



HF TRANSCEIVER  
**TS-940S**  
ALIGNMENT INSTRUCTIONS

TRIO-KENWOOD CORPORATION



# ADJUSTMENT

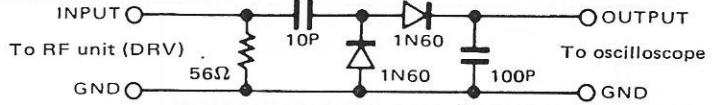
## REQUIRED TEST EQUIPMENT

1. DC Voltmeter (DC V.M)
  - 1) Input resistance : More than  $1M\Omega$
  - 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 :  $1M\Omega$  and less than  $3pF$ , 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 :  $1M\Omega$  or greater
  - 3) Voltage range : 10mV to 30V
5. AF Generator (AG)
  - 1) Frequency range : 200Hz to 5kHz
  - 2) Output : 1mV or less to 1V, low distortion
6. AF Dummy Load
  - 1) Impedance :  $8\Omega$
  - 2) Dissipation : 3W or greater
7. Oscilloscope (SCOPE)
 

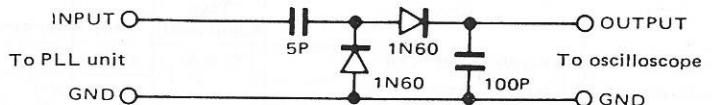
Requires high sensitivity, and external synchronization capability.
8. Sweep Generator (SWEEP)
  - 1) Center frequency : 50kHz to 90MHz
  - 2) Frequency deviation : Maximum  $\pm 35MHz$
  - 3) Output voltage : 0.1V or greater
  - 4) Sweep rate : At least 0.5sec/cm
9. Standard Signal Generator (SSG)
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

NOTE : Generator must ve 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 cintinuous or greater
  - 3) Frequency limits : 60MHz or greater
14. Spectrum Analyzer (SPE-ANA)
  - 1) Frequency range : 100kHz to 110MHz or greater
  - 2) Bandwidth : 1kHz to 3MHz
15. Detector
  - 1) For adjustment of TX BPF

To RF unit (DRV)      To oscilloscope

GND      GND

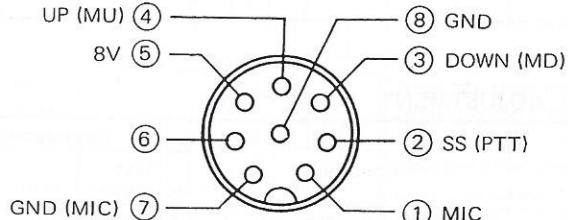
  
  - 2) For adjustment of PLL/VCO BPF

To PLL unit      To oscilloscope

GND      GND
16. Directional Coupler
17. Monitor Receiver
 

R-1000 class
18. Microphone
 

MC-60S8 or MC-42S



MIC terminals (view from front panel side)

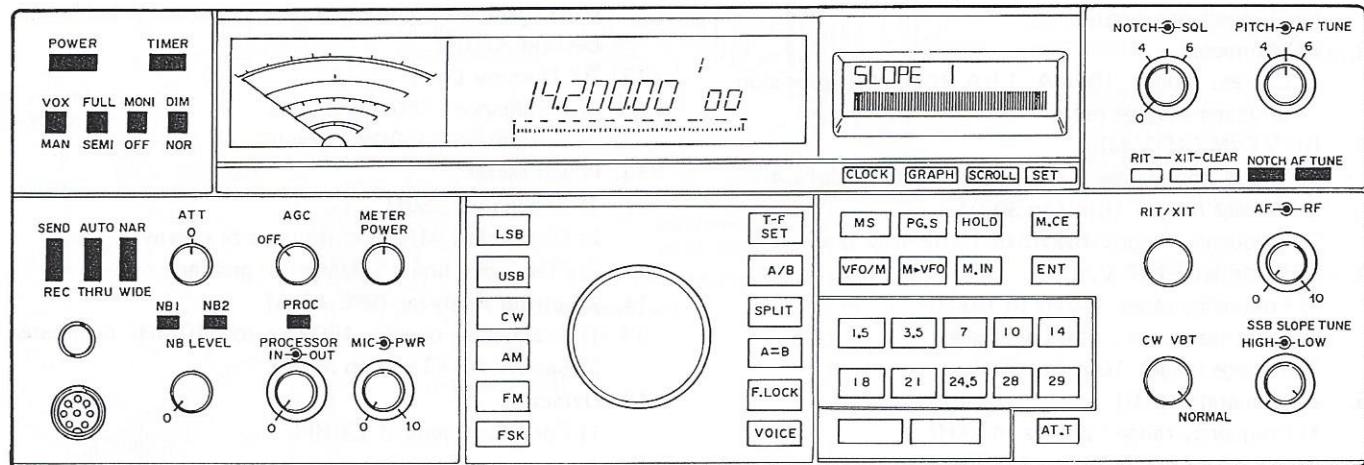
## ADJUSTMENT

## PREPARATION

Unless otherwise specified, set the controls as follows :

- Power ON, holding A=B SW, keep □ condition from □ or □ SW's which marked ■.  
(other push SW's are nonlock type or tact SW.)

- 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



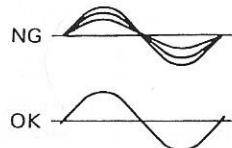
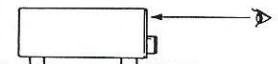
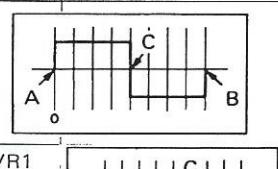
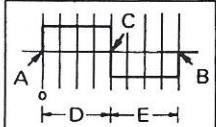
## VOLTAGE ADJUSTMENT AND CONFIGURATION

Item	Condition	Measurement			Adjustment			Specification/Remarks
		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
			IF	RB (10)-5	CONT	VR1	ADJ to 2.1V	2.1V±0.01V
			RF	AGC (4)-2	IF	VR5	ADJ to 3.2V	3.2V±0.01V
			IF	W31			Confirm	About 14V
			IF	W22				About 12V
			IF	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

