

## 2 CIRCUIT DESCRIPTION

### 2.1 TRANSMITTER

#### 1) MIC Amp. Circuit

Voice signal from condenser MIC is amplified in U2. Then, as taking the procedure of Limiting and Low-Pass Filter, this signal keeps the frequency characteristic of +6dB/OCT Pre-emphasis over audio frequency range (from 300Hz to 3KHz) and is adjusted the maximum deviation by VR204. This signal is fed to VCO for frequency modulation.

#### 2) IN SUB-AUDIO operation, through U3 buffer and VR201, pre-defined and pre-programmed frequency tone is modulated by U202(VCTCXO), Reference OSC

#### 3) TX VCO & Amplification Circuit

In transmitting, activated Q208 helps VCO turn on. And through LPF of PLL, VT voltage makes capacity of D303 fluctuated. So, carrier signal whose frequency is generated by L301, C303, D301, C305, C306, C307 and Q302 is stabilized through LPF of PLL. By the way, voice signal amplified by U2 and deviation limited by VR106 makes capacity of D303 fluctuated finely. Therefore, frequency modulated signal is generated at this point. Then, it is fed to Q212, TX amplifying driver through D205.

#### 4) Power Amp. Circuit

Signal amplified by Q212 is fed to U206 and increases more than 4.0W and can be adjusted to standard output using VR203 (HI - POWER) and VR202 (LOW - POWER).

### 2.2 RECEIVER

#### 1) Antenna Switching Circuit

Received signal from the antenna is fed to antenna switching circuit through Low-Pass-Filter consisting of L210~L212, C266, C268, C271 and C273. D204 turns off and it makes isolation from the transmitter circuit, and the incoming signal is fed to the RF amplifier through L101.

#### 2) RF AMP Circuit

The signal from switching circuit is fed to the RF amplifier Q101 through Band-Pass-Filter that decreases over-the-ranged signal.

#### 3) First Mixer Circuit

The amplified signal is fed to the GATE 1 of the first mixer Q102. And output of RX VCO is fed to the GATE 2 of the Q102. Therefore the first IF signal of 45.3MHz is taken from the DRAIN of Q102.

#### 4) IF Circuit

The first IF signal is increased by Q103 through FL101, X-TAL filter. And it is fed to U101 consisting of the second local oscillator, second mixer, Limiter, and detector. The second local oscillator generates signal at 44.845 MHz, and it is fed to the second mixer. Then output of second mixer is the second IF signal of 455kHz, FL102 makes that has desired selectivity. Therefore, detected signal is taken from 9<sup>th</sup> terminal of U101 through limiter amplifying circuit and detecting circuit.

## 5) Audio and Squelch Circuit

The detected audio signal is fed to speaker via de-emphasis circuit (R143, C166) of 6dB/OCT frequency characteristic and U107, audio amplifier which output is more than 0.5W. VR102 adjusts audio output.

Noise signal from 9<sup>th</sup> terminal of U101 is fed to 10<sup>th</sup> terminal through high pass filter circuit. Then it is taken from 11<sup>th</sup> terminal via internal filter circuit. The output signal of 11<sup>th</sup> terminal is rectified and fed to 12<sup>th</sup> terminal. By the way, output signal of 14<sup>th</sup> terminal (MUTE) is fed to U8 ( $\mu$ -COM) that makes squelch operation. Also, VR101, external squelch adjuster controls squelch operation.

## 2.3 VCO CIRCUIT

In receiving, activated Q209 helps VCO turn on. And through LPF of PLL, VT voltage makes capacity of D401 fluctuated. So, carrier signal whose frequency is generated by L401, C403, D401, C405, C406, C407 and Q402 is stabilized through LPF of PLL. And it is fed to Q102, Mixer through D202.

## 2.4 CONTROLLER

## 1) Reset Circuit

When turning on the radio, R70, C71 and D05, generate high pulse of 6mS which resets the CPU.

## 2) Power Circuit

Power is stabilized 5V at U5 and supplied to U1 ~ U4 and U6 ~ U8. Rx & Tx power is stabilized by U201. Output of Q202 is Rx power from  $\mu$ -COM and output of Q201 is Tx power. Also, PLL IC and VCO is stabilized by U203.

