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## Appendix 8. Description of RF

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### 3. OPERATING DESCRIPTION

The circuit description of remote controller. The remote controller consists of 3 parts. The first is RF stage which transmits and receives the RF signal and it is located in the RF PCB Assy. The second is CPU and it's peripherals and it is located in the DIGITAL PCB Assy. The third is rechargeable battery and recharging circuit which are located in the DIGITAL PCB Assy.

#### 3-1. RF PCB Assy

The RF PCB Assy is connected with the DIGITAL PCB Assy with 3 connectors, CON501 & CON502 & CON503. The operating power and control signal feeds from DIGITAL PCB Assy through connectors and the receiving data sends to the DIGITAL PCB Assy through connectors.

##### 3-1-1. The TX circuit

The remote controller transmits and receives data using FSK format. The transmit circuit consists of oscillation circuit, multiplier circuit, amplifier and switching circuit. Oscillation circuit is composed of transistor ( Q507 ), crystal ( X502 / 48.2133MHz ) and several passive components ( C552, C553, C543, C544, C547, CH501, CH502, L508, R527, R525 ). The multiplier circuit is composed of transistor ( Q505 ) and several passive components ( C528, C531, C535, C536, C537, C538, L506, L504, R506, R519 ). The amplifier is composed of transistor ( Q503 ) and several passive components ( C529, C505, C571, L505, R505, R517 ). Antenna matching circuit and switching circuit are composed of several passive components such as C526, C511, C512, C503, C522, L502, L501, R504, D503, D501, D502, R501 ). The power is +3V which is supplied from Digital board.

##### 3-1-2. The RX circuit

The receiving circuit consists of front-end amplifier, mixer, 1st local oscillator, IF amplifier, demodulator and control circuit of power supply.

##### 3-1-3. Front-end amplifier

The small signal ( RF signal ) which is picked up by antenna is supplied to the front-end amplifier ( Q502 ) through capacitor ( C523 ) and then, amplified to 15dB. The amplified RF signal is filtered by SAW Filter ( CF503 ) and then, supplied to the mixer.

##### 3-1-4. 1st mixer

The RF signal and signal from 1st local oscillator are mixed by mixer ( Q506 ) and then, 1st IF signal is generated whose frequency is 10.7MHz. 1st IF signal is filtered by ceramic filter ( CF502 ) which increases channel selectivity and then it is supplied to the IF amplifier.

##### 3-1-5. Demodulator

The demodulator is in U501. It has a 2nd LO of 10.245MHz, 2nd mixer, limiter, and discriminator in it. The signal of 10.7MHz and 10.245MHz are mixed in the 2nd mixer, and, 2nd mixer generates signal of 455KHz. The signal of 455KHz is then supplied to the discriminator which demodulates data signal from 2nd IF signal. The data signal is filtered by external filter and then supplied to the Pin46 of microprocessor.

### 3-1-5. 1st local oscillator

Q509 oscillates 47.02444MHz signal using crystal and then it is multiplied to the signal of 141.07333MHz. The signal of 141.07333MHz is filtered by L512 and C559 and then supplied to the base of Q508. And then, it is multiplied again by Q508, L511 and C555 whose frequency is 423.22MHz. The 1st local signal is then supplied to the base of 1st mixer ( Q506 ).

### 3-2. DIGATAL PCB Assy

#### 3-2-1. Control circuit of power supply

When the CPU outputs 3V at the Pin7, the regulator in the U501( +1V regulator ) is operated, which supplies power to the receiving circuit.

#### 3-2-2. Microprocessor

The power from rechargeable battery is fed to the regulator and regulated to the +3V, which is supplied to all of the circuit including CPU, control circuit and RF circuit. Microprocessor ( U901 ) has LCD driver in it and it uses 2 crystals such as 4MHz ( X902 ) and 32768KHz ( U901 ). Microprocessor is usually in sleep mode and wakes up every 1.5 seconds to reduce current consumption. It can be woken by stroke of key button. Also, it controls EL Backlight and Buzzer to be operated. It also has external EEPROM to keep the options which users set previously.

#### 3-2-3. Power Supply circuit

The power is supplied from rechargeable Lion battery ( size 2450 ). The power is regulated by +3V regulator and it is supplied to the CPU, Digital board and RF board. The battery is charged by wall charger or cigarette charger whose output is 12VDC. The charging circuit has 4.2V regulator to prevent from over-charging of battery.