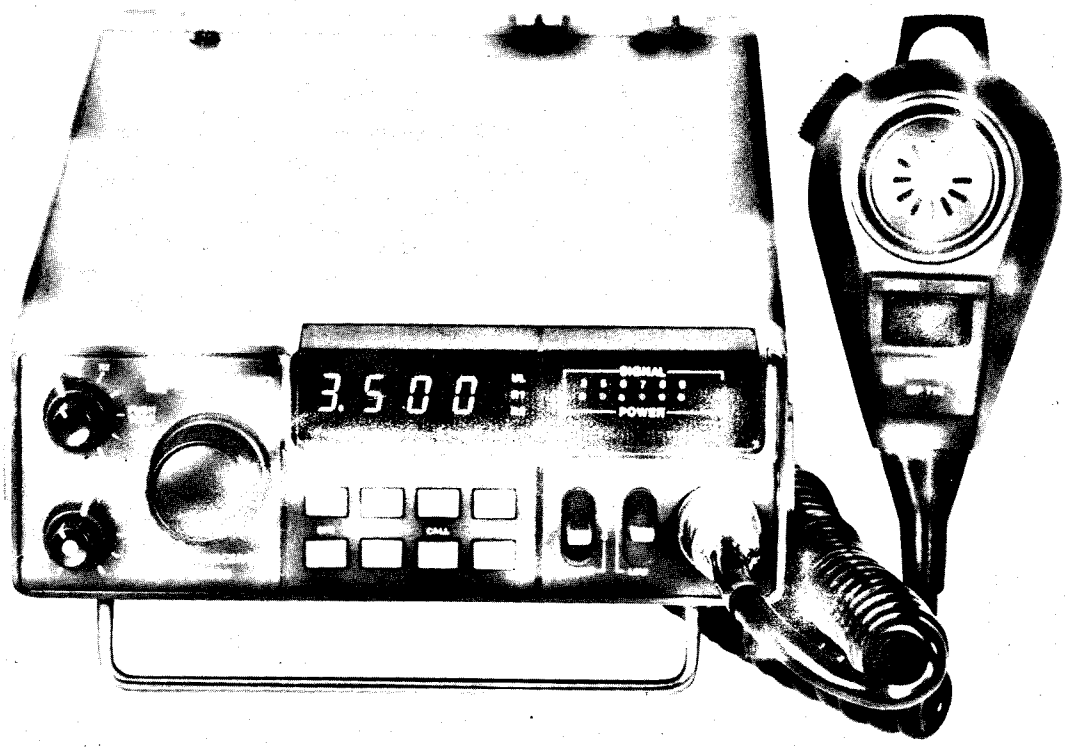
STANDARD®

C7800

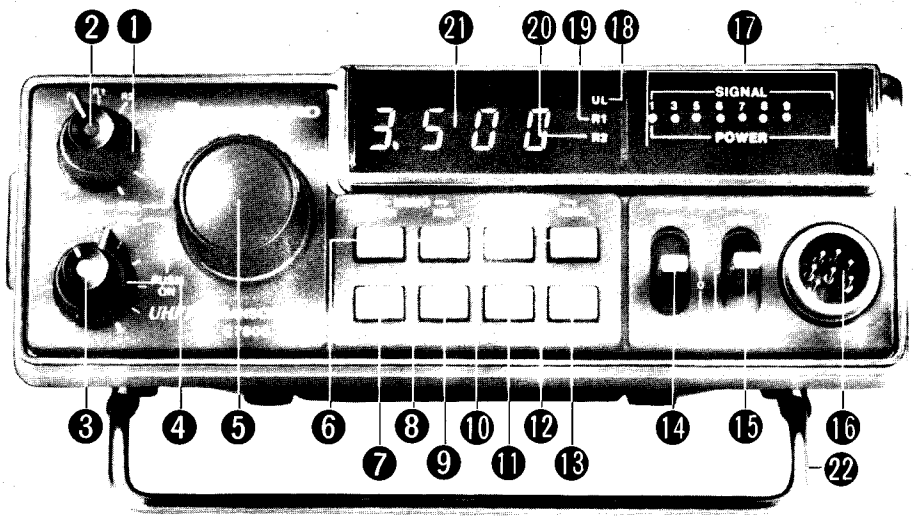
INSTRUCTIONS MANUAL



STANDARD COMMUNICATIONS CORP.

3. PANEL FEATURES

■ FRONT PANEL FEATURES



❶ MODE SELECTOR
Switches reception mode between simplex (S) and repeater (R1 and R2) modes.
NOTE:
R1 and R2 modes can be obtained by providing additional local frequency crystals in the PLL. For more details, contact your dealer or the nearest STANDARD service shop.

❷ PUSH TONE/SQL (SQUELCH) CONTROL
This dual-purpose knob is the squelch control and tone-burst switch. While this knob is depressed, the transmits a tone-burst signal for repeater driving (Tone frequency: 1750 Hz).
The squelch control is used to eliminate white noise heard on FM reception channels when no signal is present. Normally, this control should be turned gradually clockwise until the white noise disappears.

❸ PUSH ON/VOL CONTROL
This knob is also a dual-purpose control, acting as the power switch and volume control. The first time this knob is pressed turns the power to the unit ON, and the second time it is pressed turns it OFF. Clockwise rotation of this control increases output volume level.

❹ PWR SELECTOR
The PWR selector selects transmission power between 1 watt (LO) and 10 (HI) watts. The LO (1 W) position of this switch will be found to be best for local communications.

❺ CHANNEL SELECTOR
Clockwise rotation of this selector increases channel frequency in either a 25 kHz or 50 kHz intervals.

❻ MEMO ENTER KEY
Pressing this key stores the desired frequency data in the internal memory. The memory has a capacity for storing up to 5 frequencies.
Use the CHANNEL selector or the UP/DOWN control on the microphone to preset the desired frequency before pressing this MEMO ENTER key.

❼ SPR (SPARE) KEY
Provides spare key function.

❽ MEMO RCL KEY
Pressing this key recalls stored frequency data. Each time this key is depressed it recalls stored frequencies sequentially from M1 through M5.

❾ MHz KEY
Selects Mega-Hertz order of operation frequencies from 430 to 439 MHz at 1 MHz interval. Each time this key is depressed it increments the operation frequency by 1 MHz. Continuous depressing this key increments the frequency continuously in 1 MHz steps.

❿ SCAN ALL KEY
Pressing this key scans the MHz band selected with the MHz key, CHANNEL selector, or UP-DOWN switch, at 25 or 50 kHz intervals.

⓫ CALL KEY
Recalls the call frequency of 433.500 MHz with one-touch action.

⓬ SCAN MEMO KEY
Pressing this key initiates scanning stored frequencies sequentially from M1 through M5.

⓭ CCL KEY
Pressing the CCL key resets the operation mode to the initial state.

⓮ SCAN MODE SWITCH
This switch is used to search for busy or vacant channels during frequency scanning. The BUSY position of this switch initiates a search for busy channels, and the VACANT position a search for vacant channels.

⓯ SCAN SPEED SWITCH
This switch is used to select frequency scanning speeds:
HI position: 0.25 second per step
LOW position: 2.0 second per step

⑯ MIC JACK
The MIC jack is for attaching the hand microphone provided.

⑰ SIGNAL & POWER METER
This unique 9-LED meter indicates signal strength in the reception mode, and transmission power in the transmission mode.

⑱ UL INDICATOR
Lights if the PLL circuit operates incorrectly. While this indicator is lit, both transmission and reception are disabled.

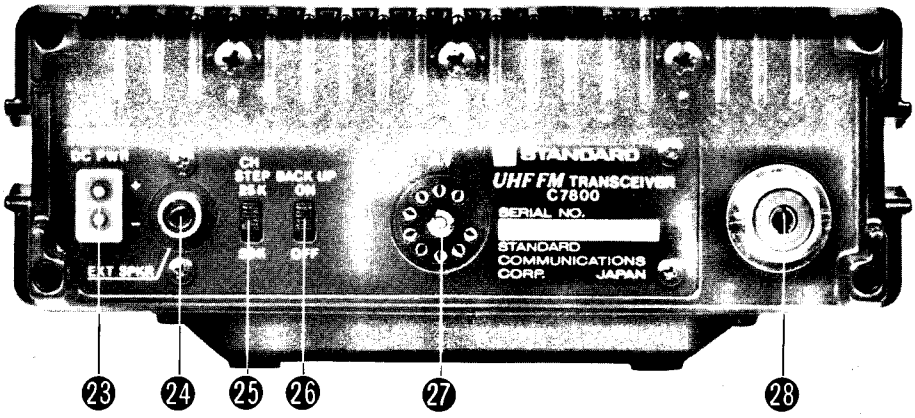
⑲ R1 INDICATOR
Indicates that the transmitter is in the repeater (R1) mode.

⑳ R2 INDICATOR
Indicates that the transmitter is in the repeater (R2) mode.

㉑ FREQUENCY READOUT
When a signal of, say, 433.00 MHz is received, this frequency readout displays the last four digits as "3.00". If the CALL key is depressed, the least significant digit of the readout is replaced with "C" to indicate that the CALL function is activated.

㉒ STAND
The unit can be placed on the stand when it is operated as a fixed station.

■ REAR PANEL FEATURES



㉓ DC 13.8V
This receptacle accepts a DC 13.8 V power supply. Connect the supplied connection cord being careful to ensure the correct polarity.

㉔ EXT SPKR JACK
This jack accepts an external speaker with an impedance of 4~8 ohms.

㉕ CH STEP SWITCH
The CH STEP switch is used to select a single frequency step interval of either 25 kHz or 50 kHz.

㉖ BACK-UP SWITCH
Activating this switch provides the internal memory with a back-up power supply to maintain stored frequency data even when the main power to the unit is switched OFF. If the transceiver unit is left unused for a long period of time, be sure to set this switch in the OFF position.

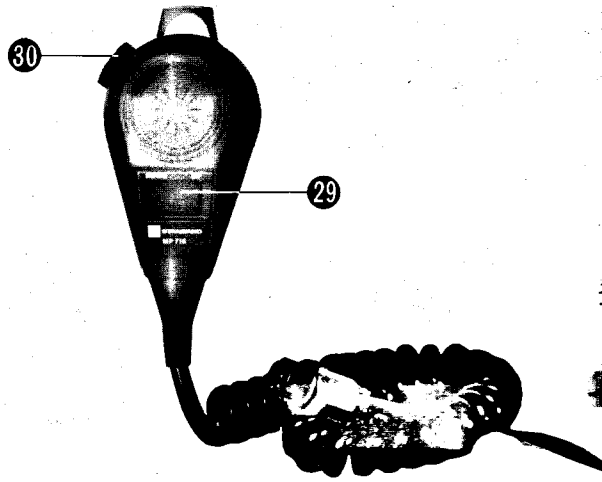
㉗ A.T. (Accessory Terminal)
For details of the pin configuration of this terminal, refer to the paragraph "Accessory Terminal".

㉘ ANT CONNECTOR
The ANT connector accepts an antenna with an impedance of 50 ohms.

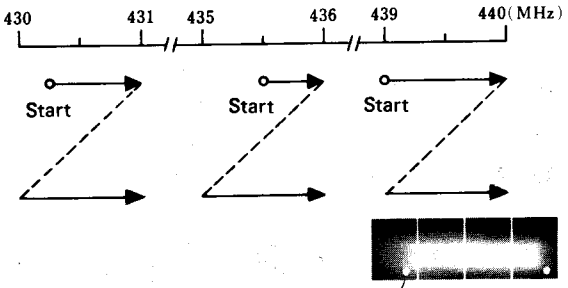
■ HAND MICROPHONE

㉙ FREQ. UP-DOWN CONTROL
This control initiates continuous up and down scanning of channel frequencies.

㉚ PTT BUTTON
Pressing this PTT (Press-To-Talk) button puts the transceiver in the transmission mode.



a. Scanning from 430~439 MHz
   * Select the desired MHz band with the [MHz] key.
   * Pressing the [ALL] key starts scanning upward from the current frequency.
   * Pressing the [MHz] key during scanning shifts the MHz order of the frequency by 1 MHz.

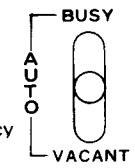


During scanning, this dot blinks at an interval of approx. 1 sec.

Scanning period

Channel / Switch position	50 kHz step (1 MHz) 20 channel	25 kHz step (1 MHz) 40 channel
Fast Scan	Approx. 6.25 sec.	Approx. 12.5 sec.
Slow Scan	Approx. 50 sec.	Approx. 1 min. 40 sec.

b. To search for busy channels:
   * Set the **MODE** switch on the front panel of the unit to the **BUSY** position.
   * Adjust the **SQUELCH** control to eliminate FM noise.
   * Scanning is stopped at the frequency at which a signal is present.
   * Scanning is automatically restarted when the input signal disappears from that channel.



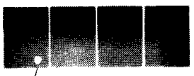
Blinks also when scanning is stopped.

The above condition indicates that scanning is about to restart because there is no longer a signal on the channel.

   * If the **PTT** button on the microphone is depressed once to put the transceiver into the transmission mode, scanning is not restarted when the signal disappears.

Stops blinking

c. To search for vacant channels:
   * Set the **MODE** selector on the front panel of the unit to the **VACANT** position.
   * Adjust the **SQL** control to eliminate FM noise.
   * Scanning is automatically stopped at a frequency on which there is no signal.
   * Scanning is restarted when a signal appears on the previously vacant channel.



Also blinks when scanning is stopped.

   * If the **PTT** button on the microphone is depressed to put the transceiver into the transmission mode, scanning is not restarted even if a signal is present on the channel.

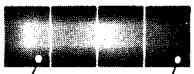
Stops blinking

d. To scan continuously:
   * Set the **SCAN MODE** switch to the **AUTO** position.
   * Adjust the **SQL** control to eliminate FM interstation noise.
   * Scanning will be started at an interval of 0.25 or 2.0 seconds regardless of the presence or absence of signals.

e. To suspend scanning either:
   * Press the [CCL] button on the front panel of the unit.
   * Or press the **PTT** button on the microphone once to put the transceiver into the transmission mode.

■ **How to scan the five frequencies stored in memory:**

a. Press the [MEMO] button on the front panel of the unit. This will start scanning of frequencies sequentially from the one stored in **M1** through to the one stored in **M5**.

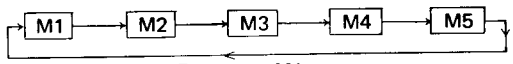


Blinks during scanning

Memory scan indicator: lights during scanning

   * When frequency data is stored in all five memories:

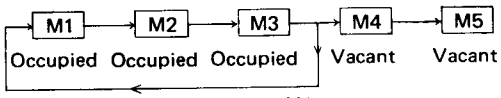
Scan



Return to M1

   * When **M4** and **M5** are vacant:

Scan



Return to M1

b. To search for a busy memory channel, or vacant memory channel, or perform continuous memory channel scanning, select the corresponding positions of the **SCAN MODE** switch on the front panel of the unit in the same way as for scanning entire frequency band.

5.2.8 SELECTING CALL FREQUENCIES (433.50 MHz)

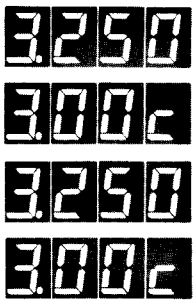
a. Pressing the [CALL] key once selects the call frequency of 433.50 MHz with the highest priority. At the time, character [C] is added to the end of the display frequency to indicate that the call frequency is selected.

Call channel indication

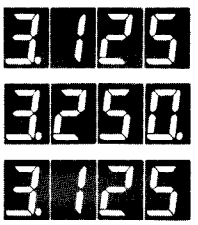
b. While the call frequency is selected, all other keys are made ineffective unless the [CCL] key is depressed again to release the **CALL** mode. When the call function is reset by depressing the [CCL] key, the channel frequency returns to the one displayed immediately before the [CALL] key was depressed.

