

KENWOOD

HF TRANSCEIVER

# TS-530S

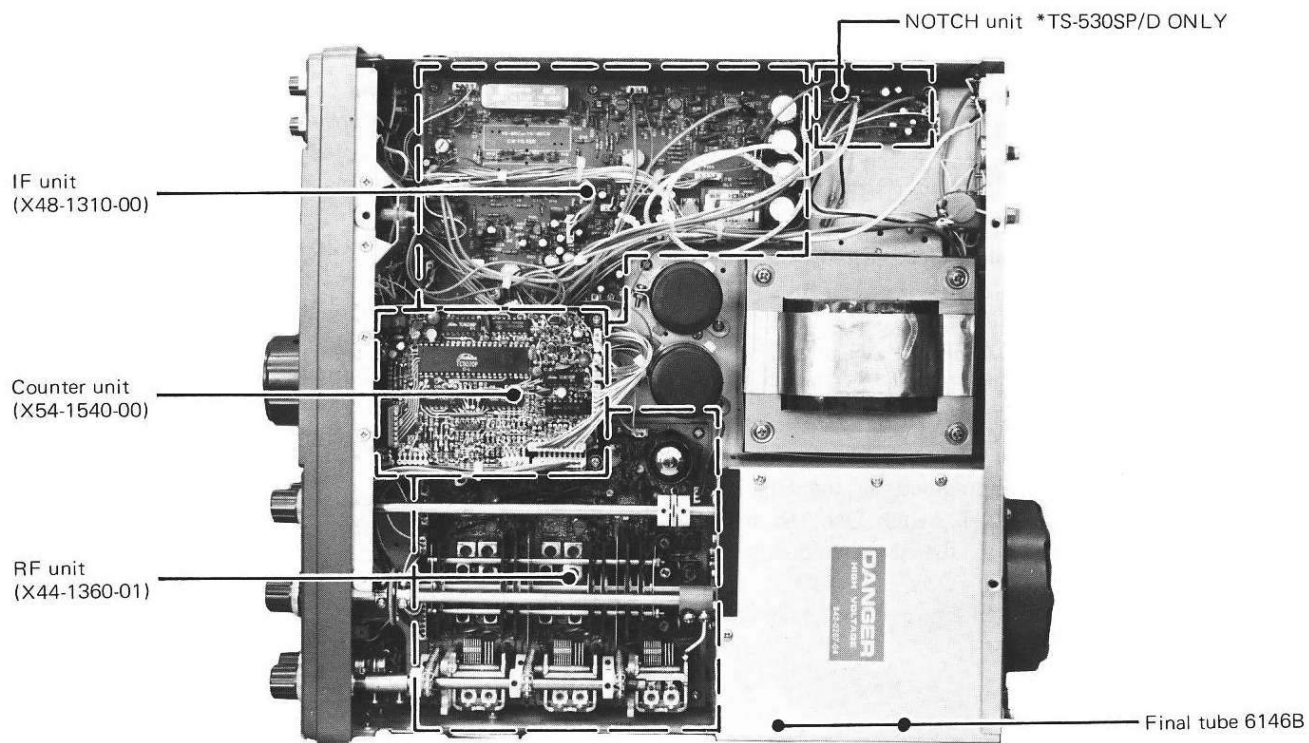
## ALIGNMENT INSTRUCTIONS

TRIO-KENWOOD CORPORATION

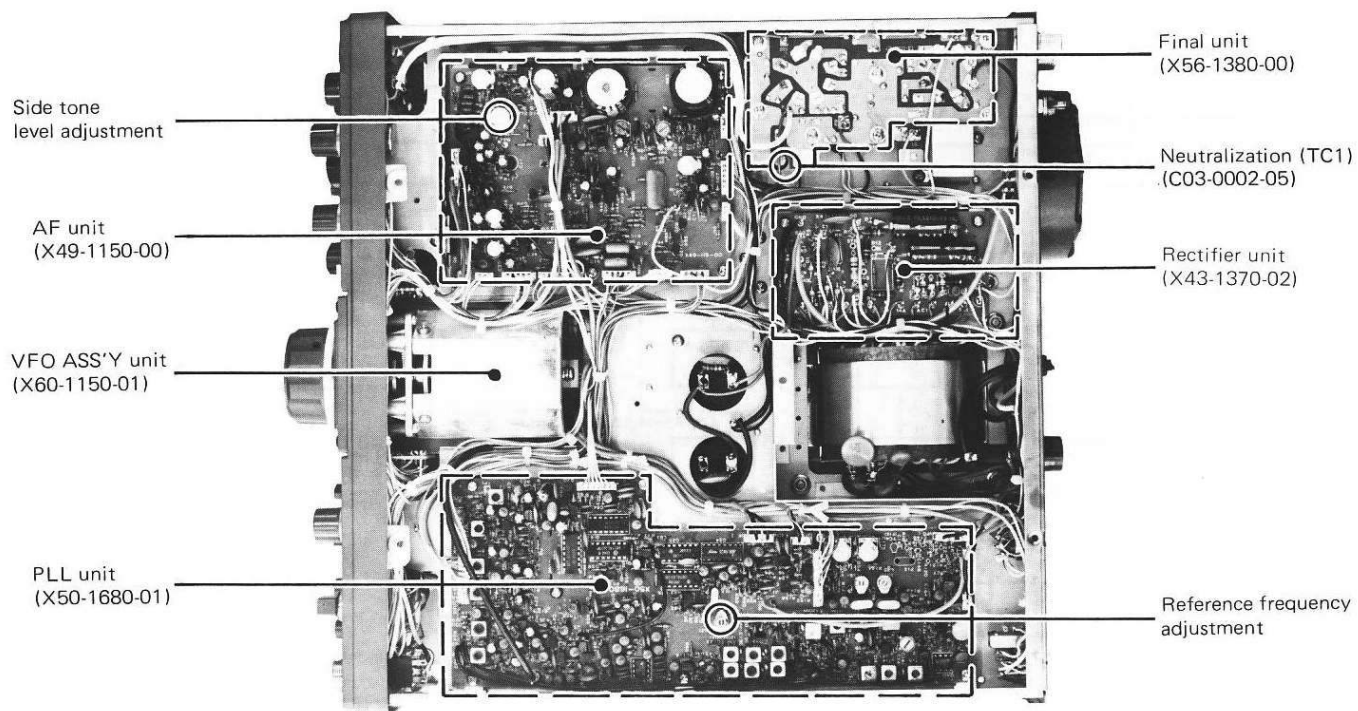


## INSIDE VIEWS

### TOP VIEW



### BOTTOM VIEW



## ADJUSTMENTS

### TEST EQUIPMENT REQUIRED

#### 1. VTVM or DVM

- 1) Input resistance: More than 1 MΩ
- 2) Voltage range: 1.5 to 1000V AC/DC

#### NOTE:

A high-precision voltmeter may be used. However, accurate readings can not be obtained for high-impedance circuits.

