

## CIRCUIT DESCRIPTION

Model: MH9934/MH9937 (BellSouth)

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**1**     **Base**

**a. RF Transmitter Section – RF Board**

Compressed audio signal is frequency modulated through the varactor diode D3. Diode D3, choke coil L2 and the external components formed the voltage controlled oscillator circuit for the transmitter part. This circuit generates the TX VCO frequency. A portion of this signal is fed back to the PLL IC's pin1 (FIN1) for phase comparison. Once the phase of oscillation stabilized, the PLL circuit generates the error voltage necessary for the VCO to oscillate at the desired transmitter's RF frequency. The VCO circuit impedance is matched with the succeeding circuit through the transistor Q7 that also acts as the buffer amplifier. RF amplifier Q5 boosts the signal for transmission. This amplified RF signal is trimmed to the desired frequency band by BPF903 so as not to interfere with the receiver circuit. The transmitter RF signal is then propagated through the antenna.

**b. RF Receiver Section - RF Board**

The Base Unit antenna receives RF signal. Band Pass Filter BPF927 trims the signal to the desirable frequency band. Transistor Q8 is a low noise amplifier that boosts the RF signal to a specific level for mixing. PLL IC1 (TB31202) is used as a Universal Phase Lock Loop circuit. The frequency from the Voltage Controlled Oscillator (VCO) D1, L1 and Q4, is fed back to the PLL IC through pin 16 (FIN2) for phase comparison. During channel scanning or turning the unit on, once the phase of oscillation stabilized (locked), the PLL circuit generates the first local oscillator frequency for down-converting the received RF signal into the first IF frequency 10.7MHz. This process is accomplished through the IF mixer circuit Q3. Q1 is used for matching the impedance of the mixer circuit with the succeeding circuits. The resulting IF signal is kept constant by the IF Filter FL2 to 10.7MHz which is then mixed with the second local oscillator frequency 11.150MHz (derived from X1 & C47) to produce a much lower IF frequency. This lower IF frequency is further filtered by IF Filter FL4 to produce a more stable signal of 450KHz. Quadrature signal detection is accomplished internally by the Narrow-band Detector IC2 (KA3361) with the IF coil L7. The recovered audio frequency can be taken from IC2 audio output pin9. Double conversion of received signal is utilized to improve the image frequency rejection of the unit.

**c. Transmitter Audio Section – Main Board**

Audio Frequency signal from the telephone line is compressed through the compressor part of IC101 to minimize the transmission noise. The degree of compression depends on the external RC combinations. The compressed audio is filtered and amplified for better acoustical performance. VR101 trims the transmitted audio into a desirable level.

**d. Receiver Audio Section – Main Board**

The compressed Audio Frequency signal is passed through passive RC filters for acoustic compliance. The filtered audio is then fed to the Componder IC101 for expansion thus retrieving the original Audio signal with noise filtered out. Q300 & Q301 are used as buffer circuit. Matching transformer T400 isolates the high-voltage telephone line to the rest of the circuit. T400 is also used as a hybrid transformer to create a two-way path for audio transmission to and reception from the telephone line.

**2 Handset**

**a. RF Transmitter Section – RF Board**

Refer to portion 1.a for this section. All circuit performance is exactly the same except that Band Pass Filter BPF903 be changed to BPF927 for the handset transmission.

**b. RF Receiver Section – RF Board**

Refer to portion 1.b for this section. All circuit performance is exactly the same except that Band Pass Filter BPF927 be changed to BPF903 for the handset reception.

**c. Transmitter Audio Section – Main Board**

Audio Frequency signal from the handset or from the headset microphone is compressed through the compressor part of IC103 to minimize the transmission noise. The degree of compression depends on the external RC combinations. AGC is also utilized by IC103 to avoid shock noise caused by abrupt change of audio levels. The compressed audio is filtered and amplified for better acoustical performance. SVR101 trims the transmitted audio into a desirable level. Q101 is a switching transistor that controls the power supply for the TX RF part.

#### d. Receiver Audio Section – Main Board

The compressed Audio Frequency signal is passed through passive RC filters for acoustic compliance. The filtered audio is then fed to the Comander IC103 for expansion thus retrieving the original Audio signal with noise filtered out. Q104 act as audio amplifier to sufficiently drive the handset speaker. Q100, Q180 and Q181 are switching transistors that control the power supply for the RF part, the Comander part and the AF amplifier respectively. An earphone jack is provided for an optional headset unit for handsfree conversation on the handset. Speaker volume is manually adjusted through switch SW100A which sets the level to either Hi, Mid or Low.

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### OTHERS (Handset)

#### a. Charging and Reset Controls

Recharging the handset battery is accomplished by putting the handset on the cradle. Q107 detects this action and sends a command to the CPU for proper exchange of security code. Switching SW100B to the RING OFF mode can extend Battery life.

#### b. Ring Detection

When the handset receives the ring command from the base unit, the CPU will send buzzer signal to the ringer amplifier Q110 and Q111 that drives the Buzzer.

#### c. LCD Display

Refer to the schematic diagram, The LCD controlled CPU (IC100) by  $\frac{1}{4}$  bias with external contrast controlling.

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### OTHERS (Base)

#### a. Hook Switching and Dialing

Hook switching and pulse dialing is accomplished by the reed relay RL300A which is controlled by the CPU through switching transistor Q304.

