STABO 933/934

SERVICE MANUAL

CONTENTS

SPECIFICATIONS

- **General**

Channel	High band 40 channels F2D for channel 1 F3D for channel 2 to 40 Low band 40 channels F2D for channel 1 F3D for channel 2 to 40
Frequency range	High band 934.0125 MHz – 934.9875 MHz Low band 933.0125 MHz – 933.9875 MHz
Channel spacing	25 kHz
Mode of operation	Simplex
Power supply	13.2 V dc
Frequency control	PLL synthesizer
Dimension(W x H x D)	150mm x 40mm x 182mm

- **Receiver**

Sensitivity	below 0 dBμ (at 20 dB SINAD)
6 dB selectivity	greater than±12 kHz
60 dB atenuation	below ±30 kHz
Image and spurious	greater than 60 dB
Inter modulation	greater than ±60 dB
Blocking effect	greater than ±60 dB
Hum and noise	below –40 dB (20 dBμ input)
AF output 10 % THD	greater than 3.5 W (4 ohms)

- **Transmitter**

RF power output	below 5 W
Frequency tolerance	below ±3 PPM
Deviation	below ±5 kHz (maximum)
Occupied band width	below 16 kHz
AF distortion	below 5 % (1 kHz with 3.5 kHz Dev.)
Hum and noise	below –40 dB (H.P.F 300 Hz, L.P.F 3 kHz)
Cabinet radiation	below 20 nW (41 MHz – 862 MHz) below 5 μW (933 MHz – 934 MHz) below 250 nW (up to 1 GHz) 1 μW (over 1 GHz)
Current drain	below 2.5 A (transmission)

CIRCUIT DESCRIPTION

I. OPERATING DESCRITION

This radio can be used at both 933 MHz band (hereafter this is called LOW band) and 934 MHz band (hereafter this is called HIGH band) frequencyies as shown in Table – 1.(see page 8)
At both High and Low bands, the 1st channel (C–ch = Call channel) is exclusive for calling and the remaining 39 channels can be used for communication (S–ch = Sub channel).
In the PRS mode, this radio can be changed from C–ch (standby condition) to S–ch (communication channel) by station calling, monitoriang and receiving.
In the CB mode, the required channel can also be set by key input.

Calling operation is entered by pressing the PTT(Press To Talk) key and searches vacant channel among the communication channels at random. When a vacant channel is found, the data of that channel and the group number are transmitted as the ATLS signal so that a standby station with the same group number can be received. If a standby station receives the signal, this radio calls the remote station at that channel and changes to the same channel for communication.

On the other hand, receiving operation is performed in the reverse way. The radio is changed to the calling channel (designated by the remote station) so that communication can be made.

Monitoring operation can be entered by pressing the Monitor key. The radio begins scanning the S–ch to detect the signal at each channel. When a signal is detected, channel searching stops. In the PRS mode, when the signal is received at that channel, transmission becomes possible for five minutes. If the signal is received within five minutes, further transmission becomes possible for another five minutes. After five minutes have elapsed, the READY indicator goes off and the transmission–possible condition is cancelled. In this condition, transmission is impossible unless the other signal is received.

II. KEY OPERATION

1. Group number assignment method

key input order	display
SET	not lit
6	6
7	67
8	678
9	6789
0	67890

When key inputting, if the key is valid, the beep tone sounds for 26 ms. And when the 5-column group number assignment is completed, the beep tone sounds for 130 ms.

The group number assignment is possible only when the radio is set to the PRS mode and in standby condition or monitoring condition with READY indicator not lit. When no key is input within 5 seconds after the last key input, the previous display resumes.

2. Channel number assignment method

key input order	display
SET	
2	2 blinks
3	23
SET	23

Beep tone sounds in the same manner as in the group number assignment operation.

The channel number assignment is possible only when the radio is set to the CB mode and in standby condition or in monitoring condition with READY indicator not lit. When no key is input within 5 seconds after the last key input, the previous display resumes.