#### 2. RF VTVM

- 1) Input impedance: 1 MΩ and less than 3 pF.
- 2) Voltage range: 10 mV to 300V
- 3) Frequency range: 50 MHz or greater

#### 3. AF VTVM

- 1) Frequency range: 50 Hz to 10 kHz
- 2) Input impedance: 1 MΩ or greater
- 3) Voltage range: 10 mV to 30V

#### 4. AF GENERATOR (AG)

- 1) Frequency range: 200 Hz to 5 kHz
- 2) Output: 2 mV~ 1V, low distortion

#### 5. AF DUMMY LOAD

- 1) Impedance: 8Ω
- 2) Dissipation: 3W or greater

#### 6. RF DUMMY LOAD

- 1) Impedance: 50Ω
- 2) Dissipation: 100W continuous or greater
- 3) Frequency limits: 1.8 to 30 MHz

#### 7. OSCILLOSCOPE

Requires high sensitivity and external synchronization capability.

#### 8. SWEEP GENERATOR

- 1) Center frequency: 8 to 40 MHz
- 2) Sweep bandwidth: Maximum ±16 MHz
- 3) Output voltage: More than 0.1V

#### 9. STANDARD SIGNAL GENERATOR (SSG)

- 1) Frequency range: 1.8 to 30 MHz
  - 2) Output: -20 dB/0.1 μV~120 dB/1V
  - 3) Output Z= 50Ω
- Generator must be frequency stable.

#### 10. FREQUENCY COUNTER

- 1) Minimum input voltage: 50 mV
- 2) Frequency range: Greater than 50 MHz

#### 11. NOISE GENERATOR

Must generate ignition-like noise containing harmonics beyond 30 MHz.

#### 12. Spectrum analyzer

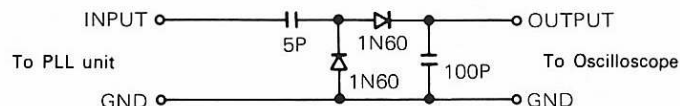
- 1) Frequency range: 100 kHz to 110 MHz
- 2) Bandwidth: 1 kHz to 3 MHz

#### NOTE:

R-1000 receiver may be used.

#### 13. Detector

For adjustment of PLL unit BPF.



#### 14. Directional coupler

#### 15. 8P DIN connector

Refer to Fig. 9 on page 43.

### PREPARATION

Unless otherwise specified, set the controls as follows.

#### Rear panel

SG SW OFF



#### Front panel

MODE	TUNE	MIC GAIN	MIN
CAR	MIN	RF GAIN	MAX
VOX	OFF	PROC	OFF
METER	IP	BAND	1.5
RIT/XIT	CENTERED	AGC	OFF
HEATER	OFF	VOX GAIN	MIN
NB	OFF	RIT	OFF
RF ATT	OFF	CAL	OFF
XIT	OFF	VOX DELAY	MIN
IF SHIFT	CENTERED	AF GAIN	MIN
		NB LEVEL	MIN

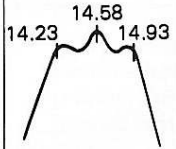
## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. 9V AVR and 3.2V adjustment		DVM	AF	TP-6 Pin-5, connector ⑪	AF	VR2 VR3	9V 3.2V	9V±0.05V 3.2V±0.05V	RF1 (FET bias)
2. Base current adjustment	SG SW : ON MODE: USB METER : IP HEATER : ON DRIVE :Fully clockwise STBY : SEND BIAS pot. : Adjust	1P meter							
	STBY REC, SG SW OFF				Rear panel	Bias pot.		Set to 60mA	Set to 30mA (TS-530D)
3. Carrier adjustment①	IF SHIFT : Centered MODE : USB	RF VTVM	IF	Pin1, connector ⑧	PLL	NOTE : T16	0.3V	0.3V±1 dB	NOTE : The slug of T16 should be turned counter clockwise for this adjustment after the peak point is determined.
	MODE : LSB STBY : REC ↓ SEND	F. counter				VR2	Obtain the same frequency for both transmission and reception	±20 Hz	
	STBY : REC					TC2	8828.50 kHz		
	MODE : USB					TC3	8831.50 kHz		
	MODE : CW STBY : SEND					VR3	8830.70 kHz		
	STBY : REC								
4. IF SHIFT check	MODE : LSB Rotate the IF SHIFT and check the variation	F. counter	IF	Pin 1, connector ⑧				Set IF SHIFT to center. More than + 1.1 kHz , Less than -1.1 kHz.	
	MODE : USB Same as above								
	STBY : SEND Regardless of the IF SHIFT setting							8831.50 kHz	USB
	STBY : REC							8828.50 kHz	LSB
5. VFO, RIT check and adjustment	Scale 0~500							Should rotate smoothly and have no abnormal noise.	
	Rear panel SG SW OFF	RF VTVM	PLL	Pin 1, connector ⑧ 2P(GND)	Adjust if the voltage is out of specification.			200 mV± 1 dB	
	VFO : 250				VFO	TC2	200mV		
MODE : CW STBY : SEND	F. counter	Rear panel	EXT VFO 1P, 7P (GND)	Adjust if the frequency is out of specification.			800 Hz UP	800±50 Hz	CW SHIFT

## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	STBY : REC Set the VFO dial to 50. At this time set the CAL control to the index.	F.counter	Rear panel	EXT VFO	VFO	L3		5550.00 kHz ± 200 Hz	Repeat the adjustment several times until the frequency is within specification.
	1P 7P (GND)			TC1		5950.00 kHz ± 200 Hz			
	Tune to 5550.00 kHz with the main tuning knob.						The 50 kHz point on the dial scale must be aligned to the index.		
Dial calibration, electrical.	Tune to the CAL signal in order : 0, 100, 200, 300, 400, and 500 to check dial calibration at each 100 kHz point.				0 100 200 300 400 500	5.5 MHz 5.6 5.7 5.8 5.9 6.0		Within ± 2.5 kHz	Check the dial scale (Electrically)
Backlash	Calibrate the dial at 0 kHz. Tune to 250kHz, then reverse direction and tune back to 0kHz without rocking the dial, and stop.							Less than 400Hz Backlash	Backlash
Dial calibration mechanical	Repeat electrical dial scale check procedure (for mechanical spec).							Calibration should come in contact with the dial pointer.	Check the dial scale (mechanically).
	RIT : Centered RIT SW : ON Set the VFO main control to 5750.000 kHz				IF	VR5		5750.000 kHz	
	Check that the same frequency is obtained when the RIT switch is turned ON and OFF.							Within ± 50 Hz	
	RIT SW : ON VFO : 250 RIT control : fully counter-clockwise (⊖ position) RIT control: fully clockwise (⊕ position).								-1.5kHz or less +1.5kHz or more Reference to the center (ϕ position of the RIT control).

## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks																																																																																			
		Test equipment	Unit	Terminal	Unit	Parts	Method																																																																																					
	RIT OFF																																																																																											
6. Reference oscillator adjustment		F. counter	PLL	TP2	PLL	TC1	1000.000 kHz																																																																																					
7. VCO adjustment and check	Check the frequencies at the following points and adjust coils until those given in brackets are obtained.	F. counter DVM	PLL PLL	D40 TP1																																																																																								
		<table border="1"> <thead> <tr> <th rowspan="2">VFO BAND</th> <th>0</th> <th>250</th> <th>500</th> <th colspan="2">Adjusting point</th> </tr> <tr> <th></th> <th></th> <th></th> <th>Unit</th> <th>Part</th> </tr> </thead> <tbody> <tr> <td>1.5</td> <td>10.33 MHz</td> <td>10.58 MHz (4.0V)</td> <td>10.83 MHz</td> <td>PLL</td> <td>T2</td> </tr> <tr> <td>3.5</td> <td>12.33</td> <td>12.58</td> <td>12.83</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td>15.83</td> <td>16.08 (4.75V)</td> <td>16.33</td> <td></td> <td>T1</td> </tr> <tr> <td>10</td> <td>18.83</td> <td>19.08</td> <td>19.33</td> <td></td> <td></td> </tr> <tr> <td>14</td> <td>22.83</td> <td>23.08 (4.5V)</td> <td>23.33</td> <td></td> <td>T3</td> </tr> <tr> <td>18</td> <td>26.83</td> <td>27.08 (5.0V)</td> <td>27.33</td> <td></td> <td>T4</td> </tr> <tr> <td>21</td> <td>29.83</td> <td>30.08 (3.5V)</td> <td>30.33</td> <td></td> <td>T6</td> </tr> <tr> <td>24.5</td> <td>33.33</td> <td>33.58</td> <td>33.83</td> <td></td> <td></td> </tr> <tr> <td>28</td> <td>36.83</td> <td>37.08</td> <td>37.33</td> <td></td> <td>T5</td> </tr> <tr> <td>28.5</td> <td>37.33</td> <td>37.58</td> <td>37.83 (4.75V)</td> <td></td> <td></td> </tr> <tr> <td>29</td> <td>37.83</td> <td>38.08</td> <td>38.33</td> <td></td> <td></td> </tr> <tr> <td>29.5</td> <td>38.33</td> <td>38.58</td> <td>38.83</td> <td></td> <td></td> </tr> </tbody> </table>								VFO BAND	0	250	500	Adjusting point					Unit	Part	1.5	10.33 MHz	10.58 MHz (4.0V)	10.83 MHz	PLL	T2	3.5	12.33	12.58	12.83			7	15.83	16.08 (4.75V)	16.33		T1	10	18.83	19.08	19.33			14	22.83	23.08 (4.5V)	23.33		T3	18	26.83	27.08 (5.0V)	27.33		T4	21	29.83	30.08 (3.5V)	30.33		T6	24.5	33.33	33.58	33.83			28	36.83	37.08	37.33		T5	28.5	37.33	37.58	37.83 (4.75V)			29	37.83	38.08	38.33			29.5	38.33	38.58	38.83		
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	Check the level at each of the above points.	RF VTVM	RF	TP3				1V +3 dB -2																																																																																				
PLL lock range	Both edges of the VFO frequency in each band.							Display should indicate.																																																																																				
8. BPF-A	Disconnect connectors ① and ② on the PLL unit. Connect the cathode of D24 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the sweep generator RF output to the EXT-VFO connector.	Sweep generator Oscilloscope	PLL	Q35 ③	PLL	T13 T14 T15	Adjust until the response shown to the right is obtained.																																																																																					

## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
9. BPF-B adjustment	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D27 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the cathode of D50 (1S1587) to the jumper wire next to TC1 with a clip lead. Connect the RF output of the sweep generator to R111(100Ω) via a 15pF capacitor.	Sweep generator Oscilloscope	PLL	Q35 ⑥	PLL	T7 T8 T9 T17	Adjust T7~T9 until the response shown at the right is obtained. Then adjust T17 for maximum amplitude.		
10. BPF-C adjustment	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D26 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the cathode of D50 (1S1587) to the jumper wire next to TC1 with a clip lead.					T10 T11 T12  T18	Adjust T10 through T12 until the band response shown at right is obtained. Then adjust T18 for maximum amplitude.		
11. Carrier balance adjustment	IF SHIFT : Centered RF GAIN : Fully counter-clockwise	RF VTVM	IF	Drain of Q4	IF	TC2	Minimum		Reference approx. 5 mV
12. IF AMP adjustment	BAND : 1.5 VFO : 400 DRIVE : 12 : 00 RF GAIN : fully clockwise IF SHIFT : Centered RF ATT : OFF MODE : USB AGC : OFF NB SW : OFF SG SW : OFF Connect the SSG output (1.9MHz, 40dB) to the antenna terminal. While adjusting, gradually decrease the SSG output level down to -6dB.	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil 1.8	Max. audio output		
						RF coil 1.8			
					IF	T2 L2 L5 L6 L7 L8 L10			

## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks								
		Test equipment	Unit	Terminal	Unit	Parts	Method										
13. Coil pack adjustment	Connect the SSG (40dB) to the ANT terminal DRIVE : 12:00 While adjusting, gradually decrease the SSG output level down to -6 dB. Adjust at the following points:	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil  RF coil	Max. audio output										
										No.	BAND	VFO	f				
										1	1.5	400	1.9 MHz				
										2	3.5	250	3.75				
										3	7	150	7.15				
										4	10	125	10.125				
										5	14	175	14.175				
										6	18	125	18.125				
										7	21	225	21.225				
										8	24.5	450	24.950				
9	28.5	300	28.800														
14. Drive coil adjustment	CAL : ON CAR VR : optimum level METER : ALC HEATER : ON MODE : CW SG SW : OFF ANT : 50Ω dummy should be connected. Connect pin 2 to pin 4, connector ⑦ on the AF unit with a clip lead. Receive the marker frequency in the following bands and obtain the peak level by adjusting the DRIVE control. Set the STBY switch to SEND and adjust each drive coil.	50Ω dummy			RF	DRIVE coil	Max. ALC meter reading		NOTE: The 50Ω dummy should be connected to the ANT terminal. Otherwise drive tuning will be incorrect.  ( ) : See note <b>BEFORE</b> adjustment Note :  <b>TRANSMITTING ON WARC BANDS</b>  As supplied, the TS-530S will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required. 1. For all 3 bands : Break the line between the RF unit X44-1360-01, connector #6, Pin #1 (TOF terminal) and AF unit X49-1150-00, connector #7, Pin #4 (TOF terminal). 2. Or, for individual Bands : On the RF unit X44-1360-01 :  <table border="0"> <tr> <td>Band</td> <td>Remove (or Cut) Part</td> </tr> <tr> <td>10 MHz</td> <td>D4</td> </tr> <tr> <td>18 MHz</td> <td>D5</td> </tr> <tr> <td>24.5 MHz</td> <td>D6</td> </tr> </table>	Band	Remove (or Cut) Part	10 MHz	D4	18 MHz	D5	24.5 MHz	D6
										Band	Remove (or Cut) Part						
										10 MHz	D4						
										18 MHz	D5						
										24.5 MHz	D6						
										BAND	VFO						
										1.5	400		1.8				
										3.5	250		3.5				
										7	150		7				
										(10)	(125)		10				
14	175		14														
(18)	(125)		18														
21	225		21														
(24.5)	(450)		24.5														
28.5	300		28														
	STBY : REC																



# ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	BAND : 14 VFO : 175 STBY : SEND Adjust the CAR control until the ALC meter reads maximum.				IF RF	L13 T4	Max. ALC meter reading		
	STBY : REC Disconnect clip lead from connector ⑦.								
15. IF TRAP adjustment	BAND : Between 1.5 and AUX. Connect the SSG (8.83 MHz, 80dB) to the ANT terminal.	Oscilloscope AF VTVM	Rear panel	EXT. SP	RF	L3 L4	Adjust alternately for minimum		Preset the slugs of L3 and L4 fully clockwise.
16. VFO MIX spurious adjustment	BAND : 3.5 VFO : 388 MODE : LSB Connect the SSG output (3.888 MHz, 60dB) to the ANT terminal. 1) Adjust the SSG frequency to obtain zero beat. 2) Turn the VFO tuning to dial 384 to obtain a spurious beat.	Oscilloscope AF VTVM	Rear panel	EXT. SP	PLL	VR1	minimum beat output		The position of VR1 after adjustment should be approximately centered.
17. S meter adjustment	AGC : OFF				IF	VR1	Set to the deflection starting point.		
	BAND : 14 VFO : 175 AGC : FAST Connect the SSG (14.174 MHz, 8dB) to the ANT terminal.	Oscilloscope AF VTVM	Rear panel	EXT. SP			Adjust the DRIVE control for maximum AF output.		
	SSG output : 40dB				IF	L8	Turn the coil slug counterclockwise until S-1 is obtained.		
						VR2	Set to S-9		Repeat S-1,9 adjustment several times.
18. NB adjustment	NB LEVEL : fully counterclockwise BAND : 14 VFO : 175 Connect the SSG output (14.175 MHz 60dB) to the ANT terminal. SSG output : 20dB Adjust as described above.	DVM	AF	TP4	AF	T1 T2	Minimum		

## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
NB adjustment	AGC : FAST	Speaker	Rear panel	EXT. SP					
	Disconnect the SSG output from the ANT terminal, and connect the noise generator output in it's place. Set the noise generator output level to S5~7.								
	NB : ON							The NB must provide adequate effect.	
									If adequate effect is not obtained, repeat the adjustment several times.
	Reduce the noise generator output level to below the threshold of sensitivity. Turn the NB LEVEL control fully clockwise.							Noise must be blanked.	
	NB : OFF								
19. Neutralization trimmer adjustment	+0.5 SHIFT : ON	Power meter Sync'ed scope	Rear panel	ANT					Tune-up for MAX RF output.
	VFO :300 SG SW : ON STBY : SEND Tune the DRIVE, PLATE and LOAD								
	SG SW : OFF							RF output must be 0.	
	METER : ALC Set the ALC to maximum with the DRIVE control. Increase oscilloscope sensitivity.					Neutralization trimmer TC1	Minimum		
	Reduce oscilloscope sensitivity (5V/div.). SG SW : ON							The normal power must be obtained. The signal waveform must be normal.	
20. Side tone, semi-break-in function adjustment	Connect a power meter to the ANT terminal. Plug key into the rear Key jack to transmit in any band. Operate the key.	Oscilloscope AF VTVM	Rear panel	EXT. SP	AF	VR1	0.63V/8Ω		
	STBY : REC VOX : ON Operate the key								The key must control RF output. Semi-break-in operation should be available.

## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks	
		Test equipment	Unit	Terminal	Unit	Parts	Method			
21. Transmission spurious adjustment	Connect pin2 and 4 of connector ⑦ on the AF unit with a clip lead. Set the BAND switch to 18, and VFO to 125. Connect a power meter to the ANT terminal. Set the STBY switch to SEND and tune up. STBY : REC Disconnect clip lead from connector ⑦	Spectrum analyzer (receive 17.66MHz with a monitor receiver.)	Rear panel	ANT	RF	VR2	Minimum (Monitor level)	Less than -40dB		
22. RF meter adjustment	BAND : 14 VFO : 175 METER : RF Connect a power meter to the ANT terminal. Tune up. STBY : REC				Rear panel	RF Meter Pot.	Set the meter to read 250 on the IP scale.			
23. Carrier suppression adjustment	BAND : 14 VFO : 175 MODE : CW Connect power meter to ANT. STBY : SEND MODE : USB MODE : LSB ↓ USB MODE : CW Sync'ed scope level calibration MODE : USB, LSB STBY : REC	Sync'ro scope	Rear panel	ANT						Tune-up for max RF output.
						IF	VR4 TC1	Adjust alternately until minimum output is obtained.		
								Adjust until no level difference exists between LSB and USB.		
								Note scope deflection level.		
								Less than -50dB	Compared with CW.	
24. SSB frequency response adjustment	BAND : 14 VFO : 175 MODE : USB Connect the AG (1500 Hz, 7mV) to the MIC input connector. STBY : SEND Tune up. Set to 50W output with MIC GAIN control.	Power meter Sync'ed scope	Rear panel	ANT						

## ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	AG : 300Hz ↓ 2700Hz				PLL	TC3	Adjust until the same level is obtained for both 300Hz and 2700Hz (equal audio rolloff).		
	MODE : LSB same as above					TC2			
	AG : 400Hz AG : 2600Hz							More than 1/2 with respect to the 1500Hz signal level observed on the scope.	
	After completing the above adjustment, readjust carrier suppression (see item 23.)				IF	VR4 TC1	Minimum	Less than -50dB	
	STBY : REC								
25. Speech processor adjustment	SG SW : OFF MODE : USB PROC : OFF METER : ALC Connect the AG (1500 Hz, 10mV) to the MIC input connector. STBY : SEND Adjust the MIC gain control until the meter indicates the maximum on-scale ALC reading.								
	PROC : ON				IF	VR3	Adjust until the same meter reading is obtained (max on-scale ALC).		
	STBY : REC PROC : OFF								

## ADJUSTMENTS

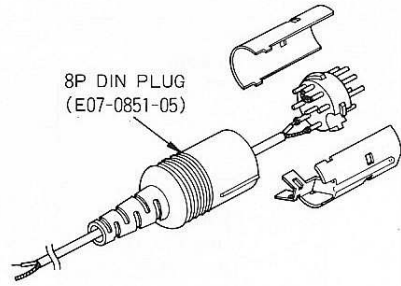


Fig. 9 8P DIN connector

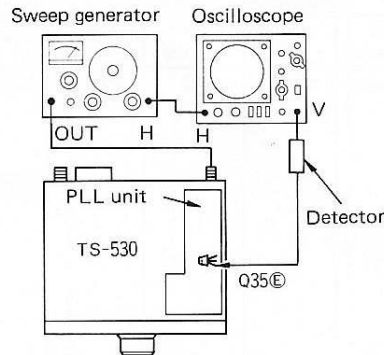


Fig. 10 (8) BPF-A, (9) BPF-B, (10) BPF-C

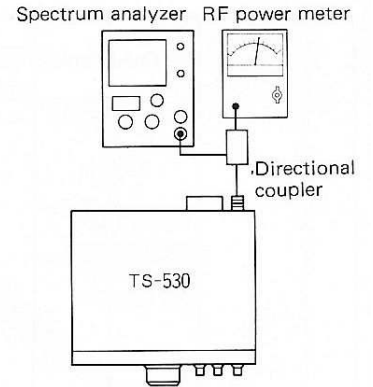
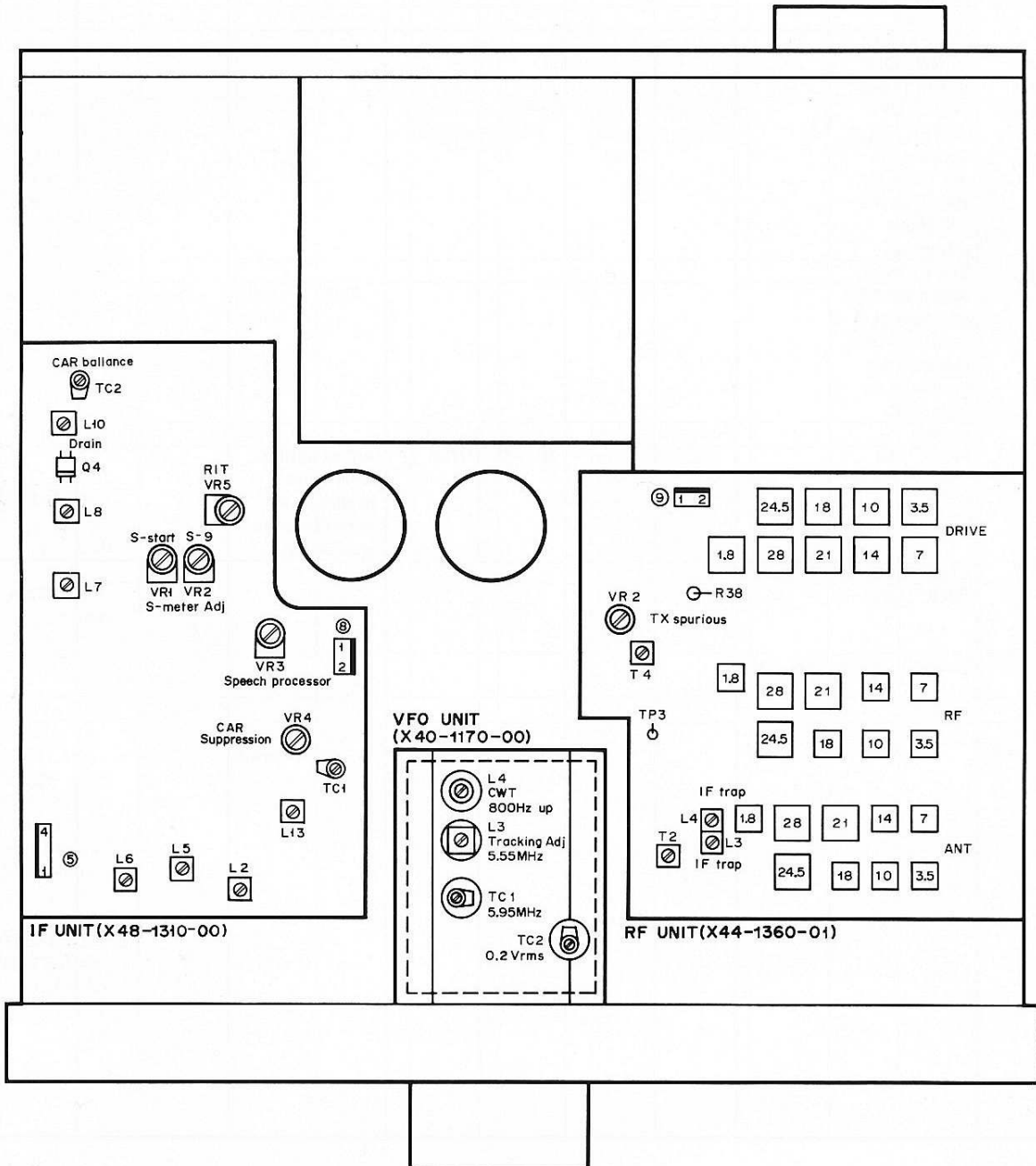


