

# ADJUSTMENT

## OUTLINE OF ADJUSTMENT MODE

The adjustment items on the service adjustment mode menu are set in service adjustment mode. The data is updated when a write operation is performed with the switch on menu No. B3, Write into EEPROM. The following items must be set as shown to adjust correctly:

### • Settings for adjustment

Item	Setting
IF-SHIFT	Center (0Hz)
RIT	OFF
AIP	OFF
NB	OFF
Power	HIGH
Microphone gain control by ALC	OFF

### • Frequencies and modes for adjustment

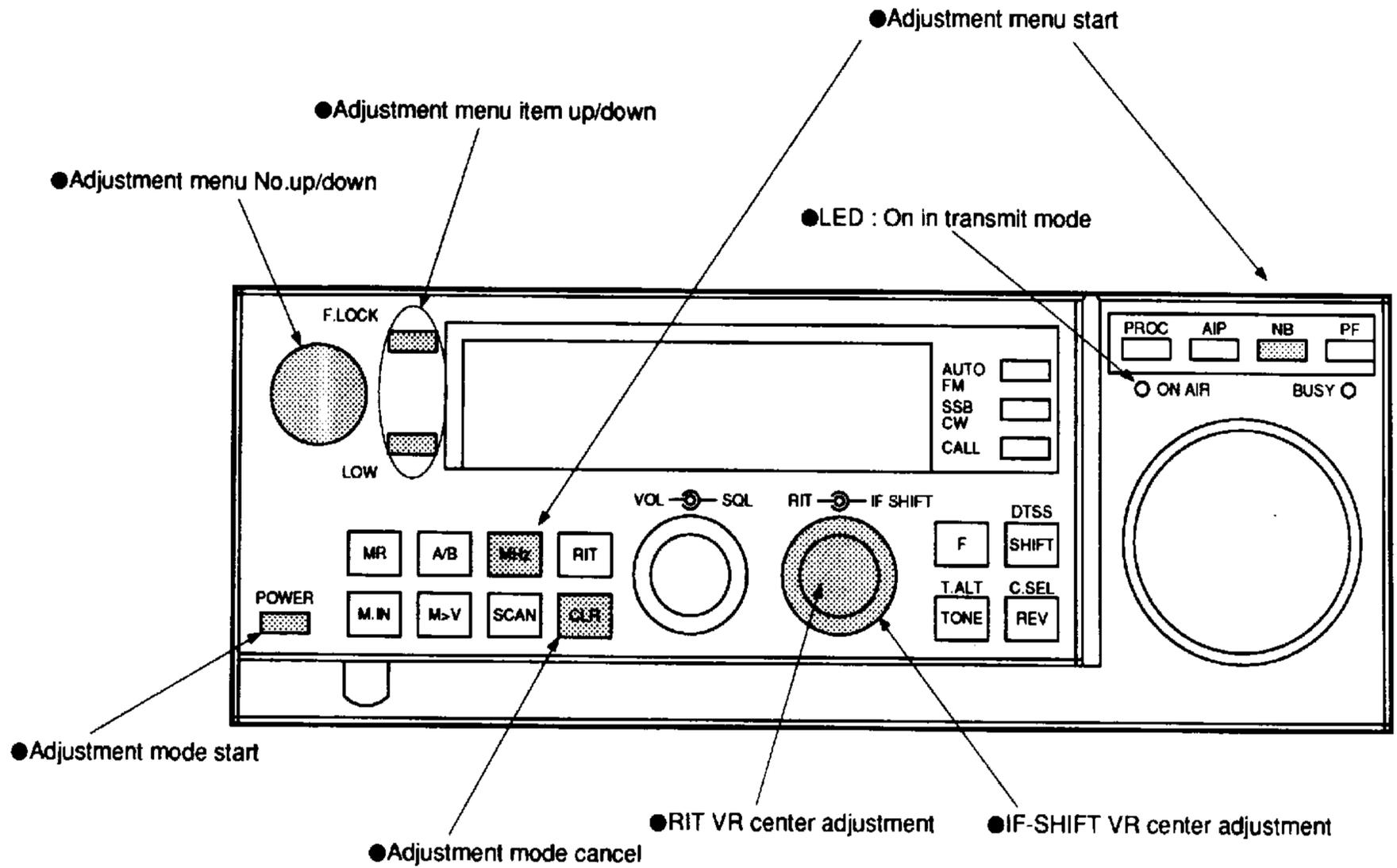
Menu No.	Frequency	Mode	TX/RX
A0	145.040	FM	RX
A1	145.040	FM	RX
A2	145.040	FM	RX
A3	144.950	LSB	TX
A4	144.950	USB	TX
A5	144.039	USB	RX
A6	144.039	USB	RX
A7	144.039	USB	RX
A8	145.040	FM	RX
A9	145.040	FM	RX
AA	144.950	USB	TX
AB	144.950	USB	TX
AC	144.950	USB	TX
AD	144.780	FM	TX
AE	144.950	USB	TX
AF	144.950	USB	TX
B0	144.950	USB	TX
B1	144.980	FM	TX
B2	144.950	USB	TX
B3	145.040	FM	RX

## SERVICE ADJUSTMENT MODE MENU

Menu No.	Menu contents
A0	Checksum display
A1	RIT VR mechanical center correction
A2	IF-SHIFT VR mechanical center correction
A3	LSB carrier point adjustment
A4	USB carrier point adjustment
A5	S meter curve adjustment (except FM) S1
A6	S meter curve adjustment (except FM) S9
A7	S meter curve adjustment (except FM) Full scale
A8	S meter curve adjustment (FM) Start
A9	S meter curve adjustment (FM) Full scale
AA	RF meter curve adjustment (low)
AB	RF meter curve adjustment (middle)
AC	RF meter curve adjustment (high)
AD	DTMF single tone output
AE	ALC start (for microphone gain control by ALC)
AF	ALC zone max. (for microphone gain control by ALC)
B0	ALC zone max. + 6 dB (for microphone gain control by ALC)
B1	FM microphone gain (high level)
B2	SSB microphone gain
B3	Write into EEPROM

# ADJUSTMENT

## PANEL OPERATION IN ADJUSTMENT MODE



### Setting

- 1) Hold down the NB and MHz keys and switch the power on. (Turn the encoder to change the menu number.)
- 2) When the UP or DOWN key is pressed, the menu number is set.
- 3) Menu numbers A1 to A9 and AA to AC can be used in adjustment mode.
- 4) Press the CLR key to cancel adjustment mode. (It is also canceled when the power is turned off.)

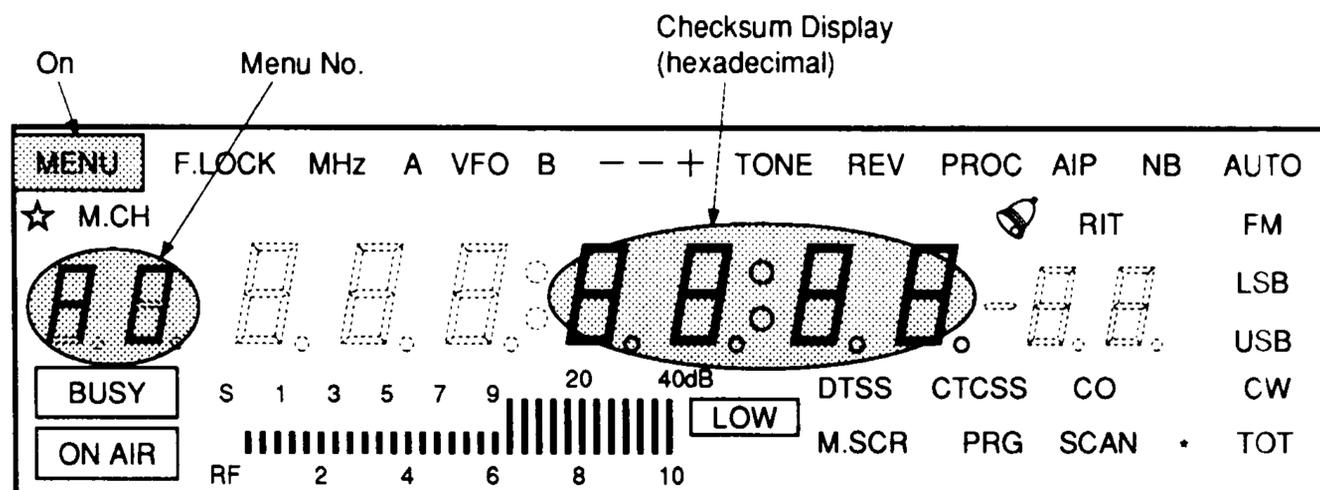
# ADJUSTMENT

## A0 CHECKSUM DISPLAY

### • Adjustment function

Displays the version of the installed program. Displays the two low-order bytes of the checksum obtained by adding all the program codes.

### • Display



### • Adjustment procedure

None

## A1 RIT VR MECHANICAL CENTER CORRECTION

### • Adjustment function

Input the RIT control center position to the microcomputer so that the RIT frequency is zero when the RIT control is at the center position on the panel.

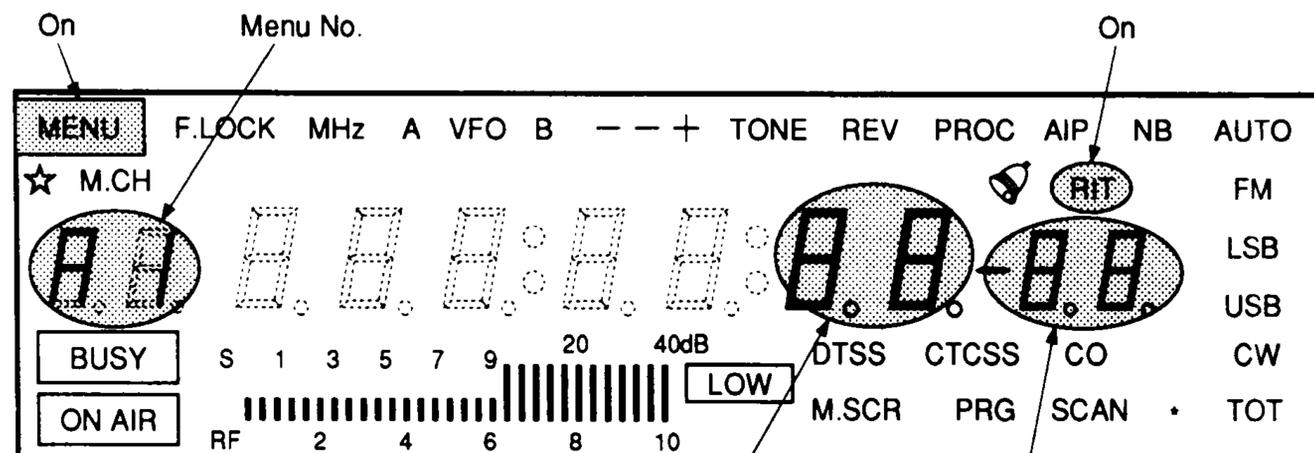
### • Display

### • Adjustment procedure

1. Set the RIT control to the center position on the panel.
2. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Remarks

The center position can be input unconditionally without pressing the key. However, the key must be pressed to prevent this menu item data from being modified accidentally when the RIT control is not at the center. When the key is pressed, data is updated and the two displays match.



The input A/D value is displayed. (0-FFH)

The current A/D value for the RIT control center stored in the microcomputer is displayed. (0-FFH)

# ADJUSTMENT

## A2 IF-SHIFT VR MECHANICAL CENTER CORRECTION

### • Adjustment function

Input the IF-SHIFT control center position to the micro-computer so that the IF-SHIFT frequency is zero when the IF-SHIFT control is at the center position on the panel.