3. Group number memory setting method
The displayed group number can be stored only when the radio is set to the PRS mode and in standby condition or monitoring condition with READY indicator not lit. The operation should be performed within 5 seconds.

key input order	display	MEMO indicator
MEM	12345	blinks
2	12345	not lit

Nine memory positions are available from 1 to 9. 0 is used exclusively for read out 00000 sand no number can be stored in this memory location.

4. Sub group number assignment method

(A)

key input order	display	
SET		
DUAL	12345	
2	22222	
3 secs. after	12345	displays every 3 secs.
another 3 secs. after	22222	

(B)

key input order	display	
SET		
DUAL	12345	
SET		
6	6	
7	67	
8	678	
9	6789	
0	67890	
3 secs. after	12345	displays every 3 secs.
another 3 secs. after	67890	

5. Channel memory method
Addition : When the radio is in the monitor channel stop mode, monitor ready mode or in the communication receiving mode, pressing the [CH MEM] key stores the current using channel and the group number for 15 minutes. Then 14 minutes 30 seconds later, a tone sounds as a warning.

III. KEYS AND SWITCHES

1. **[1 – 0] numeric keys**
   These keys are used when setting the group number and channel number, memorizing the group number and displaying the stored memory.

2. **MEMORY key**
   When memorizing the displayed group number, pressing this key set the radio to the memory enable status.

3. **SET key**
   This key is used to set the radio to the set enable status for group number assignment and when completing the operation in the channel setting mode.

4. **RESET key**
   This key is used to release the operation of the group number setting, memory setting and DUAL mode, and used to return to the C-ch mode.

5. **DUAL key**
   When setting the sub group number, pressing this key sets the radio to the sub-enable status.

6. **CB/PRS mode select key**
   This key is used to select the operation mode between CB mode and PRS (Personal Radio System) mode. Each press alternates the operation mode. This is effective only for the High band.

7. **CH MEM (Channel Memory) key**
   This key is effective only while the channel-fixed condition in the S-ch mode. Press this key to store the group number and channel number for 15 minutes.

8. **SEARCH key**
   This key is used to call the channel when 5-minute channel memory is entered, and used to search the signal-receiving channel in the S-ch mode. The 5-minute channel memory calling operation is first.

9. **H/L (High band/Low band) select key**
   This key is used to select the frequency band of 933 MHz or 834 MHz. Each press alternates the frequency.

10. **RECALL key**
    When designating the group number for transmission/reception, this key is used to recall the station with the same group number in C-ch to the using channel. This key is also used to recall the channel memory of 15 minutes and store into the memory monitor when C-ch is minitored with READY indicator not lit.

IV. INDICATORS

1. **High band/Low band indicator**
   This indicator shows the communication mode; High band or Low band. It lights up when the High band mode.

2. **Channel memory indicator**
   This indicator lights when 15-minutes communication memory is used, and blinks during group number memory enable condition even when 15-minute memory is used.

3. **Search indicator**
   This indicator blinks during channel search operation, and stays lit when channel search stops. It also lights when 5-minute/15 minute memory monitor is used and when channel assignment is finished in the channel setting mode for the high band.

4. **Ready indicator**
   This indicator lights when the radio is in the S-ch mode and PTT operation is effective.

5. **TX indicator**
   This indicator lights during transmission.

V. CHANNEL ASSIGNMENTS (Table – 1)

High band
(934 MHz, 25 kHz spacing, 40 channels)

