SPECIFICATIONS

Emission Type . . . . . SSB (USB and LSB selectable) CW

CONGRATULATIONS! You have just purchased one of the finest, high performance transceivers available to the amateur today. To fully appreciate the features,

ment on the FTdx560 Standard equipment includes built-in solid state power supply, noise blanker, fully adjustable VOX, break-in CW operation, adjustable

PRINCIPLES OF OPERATION

The block diagram and the circuit description provides you with a better understanding of this transceiver. The transceiver consists of a double-conversion receiver and a double-conversion exciter-transmitter. Receiver and transmitter circuits use common oscillators, common crystal filter, and common IF stages. The low frequency IF is 3,180 KHz. The high frequency IF is pass band tuned to cover 5,520 to 6,020 KHz.

RECEIVER CIRCUIT:

A signal from the antenna passes through the antenna relay and trap coil, (tuned to 5,770 KHz), then to the tuned circuit and is applied to the grid of the RF ampli-

TRANSMITTER CIRCUIT:

The microphone input is connected to the grid of the first microphone amplifier V208A, 12AX7, and then coupled to the grid of the second amplifier, V208B, the other half of the tube. Output from V208B is coupled to the beam deflection electrode of V207, 7360, through the MIC GAIN control, VR-6.

In the CW/TUNE position of the MODE switch, output from the tone oscillator, V212, 6U8, is fed to the grid of the receiver power amplifier tube, V210. The carrier signal generated in V206, 12AU7, is fed to the control grid of V207. Output from the balanced modulator V207

modulation without increased distortion.

The output voltage from the second microphone amplifier, V208, is coupled through the VOX GAIN control to the grid of V209A, 12AT7, and fed to the VOX rectifier. The positive DC output voltage of the VOX rectifier is applied to the grid of VOX relay amplifier tube, V209B, 12AT7, causing it to conduct current and actuate the VOX relay RL1. The relay tube is so biased that the relay is actuated by the VOX GAIN switch in the MOX position. Contacts on the relay switch, —70 volts DC muting and bias voltage, the metering circuit from receive to transmit, the clarifier and antenna relay.

High Frequency Oscillator

The band determining oscillator, V2, 6BA6, is crystal controlled by one of the 9 crystals selected by the BAND switch. Output from the oscillator is fed to the cathode of the receiver first mixer V202, 6CB6, and the grid of the transmitter second mixer, V3, 6AH6. The output frequency of this oscillator is always 6,020 KHz higher than the lower edge of the selected band. The output signal from this oscillator is the crystal fundamental frequency for 80 and 40 meters, but for higher bands, the crystal frequency isdoudled in the plate circuit of the oscillator.

Variable frequency oscillator

The VFO uses a FET transistor, TR401, 3SK22G, as the oscillator, and TR402, first buffer and TR403 buffer amplifier. The VFO oscillating frequency is 8,700 to

INSTALLATION

It is recommended that an excessively warm location be avoided. The transceiver should be placed in a location that has adequate space to permit free air circulation through the cabinet openings.

The transceiver should be connected to a good ground by a heavy lead to the terminal marked GND on rear apron of the chassis. It is not recommended that a gas pipe or electrical conduit pipes be used. The ground lead should be as short as possible.

Impedance of the antenna is designed to match a 50 to 120 ohm load. Most commercial antenna and feeders are designed between 50 and 75 ohms. If the impedance is far from this value, an antenna matching device should be placed between the antenna terminal and the feeder.

OPERATION

audio tone to decrease in frequency, until tone is just inaudible. (Zero Beat) Hold tuning knob firmly at this point and rotate skirt vernier dial to zero position. The skirt vernier dial surrounds the tuning knob and is held in position by a friction locking device. This dial is easily movable by hand but will retain its position after adjustment. The transceiver must be recalibrated when changing mode of operation to LSB, USB, or CW.

METER ADJUSTMENTS:

The transceiver features four separate meter functions; S-meter, ALC (Automatic Limiter Control Indication), IC (Cathode Current of Final Amplifier Tubes), and PO (Relative Power Output Indication).