5.2.9 OTHER USEFUL OPERATIONS

a. By using the [CALL] and [CCL] keys, the one call channels and one other channel can be easily obtained. When a frequency of 433.250 MHz is interchanged with the **CHANNEL** selector or **UP-DOWN** control:



b. By using the [RCL] and [CCL] keys, the frequency stored in memory **M1** and another frequency can be easily interchanged.
When the frequency 433.250 MHz is stored in **M1** and another frequency (433.125 MHz) is selected with the **CHANNEL** selector or **UP-DOWN** control:



c. During [ALL] or [MEMO] scanning, pressing the **PTT** (Press-To-Talk) switch on the microphone suspends scanning.
By utilizing this feature, scanning can be stopped momentarily by pressing the **PTT** switch on the microphone when the desired frequency is reached or desired QSO station is found while scanning.

d. Step-by-step channel scanning can be done by using the **UP-DOWN** control on the hand microphone.

5.3 RECEPTION PROCEDURE

1. Pressing the **PUSH ON/VOL** switch ❸ on the front panel of the unit turns the power of the unit ON. When there is no back up memory, the initial channel selection is always started at 433.000 MHz.
2. Adjust the **VOL** control ❸ to a comfortable listening level.
3. Adjust the **SQL** control ❷ so that FM white noise disappears when no input signal is received.
4. Select the desired frequency as follows:
   a. Select with the **CHANNEL** selector ❺ on the front panel.
   b. Select with the **UP-DOWN** control ㉙ on the microphone.
   c. Press the [CALL] key ⓫ to call 433.500 MHz.
   d. Press the [SCAN ALL] key ⓾ to scan all frequencies. At this time, the following functions are available by operating the **SCAN MODE** switch:
      * **BUSY:** stops scanning at a busy channel.
      * **VACANT:** stops scanning at a vacant channel.
      * **FREE:** scans all frequencies to check band condition.

      Two scanning speeds are selectable with the **SCAN SPEED** switch (15) on the front panel of the unit. Also, a scanning interval of either 25 kHz or 50 kHz is selectable with the **CH STEP** switch on the rear of the unit.
   e. Press the [SCAN MEMO] key ⓬ to scan the frequencies stored in the memories.
      At this time, the following functions are available with **SCAN MODE** switch ⓭ operation.
      * Same as those obtained in SCAN ALL mode (with SCAN MODE and SCAN SPEED switch functions).
   f. Press the [MEMO RCL] key ❽ to recall frequencies stores in the memories.

For details of the above procedure, refer to section 5.2 "Microcomputer Operation".

5.4 TRANSMISSION PROCEDURE

1. Prior to transmission, make sure that your transmission frequency does not interfere with other communications.
2. Select LOW or HI transmission power with the PWR selector ❹ on the front panel of the unit. For local communications, LOW is recommended.
3. Press the PTT ㉚ button on the Hand Microphone to put the transceiver into the transmission mode. Talk into the microphone from a distance of 5 to 10 cm.

5.5 REPEATER COMMUNICATIONS

Mounting additional crystals in the PLL circuit permits repeater operation.

5.5.1 DETERMINING X'TAL FREQUENCY FOR REPEATER

(1) Transmission A band frequency shift (430—434.75 MHz)

$$f_{lA} = \frac{\text{shift frequency (±MHz)}}{10} + 42.2225 \text{ MHz}$$

(2) Transmission B band frequency shift (435—439.75 MHz)

$$f_{lB} = \frac{\text{shift frequency (±MHz)}}{10} + 42.7225 \text{ MHz}$$

5.5.2 RELATIONSHIP BETWEEN TRANSMISSION FREQUENCY AND PLL INTERNAL LOCAL FREQUENCY

f_c: Transmission frequency
f_{ref}: PLL reference frequency
f_l: PLL internal local frequency
N: Programmable divider dividing ratio

(1) A band (430 – 434.75 MHz)

$$f_c = (f_{ref} \times N + 2f_l) \times 5$$

$$f_{lA} = \frac{\frac{f_c}{5} - f_{ref} \times N}{2}$$

Substituting $f_c = 430$ (MHz) in the above equation gives:

$$f_{lA} = \frac{\frac{430}{5} - 0.005 \times 311}{2} = 42.2225 \text{ MHz}$$

(2) B band (435 – 439.75 MHz)
We obtain f_{IB} at f_C = 435 (MHz) as follows:

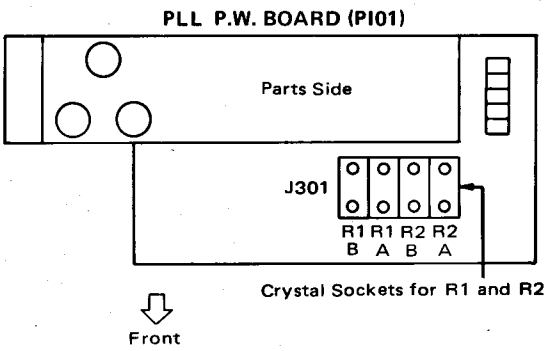
$$f_{IB} = \frac{\frac{435}{5} - 0.005 \times 311}{2} = 42.7225 \text{ MHz}$$

5.5.3 EXAMPLE OF FREQUENCY SHIFT

Shifting transmission frequency by –7.6 MHz since f_C goes into OFF BAND in A BAND (430 – 434.75 MHz), only B-band local frequency of f_{IB} is to be added.

$$f_{IB} = \frac{-7.6 \text{ MHz}}{10} + 42.7225 \text{ MHz}$$

$$= 41.9625 \text{ MHz}$$

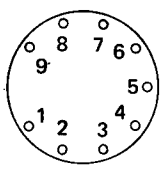


5.5.4 OFF BAND OPERATION IN THE R1 AND R2 POSITIONS

When its operation frequency is shifted in the R1 or R2 mode, the transmission frequency can go into the OFF BAND (frequencies other than 430 ~ 440 MHz), causing the PLL to be unlocked.
Frequency stability in the OFF BAND is not guaranteed.

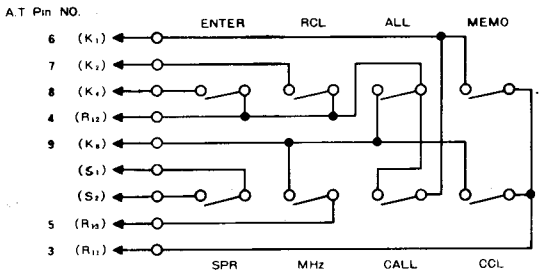
5.6 ACCESSORY TERMINALS

1. The pin configuration of the accessory terminal on the rear of the unit is as follows:



1	GND	
2	EXT BACK UP	
3	R_{11}	For Key Board
4	R_{12}	
5	R_{13}	
6	K_1	
7	K_2	
8	K_4	
9	K_8	

2. For a remote control keybaord, use the following circuit configuration:



5.7 ADJUSTING PIEZO-ELECTRIC BUZZER SOUND LEVEL

The piezo-electric buzzer is fixed on the bottom cover (speaker side). The sound adjustment variable resister is located adjacent to the piezo-electric buzzer connector. Remove four screws from the bottom cover, lift the cover, then adjust the sound level using a slot driver.

5.8 RESETTING THE MICROCOMPUTER

In the event of a malfunction, or when key operation is not effective, reset the microcomputer in the following way:

1. Turn the unit power switch and back-up switch located at the rear side, OFF. (The battery and power supply may be kept connected.)
2. After about 5 seconds, turn the power switch and the back-up switch, ON.

6. OPERATING INSTRUCTIONS

6.1 RECEIVER SECTION

* Reception system: Double conversion superheterodyne system using 21.4 MHz for the 1st IF, and 455 kHz for the 2nd IF.
* The input signal from the antenna terminal (J802) is fed to a dual-stage helical cavity consisting of L801 and L811. The output of the helical cavity is fed to JR06 on the main board (PR10) in the RX via an antenna switch circuit provided on the transmission booster borad (PB01).
* The signal fed to JR06 through a cavity consisting of LR01 and LR02. The output of the cavity is applied to gate-1 of QR02 (MOSFET) where it is amplified.
* The output of QR01 goes through another cavity consisting of LR03 and LR04 to and is fed to gate-1 of the 1st mixer QR10 (MOSFET). Gate-2 of QR02 accepts the local signal (408.6~418.575 MHz) from the PLL board (PL01) via JR07 and LR15.
* The 1st mixer output of 21.4 MHz goes through monolithic filter FR01.
* The monolithic filter output is amplified by QR03, then is fed to the base of the 2nd mixer QR04.
* The 2nd local signal of 20.955 MHz generated by QR05 is also fed to the base of the 2nd mixer QR04, where the input RF signal is mixed down to the 2nd IF signal of 455 kHz.
* The 2nd IF signal goes through ceramic filters FR02 and FR03. The output of the ceramic filter is then amplified by the 2nd IF amplifier (QR07 and QR08) to a limiter level.
* The output of the limiter circuit goes through LR20 and LR21 to be subject to ratio detection. The ratio detector output is amplified by the AF Pre-amplifier (QR12) via a de-emphasis circuit (RR37 and CR74).
* The AF signal output of the AF Pre-amplifier goes to the power amplifier (QR27) via a volume control (VOL.). The output of the power amplifier drives the built-in speaker (E801).

■ SQUELCH CIRCUIT

* The squelch circuit picks up the noise present on the power supply side of LR20 and filters the noise through a dual-stage L-C filter. The output of the filter is amplified by QR14 and QR15 after being adjusted by squelch control R802. The output of QR15 is subject to voltage doubling by QR16 and QR17 before being applied to DC switching circuit QR18.
* The output of the DC switching circuit is fed to the base of QR12. Setting the SQL switch to ON grounds the base of QR18; setting it to OFF opens the base of QR18.

■ METER CIRCUIT

* The pin-7 output of Q709 goes through a filter consisting of LR24 and LR25. The output of the filter is amplified by QR19 and QR22 (DC amplifier) after being adjusted by level adjustment RR54 (variable resistor). The output of the amplifier is fed to Display board PD01 via pin 4 of JR03.
  QR05 and QR31 adjust the attack and decay times of the meter.

6.2 TRANSMITTER SECTION

* The external microphone (MP716) output is amplified by QR401 and QR402. The amplifier output goes through a low-pass filter where frequency components above 3 kHz are filtered out. The signal is then applied to C172 in the VCO circuit (P150) to directly frequency modulate the VCO output (reactance modulation).
* The output of J111 on the PLL board (P101) is fed to JT02 (RCA jack) on the transmission younger stage board (TP01).
* The signal coupled to JT02 is amplified by QT01, QT02, QT03, and QT04 in this order, then is applied to JB01 on the TX Booster board (PB01) via WT10.
* The +B power supply to QT01 and QT02 is supplied from Q124 on the PLL board to pin JT013 only when the PLL circuit is locked to a specific frequency. This +B voltage is regulated to +9 V in the younger stage board.
* The +B power supply to QT03 and QT04 is regulated to +8.4 V by QC02 on the APC board (PC01). The regulated voltage is supplied from JC07 to pin 1 of JT01. The signal applied to JB01 on the TX Booster board (PB01) is power amplified to approx. 15 watts by QB01 (power hybrid IC).
* The output of QB01 is fed to the antenna terminal via a single-stage filter and a dual-stage band-pass filter.
* The +B voltage applied to pin 2 of QB01 (pre-driver in the IC) is controlled by the APC circuit.
  The +B voltage is adjustable with RC17 at high transmission power, and with RC08 at low transmission power.

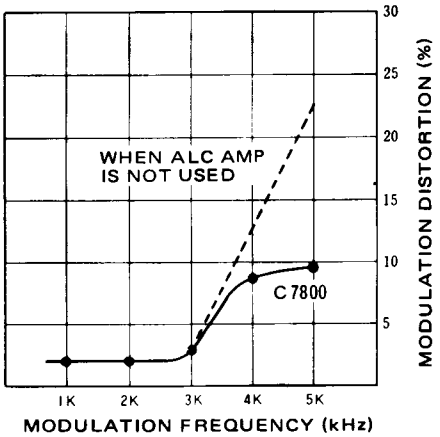


Fig. 1 Modulation Distortion

6.2.1 APC (Automatic Power Control)

* The APC circuit controls output current at high and low transmission power. It also controls the current passing through the output transistors in accordance with SWR or supply voltage variations and protects the output transistors from possible damage.
* Current variation (pins 3 and 4) through QB01 (on PB01) is sensed by RB08, and is fed to the input (JC01) of the APC board. The collector voltage of the predriver stage of QB01 is controlled by the APC voltage which is controlled by the APC circuit.
* At a high transmission power, a divided voltage is applied to pin 5 of QC01b as a reference voltage. The voltage detected by RB08 is coupled to pin 6 of QC01b.
* QC01b compares the two voltages applied to pins 5 and 6.
* Variable resistor RC17 adjusts the difference in the two voltages at high transmission power. Since QC03 on the low power control side is cut off, Q806 is controlled by QC01b
* When, for instance, the final current (pin 4) through QB01 is increased, the voltage at pin 6 of QC01b decreases. This causes the voltage at pin 7 of QC01b to be slightly higher than normal. As a result, the

base current of Q806 is decreased to cause the APC voltage to decrease. The decrease in the APC voltage causes reduced final current through QB01, which maintains transmission power constant.

* At low transmission power, JC08 is opened. This pulls up the voltage at pin 5 of QC01b to the supply voltage. As a result, QC04 on the high power control side is cut off. At low transmission power, the APC voltage is thus controlled by QC01a.
* The operation of QC01a is similar to that of QC01b. Adjustment at low transmission power is accomplished by variable resistor RC08.
* During reception, a +B voltage is coupled from the switch to QC06 via RC09. This increases the voltage at pin 3 of QC01 to cut QC06 off. As a result, no APC voltage is supplied.
* QC02 and QC05 supply +8 V to QT03 and QR04 on the younger stage board (PT01). The zener voltage across QC05 is fed to pin 6 of QC01b via RC11 to improve reduction voltage response.

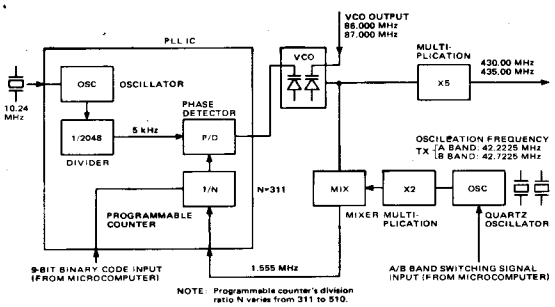


Fig. 2 PLL Basic Block Diagram

6.3 PLL SECTION

* The PLL circuit in the C7800 is controlled by 9-bit binary code and A/B band switching signal both coming from microcomputer QL01.
* The VCO frequency is one fifth (80 MHz) the object transmission and reception frequency.
* The 80 MHz band signal oscillated by the VCO is multiplied by 5 in the PLL.
  For transmission, the object frequency is obtained, while for reception, a frequency 21.4 MHz lower than the object frequency is obtained.
* The A/B band switching signal is automatically supplied from the control IC (Q101) according to operation frequencies selected. The A/B band switching signal switches local oscillator frequencies inside the PLL.

[PLL IC (Q101)]

PLL IC Q101 integrates the following circuits on a single chip.

1. Reference frequency oscillator: 10.24 MHz
2. Phase Detector: P/D
3. Programmable Counter: 1/N
4. Unlock Detector

6.3.1 PROGRAMMABLE COUNTER (1/N)

The programmable counter accepts a 9-bit binary code from the microprocessor which determines the frequency division ratio. The output frequency from the mixer is divided by the programmable counter in accordance with the determined division ratio, and the divided frequency is fed to the phase detector.