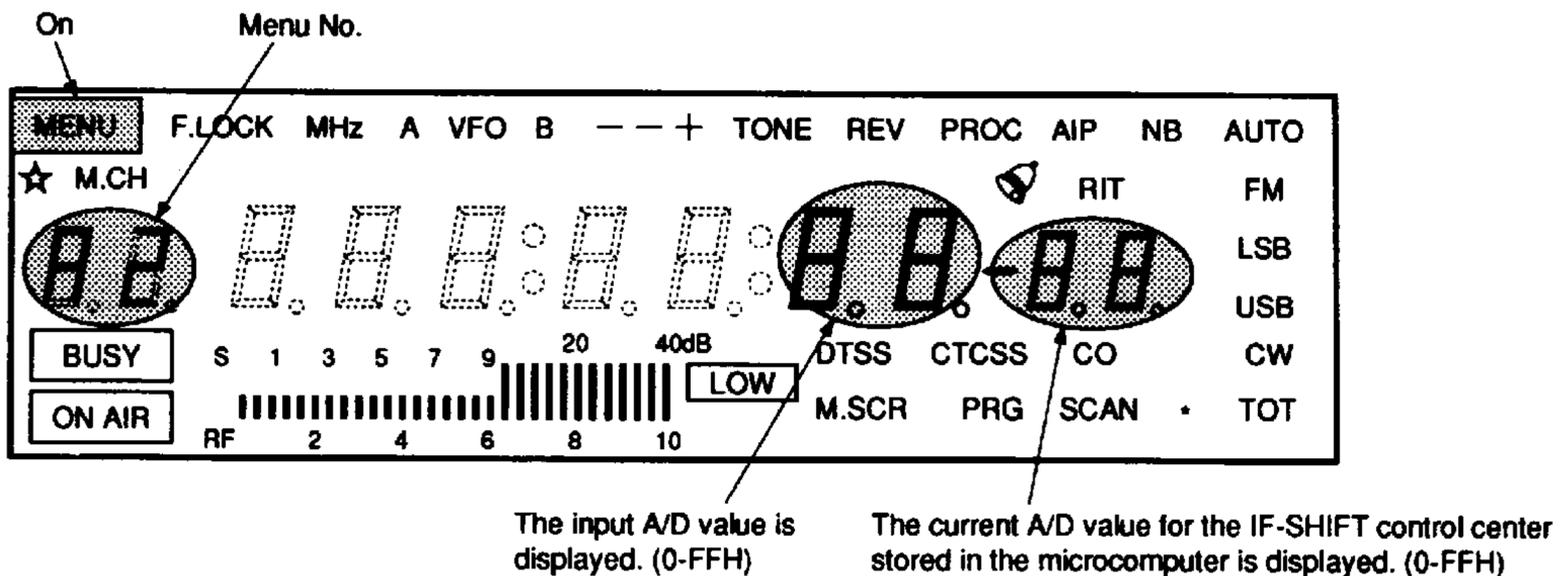
### • Adjustment procedure

1. Set the IF-SHIFT control to the center position on the panel.
2. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Remarks

The center position can be input unconditionally without pressing the key. However, the key must be pressed to prevent this menu item data from being modified accidentally when the IF-SHIFT control is not at the center. When the key is pressed, data is updated and the two displays match.

### • Display



## A3 LSB CARRIER POINT ADJUSTMENT

### • Adjustment function

Adjust the carrier point in 10 Hz steps to correct variations of the IF filter center frequency in LSB mode.

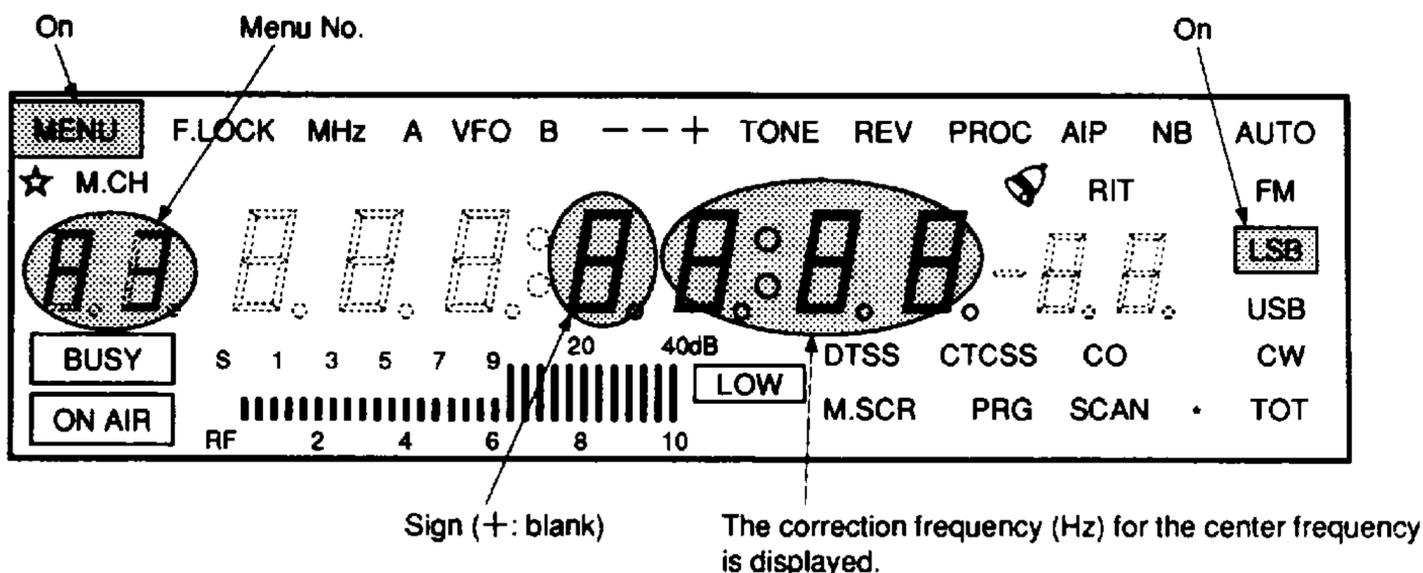
### • Adjustment procedure

1. Transmit.
2. Change the correction frequency with the F.LOCK/LOW key or MIC UP/DOWN key.

### • Remarks

The plus sign (+) indicates the frequency is moving away from the carrier frequency. (Same as IF-SHIFT)

### • Display



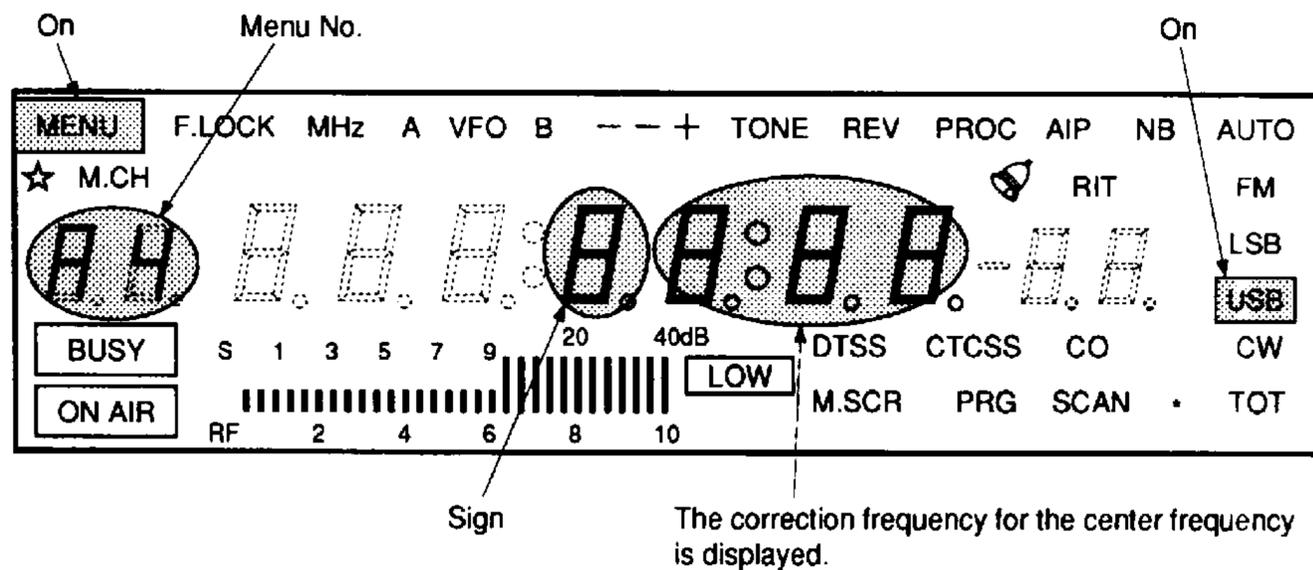
# ADJUSTMENT

## A4 USB CARRIER POINT ADJUSTMENT

### • Adjustment function

Adjust the carrier point in 10 Hz steps to correct variations of the IF filter center frequency in USB mode.

### • Display



### • Adjustment procedure

1. Transmit.
2. Change the correction frequency with the F.LOCK/LOW key or MIC UP/DOWN key.

### • Remarks

The plus sign (+) indicates the frequency is moving away from the carrier frequency. (Same as IF-SHIFT)

## A5 S METER CURVE ADJUSTMENT (S1) (ANY MODE EXCEPT FM)

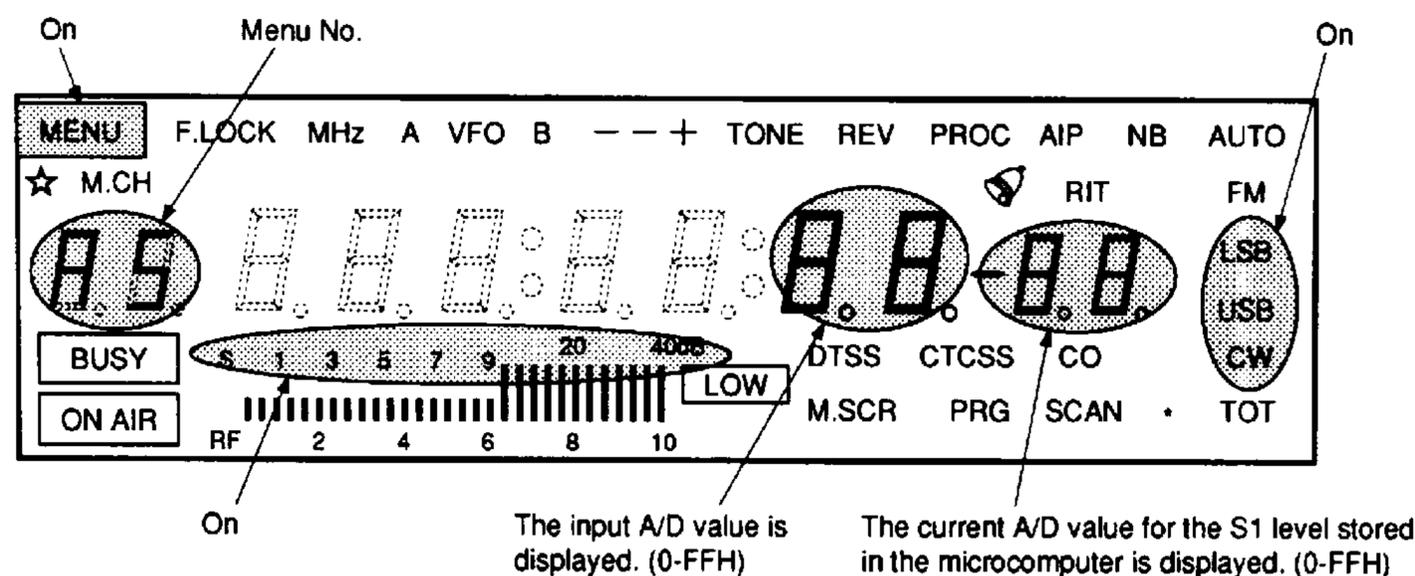
### • Adjustment function

Input the S meter voltage at which two bars of the S meter light to the microcomputer to correct variations of the S1 level of the S meter.

### • Adjustment procedure

1. Input the specified level at which S9 begins to light with the SG.
2. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



### • Remarks

The threshold is the input level minus the fixed value (9: approximately 0.18 V). When the input signal exceeds the threshold, one bar of the S meter lights. The curve between S1 and S9 is obtained from the levels of menus A5 and A6 by line approximation. Only the A/D values of the S1, S9, and full-scale levels are stored in the EEPROM. The meter bars operate according to the currently set curve. The curve is calculated when the key is pressed. The default for S1 is 63, approximately 1.24 V.