ch	TX frequency	RX frequency
1	934.0125 MHz	992.125 MHz
2	934.0375 MHz	992.150 MHz
3	934.0625 MHz	992.175 MHz
4	934.0875 MHz	992.200 MHz
5	934.1125 MHz	992.225 MHz
6	934.1375 MHz	992.250 MHz
7	934.1625 MHz	992.275 MHz
8	934.1875 MHz	992.300 MHz
9	934.2125 MHz	992.325 MHz
10	934.2375 MHz	992.350 MHz
11	934.2625 MHz	992.375 MHz
12	934.2875 MHz	992.400 MHz
13	934.3125 MHz	992.425 MHz
14	934.3375 MHz	992.450 MHz
15	934.3625 MHz	992.475 MHz
16	934.3875 MHz	992.500 MHz
17	934.4125 MHz	992.525 MHz
18	934.4375 MHz	992.550 MHz
19	934.4625 MHz	992.575 MHz
20	934.4875 MHz	992.600 MHz
21	934.5125 MHz	992.625 MHz
22	934.5375 MHz	992.650 MHz
23	934.5625 MHz	992.675 MHz
24	934.5875 MHz	992.700 MHz
25	934.6125 MHz	992.725 MHz
26	934.6375 MHz	992.750 MHz
27	934.6625 MHz	992.775 MHz
28	934.6875 MHz	992.800 MHz
29	934.7125 MHz	992.825 MHz
30	934.7375 MHz	992.850 MHz
31	934.7625 MHz	992.875 MHz
32	934.7875 MHz	992.900 MHz
33	934.8125 MHz	992.925 MHz
34	934.8375 MHz	992.950 MHz
35	934.8625 MHz	992.975 MHz
36	934.8875 MHz	993.000 MHz
37	934.9125 MHz	993.025 MHz
38	934.9375 MHz	993.050 MHz
39	934.9625 MHz	993.075 MHz
40	934.9875 MHz	993.100 MHz

Low band
(933 MHz, 25 kHz spacing, 40 channels)

ch	TX frequency	RX frequency
1	933.0125 MHz	991.125 MHz
2	933.0375 MHz	991.150 MHz
3	933.0625 MHz	991.175 MHz
4	933.0875 MHz	991.200 MHz
5	933.1125 MHz	991.225 MHz
6	933.1375 MHz	991.250 MHz
7	933.1625 MHz	991.275 MHz
8	933.1875 MHz	991.300 MHz
9	933.2125 MHz	991.325 MHz
10	933.2375 MHz	991.350 MHz
11	933.2625 MHz	991.375 MHz
12	933.2875 MHz	991.400 MHz
13	933.3125 MHz	991.425 MHz
14	933.3375 MHz	991.450 MHz
15	933.3625 MHz	991.475 MHz
16	933.3875 MHz	991.500 MHz
17	933.4125 MHz	991.525 MHz
18	933.4375 MHz	991.550 MHz
19	933.4625 MHz	991.575 MHz
20	933.4875 MHz	991.600 MHz
21	933.5125 MHz	991.625 MHz
22	933.5375 MHz	991.650 MHz
23	933.5625 MHz	991.675 MHz
24	933.5875 MHz	991.700 MHz
25	933.6125 MHz	991.725 MHz
26	933.6375 MHz	991.750 MHz
27	933.6625 MHz	991.775 MHz
28	933.6875 MHz	991.800 MHz
29	933.7125 MHz	991.825 MHz
30	933.7375 MHz	991.850 MHz
31	933.7625 MHz	991.875 MHz
32	933.7875 MHz	991.900 MHz
33	933.8125 MHz	991.925 MHz
34	933.8375 MHz	991.950 MHz
35	933.8625 MHz	991.975 MHz
36	933.8875 MHz	992.000 MHz
37	933.9125 MHz	992.025 MHz
38	933.9375 MHz	992.050 MHz
39	933.9625 MHz	992.075 MHz
40	933.9875 MHz	992.100 MHz

RX frequency = TX frequency + 58.1125 MHz

channel 1 is used for a calling channel (C-ch).
channels 2 to 40 are used for sub channels (S-ch).

ALIGNMENT PROCEDURE

- **Measurement condition**

Reference temperature 25 °C
reference humidity 65 %

Note :
Unless oterwise specified, alignment may be performed under the room temperature of 5 – 35 °C and the room humidity of 45 – 80 %.