Fig. 11 (21) TX SPURIOUS

### ▼ TOP VIEW



# ADJUSTMENTS

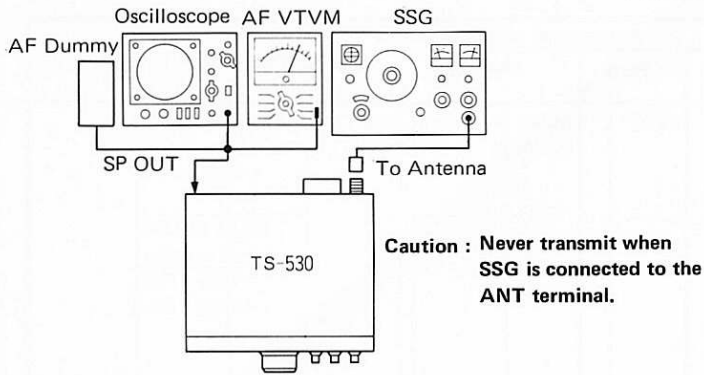
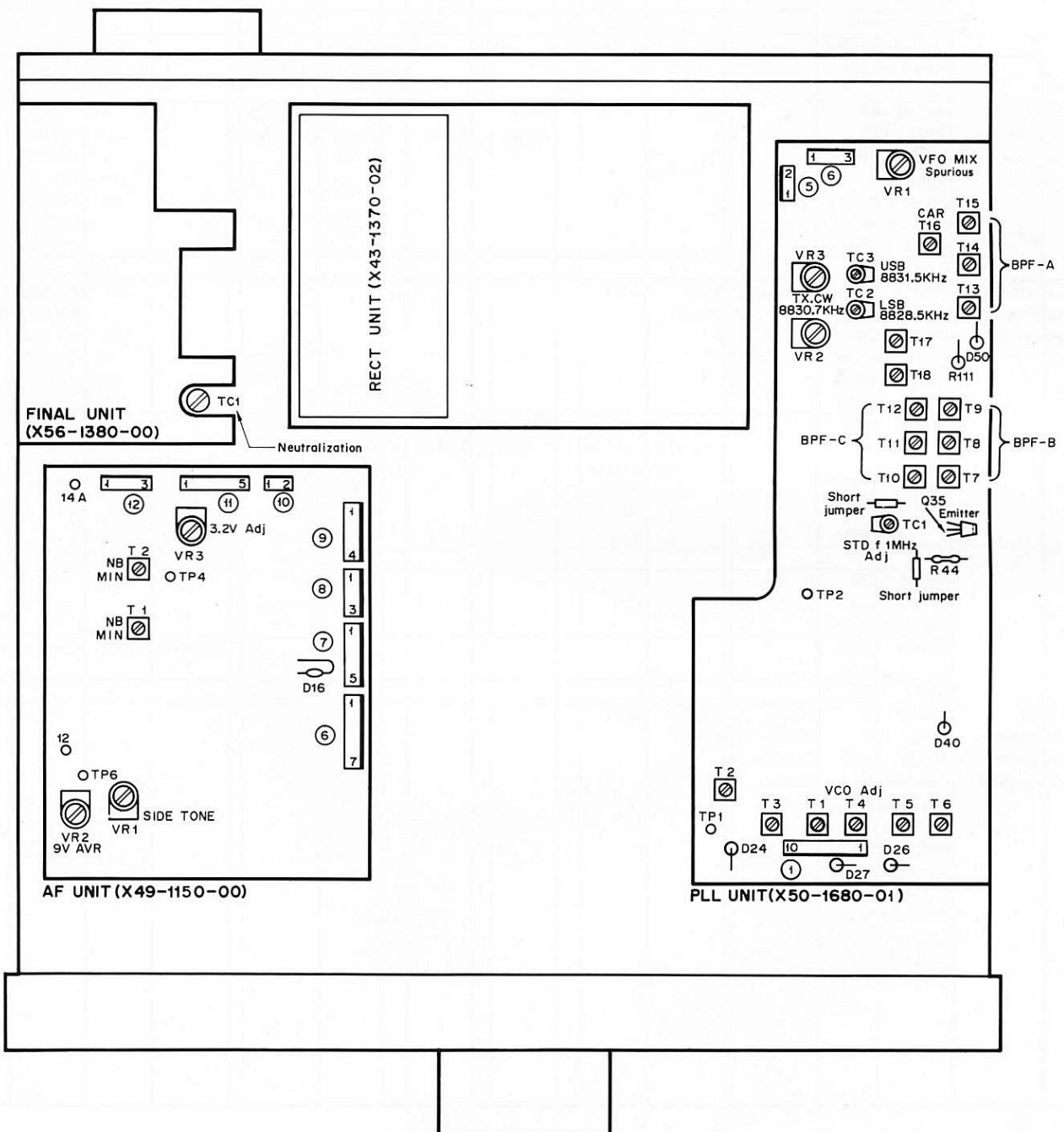


