

## ADJUSTMENT

## Adjustment Mode

## • Overview

The transmission output, deviation, QT, DQT, and squelch can be adjusted by using the KPG-28D. There are three-point adjustment and one-point adjustment.

## 1. Three-point adjustment

(Three-point adjustment is carried out for each destination in the factory. After a desired frequency is written, each rating is checked.)

In the three-point adjustment, the inclination of adjustment is obtained based on the center (1CH), low (2CH), and high (3CH) frequencies in the frequency range in which the performance of the transceiver is guaranteed. The microprocessor calculates the adjustment value of the frequency in the band automatically according to the inclination.

**Note: Three-point tuning for the KPG-28D  
(Adjustment of the center, lower limit, and upper limit frequencies (Three-point tuning))**

The electronic volume can be tuned at the center, lower limit, and upper limit frequencies. (Three-point tuning)

1. Hold down [Alt] + [Shift] and press [F5] on the Main screen. The Password Window shown below will open.

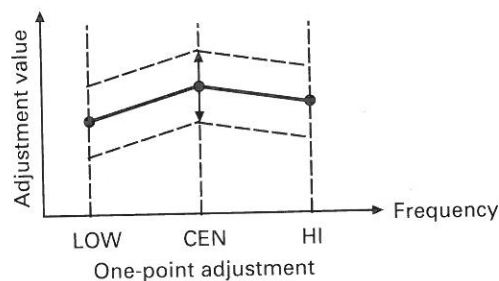
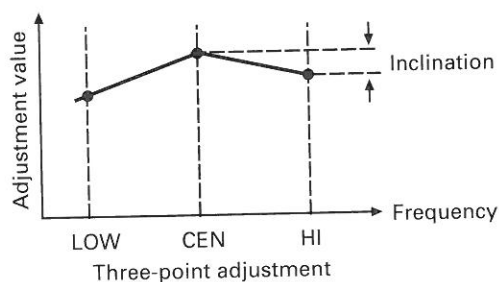
Password	
Password :	<input type="text"/>

2. Enter the password. (3TUNING)
3. Press [Enter]. If the password is correct, the Test Mode Window opens.

## 2. One-point adjustment

When the three-point adjustment is carried out, the center (1CH) value is automatically set to magnification rate 1. Therefore, it is not required to perform one-point adjustment. (However, one-point adjustment is performed for squelch only.)

In the one-point adjustment, all frequencies in the band can be re-adjusted using the center (CH1) value as magnification rate 1. If a frequency is fine-adjusted, a desired frequency is set for 4CH or subsequent channel (4CH to 8CH), and the frequency is re-adjusted. In this case, all frequencies in the band are also re-adjusted.



**Note:** One-point adjustment is used by dealers for fine adjustment. All the values are shifted automatically by moving one point (adjustment value).

**Notes:**

- 1) When the microprocessor is replaced, the main mode item of optional feature should be enabled using the KPG-28D. The main program appropriate for the version of the microprocessor should be written into the flash memory. In this case, re-adjustment is not required. (If the main item is not enabled, the main program is not written into the flash memory.)
- 2) If the flash memory is replaced, the main program should be written into the new flash memory. Then, re-adjustment should be carried out using the KPG-28D. In this case, set the frequency, then perform three-point adjustment. Perform one-point adjustment if necessary.

## ADJUSTMENT

### Required Test Equipment

#### 1. Stabilized power supply

- 1) The supply voltage can be changed between 5V and 18V, and the current is 15A or more.
- 2) The standard voltage is 13.2V

#### 2. DC ammeter

- 1) Class 1 ammeter (17 ranges and other features).
- 2) The full scale can be set to either 300mA or 10A.
- 3) A cable of less internal loss must be used.

#### 3. Frequency counter (f. counter)

- 1) Frequency of up to 1GHz or so can be measured.
- 2) The sensitivity can be changed to 500MHz or below, and measurements are highly stable and accurate (0.2ppm or so).