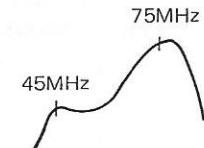
## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specification/Remarks
		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 
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	3.20V±0.01V
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 voltage changes from about 2.5V to 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
	2) VCO2 Display : 19.499.99MHz			VC2 (9)-2		L68		12.00V±0.01V
	3) VCO3 Display : 30.000.00MHz					L71		12.00V±0.01V
9. Main encoder	1) Remove the VFO knob and motor-drive the encoder at approx. 300rpm.	SCOPE	Digital B	Connec- tor (1) ME 1–2	Main encod- er	VR1		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					VR2		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.			Connec- (1) ME 2–3			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 ⑪ 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° ± 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.  2) RE1 duty ratio adjustment : Turn a motor CW and CCW  3) RE2 duty ratio adjustment : Turn a motor in the both direction  4) RE1, RE2 phase difference alignment : Same as above.	SCOPE	Digital B	Connector ⑫ RE1-3	RIT encoder	VR1		Point C may be located anywhere. When a motor is not available, manually turn the RIT to check the duty ratio.
				Connector ⑫ RE2-2		VR2	Adjust until intervals D and E are equal to each other with point C placed at the center.	After adjusting with the RIT control tuned CW, check that intervals D and E are also identical when the RIT control is turned CCW.
				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  2) STBY : SEND  3) STBY : REC MODE : LSB	FREQ. C DC V.M	IF	CR1 ⑯ -2	CAR	TC1	ADJ to 453.50kHz	453.50kHz±50Hz
			CAR	TP1		L6	ADJ to 7.0V	7.00±0.04V
			IF	CR1 ⑯ -2			Confirm	Same frequency as REC.
						TC2	ADJ to 456.50kHz	456.50kHz±50Hz

## ADJUSTMENT

Item	Condition	Measurement			Adjustment		Specification/Remarks	
		Test equipment	Unit	Terminal	Unit	Part		
11. CAR1 adjustment	4) STBY : SEND	FREQ. C DC V.M	IF	CR1 <u>(18)</u> -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							457.20kHz±50Hz
12. CAR2 Adjustment	1) MODE : CW	FREQ. C	IF	CR1 <u>(18)</u> -2	CAR		Confirm	9.285.00±50Hz (0.3Vrms)
			IF	W25	CAR	TC3	ADJ to 9.285.0MHz	7.00V±0.04V
			CAR	TP2		L10	ADJ to 7.0V	
	2) STBY : SEND		IF	W25			Confirm	Same frequency as REC.
13. CAR3 Adjustment and con- firmation	1) MODE : CW	CONT	CR3 <u>(35)</u> -4	IF	L20	ADJ to 100.0kHz	100.0kHz±20Hz	
	2) MODE : USB : LSB : AM : FM : FSK						USB : 98.5kHz±250Hz LSB : 101.5kHz±200Hz AM : 100.0kHz±100Hz FM : 100.0kHz±100Hz FSK : 101.5kHz±200Hz	
14. CAR4 Adjustment	1) MODE : CW	FREQ. C	CONT	CR4 <u>(35)</u> -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 <u>(2)</u> -4	CAR	L19 L20	ADJ to MAX.	(REF. 100mV±50mV)
16. VCO BPF		SWEET 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 RF	ANT RIF	RF	L2, L31– 33,40, 44	Adjust as shown at right.	
	2) BAND : 14.0–20.0MHz FREQ : 18,000.0kHz					L28– 30		
	3) BAND : 8.5–14.0MHz FREQ : 10,000.0kHz					L25– 27		

## ADJUSTMENT

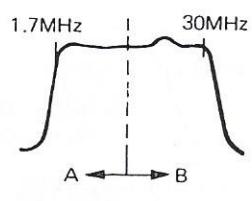
Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
1. 0.1–30MHz BPF	4) BAND : 7.0–8.5MHz FREQ : 7.000.0kHz	SWEEP Detector SCOPE	Body RF	ANT RIF	RF	L22–24	Adjust as shown at right.	7MHz 8.5MHz
	5) BAND : 4.0–7.0MHz FREQ : 6.900.0kHz					L18–21		4MHz 7MHz
	6) BAND : 3.0–4.0MHz FREQ : 3.900.0kHz					L14–16		3MHz 4MHz
	7) BAND : 1.5–3.0MHz FREQ : 1.900.0kHz				RF	L11–13		1.5MHz 3MHz
	8) BAND : 0.5–1.5MHz FREQ : 1.000.0kHz					L9, 10		0.5MHz 1.5MHz
	9) BAND : 100–500kHz DISPLAY : 300.0kHz					L5–7		100kHz 500kHz
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	45.047 45.053 0.5dB
			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				IF L7–15,17, 23–25			
4. NOTCH	1) NOTCH VR : Center SSG : 0dB	SSG AF V.M SP SCOPE			L16 VR2	ADJ the AV VR to 800Hz/0.63V. Repeat ADJ for MIN AF output.	Dip point should be in between 11–1 o'clock position.	
	2) NOTCH SW : ON SSG : 40dB							
5. IF TRAP Coil	BAND : 1.400MHz SSG : 45.05MHz 80dB	SSG AF V.M SP SCOPE		RF	L2	Set the core all the way inside. ADJ for MIN AF output.		
					L40			
6. S meter	BAND : 14.175MHz SSG : 0dB	SSG AF V.M SP SCOPE		IF	VR3	ADJ meter needle for mechanical $\phi$ point. Set the VR1 to CCW.		
				RF	VR1			

## ADJUSTMENT

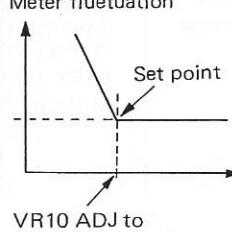
Item	Condition	Measurement			Adjustment			Specification/Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method	
6. S meter	SSG : 8dB AGC : FAST				IF	VR1	ADJ to S1	S1 : 8dB +6dB -4dB
	SSG : 40dB					VR4	ADJ to S9	S9 : 40dB±6dB
							Repeat ADJ S1 and S9.	S9 + 60dB : 100dB±10dB
7. ATT Confirmation	BAND : 14.175MHz	SSG AF V.M SP		PAN-EL	ATT	ATT : 10dB 20dB 30dB	SSG 50dB 60dB 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)						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)					L2,3	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.	