DATA OUTPUT & DISPLAY

	FREQUENCY (MHz)	FREQUENCY SPACE (kHz)	CHANNEL NO.	DP DATA 1 2 3 4 5 6 7 8 9 10	DISPLAY
	430.000			N=311 1 0 1 0 0 0 0 0 1 0	0 . 0 0 0
	430.025			N=312 0 1 1 0 0 0 0 0 1 0	0 . 0 2 5
	≀	25	400		≀
A	434.975			N=510 0 1 1 1 1 1 1 1 1 0	4 . 9 7 5
	435.000			N=311 1 0 1 0 0 0 0 0 1 1	5 . 0 0 0
	≀	Select band.			≀
	439.975			N=510 0 1 1 1 1 1 1 1 1 1	9 . 9 7 5
	430.000			N=311 1 0 1 0 0 0 0 0 1 0	0 . 0 0 0
	430.000			N=311 1 0 1 0 0 0 0 0 1 0	0 . 0 0 0
	430.050				0 . 0 5 0
	≀	50	200		≀
B	434.950			N=509 1 0 1 1 1 1 1 1 1 0	4 . 9 5 0
	435.000			N=261 1 0 1 0 0 0 0 0 1 1	5 . 0 0 0
	≀	Select band.			≀
	439.950			N=509 1 0 1 1 1 1 1 1 1 1	9 . 9 5 0
	430.000			N=311 1 0 1 0 0 0 0 0 1 0	0 . 0 0 0

Fig. 3 9-Bit Binary Output for PLL Programmable Counter

6.3.2 PHASE DETECTOR (P/D)

1. The phase detector detects the phase difference between 5 kHz frequency, which is obtained by dividing the reference frequency of 10.24 MHz by 2048, and the programmable counter output frequency.
2. The detector output obtained at pin 7 is converted into a DC voltage by an R/C integrating circuit. This DC voltage is applied to a varicap in the VCO to control the VCO output frequency.

6.3.3 VCO CIRCUIT (P150)

1. The phase detector output from PLL IC Q101 is converted into a DC voltage by an R/C integration circuit.
2. The DC voltage is applied to varicap diode Q151 to vary its capacity.
3. The VCO output frequency is controlled by the variation of the varicap diode capacity.
4. The VCO output frequency covers a maximum variation range of 5 MHz according to input DC voltage variation.

6.3.4 LOCAL OSCILLATOR

* The local oscillator using the overtone oscillation system is located on PLL circuit board (P101). It oscillates at the following frequencies:

  RX-S 40.0825 MHz in band A
  40.5825 MHz in band B
  TX-S 42.2225 MHz in band A
  42.7225 MHz in band B

* Each of the above frequencies is doubled before they are coupled to mixer Q202:

  RX-S 80.165 MHz in band A
  81.165 MHz in band B
  TX-S 84.445 MHz in band A
  85.445 MHz in band B

6.3.5 MIXER

* The output of the VCO circuit (P150) is fed to the mixer via buffer amplifier Q120.
* The VCO output and local oscillator output are mixed in mixer Q202 to create frequencies from 1.555~2.550 MHz.
  Fv(VCO) – Fe(Local OSC) = 1.555~2.550 MHz.
* The mixer output goes through an LPF and Q203 and Q204 to be subject to waveform shaping before it is fed to Q101's pin 2 (1/N circuit).

6.3.6 PLL IC (Q101) UNLOCK

* An unlock signal is obtained at pin 8 of the phase detector circuit in the PLL IC.

6.3.7 UNLOCK SWITCH CIRCUIT

* The state of the unlock signal present at pin 2 of Q01 is discriminated by Q102.
* The unlock indicator LED is driven by Q102 via Q103.

6.3.8 UNLOCK PREVENTION CIRCUIT

* In order to prevent faulty VCO circuit operation, a UL (unlock) voltage is applied from Q104 to the varicap in the VCO circuit if the PLL circuit is unlocked. This maintains the VCO circuit within its stable operation range.

  As known from the above discussions:

  (1) In the phase detector circuit, a frequency is repeatedly controlled within the loop until the 1/N circuit output coincides with the reference signal (refer to PLL Basic Block Diagram).
  (2) The state wherein the 1/N circuit output frequncy agrees with the reference frequency is called the Locked state.

6.4 CONTROL SECTION

The Control Section consists of the following sub sections:

PL01: Microprocessor section
PD01: Display section
PP01: Channel switching section (manual)
PM01: Control I/O decoder section

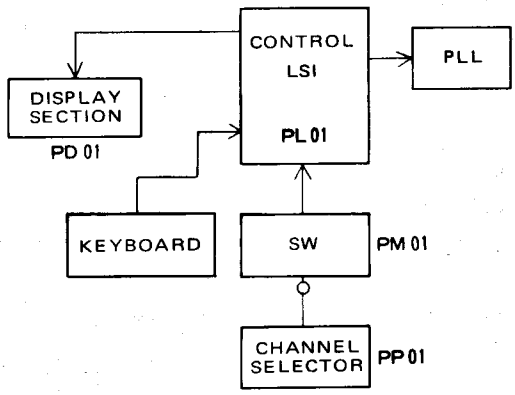


Fig. 4 Block Diagram of Control Section

* Control LSI QL10 operates on a supply voltage +8 to +10 V. With the C7800, it operates on a supply voltage +9 V.

6.4.1 THE FOLLOWING OUTPUT SIGNALS ARE AVAILABLE FOR EXTERNAL CIRCUIT CONTROL

1. PLL IC programmable counter drive output:
   9-bit binary code output for programmable counter drive is available at pins 29 (R0) through 38 (R8). Pin 35 is, however, not connected.
2. 7 segment LED drive output:
   4-digit 7-segment LED drive output (dynamic) is available at pins 18(02)~19(03) and 23(02)~25(00).
3. X'tal switching output for PLL and Local OSC sections:
   The X'tal switching signal is available at pin 40 (R10) for Hch-Lock switching as follows:
   430~434.975 MHz 439~439.975 MHz
   R10 = Low Level R10 = Hi Level

6.4.2 THE LSI REQUIRES THE FOLLOWING COMMANDS

1. Initial clear [pin 11 (INIT)]
   A positive pulse is applied to pin (11) of the control LSI so as to reset all internal circuits to their initial state when the power to the unit is turned ON.
2. Matrix circuit [pins 1(R11)~5(R15) and 7(K1)~10(K8)]
   The matrix circuit permits up to 20 key inputs.

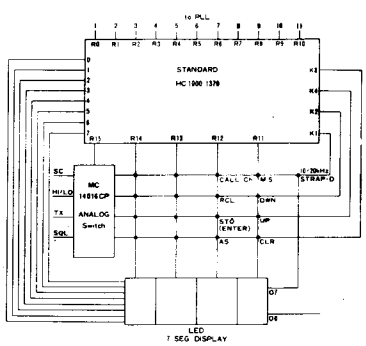


Fig. 5 Matrix Circuit

* **CHANNEL selector operation (manual)**
  a. Channel switching command to the microprocessor is accomplished by photo-interrupters QP01 and QP02.
  b. The outputs of the photo interrupters are fed to an UP-DOWN discriminator circuit where up-going channel shift is discriminated from down-going channel shift. When the CHANNEL selector is turned clockwise, pulses corresponding to the channel shift span are applied only to the UP key.
  c. The discriminated signal is coupled to analog switch QL06 via QM06 and JM03.
  d. Applying an "H" level signal to pin 13 of QL06 during UP shifting and to pin 12 of QL06 during DOWN shifting shorts R11 and K4 (UP), and R11 and K2 (DOWN) respectively via a 260Ω resistor.
  e. In other words, the analog switch in QL06 is turned ON by the pulses discriminated to close the matrix.

* **Channel scanning using the UP-DOWN switch on the microphone:**
  a. In channel scanning using the CHANNEL selector, the analog switch is turned on and off by pulses.
  b. In channel scanning using the UP-DOWN switch on the microphone, the analog switch is turned on and off by DC levels.
  c. UP-DOWN signals from the micrphone are coupled to pins 5 and 6 of QL60 respectively.

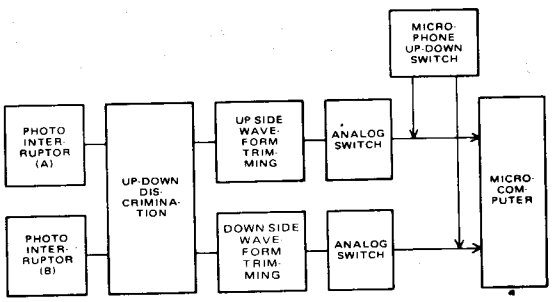


Fig. 6 Channel Selector Configuration

1) Channel scanning
   Matrix circuits R11 and K4, and R11 and K2 are closed for UP and DOWN scanning respectively.
2) Memory Enter (MEMO-ENTER)
   Pressing the MEMO-ENTER key closes matrix R12 and K4. This stores the displayed frequency in memory.
3) Memory Recall (MEMO-RCL)
   Pressing this key closes matrix R12 and K2. This recalls the stored frequency to the display.
4) Scan All (SCAN-ALL)
   Pressing the SCAN-ALL key closes matrix R12 and K8. This starts channel scanning upward from the displayed frequency.
5) Scan Memo (SCAN-MEMO)
   Pressing the SCAN-MEMO key closes matrix R11 and K1. This scans the 5 stored channel frequencies in sequential order.
6) MHz
   Pressing the MHz key closes matrix R13 and K8. Each depression of the MHz key increments the operation frequency by 1 MHz.
7) Call Channel (CALL Ch)
   Pressing the CALL Ch key closes matrix R13 and K1. The first depression of this key recalles 433.500 MHz.
8) CCL
   Pressing the CCL key closes matrix R11 and K8. This resets the MEMO RCL, SCAN ALL, SCAN MEMO, and CALL Ch features to their initial state.
9) SCAN SPEED switch
   a. Closes matrix R15 and K2.
   b. The SCAN SPEED switch (SM01) on the front panel turns on or off analog switch QL07.
   c. Setting the SCAN SPEED switch to the LOW position turns on the analog switch to select a scanning speed of 0.5 ch/sec.
   d. Setting the SCAN SPEED switch to the HIGH position turns off the analog switch to select scanning speed of 4 ch/sec.
10) SCAN MODE switch (Busy, Free, and Vacant)
   a. When the SCAN MODE switch is in the Busy position, channel scanning stops when a signal is received.
   b. When a signal is received, an "L" level output is present at the collector of QR13.
   c. The "L" level output of QR13 is fed to QM03 where the signal polarity is reversed to "H".
   d. The output of QM01 is fed to analog switch QL7, which closes matrix R15 and K8.
   e. Setting the SCAN MODE switch to the VACANT position stops scanning when there is no signal received.
   f. When no received signal is present, an "H" level output is present at pin 13 of QR07.
   g. The "H" level output of QR13 is fed to QM01, where its polarity is reversed twice to produce a high level output.
   h. The output of QM01 is fed to analog switch QL07, which closes matrix R15 and K8.
11) Control section in the transmission mode:
   a. During transmission, matrix R15 and K4 is closed to inhibit all inputs to the control IC so that the internal status of the control IC remains unchanged.
   b. Analog switch QL07 is turned on and off by the +B voltage for transmission.
12) Switching between 25 kHz and 50 kHz
   a. Slide switch S803 on the rear of the unit switches between 25 kHz and 50 kHz:
      S803 ON: 25 kHz separation
      S803 OFF: 50 kHz separation
   b. Closes matrix O7 and K1.
13) Chip Select switch (CS)
   a. Closes matrix R15 and K1.
   b. The CS switch is interlocked with the POWER switch.
   c. Switch +B turns on and off analog switch QL07:
      Analog switch ON: normal operation
      Analog switch OFF: Stops controller operation with the display turned off. Only the memory is operative.

6.4.3 DISPLAY SECTION

* 4-digit 7-segment LED display is driven by the segment output of LSI QL01 via segment driver QL03 and QL04. The timing sequence for displaying "433.500C" is shown in Figure 7.
* The signals as shown in Figure 7 are repeatedly present at pins O0 to O7 to drive each segment.
* Simultaneously with the segment drive output from LSI QL01, strobe signals R11~R14 are coupled to QL02 (digit river).
* The 4 digits QD01 to QD04 are thus sequentially driven by digit driver QL02.
* These 4 digits are driven, actually, from one digit to the next digit sequentially. But the scanning speed is so high that all the four digits are driven at the same time.

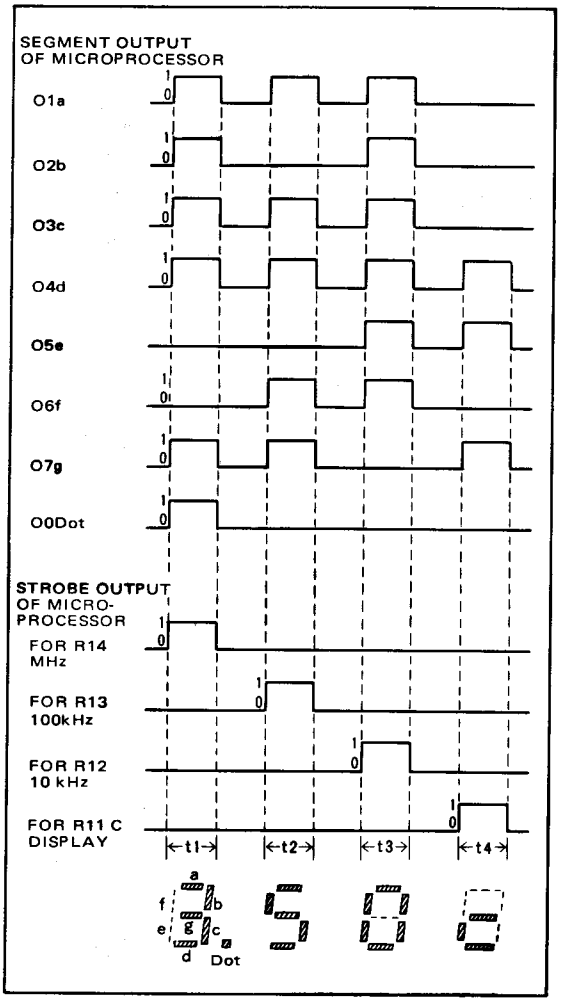


Fig. 7 Drive Signal Timing Sequence for 3.50C

6.4.4 OPERATION OF CTN-5

The 1750 Hz tone signal is fed to Q101 emitter during transmission. This signal passes through the MIC input circuit and AF circuit, and is then fed to the modulator where it is modulated. The modulation degree can be adjusted with the output level control VR on CTN-5. In CW mode, Q101 is reverse biased, so the signal is not modulated.

6.4.5 BACK-UP UNIT

1. The zener voltage across QZ04 is used as a reference voltage. When the base and emitter voltages of QZ01 are lowered, QZ01 is turned ON.
2. ZQ10 turns on QZ02, which turns QZ03 ON, driving DC/DC converter AZ01.
3. AZ01 generates +10 VDC.

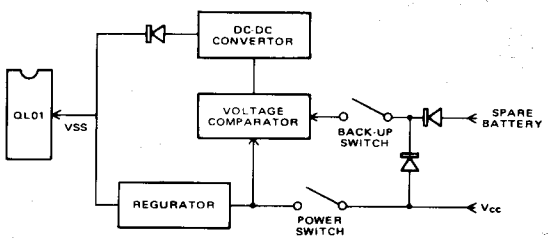


Fig. 8 Back-Up Unit

4. This BACK-UP unit is made operative with a supply voltage of approx. 11 V, and remains ON down to a supply voltage of +3 V to maintain the supply voltage to MEMO circuit QL01 to 9 V.