# ADJUSTMENT

## A6 S METER CURVE ADJUSTMENT (S9) (ANY MODE EXCEPT FM)

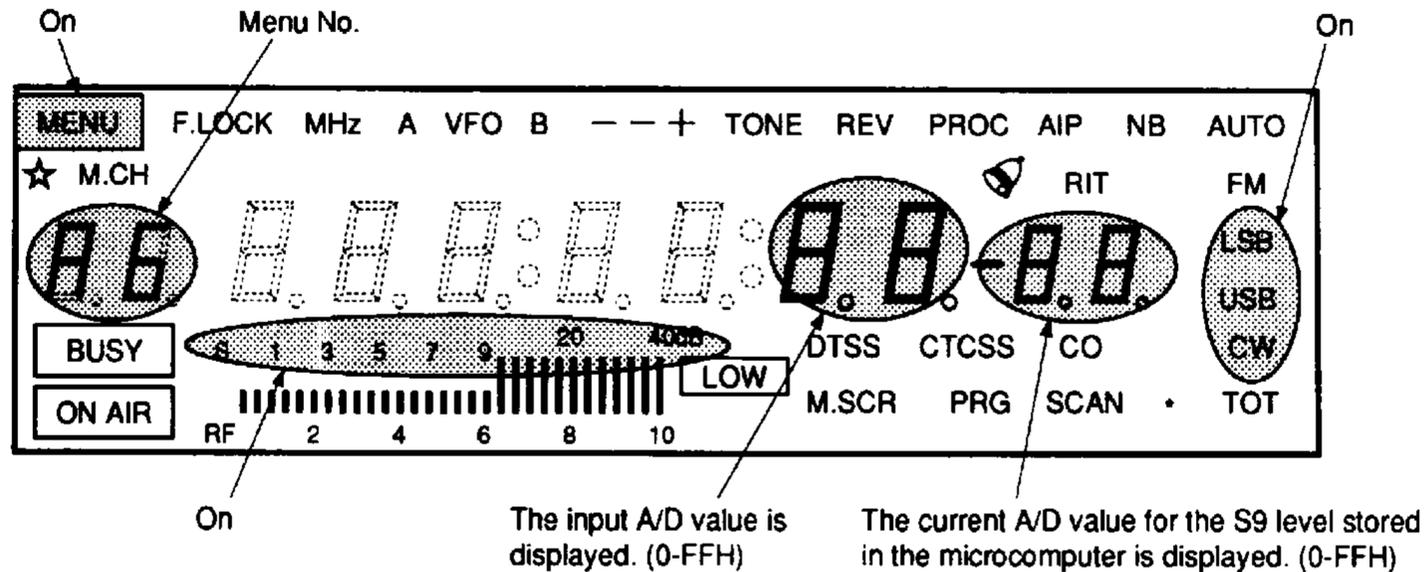
### • Adjustment function

Input the S meter voltage that indicates S9 (the first large segment) to correct variations of the S9 level of the S meter.

### • Adjustment procedure

1. Input the specified level at which S9 begins to light with the SG.
2. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



### • Remarks

The curve between S1 and S9 is obtained from the level of menus A5 and A6 by line approximation. The curve between S9 and full scale is obtained from the levels of menus A6 and A7 by line approximation. The meter bars operate according to the currently set curve. The curve is calculated when the UP/DOWN key is pressed. The default for S1 is 121, approximately 2.37 V.

## A7 S METER CURVE ADJUSTMENT (FULL SCALE) (ANY MODE EXCEPT FM)

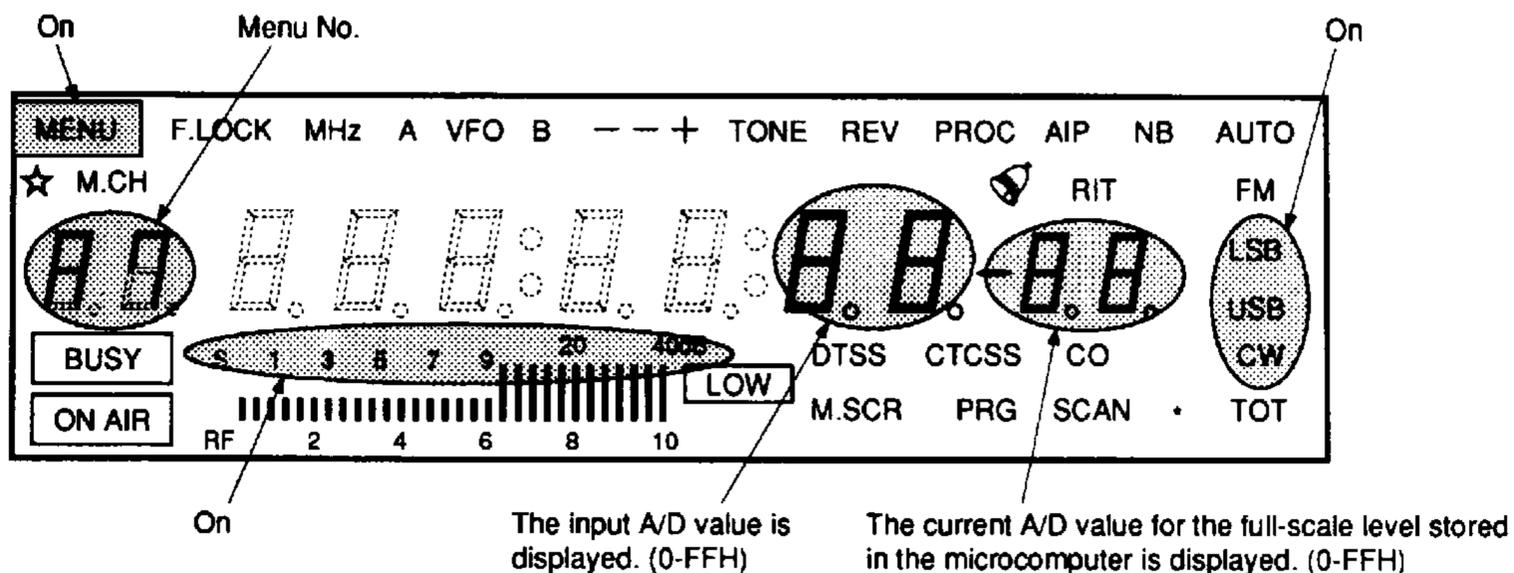
### • Adjustment function

Input the S meter voltage at which all the segments of the S meter light to correct variations of the full-scale level of the S meter.

### • Adjustment procedure

1. Input the specified level at which S9+40 dB begins to light with the SG.
2. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



### • Remarks

The curve between S9 and full scale is obtained from the levels of menus A6 and A7 by line approximation. The meter bars operate according to the currently set curve. The curve is calculated when the key is pressed. The default for full scale is 158, approximately 3.10 V.

# ADJUSTMENT

## A8 S METER CURVE ADJUSTMENT (S1) (FM)

### • Adjustment function

Input the S meter voltage at which two bars of the S meter light to the microcomputer to correct variations of the S1 level of the S meter.

### • Adjustment procedure

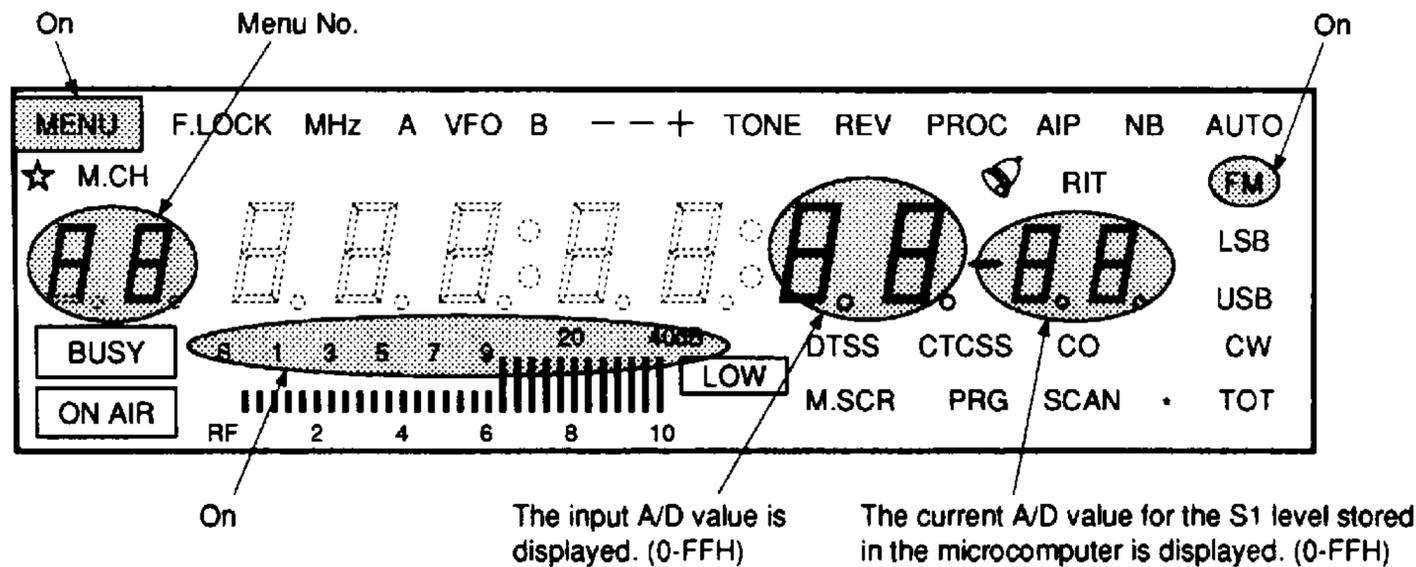
1. Input the specified level at key S1 begins to light with the SG.
2. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display

### • Remarks

The threshold for the S meter start is the input level minus the fixed value (1; approximately 0.02 V). When the input signal exceeds the threshold, one bar of the S meter lights. The curve between S1 and full scale is obtained from the levels of menus A8 and A9 by line approximation. Only the A/D values of the S1 and full-scale levels are stored in the EEPROM. The meter bars operate according to the currently set curve. The curve is calculated when the key is pressed.

The default for S1 is 111, approximately 2.18 V.



## A9 S METER CURVE ADJUSTMENT (FULL SCALE) (FM)

### • Adjustment function

Input the voltage at which all the segments of the S meter light to correct variations of the full-scale level of the S meter.

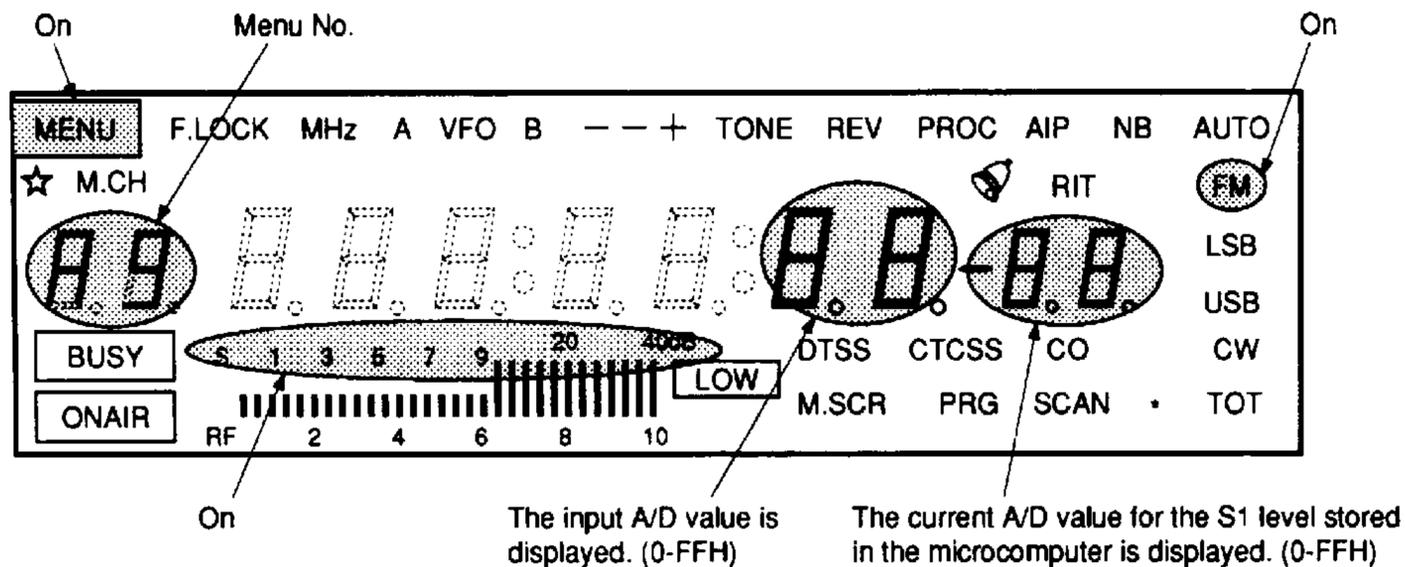
### • Adjustment procedure

1. Input the specified level at which S9+40 dB begins to light from the SG.
2. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display

### • Remarks

Only the A/D values of S1 and full-scale are stored in the EEPROM. The meter bars operate according to the currently set curve. The curve is calculated when the key is pressed. The default for full scale is 143, approximately 2.80 V.