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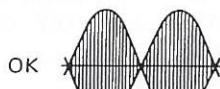
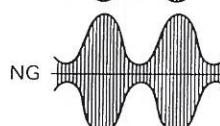
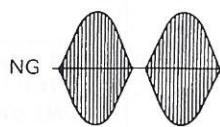
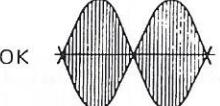
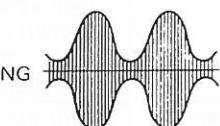
## TX ADJUSTMENT

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		
	2) MODE : CW				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, re-connected 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	FI-NAL	L7	FI-NAL	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.)						Read the meter when VR1 is at MIN. Then ADJ VR1 so that the current is increased by 1.3A.	1.3A±0.2A
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.	

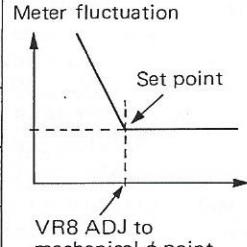
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		Test equipment	Unit	Terminal	Unit	Part	Method			
6. VC, IC METER and current limiter	1) METER : IC STBY : SEND		Meter		CONT	VR10	Set for mechanism start point.	 <p>IC meter Meter fluctuation</p> <p>Set point</p> <p>VR10 ADJ to mechanical φ point</p>		
	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		
	3) METER : IC (After ADJ, STBY : REC)				CONT	VR11	ADJ to 28.5V	28.5V±0.5V		
	4) MODE : CW CAR LEVEL : 10 (After ADJ, STBY : REC)					VR7	ADJ to 10A	10A±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		VR12	ADJ to 0.5V	0.5V±0.01V		
	3) ANT : OPEN					VR18	ADJ to "3".	SWR : 3		
	4) ANT : 50Ω Dummy load		Power meter			Confirm		SWR : ∞		
						Confirm		SWR less than 1.2		

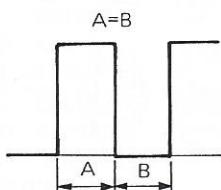
## ADJUSTMENT

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 Rear panel SCOPE AG	ANT (Directional coupler) DG-B (CAR) MIC	10kΩ AG1 300Hz AG2 2700Hz	7mV 560Ω	TC1	ADJ as shown at right. (Equal 300Hz, 2.700Hz amplitude within 5W.)	  	
	2) MODE : LSB						Calibrate scope.		
	3) MODE : USB, LSB AG : 1500Hz, 5mV STBY : SEND						Confirm		
	4) MODE : USB, LSB AG : 2600Hz, 5mV STBY : SEND					TC2	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 SCOPE	IF AFS (24) -3	ANT (Directional coupler)	DG-B (CAR)	TC2	Turn comp VR CW until get enough signal to measure. ADJ TC2 and TC3 as shown at right.	 	
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 VR6	MIN (Adjust alternately.) Adjust for no difference between USB and LSB.		
	2) MODE : CW CAR CONTROL : MAX STBY : SEND						Calibrate Oscilloscope (SPE-ANA)		
	3) MODE : USB ↔ LSB STBY : SEND						Check If less than -50dB, repeat adjustment 1).	-50dB or less.	
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.	
	2) ALC Meter zero ADJ				SW	MIC GAIN	ADJ for ALC meter zero point.	
	3) AG : 6dB up (After ADJ, STBY : REC)				CONT	VR9	ADJ for ALC zero MAX.	
	4) MODE : FM BAND : 29.25MHz (After ADJ, STBY : REC)				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.	
	2)					VR10	ADJ for MIN comp meter reading.	
	3) AG (MIC) : 20dB up (10mV)				Panel	Processor IN	ADJ for S1, S-meter reading.	
	4) AG (MIC) : 10dB up (32mV)				IF	VR7	ADJ for S1 + 20dB comp meter reading. Repeat ADJ 2), 3).	
	5) METER : ALC (After ADJ, STBY : REC)						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/8Ω 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/8Ω±3dB
	2) MIC terminate with 50kΩ MIC VR : MIN (After ADJ, STBY : REC, MONI : OFF)				CONT	VR13	ADJ to 0.63V/8Ω	
							Don't move AF VR and confirm the hum and noise.	
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  STBY : SEND					VR10	29.930MHz : MIN (S meter and AF output.)	
					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 installed.)	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	ADJ VR102 until ANT TUN indicator just goes off.
	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.	SWR 1.2 or less.
	4) Check at the each center frequency of the HAM BAND						Confirm	

## 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 "14.000.000" 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 "14.000.000" While pressing.
	3) Push A/B SW once.	Display : "VFO B" "14.000.000" and tone sounds.
	4) STBY : SEND	Display : "VFO A"
	5) STBY : REC	Display : "VFO B"