## 3) Power Off, Low Battery Detecting Circuit

If input voltage decreases to 6.8Vdc, Q2 turns off and Vdc is fed to Collector of Q3. And when at 43<sup>th</sup> pin of  $\mu$ -COM detects low,  $\mu$ -COM recognizes low battery and output high and low signal at 5<sup>th</sup> pin. Which makes TX lamp blink.

## 2.5 ALIGNMENT

### 2.5.1 PLL VCO

Connect the Voltmeter to TP4 jack, and adjusting the L302, L304 as following.

460.0125MHz	Rx	2.2 ~ 3.7V
	Tx	2.2 ~ 3.7V

### 2.5.2 RECEIVER

- 1) Adjust SG to channel frequency 460.0125MHz, and signal level 1mV, 1KHz to 1.5KHz FM modulation, and then connect to antenna jack.
- 2) Connect the Scope to IF DET jack of JP101 and adjust the T105 until DC voltage turns 2.1V.

- 3) Adjust T101~T104 in 460.0125MHz band in detail, find minimum signal level which makes SINAD be 12dB. This time, SQ has to keep turning off.

### 2.5.3 TRANSMITTER

- 1) In transmitting, reference frequency is adjusted to 460.0125MHz
- 2) Adjust output power to be high (4W) by VR203 and low (2W) by VR202.
- 3) Adjust TX frequency in detail using U202 (VCTCXO).
- 4) After turn VR201 and VR204 fully (CCW), feed signal of 96mVrms at 1.0 kHz without tone to MIC jack, and adjust VR204 in order that deviation is turned to 2.0kHz. And confirm that deviation is about 1.5 kHz, when signal of 9.5mVrms (20dB down).
- 5) Feed tone 67Hz(CTCSS) and adjust the VR105 until the deviation is 0.38kHz. In this condition, make sure that deviation of CDCSS tone is less than +0.5 kHz and deviation of CTCSS tone in 67Hz and 250.3Hz is 0.35~0.6 kHz. Also when audio signal of 1kHz and with tone are modulated together, confirm that deviation of CTCSS tone is  $\pm 2.5$ kHz or less.

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EXHIBIT #: 10C

## CTCSS FREQUENCY & CDCSS CODE TABLE

### • CTCSS

Tone No.	Freq. (Hz)	Tone No.	Freq. (Hz)	Tone No.	Freq. (Hz)
C 00	No Tone	C 13	103.5	C 26	162.2
C 01	67.0	C 14	107.2	C 27	167.9
C 02	71.9	C 15	110.9	C 28	173.8
C 03	74.4	C 16	114.8	C 29	179.9
C 04	77.0	C 17	118.8	C 30	186.2
C 05	79.7	C 18	123.0	C 31	192.8
C 06	82.5	C 19	127.3	C 32	203.5
C 07	85.4	C 20	131.8	C 33	210.7
C 08	88.5	C 21	136.5	C 34	218.1
C 09	91.5	C 22	141.3	C 35	225.7
C 10	94.8	C 23	146.2	C 36	233.6
C 11	97.4	C 24	151.4	C 37	241.8
C 12	100.0	C 25	156.7	C 38	250.3

### • CDCSS

Tone No.	CODE	Tone No.	CODE	Tone No.	CODE
D 01	023	D 29	174	D 57	445
D 02	025	D 30	205	D 58	464
D 03	026	D 31	223	D 59	465
D 04	031	D 32	226	D 60	466
D 05	032	D 33	243	D 61	503
D 06	043	D 34	244	D 62	506
D 07	047	D 35	245	D 63	516
D 08	051	D 36	251	D 64	532
D 09	054	D 37	261	D 65	546
D 10	065	D 38	263	D 66	565

## Circuit Description

D 11	071	D 39	265	D 67	606
D 12	072	D 40	271	D 68	612
D 13	073	D 41	306	D 69	624
D 14	074	D 42	311	D 70	627
D 15	114	D 43	315	D 71	631
D 16	115	D 44	331	D 72	632
D 17	116	D 45	343	D 73	654
D 18	125	D 46	346	D 74	662
D 19	131	D 47	351	D 75	664
D 20	132	D 48	364	D 76	703
D 21	134	D 49	365	D 77	712
D 22	143	D 50	371	D 78	723
D 23	152	D 51	411	D 79	731
D 24	155	D 52	412	D 80	732
D 25	156	D 53	413	D 81	734
D 26	162	D 54	423	D 82	743
D 27	165	D 55	431	D 83	754
D 28	172	D 56	432		

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