These functions are controlled from the METER switch on the front panel and are adjusted for zero settings by means of two variable potentiometers on the rear apron of the chassis.

TRANSMITTER TUNING

Set controls as follows:

SELECT	NOR
VOX GAIN	STBY
MODE	CW/TUNE
MIC GAIN	Fully counter clockwise
AF GAIN	Normal listening level
METER	IC position
CLARIFIER	OFF
BAND	Desired band
PLATE	Desired band
LOADING	To position shown in table

LOADING POSITIONS

BAND	LOADING
80	4
40	2.5
20	5
15	3
10A	3
10B	3
10C	3
10D	3

PRE-TUNING

1. Adjust PRESEL for maximum receiver noise level.
2. Turn VOX GAIN switch to MOX position with meter in IC position.
3. Rotate MIC GAIN control until meter rises just above normal idling current. (50 ma)
4. Rotate PRESEL control for maximum meter reading. (Caution: if meter reading exceeds 0.2 reduce MIC GAIN control).
5. Rotate PLATE control for minimum meter reading. (Dip plate).
6. Return VOX GAIN switch to STBY.
   The transmitter is now pre-tuned to the desired frequency. Final peak tuning is accomplished by carefully following the final tuning procedure.

FINAL TUNING

CAUTION: EXCEEDING THE TIME LIMITS NOTED DURING FINAL TUNING MAY RESULT IN DESTRUCTION OF THE FINAL OUTPUT TUBES.

1. Set meter to P.O. position, VOX-GAIN to STBY, MODE to CW/TUNE, MIC GAIN to 10.
2. Momentarily set VOX-GAIN to MOX (ten seconds maximum), adjust PRESEL for *maximum* meter reading. Return VOX-GAIN to STBY.
3. Momentarily set VOX-GAIN to MOX (ten seconds maximum), increase or decrease LOADING slightly for *maximum* meter reading. Return VOX-GAIN to STBY.
4. Momentarily set VOX-GAIN to MOX (ten seconds maximum), adjust PLATE for *maximum* meter reading. Return VOX-GAIN to STBY.
5. Repeat steps 3 and 4 until maximum meter reading is obtained.
   The transmitter is now peaked to maximum output. Return MIC GAIN to zero, meter to IC position, and set MODE switch to desired operating position.

SSB OPERATION

After completion of tuning set MODE to LSB or USB. Set the METER switch to ALC position. Set the VOX GAIN control to MOX, and adjust the MIC GAIN

TRIP control to the minimum point to prevent the speaker output from tripping the VOX. Do not use more VOX gain or more ANTITRIP gain than necessary.

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

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.

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

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 bandswitch 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

RECEIVER CIRCUIT ALIGNMENT

When the transmitter circuits are aligned, the only alignment remaining for the receiver circuits are the last

NOISE BLANKER CIRCUIT ALIGNMENT

The blanking level of the noise blanker is determined

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

RESISTANCE CHART

(Ω) USB

	PIN / TUBE	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 G K 6	200	60 K	0	0	0	0	10K	10K	0			
V 5	6 K D 6	0	0	7 K	0	30K	0	0	0	30K	0	7K	0

TRANSMIT (USB)