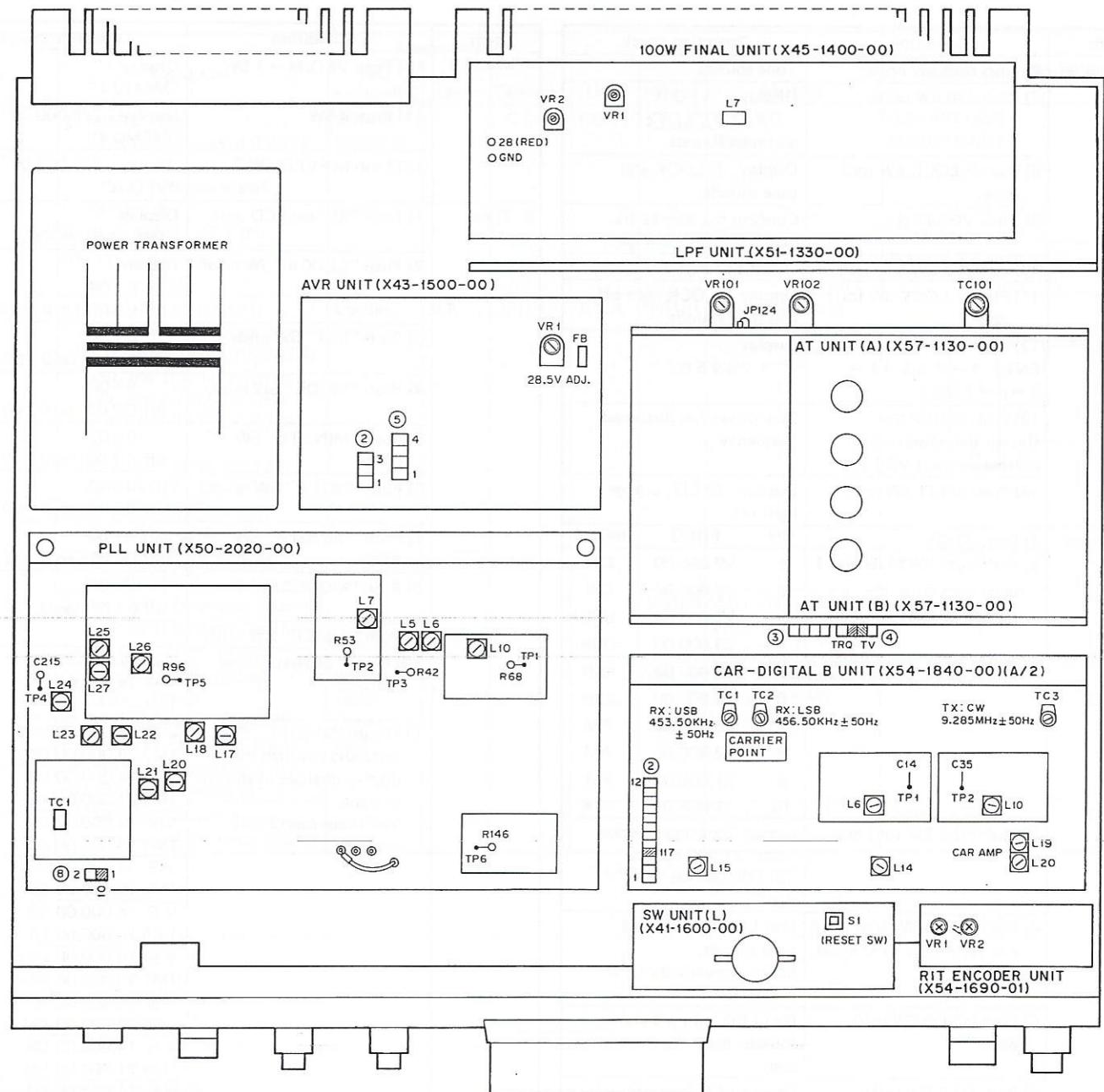
## ADJUSTMENT

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 "MEMORY 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)

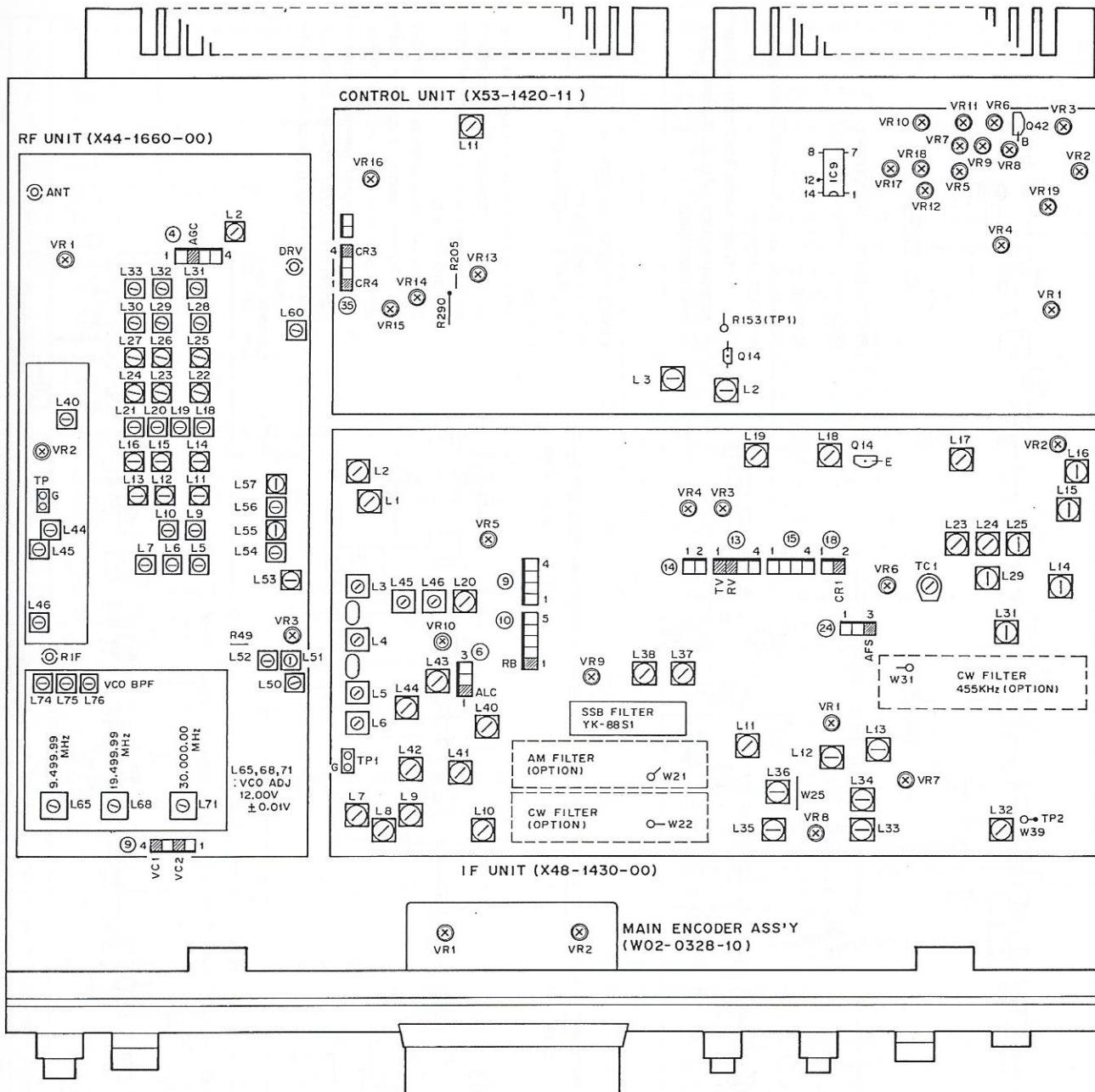
VR101 : Waveform ratio (A=B)  
VR102 : ANT TUNE indicator goes off

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)