**b. Over-voltage Protection**

Fuse FS400 and varistor VA400 act as high current and high voltage protectors for the telephone line interface. In case of presence of voltage surge across the telephone line, VA400 decreases its resistance and dumps the line voltage to a safe level. Fuse F400 opens when excessive current is present on the line thus protecting both the user and the line interface.

**c. Battery Charging & Code Setting**

Battery charging commences when transistor Q602 detects the presence of the handset on cradle. Q601, & C604 form the reset circuit in conjunction with the charge detect circuit to command the CPU to change the security code. When the reset circuit is activated, the CPU will send a new security code to the handset selecting among 65536 combinations.

**d. Ring Detection**

Incoming ring signal is detected by the photo-coupler IC401. Diode D406, D405, D404, and R405 set the level of signal detection. The CPU checks the frequency of the ring signal, and when valid, sends the ringing command to the speaker or to the Handset.

**e. Power Supplies**

Diodes D203-D206 rectify the input 9VAC. Transistor IC202 and capacitor C222 regulate the voltage to 9AC for the buffer circuit. Transistor Q101 controls the power supplied to the TX part of the RF circuits.

**f. Squelch Detection**

In conjunction with the 3361 IC (IC2 of the Base RF), VR100 sets the level of signal detection and IC100C acts as the comparator circuit whose composite output is the RSSI signal for the CPU.

**g. RX Data**

Commands from the Handset is filtered and re-constructed by the Schmitt trigger circuit IC100B. The composite output is the RX Data that is input to the CPU for validation and processing

**h. Branch Phone Detector**

IC300B and IC300A is configured as comparators which work with diodes D302 ~D301 to detect th branch phone utility. Once a branch phone is being used, this circuit compares the telephone line's voltage level with that of a preset level and

informs the CPU of any voltage change. R408 and R409 isolate the circuit from the high voltage part of the telephone line.

**i. Caller ID Detection**

FSK Caller ID data is processed through the FSK detector IC501 for input to the CPU. The signal levels and signal frequency spectrum is filtered by IC300D. The CPU controls the call state signal detection whether it be a normal caller ID or a caller ID on call waiting.

**j. Answering Branch Phone Detection**

Refer to the schematic diagram, The circuit initiated (A.B.P.D. circuit) when off-hook mode such as ANSWERING machine answered. Then if any LINE voltage changes the A.B.P.D. circuit will through the R402, R403, and C401.

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**AUTOMATIC CHANNEL SELECTION MECHANISM**  
**(Cordless Telephone with Answering Machine and Caller ID on Handset)**  
**MODEL: MH9934/MH9937**

During the activation of Talk, the Handset receiver scans for free channel from its last linked receiver channel (about 50ms per channel). Once a free channel is found, the Handset transmits the Talk instruction to Base together with the receiver's free channel information for the Base to use this free channel as the Transmit channel.

Likewise, the Base receiver continuously scans each channel (25ms per channel) and stores all free channels into its memory. Once the Base receiver received the instruction from its Handset, it will stop from scanning and transmits its acknowledgement data with the Base receiver free channel information. When the Handset receives this Base free channel information, it will transmit the link command to Base and both will link on the clearest channel. The Handset and Base scan and find their receiver's clearest channel separately. If all transmit channels of Handset and Base are occupied (all busy), Handset and Base will link on the default channel (Channel 20).

B A S E			HANDSET		B A S E			HANDSET	
CH	TX	RX	TX	RX	CH	TX	RX	TX	RX
1	902.121	926.117	926.117	902.121	21	902.722	926.717	926.717	902.722
2	902.152	926.147	926.147	902.252	22	902.752	926.747	926.747	902.752
3	902.182	926.177	926.177	902.182	23	902.782	926.777	926.777	902.782
4	902.212	926.207	926.207	902.212	24	902.812	926.807	926.807	902.812
5	902.242	926.237	926.237	902.242	25	902.842	926.837	926.837	902.842
6	902.272	926.267	926.267	902.272	26	902.872	926.867	926.867	902.872
7	902.302	926.297	926.297	902.302	27	902.902	926.897	926.897	902.902
8	902.332	926.327	926.327	902.332	28	902.932	926.927	926.927	902.932
9	902.362	926.357	926.357	902.362	29	902.962	926.957	926.957	902.962
10	902.392	926.387	926.387	902.392	30	902.992	926.987	926.987	902.992
11	902.422	926.417	926.417	903.422	31	903.022	927.017	927.017	903.022
12	902.452	926.447	926.447	903.452	32	903.052	927.047	927.047	903.052
13	902.482	926.477	926.477	903.482	33	903.082	927.077	927.077	903.082
14	902.512	926.507	926.507	903.512	34	903.112	927.107	927.107	903.112
15	902.542	926.537	926.537	903.542	35	903.142	927.137	927.137	903.142
16	902.572	926.567	926.567	903.572	36	903.172	927.167	927.167	903.172
17	902.602	926.597	926.597	903.602	37	903.202	927.197	927.197	903.202
18	902.632	926.627	926.627	903.632	38	903.232	927.227	927.227	903.232
19	902.662	926.657	926.657	903.662	39	903.262	927.257	927.257	903.262
20	902.692	926.687	926.687	903.692	40	903.292	927.287	927.287	903.292

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