

KENWOOD

HF TRANSCEIVER

# TS-940S

## ALIGNMENT INSTRUCTIONS

TRIO-KENWOOD CORPORATION



## ADJUSTMENT

### REQUIRED TEST EQUIPMENT

1. DC Voltmeter (DC V.M)
  - 1) Input resistance : More than  $1\text{M}\Omega$
  - 2) Voltage range : 1.5 to 1000V AC/DC

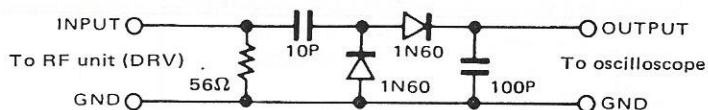
NOTE : A high-precision multimeter may be used. However, accurate readings can not be obtained for high-impedance circuits.
2. DC Ammeter
  - 1) Current range : 100mA, 1.5A, 15A, High-precision ammeter may be used.
3. RF VTVM (RF V.M)
  - 1) Input impedance :  $1\text{M}\Omega$  and less than  $3\text{pF}$ , min.
  - 2) Voltage range : 10mV to 300V
  - 3) Frequency range : 10kHz to 100MHz or greater
4. AF Voltmeter (AF V.M)
  - 1) Frequency range : 50Hz to 10kHz
  - 2) Input resistance :  $1\text{M}\Omega$  or greater
  - 3) Voltage range : 10mV to 30V
5. AF Generator (AG)
  - 1) Frequency range : 200Hz to 5kHz
  - 2) Output : 1 mV or less to 1 V, low distortion
6. AF Dummy Load
  - 1) Impedance :  $8\Omega$
  - 2) Dissipation : 3W or greater
7. Oscilloscope (SCOPE)
 

Requires high sensitivity, and external synchronization capability.
8. Sweep Generator (SWEEP)
  - 1) Center frequency : 50kHz to 90MHz
  - 2) Frequency deviation : Maximum  $\pm 35\text{MHz}$
  - 3) Output voltage : 0.1V or greater
  - 4) Sweep rate : At least 0.5sec/cm
9. Standard Signal Generator (SSG)
  - 1) Frequency range : 50kHz to 50MHz
  - 2) Output :  $-20\text{dB}/0.1\mu\text{V}$  to  $120\text{dB}/1\text{V}$
  - 3) Output impedance :  $50\Omega$
  - 4) AM and FM modulation can be possible.

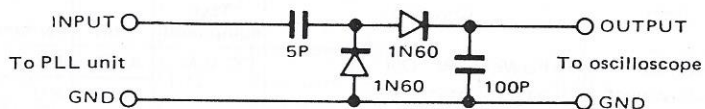
NOTE : Generator must be frequency stable.

10. Frequency Counter (FREQ.C)
  - 1) Minimum input voltage : 50mV
  - 2) Frequency range : 50MHz or greater
  - 3)
11. Noise Generator
 

Must generate ignition noise containing harmonics beyond 30MHz.
12. RF Dummy Load
  - 1) Impedance :  $150\Omega$  and  $20\Omega$
  - 2) Dissipation : 150W or greater
13. Power Meter
  - 1) Impedance :  $50\Omega$
  - 2) Dissipation : 150W continuous or greater
  - 3) Frequency limits : 60MHz or greater
14. Spectrum Analyzer (SPE-ANA)
  - 1) Frequency range : 100kHz to 110MHz or greater
  - 2) Bandwidth : 1 kHz to 3MHz
15. Detector
  - 1) For adjustment of TX BPF



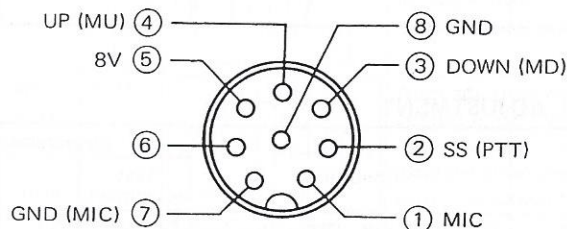
2) For adjustment of PLL/VCO BPF



16. Directional Coupler
17. Monitor Receiver
 

R-1000 class
18. Microphone
 

MC-60S8 or MC-42S



MIC terminals (view from front panel side)

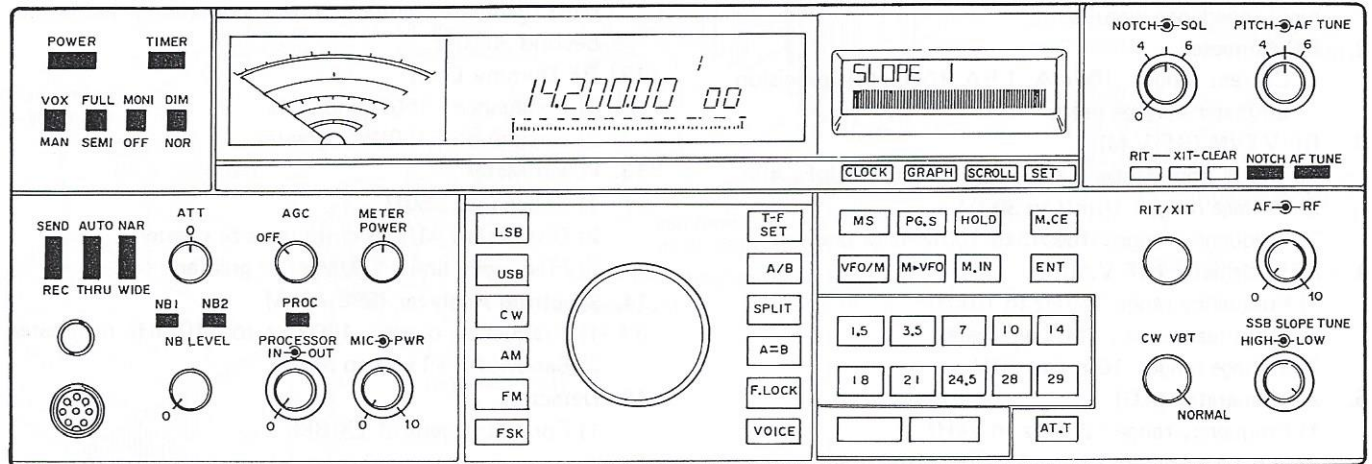
## ADJUSTMENT

### PREPARATION

Unless otherwise specified, set the controls as follows :

1. Power ON, holding A=B SW, keep  $\square$  condition from  $\square$  or  $\square$  SW's which marked  $\blacksquare$  .  
(other push SW's are nonlock type or tact SW.)

2. ATT ..... 0 NOTCH/SQ ..... CENTER/0  
AGC ..... OFF PITCH/AF TUNE ... CENTER  
METER ..... POWER AF/RF ..... 0/10  
NB LEVEL ..... 0 CW VBT ..... NORMAL  
PROCESSOR ..... 0 SSB SLOP TUNE  
MIC/PWR ..... 0/10 HIGH/LOW ... CW/CCW, MAX



### VOLTAGE ADJUSTMENT AND CONFIGURATION

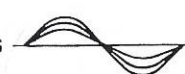
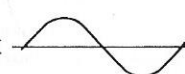
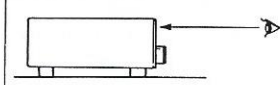
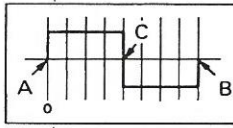
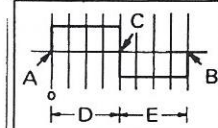
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		Test-equipment	Unit	Terminal	Unit	Part	Method		
1. Voltage adjustment and confirmation	1) POWER SW : ON STBY : REC MODE : CW WIDE/NAR : NAR	DC V.M	AVR	FB	AVR	VR1	ADJ to 28.5V	28.5V±0.5V	
			IF	RV	(13) -2			Confirm	14.0-16.0V
				RB	CONT	VR1	ADJ to 2.1V		2.1V±0.01V
				(10) -5					
			RF	AGC	IF	VR5	ADJ to 3.2V		3.2V±0.01V
				(4) -2					
		IF	W31			Confirm	About 14V		
			W22				About 12V		
			W21				About 11V		

### CONTROL ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. PLL-BPF	1) POWER SW : ON STBY : REC MODE : CW WIDE/NAR : NAR	SWEEP Detector SCOPE	PLL	TP4 TP5	PLL	L25- 27	ADJ as shown at right.	
2. PLL-1 100-110 MHz		RF V.M FREQ. C	PLL	TP1	PLL	L10	ADJ to 8V at 110MHz.	110MHz : 8V 100MHz : 3.5-4.5V

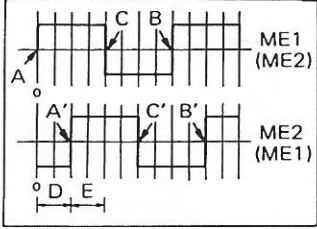
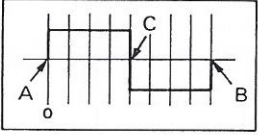
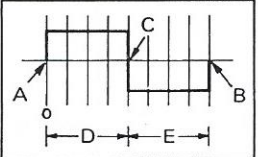
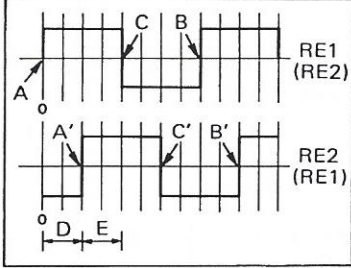


## ADJUSTMENT

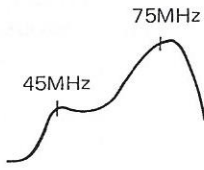
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		Test equipment	Unit	Terminal	Unit	Part	Method				
3. PLL-2 35.5-40.5 MHz	1) POWER SW : ON STBY : REC MODE : CW WIDE/NAR : NAR	RF V.M FREQ. C	PLL	TP3	PLL	L5-6  L7	ADJ L5 and L6 for MAX. ADJ to 8V at 40.399.00MHz.	40.399.00MHz : 8V 35.499.00MHz : 3.5-4.5V			
4. PLL-IF		RF V.M FREQ. C	PLL	TP5	PLL	L17, 18, 20-24	ADJ to MAX.	100-170mV			
5. Standard oscillator adjustment and the marker check	1) CAL : ON BAND : 20.000.00MHz	SSG SCOPE	PLL	⑧-1	PLL	TC1	Receive the 10MHz and make the zero beat waveform as shown at right. (HET : 36.220.000 MHz)	Waveform on scope  NG  OK 			
6. Adjustment of TX control voltage	1) Display : 14.600.00	DC V.M	IF	TV ⑬-1			Confirm	Under -0.5V.			
	2) STBY : SEND						Confirm	14.0-16.0V			
	3) STBY : REC after ADJ.						IF	ALC ⑥-1	CONT	VR3	ADJ to 3.2V
7. LCD Contrast			LCD		SW	VR13	Confirm LCD letters can see from as shown at right.	LCD control changes.  			
8. VCO Adjustment	1) VCO1 Display : 9.499.99MHz	DC V.M	RF	VC1 ⑨-4	RF	L65	ADJ to 12V and confirm the VC1	12.00V±0.01V			
	2) VCO2 Display : 19.499.99MHz						L68	voltage changes from about 2.5V to	12.00V±0.01V		
	3) VCO3 Display : 30.000.00MHz						L71	4.0V with the display frequency from 30kHz to 9.5MHz and VC2 voltage changes also with the display from 20MHz to 29.5MHz.	12.00V±0.01V		
9. Main encoder	1) Remove the VFO knob and motor-drive the encoder at approx. 300rpm.	SCOPE	Digital B	Conne- ① ME 1-2				Point C may be located anywhere. when a motor is not available, manually turn the VFO to check the duty ratio.			
	2) ME1 duty ratio adjustment : Turn a motor CW and CCW						Main encoder		VR1		After adjusting with the VFO control tuned CW, check that intervals D and E are also identical when the VFO control is turned CCW.
	3) ME2 duty ratio adjustment : Turn a motor in the both direction.								VR2	Adjust until intervals D and E are equal to each other with point C placed at the center.	



## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks			
		Test equipment	Unit	Terminal	Unit	Part	Method				
9. Main encoder	4) ME1, ME2 phase difference alignment : Same as above. 	SCOPE	Digital B	Connector ① ME1, ME2	Main encoder	Phase adjustment screw	Adjust until intervals D and E are equal to each other (point A' on ME2 is located in the middle of points A and C on ME1.)	ME1 (ME2) : Within $90^\circ \pm 10\%$ (The difference between CW and CCW rotation must also be within this specification.) The phases of ME1 and ME2 may be replaced with each other, as indicated in the brackets.			
10. RIT encoder	1) Remove the RIT knob and motor-drive the encoder at approx. 300rpm.	SCOPE	Digital B	Connector ⑫ RE1-3				Point C may be located anywhere. When a motor is not available, manually turn the RIT to check the duty ratio.			
	2) RE1 duty ratio adjustment : Turn a motor CW and CCW						RIT encoder		VR1		After adjusting with the RIT control tuned CW, check that intervals D and E are also identical when the RIT control is turned CCW.
	3) RE2 duty ratio adjustment : Turn a motor in the both direction						Connector ⑫ RE2-2		VR2	Adjust until intervals D and E are equal to each other with point C placed at the center.	
	4) RE1, RE2 phase difference alignment : Same as above.						Connector ⑫ RE1, RE2			The phases of RE1 and RE2 may be replaced with each other as indicated in the brackets.	
11. CAR1 adjustment	1) MODE : USB	FREQ. C DC V.M	IF	CR1 ⑮ -2	CAR	TC1	ADJ to 453.50kHz	453.50kHz±50Hz			
	2) STBY : SEND		CAR	TP1		L6	ADJ to 7.0V	7.00±0.04V			
	3) STBY : REC MODE : LSB		IF	CR1 ⑮ -2		TC2	ADJ to 456.50kHz	456.50kHz±50Hz			

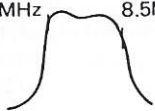
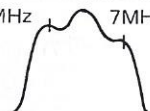
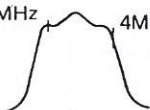
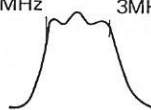
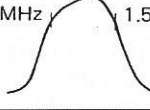
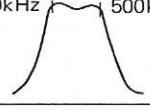
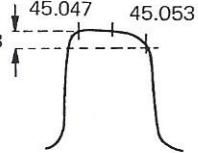
## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
11. CAR1 adjustment	4) STBY : SEND	FREQ. C DC V.M	IF	CR1 ⑱ -2	CAR		Confirm	Same frequency as REC.
	5) MODE : CW WIDE/NAR : WIDE STBY : REC						Confirm at REC & SEND	454.30kHz±50Hz
	6) WIDE/NAR : NAR						Confirm green LED light on.	455.00kHz±50Hz
	7) MODE : AM							
	8) MODE : FM							
	9) MODE : FSK WIDE/NAR : WIDE	FREQ. C	IF	CR1 ⑱ -2	CAR		Confirm	457.20kHz±50Hz
12. CAR2 Adjustment	1) MODE : CW		IF	W25	CAR	TC3	ADJ to 9.285.0MHz	9.285.00±50Hz (0.3Vrms)
			CAR	TP2		L10	ADJ to 7.0V	7.00V±0.04V
	2) STBY : SEND		IF	W25				Confirm
13. CAR3 Adjustment and confirmation	1) MODE : CW		CONT	CR3 ⑳ -4	IF	L20	ADJ to 100.0kHz	100.0kHz±20Hz
	2) MODE : USB : LSB : AM : FM : FSK							Confirm
14. CAR4 Adjustment	1) MODE : CW	FREQ. C	CONT	CR4 ㉑ -1	IF	L19	ADJ to 99.20kHz	99.20kHz±20Hz
	2) CW PITCH : MAX	RF V.M	IF	Q14 (E)		L18	ADJ to MAX.	About 0.3Vrms.
15. CAR AMP	1)	RF V.M	CAR	PLUG ㉒ -4	CAR	L19 L20	ADJ to MAX.	(REF. 100mV±50mV)
16. VCO BPF		SWEEP SCOPE Detector	RF	Q17-G Q21-E	RF	L74 -76	ADJ as shown at right.	

## RX ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks	
		Test equipment	Unit	Terminal	Unit	Part	Method		
1. 0.1-30MHz BPF	1) BAND : 20.0-30.0MHz FREQ : 29.500.0kHz RF ATT : 0dB STBY : REC Disconnect RF unit, RIF connector, and connect this plug to detector.	SWEEP Detector SCOPE	Body	ANT	RF	L2, L31- 33,40, 44	Adjust as shown at right.	21MHz 30MHz	
	2) BAND : 14.0-20.0MHz FREQ : 18.000.0kHz		RF	RIF				L28- 30	14MHz 21MHz
	3) BAND : 8.5-14.0MHz FREQ : 10.000.0kHz							L25- 27	8.5MHz 14MHz

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. 0.1-30MHz BPF	4) BAND : 7.0-8.5MHz FREQ : 7.000.0kHz	SWEEP Detector SCOPE	Body RF	ANT RIF	RF	L22- 24	Adjust as shown at right.	
	L18- 21							
	L14- 16							
7) BAND : 1.5-3.0MHz FREQ : 1.900.0kHz	8) BAND : 0.5-1.5MHz FREQ : 1.000.0kHz	SWEEP Detector SCOPE	Body RF	ANT RIF	RF	L11- 13	Adjust as shown at right.	
						L9, 10		
						L5- 7		
2. MCF	1) BAND : 14.250MHz MODE : CW	SWEEP  SPE- ANA	RF	TP1	RF	L44- 46	ADJ to MAX as shown at right. Center frequency 45.050MHz	
			IF	TP1	IF	L3-5		
3. RX IF AMP	1) MODE : CW BAND : 14.175MHz VR1.on RF unit : Center AF VR : As desire	SSG AF V.M SP SCOPE		EXT. SP	RF	VR2 L44- 46	VR2 ADJ to center and other L's ADJ to MAX AF output.  Note : Repeat ADJ L7-10 and 23-25.	
	2) SSG : 15dB		DC V.M	CONT	TP1 (R153)	CONT		L2,3
4. NOTCH	1) NOTCH VR : Center SSG : 0dB	SSG AF V.M SP SCOPE					ADJ the AV VR to 800Hz/0.63V.	
	2) NOTCH SW : ON SSG : 40dB					IF	L16 VR2	Repeat ADJ for MIN AF output.
5. IF TRAP Coil	BAND : 1.400MHz SSG : 45.05MHz 80dB				RF	L2	Set the core all the way inside.	
						L40	ADJ for MIN AF output.	
6. S meter	BAND : 14.175MHz SSG : 0dB	SSG AF V.M SP SCOPE			IF	VR3	ADJ meter needle for mechanical $\phi$ point.	
					RF	VR1	Set the VR1 to CCW.	



## ADJUSTMENT

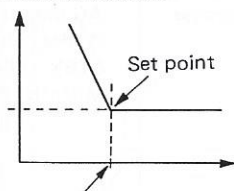
Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
6. S meter	SSG : 8dB AGC : FAST				IF	VR1	ADJ to S1	S1 : 8dB +6dB -4dB
	VR4					ADJ to S9	S9 : 40dB±6dB	
						Repeat ADJ S1 and S9.	S9 + 60dB : 100dB±10dB	
7. ATT Confirmation	BAND : 14.175MHz	SSG AF V.M SP			PAN- EL	ATT	ATT : SSG 10dB 50dB 20dB 60dB 30dB 70dB	10dB±3dB 20dB±6dB 30dB±9dB
8. FM IF	MODE : FM BAND : 14.175MHz SSG : 40dB f : 1kHz DEV : 5kHz				IF	L3-12, 35-38	ADJ to MAX. Repeat ADJ L3-5 and L7-10 for MAX S meter reading.	
					CONT	L11		
9. NB	1) FREQ : 14.175.0kHz MODE : USB SSG output : 14.175.0kHz	SSG  DC V.M.	Rear panel	ANT	CONT	L2,3	MIN (SSG output : 20dB) Lower SSG output to the point where DC voltage falls slightly, and again reset to MIN.	
	2) MODE : USB NB LEVEL : CCW	Noise GEN. S meter	Rear panel	ANT			Adjust Noise GEN. level to read to S1.	
	3) NB 1 SW : ON Adjust NB LEVEL control to the point where N.B. action begins. (After checking, turn NB1 SW : OFF)				CONT	L2,3	MIN (If NB level has insufficient effect, adjust L8 core slightly CCW (out) from peak.	Noise disappears.
	4) NB 2 SW : ON (After checking, shut NB 2 SW OFF)						Confirm	The same effect as NB 1 is obtained.
	5) Raise Noise GEN. level to S9. NB1 SW : ON (After checking, turn NB1 SW OFF.)						If any noise remains adjust NB LEVEL to find the point where NB operates.	Noise disappears.
10. Buzzer	1) AF VR : MIN RF VR : MAX (CW) R290 (R205 side) connect to GND on CONT unit. (After ADJ disconnect.)				CONT	VR14	ADJ for 50mV/8Ω	50mV/8Ω±3dB
	2) AF VR : MAX RF VR : MIN (CCW)						Confirm	8.0mV/8Ω or less.

## ADJUSTMENT

### TX ADJUSTMENT

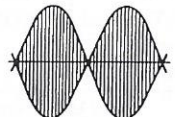
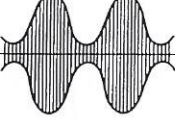
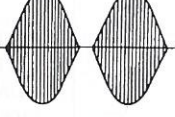
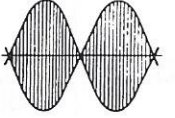
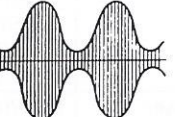
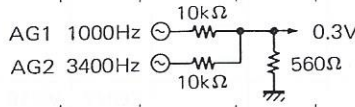
Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. Base current confirmation	1) Display : 14.250MHz MODE : USB STBY : SEND	DC V.M	AVR	FB			Connect DC V.M in FINAL DC cable and confirm the flow current.	1.1-1.5A
2. Drive	1) Display : 14.250MHz AG : 2.0mV, 1.5kHz Disconnect DRV connector and terminate with a 50Ω dummy load. (After ADJ, remove and reconnect DRV connector.)	AG SCOPE	RF	DRV	IF	L29, 31, 34-36, 41,42, 44-46	ADJ to MAX. Note : While adjusting each coil, be keep output less than 2Vp-p by MIC GAIN or CAR VR control. 2) Repeat ADJ L46, 50, 51 and 52.	Greater than 2.3V p-p
	RF L50-52 IF L40							
3. TX BPF 1.7-30MHz	1) RF ATT : 0dB FREQ : 14.175MHz STBY : SEND Disconnect DRV connector and terminate with a 50Ω dummy load (After ADJ, reconnected DRV)	SWEEP SCOPE Detector	RF	R49	RF	VR3 L50-57, 60	ADJ to center. L50, 51, 52 ADJ to MAX. L53, 55, 57 ADJ for 1.7MHz side (A). L54, 56, 60, ADJ for 30MHz side (B). ADJ in upon order, so that wave form shown at right is obtained. (ADJ sweep band A and B separately.)	
4. Final bias	1) FREQ : 14,175.0kHz MODE : USB MIC CONTROL : MIN Desolder L7 lead and connect ammeter in its place, minus to L7 side. STBY : SEND (After adjustment, resolder L7 lead.)	DC ammeter	FINAL	L7	FINAL	VR2	50mA Note : Stabilization requires approximately 20 seconds.	50mA±10mA
	2) FINAL unit VR1 : MIN Disconnect relay connector in FINAL unit, 28V line and connect ammeter in its place. STBY : SEND (Disconnect ammeter and reconnect this connector after ADJ.)					VR1	Read the meter when VR1 is at MIN. Then ADJ VR1 so that the current is increased by 1.3A.	
5. TX IF AMP	1) FREQ : 14.175MHz MODE : USB AG : 1500Hz, 2mV METER : ALC STBY : SEND	RF V.M AG 8Ω Dummy load	Rear panel	ANT	IF	L40-42, 44-46	ADJ for MAX ALC meter reading. Repeat ADJ.	

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
6. VC, IC METER and current limiter	1) METER : IC STBY : SEND		Meter		CONT	VR10	Set for mechanism start point.	IC meter Meter fluctuation  VR10 ADJ to mechanical φ point
	2) ANT : Connect dummy load METER : VC CONT VR2 : MAX MODE : FSK STBY : SEND PROCESSOR OUT : Set to 10A IC meter reading. (After ADJ, STBY : REC)	DC V.M	AVR	FB	AVR	VR1	ADJ to 28.5V	28.5V±0.5V
						CONT	VR11	ADJ to 28.5V
	3) METER : IC (After ADJ, STBY : REC)					VR7	ADJ to 10A	10A±1A
4) MODE : CW CAR LEVEL : 10 (After ADJ, STBY : REC)		AVR	FB		VR6	Disconnect the FB terminal and connect the current meter between the FB lead and the FB terminal. ADJ to 14A.	14A±1A	
7. Power	1) BAND : 14.175MHz MODE : CW CAR LEVEL : 10 METER : POWER STBY : SEND (After ADJ, STBY : REC)	Power meter	Rear panel	ANT	CONT	VR2	ADJ to 110W	
						VR17	ADJ meter reading to 110W.	110W±10W
8. Power (Low)	1) PWR VR : MIN CCW STBY : SEND (After ADJ, STBY : REC) (PWR VR : MAX CW)				CONT	VR19	ADJ to 5W	
9. AM Power	MODE : AM METER : POWER STBY : SEND (After ADJ, STBY : REC)				SW	CAR VR	AM power is adjustable with CAR VR.	
10. Protection and SWR	1) ANT : OPEN METER : Power				CONT	VR5	ADJ to 10W	10W±2.5W
	2) ANT : 150Ω Dummy load BAND : 3.750MHz METER : SWR	DC V.M 150Ω Dummy load	CONT	IC9- (12)		VR12	ADJ to 0.5V	0.5V±0.01V
						VR18	ADJ to "3".	SWR : 3
	3) ANT : OPEN						Confirm	SWR : ∞
4) ANT : 50Ω Dummy load	Power meter				Confirm	SWR less than 1.2		