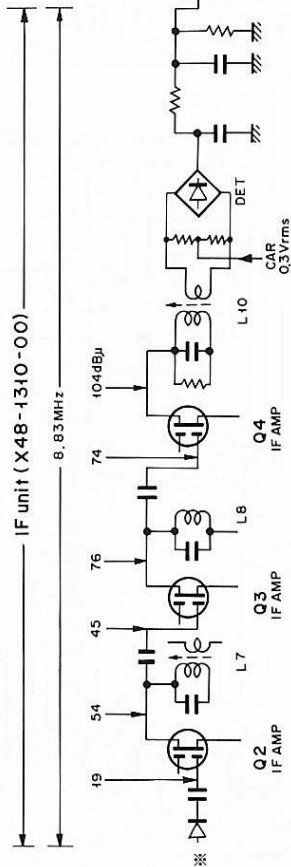
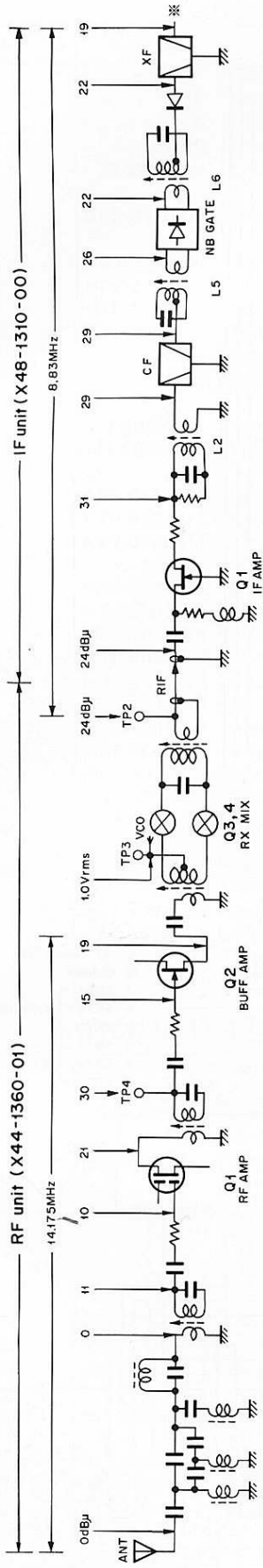
Fig. 12 (12) IF AMP, (13) COIL PACK, (15) IF TRAP

▼ BOTTOM VIEW



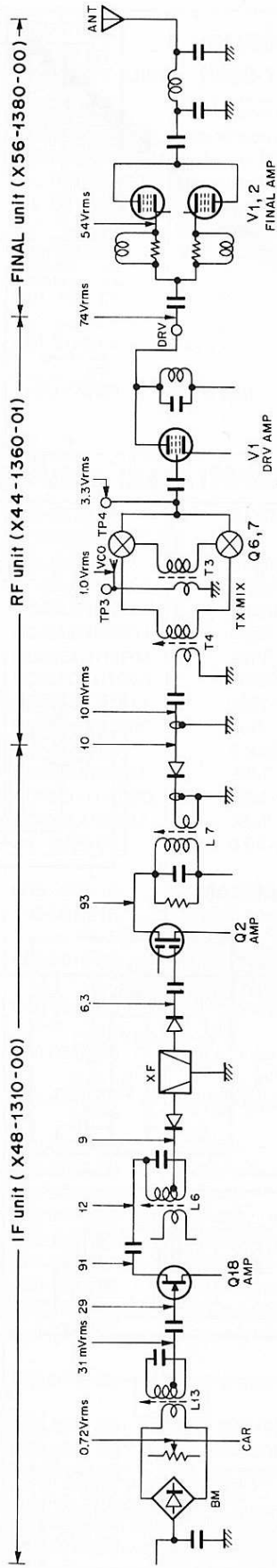
# LEVEL DIAGRAM

## RECEIVER SECTION



- NOTES:**
- The figures shown are signal generator output required for a constant audio output with a constant AF gain control setting. Set the AF gain control for 0.63V/8Ω (50 mW) audio output 0 dBμ signal generator input at 14.175 MHz.
  - To inject signal generator output connect a 0.04μF 50V capacitor between the signal generator and the check point.