#### 4. Power meter

- 1) Measurable frequency : Up to 500MHz
- 2) Impedance : 50Ω, unbalanced
- 3) Measuring range : Full scale of 30W or so
- 4) A standard cable (5D2W 1m) must be used.

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

- 1) Measurable frequency : Up to 500MHz or so

#### 6. Linear detector

- 1) Measurable frequency : Up to 500MHz
- 2) Characteristics are flat, and CN is 60dB or more.

#### 7. Digital voltmeter

- 1) Voltage range : FS=18V or so
- 2) Input resistance : 1MΩ or more

#### 8. Oscilloscope

- 1) Measuring range : DC to 30MHz
- 2) Provides highly accurate measurements for 5 to 25MHz.

#### 9. AF voltmeter (AF VTVM)

- 1) Measurable frequency : 50Hz to 1MHz
- 2) Maximum sensitivity : 1mV or more

#### 10. Spectrum analyzer

- 1) Measurable range : DC to 1GHz or more

#### 11. Standard signal generator (SSG)

- 1) Maximum frequency : 500MHz or more
- 2) Output : -20dB/0.1μV to 120dB/1V
- 3) Output impedance : 50Ω

#### 12. Tracking generator

- 1) Center frequency : 50kHz to 500MHz
- 2) Frequency deviation : ±35MHz
- 3) Output voltage : 100mV or more

#### 13. Dummy load

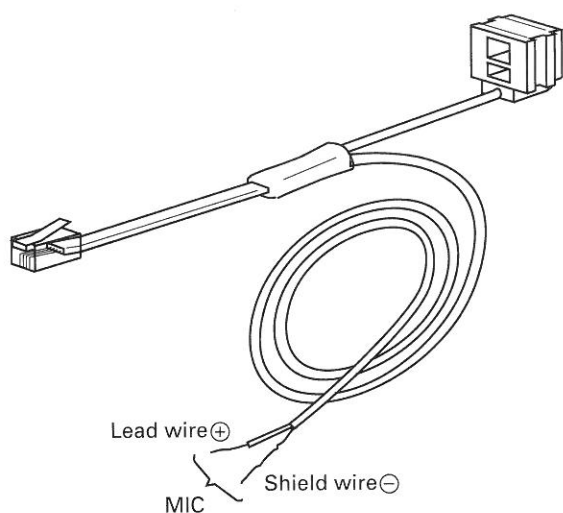
- 1) 4Ω, 3W or more

- Use a non-conductive rod such as a Bakelite rod for adjustment (Especially of trimmers and coils).
- To protect the SSG, do not send out signals while adjusting the receiving unit.
- The indicated SSG output levels are for maximum output.

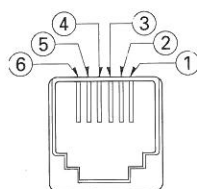
The set has been adjusted for the frequencies shown in the following table. When required, re-adjust them following the adjustment procedure to obtain the frequencies you want in actual operation.

	E,E3,E4		E2	
	TX (MHz)	RX (MHz)	TX (MHz)	RX (MHz)
CH1 (Center)	460.000	460.050	420.000	420.050
CH2 (Low)	450.000	450.050	410.000	410.050
CH3 (High)	470.000	469.950	430.000	429.950

- The following test cable is recommended.

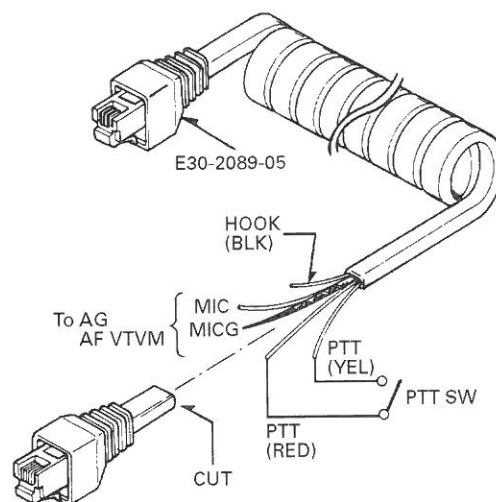


Tuning cable (E30-3217-05)