L<sub>2</sub>,40 : IF TRAP adj. (BAND 1.400MHz, SSG : 45.05MHz 80dB)  
 L<sub>5</sub>–7 : BPF 100–500kHz (Freq. : 300.0kHz)  
 L<sub>9</sub>,10 : BPF 0.5–1.5MHz (Freq. : 1,000.0kHz)  
 L<sub>11</sub>–13 : BPF 1.5–3.0MHz (Freq. : 1,900.0kHz)  
 L<sub>14</sub>–16 : BPF 3.0–4.0MHz (Freq. : 3,900.0kHz)  
 L<sub>18</sub>–21 : BPF 4.0–7.0MHz (Freq. : 6,900.0kHz)  
 L<sub>22</sub>–24 : BPF 7.0–8.5MHz (Freq. : 7,000.0kHz)  
 L<sub>25</sub>–27 : BPF 8.5–14MHz (Freq. : 10,000.0kHz)  
 L<sub>28</sub>–30 : BPF 14.0–20.0MHz (Freq. : 18,000.0kHz)  
 L<sub>31</sub>–33 : BPF 20.0–31.0MHz (Freq. : 29,500.0kHz)  
 L<sub>44</sub>–46 : MCF (Center freq. : 45.050MHz)  
 L<sub>50</sub>–52 : DRIVE adj.  
 L<sub>53</sub>,55,57 : TX BPF 1.7MHz Side (A)  
 L<sub>54</sub>,56,60 : TX BPF 30MHz Side (B)  
 L<sub>65</sub> : VCO1 adj. (9.499.99MHz)  
 L<sub>68</sub> : VCO2 adj. (19.499.99MHz) } 12.00V±0.01V  
 L<sub>71</sub> : VCO3 adj. (30,000.00MHz)

- 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 $\phi$ 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. 21.55MHz (AM 21.1MHz)
VR9	:	ALC LEVEL adj. (FM 29.25MHz)
VR10	:	MIXER BALANCE adj. (CW 29.930MHz)

CONTROL UNIT (X53-1420-11)

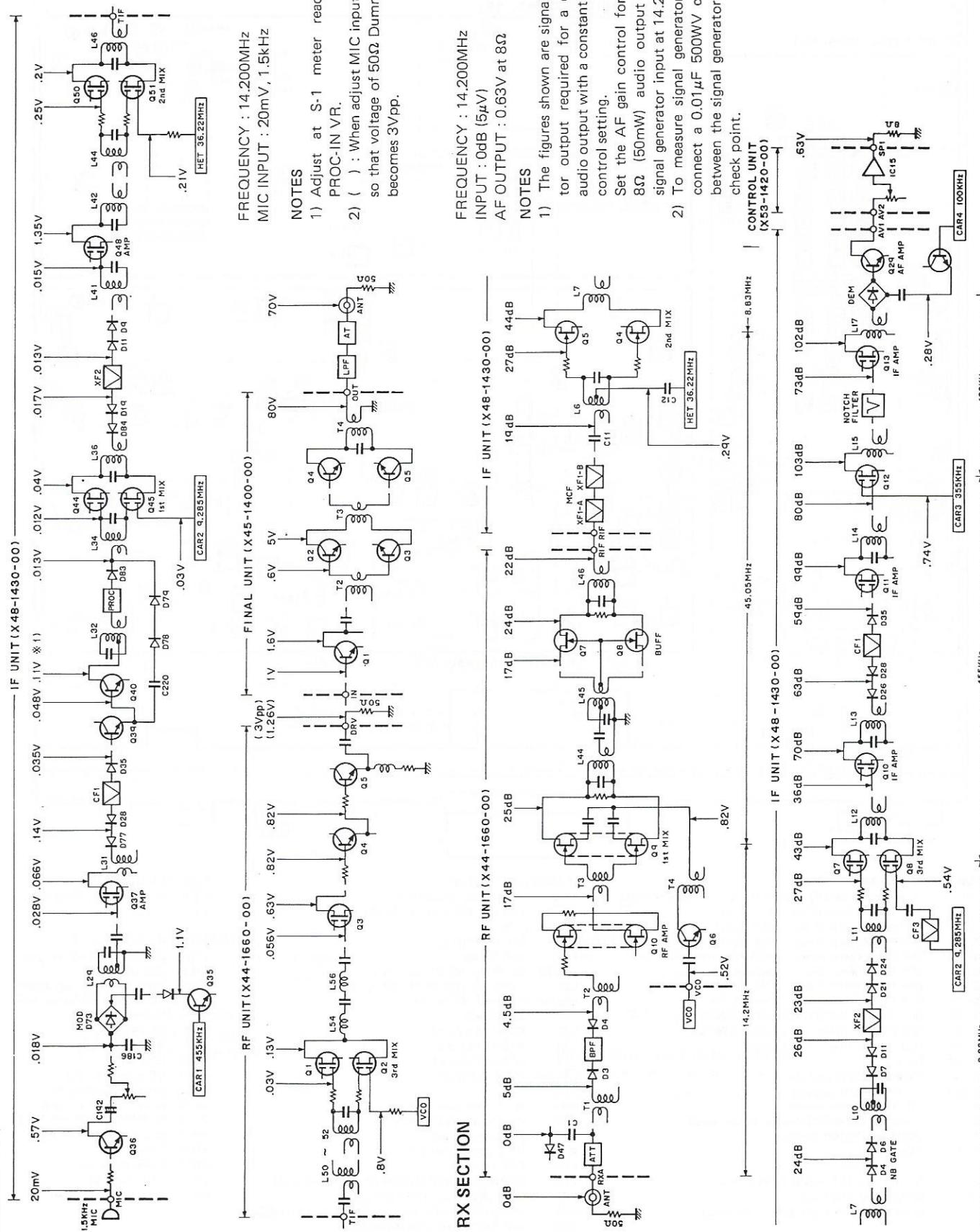
L2,3 : SSB IF GAIN (MIN. adj.)  
 L11 : FM IF GAIN  
 VR1 : RB adj. 2.1V  
 VR2 : MAX POWER adj. (110W)  
 VR3 : ALC adj. 3.2V  
 VR5 : SWR protection adj. (100W)  
 VR6 : Current protection adj. 14A  
 VR7 : IC meter adj. 10A  
 VR8 : ALC- $\phi$  adj.  
 VR9 : ALC meter adj.  
 VR10 : IC- $\phi$  adj.  
 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)