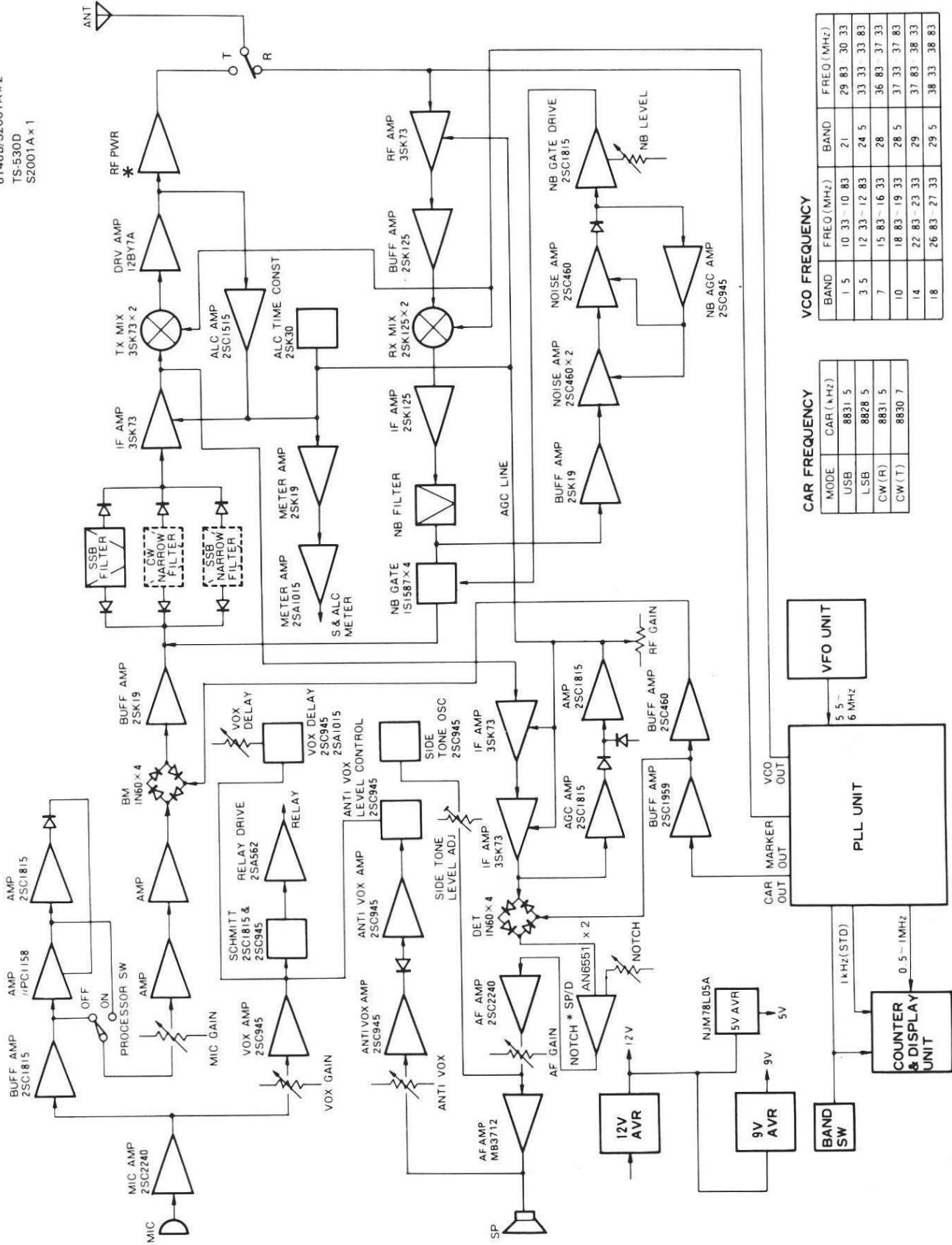
## TRANSMITTER SECTION



- NOTES:**
- Levels are measured at 14.175 MHz in the CW MODE and SG SW OFF. Carrier level is adjusted until the meter indicates the maximum on-scale ALC reading.
  - All voltage measurements are read from an RF VTVM.
  - A probe with a capacitance of less than 3PF should be used and the ground should be made near the point of measurement.

# BLOCK DIAGRAM

\* TS-530S/SP  
6146B/S2001A x 2  
TS-530D  
S2001A x 1



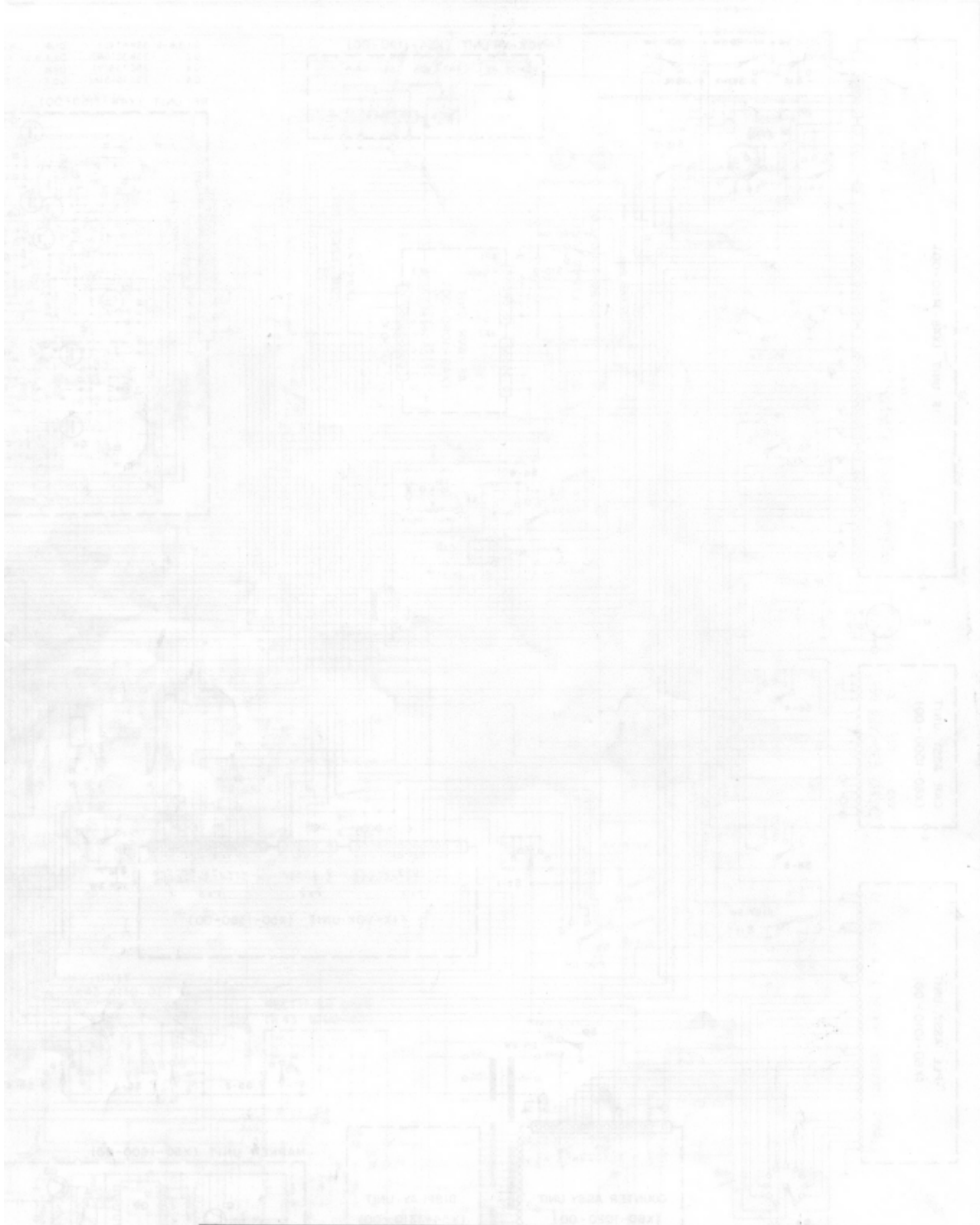
**VCO FREQUENCY**

BAND	FREQ (MHz)	BAND	FREQ (MHz)
1-5	10.33 - 10.83	21	29.83 - 30.33
3-5	12.33 - 12.83	24-5	33.33 - 33.83
7	15.83 - 16.33	28	36.83 - 37.33
10	18.83 - 19.33	28-5	37.33 - 37.83
14	22.83 - 23.33	29	37.83 - 38.33
18	26.83 - 27.33	29-5	38.33 - 38.83

**CAR FREQUENCY**

MODE	CAR (kHz)
USB	8831.5
LSB	8828.5
CW (R)	8831.5
CW (T)	8830.7





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A product of  
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