- ① SB
- ② PTTG
- ③ PTT
- ④ MICG
- ⑤ MIC
- ⑥ HOOK

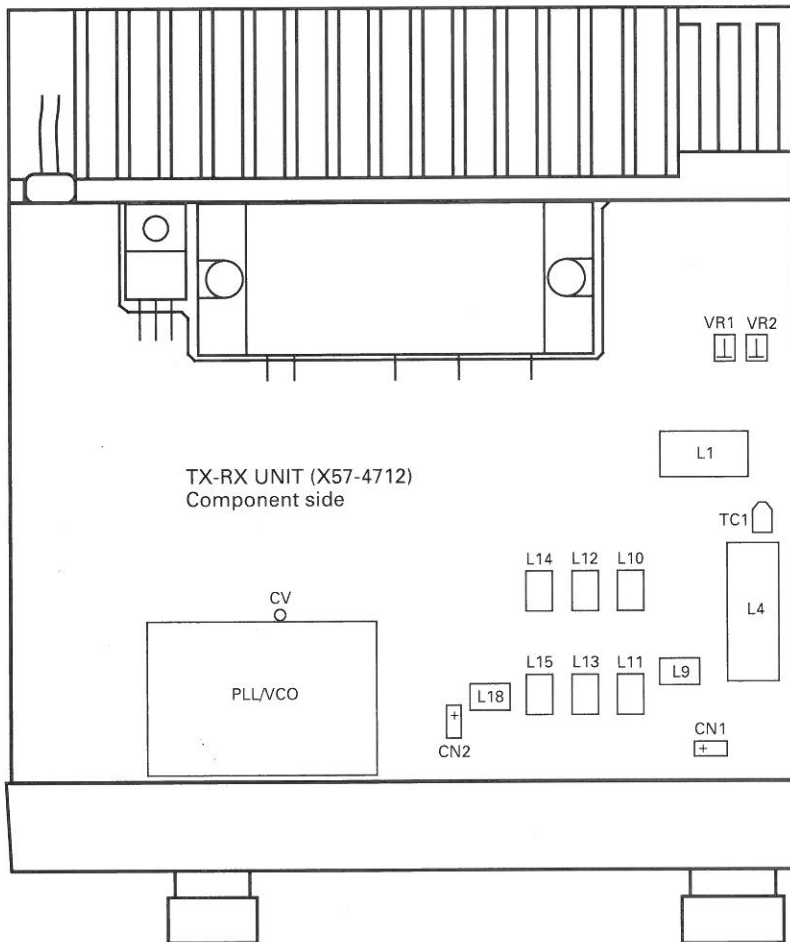
MIC connector  
(Front view)



Test cable for microphone input

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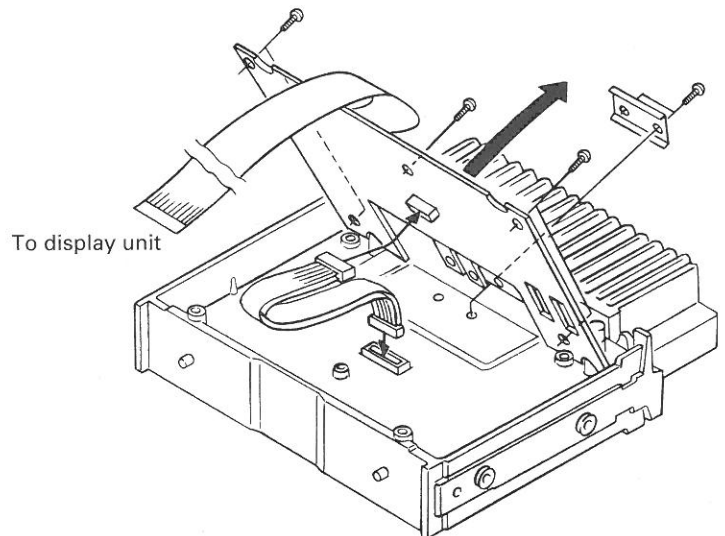
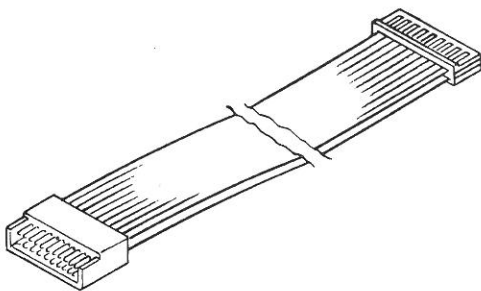
### Adjustment Point