- **Power supply**

DC 13.2 V ±1 %, unless other wise specified.

- **Test equipments**

Audio signal generator	Sine wave, 10 Hz – 20 kHz.
Voltmeter	1 mV measurable
DC ampare meter	DC 3A.
Audio distortion meter	10 Hz – 20 kHz
Regulated power supply	DC 0 – 20 V, 3 A or higher
Frequency counter	0 – 1000 MHz, high input impedance
Deviation meter	For FM UHF use
Oscilloscope	100 MHz, high imput impedance
RF power meter	Thermo–couple type, 15 W
Standard signal generator	FM 900 MHz
Dummy load resistor	8 ohms, 10 W.
Spectrum analyzer	900 MHz
Circuit tester	DC 20 kohms/V, high input impedance.

All test equipment should be properly calibrated.

- **Voltage check**

VCO
1. Set the radio to channel 1.
2. Connect oscilloscope to 8 pin of VCO, verify that the voltage is 3.5 – 4.5 V.

BACK UP
1. Connect the oscilloscope to 9 pin of connector P10 (9 pin type connector).
2. Verify that the voltage is approx. 5.0 V while power is on, 4.5 V when power is off.

5 V AVR
1. Connect oscilloscope to 12 pin of connector P9 (12 pin type connector)
2. Verify that the voltage is 5.0 V.

AVR
1. Verify the voltage at following points.
2. Connect oscilloscope to 1 pin of U5 and check the voltage is 8.0 V.
3. Check the voltage is 8.0 V at 8 pin of U5 while transmitting mode.
4. Check the voltage is 8.0 V at 6 pin of U5 when the radio is receiving mode.

PLL
1. Connect oscilloscope to 18 pin of U1.
2. Verify the voltage is approx. 5.6 V.

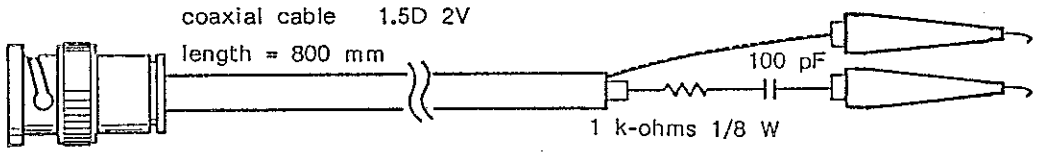
- **Frequency check**

2nd local frequency check
1. Connect frequency counter to TP3 on the main PCB.
2. Adjust T1 core for 58.5675 MHz ±300 Hz .

900 MHz adjustment
1. Connect frequency to 3rd pin of VCO.
2. Adjust CT901 on the TCXO for 992.1250 MHz ± 1 kHz.

- **Pre-scaler input level adjustment**

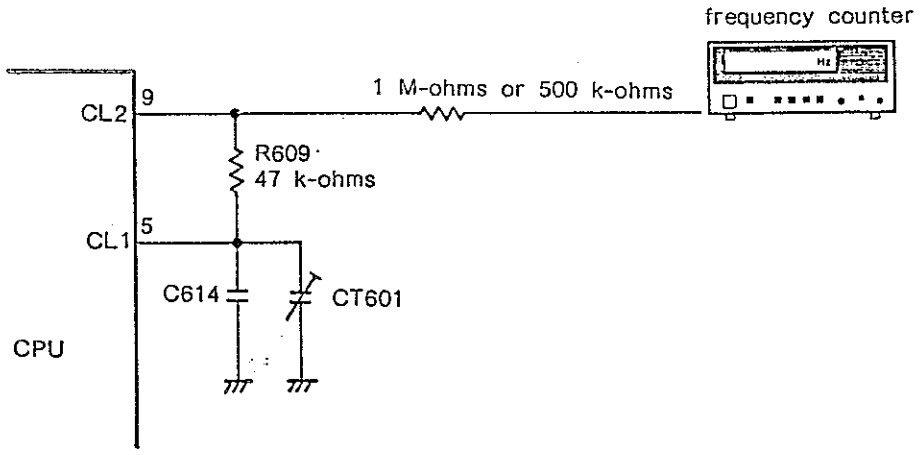
1. Connect coaxial test cable to 2nd pin of U2.
2. Adjust CT1 for more than -10 dBm at both transmitting mode or receiving mode.



