

## CW OPERATION

Using the two contact jack supplied with the accessory pack, connect key as shown in the illustration. Most relay type automatic keyers can be connected into the transceiver for break-in operation without modification, but when using reed relay or transistorized automatic keyers place 390 ohm resistor in series with key line.

## TUNING PROCEDURE - CW

Set up transceiver as described in transmitter tuning with adjusting CARRIER control to desired power output up to maximum.

After completion of final tuning, install key jack in rear apron of transceiver. Set MODE switch to CW and VOX-GAIN switch to MOX. The transceiver is now set up for manual CW operation. After completing a transmission the VOX-GAIN switch must be returned to STBY position for receive operation. For break-in operation, simply advance VOX-GAIN control.

## SIDETONE ADJUSTMENT

CW sidetone level may be adjusted by rotating the tone level potentiometer (VR 203) located on the main circuit board under the top cover. NOTE: Do not disturb setting of adjacent paint marked controls.

## SERVICE INSTRUCTIONS

### WARNING

Dangerous voltages are present, therefore extreme care is essential. Be sure that all power is disconnected before working on the chassis. Check the high voltages in the capacitors by shorting the high voltage line to ground with an insulated screw driver. The transceiver has been aligned and calibrated at the factory with proper test instruments and should not require realignment. Service or replacement of a major component may require subsequent realignment, but do not attempt to make an alignment unless the operation of the transceiver is fully understood.

## TEST EQUIPMENT REQUIRED

A signal generator, a vacuum tube volt ohm meter with RF probe, a general coverage communication receiver, and a 300 watt dummy load.

## VOLTAGE AND RESISTANCE MEASUREMENTS

The table lists voltages and resistance at all tube sockets. These values are measured with a VTVM with all tubes installed in their respective sockets.

All measurements should be made from socket pins to ground.

Adjust transistor voltage regulator to exactly 9 volts with VR-202 on the printed board. Measure voltage at junction of R294 and R295.

## TRANSMITTER ALIGNMENT

1. Disconnect the high voltage (600 volts) by unsoldering the lead at rectifier, and also the screen voltage by unsoldering the connection at pin 3 of the two tube sockets (V5, V6)
2. Connect VTVM RF probe to pin 5 of V5.
3. Set the MODE switch to USB or LSB, and the VOX GAIN switch to MOX position. Adjust carrier balance potentiometer VR 201 on the main print board for minimum VTVM indication.
4. Advance MIC GAIN control two positions, and turn the MODE switch to CW/TUNE.
5. Adjust PRESEL control for maximum VTVM reading.
6. Adjust the MIC GAIN control during transmitter alignment to keep VTVM reading at 15 volts to avoid saturation of the circuits.
7. Start with upper slug of T203 nearly out and peak for peak VTVM reading.
8. Start with both slugs of T204 nearly out and adjust both slugs for peak VTVM reading.
9. Set the BAND switch to the 80 meter band, the main tuning dial to the center (250 KHz), and the PRESEL control at center. Adjust the slugs of L901 & L1001 for peak VTVM reading. Adjust the slugs on all appropriate bands from 40 to 15 meters using the same procedure. Set the BAND switch to 10B and the main tuning dial at upper edge, and adjust L905 and L1005 for peak VTVM readings.

10. Disconnect the VTVM from pin 5 of V5, and connect it to pin 2 of V202. Set the BAND switch to 10D and adjust slug L3 for peak VTVM reading. Set the BAND switch to 10C and adjust the TC1101 for peak VTVM reading. Adjust TC1102 for 10B, TC 1103 for 10A, TC1104 for 15 and TC1105 for the 20. Set the band switch to 40 and adjust L4 for peak VTVM reading. For 80 meter band, adjust TC1106 for peak VTVM reading. Disconnect VTVM.
11. It is not recommended to align BPF5 passband network unless proper measuring instrument is available.
12. Turn the FUNCTION switch to OFF. Restore unsoldered PA screen grid and high voltage wire.
13. Connect the transceiver output to a 50 or 75 ohms dummy load. Set the main tuning dial at center, and tuneup the transceiver on 80 meter band as described. Adjust MIC GAIN control setting to keep PA current less than 100 ma. Readjust L1001 for peak meter reading. Readjust L1001 to L1005 for appropriate BAND settings.
14. Tune the transceiver to maximum output at 14,350 Kc. To measure spurious radiation, use the S-meter of another receiver and tune it to 14,520 Kc where a spurious signal can be heard. Adjust TC 205 for minimum S meter reading without decreasing power output of the transceiver.  
Adjust L17 and L19 for minimum S meter reading.