6.4.6 PERIPHERAL CIRCUIT OPERATION

1. QL02 (μPA57C) digit driver
   * Strobe signals (R11~R14) from control IC QL01 scan driving digits.
   * Digit driver μPA57C integrates NPN Darlington transistors and peripherical resistors into a single chip.

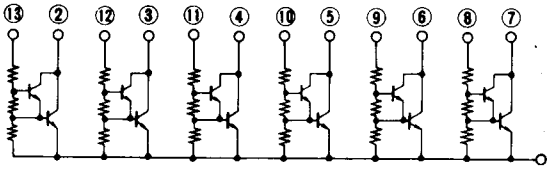
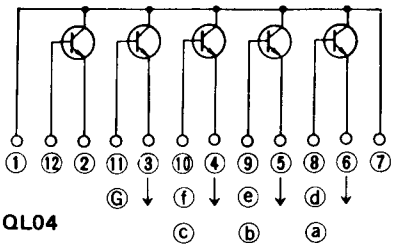


Fig. 9

2. QL03 and QL04 (TA-76) are IC's to drive 7 segment LED's.



QL03 and QL04

Fig. 10

3. QL07 (14016CP)
   * This IC is an analog switch. It is used for QL07 and QL06 in the C7800.
   * As shown below, the input and output are ON when an high level signal is applied to its CONTROL input.

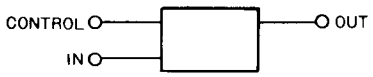


Fig. 11

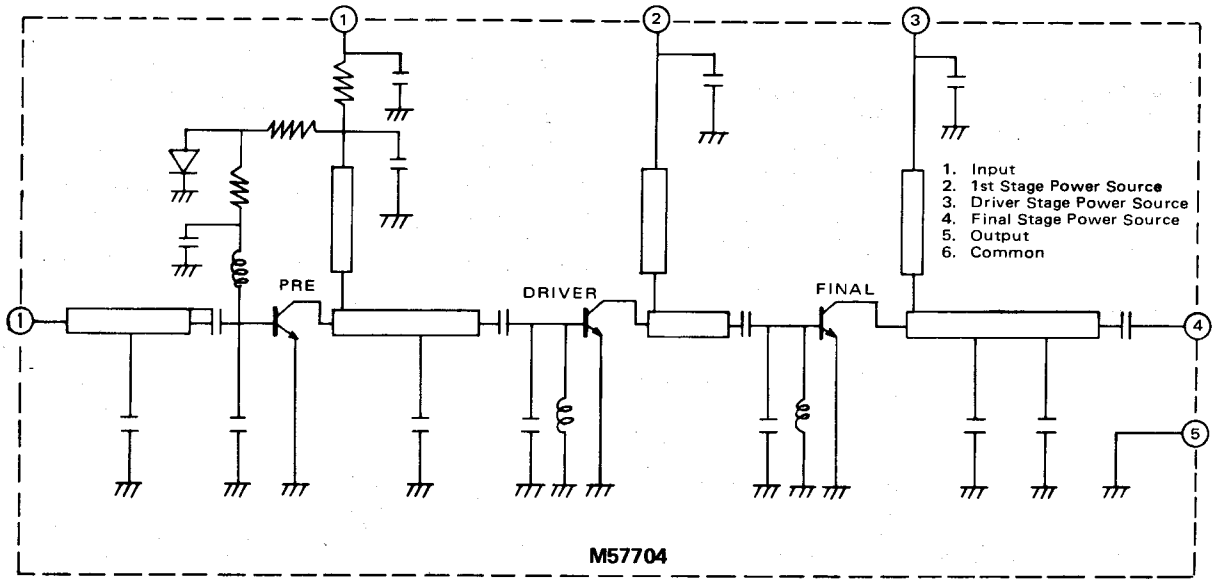

1. Input
2. 1st Stage Power Source
3. Driver Stage Power Source
4. Final Stage Power Source
5. Output
6. Common
PRE
DRIVER
FINAL
M57704

Fig. 12

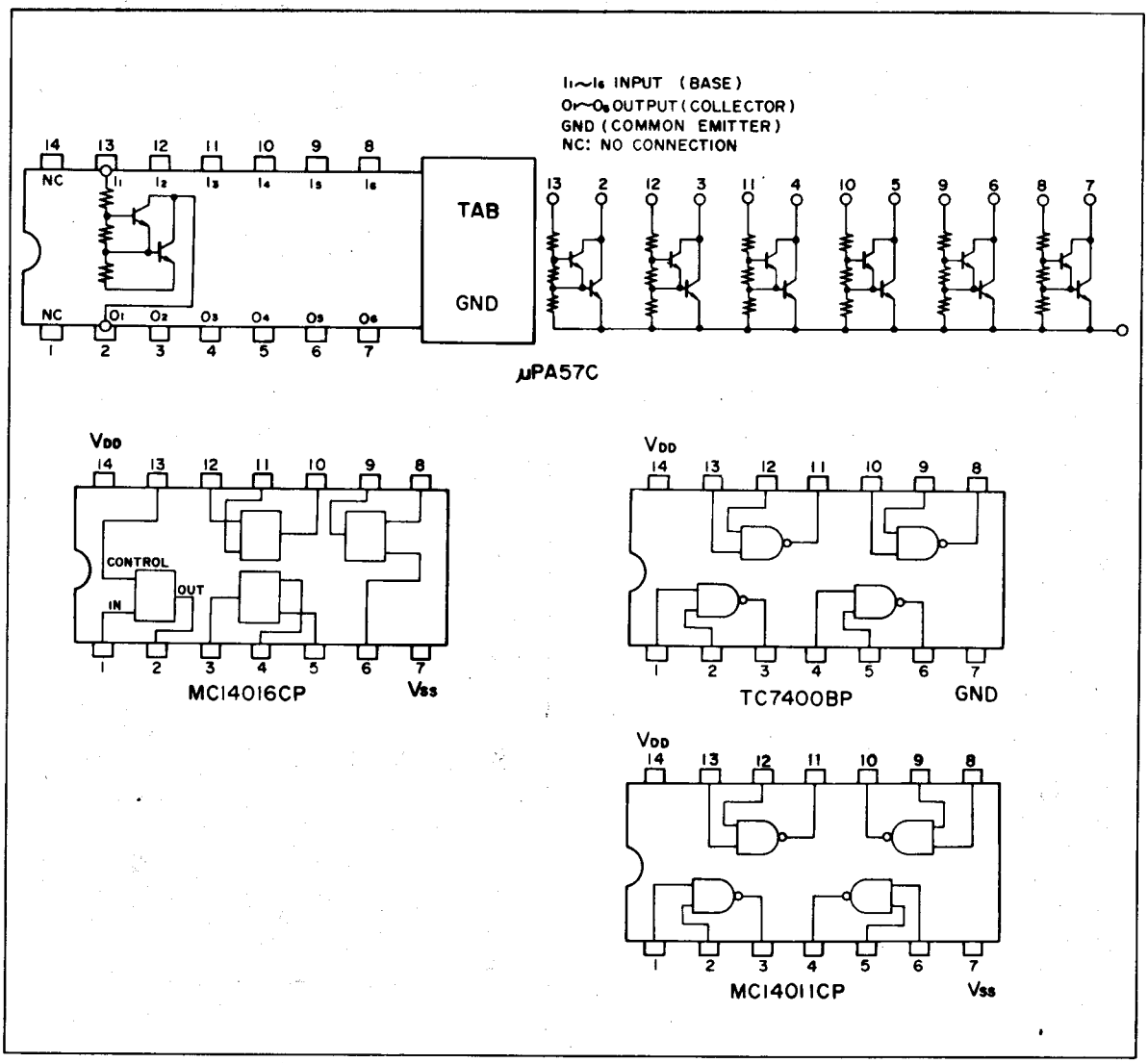
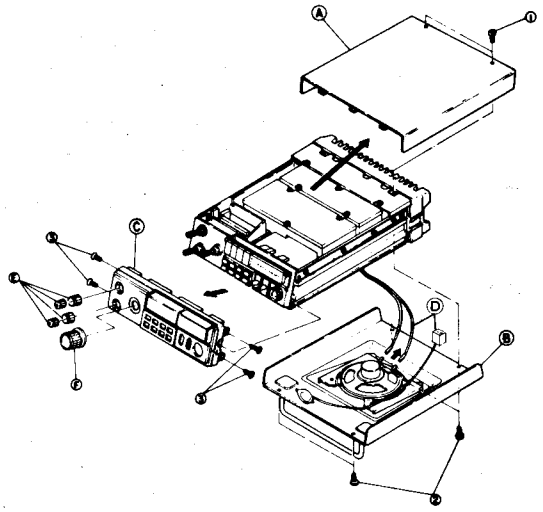

I1~I6 INPUT (BASE)
O1~O6 OUTPUT (COLLECTOR)
GND (COMMON EMITTER)
NC: NO CONNECTION
TAB
GND
μPA57C
VDD
CONTROL
IN
OUT
MC14016CP
Vss
TC7400BP
GND
MC14011CP
Vss

Fig. 13

7. DISASSEMBLY

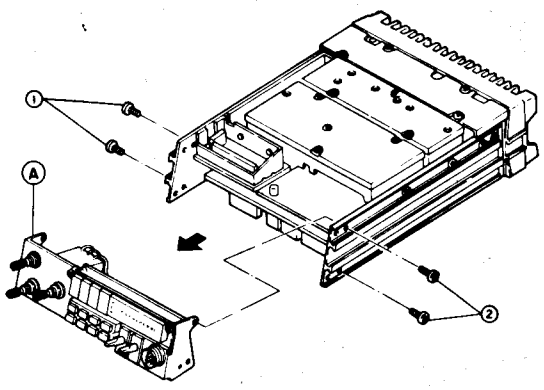
7.1 REMOVAL OF ESCUTCHEON

1. Remove 2 screws (1) and lift off top cover (A) in the arrowed direction.
2. Remove 4 screws (2), then pull off speaker jacks and buzzer cord (D) in the arrowed direction, for loosening the bottom cover (B).
3. Remove knobs (E) and (F), and 4 screws (3), then lift off the front case (C) in the arrowed direction.



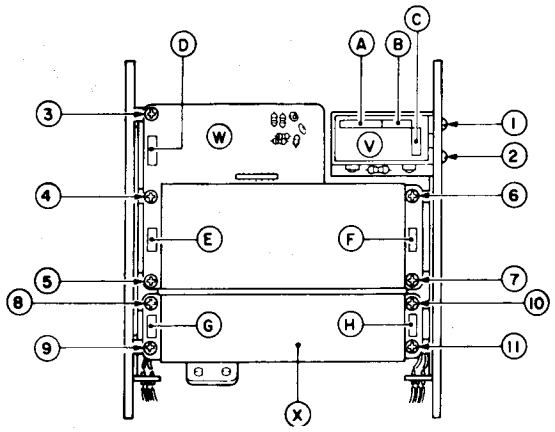
7.2 REMOVAL OF FRONT CONTROL SECTION

Remove 8 screws, 4 each (1) and (2), then disconnect connectors and desolder soldered joints, to loosen the front block (A).



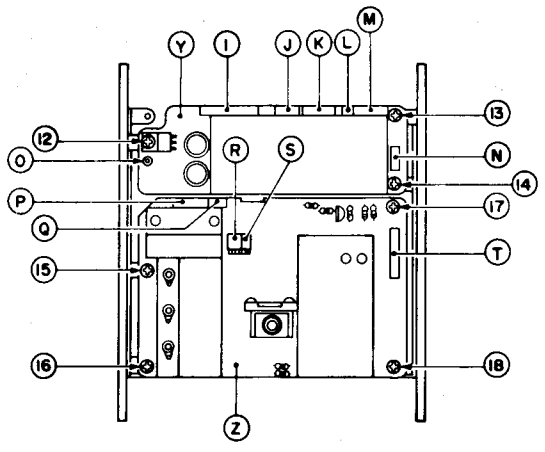
7.3 REMOVAL OF UPPER BOARDS

1. Removal of Board (V)
   Disconnect connectors (A), (B), and (C), remove 2 screws (1) and (2), to remove board (V).
2. Removal of Board (W)
   Disconnect connectors (D), (E), and (F), remove 5 screws (3), (4), (5), (6), and (7), to remove board (W).
3. Removal of Board (X)
   Disconnect connectors (G) and (H), remove 4 screws (8), (9), (10), and (11) to remove board (X).



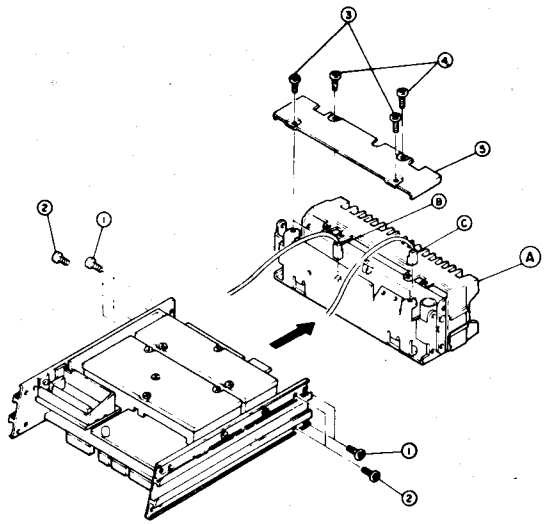
7.4 REMOVAL OF LOWER BOARDS

1. Removal of Board (Y)
   Disconnect connectors (I), (J), (K), (L), (M), and (N), pin jack (O), then remove 3 screws (12), (13), and (14), to remove board (Y).
2. Removal of Board (Z)
   Disconnect (P), (Q), (R), (S), and (T), remove 4 screws (15), (16), (17), and (18), to remove board (Z).



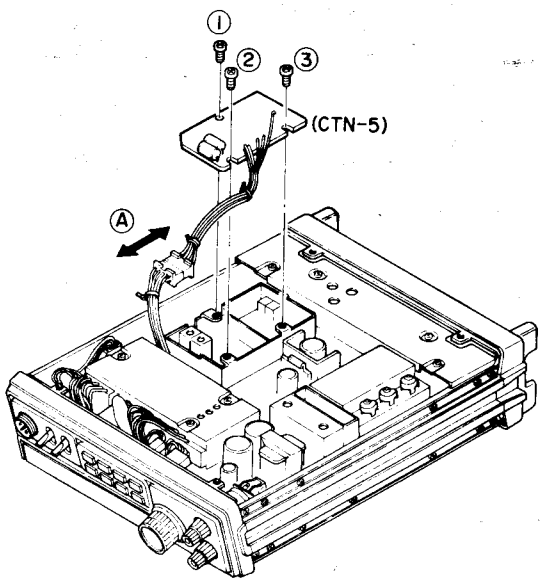
7.5 REMOVAL OF FINAL HEAT-SINK

Remove 8 screws, 2 each (1), (2), (3), and (4), shielding plate (5), disconnect connectors (B) and (C), desolder soldered joints, to remove final heat-sink (A) in the direction arrowed.



7.6 REMOVAL OF TONE BOARD (CTN-5)

Remove 3 screws (1), (2) and (3), then pull off connector (A) in the arrowed direction.



8. ADJUSTMENT PROCEDURES

- **The C7800 is factory adjusted. Readjust only when required.**
- * Warm up measuring device for about harf an hour before taking measurements.
- * Be sure that the measuring device is calibrated and operates correctly.