- L1,4 : BPF
- L9,10,12,14 : IFT & MCF (Wide)
- L11,13,15 : IFT & MCF (Narrow)
- L18 : Discriminator
- TC1 : BPF
- VR1 : Maximum power
- VR2 : Protection

### How to Use the Jig

Parts No. : E37-0660-05



## ADJUSTMENT

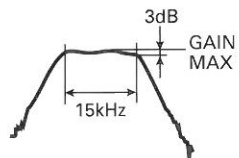
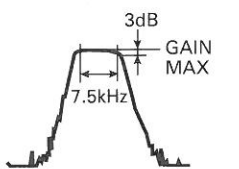
### Common Section Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting	<p>• Receiver section</p> <p>The indicated SSG output level are for maximum output.</p> <p>Whenever there is no modulation designation, standard modulation (MOD : 1kHz, (Wide) DEV : ±3.0kHz <b>E,E2</b>, ±2.4kHz <b>E3,E4</b>, (Narrow) DEV : ±1.5kHz) is indicated.</p>	<p>• Transmitter section</p>			<p><b>Description of function keys</b></p> <p>PC : IBM-PC</p> <p>←/→ : Move the cursor with the keys.</p> <p>Spacebar : Switch between TX and RX.</p> <p>Enter key : Set a value and go to the next step.</p>			
2. PLL lock voltage	<p>1) CH : Channel with lowest RX FREQ' (f<sub>RL</sub>)</p> <p>2) CH : Channel with highest RX FREQ' (f<sub>RH</sub>)</p> <p>3) CH : Channel with lowest TX FREQ' (f<sub>TL</sub>) PTT : ON</p> <p>4) CH : Channel with highest TX FREQ' (f<sub>TH</sub>) PTT : ON</p>	DVM Power meter	TX-RX	CV			Check	2.5V or more
								7.5V or less
								2.5V or more
								7.5V or less
3. Transmit frequency	1) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) PTT : ON	Power meter f.counter	Rear panel	ANT			Check	f ± 0.69kHz <b>E,E3,E4</b> f ± 0.63kHz <b>E2</b>

### Receiver Section Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. BPF	1) CH : Channel with RX center FREQ' (f <sub>RM</sub> ) SSG output : -30dBm	Tracking generator  Spectrum analyzer	Rear panel  TX-RX	ANT  CN1	TX-RX	L1,L4 TC1	Align to set the waveform of spectrum analyzer as light.	<p>450 460 470 <b>E,E3,E4</b></p> <p>410 420 430 <b>E2</b></p> <p>Gain max.</p> <p>2dB</p>

