

THEORY OF OPERATION

1. RX Operation

The desired signal input to the antenna will go through DIODE SWITCH CIRCUIT (D101) that will switch the TX signal and RX signal in ANTENNA CONNECTOR (J001), and further goes to the 2-step RESONATOR (L101, L102), RF AMPLIFIER (Q101), and the 3-step RESONATOR (L103, L104, L105), which eliminates the amplification of signal and interference signals such as spurious signal and image signal.

The signal passed through the 3-step RESONATOR will go to the MIXER (Q102), and the signal will be mixed with the 1st local frequency oscillated by PLL OSCILLATION CIRCUIT (Q204), and converted to the 1st IF frequency, 21.4MHz.

The IF signal converted to 21.4MHz. will go to the CRYSTAL FILTER (F101, F102) through IF RESONATOR and eliminates the adjacent signal.

The 21.4MHz. IF signal will be amplified at the 1st IF AMP (Q103) and goes to IF IC (IC101) through IF RESONATOR (L107)

The IF IC will convert the signal of 21.4MHz. to 455KHz. with the 2nd Local frequency (20.945MHz.) and MIXER, and send to CERAMIC FILTER (F103). The 455KHz. signal will eliminate the adjacent signal at CERAMIC FILTER, and be amplified up to the maximum voltage at the limited amplifier, then, demodulates to the audio signal at DISCRIMINATOR (F104).

The demodulated signal goes to the De-emphasis circuit that will make flat the frequency characteristic of audio signal from 300Hz. to 3KHz. and becomes to the fidelity audio signal. The noise signals will be separated (Noise Squelch operation).

The audio signal will be amplified at AMPLIFIER (Q104), adjusted the volume at the Volume Control (VR002) and passed to SPEAKER AMPLIFIER (IC102) and performed at the Speaker.

Noise signal ingredients will be adjusted the volume of noise at the Squelch Control (VR001), then, the noise signal ingredient of 30KHz. will be taken out through the Band Pass Filter, and goes to Noise Amplifier and DETECT CIRCUIT (IC101.), which drives SQUELCH SWITCH CIRCUIT

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The squelch circuit can be set the RX sensitivity in accordance with the noise signal volume of receiving signal by using the Squelch Control.

2. TX Operation

The desired transmit signal oscillated at PLL OSCILLATION CIRCUIT (Q204) will be amplified to 100mW power at AMPLIFIER (Q203, Q202, Q201) and drives POWER AMPLIFICATION IC (Power Module) (IC201).

The power module will be connected the Antenna circuit amplifying the transmit signal.

The antenna circuit is composed with DIODE SWITCH CIRCUIT (D101) which switches the transmitting signal and receiving signal, and the Low Pass Filter circuit.

The output RF signal of the antenna circuit will be supplied from ANTENNA CONNECTOR (J001) to the Antenna.

The RF power output from the antenna is controlled at AUTOMATIC POWER CONTROL CIRCUIT (APC).

3. APC Operation

The RF power of the Power Module will be detected by the detecting circuit (C207) The DC voltage which was rectified the detected voltage will be adjusted and set up to LOW POWER (VR201) and HIGH POWER (VR301) respectively.

The set up Low Power and High Power voltages will be amplified at AMPLIFICATION CIRCUIT (Q301, Q302) and drives CONTROL TRANSISTOR (Q303).

The Control Transistor will control the supply of voltage to the Power Module in accordance with the respective set up powers. Accordingly, this guarantees the RF transmit signal powers, less than 1 watt in Lower Power and less than 25 watts in High power in any circumstances.

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4. PLL (Phase Lock Loop) and VCO circuit Operation

By amplifying of AMP. (Q206), the oscillating frequency of VCO (Voltage Controlled Oscillator) will feedback to PLL IC (IC202).

Inside circuit of PLL IC , VCO frequency will be N-section divided and become to Programmable frequency F_d : 6.25 KHz, by Programmable Divider.

Oscillate CRYSTAL (X201) inside circuit of PLL IC, and divide the oscillating frequency 12.8000 MHz, and stabilize it to be the standard frequency F_r :6.25 KHz.

Phase Detector of PLL IC, phase-detecting in comparison of frequency F_d and F_r , will feedback the voltage , prorate to deviation of frequency, to VCO.

For the voltage output of Phase Detector, LOW PASS FILTER (C230, C231, R220) will be provided, lest the Residual Modulation in the oscillating frequency should deteriorate.

The CRYSTAL will be used for oscillation of F_r , and then the stability of VCO frequency will be equal to that of CRYSTAL 12.8000MHz.

For the oscillation of the desired VCO frequency, set N-figure of Programmable Divider of PLL, by Keyboard Switch of both Mike and Channel Select Switch, and input the Channel Number to Microcomputer. Microcomputer will input N-figure, corresponding to Channel Number, to PLL IC, as VCO frequency data.

5. Operation of Modulation Circuit

The audio noise signal of Microphone will be of Pre-emphasis characteristics, by AMP. (IC302), and will be amplified by AMP. (IC301), and will guarantee less than plus-minus 5 KHz Max. Modulation deviation.

By LOW PASS FILTER (IC301), the frequency band more than 3 KHz will be eliminated ,lest the occupied frequency band should enlarge.

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The amplification by AMP. will be set to the modulation deviation more than plus-minus 1.5 KHz and less than plus-minus 3.0 KHz, under noise pressure of 94 dBA.

After passing through the AMPLIFICATION CIRCUIT and LOW PASS FILTER, the audio signal will be modulated to the transmit signal by MODULATION CIRCUIT (D203).

6. Operation of DSC System

RX operation of DSC signal

MODEM, its Frequency Shift : 1300 Hz and 2100 Hz, and its Sub-carrier Frequency : 1700 Hz, and its Baud-rate : 1200.

Input DSC signal will be discriminated at MODEM, and be converted to RD signal, and be input to MICROCOMPUTER (IC501).

TX operation of DSC signal

The DSC transmit signal will input to MODEM as XD signal. The exact Rate of 1200 Baud will input to MODEM from MICROCOMPUTER as RS signal. XD signal will be converted DSC signal of Frequency Shift 1300 Hz and 2100 Hz, at MODEM. DSC transmit signal will pass through PRE-EMPHASIS CIRCUIT (IC301), and converted to the modulation signal of Index 2.0. As in the audio signal, after passing through AMP. (IC301), AMPLIFIER CIRCUIT (IC301), LOW PASS FILTER (IC301) will be modulated to the transmit signal by the MODULATION CIRCUIT (D203).

7. Microphone Operation

Numeric Key Pad will divide the standard voltage into 13 sections, and connect them to each Key. The data of each Key, with the connection of each voltage to MICROCOMPUTER, MICROCOMPUTER will notice the input of each Key. The standard voltage of Microphone will be set to the standard voltage of Analog/Digital conversion of MICROCOMPUTER.

Numeric Key Pad will be used for setting of MMSI, and/or inputting of Manual Position, and Directory.