Note:
1. Preferable minimum cable length.
2. Use a cable with specified gain loss.

- **CPU clock adjustment**

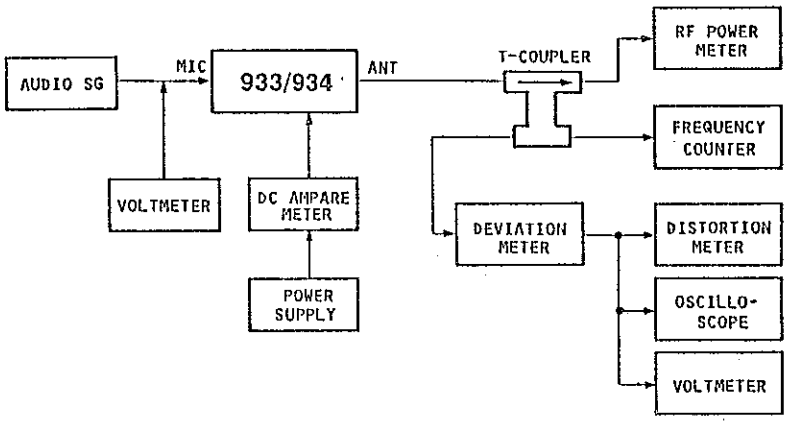
1. Connect frequency counter with the aligned probe to 9th pin of CPU IC(7508).
2. Adjust CT601 for 313.6 kHz.



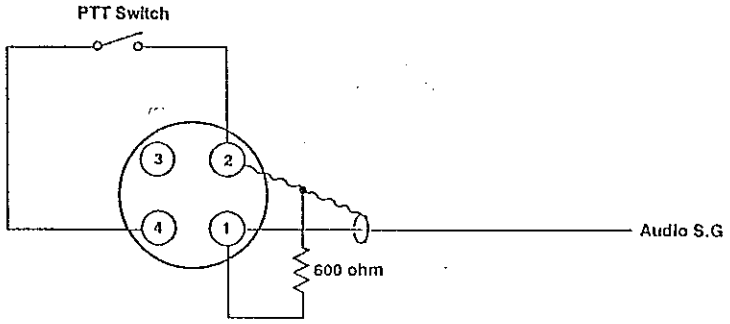
I. TRANSMITTER ADJUSTMENT

- **Preparations**

1. Connect test instruments as shown below.



2. Connect a dummy microphone to the microphone jack.



- **RF output power adjustment**

1. Set power source voltage to 10.5 V.
2. Connect oscilloscope to antenna terminal, set the radio to transmitting mode.
3. Adjust CT401 on the PCB(PTTX022H1X) for maximum output signal waveform.
4. Confirm that the output power is more than 2.0 W at 10.5 V power supply, more than 5.5 W at 13.2 V.

- **APC(Automatic Power Control) adjustment**

1. Set power source voltage to 13.2 V.
2. Connect a spectrun analyzer to antenna terminal, set the radio to transmitting mode.
3. Adjust RV752 for 4.7 W RF output, for greater than 60 dB spurious gain.
4. Verify that the RF output power does not exceed the limit of 5.0 W even if 15.6 V power is supplied.

