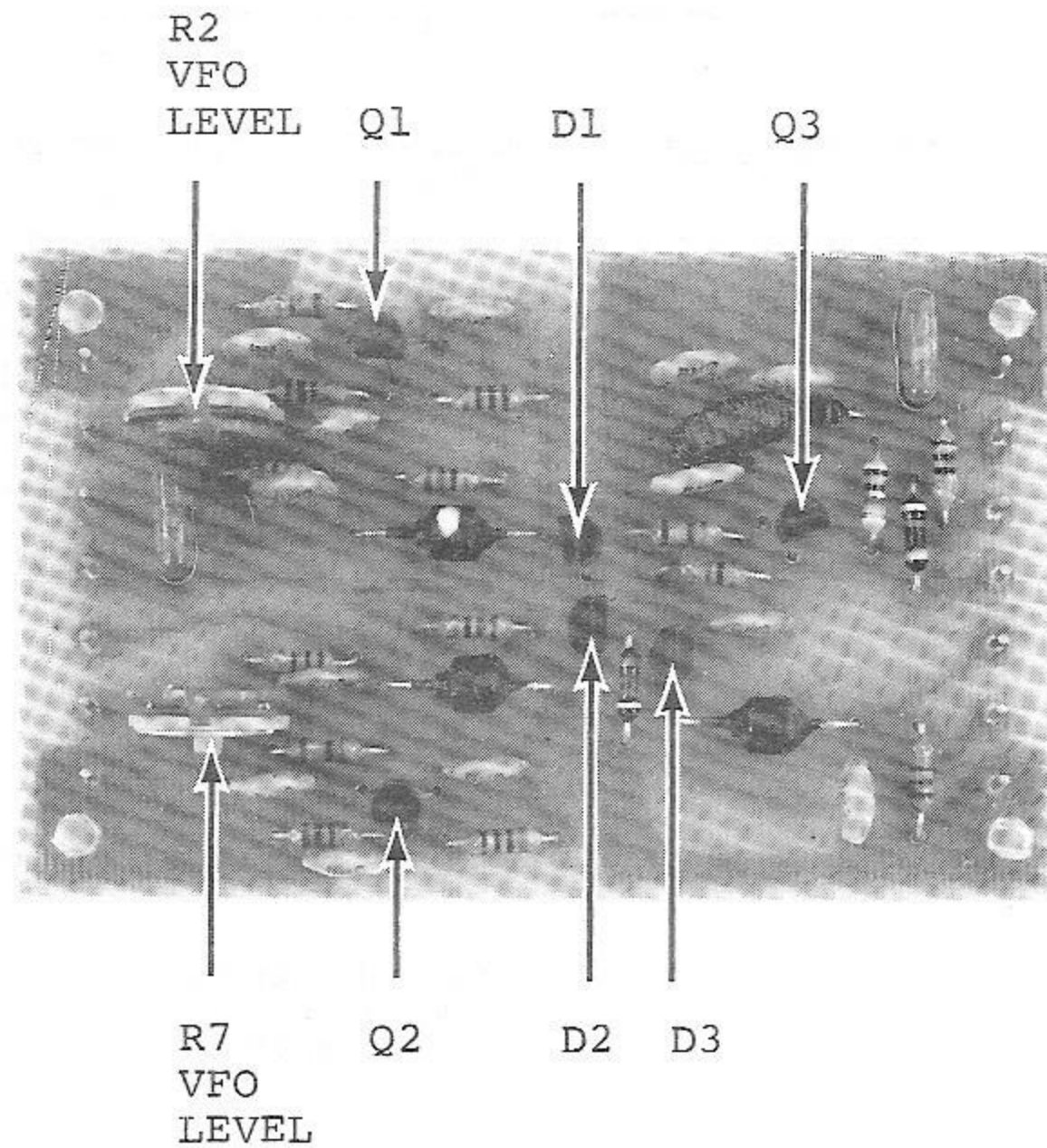
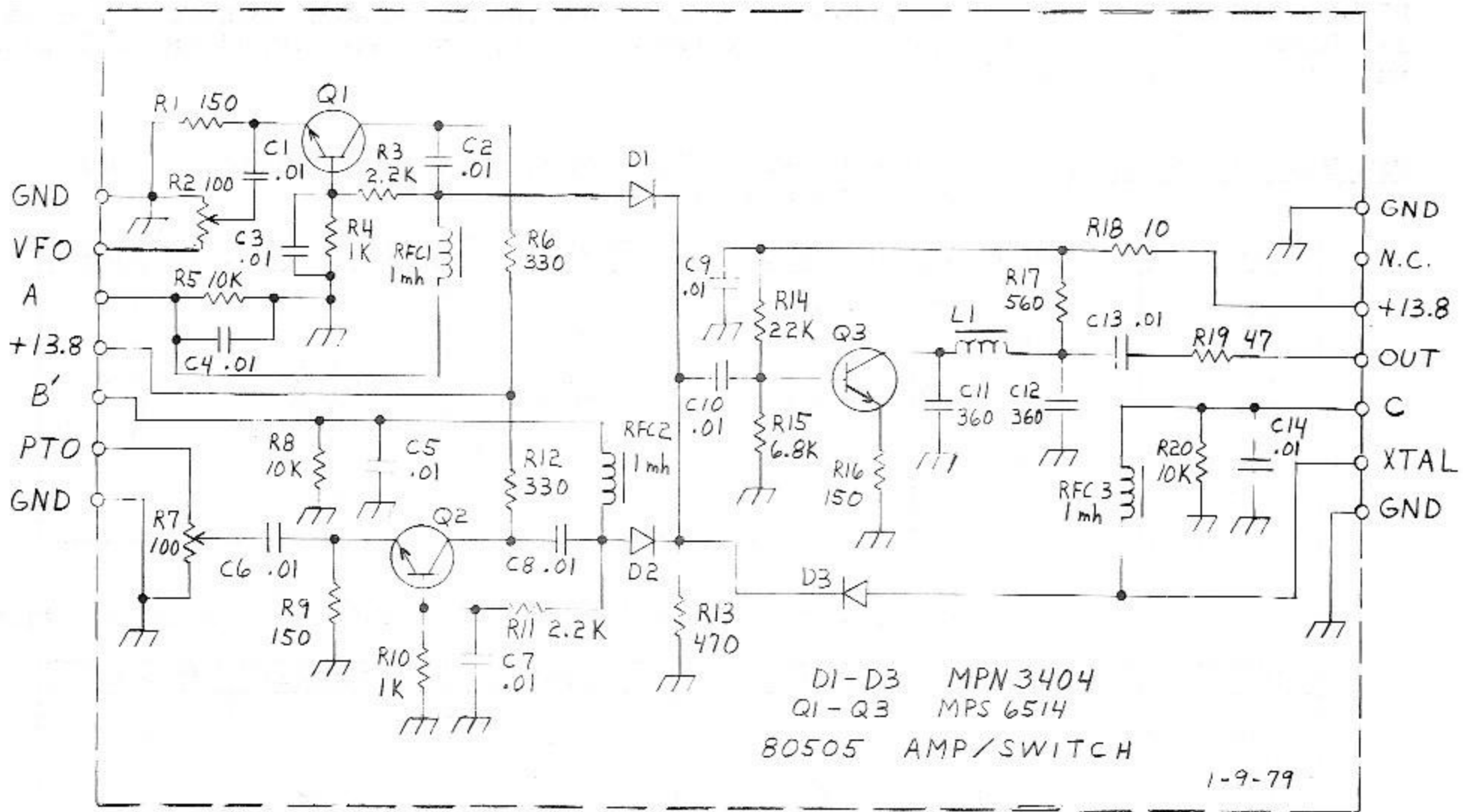
Pin	Transmit	Receive	Pin	Transmit	Receive
GND	0	0	GND	0	0
VFO	0	0	N.C.	-	-
A	12.0	0	+13	13.8	13.8
+13	13.8	13.8	OUT	0.8	0.8
B	0	0	C	0	12.0
PTO	0	0	XTAL	0	11.6
GND	0	0	GND	0	0