**TS-940S**

## LEVEL DIAGRAM

TX SECTION

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# 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			
	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			
	2 SB1	I			
	3 SB2	I			
	4 SB3	I			
	5 MRQ	I	Display data for LCD		
	6 GND		Clock for data		
(4)	1 GND		GND		
	2 RS	O	Resister, select signal		
	3 RW	O	Write/Read signal		
	4 LE	O	Latch signal		
	5 DB4	O			
	6 DB5	O			
	7 DB6	O			
	8 DB7	O			
	9 5L				
	10 LG	O	+ 5V for LCD ass'y		
(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	I	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				
	3 VE		Sub diaplay contrast		
<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 μ-com, SEND : H, REC : L		
(15)	1 ATT1	O			
	2 ATT2	O	}ATT relay drive 0, 20dB : 15V 0, 10dB : 15V		
(16)	1 NAR	I	NAR LED control for Mode + 15V		
	2 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				
	4 MVG	I	}MIC line GND		
	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 AG0	O	AGC OFF : 15V		
	7 NAF	I	SSB, FSK, CW mode : 15V		
	8 AGS	O	AGC SLOW : 15V, Normally : -12V		
	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>					
(22)	1 CWB	I	CW mode : 15V		
	2 GND		GND		
	3 15V	I	+ 15V		
(23)	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)		
(24)	1 GND		GND		
	2 RCL	O	CLEAR SW		
	3 XIT	O	XIT SW		
	4 RIT	O	}ON : L RIT SW		
<b>SWITCH UNIT (K)</b>					
(25)	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		GND	
	4	ANV	O	ANTI VOX VR	
	5	MVG		Mic line GND	
	6	FMC	O	FM MIC GAIN VR	
	7	DLY	I	VOX DELAY VR	
	8	VXG		GND	
	9	VX2	O	VOX GAIN VR	
(27)	1	MVG		Mic line GND	
	2	MV1	I	FM MIC GAIN VR, VOX GAIN VR	
(28)	1	CV2	O	CAR VR	
	2	CV1	I		
(29)	1	MBO	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		Sub display contrast	
	3	VE			
<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		MIC GND	
	7	GND		GND	
<b>SWITCH UNIT (H)</b>					
(33)	1	GND		GND	
	2	REC	O	RX AFSK signal MIC select STBY control TX AFSK signal	
	3	MSL	O		
	4	SS	I		
	5	MIN	I		
	6	GND			
	7	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		
	12	G9	I	Grid data No. 8	
				Grid data No. 9	

Terminal			Terminal Function		
No.	Name	I/O			
<b>SWITCH UNIT (E)</b>					
(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		
	9	P8	I		
	10	G4	I		
	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 (C)</b>					
(40)	1	NBL	O	NB LEVEL VR	
	2	GND		GND	
	3	MVG		Mic line GND	
	4	PIL	O	PROC-IN VR	
	5	15	I	+ 15V	
	6	MVG		Mic line GND	
	7	MG	O	MIC GAIN VR	
	8	MVG		Mic line GND	
	9	MV1	O	MIC GAIN VR	
(41)	1	GND		GND	
	2	PC	O	Power control VR	
(42)	1	PC1	O	Power control VR	
	2	PC2	I		
<b>SWITCH UNIT (B)</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		GND	
	5	NTH	I	NOTCH SW ON : 15V	
(45)	1	NTL	O	NOTCH LED light on, NOTCH SW ON : H	
	2	FMG	I	FM mode : 0V	
(46)	1	SQ2	O	SQL VR	
	2	SQ1	I		
<b>SWITCH UNIT (A)</b>					
(47)	1	GND		GND	
	2	AVG		AF line GND	
	3	AV2	O	AF GAIN VR	
	4	AVG		AF line GND	
	5	AV1	I	AF GAIN VR	
	6	RFG	O	RF GAIN VR	

# TERMINAL FUNCTION TS-940S

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

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

# 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 CRO	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)		
(19)	1 PRS	I	SSB mode PROC SW ON : 15V		
	2 PRM	O	PROC meter		
	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	I	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			
(24)	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>					
(2)	1 DA0	O	PLL data for CAR1, CAR2		
	2 DA1	O	}		
	3 DA2	O	}		
	4 DA3	O	}		
	5 UL1	I	Unlock signal		
(3)	1 GND		GND		
	2 DA0	I	}		
	3 DA1	I	PLL data		
	4 DA2	I	}		
	5 DA3	I	}		
(4)	1 CL2	I	Data clock for IC8		
	7 CL1	I	Data clock for IC9		
	8 CL0	I	Data clock for IC19		
(5)	1 GND		GND		
	2 117	I	117MHz from CAR unit		
	1 FMM	I	FM modulate signal		
	2 GND		GND		
	3 15A	I	+ 15V		
(6)	4 UL	O	PLL unlock signal		
	5 5	I	+ 5V		
	1 KFS	I	RTTY KEY signal, KEY DOWN : L		
	2 GND		GND		
	3 MKR	O	100kHz marker signal output		
	4 MKG		NC		
(7)	5 GND		GND		
	6 MKS		Marker ON : L, Normally : H		
	1 AFS	O	AFSK signal (2290/2125Hz)		
(8)	2 GND		NC		
	3 FSB	I	FSK mode data, FSK : 15V		
(10)	1 10	O	10MHz for CAR unit		
	2 GND		GND		
	1 TCB	I	Power supply for IC18		
	2 VC2	O	Control voltage for RF unit VCO3		
(11)	3 GND		GND		
	4 VC1	O	Control voltage for RF unit VCO1, 2		
	1 PLE	I	Data latch for IC17		
	2 CL3	I	Clock for IC17		
(12)	3 PLD	I	PLL data IC17		
	1 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>					
(1)	1 VSF	O	Forward detect for SWR		
	2 GND		GND		
	3 VSR	O	Reverse detect for SWR		
	4 GND		GND		
(2)	1 ANT	O	LPF unit output		
	1 GND		GND		
(3)	2 XVR	I	X. VERTER 4 pin		
	1 TXC	O	TX control for Final unit, TX : 15V		
(4)	2 GND		GND		
	3 TH	I	Final thermal sensor		
	1 LP2	I	LP2		
(5)	2 LPO	I	LPO		
	3 LP1	I	LP1		
	1 M0	O	Fan control		
(6)	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,	
	2	EX1		TX : Connecto to EX1, EX2	
(5)	1	8C		+ 8V for SW unit (L)	
	2	TMY		TIMER SW ON : OV	
	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	ATO	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	TRQ-H : H, Normally : -12V	
	4	PC1	I	Power control VR	
	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	Connect to TV	
	2	RLT	O	TX : GND, Normally : OPEN } When remote	plug IN
	3	TV	O	TX : 15V	
	4	RAL	I	ALC input	
	5	XAL	I	ALC input } X. VERTER	
	6	XRL	O	Relay control	
(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	CRO	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		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
	2	GND	O
	3	GND	O
	4	SP2	O
	5	KEY	I
	6	STK	I
(37)	1	AV2	I
	2	AVG	O
(38)	1	SP2	I
	2	GND	O
	3	GND	O
	4	SP1	O
(39)	1	VO	I
	2	GND	O
(40)	1	GND	O
	2	FMV	O
(41)	1	ICB	I
	2	ICA	I
(42)	1	AR	O
	2	GND	O
(44)	1	8V	O
	2	GND	O
		SS	I
DIGITAL A UNIT (X54-1830-00)			