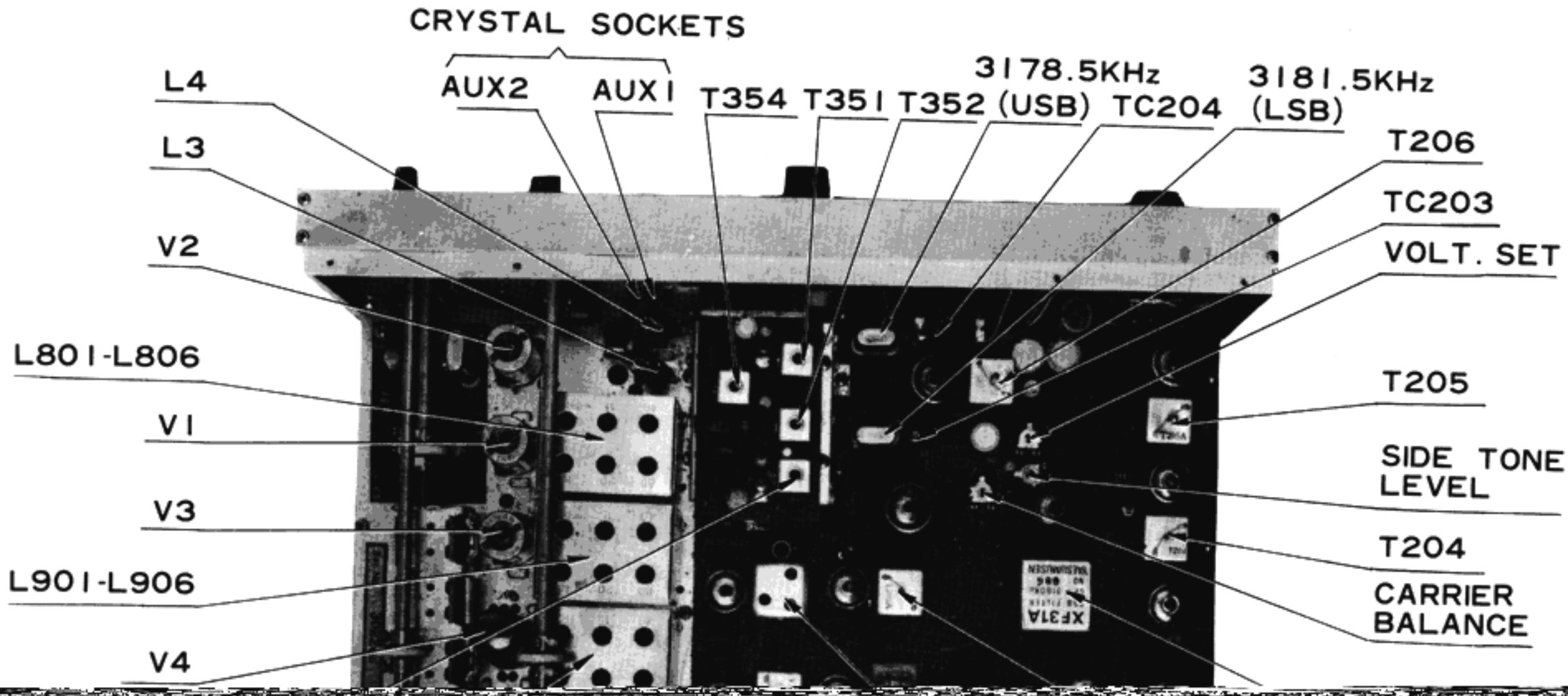
DC (V)

3	4	5	6	7	8	9	10	11	12
AC 6.3	0	165	105	0					
AC 6.3	0	105	105	0					
AC 6.3	0	350	165	4.4					
0	0	AC 6.3		350	300	0			
170	0	−50	0	0	0	−50	0	170	0
170	0	−50	0	0	0	−50	0	170	0
0	0	105	0	0					
0	AC 6.3	150	150	0					
AC 6.3	0	150	150	0					
AC 6.3	0	150	70	−90					
0	AC 6.3	150	115	1.7					
0	AC 6.3	150	105	35					
13	0	0	80	–	3.0	AC 6.3			
–	0	AC 6.3	90	90	11.5	11.5			
2.7	AC 6.3	AC 6.3	65	–	2.9	0			
1.2	AC 6.3	AC 6.3	150	0	0.3	0			
–	AC 6.3	AC 6.3	160	160	1.3	75			
AC 6.3	0	155	105	2.4					
150	AC 6.3	0	120	14	14	–			
4.5	0	0	70	–	4.5	AC 6.3			
40	AC 6.3	0	70	1.9	8.0	–			