STANDARD CONDITIONS

1. Power supply voltage . . . . . 13.8 V DC
2. Receiver output . . . . . .500 mW
3. Receiver load . . . . . 4 Ω
4. Transmitter load . . . . . 50 Ω
5. Modulaton . . . . . 1 kHz
6. Deviation . . . . . RX 3.5 kHz
   TX 3.5 kHz

***Test equipment and jigs**

1. Frequency counter
2. RF millivoltmeter (VTVM)
3. 50-ohm dummy load for RF VTVM
4. Digital voltmeter
5. Circuit tester (preferrably with high input impedance)
6. Power supply (13.8 V 5 A)
7. Transmitting jig (or microphone)

CONDITIONS

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy . . . . . TX50 Ω
    RX4 Ω
11. Frequency . . . . . TX 435.50 MHz
    RX 535.00 MHz

CONNECTION DIAGRAMS FOR ADJUSTMENT

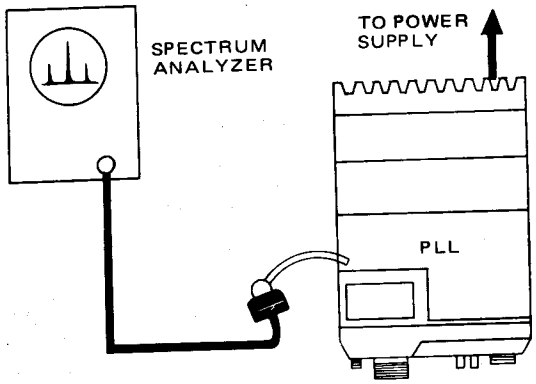


Fig. 14 PLL Cabity Adjustment

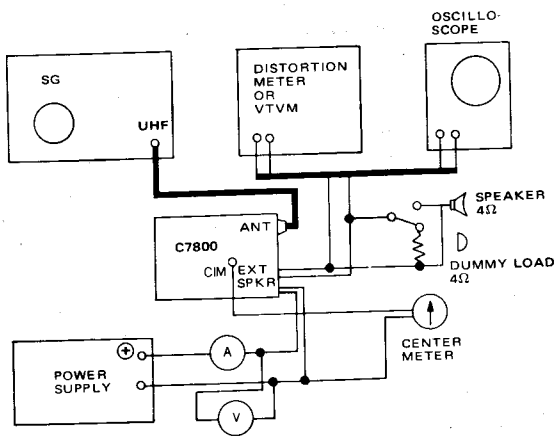


Fig. 15 RX Adjustment

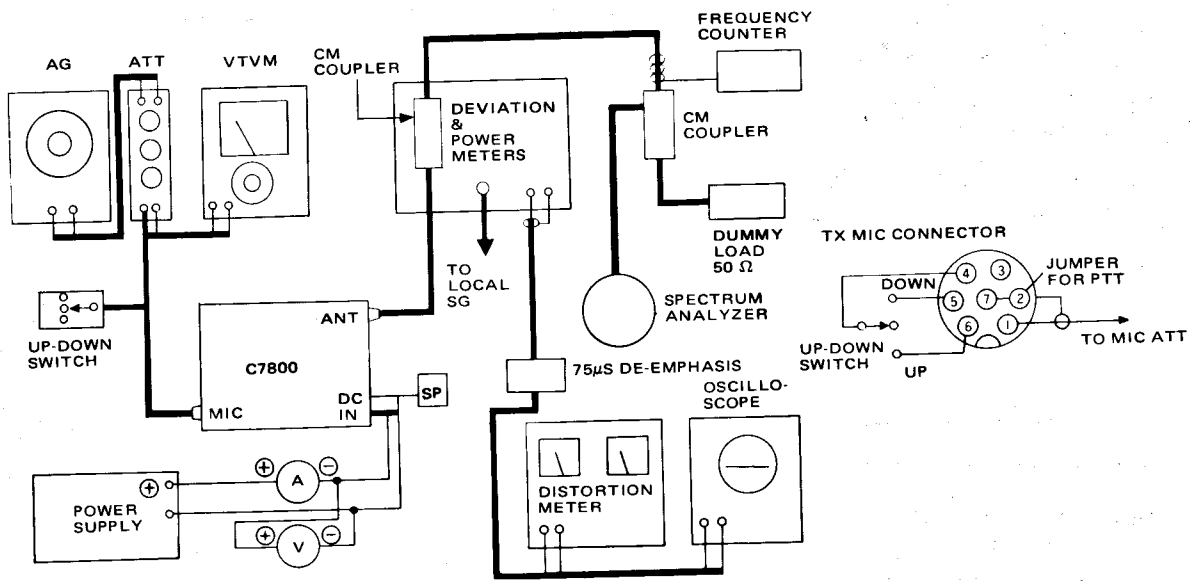


Fig. 16 TX Adjustment

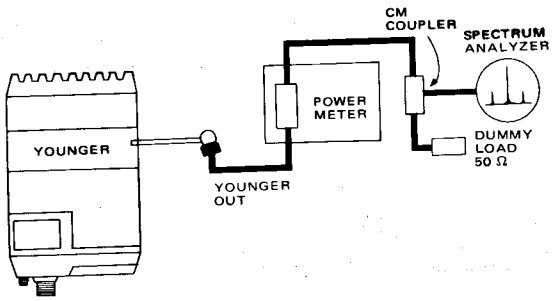


Fig. 17 TX Younger Adjustment

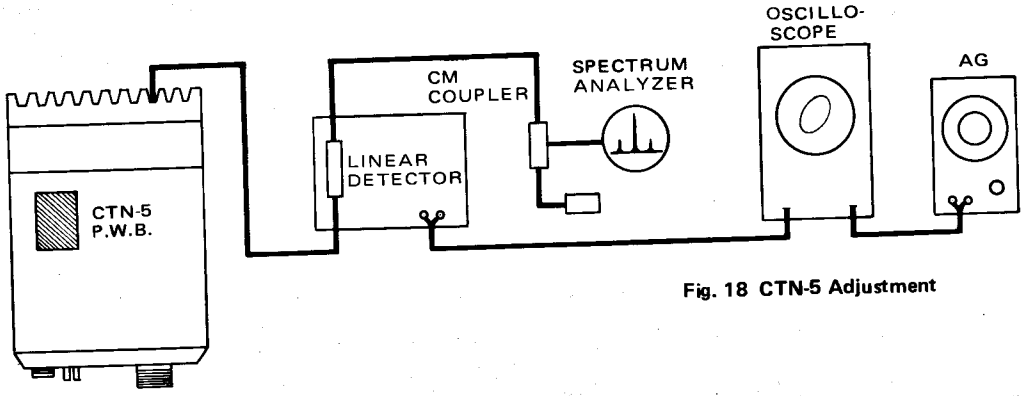


Fig. 18 CTN-5 Adjustment

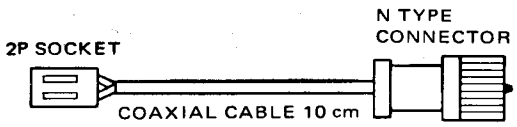
8.1 PLL ADJUSTMENTS (P101)

PROCEDURE

1. During PLL and RX adjustment, set the PTT switch to OFF unless otherwise specified.
2. The PLL should be adjusted before RX and TX adjustment is carried out.
3. For PLL adjustment, disconnect the coaxial cable from JT02. After completing the adjustment, reconnect it to JT02.

ADJUSTING JIGS REQUIRED

1. 2P Molex socket



2. 50 ohms dummy resistor for RF VTVM.
   Use the N type dummy attached to an RF VTVM.

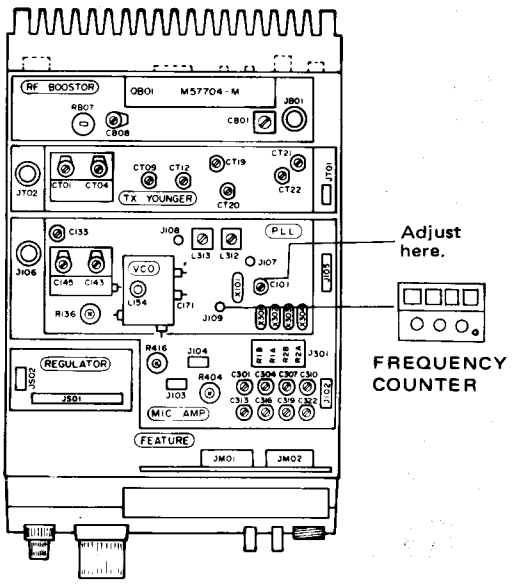
1. PLL COMPARISON OSCILLATOR ADJUSTMENT

CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Frequency . . . . . 435.00 MHz

PROCEDURE

Connect a frequency counter to J109 (pin 5 of Q101). Adjust C101 until the frequency J101 is 5.120 MHz (within +100 Hz).



2. PLL REFERENCE OSCILLATOR ADJUSTMENT

CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V

PROCEDURE

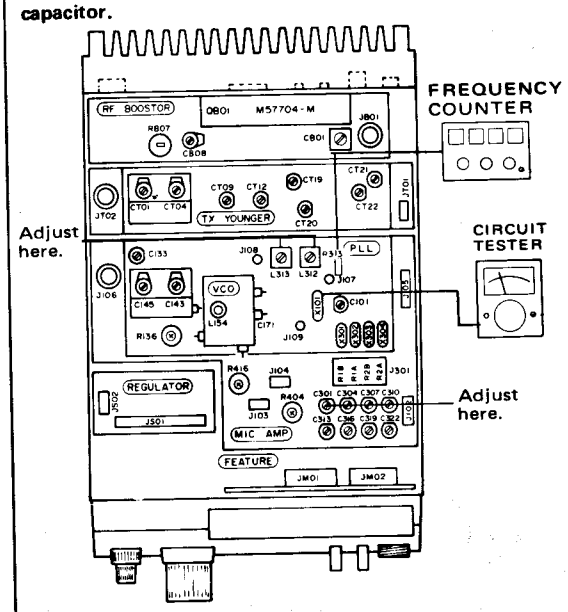
1. Connect a tester to L107.
2. Press the CALL key to recall frequency 433.00 MHz. Adjust L312 and L313 until maximum voltage is obtained at J107.
3. Depress the CALL key again to recall the frequency of 439.95 MHz. Press the PTT switch ON (transmission) and adjust L312 and L313 until maximum voltage is obtained at J107. Repeat the above adjustment until the difference in voltages at frequencies 439.95 and 433.00 MHz is minimum. (The voltage at J107 must exceed 0.5 V.)
4. Connect a frequency counter to R313 and adjust the frequency at R313 as follows:

	DISPLAY	ADJUSTMENT	FREQUENCY
RX	433.00 MHz	C301	40.0825 MHz
	439.95 MHz	C304	40.5825 MHz
TX	433.00 MHz	C307	42.2225 MHz
	439.95 MHz	C310	42.7225 MHz

5. Set the MODE selector to R1.
   Set channel frequency to 435.00 MHz.
   Adjust the frequency in the same manner described in item 4.

R1-B Repeater	435.00 MHz	C313	41.9625 MHz

NOTE:
Connect the frequency counter to R313 via a 100 pF capacitor.



3. PLL VCO ADJUSTMENT

CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STOP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Frequency . . . . . 430.00 MHz

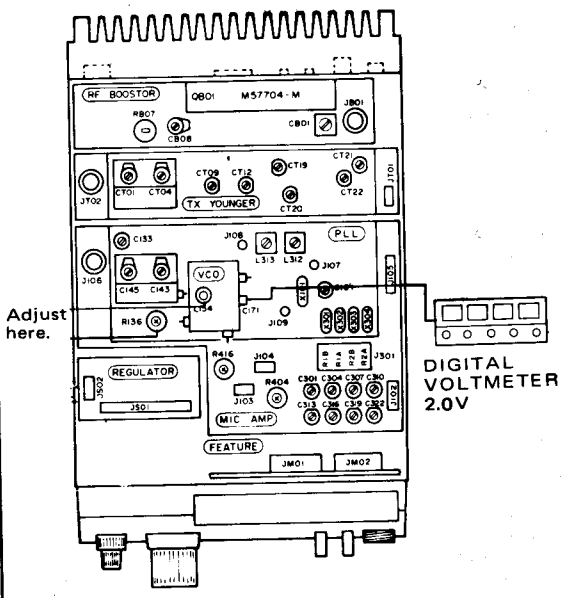
PROCEDURE

1. Press the MHz key to set the channel frequency to 430.00 (0000) MHz. Connect a digital voltmeter to through capacitor C171 in the VCO.
2. Select the transmission mode. Adjust VCO coil L154 until the digital voltmeter reads 1.5 V.

NOTE:
If the transmission mode is selected with the SG left connected, the SG will be damaged. Make sure to disconnect the coaxial plug from JT02.

3. Select the reception mode.
4. Adjust R136 until the digital voltmeter reads 1.5 V.
5. Make sure that the PLL is locked over the frequency range from 430~440 MHz.

NOTES:
1. **Adjustment should be carried out after the silicon rubber in the VCO is completely hardened.**
2. **Leave the top cover and shield housing of the VCO installed.**



4. PLL CAVITY ADJUSTMENT

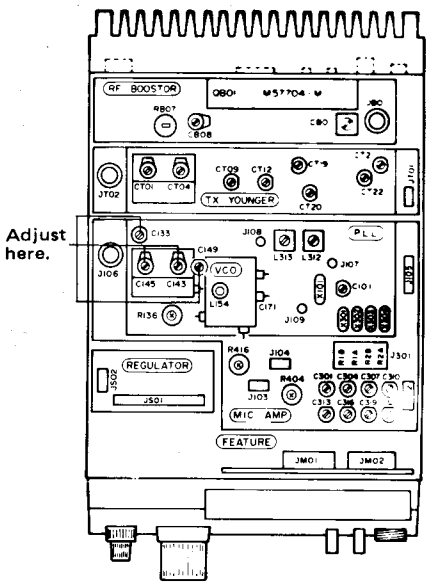
CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V

*For connection, see Figure 14.

PROCEDURE

1. Connect a spectrum analyzer to JT02.
2. Use the channel selector to set the channel frequency to 435.500 MHz.
3. Select the transmission mode. While watching the spectrum analyzer, adjust C143, C145, and C149 until the level at 435.500 MHz is maximum.
4. Select the reception mode. Connect the spectrum analyzer to J106 and use the CHANNEL selector to set channel frequency to 435.00 MHz.
5. While watching the spectrum analyzer, adjust C133 until the level at 413.600 MHz is maximum.
   * 435 – 21.4 = 413.6 MHz
   * Since C133 is adjusted again in RX sensitivity adjustment, above items 4 and 5 may be skipped.
6. Connect plug JT02.



5. MICROPROCESSOR CHIP SWITCH ADJUSTMENT

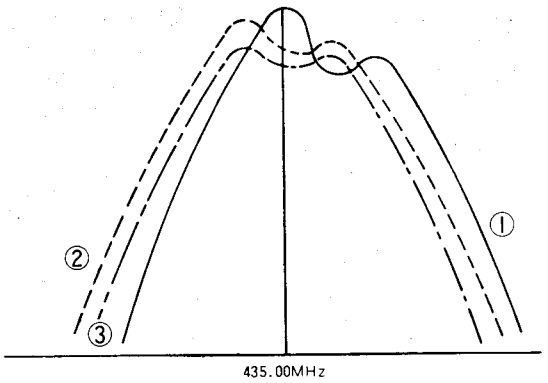
CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Frequency . . . . . 435.00 MHz

PROCEDURE

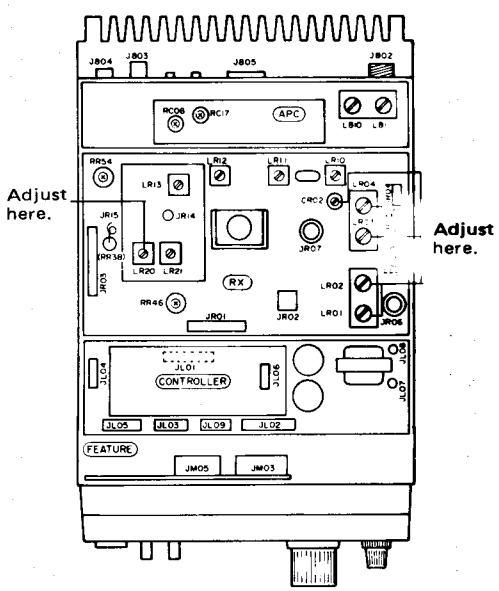
1. Set RL17 to its mechanical center.
2. Set the supply voltage to 9.5 V and adjust RL17 until the frequency display goes off.
3. Increase the supply voltage and make sure that the frequency display is turned on and that PLL is locked. Decrease the supply voltage again, and make sure that RL17 requires no more adjustment.