# ADJUSTMENT

## AA RF METER CURVE ADJUSTMENT (LOW)

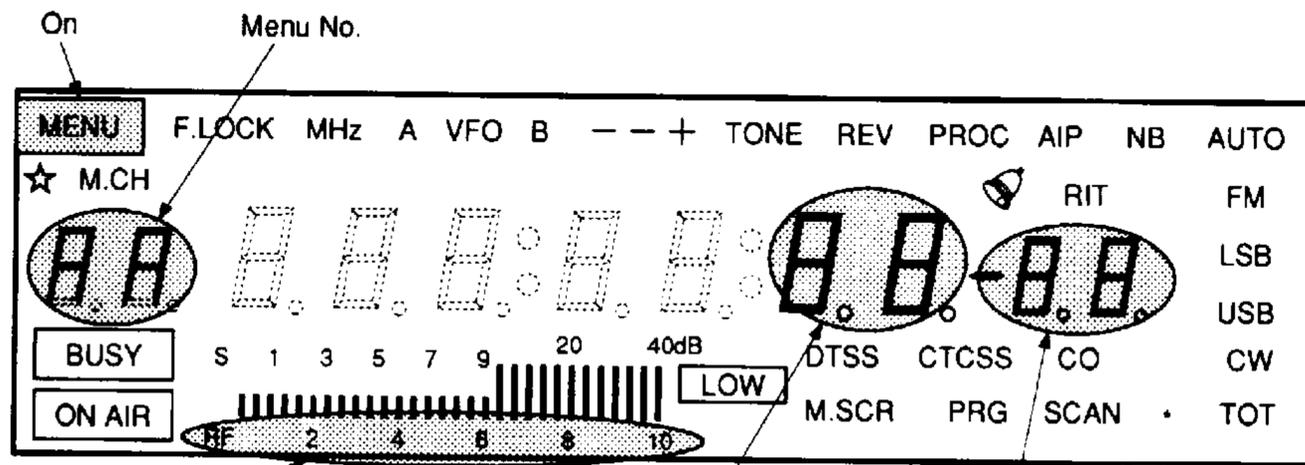
### • Adjustment function

Input the voltage at which the RF meter indicates scale 2 to the microcomputer to correct variations of the low level of the RF meter.

### • Adjustment procedure

1. Transmit.
2. Connect the AG to the microphone socket and input the specified level at which RF 2 begins to light.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



On

The input A/D value is displayed. (0-FFH)

The current A/D value for the low level stored in the microcomputer is displayed. (0-FFH)

## AB RF METER CURVE ADJUSTMENT (MIDDLE)

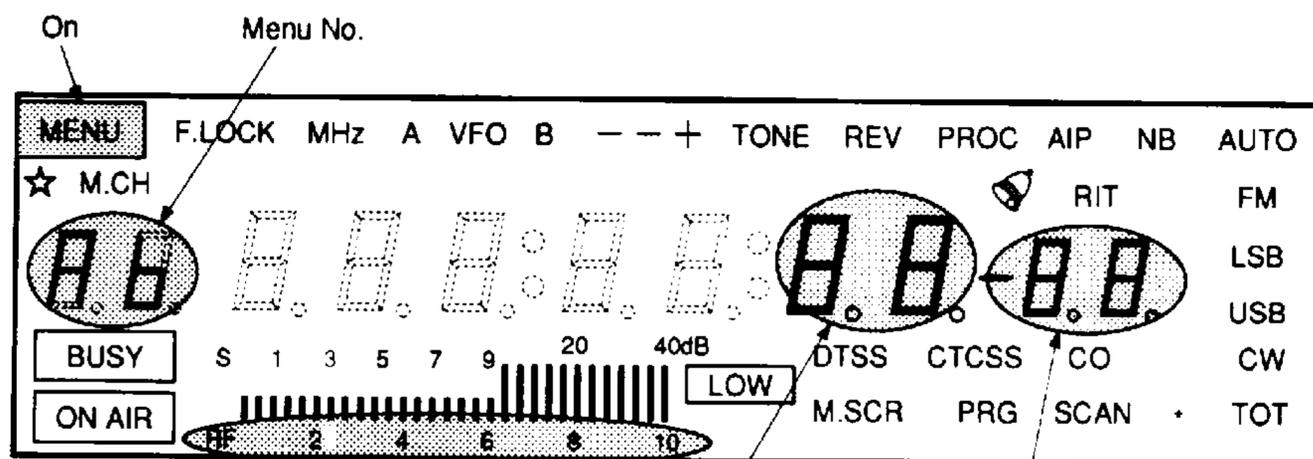
### • Adjustment function

Input the voltage at which the RF meter indicates scale 6 to the microcomputer to correct variations of the middle level of the RF meter.

### • Adjustment procedure

1. Transmit.
2. Connect the AG to the microphone socket and input the specified level at which RF 6 begins to light.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



On

The input A/D value is displayed. (0-FFH)

The current A/D value for the middle level stored in the microcomputer is displayed. (0-FFH)

## ADJUSTMENT

### AC RF METER CURVE ADJUSTMENT (HIGH)

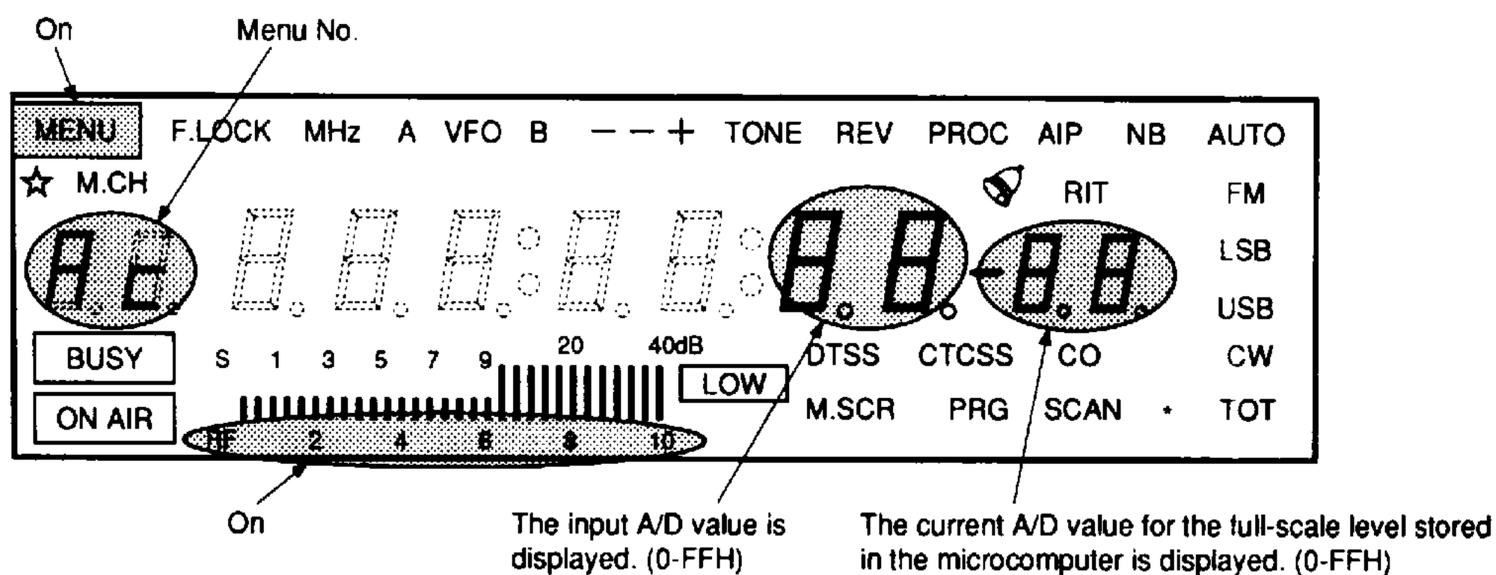
#### • Adjustment function

Input the voltage at which all the segments of the RF meter light to the microcomputer to correct variations of the full-scale level of the RF meter.

#### • Adjustment procedure

1. Transmit.
2. Connect the AG to the microphone socket and input the specified level at which RF 10 begins to light.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

#### • Display



### AD DTMF SINGLE TONE OUTPUT

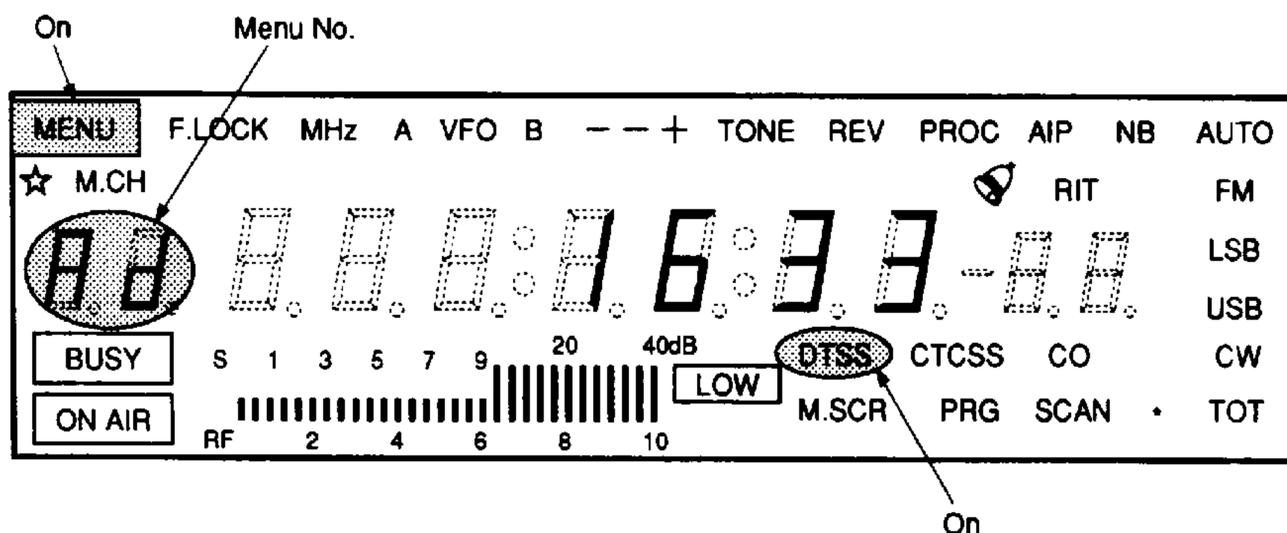
#### • Adjustment function

Output a single tone to check the DTMF deviation.

#### • Adjustment procedure

1. Confirm that "1633" is displayed.  
If "OFF" is displayed, press the F.LOCK/LOW key or the MIC UP/DOWN key to display "1633".
2. Transmit.
3. Check the deviation with a tester.

#### • Display



# ADJUSTMENT

## AE ALC START READ

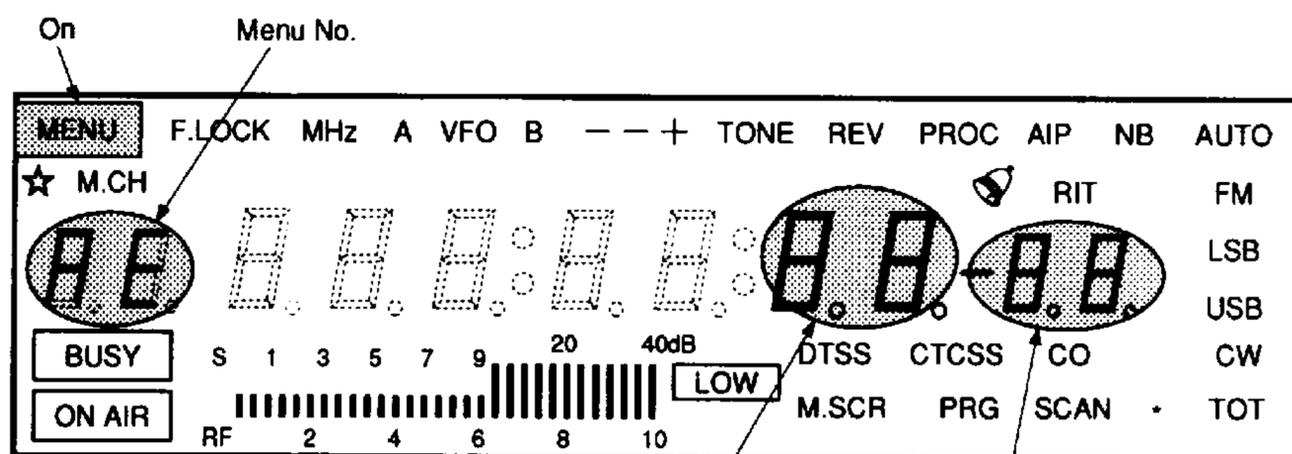
### • Adjustment function

Read the threshold voltage for microphone gain control by ALC.

