D937 Theory of Operation

Description of Circuit Operation

(1) Base Unit:

The differential I and Q signals from RF105 transceiver chip are fed to the baseband IC, U7. The signals are either audio data or control data. The DSP and CODEC process the 32 KBIT ADPCM audio data in this baseband IC. The converted differential analog audio, SPKO+ and SPKO- at pin 46 & 47 of U7 are transmitting to Tel-Line, Tip & Ring via hybrid circuit, OPAMP, U38 and Transformer, T1. The digital control data is input to the microprocessor 65C02 in the baseband IC; U7 after it is processed by the DSP.

The received analog audio signal from the Tel-Line is input the sidetone canceling circuit formed by OPAMP, U38 and other passive components. One path of the receive audio is routed to the Speakerphone IC, U12 for speakerphone function. The audio path, LINEI is fed into audio portion of the baseband IC, U7 for muting and routing. The processed audio or control data is input to RF105 transceiver IC to be modulated and sent to Handset via 900 MHz Radio Frequency carrier.

The relay K1 and Q10 via OFF_HOOK at pin 99 of U7 control the “ONHOOK” and -Line.

Ring signal is monitored by the ring detect circuit, D15, D16, D20, R528, C585 and U41 pin 4. After receive a valid ring signal from the Tel-Line, the base will send control data to handset for ringing.

DTMF signal is generated by the CODEC in U7 at pin 46 & 47 (SPKO+ and SPKO-) of U7 is output to the Tel-Line through the hybrid circuit, T1.

When the handset is in the charging cradle, the charge detect signal, PARK at pin 25 of U7 will activate the base to send security codes to the charging handset through the center charge contact.

The unregulated power supply from the AC adapter is input to U39, 5V regulators, 7805. The 5V regulator is in turn to be regulated to 3V by U37 to be supplied to the baseband, U7 and RF105, transceiver IC.

The “LINE IN USE” LED is controlled by pin 93 of U7.

Caller ID data pass through C672 and C673 from Tel-Line. It is process by differential Amplifier, U40 via pin 5-7.

CAS data and dial tone are input through U38 at pin 8 to the CODEC in U7 at pin 37. The detected CAS or Dial tone is signal back to the microprocessor in U7.

Extension phone is use is detected by U108 at pin 1.

Hold Release Circuit, Q11, Q12, Q13, Q14, Q18 and opto-coupler, U42 at pin 4 detect hold release signal.

(2) Handset unit:

The receive differential Q and I signals from RF105 transceiver chip are fed to the baseband IC, U7. The signals are either audio data or control data. The DSP and CODEC process the 32 KBIT ADPCM audio data in this baseband IC. The converted differential analog audio, SPKO+ and SPKO- at pin 46 & 47 of U7 are input to the earpiece through Stereo-Phone-Jack, J13. Other audio path is routed to U12 for speakerphone function. The digital control data is input to the microprocessor 65C02 in the baseband IC; U7 after it is processed by the DSP.

The voice signal from the Microphone at JP8 & 10 is differentially ac coupled to U7. The analog signal is digitized by the CODEC before it passes to the DSP to create the 32 Kbit ADPCM audio data. The processed audio or control data is input to RF105 transceiver IC for being modulated and sent to Base via 900 MHz Radio Frequency carrier.

The handset keys are detected at pin8-11, pin 53-60 of U7.

The speaker BZ1 generates key beep and ringing tones through the control of Q3 and pin 88 of U7.

(3) RF Circuits

Both base and Handset RF circuits and PCB layout are identical.

The RF105 transceiver IC, U1 and RF106 Class AB Power Amplifier, U3 are designed to work with the same baseband chip used in both Base and Handset unit. Together with T/R switch, receive preselect filter, low pass filter, loop filter, bandpass filter and VCO, a 900 MHz DSS cordless telephone complete transmit, receive and frequency function is formed (See attached figure).

The RF105/RF106 interface requires a minimum of 18 signals from the baseband chip.

Transmit Path:

The baseband digital input signal is shaped by external filter. The shaping of the baseband data determines the spectral shape of the transmitted RF signal. For the 900 MHz telephone system, the typical 3-dB highpass filter cutoff frequency is about 22 KHz and the lowpass filter is 820 KHz. The transmit baseband input level at the TXD input of the RF105 is typically 100 mVp-p.

The RF106 PA inputs and outputs are single ended RF signals. L15, L23 and C78 sent it out to the air via antenna switch, formed by D1, D2, U4 filter the Amplified output, pi network (C77, C90 and L10) and other passive components. The antenna switch performs TDD (Time Domain Duplex) function such that the transmitter and receiver are turn on with 50% duty cycle by TRSW.

The phone is designed to provide automatically selectable High, Medium and low output power modes. Depending on the distance between base and handset unit, the system automatically set the desired power mode.

Receive Path:

The 900 MHz signal is received at the antenna and passes through the antenna switch and RF Bandpass Filter (BPF), FL1. The BPF is used to minimize overloading of the front end of the radio. The filter has a 3-dB passband range from 902 to 928 MHz.

The output of the BPF is AC-coupled through C189 to the Low Noise Amplifier (LNA) in RF105. The RF105 downconverts the RF signals into I/Q baseband signal. The differential I/Q baseband signals are DC-coupled to the baseband IC at RXIP, RXIN, RXQP and RXQN inputs.

Antenna Switch or Transmit/Receive (T/R) Switch:

The T/R functions of the radio are enabled by TRSW control signals from the baseband IC.

LOCAL Oscillator (LO) Generation:

The LO signal is generated by a programmable PLL frequency synthesizer and the VCO in the RF105. C29, C30 and R8 form the low pass filter of the PLL.

Shielding:

Radio shield is used to minimize the VCO pulling effects, noise interference, and to comply with FCC part 15 radiated emission limits.