(1)	1	LOCK	O	F. LOCK segment data
	2	SC	O	Scale display data
	3	G5	O	
	4	G4	O	
	5	G3	O	
	6	G2	O	
	7	G1	O	Grid data
	8	G9	O	
	9	G10	O	
	10	G8	O	
	11	G7	O	
	12	G6	O	
(2)	1	B2	O	
	2	B3	O	
	3	B4	O	Multiplex segment data
	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	
	8	C7	O	Segment data control
(4)	1	LP2	O	
	2	LP1	O	LPF BAND data
	3	LP0	O	
	4	WRC	O	NC
	5	WRC	O	AT BAND data
	6	ATO	O	NC
	7	ATO	O	
	8	AT1	O	AT BAND data
	9	AT2	O	
	10	AT3	O	

Terminal			Terminal Function
No.	Name	I/O	
(5)	1	DAO	O
	2	DA1	O
	3	DA2	O
	4	PLD	O
	5	PLE	O
	6	CL3	O
(6)	7	CL2	O
	8	CL1	O
	9	CL0	O
	10	DA3	O
	11	GND	O
(7)	1	SH	O
	2	SL	O
	3	VB	O
(8)	1	CL4	O
	2	CL5	O
(9)	1	BZ	O
	2	DST	O
	3	BLK	O
	4	DIM	I
	5	SPL	O
	6	TX	O
	7	VCL	O
	8	VCM	O
	9	MDD	O
	10	MD1	O
(10)	1	MD2	O
	2	WN	O
(11)	3	GND	O
	4	ATS	O
	5	GND	O
	6	RC	O
	7	CN	O
	8	SLO	O
(12)	9	SL1	O
	10	SL2	O
	11	SL3	O
	12	GND	I
	13	12	I
	14	14	I
	15	15	I
	16	16	I
	17	17	I
(13)	1	RBO	O
	2	RB1	O
	3	RB2	O
	4	RB3	O
	5	HDL	O
	6	PSL	O
	7	MSL	O
(14)	1	SB1	O
	2	SB2	O
	3	MRQ	O
	4	SB3	O
	5	SB0	O
	6	GND	O
(15)	1	GND	I
	2	5DA	I
	3	10DA	I
(16)	1	5V	O
	2	GND	O
	3	DIM	O
(17)	1	GND	I
	2	ENC	I

Terminal			Terminal Function		
No.	Name	I/O			
(18)	1	VDD	O	+ 5V for photo coupler	ACC1
	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	EXT Control board (option)
	2	B	O	+ 10V for interface	
	3	RDY	I	READY	
	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	EXT control board (option)
	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	
CAR UNIT (X54-1840-00 : A/2)					
(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		
	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	
(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	CRO	O	CAR0 for SSB, FSK AM monitor (8.83MHz)	
	9	GND		GND	
	10	CRO	O	Carrier for TX, CW, FM (8.83MHz)	
	11	GND		GND	
	12	CR1	O	CAR1 for IF unit (455kHz)	
DIGITAL B UNIT (X54-1840-00 : B/2)					
(1)	1	GND		GND	
	2	ME1	I		
	3	ME2	I		
	4	5V	O	+ 5V for main encoder	
(2)	1	TRQ	I	AT STBY signal, Tuning : H	
	2	AS1	O		
	3	AS2	I		
	4	ATB	I	ATT-THRU : 21V	
(3)	1	GND		GND	
	2	17	O		
	3	16	O		
	4	15	O		
	5	14	O	Multiplex switch data	
(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	
DIGITAL C UNIT (X54-1850-00)					
(6)	1	M▶V	I	M▶ VFO KEY	SW ON : L
	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	
(7)	8	ATT	I	ATT KEY	
	9	GND		GND	
	1	10	I	10Hz digit display data	
	2	100	I	1MHz 100kHz switching signal	
(8)	3	MBO	I	Memory bank SW, 2, 3 : H	
	4	MB1	I	Memory bank SW, 1, 3 : H	
	1	B3	I		
	2	B2	I		
(9)	3	B1	I		
	4	B0	I		
	5	M/V	I	M/V KEY	
	6	TFS	I	TFS KEY	
(10)	7	A=B	I	A=B KEY	KEY ON : L
	8	VRC	I	VOICE KEY	
	1	VB0	I	Bit 0	
	2	VB1	I	Bit 1	
(11)	3	VB2	I	Bit 2	Code data for VBT, SLOPE TUNE
	4	VB3	I	Bit 3	
	5	VB4	I	Bit 4	
	1	ENT	I	ENT KEY	
	2	MCE	I	MCE KEY	
(12)	3	NRQ	O	TRQ output for keyboard ass'y	
	4	WIDE	I	NAR/WIDE SW, WIDE : 15V	
	5	M2	I		
	6	M1	I		
	7	M0	I		
	8	RCL	I	RIT CLEAR KEY	
	9	XIT	I	XIT KEY	
	10	RIT	I	HOLD KEY	KEY ON : L
	11	HLD	I	HOLD KEY	
	12	PSC	I	PG.S KEY	
	13	MS	I	MS KEY	
	1	RC	I	RIT CLEAR pulse	
	2	CN	I	Multiplex control data for switches	
	3	13	O		
(13)	4	12	O		
	5	11	O		
	6	10	O		
	7	SL3	I		
	8	SL2	I		
	9	SL1	I		
	10	SL0	I		
	1	GND		GND	
	2	RE2	I	RIT encoder pulse 2	
	3	RE1	I	RIT encoder pulse 1	
(14)	4	5V	O	+ 5V for RIT encoder	
	1	HS	I	LCD DATA accept message	
	2	8B	I	+ 8V for MIC connector	
	3	5C	I	+ 5V	
(15)	4	GND		GND	
	1	GND		GND	
(16)	2	ENC	O	Main encoder pulse output	
	1	B2	I		
(17)	2	B3	I		
	3	B4	I		
	4	B5	I		
	5	B6	I		
	6	B7	I		
	1			Multiplex segment data	