NOTE:
Make sure to set the supply voltage exactly to 9.5 V.



a. Adjustment at 435.00 MHz 1
b. LR03 and LR04 adjustment 2
c. LR02 adjustment 3

NOTES:
1. **Adjusting LR03 and LR04 varies the bandwidth.**
2. **Adjusting LR01 and LR02 varies the sensitivity.**



3. RX SQUELCH ADJUSTMENT

CONDITION

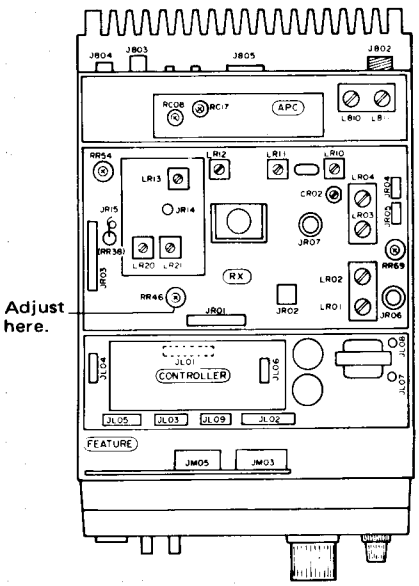
1. MODE . . . . . S
2. SQL . . . . . MAX
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy load . . . . . RX 4 Ω
11. Frequency . . . . . 435.00 MHz

*For the detail of connection, see Figure 15.

PROCEDURE

1. Set the SQL control to Tight (max.).
2. Set SG output to 1 kHz modulation with ±3.5 kHz deviation, and couple it to the unit. Adjust SG output until QS + 5 dB is obtained. Then adjust RR46 until SQL is opened.
3. Adjust the attenuator until SQL is closed so as to make sure that the adjustment is correct.
4. Then couple an SG output of 2.5 kHz modulation with ±4 kHz deviation to the unit. Adjust the attenuator on the SG to make sure that no double SQL is generated.

NOTE:
Tight SQL refers to the case where SQL is opened with the ATT increased.



4. RX S METER ADJUSTMENT

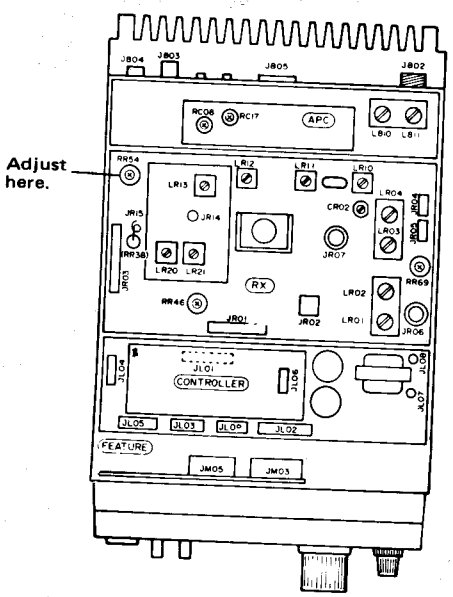
CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy load . . . . . RX 4 Ω
11. Frequency . . . . . 435.00 MHz

*For the details of connection, see Figure 15.

PROCEDURE

1. Set the SG output to −6 dB with non-modulation (CW). Couple the SG output and adjust RR54 until only one meter LED lights.
2. Turn the attenuator on the SG in both directions to make sure that the meter indication changes smoothly.



8.3 TX ADJUSTMENTS

1. TX YOUNGER ADJUSTMENT

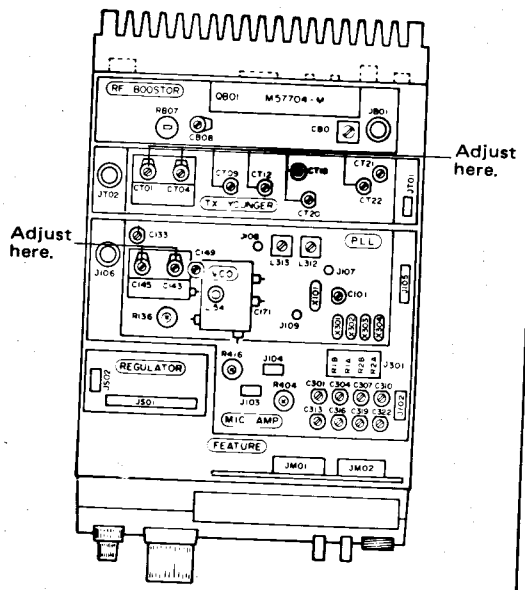
CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy load . . . . . TX 50 Ω
11. Frequency . . . . . 435.500 MHz
12. External U-DOWN SW . . . . . Center

*For the detail of connection, see Figure 17.

PROCEDURE

1. Use the CHANNEL selector to set the channel frequency to 435.500 MHz.
2. Disconnect the coaxial cable from JB01, and connect a RF power meter to JB01.
3. Adjust trimmer capacitors CT01, CT04, CT09, CT12, CT19, CT20, CT22, C143, and C145 until the RF power meter reading is maximum.
4. Repeat above step 3) several times.
5. Make sure that the RF power at 430.000 MHz is identical to that at 439.950 MHz.
6. If there is any difference between the power at 430.000 MHz and that at 439.950 MHz, adjust CT04 until no difference is present between them.



2. BOOSTER AND CAVITY ADJUSTMENT

CONDITION

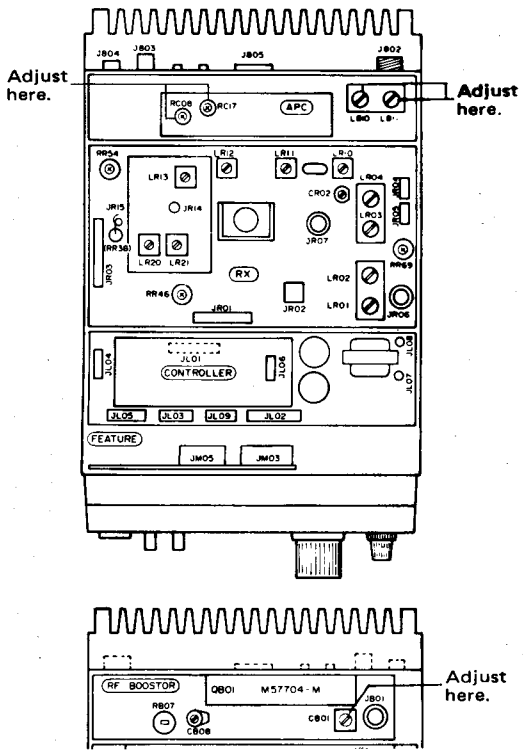
1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy load . . . . . TX 50 Ω
11. Frequency . . . . . 434.960 MHz

*For the detail of connection, see Figure 16.

PROCEDURE

1. Use the CHANNEL selector to set the channel frequency to 435.500 MHz.
2. Turn variable resistors RC08 and RC17 on the APC board fully clockwise and counterclockwise respectively.
3. Set trimmer capacitor CB01 for minimum capacitance.
4. Select the transmission mode. Adjust CB01, CB08, L810 and L811 until the maximum RF power meter reading is obtained.
5. Repeat above step 4) several times.
6. Make sure that the RF power at 430.00 MHz is identical to that at 439.950 MHz. If there is any difference between the two, carry out the adjustment given in above step 4) again.
   (RF power: approx. 14~15 watts)

NOTE:
Do not adjust trimmer capacitors in the younger circuit.



3. TX POWER AND METER ADJUSTMENT

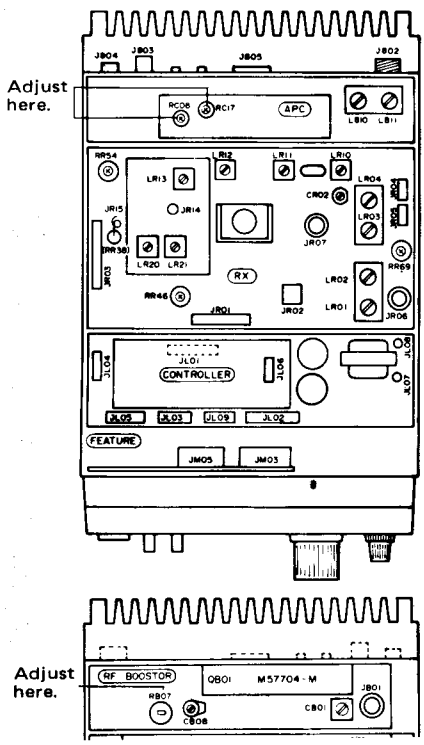
CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI/LOW
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy load . . . . . TX 50 Ω
11. Frequency . . . . . 435.500 MHz
12. External UP-DOWN SW . . . . . Center

*For the details of connection, see Figure 16.

PROCEDURE

1. Set the Hi/Low switch to the Low position.
   Adjust variable resistor RC08 in the APC circuit until an RF power of 1 watt is obtained.
2. Set the Hi/Low switch to the Hi position.
   Adjust variable resistor RC17 on the APC board until an RF power of 11.5 watts is obtained.
   Adjust CB08 until the maximum RF power is obtained. Then, adjust RC17 again to set RF power to 11.5 watts.
3. Set the Hi/Low switch to the Low position.
   Adjust RC08 until an RF power of 1 watt is obtained.
4. Adjust RB07 so 8 power-meter LEDs are lit at the Hi power position of the Hi/Low switch.
5. Make sure that one to four power-meter LEDs are lit at the Low position of the Hi/Low switch.



4. TX DEVIATION ADJUSTMENT

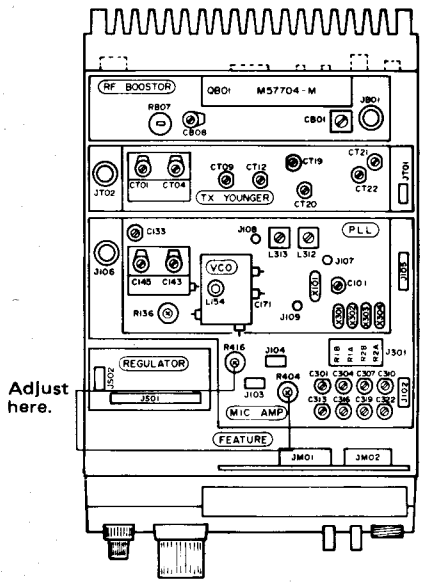
CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy load . . . . . TX 50 Ω
11. Frequency . . . . . 435.500 MHz
12. External UP-DOWN SW . . . . . Center

*For the detail of connection, see Figure 16.

PROCEDURE

1. Connect an AF oscillator to the microphone input of the unit, and set AF OSC output to 1 kHz, 30 mV. Set variable resistor R404 on the PLL board to maximum (fully clockwise).
2. Select the transmission mode.
   Adjust R416 until maximum deviation is ± 5.5 kHz.
3. Adjust R404 until maximum deviation is ± 5 kHz.
4. Check microphone input sensitivity.



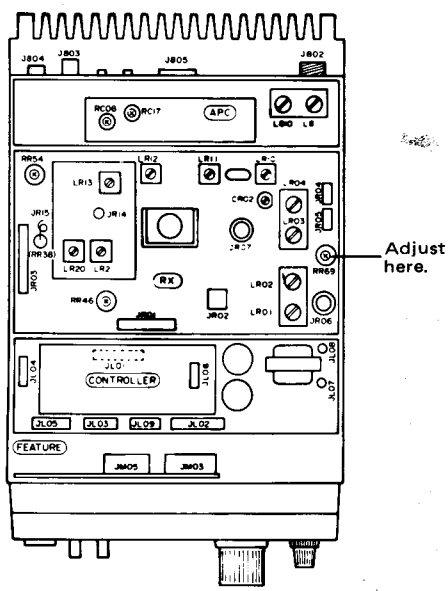
5. CHANNEL SWITCH BUZZER ADJUSTMENT

CONDITION

1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 25 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. External . . . . . SPK

PROCEDURE

1. Set RR69 to maximum (full loudness).
2. Turn the CHANNEL selector knob slowly. The buzzer will sound at each channel boundary.



6. CTN-5 ADJUSTMENT

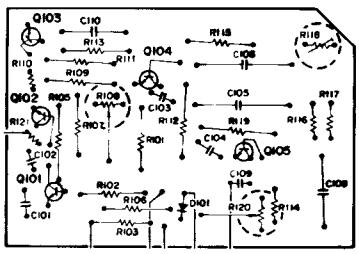
CONDITION

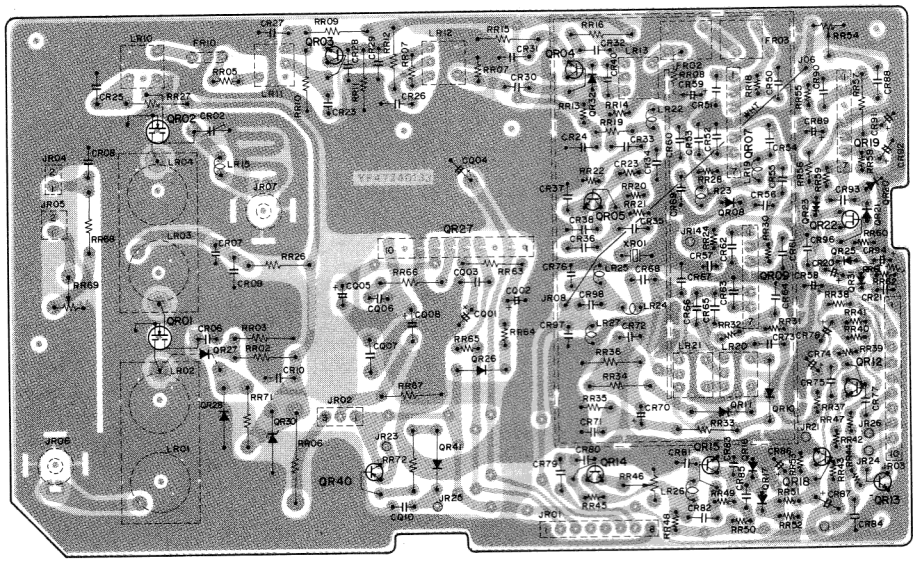
1. MODE . . . . . S
2. SQL . . . . . MIN
3. PWR . . . . . HI
4. VOL . . . . . MIN
5. MODE SCAN . . . . . AUTO
6. SCAN . . . . . LOW
7. CH STEP . . . . . 50 kHz
8. BACK UP . . . . . OFF
9. Power supply . . . . . 13.8 V
10. Dummy load . . . . . TX 50 Ω
    RX 4 Ω
11. Frequency . . . . . 435.50 MHz
12. External . . . . . None

*For the detail of connection, see Figure 18.