- **Deviation adjustment**

1. Set the radio to transmitting mode.
2. Connect audio signal generator to mic input, deviation meter to antenna terminal.
3. Apply a 1 kHz 100 mV sine wave.
4. Adjust RV1 for ±4.5 kHz deviation.
5. Reduce mic input signal for ±3.5 kHz deviation.
6. Check that the distortion is less than 10 %, signal-to-noise ratio is greater than 40 dB when without deviation.(Utilize a deviation meter with the band pass filter of 300 Hz - 3 kHz)

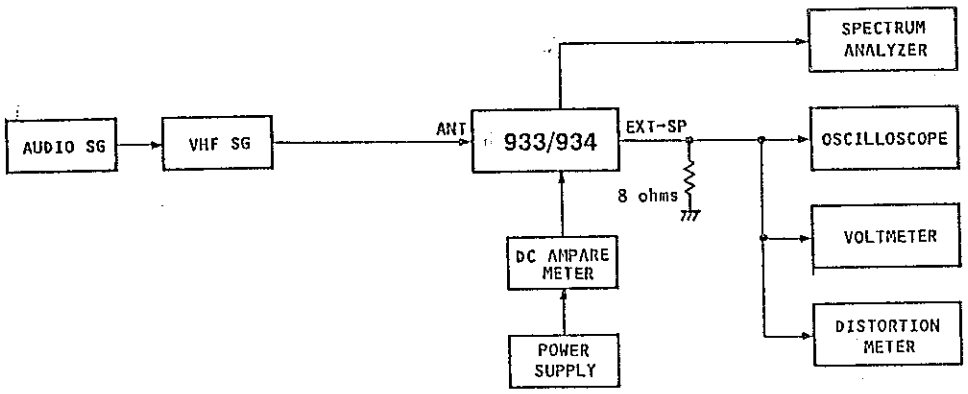
- **ATIS deviation adjustment**

1. Set the radio to transmitting mode.
2. Connect audio signal generator to mic input, deviation meter to antenna terminal.
3. Apply a 1 kHz 100 mV sine wave.
4. Observe the wave form on the scope, adjust RV2 for ±3.5 kHz deviation while repeating the PTT switch on and off several times.

II. RECEIVER ADJUSTMENT

- **Preparations**

1. Connect test instruments as shown below.



- **Sensitivity adjustment**

1. Set the radio to receiving mode.
2. Apply a 20 dBμ RF signal with 1 kHz, 3 kHz deviation to TP4.
3. Adjust T701, T702, T703 for clear sine wave on the scope.
4. After completion, verify the 20 dB NQS is lower than 0 dBμ.

- **Threshold check**

1. Set the radio to receiving mode.
2. Without applying a RF signal, turn the "SQUELCH" knob to the point noise goes off.(between the 8 o'clock position and 10:30 position.)