C-CAPACITOR						
240, 2125	DIPPED MICA 500WV	1PF ± 0.5PF	361, 364, 365, 406, 407, 409, 412, 413, 421, 1301 ~ 1304			
282, 363	DIPPED MICA 500WV	2PF ± 0.5PF	39, 42, 114, 372, 374, 2129	CERAMIC DISC 50WV	0.047μF	+80% -20%
12	DIPPED MICA 500WV	3PF ± 0.5PF	351	CERAMIC DISC 500WV	10000PF	+100% - 0%
81, 93, 1004, 2109	DIPPED MICA 500WV	5PF ± 0.5PF	85, 269, 283	CERAMIC DISC 500WV	4700PF	+100% - 0%
11, 74, 89, 98, 101, 110, 234, 246, 281, 1107	DIPPED MICA 500WV	10PF ± 10%	7, 8, 15, 23, 24, 26, 27, 28, 31, 37, 38, 40, 41, 43, 44, 49, 50, 52, 55 ~ 60, 69, 70, 72, 77, 83, 102, 108, 202, 203, 206,	CERAMIC DISC 500WV	0.01μF	+100% - 0%
212, 277, 902,	DIPPED MICA					

103	METALIZED PAPER 160WV 0.1μF ±20%	2122, 2123		
2112	METALIZED PAPER 160WV 0.47μF ±20%	306, 1302, 1304, 1305, 1306	½W	27KΩ ±10%
113	MELALIZED PAPER 220WV AC 1μF ±20%	55, 304, 2120	½W	33KΩ ±10%
36	PAPER	5, 14, 45, 236, 238, 240, 241, 243, 245, 246, 248,	½W	47KΩ ±10%

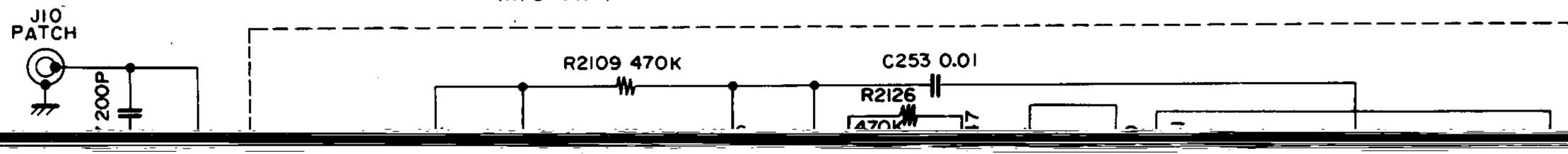
CH-A.F. CHOKE COIL	
1	1H 125mA
V-VACUUM TUBE	
3	6AH6
2, 205, 211	6BA6
203	6BE6
210	6BM8
1, 204	6BZ6
201, 202	6CB6
4	6GK6
5, 6	6KD6
212	6U8
209	12AT7
206, 213	12AU7
208	12AX7
207	7360
7	VR105MT
VS-VACUUM TUBE SOCKET	
5, 6	S−B0703−2
8	〃 35.52 〃
9	〃 16.02 〃
201	HC−6/U 3181.5KHz
202	〃 3178.5 〃
301	HC−13/U 100 〃
XF-CRYSTAL FILTER	
201	XF−31A 2.4KHz
202	XF−31C 600Hz
RL-RELAY	
2, 201	RAB−100D−11
PB-PRINTED CIRCUIT BOARD	
PB1001−2	GENERATOR
PB1002	CALIBRATOR
PB1004−2	POWER SUPPLY
PB1007 ×3	COIL ASS'Y
PB1022A	TRIM. CAP. ASS'Y
PB1056	V. F. O.
PB1058	B. P. F


CRYSTAL SOCKETS
AUX2
AUX1
T354
T351
T352
3178.5KHz (USB)
TC204
3181.5KHz (LSB)
T206
TC203
VOLT. SET
T205
SIDE TONE LEVEL
T204
CARRIER BALANCE
L4
L3
V2
L801-L806
V1
V3
L901-L906
V4