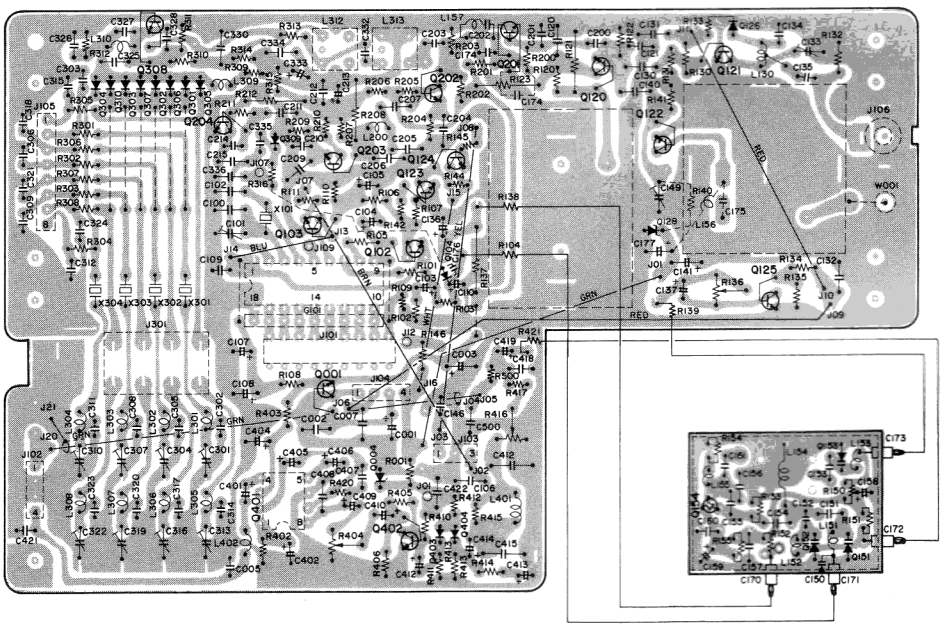
PROCEDURE

1. Set variable resistors R118 and R120 on CTN-5 to their mechanical centers and R108 on the same board to minimum position (fully counterclockwise).
2. Apply an AF oscillator output of 1750 Hz to the horizontal input of an oscilloscope.
3. Connect the AF output of linear detector to the vertical input of the oscilloscope.
4. Depress the PUSH TONE switch on the unit to select the transmission mode. Watching the Lissajous' figure obtained, adjust R118 until a tone frequency of exactly 1750 Hz is obtained.
5. While depressing the PUSH TONE switch, adjust R120 to set tone deviation to 3.5 kHz.
   At this time, the unit must be completely adjusted.



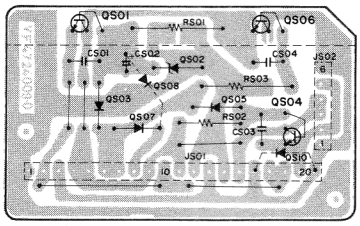


RX P.W. BOARD – PR01

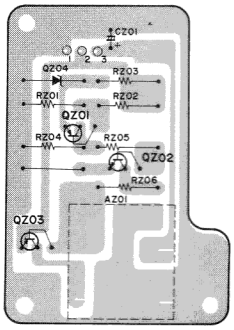


PLL P.W. BOARD – P101

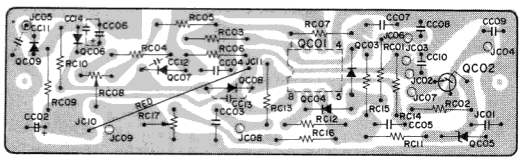
VCO P.W. BOARD – P150



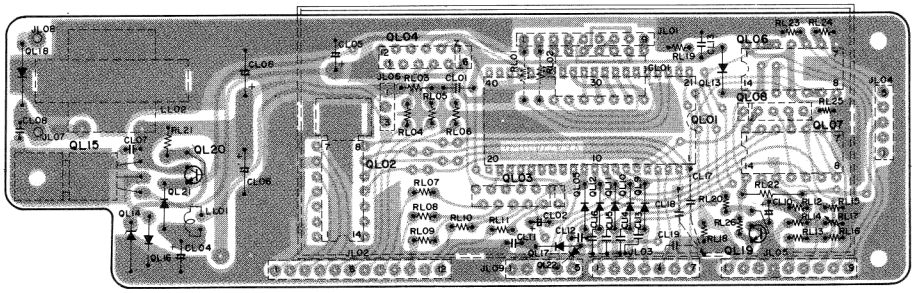
POWER SUPPLY P.W. BOARD – PS01



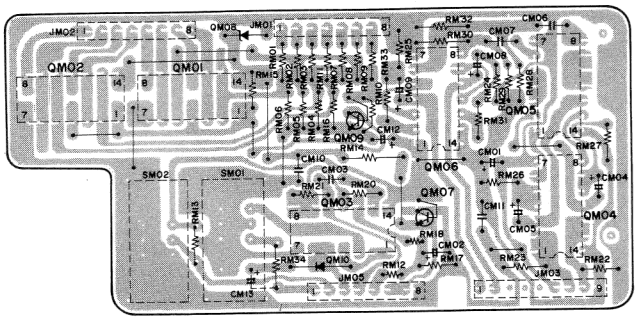
BACK UP P.W. BOARD – PZ01



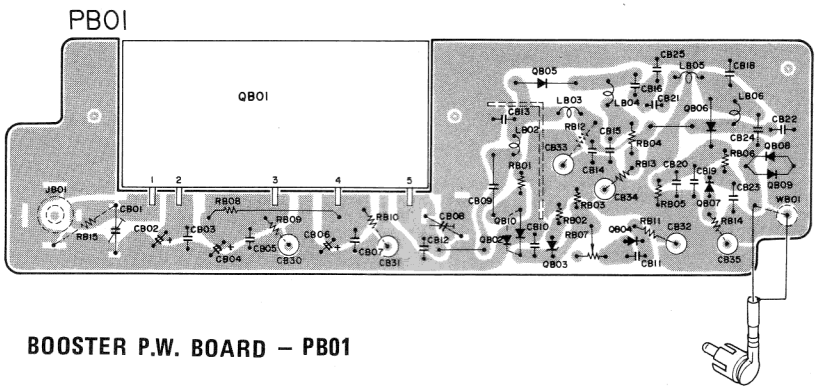
POWER CONTROL P.W. BOARD – PC01



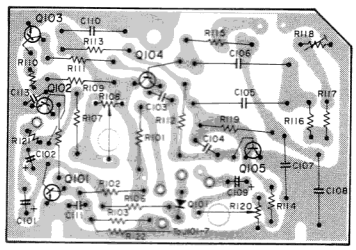
CONTROL P.W. BOARD – PL01



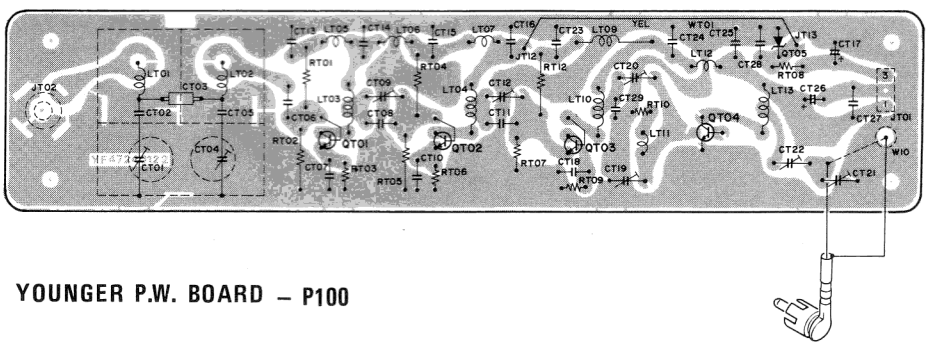
FEATURE CONTROL P.W. BOARD – PM01



BOOSTER P.W. BOARD – PB01



CTN-5 P.W. BOARD – CTN5



YOUNGER P.W. BOARD – P100

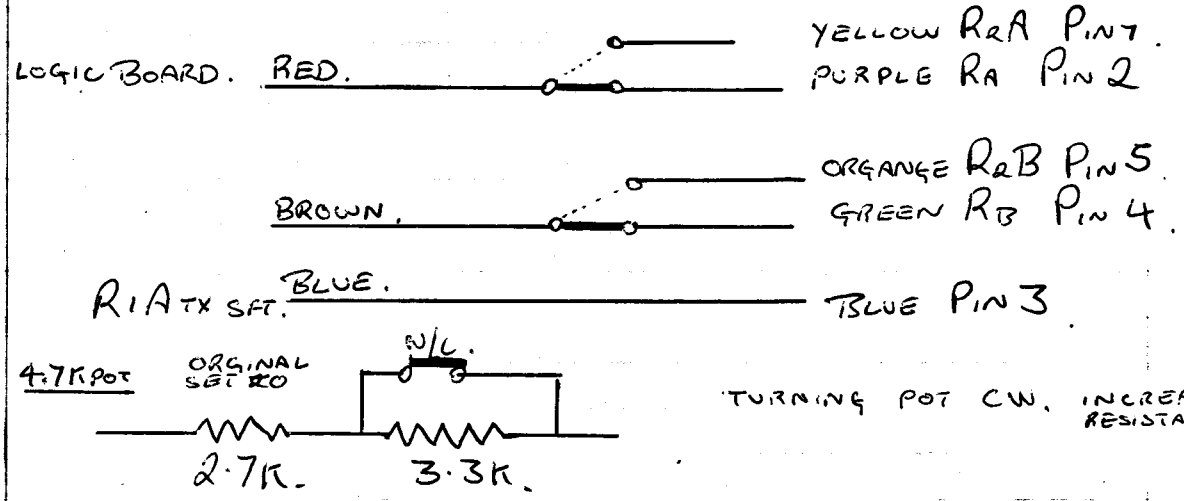
$$Rx\ Freq. = \left[\left[(2 \times XTAL) + 1.555\right] \times 5\right] + 21.4.$$

$$\frac{\left[\frac{(Rx\ Freq. - 21.4)}{5}\right] - 1.555}{2.} = XTAL.$$

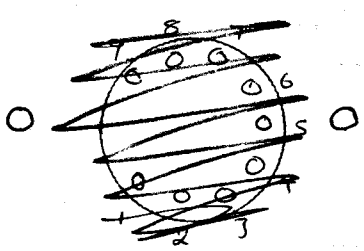
440 MHZ = 41.0825
450 MHZ = 42.0825.
42.72375 = BAND B + 12.5KC HIGH.

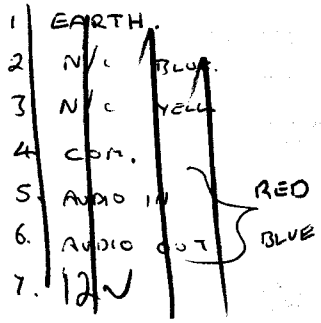
XTALS BOARD.				LOGIC BOARD.
305	GREEN	5 -	1 R1B —	PIN 5.
301	RED	2 -	2 R1A.	PIN 2.
306	BLUE	6 -	3 R1A.	PIN 6.
302	BROWN	1 -	4 RB	PIN 1.
307	ORG	3 -	5 R2B	PIN 3.
303	GREY	8 -	6 TxA.	PIN 8
308	YELL	4 -	7 R2A.	PIN 4.
304	PURPLE	7 -	8 TxB.	PIN 7.

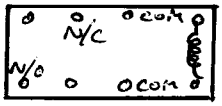
REMOVE P.T.T. LINE FROM TONE BURST BUTTON.
A/B BAND SWITCHING LINE GOES LOW ON BAND B.
TxB = 9.3V ON TX.



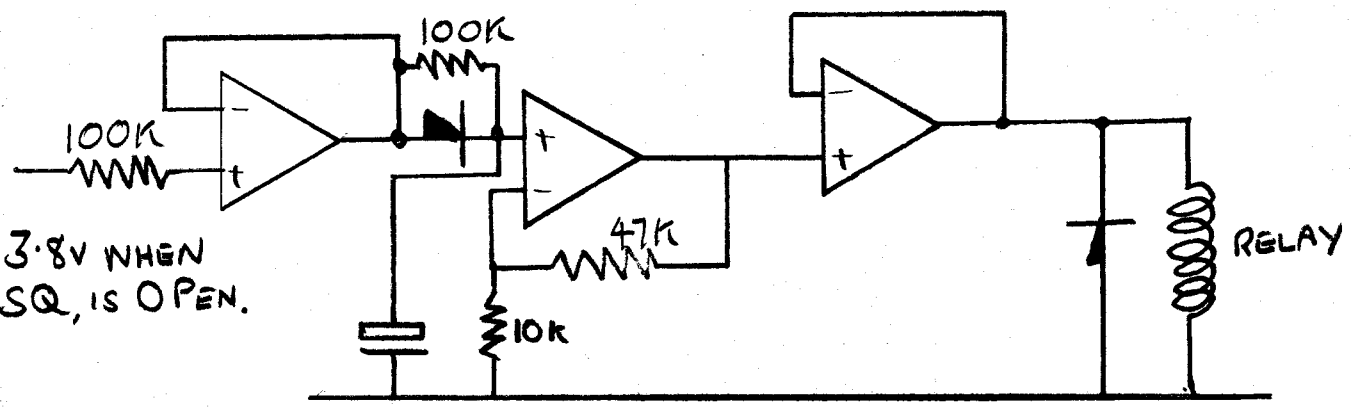
TURNING POT CW. INCREASES RESISTANCE.