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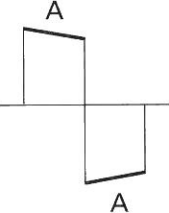
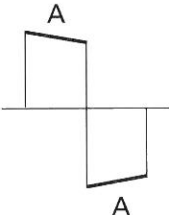
Item	Condition	Measurement			Adjustment			Specifications/Remarks		
		Test-equipment	Unit	Terminal	Unit	Parts	Method			
2. IFT & MCF	1) CH : Channel with RX center FREQ' (f <sub>RM</sub> ) (Wide) Tracking generator output : -20dBm	Tracking generator  Spectrum analyzer	TX-RX	CN1  CN2	TX-RX	L9  L10 L12	Gain MAX.  Align to set the waveform of spectrum analyzer as right.  Note : When replacing L14 or L15, turn the core two turns mechanically.			
	2) CH : Channel with RX center FREQ' (f <sub>RM</sub> ) (Narrow) Tracking generator output : -20dBm					L11 L13				
3. Discriminator	1) Channel with RX center FREQ' (f <sub>RM</sub> ) (Wide) SSG output : -53dBm AF : 1.4V/4Ω	SSG  AF VTVM Oscilloscope	Rear panel	ANT  EXT.SP	TX-RX	L18	AF output MAX.			
4. Distortion	1) CH : Channel with RX center FREQ' (f <sub>RM</sub> ) (Wide) SSG output : -53dBm AF : 1.4V/4Ω	SSG  Distortion meter AF VTVM Oscilloscope	Rear panel	ANT  EXT.SP			Check	3% or less		
	2) CH : Channel with RX center FREQ' (f <sub>RM</sub> ) (Narrow)									
5. Sensitivity	1) CH : Channel with lowest RX FREQ' (f <sub>RL</sub> ) (Wide) SSG output : -117dBm AF : 0.45V/4Ω						Check	SINAD 12dB or more.		
	2) CH : Channel with highest RX FREQ' (f <sub>RH</sub> ) (Wide)									
	3) CH : Channel with lowest RX FREQ' (f <sub>RL</sub> ) (Narrow)									
	4) CH : Channel with highest RX FREQ' (f <sub>RH</sub> ) (Narrow)									
6. Squelch	1) CH : Channel with RX center FREQ' (f <sub>RM</sub> ) (Wide) SSG output : Value when 3dB is subtracted from the sensitivity value of 12dB SINAD. AF : 0.45V/4Ω	SSG  Distortion meter AF VTVM Oscilloscope Ammeter	Rear panel	ANT  EXT.SP	PC	←/→	Set to the point at which squelch just close.			
	2) SSG output : 12dB SINAD						Check	Squelch should open.		
	3) SSG output : OFF							Squelch should close.		
	4) CH : Channel with RX center FREQ' (f <sub>RM</sub> ) (Narrow) SSG output : Value when 3dB is subtracted from the sensitivity value of 12dB SINAD.						PC	←/→	Set to the point at which squelch just close.	
	5) SSG output : 12dB SINAD						Check	Squelch should open.		
	6) SSG output : OFF							Squelch should close.		

## ADJUSTMENT

## Transmitter Section Adjustment

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Power output	1) Maximum power CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) PTT : ON	Power meter	Rear panel	ANT	TX-RX	VR1	26.5W <b>E,E2</b> 11.0W <b>E3</b> 7.0W <b>E4</b>	±0.5W
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) PTT : ON	Ammeter			PC	←/→	25.0W <b>E,E2</b> 10.0W <b>E3</b> 6.0W <b>E4</b>	±0.5W 7.5A or less <b>E,E2</b> 5.0A or less <b>E3</b> 3.5A or less <b>E4</b>
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) PTT : ON						25.0W <b>E,E2</b> 10.0W <b>E3</b> 6.0W <b>E4</b>	±0.5W
	4) Low power CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) PTT : ON						5.0W <b>E,E2</b> 1.0W <b>E3,E4</b>	±0.5W <b>E,E2</b> ±0.3W <b>E3,E4</b>
	5) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) PTT : ON							
	6) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) PTT : ON							
<ul style="list-style-type: none"> <li>To adjust the power, set VR1 to the value listed above in 1-1), and adjust it accurately (to the operating power) using an IBM-PC. 10W or higher : Operating power +1.0W Lower than 10W : Operating power +0.3 to 0.5W 1W : Set VR1 to the minimum power.</li> <li>Adjust the power in the same way if the low power is mainly used.</li> </ul>								
2. Maximum deviation (Wide)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) AG : 1kHz/50mV Deviation meter filter HPF : OFF LPF : 15kHz De-emphasis : OFF PTT : ON	Power meter Deviation meter Oscilloscope	Rear panel	ANT	PC	←/→	±4.1kHz <b>E,E2</b> ±3.3kHz <b>E3,E4</b> (According to the larger +, -)	±0.1kHz  Oscilloscope waveform is not abnormal.
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) PTT : ON	AF VTVM	Front panel	MIC				
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> )	AG						
3. Maximum deviation (Narrow)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) AG : 1kHz/50mV Deviation meter filter HPF : OFF LPF : 15kHz De-emphasis : OFF PTT : ON						±2.05kHz (According to the larger +, -)	±0.05kHz  Oscilloscope waveform is not abnormal.
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) PTT : ON							
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> )							