### • Adjustment procedure

1. Transmit
2. Input the level at which the ALC starts from the AG.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



The input A/D value is displayed. (0-FFH)

The current A/D value for the threshold level stored in the microcomputer is displayed. (0-FFH)

### • Remarks

The level read in this menu is used as a threshold for the low and correct microphone gain. The default is 224, approximately 4.40 V.

## AF ALC ZONE MAX. READ

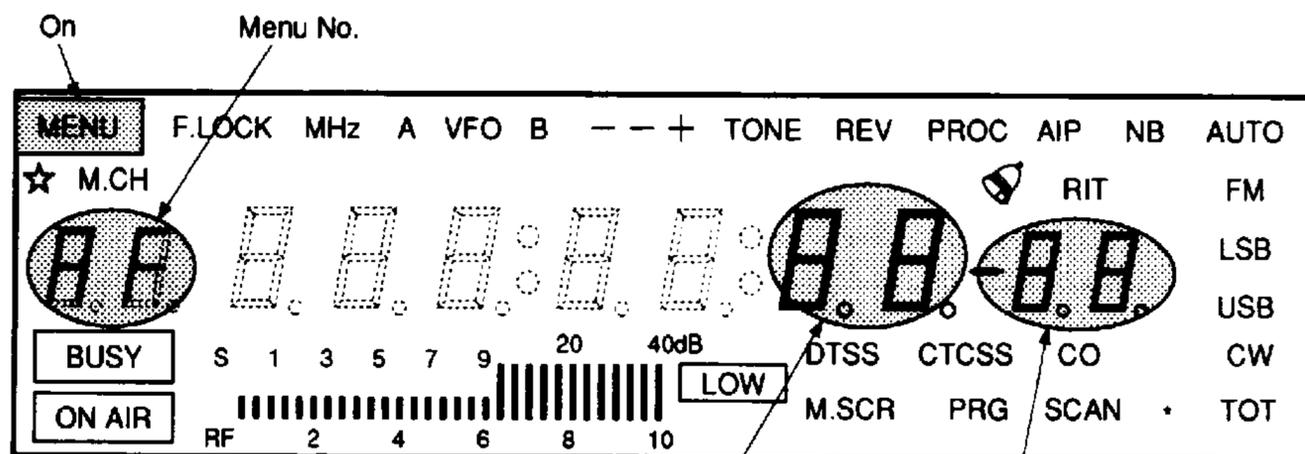
### • Adjustment function

Read the threshold voltage for microphone gain control by ALC.

### • Adjustment procedure

1. Transmit.
2. Input the maximum level of the ALC zone from the AG.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



The input A/D value is displayed. (0-FFH)

The current A/D value for the threshold level stored in the microcomputer is displayed. (0-FFH)

### • Remarks

The level read in this menu is used as a threshold for the correct and high microphone gain. The default is 82, approximately 1.60 V.

# ADJUSTMENT

## B0 ALC FULL SCALE READ

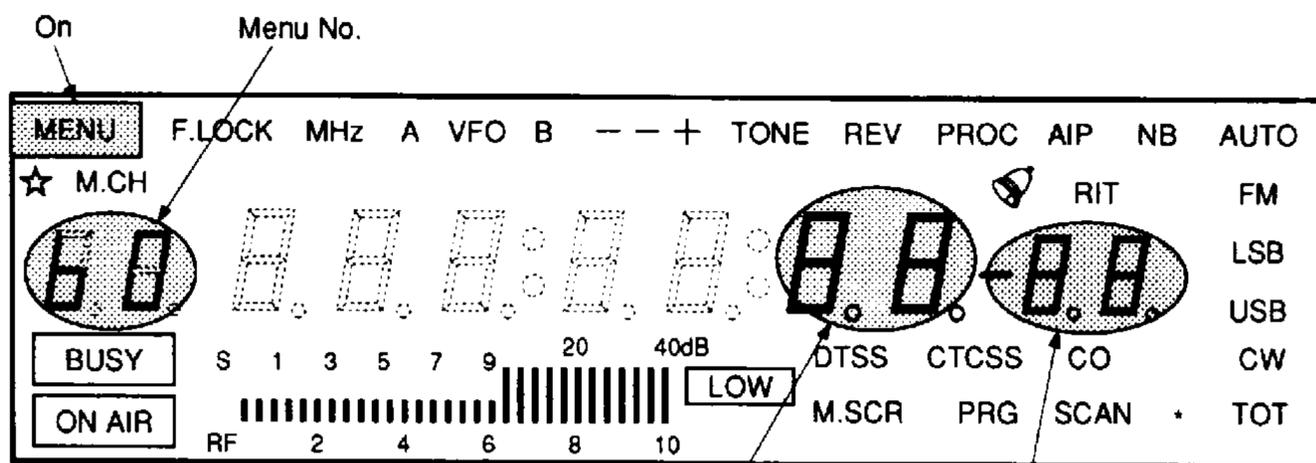
### • Adjustment function

Read the threshold voltage for microphone gain control by ALC.

### • Adjustment procedure

1. Transmit
2. Input the maximum + 6 dB level of the ALC zone from the AG.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key.

### • Display



The input A/D value is displayed. (0-FFH)

The current A/D value for the threshold level stored in the microcomputer is displayed. (0-FFH)

### • Remarks

The level read in this menu is used as a threshold for the high and excessive microphone gain. The default is 56, approximately 1.10 V.

## B1 FM MICROPHONE GAIN

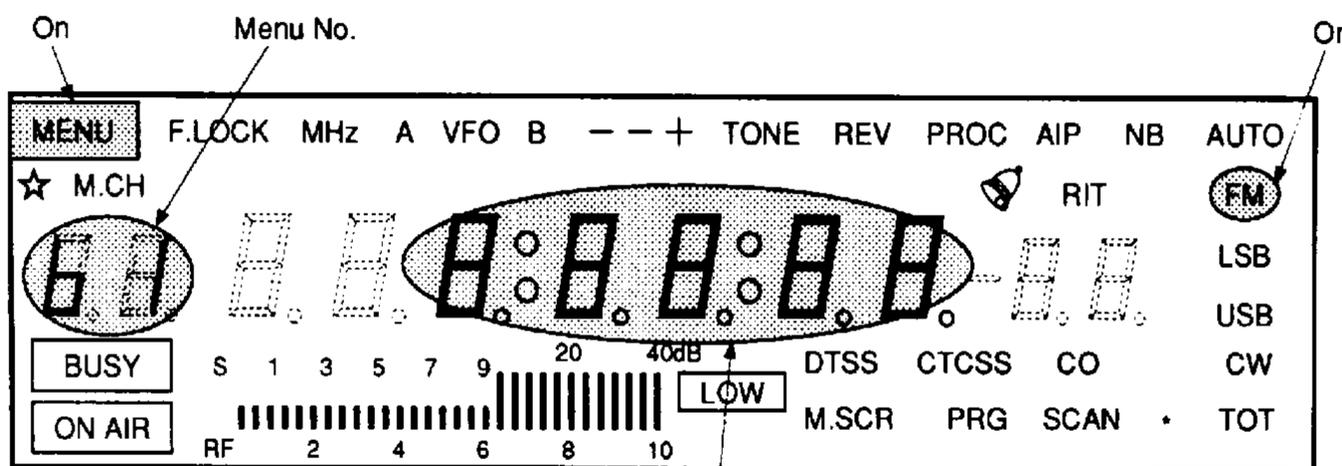
### • Adjustment function

Set the low level for FM microphone gain.

### • Adjustment procedure

1. Transmit.
2. Input the specified level from the AG.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key to change the microphone gain and obtain the specified deviation.

### • Display



Microphone gain level

### • Remarks

The high level is the level set in this menu + 6 dB.

# ADJUSTMENT

## B2 SSB MICROPHONE GAIN

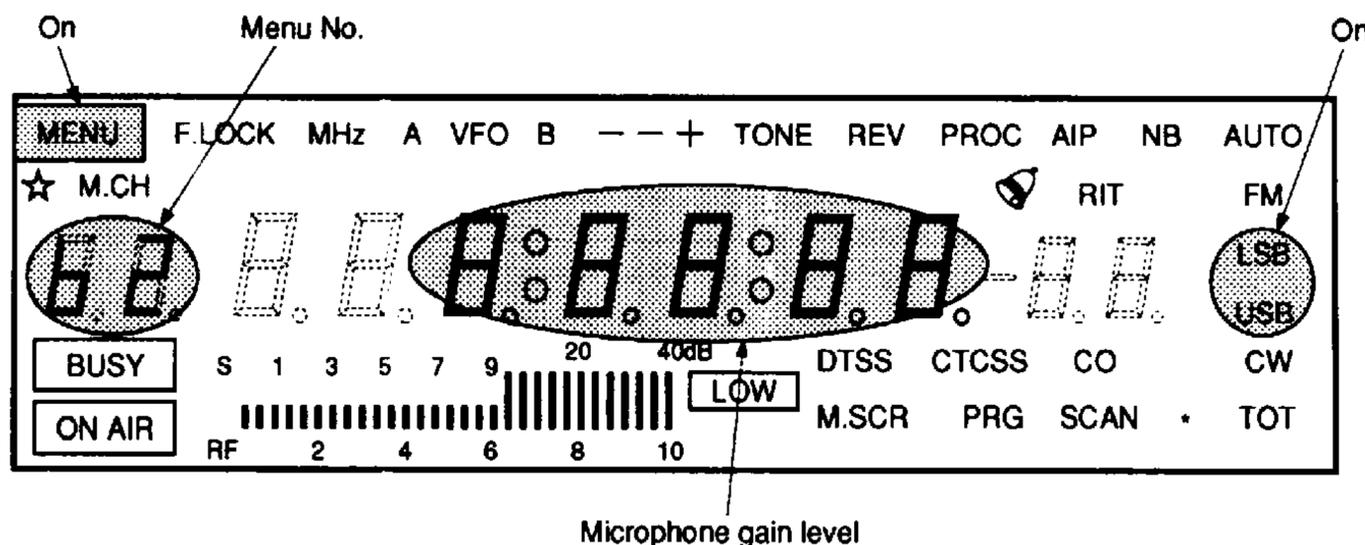
### • Adjustment function

Set the SSB microphone gain.

### • Adjustment procedure

1. Transmit
2. Input the specified level from the AG.
3. Press the F.LOCK/LOW key or the MIC UP/DOWN key to change the microphone gain and obtain the specified output.

### • Display



## B3 WRITE INTO EEPROM

### • Adjustment function

Write setting values into the EEPROM.

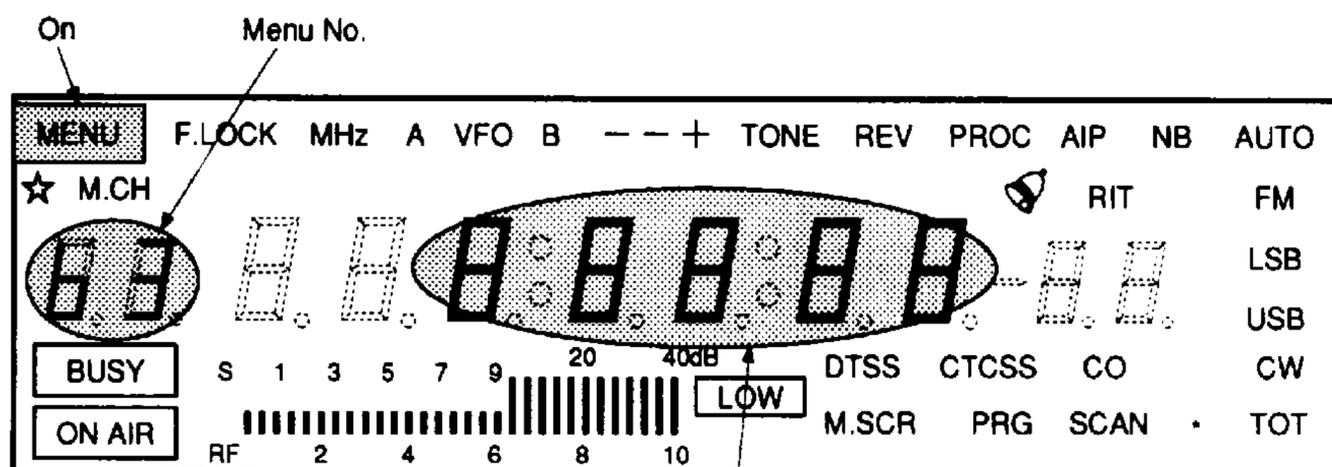
### • Adjustment procedure

1. Press the F.LOCK/LOW key or UP/DOWN key.
2. While data is being written "run" is displayed.
3. If the data is written correctly, "good" is displayed.
4. If a write error occurs, "error" is displayed. If "error" is displayed repeatedly, press the key again. If "error" is still displayed repeatedly, check the EEPROM or other hardware for defects.