#### TRANSMITTER SIGNAL LEVEL

The following table shows voltage measuring points and normal signal levels. Before making measurements, set MODE switch to CW and unsolder the lead from pin 3 of V5, and V6 sockets. Set the VOX-GAIN switch to MOX. Plug in key to key-Jack and close key to measure the signal level.

TEST POINT	FREQUENCY	RF VOLTAGE
V207 — pin 3	3,178.5 KHz	1 volt
V201 — pin 1	Variable	1.7 volts (Function STBY sw.)
V3 — pin 1	X-tal frequency selected	0.5-1 volts
V207 — pin 7	3,178.5 KHz	5.5 volts
V204 — pin 1	3,178.5 KHz	0.02 volts
V204 — pin 5	3,178.5 KHz	3.0 volts
V201 — pin 5	Variable IF	9.0 volts
V3 — pin 5	Transmit frequency	10.0 volts
V5 — pin 5	Transmit frequency	33.0 volts

Voltages given in the table are nominal and may vary  $\pm$  20%

#### FINAL AMPLIFIER NEUTRALIZATION

When replacing the final amplifier tubes it may be necessary to reset the bias to 50 ma and check neutralization. Using the procedure outlined below will guarantee maximum output and long tube life.

#### CAUTION:

HIGH VOLTAGES ARE PRESENT ON UNDERSIDE OF CHASSIS.

USE GREAT CARE WHILE MAKING ADJUSTMENTS WITH WIRING EXPOSED.

1. Locate TC-1 the neutralization variable capacitor shaft on the underside of chassis near the last band-switch wafer, in the final amplifier section.
2. Connect antenna to dummy load, set meter to I.C.
3. Check final amplifier bias in upper or lower Side Band position. If meter indicates other than 50 ma, reset bias.
4. Tune up the transceiver in the center of the 15 meter band.
5. After tune up place meter in I.C. position, Mode switch in Tune position, and advance Mic Gain until meter reads 150 ma.
6. Rotate Plate tuning control and observe dip as indicated on meter. (NOTE: If dip is not prominent, reduce loading control slightly for better indication). As the Plate control is rotated the meter should rise equally and smoothly on either side of maximum dip indication.
7. Determine which side of the dip rises abruptly. Set Plate control slightly to this side of dip keeping the meter reading below 200 ma.
8. Using a non-metallic tuning wand, rotate neutralization capacitor shaft *very slightly* in the direction which reduces the current shown on the meter.
9. Repeat steps 7 and 8 until the meter indicates a smooth, equal rise on either side of the maximum dip point.

## RECEIVER CIRCUIT ALIGNMENT

When the transmitter circuits are aligned, the only alignment remaining for the receiver circuits are the last IF stage transformer T205, T351 through T353 IF transformers in the noise blanker unit, antenna input transformer L801 to L805, trap coils L806, L906, L23 and S-meter zero set.

1. Connect signal generator output to the antenna terminal. Set the BAND switch to 80 meters, and receive 3,750 Kc signal from signal generator. Adjust PRESEL control for peak S-meter reading. Adjust L801 for peak S-meter reading. Adjust coils L802 to L805 at 7,250, 14,250, 21,250, 29,000 KHz respectively for peak S-meter reading.
2. Tune the receiver circuit to 7,100 KHz incoming signal, and leave controls as is. Apply 5,920 KHz signal generator output to antenna terminal. Adjust L806, L906, for minimum S-meter reading. Then tune the receiver to 7,500 KHz and adjust L23 same as above at 5,520 KHz signal generator output.
3. Tune the receiver to incoming signal on any band, and adjust slugs of Lower slug of T203 and slugs of T205, T351, T352 and T353 for peak S-meter reading.

## NOISE BLANKER CIRCUIT ALIGNMENT

The blanking level of the noise blanker is determined by the THRESHOLD control VR351 and the noise amplifier stage transformer T354.

Connect a signal generator output to the antenna terminal, and tune the receiver to the signal generator frequency with AGC switch OFF position. Connect VTVM DC probe between the cathode of the Diode D352 and ground, then adjust T354 for peak VTVM reading.

## RECEIVER SIGNAL LEVEL

The following table shows test points and nominal signal level to produce S-9 reading on S-meter.