# TERMINAL FUNCTION TS-940S

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

Terminal			Terminal Function		
No.	Name	I/O			
(2)	1 15B	I	+ 15V	AT STBY signal for Control unit	TX : 15V
	2 TRQ	O	AT STBY signal for Digital B unit		
	3 TV	I	{ ATT KEY signal (ATT ON : L) confirmation signal for AT installed.		
(3)	1 TRQ	O	AT THRU : 21V	AT THRU : 21V	AT STBY signal for MB control
	2 AS1	I	{ ATT KEY signal (ATT ON : L) confirmation signal for AT installed.		
	3 AS2	O	{ ATT KEY signal (ATT ON : L) confirmation signal for AT installed.		
	4 ATB	O	AT THRU : 21V		
(4)	1 ATB	I	AT THRU : 21V	AT THRU : 21V	Tuning : 14V
	2 TRQ	O	AT STBY signal for MB control		
	3 TV	O	TX : 15V		
	4 MB	I	Tuning : 14V		
(5)	1 GND		GND	GND	+ 10V
	2 10	O	+ 10V		
	3 5	O	+ 5V		
	4 14	O	+ 14V		
	5 21B	O	+ 21V		
(6)	1 28		NC	+ 21V	AT LED anode
	2 21B	I	+ 21V		
(7)	1 ATV	O	TX : 15V	AT LED cathode	AT STBY signal for SW unit (L)
	2 TNQ	O	AT STBY signal for SW unit (L)		
AT UNIT (B) (X57-1130-00)					
(8)	1 ATH	O	AT LED anode	AT THRU : 21V	AT THRU : 21V
	2 ATL	I	AT LED cathode		
(9)	1 ATB	I	AT THRU : 21V	AT STBY signal for MB control	TX : 15V
	2 TRQ	I	AT STBY signal for MB control		
	3 TV	I	TX : 15V		
	4 MB	O	Tuning : 14V		
(10)	1 MB	O	Tuning : 14V	GND	+ 21V for AT unit (C)
	2 GND		GND		
	3 21B	O	+ 21V for AT unit (C)		
(11)	1 ATI	I	AT IN : 15V	TUNE LED light on	GND
	2 LED	O	TUNE LED light on		
(12)	1 21B	I	+ 21V	GND	+ 5V
	2 5	I	+ 5V		
	3 10	I	+ 10V		
	4 14	I	+ 14V		
	5 GND		GND		
(13)	1 GND		GND	ISW	SWR level
	2 ISW	I	SWR level		
(14)	1 M1-	O		M1- M1+ M2- M2+	Tuning motor control
	2 M1+	O			
	3 M2-	O			
	4 M2+	O			
AT UNIT (C)					
(15)	1 WRC	I		AT BAND data	AT BAND data
	2 AT0	I			
	3 AT1	I			
	4 AT2	I			
	5 AT3	I			
(16)	1 21B	I	+ 21V	GND	Tuning : H
	2 GND		GND		
	3 MB	I	Tuning : H		
(17)	1 M1-	O		M1- M1+ M2- M2+	Magnetic brake relay terminal for AT tune finish
	2 M1+	O			
	3 M2-	O			
	4 M2+	O			

# TS-940S SPECIFICATIONS

## [General]

### Transmitter Frequency :

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
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### Receiver Frequency :

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)

### Antenna Impedance with AT-940 antenna tuner .....

50Ω	20–150Ω (Transmission only)
	120/220/240 VAC, 50/60Hz
	Max. 510W during transmission, 80W during reception
	Negative
Dimensions .....	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.)
Weight .....	With antenna tuner : Approx. 20kg Without antenna tuner : Approx. 18.5kg

## [Transmitter]

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

Circuitry .....	Quadruple conversion for SSB, CW, AM, FSK, Triple conversion for FM
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Intermediate Frequencies .....	1st IF : 45.05MHz, 2nd IF : 8.83MHz
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	3rd IF : 455kHz, 4th IF : 100kHz
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### Sensitivity :

150kHz–500kHz .....	10dB S/N 10dB $\mu$ (1μV) or less in SSB, CW and FSK
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500kHz–1.8MHz .....	10dB S/N 10dB $\mu$ (10μV) or less
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	10dB S/N 12dB $\mu$ (4μV) or less in SSB, CW and FSK
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1.8MHz–30MHz .....	10dB S/N 30dB $\mu$ (32μV) or less in AM
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	10dB S/N –14dB $\mu$ (0.2μV) or less in SSB, CW and FSK
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	10dB S/N 6dB $\mu$ (2μV) or less in AM
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	12dB SINAD –6dB $\mu$ (0.5μV) or less in FM
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Squelch Sensitivity .....	–10dB $\mu$ (0.32μV) or less
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Image Ratio .....	80dB or more in 1.8–30MHz
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IF Rejection .....	70dB or more in 1.8–30MHz
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### Selectivity :

(SSB, CW, AM (N), FSK) .....	2.4kHz or more/–6dB, 3.6kHz or less/–60dB
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(AM (W)) .....	–6kHz or more/–6dB, 18kHz or less/–50dB
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(FM) .....	12kHz or more/–6dB, 24kHz or less/–60dB
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### Variable Range with SSB filter :

(SSB Slope Tune) .....	High-cut : 1500Hz or more, Low-cut : 700Hz or more without SSB filter
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(CW VBT) .....	600Hz–2.4kHz variable continuously
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RIT/XIT Variable Range .....	±9.99kHz
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Notch Filter Attenuation .....	40dB or more
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Audio Output .....	1.5W (at 8 ohm load/10% distortion)
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Audio load Impedance .....	8 ohms
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Note : Circuits and ratings subject to change without notice due to developments in technology.

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