V208 12AX7
MIC AMP

V209a 12AT7
VOX AMP

V209b
RELAY C



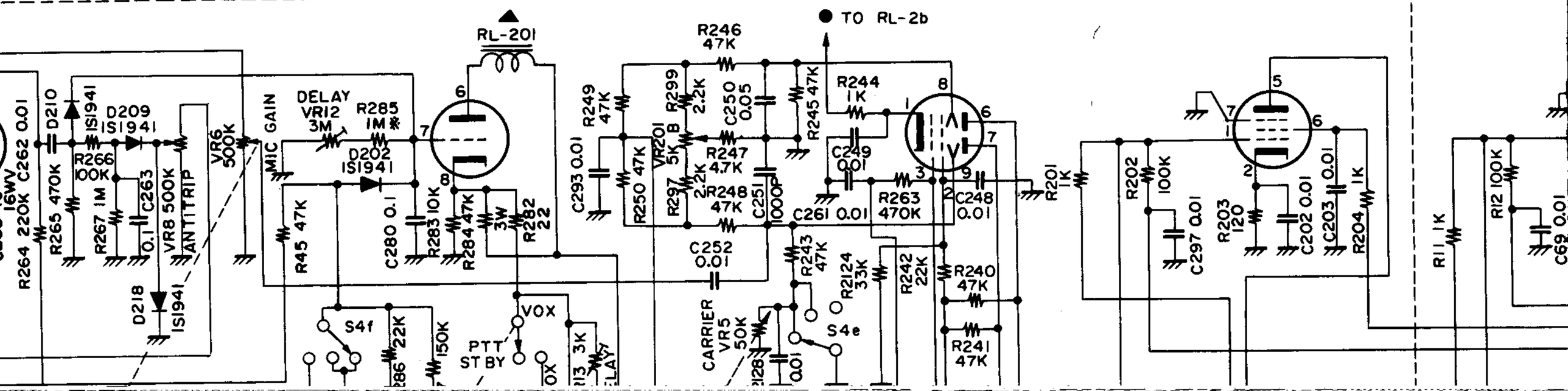
AT7
P

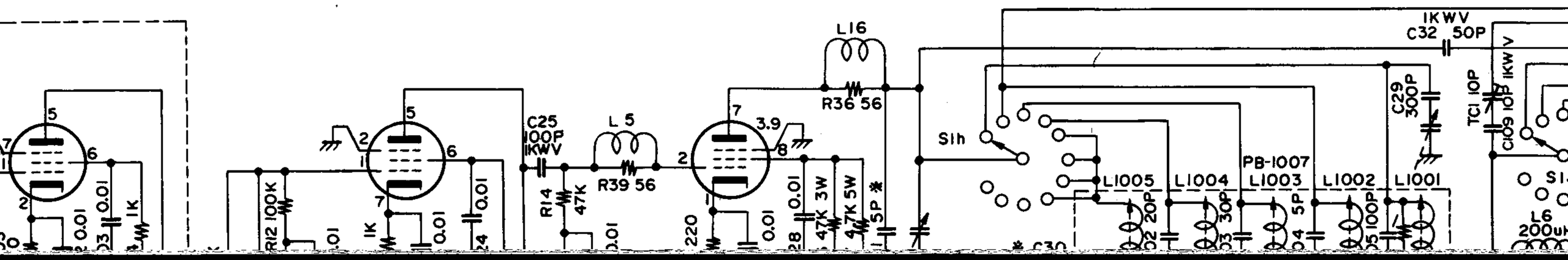
V209b 12AT7
RELAY CONTROL

V207 7360
B M

V201 6CB6
TRANS IST MIX

V3
TRANS




01 6CB6
S IST MIX
V3 6AH6
TRANS 2ND MIX
V4 6GK6
DRIVER
L16
R36 56
C25
100P
1KWV
L 5
R39 56
R14
47K
R12 100K
1K
0.01
0.24
220
3.9
47K 3W
47K 5W
5P *
S1h
1KWV
C32 50P
C29
300P
TC1 10P
C30 10P 1KW V
PB-1007
L1005
L1004
L1003
L1002
L1001
20P
30P
5P
100P
L6
200uH