Downloaded by   
Amateur Radio Directory   
  
[www.hamdirectory.info](http://www.hamdirectory.info)

SIGNAL GENERATOR CONNECTION POINT	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR OUTPUT LEVEL
V205 — pin 1	3,180 KHz	100 db
V204 — pin 1	3,180 KHz	75 db
V203 — pin 7	5,770 KHz	77 db
V201 — pin 1	5,770 KHz	50 db
V1 — pin 1	14,255 KHz	47 db
Antenna Terminal	14,255 KHz	34 db
Oscillator injection voltages		
V213 — pin 7	3,178.5 KHz	4 volts
V203 — pin 1	Variable	3 volts
V202 — pin 1	Crystal Selected	1-2 volts

The receiver was tuned to 14,255 KHz for these measurements and the test signal injected at indicated test points. Signal generator output levels are taken from signal generator attenuator. All values are nominal and may vary  $\pm 20\%$  without degrading performance.

## TROUBLE SHOOTING GUIDE

### DEFECT

### POSSIBLE CAUSE

PA idling current unstable:

1. Defective V5 and V6.
2. Defective Bias supply including bias potentiometer.

Insufficient load:

1. PRESEL improperly tuned.
2. BAND switch improperly set.
3. Antenna not resonant at frequency.
4. Defective antenna or transmission line.
5. V3, V4, V5, V6 defective.
6. Defective rectifier.

Insufficient carrier suppression:

1. Defective V207.
2. Carrier balance control improperly set.
3. Defective crystal X201 or X202.
4. Carrier frequency improperly set.

Distorted transmitted signal:

1. Excessive MIC GAIN adjust.
2. V7 defective.
3. D2, D3 defective.
4. Incorrect neutralization.

Insufficient drive or no drive:

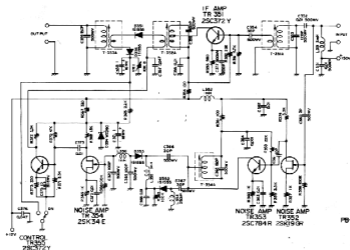
1. Defective rectifier.
2. Defective V204, V201, V3, V4, V5.
3. Defective crystal.

Low receiver sensitivity:

1. Antenna relay back contacts defective.
2. Defective V1, V201, V203, V204, V205.

VOX unstable:

1. Defective V209.
2. Improper setting of VOX GAIN and ANTITRIP controls.



PB-1205

NOTE:  
 1. ALL RESISTORS IN OHMS UNLESS OTHERWISE SPECIFIED.  
 2. ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

NOISE BLANKER  
CIRCUIT DIAGRAM

## RESISTANCE CHART

(Ω) USB

	TYPE	PIN											
		1	2	3	4	5	6	7	8	9	10	11	12
V 1	6 B Z 6	∞	100	0	0	7K	10K	0					
V 2	6 B A 6	50K	0	0	0	10K	10K	0					
V 3	6 A H 6	∞	0	0	0	10K	7K	1K					
V 4	6 C K 6	200	60K	0	0	0	0	10K	10K	0			
V 5	6 K D 6	0	0	7K	0	10K	0	0	0	30K	0	7K	
V 6	6 K D 6	0	0	7K	0	10K	0	0	0	30K	0	7K	
V 7	VR103MT	10K	0	∞	0	10K	∞	0					
V201	6 C B 6	∞	100	0	0	8K	8K	0					
V202	6 C B 6	∞	1K	0	0	8K	100K	0					
V203	6 B E 6	20K	100	0	0	8K	20K	100K					
V204	6 B Z 6	∞	100	0	0	8K	8K	100					
V205	6 B A 6	∞	60	0	0	8K	10K	60					
V206	1 2 A U 7	20K	50K	∞	0	0	20K	50K	1K	0			
V207	7 3 6 0	∞	0	∞	0	0	30K	30K	30K	30K			
V208	1 2 A X 7	∞	50K	3K	0	0	∞	∞	2K	0			
V209	1 2 A T 7	∞	∞	2K	0	0	20K	∞	1K	0			
V210	6 B M 8	∞	200	∞	0	0	10K	8K	2K	∞			
V211	5 B A 5	50K	0	0	0	10K	10K	200					
V212	6 U 8	∞	∞	∞	0	0	80K	∞	∞	∞			
V213	1 2 A U 7	50K	470	1K	0	0	100K	100K	1K	0			
V212	CW 6 U 8 TUNE	∞	∞	∞	0	0	80K	2K	10K	∞			