### • Remarks

When this menu is selected and the key is pressed, the setting is written unconditionally even if it is not changed. Two sets of the same data are written into the EEPROM.

### • Display



Initial stage	000000
Writing	run
Normal end	good
Write error	error

# ADJUSTMENT

## Test equipment for adjustment

### 1. Tester or Digital Volt Meter

- 1) Input resistance:  $1\text{M}\Omega$
- 2) Voltage range: FS = 1.5 to 1000V AC/DC  
A tester with high accuracy is acceptable, but beware that a precise reading is not possible when measuring high impedance circuits.

### 2. DC Ammeter

- 1) Voltage range: 5A, 10A, 20A

### 3. RF VTVM (RF V.M)

- 1) Input impedance:  $1\text{M}\Omega$  or more, 3pF or less
- 2) Voltage range: FS = 10mV to 300V
- 3) Measurable frequency: 500MHz or more

### 4. AF Voltmeter (AF V.M)

- 1) Measurable frequency: 50Hz to 10kHz
- 2) Input resistance:  $1\text{M}\Omega$  or more
- 3) Voltage range: FS = 10mV to 30 V

### 5. AF Generator (AG)

- 1) Frequency range: 100Hz to 10kHz
- 2) Output: Can limit range between a maximum of 1V and minimum of 1mV.  
Low distortion factor

### 6. AF Dummy Load (AF DM)

- 1) Impedance:  $8\Omega$
- 2) Capacity: 3W or more

### 7. Oscilloscope (oscillo, synchro)

Something that can get vertical amp frequency characteristics of 100MHz or more; external cycles with as much high sensitivity as possible.

### 8. Tracking Generator

- 1) Center frequency: 50kHz to 500MHz.
- 2) Frequency deviation:  $\pm 35\text{MHz}$ .
- 3) Output voltage: 100mV or more.

### 9. SSG (Standard Signal Generator)

- 1) Oscillation frequency: 50kHz to 500MHz
- 2) Output:  $-127\text{dBm}/0.1\mu\text{V}$  to  $7\text{dBm}/0.5\text{V}$
- 3) Output impedance:  $50\Omega$
- 4) Should get AM and FM  
Something with oscillation frequency that is stable at non-modulation and has small frequency modulation component.

### 10. Frequency Counter (f. counter)

- 1) Minimum input voltage: 50mV
- 2) Measurable frequency: 500MHz or more

### 11. Noise Generator

Something that generates noise that includes a high frequency component of up to 450MHz or more that is close to ignition noise.

### 12. RF Dummy Load (Dummy Load)

- 1) Impedance:  $50\Omega$
- 2) Capacity: 50W or more

### 13. Power Meter (transit type and terminal type)

- 1) Measurable frequency: 500MHz or more
- 2) Impedance:  $50\Omega$
- 3) Measuring range: 50W or more  
When there is a  $50\Omega$  dummy load for RF use, only transit type is acceptable.

### 14. Spectrum Analyzer

- 1) Frequency measuring range: 100kHz to 500MHz or more
- 2) Resolution range: 1kHz to 3MHz  
When there is no spectrum analyzer, an electric intensity measuring device is acceptable (measuring range: 10 to 500MHz)  
Voltage: Something with 10 to 17V variability  
Current: 20A or more

### 15. Linear Detector (LD)

Measurable Frequency: 500MHz or more

### 16. DC Power Source

Voltage: Something with 10 to 17 V variability  
Current: 20A or more

### 17. Microphone with UP/DOWN

MC-47

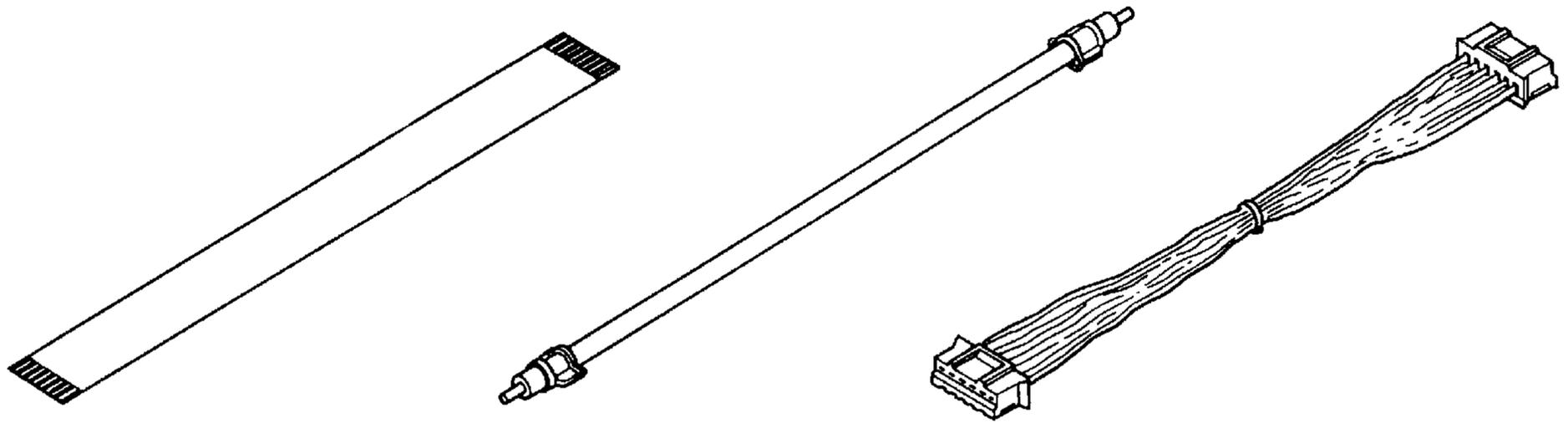
### 18. Service Tools

Extension cables (3)

# ADJUSTMENT

## Adjustment service jig

(Extension Cable .... 15 cm)

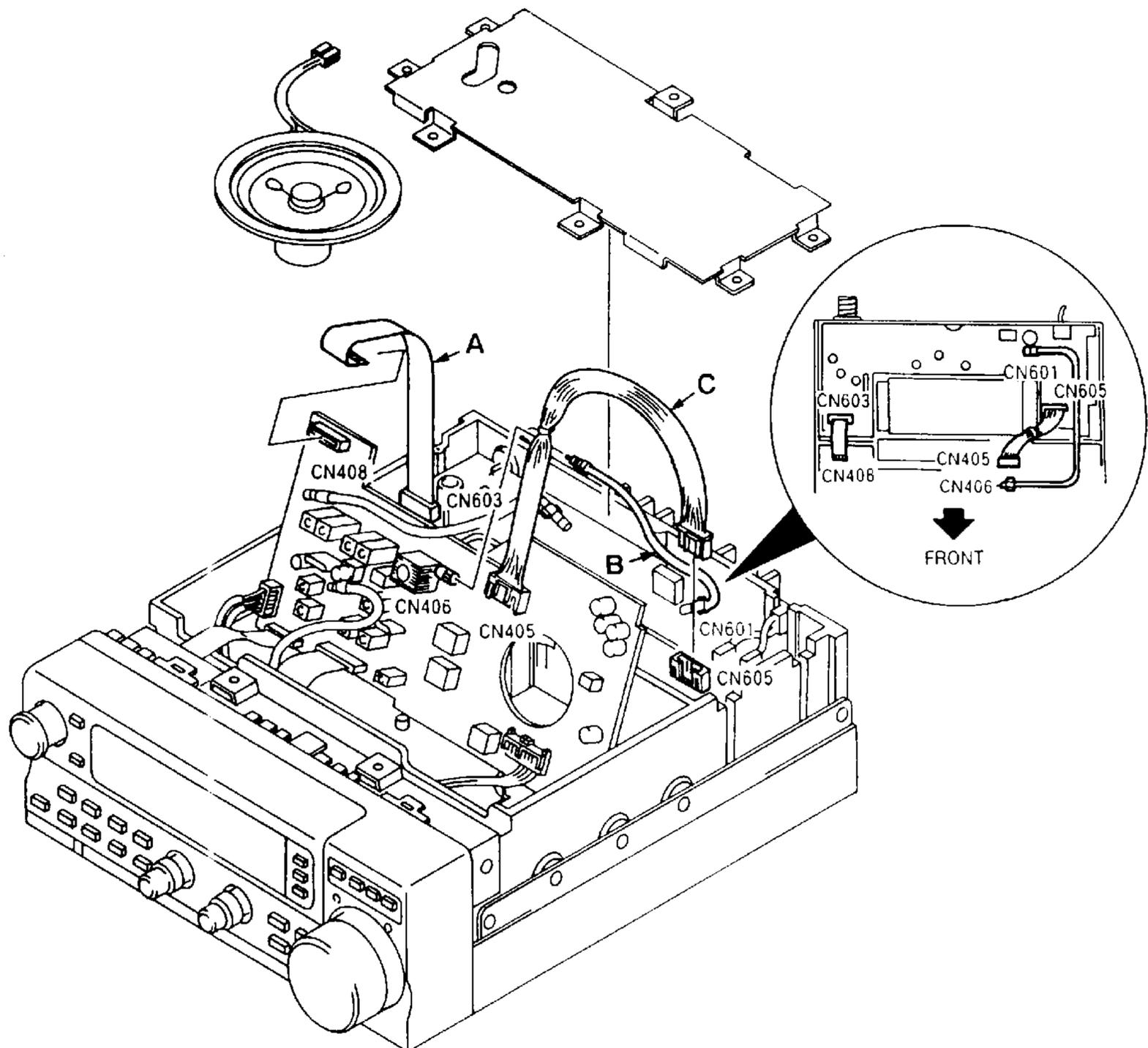


A Flat cable (8P)  
E37 - 0456 - 05

B Lead with mini pin  
E37 - 0225 - 05

C Cabled with connector (6P)  
E37 - 0455 - 05

## Service jigs usage



# ADJUSTMENT

## TX/RX Common Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks	
		Test-equipment	Unit	Terminal	Unit	Parts	Method		
1. Setting	1) Supply DC 13.8V							After all LCDs are lighted, A VFO 144.000.0 CW is displayed.	
	2) Reset POWER:OFF While pressing MR key POWER ON								
	3) Auto Mic Gain Control: OFF The lock setting for main unit key is ON.								(1) F key: Press for 1.5 sec will go MENU mode. (2) A/B key: press once MENU A→B (3) Turn encoder and set MENU No. to 61. MENU 61 (4) F.LOCK key: press once ON→OFF (5) Turn encoder and set MENU No. to 69. MENU 69 (6) F.LOCK key: press once OFF→ON (7) CLR key: press once returns to VFO mode.
	4) Center calibration of RIT and IF SHIFT RIT VR: Center IF SHIFT: Center (Adjustment Mode)								(1) Setting Method While pressing NB key and MHz key at same time, turn POWER: ON. (2) Adjustment Mode (About operations, refer to P67 to P78) (3) Cancellation Method After saving in EEPROM, press CLR key once or POWER: OFF.