## ADJUSTMENT

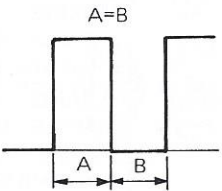
Item	Condition	Measurement			Adjustment			Specification/Remarks	
		Test equipment	Unit	Terminal	Unit	Part	Method		
11. SSB mode Frequency response	1) BAND : 14.175MHz MODE : USB AG output : 2 tone, 7mV 300Hz, 2700Hz STBY : SEND MIC VR : 50W output	Power meter SCOPE AG	Rear panel	ANT (Directional coupler) MIC	DG-B (CAR)	TC1	ADJ as shown at right. (Equal 300Hz, 2.700Hz amplitude within 5W.)	OK 	
	2) MODE : LSB					TC2	Calibrate scope.	NG 	
	3) MODE : USB, LSB AG : 1500Hz, 5mV STBY : SEND						Confirm	NG 	
	4) MODE : USB, LSB AG : 2600Hz, 5mV STBY : SEND							Within 6dB (from 1500Hz)	
	5) MODE : USB, LSB AG : 400Hz, 5mV STBY : SEND								
	6) Check carrier suppression after this ADJ.					IF	TC1 VR6	-50dB or less.	
12. FSK	1) MODE : FSK COMP OUT : MIN AG : 2 tone 0.3V 1000Hz, 3400Hz STBY : SEND	AG	IF	AFS (24) -3	DG-B (CAR)	TC2	Turn comp VR CW until get enough signal to measure. ADJ TC2 and TC3 as shown at right.	OK 	
		SCOPE		ANT (Directional coupler)		TC3			NG 
									
13. CAR suppression	1) FREQ : 14.175.0kHz MODE : USB ↔ LSB MIC CONTROL : MIN STBY : SEND	SCOPE (SPE-ANA)	Rear panel	ANT (through Directional coupler)	IF	TC1	MIN (Adjust alternately.) Adjust for no difference between USB and LSB.	-50dB or less.	
	VR6					Calibrate Oscilloscope (SPE-ANA)			
						Check If less than -50dB, repeat adjustment 1).			
14. FM Deviation	1) MODE : FM BAND : 29.25MHz MIC : 1kHz, 50mV FM MIC GAIN : MAX	AG Linear detector			CONT	VR16	1. Linear detector SET ex.) MS-57A/MS-61A HPF : OFF LPF : 20kHz 4101 FILTER : 25kHz/ 15kHz De-emphasis : OFF 2. ADJ to ±4.5kHz	DEV ±3kHz with less than 5mV MIC input. DEV ±4.0-6.0kHz with less than 50mV MIC input.	

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remark
		Test equipment	Unit	Terminal	Unit	Part	Method	
15. ALC Meter	1) MODE : USB METER SW : ALC MIC VR : MAX AG : 1.5kHz, 5mV STBY : SEND	AG AF V.M Dummy load	S-meter		CONT	VR8	ADJ to the mechanical zero point.	<p>Meter fluctuation</p> <p>Set point</p> <p>VR8 ADJ to mechanical <math>\phi</math> point</p>
	SW				MIC GAIN	ADJ for ALC meter zero point.		
	CONT				VR9	ADJ for ALC zero MAX.		
	IF				VR9	ADJ for ALC zero MAX.		
16. Speech Processor	1) BAND : 14.250MHz MODE : USB METER : COMP MIC VR : MIN* PRO : ON PROCESSOR : 9 o'clock AG (MIC) : 1.5kHz, 1mV STBY : SEND	AG AF V.M Dummy load	Panel Rear panel	MIC ANT	IF	L29, 31-34, 36, 41, 42, 44-46	ADJ for MAX comp meter reading.	
	VR10				ADJ for MIN comp meter reading.			
	Panel				Processor IN	ADJ for S1, S-meter reading.		
	IF				VR7	ADJ for S1 + 20dB comp meter reading. Repeat ADJ 2), 3).		
						Confirm the meter reading is increase.		
	IF				L33	ADJ for MAX ALC meter reading.		
17. Monitor Level	1) AGC : ON MONI : ON AF VR : Set to 0.63V/8 $\Omega$ point with CAL marker signal. AG (MIC) : 1kHz, 10mV MIC VR : Within ALC zero. STBY : SEND	AF V.M SCOPE	Panel Rear-panel	MIC ANT	IF	L43	ADJ for MAX ALC meter reading.	0.63V/8 $\Omega$ ±3dB
	CONT				VR13	ADJ to 0.63V/8 $\Omega$		
						Don't move AF VR and confirm the hum and noise.	Less than 1.5mV/8 $\Omega$	
18. MIX Balance	1) BAND : 21,100.0kHz MODE : AM MIC VR : MIN STBY : SEND	Power meter Monitor receiver (SPE-ANA)	Rear panel	ANT	IF	VR8	21.555MHz : MIN (S meter and AF output.)	
	2) MODE : CW				VR10	29,930MHz : MIN (S meter and AF output.)		
	STBY : SEND				RF	VR3	23.950MHz : MIN (S meter and AF output.)	



## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
19. Side tone	1) MODE : CW AF VR : AF output 0.63V/ 8Ω with CAL marker signal. MONI : ON KEY JACK : KEY IN	SCOPE FREQ. C			CONT	VR15	0.2V/8Ω 800Hz	0.2V/8Ω ± 6dB 800Hz ± 100Hz
	2) PITCH CONTROL : MIN ↔ MAX						Confirm	800Hz ± 300Hz or more.
20. AT-940 Auto antenna tuner (If in- stalled.)	1) BAND : 1.500.00MHz TC1 : Preset to center Disconnect the ③ on AT-B unit, the ⑭ on AT-A unit and jumper between TRQ and TV at the ④ on AT-B unit. CAR VR : MAX, METER : SWR, STBY : SEND Turn VFO frequency (up) until SWR becomes "3" (After ADJ, STBY : REC) STBY : SEND	Oscillo- scope	AT	JP124	AT-A	VR101	ADJ as shown at right.	
	2) Turn VFO frequency (down) until SWR becomes "1.15" (After ADJ, STBY : REC)						VR102	
	3) BAND : 18,000.0MHz STBY : SEND (After ADJ, STBY : REC Re- connect the ③ on AT-B and remove jumper between TRQ and TV on connector ④.)	20Ω & 150Ω Dummy load	TC1	ADJ for motor stops and SWR reads MIN.				
	4) Check at the each center frequency of the HAM BAND			Confirm	SWR 1.2 or less.			

### Microprocessor operation check

Item	Condition	Operation check
1. Reset	1) POWER SW : ON ↔ OFF Then, pressing A=B SW, power SW on.  Push S1 on LCD unit	Display : VFO A 14.000.00 USB Sub display : "TRIO-KENWOOD"
2. RIT/XIT	1) Turn RIT, XIT encoder knob UP ↔ DOWN	Display frequency in- crease or decrease smooth.
	2) Push RIT SW (ON) once	Display RIT and tone sounds.
	3) STBY : SEND (After check, STBY : REC)	Same frequency as RIT off.
	4) Push RIT SW (off) once.	Display RIT light off and tone sounds.
	5) Push XIT SW (on) once.	Display XIT on and tone sounds.

Item	Condition	Operation check
2. RIT/XIT	6) Push XIT SW (off) once.	Display XIT light off and tone sounds.
	7) Push clear SW	RIT frequency display changes to "00".
3. Function	1) Push SPLIT SW once.	SPLIT light on (orange).
	2) Push T-F SET SW once.	Display : VFO B " 14.000.00 " While pressing.
	3) Push A/B SW once.	Display : "VFO B" " 14.000.00 " and tone sounds.
	4) STBY : SEND	Display : "VFO A"
	5) STBY : REC	Display : "VFO B"



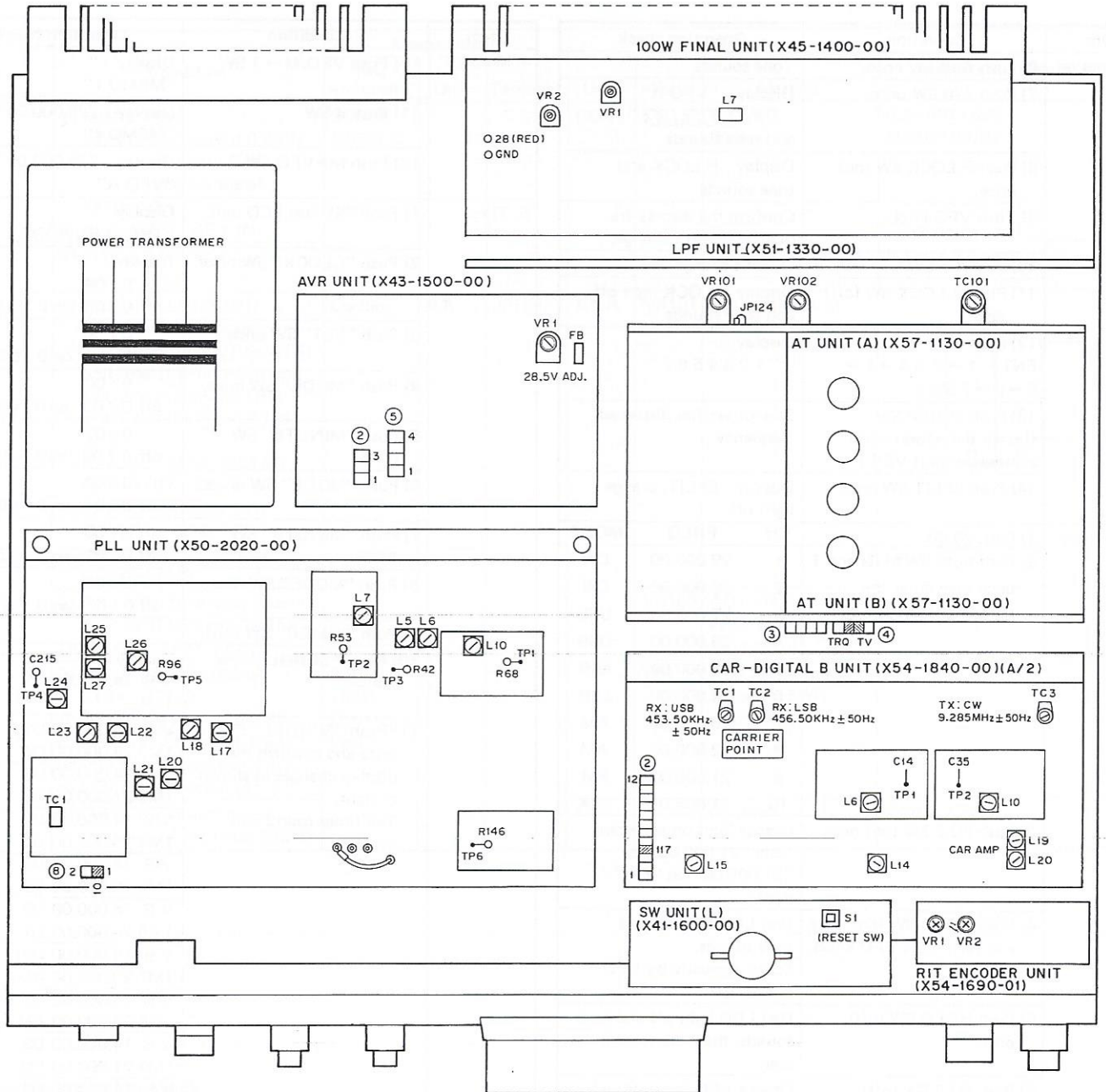
ADJUSTMENT

Item	Condition	Operation check		
3. Function	6) Push A=B SW once.	Tone sounds.		
	7) Push A/B SW once.	Display : "VFO A" "14.000.00" and tone sounds.		
	8) Push F.LOCK SW (on) once.	Display : F.LOCK and tone sounds.		
	9) Turn VFO knob.	Confirm the display frequency doesn't change.		
	10) Push 1.5 SW.	Doesn't change any.		
	11) Push F.LOCK SW (off) once.	Display F.LOCK light off and tone sounds.		
	12) Push ENT → 1 → 2 → 3 → 4 → 5 → 6 → 7 SW's	Display : " 1 2 3 4 5 6 7 "		
	13) Push VOICE SW. (Install the option voice synthesizer unit VS-1.)	Sounds verifies displaced frequency.		
14) Push SPLIT SW once.	Display : SPLIT, orange light off.			
4. Memory	1) Push 29 SW	CH    FREQ'    MODE		
	2) Push both SW M.IN and 1 once then enter the MEMO as on right chart.	1	29.000.00	CW
		2	28.000.00	CW
		3	27.000.00	USB
		4	26.000.00	USB
		5	25.000.00	LSB
		6	24.000.00	LSB
		7	23.000.00	AM
		8	22.000.00	AM
9		21.000.00	FM	
10		21.005.00	FSK	
3) Push PG.S SW (on) once.	Orange light on and scans from "21.000.00" to "21.005.00" on "FM" mode.			
4) Push HOLD SW (on) once and turn main VFO knob.	Red LED light on and tone sounds. Scans manually by VFO knobs.			
5) Push HOLD SW (off) once.	Red LED light off and tone sounds. then, starts auto-scan.			
6) Push PG.S SW (off) once.	Orange LED light off and tone sounds.			
7) Push MS SW (on) once.	Green LED and MEM light on and tone sounds. Scans MEMO from MEMO1 to MEMO0, (skips memorized channels.)			
8) Push MS SW (off) once.	Green LED light off and tone sounds.			
9) Push both M.CE and 1 switches.	Tone sounds.			