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Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. MIC sensitivity	1) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) (Wide) AG : 1kHz/5mV PTT : ON	Power meter Deviation meter Oscilloscope	Rear panel	ANT			Check	±2.2~3.6kHz <b>E,E2</b> ±1.7~2.8kHz <b>E3,E4</b>
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) (Narrow) AG : 1kHz/5mV PTT : ON	AF VTVM AG	Front panel	MIC				±1.1~1.8kHz
5. DTMF deviation	1) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / D (Wide) PTT : ON				PC	←/→	±3.0kHz <b>E,E2</b> ±2.4kHz <b>E3,E4</b> (According to the larger +, -)	±0.1kHz
6. 5-TONE deviation	1) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / 1kHz (Wide) Deviation meter filter HPF : 300Hz LPF : 3kHz De-emphasis : OFF PTT : ON						±3.0kHz <b>E,E2</b> ±2.4kHz <b>E3,E4</b> (According to the larger +, -)	±0.1kHz
7. DQT balance (Wide)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) / 023N Deviation meter filter HPF : OFF LPF : 3kHz De-emphasis : OFF PTT : ON							Flat the A parts. 
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / 023N PTT : ON							
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) / 023N PTT : ON							
8. DQT balance (Narrow)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) / 023N Deviation meter filter HPF : OFF LPF : 3kHz De-emphasis : OFF PTT : ON							Flat the A parts. 
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / 023N PTT : ON							
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) / 023N PTT : ON							
9. DQT deviation (Wide)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) / 023N Deviation meter filter HPF : OFF LPF : 3kHz De-emphasis : OFF PTT : ON						0.75kHz <b>E,E2</b> 0.60kHz <b>E3,E4</b>	±0.05kHz
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / 023N PTT : ON							
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) / 023N PTT : ON							

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
10. DQT deviation (Narrow)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) / 023N Deviation meter filter HPF : OFF LPF : 3kHz De-emphasis : OFF PTT : ON	Power meter Deviation meter Oscilloscope	Rear panel	ANT	PC	←/→	0.35kHz	±0.05kHz
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / 023N PTT : ON	AF VTVM AG	Front panel	MIC				
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) / 023N PTT : ON							
11. QT deviation (Wide)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) / 151.4Hz Deviation meter filter HPF : 50Hz LPF : 3kHz De-emphasis : OFF PTT : ON						0.75kHz <b>E,E2</b> 0.60kHz <b>E3,E4</b>	±0.05kHz
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / 151.4Hz PTT : ON							
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) / 151.4Hz PTT : ON							
12. QT deviation (Narrow)	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) / 151.4Hz Deviation meter filter HPF : 50Hz LPF : 3kHz De-emphasis : OFF PTT : ON						0.35kHz	±0.05kHz
	2) CH : Channel with TX center FREQ' (f <sub>TM</sub> ) / 151.4Hz PTT : ON							
	3) CH : Channel with lowest TX FREQ' (f <sub>TL</sub> ) / 151.4Hz PTT : ON							
13. Protection	1) CH : Channel with highest TX FREQ' (f <sub>TH</sub> ) ANT : Open Space key 1 push : TX	Ammeter	Front panel	MIC	TX-RX	VR2	Current min.	7.5A or less <b>E,E2</b> 4.0A or less <b>E3</b>
							Check	3.5A or less <b>E4</b>