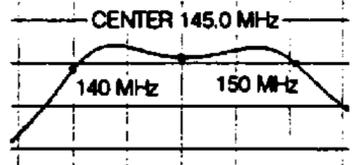
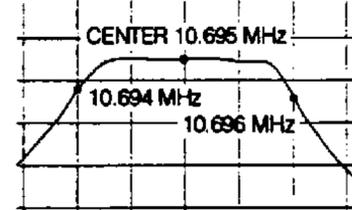
## PLL/CAR Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Reference Oscillation (TCXO)	1) MODE: FM	f. counter Oscillo or RF V.M	TX-RX (A/5)	TP3	TX-RX (A/5)		Check.	20.480,000MHz±20Hz (Ref.) Align with 2 times standard oscillation.
						L204	Level MAX	
2. CAR Oscillation level (10.695MHz)	1) MODE: USB	Oscillo or RF V.M		TP4		L206	Level MAX	
3. 30.72MHz level	1) MODE: FM			TP9		L207 L208	Level MAX	(Ref.)Align with 3 times standard oscillation.
4. 92.16MHz level	1) MODE: FM			IC202 (Pin 2)		L210 L211	Level MAX	
5. 103.625MHz level	1) MODE: FM			TP5		L217 L218	Level MAX	
6. Lock voltage	1) Frequency: 144.000MHz MODE: USB	DC V.M		TP6	(VCO)	TC1	3.5V	±0.1V
	2) Frequency: 145.999MHz: E 147.799MHz: K, M MODE: USB						Check.	4.0 to 5.0V: E 5.0 to 6.5V: K, M

## RX Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. RFG	1) Frequency: 145.039MHz MODE: USB	DC V.M	TX-RX (A/5)	TP1	TX-RX (A/5)	VR4	3.0V	±0.03V

# ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks	
		Test-equipment	Unit	Terminal	Unit	Parts	Method		
2. Helical	1) Remove CN402 of TX-RX (B/5) 2) Frequency: 145.040MHz MODE: FM Tracking Generator output: -10dBm Spectrum Analyzer Setting fc: 145.000MHz: E 146.000MHz: K, M SPAN: 25MHz REF: -40dBm	Trk. Gen. Spectrum Analyzer	Rear panel TX-RX (B/5)	ANT CN413	TX-RX (B/5)	L401 L402	Repeat adjustment 2 to 3 times and with gain at maximum, adjust waveform to figure at below.  REF -30.0 dBm, ATT 10 dB, MKR 145.00 MHz -44.45 dBm, 5 dB/CAL OFF, RBW 300 kHz, POS PK, VBW 100 kHz, SWP 50 ms		
3. MCF (10.695MHz)	1) Remove CN402 of TX-RX (B/5) 2) Frequency: 145.040MHz MODE: FM Tracking Generator output: -10dBm Spectrum Analyzer Setting REF: -30dBm fc: 10.695MHz SPAN: 50kHz		TX-RX (B/5)	CN414 CN403 (Pin 4)		L407 L408	 REF -10.0 dBm, ATT 10 dB, MKR 10.6950 MHz -35.1 dBm, 10 dB/CAL OFF, RBW 1 kHz, POS PK, VBW 1 kHz, SWP 30 ms		
Attach CN402.									
4. BPF	1) Frequency: 145.039MHz: E 146.039MHz: K, M MODE: USB SSG output: -123dBm (0.16μV)	SSG SP (AF D.M) Oscillo AF V.M	Rear panel	ANT EXT SP	TX-RX (B/5)	L403 L404 L405 L410	AF output MAX		
5. IF AMP	1) Frequency: 145.039MHz: E 146.039MHz: K, M MODE: USB SSG output: -123dBm (0.16μV) IC2 VR: 9 o'clock					TX-RX (A/5)	L1 IC2 (L 2pcs.)	AF output MAX	
6. LO1	1) Frequency: 145.039MHz: E 146.039MHz: K, M MODE: USB SSG output: -123dBm (0.16μV)					TC201	AF output MAX		
7. NB	1) Frequency: 145.039MHz: E 146.039MHz: K, M MODE: USB SSG output: -93dBm (5.0μV)	SSG Oscillo or DC V.M	Rear panel TX-RX (A/5)	ANT IC1 (Pin 4)		IC1 (L 2pcs.)	Voltage: MIN	(Ref.) Approx. 3.1V	
	2) SSG output: OFF						Check	4.0 to 5.0V	
8. IF GAIN	1) Frequency: 145.039MHz: E 146.039MHz: K, M MODE: USB SSG output: -109dBm (0.8μV)	SSG SP (AF D.M) Oscillo AF V.M	Rear panel	ANT EXT SP	Front panel	AF VOL	Set AF output to 0.63V		
	2) SSG output: -119dBm (0.25μV)					TX-RX (A/5)	IC2 (VR)	Adjust AF output to 0.4V	
	3) SSG output: -109dBm (0.8μV)							Check.	AF output 0.63V
When adjusting items 9 to 11, set to Adjustment mode and refer to menu operations (P67 to P78).									
9. SSB S meter (S1)	1) MENU No.: A5 SSG freq.: 145.040MHz output: -113dBm (0.5μV)	SSG SP (AF D.M) Oscillo AF V.M	Rear panel	ANT EXT SP	Front panel		F.LOCK key: press once	Note: AF output is 1kHz sine wave. (Fine tune the SSG frequency)	
(S9)	2) MENU No.: A6 SSG output: -93dBm (5.0μV)						F.LOCK key: press once		
(FULL)	3) MENU No.: A7 SSG output: -53dBm (500μV)						F.LOCK key: press once		

## ADJUSTMENT

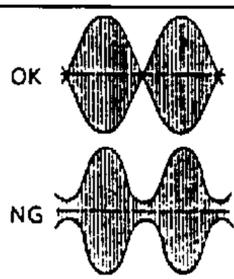
Item	Condition	Measurement			Adjustment			Specifications/Remarks			
		Test-equipment	Unit	Terminal	Unit	Parts	Method				
10. FM S meter (S1)  (FULL)	1) MENU No.: A8 SSG Freq.: 145.040MHz MOD Freq.: 1kHz DEV: 3kHz SSG output: -119dBm (0.25 $\mu$ V)	SSG SP (AF D.M) Oscillo AF V.M	Rear panel	ANT EXT SP	Front panel		F.LOCK key: press once	Note: AF output is 1kHz sine wave. (Fine tune the SSG frequency)			
	2) MENU No.: A9 SSG output: -93dBm (5.0 $\mu$ V)						F.LOCK key: press once				
11. ROM DATA Writing	1) MENU No.: B3	LCD					LCD display: "ready" F.LOCK key: press once				
							LCD display: "good" CLR key: press once				
12. BEEP	1) AF VR: MIN Continuously ON and OFF SSB/CW key.	AF D.M Oscillo	Rear panel	EXT SP	TX-RX (A/5)	VR2	0.4Vp-p	$\pm$ 0.1V			
13. RX Sensitiv- ity(S/N)	1) Frequency: 145.039MHz MODE: USB AIP: OFF SSG output: -125dBm (0.126 $\mu$ V)  AF VR: 0.63V (1kHz sine wave)	SSG SP (AF D.M) Oscillo AF V.M)		ANT EXT SP				AF output of SSG output is turned off.	S/N 10dB or more		
	2) AIP: ON SSG output: ON							TX-RX (B/5)	VR402		0.2V (-10dB)
	3) Frequency: 145.040MHz MODE: FM SSG output: -121dBm (0.2 $\mu$ V)  MOD Freq.: 1kHz DEV: 3kHz									Measuring SINAD	12dB SINAD or more
14. Squelch (FM)	1) Frequency: 145.040MHz MODE: FM SSG output: OFF					Front panel	SQL VR	Adjust where squelch is closing.	SQL VR position: 8:00 to 11:00		
	2) SSG output: -128dBm (0.09 $\mu$ V)  MOD Freq.: 1kHz DEV: 3kHz								Squelch open.		
	3) SQL VR: MAX								Squelch close.		
	4) SSG output: -118dBm (0.28 $\mu$ V)								Squelch open.		
15. Squelch (SSB)	1) Frequency: 145.039MHz MODE: USB SSG output: OFF					Front panel	SQL VR	Adjust where squelch is closing.	SQL VR position: 8:00 to 11:00		
	2) SSG output: -125dBm (0.126 $\mu$ V)  MOD Freq.: 1kHz DEV: 3kHz								Squelch open.		
	3) SQL VR: MAX								Squelch close.		
	4) SSG output: -115dBm (0.4 $\mu$ V)								Squelch open.		

# ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
16. S Meter Sensitivity Check	1) Frequency: 145.039MHz MODE: USB SSG output: ON	SSG SP (AF D.M) Oscillo AF V.M)	Rear panel	ANT EXT SP			SSG output check S1 lights	-119dBm to -107dBm (0.25 to 1.0 $\mu$ V) -99dBm to -87dBm (2.5 $\mu$ V to 10 $\mu$ V)
	2) Frequency: 145.040MHz MODE: FM SSG output: ON MOD Freq: 1kHz DEV: 3kHz						All lights	

## TX Adjustment

Note: When adjusting (items 8 to 10) TX-RX unit (A/5), first attach case (upper) to TX-RX unit (B/5, C/5) side or stand set up.

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. FM TX Freq.	1) Remove CN406 of TX-RX unit (B/5) 2) MODE: FM 3) Transmit	f.counter	TX-RX (A/5)	VR1 right bottom terminal	TX-RX (A/5)	TC1	10.6950MHz	$\pm$ 50Hz
2. TX IF AMP	1) Frequency: 144.950MHz: E 145.950MHz: K, M MODE: CW Set to the center VR7, 8 and 9 of TX-RX(A/5). fc: 144.950MHz: E 145.950MHz: K, M (Use 10dB ATT) SPAN: 500kHz 2) Transmit.	Spectrum Analyzer	TX-RX (B/5)	CN406	TX-RX (B/5)	L415 L416 L411- L414 L417 TC401- TC404	Repeat adjustment 2 to 3 times and with level at maximum.	Note: If the level is over 10dBm, adjust VR9 of TX-RX (A/5).
					TX-RX (A/5)	VR9	Level: MAX	
When adjusting items 3 to 5, set to Adjustment mode.								
3. MIC sensitivity setting	1) MENU No.: B2	LCD			Front panel		With F.LOCK and LOW key, set characters displayed by LCD.	Display: "-7dB"
4. CAR point	1) LSB CAR Point MENU No.: A3 USB CAR Point MENU No.: A4	Oscillo	TX-RX (B/5)	CN403 (Pin 2)			Adjust oscilloscope waves so that they cross by pressing F.LOCK key and LOW key.	
	2) From MIC terminal AG1: 300Hz 2mV AG2: 2700Hz 2mV	AG AF V.M	TX-RX (D/5)	MIC				
	3) Transmit.							
5. ROM DATA Writing	1) MENU No.: B3	LCD					LCD Display: "ready" F.LOCK key: press once	
							LCD Display: "good" CLR key: press once	
Attach CN406. When adjusting items 6 to 10, turn VR401 and VR603 fully clockwise.								
6. NULL	1) Frequency: 144.980MHz: E 146.980MHz: K, M MODE: FM	Power meter	Rear panel	ANT	TX-RX (C/5)	VR601	45W	$\pm$ 3.0W
	2) Transmit	Oscillo or DC V.M	TX-RX (C/5)	ANT CN608		VR602	Voltage: MIN	0.6V or less