Item	Condition	Operation check
4. Memory	10) Push VFO/M → 1 SW	Display : " . . . " "MEMO 1"
	11) Push 4 SW	Display : "26.000.00" "MEMO 4"
	12) Push M▶VFO SW	Display : "26.000.00" "VFO A"
5. Timer	1) Push "S1" on LCD unit.	Display : "TRIO-KENWOOD"
	2) Push "CLOCK" SW once.	Display : 0 : 00 off 0 : 00 on 0 : 00
	3) Push "SET" SW once.	0 ? 00 off 0 : 00 on 0 : 00
	4) Push "MODE" SW once.	0 : 00 off 0 ? 00 on 0 : 00
	5) Push "MINUTE" SW once.	0 : 00 off 0 ? 00 on 0 : 00
	6) Push "MODE" SW once.	0 : 00 off 0 : 01 on 0 ? 00
	7) Push "MINUTE" SW twice.	0 : 00 off 0 : 01 on 0 : 02
	8) Push "MODE" SW once.	0 : 00 off 0 : 01 on 0 : 02
	9) Push "TIMER" SW (on).	
	10) Push " SCROLL" SW once.	Display : V-B 14.000.00 US 1M1 . . .
	11) Push "SCROLL" SW once and confirm the display changes as shown at right. Ten times round one cycle.	V-B 14.000.00 US 1M2 28.000.00 CW
		V-B 14.000.00 US 1M3 27.000.00 US
		V-B 14.000.00 US 1M4 26.000.00 US
		V-B 14.000.00 US 1M5 25.000.00 LS
V-B 14.000.00 US 1M6 24.000.00 LS		
V-B 14.000.00 US 1M7 23.000.00 AM		
V-B 14.000.00 US 1M8 22.000.00 AM		
V-B 14.000.00 US 1M9 21.000.00 FM		
V-B 14.000.00 US 1M0 21.005.00 FS		
V-B 14.000.00 US V-A 14.000.00 US		
12) Switch to "MEMORY BAND 2"	V-B 14.000.00 US 2M1 . . .	
13) Switch to "MEMORY BAND 3"	V-B 14.000.00 US 3M1 . . .	
14) Switch to "MENORY BAND 4"	V-B 14.000.00 US 4M1 . . .	

# TS-940S ADJUSTMENT

TOP VIEW



### PLL UNIT (X50-2020-00)

L5-7 : PLL-2 adj. (35.5-40.5MHz)  
 L10 : PLL-1 adj. (100-110MHz)  
 L17,18,20-24 : PLL IF adj.  
 L25-27 : PLL BPF adj. (9.5-44MHz)  
 TC-1 : STD freq' adj (20MHz)

### AT UNIT (A) (X57-1130-00)

VR101 : Waveform ratio (A=B)  
 VR102 : ANT TUNE indicator goes off

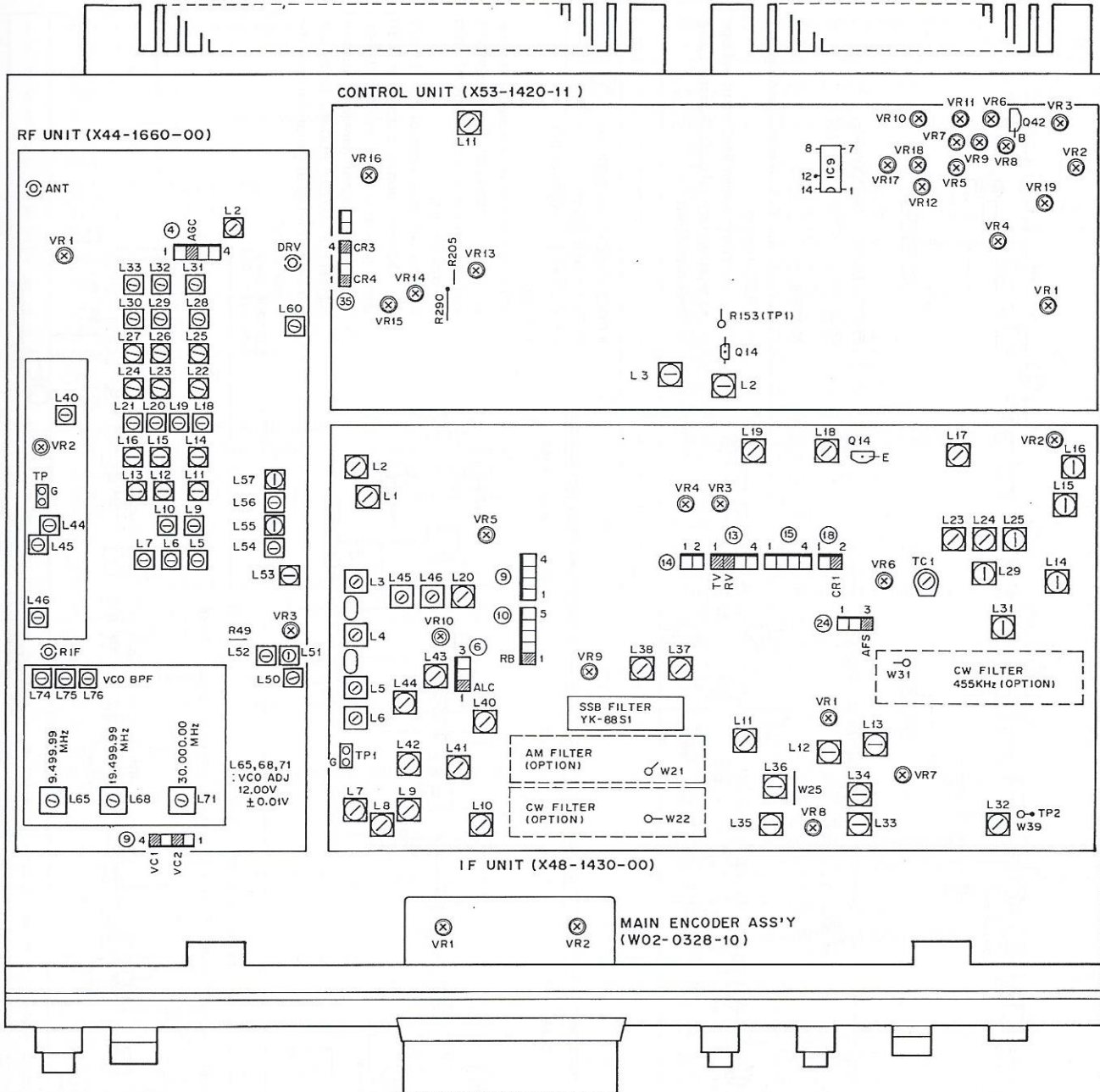
TC101 : Motor stop and SWR reads MIN

### 100W FINAL UNIT (X45-1400-00)

VR1 : 130mA +100mA, -50mA (100W Final bias)  
 VR2 : 50mA ± 10mA (10W Final bias)



## BOTTOM VIEW



### RF UNIT (X44-1660-00)

- L2,40 : IF TRAP adj. (BAND 1.400MHz, SSG : 45.05MHz 80dB)
  - L5-7 : BPF 100-500kHz (Freq. : 300.0kHz)
  - L9,10 : BPF 0.5-1.5MHz (Freq. : 1,000.0kHz)
  - L11-13 : BPF 1.5-3.0MHz (Freq. : 1,900.0kHz)
  - L14-16 : BPF 3.0-4.0MHz (Freq. : 3,900.0kHz)
  - L18-21 : BPF 4.0-7.0MHz (Freq. : 6,900.0kHz)
  - L22-24 : BPF 7.0-8.5MHz (Freq. : 7,000.0kHz)
  - L25-27 : BPF 8.5-14MHz (Freq. : 10,000.0kHz)
  - L28-30 : BPF 14.0-20.0MHz (Freq. : 18,000.0kHz)
  - L31-33 : BPF 20.0-31.0MHz (Freq. : 29,500.0kHz)
  - L44-46 : MCF (Center freq. : 45.050MHz)
  - L50-52 : DRIVE adj.
  - L53,55,57 : TX BPF 1.7MHz Side (A)
  - L54,56,60 : TX BPF 30MHz Side (B)
  - L65 : VCO1 adj. (9,499.99MHz)
  - L68 : VCO2 adj. (19,499.99MHz)
  - L71 : VCO3 adj. (30,000.00MHz)
  - L74-76 : VCO BPF
- L65,68,71 : VCO ADJ 12.00V ±0.01V

- VR1 : RF AGC adj. (AF output 0.2dB down)
- VR2 : MIXER BALANCE adj.
- VR3 : MIXER BALANCE adj. (CW 23.950MHz)

### IF UNIT (X48-1430-00)

- L1,2 : IF OUT adj. (8.83MHz)
- L3-6 : MCF adj. (RF unit : L44-46)
- L7-15,17,23-25 : SSB IF GAIN adj.
- L16 : NOTCH adj.
- L18,19 : CAR4 adj. (99.20kHz ±20Hz)
- L20 : CAR3 adj. (100.0kHz ±20Hz)
- L29,31,34-36,40-42,44-46 : DRIVE adj.
- L32 : COMP LEVEL adj.
- L33 : ALC LEVEL adj.
- L43 : MONI LEVEL adj.
- L37,38 : FM IF GAIN adj.

- VR1 : RX S-meter Sens. S-1
- VR2 : NOTCH adj. (VR2 and L16)
- VR3 : RX S-meter φ adj.
- VR4 : RX S-meter Sens. S-9
- VR5 : AGC adj. 3.2V
- VR6 : CARRIER SUPPRESSION adj. (VR6 and TC1)
- VR7 : COM LEVEL adj. (VR7 and L32)
- VR8 : MIXER BALANCE adj. 21.555MHz (AM 21.1MHz)
- VR9 : ALC LEVEL adj. (FM 29.25MHz)
- VR10 : MIXER BALANCE adj. (CW 29.930MHz)

### CONTROL UNIT (X53-1420-11)

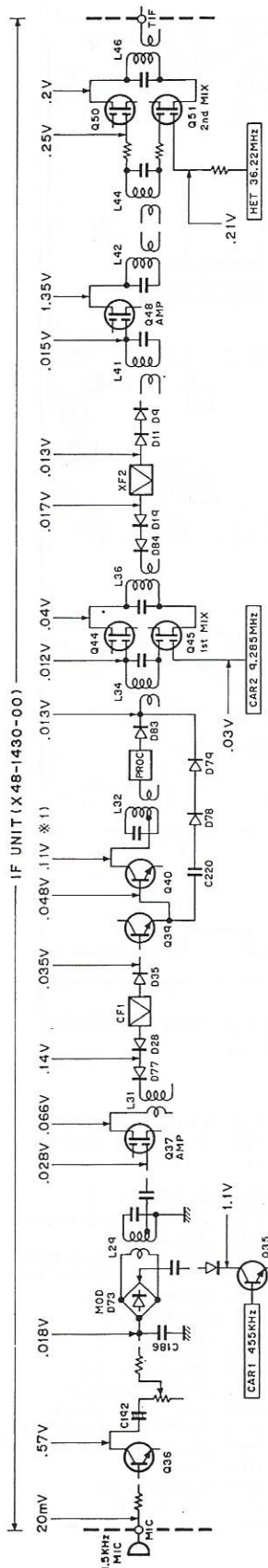
- L2,3 : SSB IF GAIN (MIN. adj.)
- L11 : FM IF GAIN

- VR1 : RB adj. 2.1V
- VR2 : MAX POWER adj. (110W)
- VR3 : ALC adj. 3.2V
- VR5 : SWR protection adj. (100W)
- VR6 : Current protection adj. 14A
- VR7 : IC meter adj. 10A
- VR8 : ALC-φ adj.
- VR9 : ALC meter adj.
- VR10 : IC-φ adj.
- VR11 : VC meter adj. 28.5V
- VR12 : SWR standard adj. 0.5V
- VR13 : MONITOR LEVEL adj.
- VR14 : BUZZER LEVEL adj.
- VR15 : Side tone level
- VR16 : DEV.
- VR17 : Power meter adj.
- VR18 : SWR meter adj.
- VR19 : MIN. power adj. (5W)



## LEVEL DIAGRAM

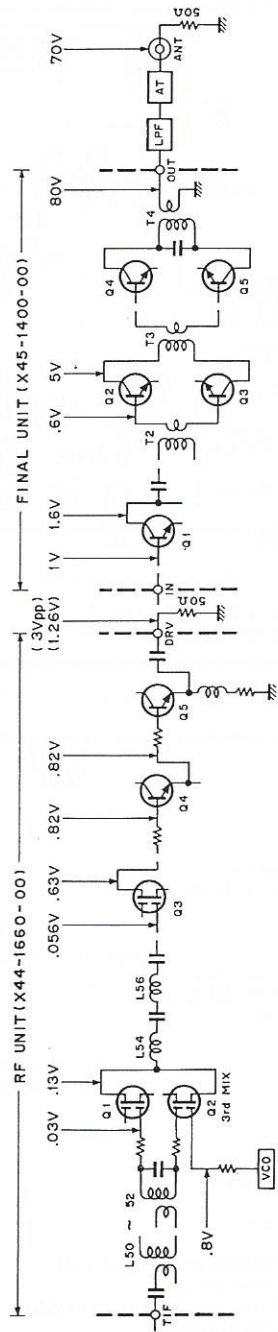
### TX SECTION



FREQUENCY : 14.200MHz  
MIC INPUT : 20mV, 1.5kHz

### NOTES

- 1) Adjust at S-1 meter reading by PROC-IN VR.
- 2) ( ) : When adjust MIC input voltage so that voltage of 50Ω Dummy Load becomes 3Vpp.