## ACCESSORY SOCKET CONNECTION

Pin 1. 6KD6 Heater

2. 6.3 Volt AC

3. -150 Volt DC

4. +300 Volt DC

5. +600 Volt DC

6. -100 Volt DC

7. ALC

8. Ground

9. Relay contact open for receive and close to ground for transmit.

10. Relay contact open for transmit and close to ground for receive.

11. 6.3V AC

NOTE: ACCESSORY SOCKET IS WIRED TO USE TRANSVERTOR. WHEN TRANSVERTOR IS NOT USED, ACCESSORY PLUG MUST BE IN THE SOCKET, OTHERWISE, 6KD6 HEATERS ARE NOT CONNECTED TO POWER SUPPLY.

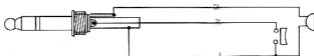


## KEY AND MICROPHONE CONNECTIONS

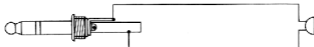
CONNECTION



CONNECTION FOR PTT OPERATION



CONNECTION FOR MOX OPERATION



### VOLTAGE CHART

RECEIVE (USB)

TRANSMIT (USB)

DC (V)

DC (V)

TUBE	RECEIVE (USB)												TRANSMIT (USB)												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
V 1	6BZ6	-	1.5	AC 6.3	0	170	105	0					-	35	AC 6.3	0	165	105	0						
V 2	6BA6	-	0	AC 6.3	0	105	105	0					-	0	AC 6.3	0	105	105	0						
V 3	6AH6	-90	0	AC 6.3	0	370	170	-					-	0	AC 6.3	0	350	165	4.4						
V 4	6GK6	0	-90	0	0	AC 6.3	-	370	320	0			10	-	0	0	AC 6.3	350	300	0					
V 5	6KD6	AC 6.3	-	175	0	95	0	-95	0	-95	0	175	0	AC 6.3	0	170	0	-50	0	0	0	-90	0	170	0
V 6	6KD6	AC 6.3V	-	175	0	-95	0	0	-95	0	175	0	AC 6.3	0	170	0	-90	0	0	0	-50	0	170	0	
V 7	VR105MT	105V	0	-	0	105	0	0					105	0	0	0	105	0	0						
V201	6CB6	-90	-	0	AC 6.3	165	165	0					-	2.7	0	AC 6.3	150	150	0						
V202	6CB6	-	2.5	AC 6.3	0	165	100	0					-90	-	AC 6.3	0	150	150	0						
V203	6BE6	-	0.8	AC 6.3	0	165	75	-					-	-	AC 6.3	0	150	70	-90						
V204	6BZ6	-	1.7	0	AC 6.3	155	120	1.7					-	1.7	0	AC 6.3	150	115	1.2						
V205	6BA6	-	1.3	0	AC 6.3	155	105	1.1					-	35	0	AC 6.3	150	105	35						
V206	1.2AU7	80	-	0	0	80	-	3.0	AC 6.3				80	-	1.3	0	0	80	-	3.0	AC 6.3				
V207	7.3.6.0	-	60	-90	0	AC 6.3	105	11	11				1.5	60	-	0	AC 6.3	90	11.5						
V208	1.2AX7	55	-	2.7	AC 6.3	65	-	2.9	0				55	-	2.7	AC 6.3	65	65	-	2.9	0				
V209	1.2AT7	60	-	1.2	AC 6.3	300	-	6.0	0				90	-	1.2	AC 6.3	150	0	0.3	0					
V210	6BM8	-	9.5	-	AC 6.3	160	170	1.3	75				-	9.5	-	AC 6.3	160	160	1.3	75					
V211	6BA6	-	0	AC 6.3	0	160	105	2.4					-	-	AC 6.3	0	155	105	2.4						
V212	6U8	0	-	165	AC 6.3	0	120	3.4	1.4	-90			0	-	150	AC 6.3	0	120	3.4	1.4	-				
V213	1.2AU7	115	-	4.5	0	0	70	-	4.5	AC 6.3			115	-	4.5	0	0	70	-	4.5	AC 6.3				
V212	6W6UB TUNE	310	-	45	AC 6.3	0	78	2.2	-	-55			180	-	40	AC 6.3	0	70	1.9	8.0	-				