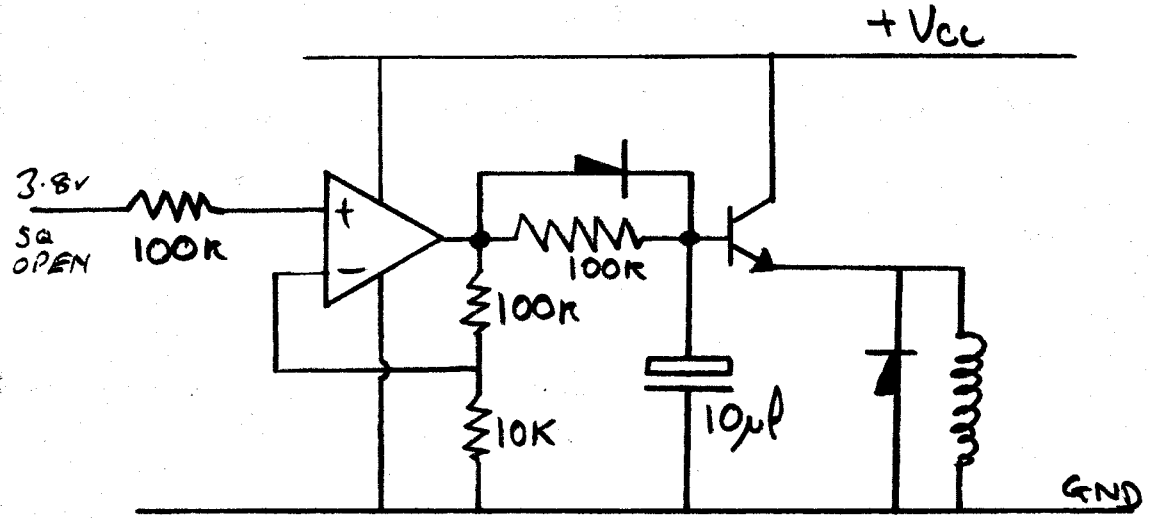






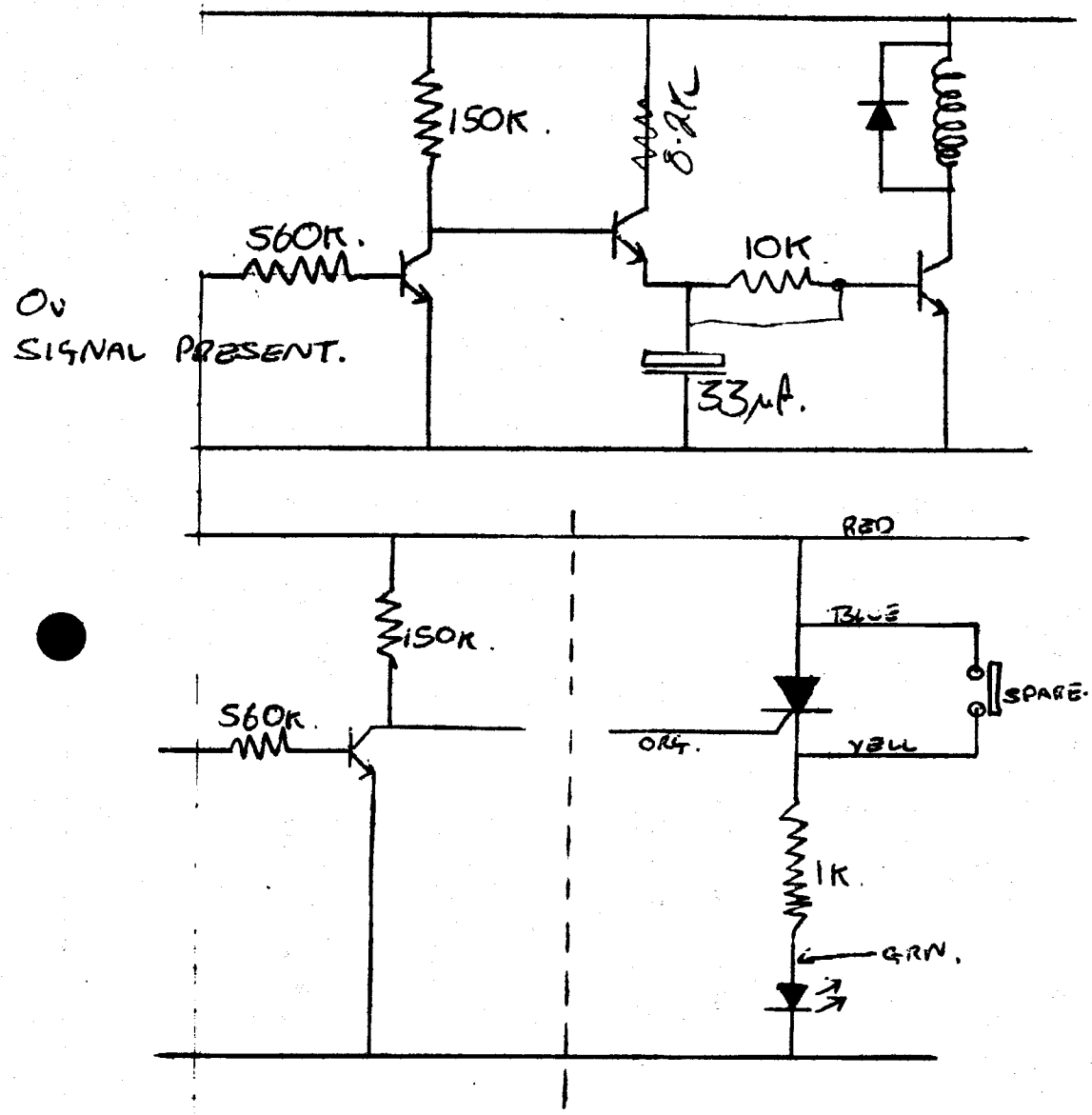
C7800 SQ, SWITCHING RELAY CIRCUIT





COUNTER DISPLAY

- PINK — LOW WILL LATCH
- WHITE — GND.
- BLUE — CLOCK IN
- BLACK — HIGH WILL RESET
- ORGAE — 5v SUPPLY



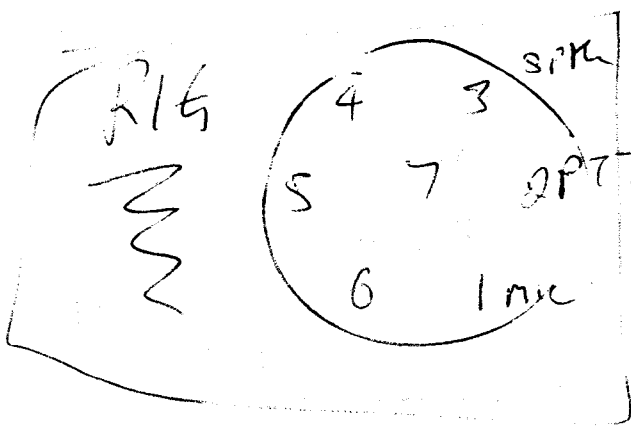
BACK OF RIG

1 2 3

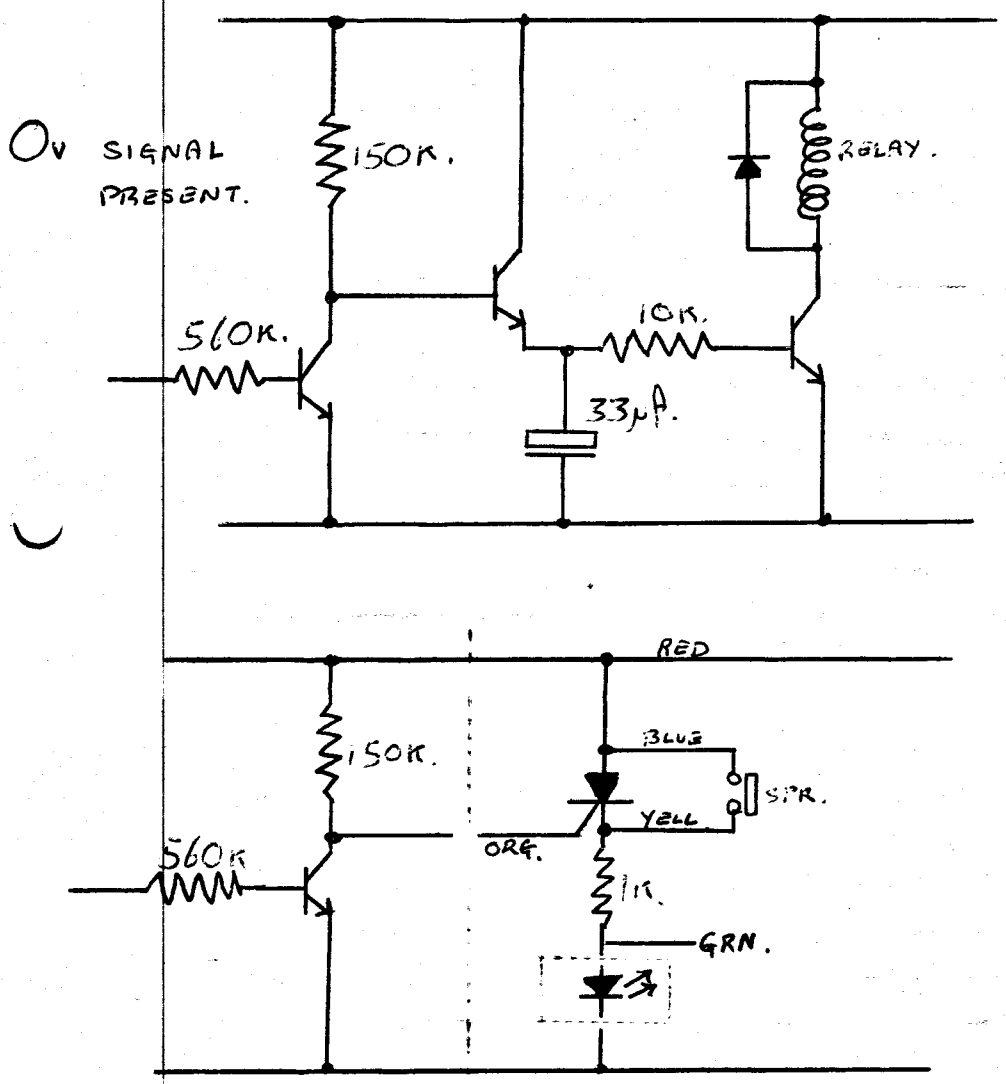
SQ. SWITCHING BOARD.

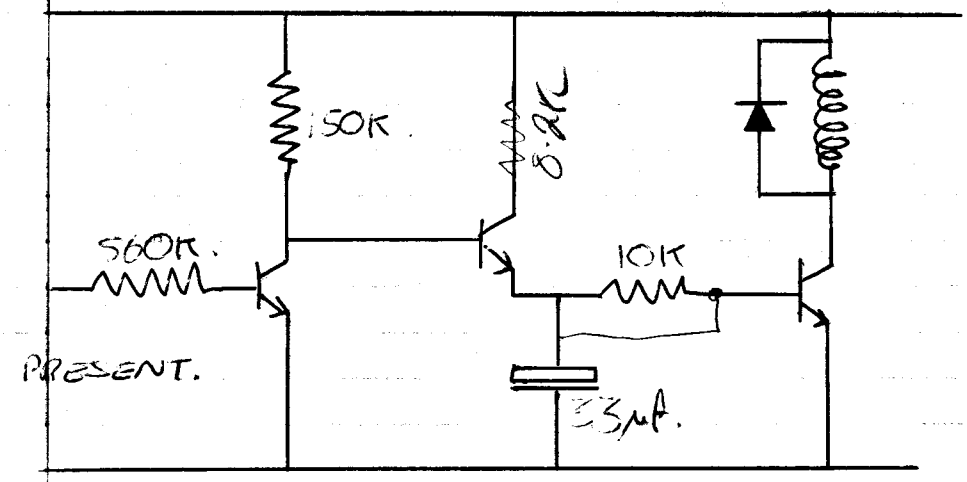
RED	Vcc AND	RELAY +ve
YELL.		RELAY −Ve
BLK.	−Ve	
BLUE	Sq. LINE.	0v ON SIGNAL PRESENT.

1	EARTH	BLACK
2	AUDIO OUT	YELL
3		YELL
4		GRN
5		WHITE
6	AUDIO IN	GREEN
7	PTT	BLUE
8	S METER	NOT USED
9	+12v	RED

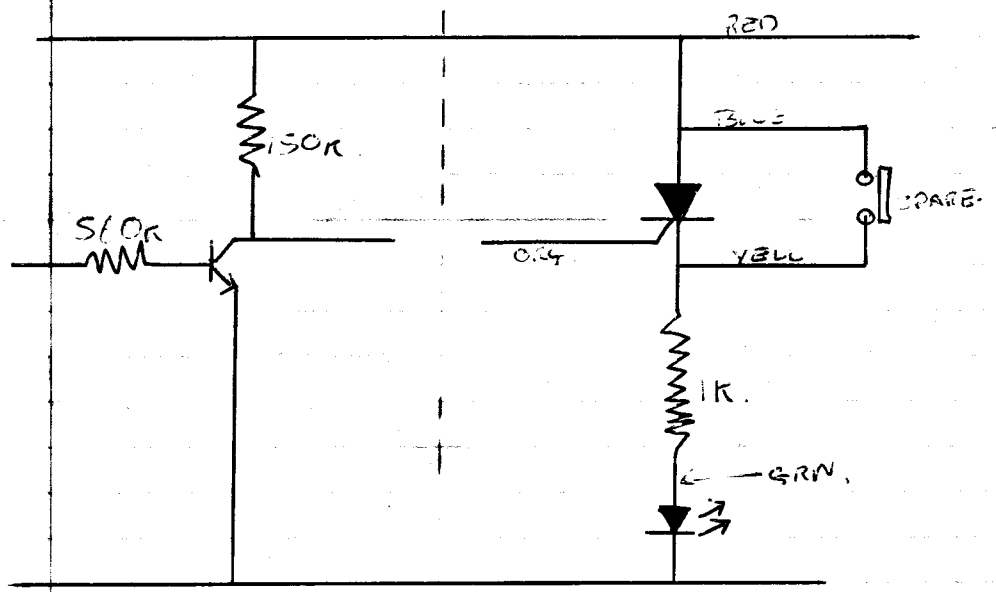


STANDARD C8800 SQ. SWITCHING CCT.





0v
SIGNAL PRESENT.



BACK OF RIG

1 2 3

SQ. SWITCHING BOARD.
RED Vcc AND RELAY +ve
YELL. RELAY − Ve
BLK. -Ve
BLUE Sq. LINE. 0v ON SIGNAL PRESENT.

1	EARTH	BLACK
2	AUDIO OUT	YELL
3		YELL
4		GRN
5		WHITE
6	AUDIO IN	GREEN
7	PTT	BLUE
8	S METER	NOT USED
9	+12V	RED

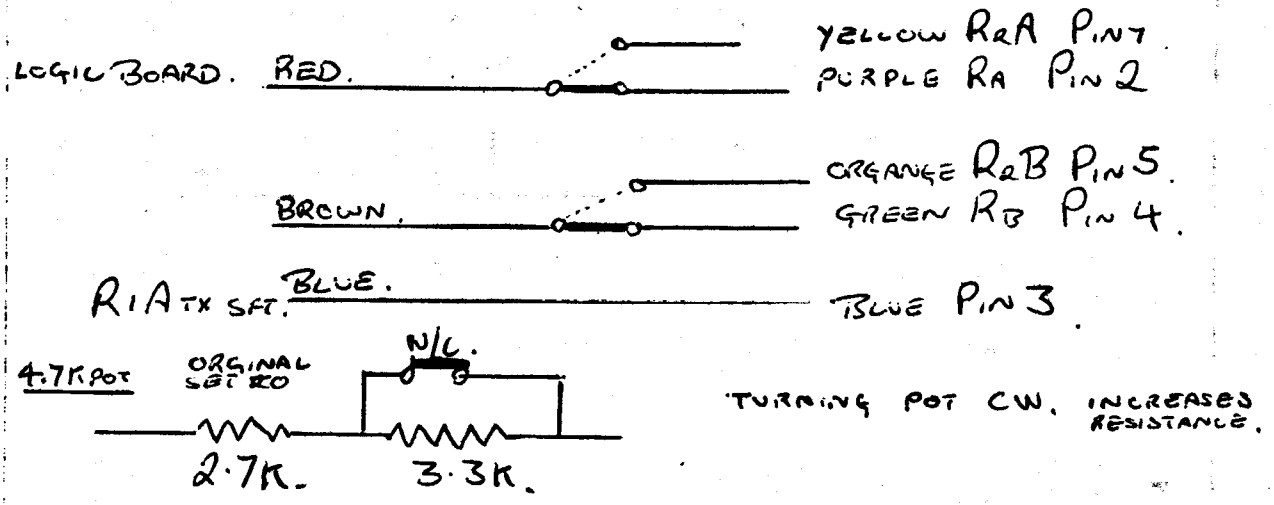
$$Rx\ Freq. = \left[\left[(2 \times XTAL) + 1.555\right] \times 5\right] + 21.4$$

$$\frac{\left[\frac{(Rx\ Freq. - 21.4)}{5}\right] - 1.555}{2} = XTAL.$$

440 MHZ = 41.0825
450 MHZ = 42.0825.
42.72375 = BAND B + 12.5KC HIGH.

XTALS BOARD.					LOGIC BOARD
305	GREEN	5	1	R1B	PIN 5.
301	RED	2	2	RA	PIN 2.
306	BLUE	6	3	R1A.	PIN 6.
302	BROWN	1	4	RB	PIN 1.
307	ORG	3	5	R2B	PIN 3.
303	GREY	8	6	TxA.	PIN 8.
308	YELL	4	7	R2A.	PIN 4.
304	PURPLE	7	8	TxB.	PIN 7.

REMOVE P.T.T. LINE FROM TONE BURST BUTTON.
A/B BAND SWITCHING LINE GOES LOW ON BAND B.
TxB = 9.3V ON TX.



TURNING POT CW. INCREASES RESISTANCE.