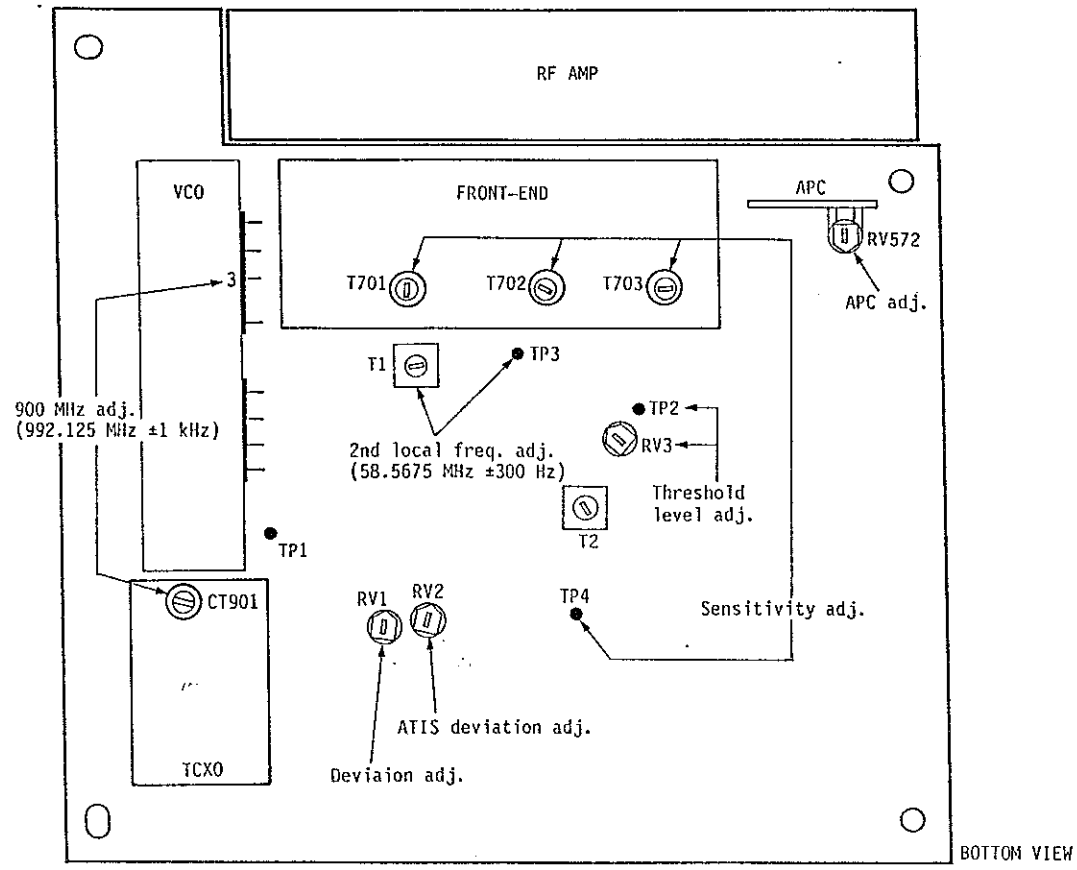
- **Tight squelch check**

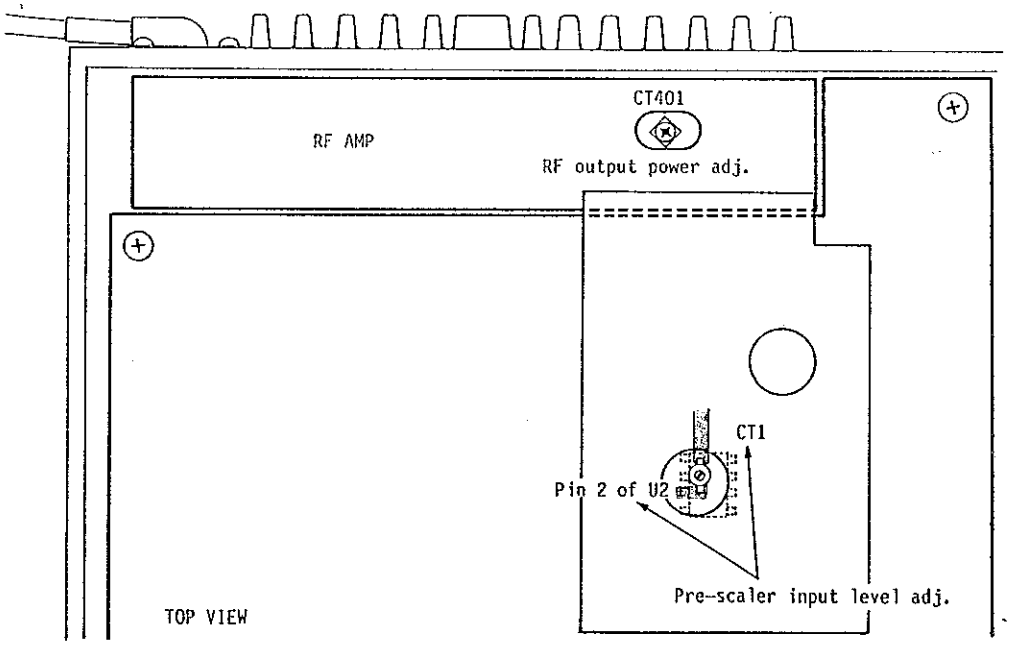
1. Set the radio to receiving mode.
2. Turn the "SQUELCH" knob to its fully clockwise.
3. Apply a 1 kHz sine wave with 3 kHz deviated RF signal to antenna terminal.
4. Increase signal generator output gradually observing antenna input level which just produces an audio output.
5. Check the input signal level is between 0 dBμ EMF and 20 dBμ EMF.