Semiconductor Voltage Readings - (REMOTE switch on VFO position. MODE switch on position 3.)

Transistor	Collector		Base		Emitter	
	Transmit	Receive	Transmit	Receive	Transmit	Receive
Q1	7.6	13.8	3.5	0	2.8	0
Q2	13.8	7.6	0	3.6	0	2.9
Q3	5.5	5.5	2.9	2.9	2.2	2.2



Semiconductor pins
viewed from top of
PC board



80505 AMP/SWITCH

80504 CONTROL

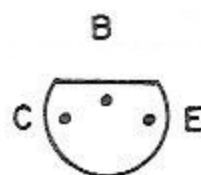
This board contains all of the switch wafers associated with the MODE switch. S1A and S1B route the switching control voltages. S1C and S1D provide voltages to light the indicator LEDs on the front panel.

Pin Voltage Readings - (REMOTE switch on VFO position. MODE switch on position 3.)

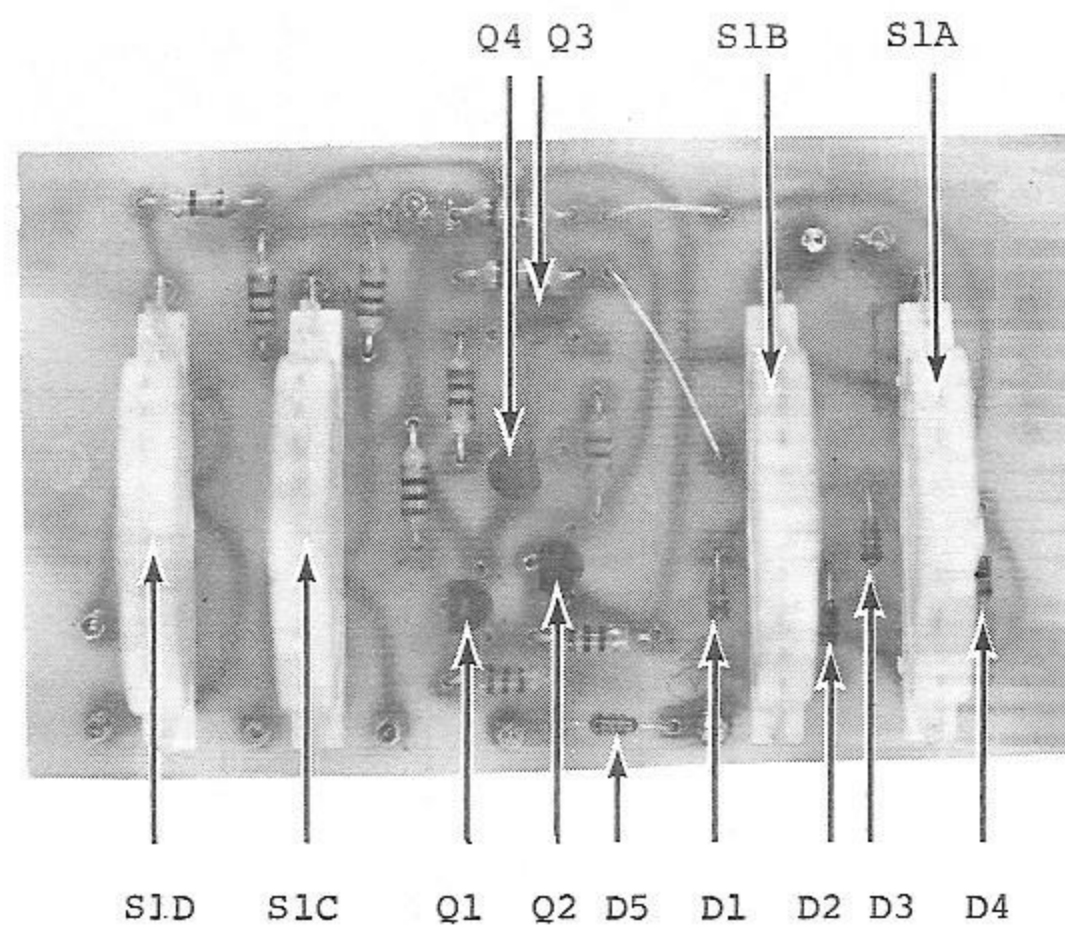
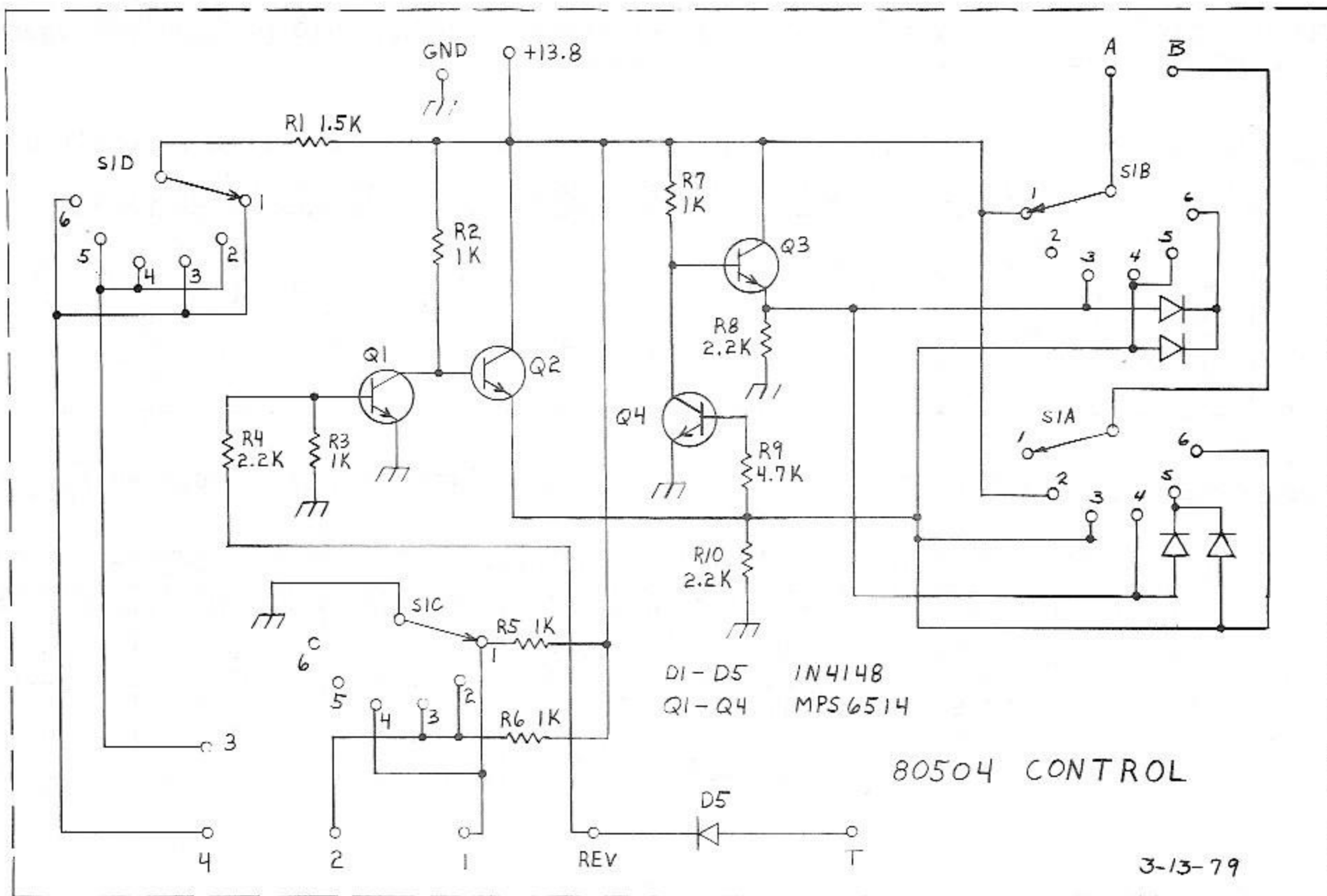
Pin	Transmit	Receive	Pin	Transmit	Receive
A	12.0	0	REV	9.9	0
+13	13.8	13.8	1	2.0	2.0
GND	0	0	2	0	0
B'	0	11.9	3	0	0
T	10.5	0	4	2.0	2.0

Semiconductor Voltage Readings - (REMOTE switch on VFO position. MODE switch on position 3.)

Transistor	Collector		Base		Emitter	
	Transmit	Receive	Transmit	Receive	Transmit	Receive
Q1	0.04	13.4	0.78	0	0	0
Q2	13.8	13.8	0.04	13.4	00	12.7
Q3	13.8	13.8	13.5	0.06	12.8	0
Q4	13.5	0.06	0	0.76	0	0



Transistor pins
viewed from top
of PC board



80504 CONTROL