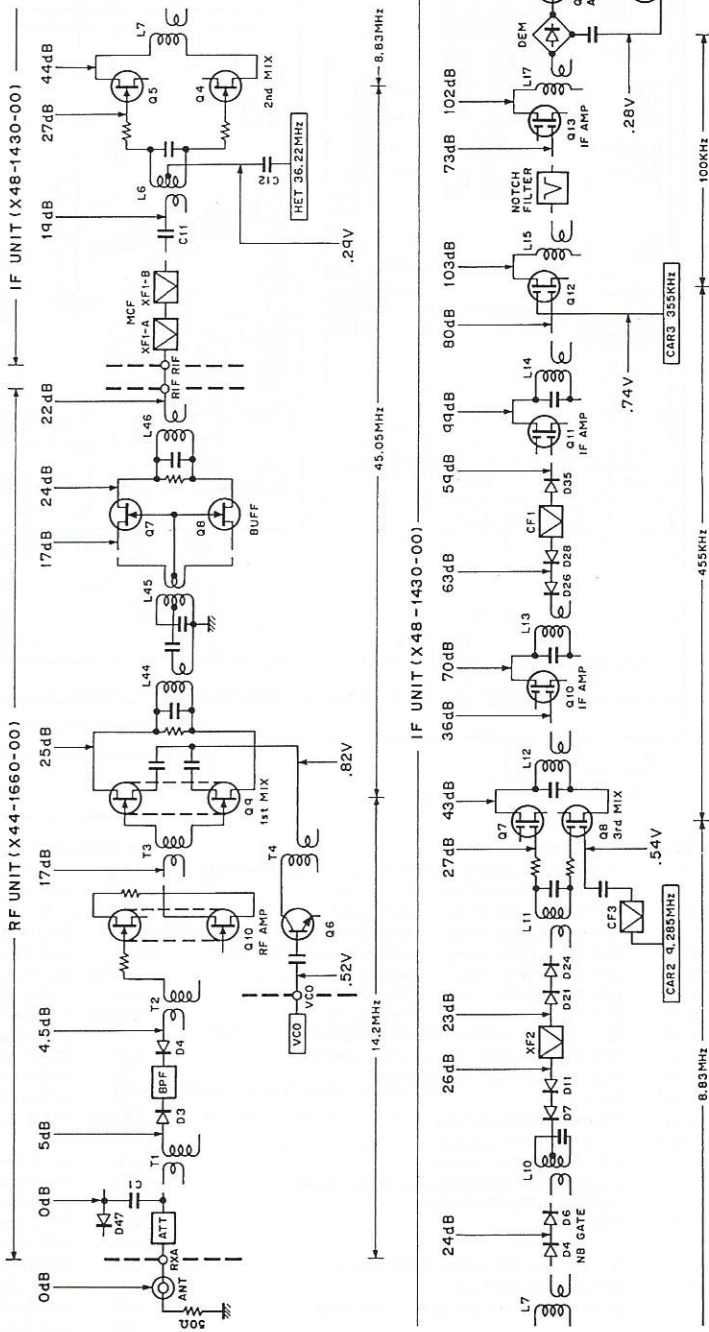


### RX SECTION

FREQUENCY : 14.200MHz  
INPUT : 0dB (5μV)  
AF OUTPUT : 0.63V at 8Ω

### NOTES

- 1) 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 (50mW) audio output at 0dB signal generator input at 14.200MHz.
- 2) To measure signal generator output connect a 0.01μF 500WV capacitor between the signal generator and the check point.



# TERMINAL FUNCTION TS-940S

Terminal			Terminal Function				
No.	Name	I/O					
<b>SWITCH UNIT (L)</b>							
①	1	VBY	I	VS-1 Busy signal			
	2	VSR	O	VS-1 voice synthesizer start signal			
	3	PS4	O	}	VS-1 voice synthesizer data		
	4	PS0	O				
	5	PS1	O				
	6	PS2	O				
	7	PS3	O				
	8	5C1	O	+ 5V for VS-1			
②	1	21T	I	+ 21V			
	2	GND		GND			
③	1	SB0	I	}	Display data for LCD		
	2	SB1	I				
	3	SB2	I				
	4	SB3	I				
	5	MRQ	I	Clock for data			
	6	GND		GND			
④	1	GND		GND	}	LCD ass'y control data	
	2	RS	O	Resister, select signal			
	3	RW	O	Write/Read signal			
	4	LE	O	Latch signal			
	5	DB4	O	}			Data
	6	DB5	O				
	7	DB6	O				
	8	DB7	O				
	9	5L		+ 5V for LCD ass'y			
	10	LG	O	LCD Intensity control bias, -3V approx.			
⑤	1	GND		GND			
	2	HS	O	LCD data accept signal message			
	3	5C	O	+ 5V for Digital B unit			
	4	8B	O	+ 8V for Digital B unit			
⑥	1	8C	I	+ 8V			
	2	GND		GND			
	3	TMY	O	Timer output, Timer SW ON, Timer SW OFF : H			
⑦	1	TMY	I	Timer SW OFF : L			
	2	TMR	I	Timer SW ON : L			
⑧	1	ATV	I	AT unit TX data			
	2	TNQ	I	AT unit STBY signal			
⑨	1	5K	I	+ 5V			
	2	SET		SET KEY			
	3	GRP	I	GRAPH KEY			
	4	SCR	I	SCROLL KEY			
	5	CLK	I	CLOCK KEY			
	6	GND		GND			
④⑨	1	GND		GND			
	2	LG		}	Sub diplay contrast		
	3	VE					
<b>SWITCH UNIT (I)</b>							
⑩	1	VB0	O	Bit 0			
	2	VB1	O	Bit 1			
	3	VB2	O	Bit 2			
	4	VB3	O	Bit 3			
	5	VB4	O	Bit 4			
⑪	1	VB		VBT			
	2	SH	I	SLOPE HIGH cut			
	3	SL	I	SLOPE LOW cut			
<b>SWITCH UNIT (A)</b>							
⑫	1	TM	O	Meter SW common			
	2	SSB	I	SSB mode : 15V			
	3	CWB	I	CW mode : 15V			
	4	MA	I	AM, SSB mode : 15V			
⑬	1	15B	I	+ 15V			
	2	MS	O	Power supply for monitor, MONI SW ON : 15V			
	3	FBK	O	CW mode FULL/SEMI SW, FULL : 15V			
	4	VS2	O	CW mode VOX SW ON : 15V			
	5	VS1	O	AM, SSB mode VOX SW ON : 15V			
	6	SS	O	STBY SW, MIC PTT ON : 0V			

Terminal			Terminal Function		
No.	Name	I/O			
⑭	1	SPL	I	SPLIT LED light on	
	2	DIM	O	DIM SW output, OFF : 0V	
	3	TX	I	STBY control by $\mu$ -com, SEND : H, REC : L	
⑮	1	ATT1	O	}	ATT relay drive
	2	ATT2	O		
⑯	1	NAR	I	NAR LED control for Mode	
	2	15V		+ 15V	
	3	CWB	I	CW mode : 15V	
	4	SS	I	MIC PTT ON : 0V	
	5	WIDE	O	NAR SW OFF : 5V (approx.)	
⑰	1	ATI	O	AUTO/THRU SW AUTO : 15V	
	2	TUN	I	AT tuning : H	
⑱	1	15B	I	+ 15V	
	2	NB1	O	NB1 SW	
	3	NB2	O	NB2 SW ON : H	
⑲	1	PRM	I	COMP meter	
	2	MVG		Mic line GND	
	3	PRS	O	SSB mode PROC SW ON : 15V	
	4	MV2	O	MIC GAIN/PROC-IN VR	
⑳	1	GND		GND	
	2	PIL	I	PROC-IN VR OUT	
	3	MVG		}	MIC line GND
	4	MVG			
	5	MG	I	MIC GAIN VR OUT	
	6	NBL	O	NB LEVEL VR	
	7	15	O	+ 15V for SW unit (E)	
㉑	1	ALM	I	ALC meter	
	2	PWR	I	Power meter	
	3	SWR	I	SWR meter	
	4	ICM	I	IC meter	
	5	VCM	I	VC meter	
	6	AGO	O	AGC OFF : 15V	
	7	NAF	I	SSB, FSK, CW mode : 15V	
	8	AGS	O	AGC SLOW : 15V, Normally : -12V	
㉒		NAI	O	NAR SW ON : H	
		NAR	I	NAR LED control for MODE	
		TUN	O	TUNE LED light ON	
		SPL	O	SPLIT LED light ON	
		PL	O	Power supply for meter lamp	
		G		GND for meter lamp	
	<b>SWITCH UNIT (D)</b>				
㉓	1	CWB	I	CW mode : 15V	
	2	GND		GND	
	3	15V	I	+ 15V	
㉔	1	AP5	O	CW mode AF TUNE ON : 15V	
	2	AP0	O	CW mode AF TUNE OFF : 15V	
	3	NTH	O	NOTCH SW ON : 15V	
	4	15V	O	+ 15V for SW unit (C)	
㉕	1	GND		GND	
	2	RCL	O	CLEAR SW	
	3	XIT	O	XIT SW	
	4	RIT	O	RIT SW	
<b>SWITCH UNIT (K)</b>					
㉖	1	IO2	I	IF OUT2 (4th IF 100kHz)	
	2	GND		GND	
	3	LO1	I	PHONE OUT	
	4	GND		GND	
	5	GND		GND	
	6	IO1	I	IF OUT 1 (8.83MHz)	
	7	GND		GND	
	8	LN1	I	PHONE IN	



# TS-940S TERMINAL FUNCTION

Terminal			Terminal Function
No.	Name	I/O	
<b>SWITCH UNIT (F)</b>			
②6	1	V15	I + 15V
	2	VXC	I ANTI VOX VR
	3	VXG	I GND
	4	ANV	O ANTI VOX VR
	5	MVG	O Mic line GND
	6	FMC	O FM MIC GAIN VR
	7	DLY	I VOX DELAY VR
	8	VXG	I GND
	9	VX2	O VOX GAIN VR
②7	1	MVG	O Mic line GND
	2	MV1	I FM MIC GAIN VR, VOX GAIN VR
②8	1	CV2	O } CAR VR
	2	CV1	I }
②9	1	MB0	O Memory bank SW data, 2, 3 : H
	2	MB1	O Memory bank SW data, 1, 3 : H
	3	100	O VFO : 100kHz SCALE DATA : L
	4	10	O VFO : 10kHz DIGIT DATA : L
③0	1	GND	GND
	2	MKS	O MARKER SW ON : L
④8	1	GND	GND
	2	LG	I }
	3	VE	I } Sub display contrast
<b>SWITCH UNIT (J)</b>			
③1	1	TMY	O TIMER SW OFF : L
	2	GND	GND
	3	TMR	O TIMER SW ON : L
<b>SWITCH UNIT (G)</b>			
③2	1	8V	I + 8V
	2	MD	O MIC DOWN SW
	3	MU	O MIC UP SW
	4	SS	O PTT SW
	5	MIC	O MIC COM
	6	GND	I MIC GND
	7	GND	I GND
<b>SWITCH UNIT (H)</b>			
③3	1	GND	GND
	2	REC	O RX AFSK signal
	3	MSL	O MIC select
	4	SS	I STBY control
	5	MIN	I TX AFSK signal
	6	GND	I GND
	7	GND	I GND
<b>SWITCH UNIT (M)</b>			
③4	1	XIT	I XIT display data
	2	RIT	I RIT display data
	3	FG	I Heater for display tube
	4	DP	I Dot display data
	5	a	I Segment data a
	6	SC	I Scale display data
③5	1	MEMO	I MEMO display data
	2	P9	I Analog digit data
	3	G5	I Grid data No. 5
	4	P10	I Analog digit data
	5	G6	I Grid data No. 6
	6	P4	I } Analog digit data
	7	P3	I }
	8	G7	I Grid data No. 7
	9	P2	I } Analog digit data
	10	P1	I }
	11	G8	I Grid data No. 8
	12	G9	I Grid data No. 9