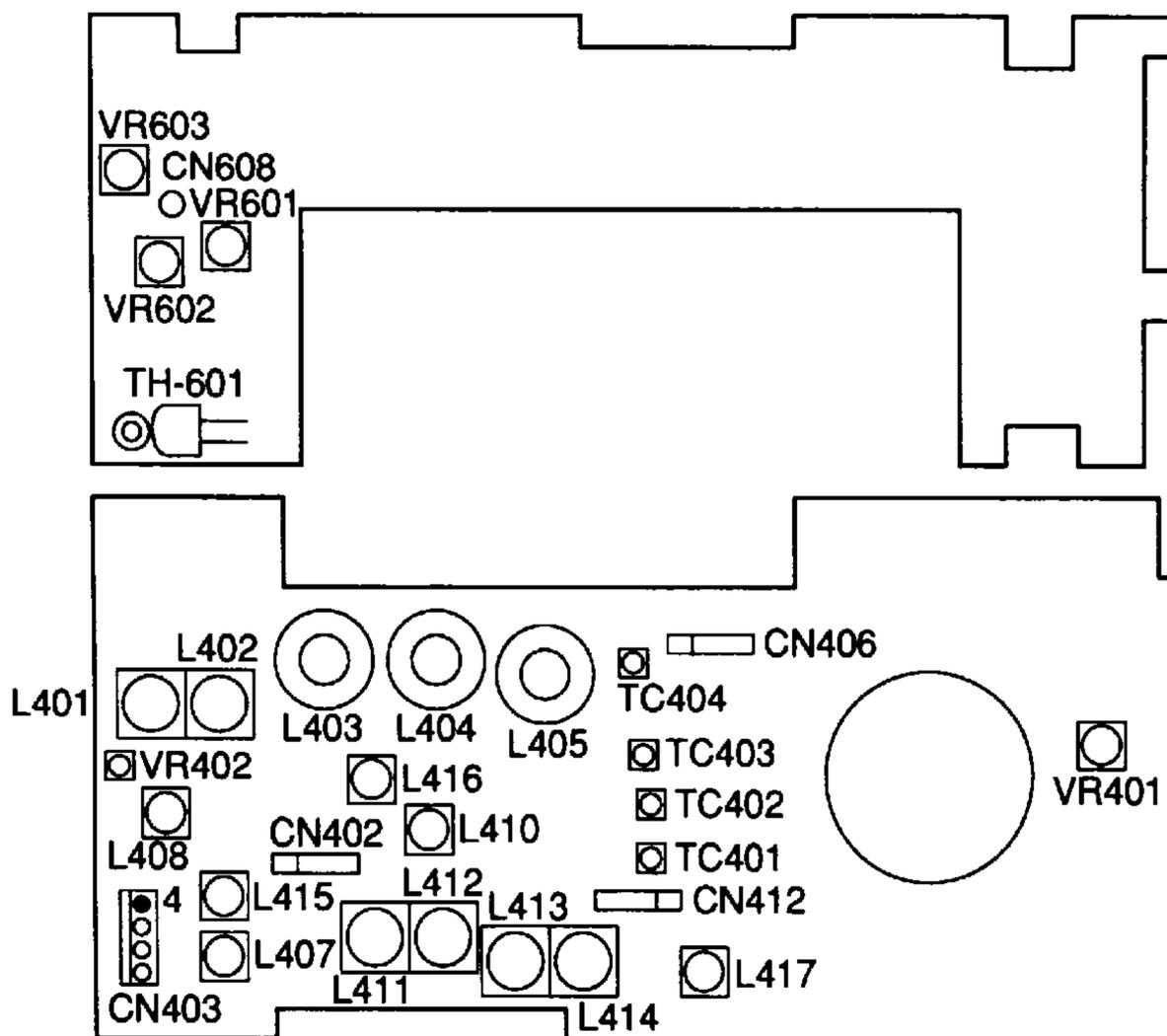
## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. SSB MIC sensitivity	1) Frequency: 144.950MHz: E 145.950MHz: K, M MODE: USB	Power meter AG AF V.M	Rear panel TX-RX (D/5)	ANT MIC	TX-RX (A/5)	VR1	24W	±1.0W
	2) MIC terminal AG: 1kHz 2.8mV :E AG: 1kHz 5mV :K, M							
	3) Transmit							
8. Carrier level	1) Frequency: 144.950MHz: E 146.950MHz: K, M MODE: CW, LOW SW: ON	Power meter	Rear panel	ANT	TX-RX (A/5)	VR9	42W	±1.0W
	2) Transmit							
9. FM MAX DEV.	1) Frequency: 144.980MHz	Power meter LD AG AF V.M	Front panel TX-RX (D/5)	ANT MIC	TX-RX (A/5)	VR6	Check ±. Larger Value should be 4.4kHz	±100Hz
	2) MIC terminal AG: 1kHz 30mV :E AG: 1kHz 50mV :K, M							
	3) Transmit.							
10. POWER	1) Frequency: 144.0000MHz(FM): E 145.950MHz(FM): K, M	Power meter	Rear panel	ANT	TX-RX (C/5)	VR601	42W	±1W
	2) Transmit.							
	3) POWER: LOW				TX-RX (B/5)	VR401	5W	±0.2W
	4) Transmit.							
11. Protection	1) Frequency: 144.980MHz: E 145.980MHz: K, M MODE: FM Open ANT terminal.	Ammeter		Power supply	TX-RX (C/5)	VR603	5.0A	±0.1A
	2) Transmit.							
When adjusting items 12 to 16, set to Adjustment mode and refer to menu operations (P67 to P78).								
12. RF meter LOW (RF-2)  MID (RF-6)  HI (FULL)	1) MENU No.: AA Adjust AG input to set transmit output levels shown below.	Power meter AG AF V.M LCD	Rear panel TX-RX (D/5)	ANT MIC	Front panel		F.LOCK key: press once	
	2) Transmit. 5W							
	3) MENU No.: AB							
	4) Transmit. 24W							
	5) MENU No.: AC							
	6) Transmit. 37W							
13. ALC Meter Start Point	1) MENU No.: AE AG: 1kHz 7mV :K, M AG: 1kHz 4.0 mV :E						F.LOCK key: press once	
	2) Transmit.							
Zone MAX	1) MENU No.: AF AG: 1kHz 14mV :K, M AG: 1kHz 8.0mV :E						F.LOCK key: press once	
	2) Transmit.							
FULL	1) MENU No.: B0 AG: 1kHz 28mV :K, M AG: 1kHz 16mV :E						F.LOCK key: press once	
	2) Transmit.							
14. FM MIC Sensitivity	1) MENU No.: B1 AG 1kHz 5mV: K, M AG: 1kHz 3mV: E	Power meter LD AG AF V.M LCD					Adjust to ±3.0kHz using F.LOCK key and LOW key.	±100Hz
	2) Transmit.							
15. DTMF DEV	1) MENU No.: AD LCD Display: 1633 If the display is "OFF", then F.LOCK key press once.						Check DEV.	±2.5kHz or more
	2) Transmit.							

# ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
16. ROM DATA Writing	1) MENU No.: B3	LCD			Front panel		LCD display: "ready" F.LOCK key: press once	
							LCD Display: "good" CLR key: press once	
17. Check TONE DEV.	1) 144.980MHz MODE: FM TONE: ON	Power meter LD	Rear panel	ANT			Check DEV.	0.5 to 1.5kHz
	2) Transmit.							
	3) TONE: OFF							
18. Suppression	1) Frequency: 144.980MHz MODE: USB or LSB Spectrum Analyzer fc: 145.000MHz SPAN: 10MHz	Power meter Spectrum analyzer	Rear panel	ANT	TX-RX (A/5)	VR7 VR8	Repeat USB, LSB alternately, CAR level: MIN	-40dB or more for level at CW.
	2) Transmit.							
19. SIDE TONE	1) Frequency: 144.950MHz MODE: USB AF VR: MIN KEY: ON	Oscillo AF V.M	Rear panel	EXT SP KEY	TX-RX (A/5)	VR3	0.2V	±0.1V
20. Check Processor operation	1) Release the lock of main unit key MENU No. 69: ON→OFF	Power meter AG AF V.M	Front panel	ANT MIC	TX-RX (D/5)	Front panel	Check by ON and OFF of PROC key.	Power value at ON should be higher than at OFF.
	2) Frequency: 144.950MHz: E 145.950MHz: K, M MODE: USB							
	3) MIC terminal AG: 1kHz 2mV							
	4) Transmit.							
21. Auto MIC Gain control check	1) Frequency: 144.950MHz: E 145.950MHz: K, M MODE: USB						Set F.LOCK key OFF to ON, check after few seconds.	Power value at ON should be higher than at OFF.
	2) MIC terminal AG: 1kHz 2mV							
	3) Set to MENU No. 61, then transmit.							
22. TX Freq. Check	1) Frequency: 144.950MHz: E 145.950MHz: K, M MODE: FM	Power meter f.counter	ANT	Rear panel			144.950MHz: E	±1kHz or less
	2) Transmit.						145.950MHz: K, M	
23. TX Output Check	1) Frequency: 144.950MHz MODE: CW and FM	Power meter					Check	[HI] 37 to 47 W [LOW] 3 to 8 W

## ADJUSTMENT

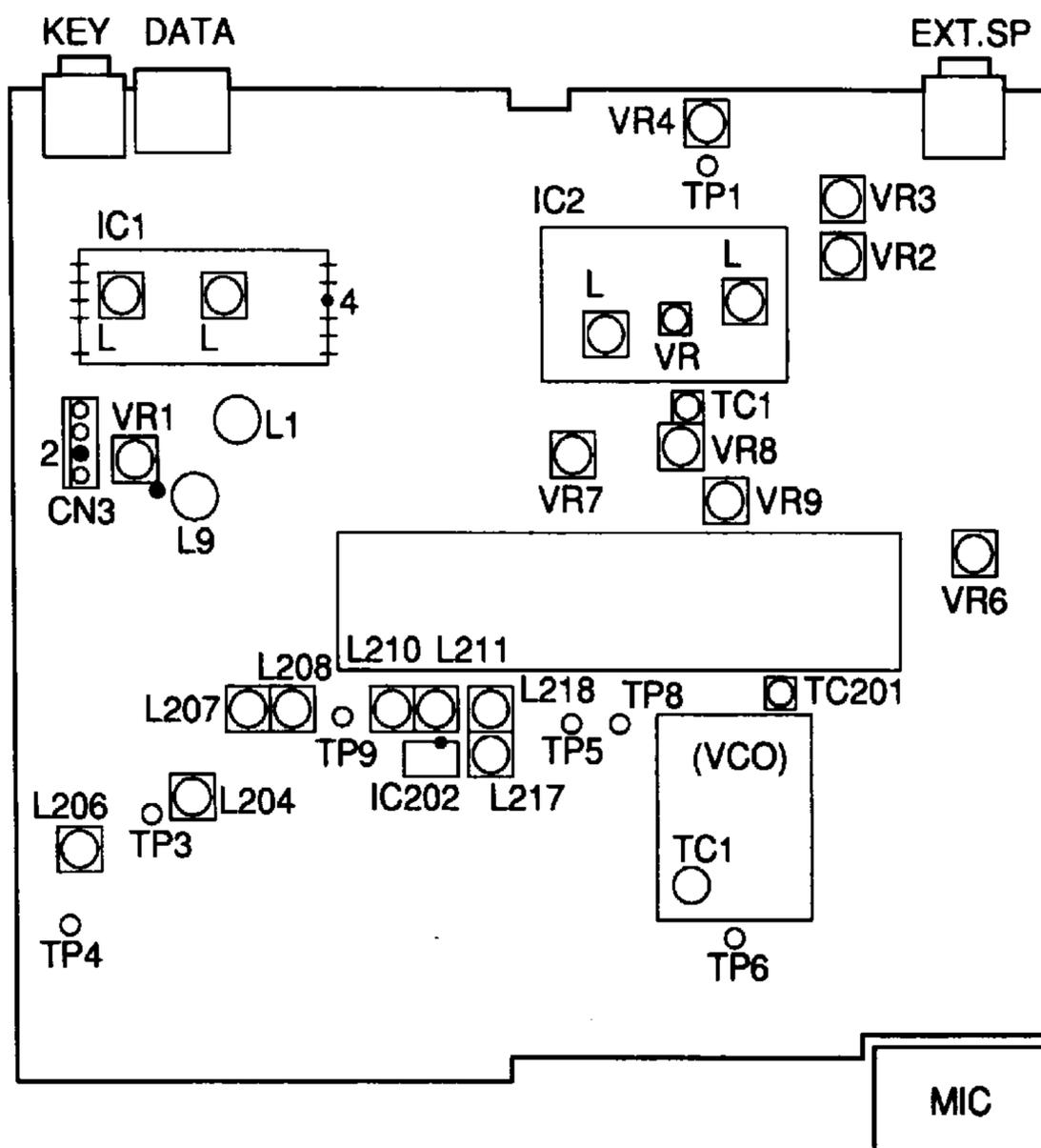


## TX-RX UNIT (C/5)

TX RX UNIT (C/5)  
 VR601: NULL and HI POWER  
 VR602: NULL  
 VR603: PROTECTION

## TX-RX UNIT (B/5)

TX-RX UNIT (B/5)  
 TC401: TX IF AMP  
 TC402: TX IF AMP  
 TC403: TX IF AMP  
 TC404: TX IF AMP  
 VR401: LOW POWER  
 VR402: RX S/N  
 L401: Helical (BPF)  
 L402: Helical (BPF)  
 L403: BPF  
 L404: BPF  
 L405: BPF  
 L407: MCF (10.695MHz)  
 L408: MCF (10.695MHz)  
 L410: BPF  
 L411: TX IF AMP  
 L412: TX IF AMP  
 L413: TX IF AMP  
 L414: TX IF AMP  
 L415: TX IF AMP  
 L416: TX IF AMP  
 L417: TX IF AMP



## TX-RX UNIT (A/5)

TC1: FM TX Frequency  
 TC1 (VCO): Lock Voltage  
 VR1: SSB MIC Sensitivity  
 VR2: BEEP  
 VR3: SIDE TONE  
 VR4: RFG  
 VR6: FM MAX DEV  
 VR7: Carrier Suppression  
 VR8: Carrier Suppression  
 VR9: Carrier Level  
 VR (IC2): IF Gain  
 L (IC1): Noise Blanker  
 L (IC2): IF AMP  
 L1: IF AMP  
 L9: TX IF AMP  
 L204: Ref. Oscillation Level  
 L206: CAR Oscillation Level  
 L207: 30.72MHz Level  
 L208: 30.72MHz Level  
 L210: 92.16MHz Level  
 L211: 92.16MHz Level  
 L217: 103.625MHz Level  
 L218: 103.625MHz Level  
 TC201: L01

## (D/5)