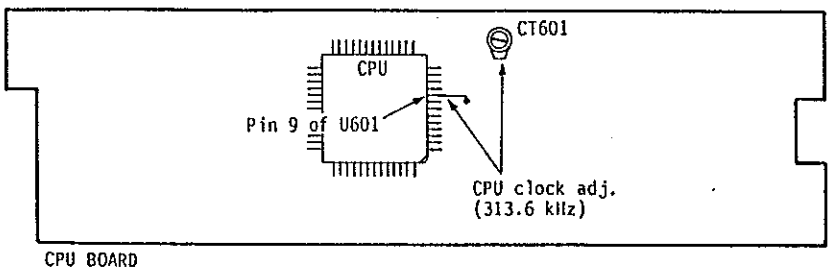
- **Threshold level adjustment**

1. Set the radio to receiving mode.
2. Connect oscilloscope to TP2, apply a 1 kHz, −2 dBμ EMF sine wave with 3.5 kHz deviated RF signal to antenna terminal.
3. By observing the scope, adjust RV3 so that the wave shape just threshes between the level of 0 V and 5 V.

ADJUSTMENT LOCATIONS







CPU PIN ASSIGNMENT
(U601, μPD7508G-784-00)

pin No.	symbol	I/O	description
1	NC		No connection
2	P73	I	PTT, High = OFF, Low = ON
3	RESET		CPU reset, High = RESET, Low = OPERATE
4	NC		No connection
5	CL1		CPU clock
6	NC		No connection
7	VDD		+ B
9	CL2		CPU clock
10	INT1	I	Modem TX clock
11	P00	I	PLL lock, H = UNLOCK, L = LOCK
12	P01	I	Modem RX clock
13	NC		No connection
14	NC		No connection
15	P02		No connection
16	P03	I	Modem RX data, H = 1200 Hz, L = 1800 Hz
17	P60	O	T/R shift, H = RX, L = TX
18	P61	O	TX mute, H = ON, L = OFF
19	P62	O	Segment I, H = ON, L = OFF
20	P63	O	Modem TX data, H = 1200 Hz, L = 1800 Hz
21	P50	O	Segment E, H = ON, L = OFF
22	P51	O	Segment F, H = ON, L = OFF
23	P52	O	Segment G, H = ON, L = OFF
24	P53	O	Segment H, H = ON, L = OFF
25	P40	O	Segment A, H = ON, L = OFF
26	P41	O	Segemnt B, H = ON, L = OFF
27	NC		No connection
28	P62	O	Segment C, H = ON, L = OFF
29	NC		No connection
30	P43	O	Segment D, H = ON, L = OFF
31	VSS		Ground
32	X1	I	CPU count clock
33	VDD		+ B
34	X2		Not used
35	NC		No connection
36	P20	O	PLL clock
37	P21	O	Buzzer, H = ON, L = OFF
38	P22	O	RX mute, H = ON, L = OFF
39	P23	O	BT, H = TX ON, L = TX ready or RX
40	NC		No connection
41	P10	I	Key return, H = KEY IN, L = OPEN
42	P11	I	Key return, H = KEY IN, L = OPEN
43	P12	I	Key return, H = KEY IN, L = OPEN
44	P13	I	Ket return, H = KEY IN, L = OPEN
45	NC		No connection
46	P30	O	4028 decode in
47	P31	O	4028 decode in
48	P32	O	4028 decode in
49	P33	O	4028 decode in
50	P70	I	Not used
51	P71	I	1μV, H = Empty, L = Busy
52	P72	I	Squelch, H = Empty, L = Signal