Terminal			Terminal Function
No.	Name	I/O	
③6	1	-	I - (minus) display data
	2	b	I Segment data b
	3	G1	I Grid data No. 1
	4	P5	I Analog digit data
	5	G2	I Grid data No. 2
	6	P6	I } Analog digit data
	7	P7	I }
	8	G3	I Grid data No. 3
	9	P8	I Analog digit data
	10	G4	I Grid data No. 4
	11	c	I Segment data c
	12	g	I Segment data g
③7	1	e	I Segment data e
	2	d	I Segment data d
	3	G10	I Grid data No. 10
	4	VFO B	I VFO B display data
	5	VFO A	I VFO A display data
	6	FH	I Heater for display tube
	7	LOCK	I LOCK display data
	8	f	I Segment data f
<b>SWITCH UNIT (E)</b>			
③8	1	PC0	O TRQ-H : H, Normally : -12V
	2	-12	I -12V
	3	TRQ	I AT STBY signal (For power control OFF)
③9	1	PRL	O PROC-OUT VR (DC)
	2	SFT	I PROC-OUT VR, SSB, FSK mode TX : 15V
	3	MVG	O Mic line GND
	4	MV1	I MIC GAIN VR
④0	1	NBL	O NB LEVEL VR
	2	GND	I GND
	3	MVG	O Mic line GND
	4	PIL	O PROC-IN VR
	5	15	I + 15V
	6	MVG	O Mic line GND
	7	MG	O MIC GAIN VR
	8	MVG	O Mic line GND
	9	MV1	O MIC GAIN VR
④1	1	GND	I GND
	2	PC	O Power control VR
④2	1	PC1	O } Power control VR
	2	PC2	I }
<b>SWITCH UNIT (C)</b>			
④3	1	AP1	I } CW PITCH VR
	2	AP2	O }
	3	AP3	O } AF TUNE VR
	4	AP4	I }
	5	CWP	O CW PITCH VR
	6	NTH	O NOTCH VR
	7	AP0	O CW mode AF TUNE OFF : 15V
	8	AP5	O CW mode AF TUNE ON : 15V
④4	1	AP5	I CW mode AF TUNE ON : 15V
	2	AP0	I CW mode AF TUNE OFF : 15V
	3	15V	I + 15V
	4	GND	I GND
	5	NTH	I NOTCH SW ON : 15V
④5	1	NTH	O NOTCH LED light on, NOTCH SW ON : H
	2	FMG	I FM mode : 0V
④6	1	SO2	O } SQL VR
	2	SQ1	I }
<b>SWITCH UNIT (B)</b>			
④7	1	GND	I GND
	2	AVG	I AF line GND
	3	AV2	O AF GAIN VR
	4	AVG	I AF line GND
	5	AV1	I AF GAIN VR
	6	RFG	O RF GAIN VR



# TERMINAL FUNCTION TS-940S

Terminal			I/O	Terminal Function
No.	Name			
<b>AVR UNIT (X43-1500-00)</b>				
①	1	AC2	I	} AC LINE for AVR (21T)
	2	AC1	I	
②	1	PE	I	Q103 Emitter
	2	PC	O	Q103 Collector
	3	PB	O	Q103 Base
③	1	28C	O	+ 28V to POWER SW
	2	28B	I	+ 28V from POWER SW
④	1	21T	O	+ 21V for Control unit
	2	GND		GND
⑤	1	21T	O	+ 21V for Control unit
	2	28C	O	+ 28V for Control unit
	3	21B	I	+ 21V for AVR unit
	4	GND		GND
⑥	1	10E	I	Q104 Emitter
	2	10C	O	Q104 Collector
	3	10B	O	Q104 Base
⑦	1	10V	I	+ 10V for IC101 : 5V AVR IC
	2	GND		GND
	3	5V	O	+ 5V AVR output
⑧	1	10L	O	+ 10V for LCD ass'y
	2	GND		GND
⑨	1	5CO	O	+ 5V for Control unit
	2	5IF	O	+ 5V for IF unit
	3	GND		GND
	4	5KE	O	+ 5V for key board ass'y
	5	GND		GND
	6	5DA	O	+ 5V for Digital A unit
	7	GND		GND
	8	10DA	O	+ 10V for Digital A unit
⑩	1	ICA	O	Detect terminal for VC, IC meter
	2	ICB	O	Detect terminal for IC meter
⑪	1	FAN	O	Fan motor control output
	2	GND		GND
⑫	1	40V	I	40V DC inline
	2	BS1	O	Q102 Base
	3	BS2	O	Q101 Base
⑬	1	THM	I	Thermister TH101 output
	2	18	O	+ 18V for thermister TH101
		28A	I	Q101, 102 output
		FB	O	+ 28V for Final unit
		5G		5V LINE GND
		CG		Chassis GND
		FG	O	FINAL GND
<b>RF UNIT (X44-1660-00)</b>				
①	1	ATT1	I	ATT SW data, 0, 20dB : H
	2	ATT2	I	ATT SW data, 0, 10dB : H
②	1	GND		GND
	2	MKR	I	Marker signal (100kHz)
③	1	ATV	I	Bias for ANT switching (TX : H)
	2	RV	I	RX : 15V
④	1	RV	O	RV (RX : 15V) for IF unit
	2	AGC	O	AGC voltage for RF AGC circuit
	3	TB	O	TB (TX : 2.1V) for IF unit
	4	TV	O	TV (TX : 15V) for IF unit
⑤	1	GND		GND
	2	PC	I	Power control (Q3 GAIN control)
	3	TRQ	I	AT STBY signal (Q3 GAIN DOWN)
⑥	1	VCH	O	NC
	2	TB	I	TX : + 15V, RX : -12V
	3	18	I	+ 18V
	4	NC		NC
	5	TV	I	TX : + 15V

Terminal			I/O	Terminal Function
No.	Name			
⑦	1	RB0	I	} RX BPF band data
	2	RB1	I	
	3	RB2	I	
	4	RB3	I	
⑧	1	VCL	I	} Main VCO select signal
	2	VCM	I	
⑨	1	TCB	O	Power supply for PLL unit IC18
	2	VC2	I	VCO3 control voltage
	3	GND		GND
	4	VC1	I	VCO1, VCO2 control voltage
		RIF	O	RX 1st IF (45.05MHz)
		TIF	I	TX IF (45.05MHz)
		XVTR	O	TX drive output to X.VERTER 7 pin
		RXA	I	RX signal input
		EXTA	O	To EXT. ANT SW
		ANT	I	From Antenna connector
		XVR	I	X.VERTER 4 pin
		TXA	I	TX POWER
		DRV	O	Drive output to Final unit
		VCO	O	VCO signal output to PLL unit
<b>100W FINAL UNIT (X45-1400-00)</b>				
①	1	TXC	I	TX control, TX : 15V
	2	GND		GND
	3	TH	O	Final thermal sensor
		IN	I	Drive power input
		OUT	O	Power output
		28	I	+ 28V
		GND	I	GND
<b>DC-DC UNIT (X46-1030-00)</b>				
①	1	HV	O	High voltage for display drive (approx. -40V)
	2	FG	O	} Filament voltage for display
	3	FH	O	
	4	5V	O	+ 5V for Digital C unit
	5	GND		GND
②	1	DIM	I	DIM SW OFF : 0V
	2	GND		GND
	3	5V	I	+ 5V
③	1	21B	I	+ 21V for AVR UNIT
	2	-C	O	-40V for -12V power supply for Control unit
<b>IF UNIT (X48-1430-00)</b>				
①	1	I01	O	IF OUT1 (8.83MHz)
	2	GND		GND
	3	LN1	I	PHONE IN
	4	GND		GND
	5	MSL	I	Mic select signal for ACC2-9 pin
	6	GND		GND
	7	MIN	I	TX AFSK signal for ACC2-11 pin
	8	GND		GND
	9	REC	O	RX AFSK signal for ACC2-3 pin
②	1	MIC	I	Mic input
	2	GND		GND
③	1	MV1	O	MIC GAIN VR
	2	MVG		Mic line GND
	3	SFT	O	To PROC-OUT VR (SSB, FSK mode TX : 15V)
	4	PRL	I	PROC-OUT VR (DC)
④	1	TBK	I	TX : 15V
	2	-12	I	-12V
	3	CR3	O	CR3 for SIDE TONE (100kHz)
	4	GND		GND
	5	CWG	O	CWG for Control unit, CW mode : 0V
⑤	1	TM	I	TX meter amp
	2	MA	O	AM, SSB mode : 15V
	3	SSB	O	MOD data for SW unit (A), SSB mode : 15V
	4	CWB	O	MOD data for SW unit (A), CW mode : 15V
⑥	1	ALC	I	ALC for TX IF control
	2	GND		GND
	3	MON	O	TX IF for SSB, FSK, AM monitor (8.83MHz)



# TS-940S TERMINAL FUNCTION

Terminal				Terminal Function	
No.	Name	I/O			
⑦	1	NG1	I	Noise blanker gate input	
	2	NBB	O	+ B for Noise blanker circuit	
	3	GND		GND	
	4	NA	O	IF output for Noise blanker	
⑧	1	GND		GND	
	2	5IF	I	+ 5V	
⑨	1	USB	O	USB, CW, AM, FM, TUNE : H	
	2	LSB	O	LSB, FSK : H	
	3	5V	O	+ 5V for CAR unit	
	4	15V	O	+ 15V for CAR UNIT	
⑩	1	RB	I	Bias for RX circuit, RX : 2.1V	
	2	15V	I	+ 15V	
	3	TRQ	I	AT STBY signal	
	4	FMB	O	FM : 15V } Mode data	
	5	AMB	O	AM : 15V } for Control unit	
⑪	1	GND		GND	
	2	CR0	I	Carrier for TX CW, FM (8.83MHz)	
⑫	1	USG	I	USB KEY	
	2	LSG	I	LSB KEY	
	3	FSG	I	FSK KEY	
	4	AMG	I	AM KEY	
	5	FMG	I	FM KEY	
	6	CWG	I	CW KEY	
	7	WN	I	WIDE/NAR & IF Filter switching data	
	8	MD2	I	IF Filter switching data	
	9	MD1	I	IF Filter switching data	
⑬	1	TV	I	TX : 15V	
	2	RV	I	RX : 15V	
	3	TB	I	Low voltage for TX circuit	
	4	AGC	O	AGC output for RF unit RF AGC	
⑭	1	CV1	O	DC for CAR VR, CW, AM mode TX : 15V	
	2	CV2	I	CAR VR output	
⑮	1	M	O	Meter output	
	2	NAF	O	DC for AGC SW, SSB, FSK, CW mode : 15V	
	3	AGS	I	AGC SLOW : 15V, Normally : -12V	
	4	AG0	I	AGC OFF : 15V	
⑯	1	FMI	O	FM IF (455kHz)	
	2	GND		GND	
	3	GND		GND	
	4	NG2	I	Noise gate (3rd MIX) control signal for NB2	
⑰	1	GND		GND	
	2	CR2	I	CAR2 input (9.285MHz)	
⑱	1	GND		GND	
	2	CR1	I	CAR1 input (455kHz)	
	1	PRS	I	SSB mode PROC SW ON : 15V	
	2	PRM	O	PROC meter	
⑲	3	MVG		GND	
	4	MV2	I	MIC GAIN/PROC-IN VR	
	⑳	1	GND		GND
		2	IO2	O	IF OUT 2 (100kHz)
㉑	1	GND		GND	
	2	CR4	O	CAR4 for SIDE TONE (99.2kHz)	
	3	MUT	I	SQL MUT signal, Muting : H	
	4	FMV	I	FM Detector signal	
	5	GND		GND	
㉒	1	AP0	I	CW mode AF TUNE OFF : 15V	
	2	AP5	O	CW mode AF TUNE ON : 15V	
	3	AP4	O	AF TUNE VR	
	4	AP2	I	} CW PITCH VR	
	5	AP1	O		
	6	AP3	I	AF TUNE VR	
	7	NTH	I	NOTCH VR	
	8	CWP	I	CW PITCH VR	
㉓	1	AV1	O	AF GAIN VR	
	2	AVG		GND	
	3	GND		GND	
	4	RFG	O	RF GAIN VR	

Terminal				Terminal Function
No.	Name	I/O		
⑳	1	FSB	O	FSK mode data, FSK : 15V
	2	GND		GND
	3	AFS	I	AFSK modulate signal (2290/2125Hz)
		TIF	O	TX IF signal (45.05MHz)
		RIF	I	RX 1st IF signal (45.05MHz)
		HET	I	HET (36.22MHz)
<b>PLL UNIT (X50-2020-00)</b>				
㉑	1	DA0	O	} PLL data for CAR1, CAR2
	2	DA1	O	
	3	DA2	O	
	4	DA3	O	
	5	UL1	I	Unlock signal
㉒	1	GND		GND
	2	DA0	I	} PLL data
	3	DA1	I	
	4	DA2	I	
	5	DA3	I	
	6	CL2	I	Data clock for IC8
	7	CL1	I	Data clock for IC9
	8	CL0	I	Data clock for IC19
㉓	1	GND		GND
	2	117	I	117MHz from CAR unit
㉔	1	FMM	I	FM modulate signal
	2	GND		GND
	3	15A	I	+ 15V
	4	UL	O	PLL unlock signal
	5	5	I	+ 5V
㉕	1	KFS	I	RTTY KEY signal, KEY DOWN : L
	2	GND		GND
	3	MKR	O	100kHz marker signal output
	4	MKG		NC
	5	GND		GND
	6	MKS		Marker ON : L, Normally : H
㉖	1	AFS	O	AFSK signal (2290/2125Hz)
	2	GND		NC
	3	FSB	I	FSK mode data, FSK : 15V
㉗	1	10	O	10MHz for CAR unit
	2	GND		GND
㉘	1	TCB	I	Power supply for IC18
	2	VC2	O	Control voltage for RF unit VCO3
	3	GND		GND
	4	VC1	O	Control voltage for RF unit VCO1, 2
㉙	1	GND		GND
	2	PLE	I	Data latch for IC17
	3	CL3	I	Clock for IC17
	4	PLD	I	PLL data IC17
		HET	O	HET for RF unit (36.22MHz)
		VCO	I	Output signal of RF unit, VCO1, 2 and 3
<b>LPF UNIT (X51-1330-00)</b>				
㉚	1	VSF	O	Forward detect for SWR
	2	GND		GND
	3	VSR	O	Reverse detect for SWR
	4	GND		GND
㉛	1	ANT	O	LPF unit output
㉜	1	GND		GND
	2	XVR	I	X. VERTER 4 pin
㉝	1	TXC	O	TX control for Final unit, TX : 15V
	2	GND		GND
	3	TH	I	Final thermal sensor
㉞	1	LP2	I	} LPF band data
	2	LP0	I	
	3	LP1	I	
㉟	1	M0	O	Fan control
	2	GND		GND



# TERMINAL FUNCTION TS-940S

Terminal				Terminal Function
No.	Name	I/O		
⑦	1	21B	I	+ 21V for AVR unit
	2	28	I	+ 28V
	3	TV	I	TX : 15V
	4	BTP	O	PROTECTION signal (H : TX OFF)
		IN	I	LPF unit input
<b>CONTROL UNIT (X53-1420-11)</b>				
①	1	VCH	I	NC
	2	TB	O	TB for RF unit, TX : 2.1V
	3	GND		GND
	4	TV	O	TV for RF unit, TX : 15V
	5	18	O	+ 18V for RF unit
②	1	TRQ	I	AT STBY signal, TUNE : Power down
	2	15B	O	+ 15V for AT unit
	3	21B	O	+ 21V for AT unit
	4	TV	O	TV for AT unit
③	1	GND		GND
	2	28C	I	+ 28V
	3	21B	O	+ 21V for AVR unit
	4	21T	I	+ 21V
④	1	EX2		} For REMOTE connector, TX : Connecto to EX1, EX2
	2	EX1		
⑤	1	8C		+ 8V for SW unit (L)
	2	TMY		TIMER SW ON : 0V
	3	GND		GND
⑥	1	RV	O	RV for RF unit, TX : 15V
	2	ATV	O	ANT switching output for RF unit (TX : H)
⑦	1	AT0	I	NC
	2	WRC	I	NC
⑧	1	GND		GND
	2	VSF	I	Forward detect for SWR
	3	GND		GND
	4	VSR	I	Reverse detect for SWR
	5	BTP	I	Protection input
	6	TV	O	TV for LPF unit, TX : 15V
	7	28	O	+ 28V for LPF unit
	8	21B	O	+ 21V for LPF unit
⑨	1	GND		GND
	2	TRQ	O	AT STBY signal for RF unit
⑩	1	15B	O	+ 15V for IF unit
	2	TBK	O	TBK for IF unit, TX : 15V
	3	RB	O	RB for IF unit, RX : 2.1V
	4	-12	O	-12V for IF unit
⑪	1	-12	O	-12V for SW unit
	2	TRQ	O	AT STBY signal for SW unit
	3	PC0	I	} Power control VR
	4	PC1	I	
	5	PC2	O	
⑫	1	ALC	O	ALC for IF unit
	2	GND		GND
⑬	1	VCM	O	VC meter
	2	ALM	O	ALC meter
	3	ICM	O	IC meter
	4	GND		GND
	5	SWR	O	SWR meter
	6	PWR	O	POWER meter
⑭	1	GND		GND
	2	VX2	I	VOX GAIN VR
⑮	1	NC		NC
	2	ISW	O	SWR voltage for AT unit
	3	GND		GND

Terminal				Terminal Function	
No.	Name	I/O			
⑯	1	RRL	I	} When remote plug IN	
	2	RLT	O		Connect to TV TX : GND, Normally : OPEN
	3	TV	O		TX : 15V
	4	RAL	I	ALC input	
	5	XAL	I	ALC input	
	6	XRL	O	Relay control } X. VERTER	
⑰	1	BLK	I	Dial click blanking pulse	
	2	-C	I	-40V for -12V power supply	
	3	21B	O	+ 21V for DC-DC unit	
	4	BZ	I	Buzzer pulse	
	5	DST	I	BAND data for TX.OFF	
⑱	1	UL	O	PLL unlock signal for Digital B unit	
	2	TR	O	TR (TX : 15V) for Digital B unit	
⑲	1	NG1	O	Noise blanker gate	
	2	NBB	I	+ B for noise blanker circuit	
	3	GND		GND	
	4	NA	I	IF for noise blanker (8.83MHz)	
⑳	1	15B	I	+ 15V	
	2	NB2	I	NB2 SW	
	3	NB1	I	NB1 SW	
㉑	1	UL	I	Unlock signal (L : TX.OFF)	
	2	15A	O	+ 15V for PLL unit	
	3	5	O	+ 5V for PLL unit	
	4	GND		GND	
㉒	1	DLY	O	DLAY VR	
	2	VXC	O	ANTI VOX VR	
	3	V15	O	+ 15V for SW unit	
㉓	1	GND		GND	
	2	5CO	I	+ 5V	
㉔	1	NG2	O	NB2 blanking signal	
	2	GND		GND	
㉕	1	GND		GND	
	2	MON	I	TX IF for SSB, FSK, AM monitor (8.83MHz)	
㉖	1	15B	O	+ 15V for SW unit	
	2	MS	I	Power supply for monitor circuit	
㉗	1	SS	I	SEND or PTT switch data (L : TX)	
	2	FBK	I	CW mode FULL/SEMI SW FULL : 15V	
	3	VS1	I	AM, SSB mode VOX SW ON : 15V	
	4	VS2	I	CW mode VOX SW ON : 15V	
㉘	1	MUT	O	SQL MUT signal (Muting : H)	
	2	AMB	I	AM mode data, AM : 15V	
	3	CWG	I	CW mode data, CW : 0V	
	4	FMB	I	FM mode data, FM : 15V	
	5	TRQ	O	AT STBY signal for IF unit	
㉙	1	SQ1	O	SQL VR output	
	2	SQ2	I	SQL VR input	
㉚	1	GND		GND	
	2	CR0	I	CAR0 for SSB, FSK, AM monitor (8.83MHz)	
㉛	1	ANV	I	ANTI VOX VR	
	2	GND		GND	
㉜	1	FMC	I	FM MIC GAIN VR	
	2	MVG	I	GND	
㉝	1	FMM	O	FM Mic amp	
	2	GND		GND	
㉞	1	FIN	I	FM IF input (455kHz)	
	2	GND		GND	
㉟	1	CR4	I	CAR4 for side tone (99.2kHz)	
	2	GND		GND	
	3	GND		GND	
	4	CR3	I	CAR3 for side tone (100kHz)	



# TS-940S TERMINAL FUNCTION

Terminal			Terminal Function	
No.	Name	I/O		
③⑥	1	SP1	O	Audio signal for REMOTE 1pin
	2	GND		GND
	3	GND		GND
	4	SP2	O	Audio signal for EXT. SP
	5	KEY	I	KEY UP : H, Normally : L
	6	STK	I	KEY DOWN : L, Normally : H
③⑦	1	AV2	I	AF GAIN VR
	2	AVG		GND
③⑧	1	SP2	I	Audio signal from PHONE
	2	GND		GND
	3	GND		GND
	4	SP1	O	Audio signal from PHONE
③⑨	1	VO	I	VS-1 (option) voice signal
	2	GND		GND
④⑩	1	GND		GND
	2	FMV	O	FM detector output
④⑪	1	ICB	I	Detect terminal for IC meter
	2	ICA	I	Detect terminal for VC, IC meter
④⑫	1	AR	O	ON AIR LED light on
	2	GND		GND
④⑬	1	8V	O	+ 8V for VS-1 (option)
	2	GND		GND
		SS	I	REMOTE 4 pin, EXT. STBY
<b>DIGITAL A UNIT (X54-1830-00)</b>				
①	1	LOCK	O	F. LOCK segment data
	2	SC	O	Scale display data
	3	G5	O	} Grid data
	4	G4	O	
	5	G3	O	
	6	G2	O	
	7	G1	O	
	8	G9	O	
	9	G10	O	
	10	G8	O	
	11	G7	O	
	12	G6	O	
②	1	B2	O	} Multiplex segment data
	2	B3	O	
	3	B4	O	
	4	B5	O	
	5	B6	O	
	6	B7	O	
③	1	B1	O	Segment data DP
	2	B0	O	Segment data g
	3	C3	O	Segment data P10
	4	C2	O	Segment data P9
	5	C1	O	Segment data P8
	6	C0	O	Segment data P7
	7	C6	O	} Segment data control
	8	C7	O	
④	1	LP2	O	} LPF BAND data
	2	LP1	O	
	3	LP0	O	
	4	WRC	O	NC
	5	WRC	O	AT BAND data
	6	AT0	O	NC
	7	AT0	O	} AT BAND data
	8	AT1	O	
	9	AT2	O	
	10	AT3	O	

Terminal			Terminal Function	
No.	Name	I/O		
⑤	1	DA0	O	} PLL data for PLL, CAR unit
	2	DA1	O	
	3	DA2	O	
	4	PLD	O	PLL data for PLL unit IC17
	5	PLE	O	Data latch for PLL unit IC17
	6	CL3	O	Clock for PLL unit IC17
	7	CL2	O	Clock for PLL unit IC8
	8	CL1	O	Clock for PLL unit IC9
	9	CL0	O	Clock for PLL unit IC19
	10	DA3	O	PLL data for PLL, CAR unit
	11	GND		GND
⑥	1	SH	O	SLOPE HIGH cut
	2	SL	O	SLOPE LOW cut
	3	VB	O	VBT
			} Code select data	
⑦	1	CL4	O	PLL clock for CAR1 (455kHz)
	2	CL5	O	PLL clock for CAR2 (9.285MHz)
⑧	1	BZ	O	Buzzer pulse
	2	DST	O	BAND data
	3	BLK	O	Dial click blanking pulse
⑨	1	DIM	I	DIM SW OFF: 0V
	2	SPL	O	SPLIT LED light on
	3	TX	O	STBY control
	4	VCL	O	} Main VCO select signal
	5	VCM	O	
	6	MDD	O	} MODE LED light ON
	7	MD1	O	
	8	MD2	O	
	9	WN	O	WIDE, NAR data, NAR : H
	10	GND		GND
⑩	1	ATS	O	AT start pulse
	2	GND		GND
⑪	1	RC	O	RIT CLEAR pulse
	2	CN	O	Multiplex control data for switches
	3	SLO	O	} Multiplex select data for switches
	4	SL1	O	
	5	SL2	O	
	6	SL3	O	
⑫	1	GND		GND
	2	13	I	} Multiplex switch data
	3	12	I	
	4	11	I	
	5	10	I	
	6	14	I	
	7	15	I	
	8	16	I	
	9	17	I	
⑬	1	RB0	O	
	2	RB1	O	
	3	RB2	O	
	4	RB3	O	
	5	HDL	O	HOLD LED light on
	6	PSL	O	PG.S LED light on
	7	MSL	O	M.S LED light on
⑭	1	SB1	O	} LCD display data
	2	SB2	O	
	3	MRQ	O	Data clock for sub $\mu$ -processor
	4	SB3	O	} LCD display data
	5	SB0	O	
	6	GND		GND
⑮	1	GND		GND
	2	5DA	I	+ 5V
	3	10DA	I	+ 10V
⑯	1	5V	O	+ 5V for DC-DC unit
	2	GND		GND
	3	DIM	O	DIM data for DC-DC unit, DIM SW OFF : 0V
⑰	1	GND		GND
	2	ENC	I	Main encoder pulse

Terminal			Terminal Function
No.	Name	I/O	
⑱	1	VDD	O + 5V for photo coupler
	2	GND	GND
	3	TXD	O TX data
	4	RXD	I RX data
	5	CTS	I Clear to SEND
	6	RTS	O Request to SEND
⑲	1	CLK	O Clock
	2	B	O + 10V for interface
	3	RDY	I RADY
	4	CD	O Control data
	5	CS	O Chip select
	6	R	O Read
	7	WR	O Write
	8	GND	GND
⑳	1	RES	O Reset
	2	D0	I/O Data 0
	3	D1	I/O Data 1
	4	D2	I/O Data 2
	5	D3	I/O Data 3
	6	D4	I/O Data 4
	7	D5	I/O Data 5
	8	D6	I/O Data 6
	9	D7	I/O Data 7
<b>CAR UNIT (X54-1840-00 : A/2)</b>			
①	1	15V	I + 15V
	2	5V	I + 5V
	3	UL1	O Unlock signal
	4	CL4	I PLL clock for CAR1 (455kHz)
	5	DA3	I } PLL data for CAR1, CAR2
	6	DA2	I }
	7	DA1	I }
	8	DA0	I }
	9	CL5	I PLL clock for CAR2 (9.285MHz)
	10	LSB	I LSB, FLS : H
	11	USB	I USB, CW, AM, FM, TUNE : H } CAR1 f shift
②	1	GND	GND
	2	CR2	O CAR2 for IF unit (455kHz)
	3	GND	GND
	4	117	O 117MHz for PLL unit
	5	GND	GND
	6	10	I 10MHz
	7	GND	GND
	8	CR0	O CAR0 for SSB, FSK AM monitor (8.83MHz)
	9	GND	GND
	10	CR0	O Carrier for TX, CW, FM (8.83MHz)
	11	GND	GND
	12	CR1	O CAR1 for IF unit (455kHz)
<b>DIGITAL B UNIT (X54-1840-00 : B/2)</b>			
①	1	GND	GND
	2	ME1	I } Main encoder pulse input
	3	ME2	I }
	4	5V	O + 5V for main encoder
②	1	TRQ	I AT STBY signal, Tuning : H
	2	AS1	O } ATT SW data
	3	AS2	I }
	4	ATB	I ATT-THRU : 21V
③	1	GND	GND
	2	17	O } Multiplex switch data
	3	16	O }
	4	15	O }
	5	14	O }
④	1	UL	I Unlock signal
	2	TR	I TX : 15V
⑤	1	MU	I MIC UP
	2	MD	I MIC DOWN
	3	8C	O + 8V for MIC connector

Terminal			Terminal Function
No.	Name	I/O	
⑥	1	M▶V	I M▶VFO KEY
	2	MIN	I M. IN KEY
	3	LOK	I F. LOCK KEY
	4	SPT	I SPLIT KEY
	5	A/B	I A/B KEY
	6	BD	I BAND DOWN KEY
	7	BU	I BAND UP KEY
	8	ATT	I ATT KEY
	9	GND	GND
⑦	1	10	I 10Hz digit display data
	2	100	I 1MHz 100kHz switching signal
	3	MB0	I Memory bank SW, 2, 3 : H
	4	MB1	I Memory bank SW, 1, 3 : H
⑧	1	B3	I } 10 KEY (BAND) matrix data
	2	B2	I }
	3	B1	I }
	4	B0	I }
	5	M/V	I M/V KEY
	6	TFS	I TFS KEY
	7	A=B	I A=B KEY
	8	VRC	I VOICE KEY
⑨	1	VB0	I Bit 0
	2	VB1	I Bit 1
	3	VB2	I Bit 2
	4	VB3	I Bit 3
	5	VB4	I Bit 4
⑩	1	ENT	I ENT KEY
	2	MCE	I MCE KEY
	3	NRQ	O TRQ output for keyboard ass'y
	4	WIDE	I NAR/WIDE SW, WIDE : 15V
	5	M2	I } MODE KEY matrix data
	6	M1	I }
	7	M0	I }
	8	RCL	I RIT CLEAR KEY
	9	XIT	I XIT KEY
	10	RIT	I HOLD KEY
	11	HLD	I HOLD KEY
	12	PSC	I PG.S KEY
	13	MS	I MS KEY
⑪	1	RC	I RIT CLEAR pulse
	2	CN	I Multiplex control data for switches
	3	13	O } Multiplex switch data
	4	12	O }
	5	11	O }
	6	10	O }
	7	SL3	I } Multiplex select data for switches
	8	SL2	I }
	9	SL1	I }
	10	SLO	I }
⑫	1	GND	GND
	2	RE2	I RIT encoder pulse 2
	3	RE1	I RIT encoder pulse 1
	4	5V	O + 5V for RIT encoder
⑬	1	HS	I LCD DATA accept message
	2	8B	I + 8V for MIC connector
	3	5C	I + 5V
	4	GND	GND
⑭	1	GND	GND
	2	ENC	O Main encoder pulse output
<b>DIGITAL C UNIT (X54-1850-00)</b>			
①	1	B2	I } Multiplex segment data
	2	B3	I }
	3	B4	I }
	4	B5	I }
	5	B6	I }
	6	B7	I }



# TERMINAL FUNCTION TS-940S

Terminal			Terminal Function
No.	Name	I/O	
②	1	G1	} Grid data
	2	G2	
	3	G3	
	4	G4	
	5	SC	Scale data
③	1	5V	+ 5V
	2	GND	GND
	3	HV	-40V for drive display tube
④	1	B0	Segment data DP
	2	B1	Segment data g
	3	C0	Segment data P10
	4	C1	Segment data P9
	5	C2	Segment data P8
	6	C3	Segment data P7
	7	C6	} Segment control data
	8	C7	
⑤	1	G5	} Grid data
	2	G6	
	3	G7	
	4	G8	
	5	G9	
	6	G10	
	7	LOCK	Segment data F. LOCK
⑥	1	FH	} Filament voltage for display
	2	FG	
⑦	1	f	Segment data f
	2	LOCK	LOCK display data
	3	FH	Heater for display tube
	4	VFO A	VFO A display data
	5	VFO B	VFO B display data
	6	G10	Grid data No. 10
	7	d	Segment data d
	8	e	Segment data e
⑧	1	G9	Grid data No. 9
	2	G8	Grid data No. 8
	3	P1	} Analog digit data
	4	P2	
	5	G7	Grid data No. 7
	6	P3	} Analog digit data
	7	P4	
	8	G6	Grid data No. 6
	9	P10	Analog digit data
	10	G5	Grid data No. 5
	11	P9	Analog digit data
	12	MEMO	MEMO display data
⑨	1	g	Segment data g
	2	c	Segment data c
	3	G4	Grid data No. 4
	4	P8	Analog digit data
	5	G3	Grid data No. 3
	6	P7	} Analog digit data
	7	P6	
	8	G2	Grid data No. 2
	9	P5	Analog digit data
	10	G1	Grid data No. 1
	11	b	Segment data b
	12	-	- (minus) display data
⑩	1	SC	Scale display data
	2	a	Segment data a
	3	DP	Dot display data
	4	FG	Heater for display tube
	5	RIT	RIT display data
	6	XIT	XIT display data
<b>AT UNIT (B) (X57-1130-00)</b>			
⑪	1	GND	GND
	2	ATS	AT start pulse

Terminal			Terminal Function
No.	Name	I/O	
⑫	1	15B	+ 15V
	2	TRQ	AT STBY signal for Control unit
	3	TV	TX : 15V
⑬	1	TRQ	AT STBY signal for Digital B unit
	2	AS1	} ATT KEY signal (ATT ON : L)
	3	AS2	
	4	ATB	confirmation signal for AT installed. AT THRU : 21V
⑭	1	ATB	AT THRU : 21V
	2	TRQ	AT STBY signal for MB control
	3	TV	TX : 15V
	4	MB	Tuning : 14V
⑮	1	GND	GND
	2	10	+ 10V
	3	5	+ 5V
	4	14	+ 14V
	5	21B	+ 21V
⑯	1	28	NC
	2	21B	+ 21V
⑰	1	ATV	TX : 15V
	2	TNQ	AT STBY signal for SW unit (L)
<b>AT UNIT (B) (X57-1130-00)</b>			
⑱	1	ATH	AT LED anode
	2	ATL	AT LED cathode
⑲	1	ATB	AT THRU : 21V
	2	TRQ	AT STBY signal for MB control
	3	TV	TX : 15V
	4	MB	Tuning : 14V
⑳	1	MB	Tuning : 14V
	2	GND	GND
	3	21B	+ 21V for AT unit (C)
㉑	1	ATI	AT IN : 15V
	2	LED	TUNE LED light on
㉒	1	21B	+ 21V
	2	5	+ 5V
	3	10	+ 10V
	4	14	+ 14V
	5	GND	GND
㉓	1	GND	GND
	2	ISW	SWR level
㉔	1	M1-	} Tuning motor control
	2	M1+	
	3	M2-	
	4	M2+	
<b>AT UNIT (C)</b>			
㉕	1	WRC	} AT BAND data
	2	AT0	
	3	AT1	
	4	AT2	
	5	AT3	
㉖	1	21B	+ 21V
	2	GND	GND
	3	MB	Tuning : H
㉗	1	M1-	} Magnetic brake relay terminal for AT tune finish
	2	M1+	
	3	M2-	
	4	M2+	



# TS-940S SPECIFICATIONS

## [General]

<b>Transmitter Frequency :</b>	
Range .....	160m Band 1.8–2.0MHz 80m Band 3.5–4.0MHz 40m Band 7.0–7.3MHz 30m Band 10.1–10.15MHz (10.0MHz WWV) 20m Band 14.0–14.35MHz 17m Band 18.068–18.168MHz 15m Band 21.0–21.45MHz 12m Band 24.89–24.99MHz 10m Band 28.0–29.7MHz
<b>Receiver Frequency :</b>	
Range .....	150kHz–30MHz
Mode .....	A3J (USB, LSB), A1 (CW), F1 (FSK), A3 (AM), F3 (FM)
Frequency Stability .....	$\pm 10 \times 10^{-6}$ (0°C–+50°C)
<b>Antenna Impedance with AT-940 antenna tuner . . .</b> 50 $\Omega$	
	20–150 $\Omega$ (Transmission only)
<b>Power Requirement</b> .....	120/220/240 VAC, 50/60Hz
<b>Power dissipation</b> .....	Max. 510W during transmission, 80W during reception
<b>Grounding</b> .....	Negative
<b>Dimensions</b> .....	W401 x H141 x D350mm W409 x H154 x D420mm (Projections Inc.) W160.4 x H56.4 x D140 inch W163.6 x H61.6 x D168 inch (Projections Inc.)
<b>Weight</b> .....	With antenna tuner : Approx. 20kg Without antenna tuner : Approx. 18.5kg

## [Transmitter]

<b>Rated Final Power Input</b> .....	250W (160–15m bands in SSB, CW, FSK, FM) 250W (10m Band in SSB, CW, FSK, FM) 140W (in AM)
<b>Modulation</b> .....	SSB : Balanced, FM : Reactance, AM : Low level
<b>Maximum Frequency Deviation</b> .....	$\pm 5$ kHz
<b>RTTY Shift</b> .....	170Hz
<b>Carrier Suppression</b> .....	–40dB or less (in CW)
<b>Unwanted Sideband Suppression</b> .....	Better than 50dB (with 1.5kHz modulation)
<b>Third Harmonic Modulation Distortion</b> .....	–31dB or less (based on single tone output)
<b>Microphone Impedance</b> .....	500 $\Omega$ –50k $\Omega$
<b>Frequency Response</b> .....	400–2600Hz at –6dB in SSB

## [Receiver]

<b>Circuitry</b> .....	Quadruple conversion for SSB, CW, AM, FSK, Triple conversion for FM
<b>Intermediate Frequencies</b> .....	1st IF : 45.05MHz, 2nd IF : 8.83MHz * 3rd IF : 455kHz, 4th IF : 100kHz
<b>Sensitivity :</b>	
150kHz–500kHz .....	10dB S/N 10dB $\mu$ (1 $\mu$ V) or less in SSB, CW and FSK 10dB S/N 10dB $\mu$ (10 $\mu$ V) or less
500kHz–1.8MHz .....	10dB S/N 12dB $\mu$ (4 $\mu$ V) or less in SSB, CW and FSK 10dB S/N 30dB $\mu$ (32 $\mu$ V) or less in AM
1.8MHz–30MHz .....	10dB S/N –14dB $\mu$ (0.2 $\mu$ V) or less in SSB, CW and FSK 10dB S/N 6dB $\mu$ (2 $\mu$ V) or less in AM 12dB SINAD –6dB $\mu$ (0.5 $\mu$ V) or less in FM
<b>Squelch Sensitivity</b> .....	–10dB $\mu$ (0.32 $\mu$ V) or less
<b>Image Ratio</b> .....	80dB or more in 1.8–30MHz
<b>IF Rejection</b> .....	70dB or more in 1.8–30MHz
<b>Selectivity :</b>	
(SSB, CW, AM (N), FSK) .....	2.4kHz or more/–6dB, 3.6kHz or less/–60dB
(AM (W)) .....	–6kHz or more/–6dB, 18kHz or less/–50dB
(FM) .....	12kHz or more/–6dB, 24kHz or less/–60dB
<b>Variable Range with SSB filter :</b>	
(SSB Slope Tune) .....	High-cut : 1500Hz or more, Low-cut : 700Hz or more without SSB filter
(CW VBT) .....	600Hz–2.4kHz variable continuously
<b>RIT/XIT Variable Range</b> .....	$\pm 9.99$ kHz
<b>Notch Filter Attenuation</b> .....	40dB or more
<b>Audio Output</b> .....	1.5W (at 8 ohm load/10% distortion)
<b>Audio load Impedance</b> .....	8 ohms

**Note :** Circuits and ratings subject to change without notice due to developments in technology.

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