

## Model : FF930

# TECHNICAL DESCRIPTION

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## **HANDSET**

### **1. RF/Audio Sections**

The radio link between Handset and Base is full duplex at 902/928MHz within the 40 channels. FM modulation is used for the link. The 1<sup>st</sup> IF frequency is 10.7MHz and the 2<sup>nd</sup> IF frequency is 450kHz. The operating frequency for the cordless phone is selected from one of the following channels and controlled by the synthesizer U501 which is programmed by the MCU. Please refer to Table 1 for the Channel Frequency Table.

This section is common to both handset and base as the same ICs are used : LMX1602 (U501), KA3361 (U500). LMX1602 is made up of dual serial input PLL frequency synthesizer with 1000MHz prescaler. KA3361 is a narrow-band IF detector IC.

#### **1.1 Receiver**

The receiver section is of double conversion with 10.7MHz and 450kHz as the first and second IF. Rx signal from the duplexer circuit is amplified by a Low Noise RF transistor and passed to a mixer (Q500 and Q501), and it is converted to 10.7MHz IF and it is then double converted to 450kHz IF in the internal mixer of U500. Voice/data signal is demodulated and output from pin 9 of U500. The demodulated signal is then divided into two paths, a path is fed into the data amplifier Q104. The recovered data signal RX/DATA is extracted from the output of Q104. The other path will go through a de-emphasized amplifier and a expander in IC102B. The recovered audio will pass through the audio amplifier Q2 and to the receiver. The recovered signal can be muted by the pin 13 of IC102B.

#### **1.2 Transmitter**

Audio signal (from Microphone for handset / Tip & Ring for base) is first fed into the mic. amplifier and compressor inside IC102A. The signal will pass through a limiter. The AGC and the limiter has the property to limit the maximum signal which feed into the transmitter so that the RF deviation is limited. The transmitter section mainly divided into two parts. They are the voice/data modulator and the Tx power amplifier. The voltage controlled oscillator VCO operated at the Tx frequency controlled by the synthesizer is modulated by the audio and data signals. Modulated signal is amplified by the RF amplifier and sending the signal to the duplexer for radiation by the antenna.

#### **1.3 Duplexer**

A surface mount SAW duplexer is used. The function of the duplexer is to multiplex the transmitting and the receiving signals to a common antenna while providing isolation and rejection of interference and other spurious signals.

#### 1.4 Alerter

The alerting signals include the following : Ringing, Paging, Key Beep and Low battery warning tone. These tones are generated by the MCU to the alerter through the driving circuit formed by Q115 and the associated components.

#### 1.5 Microphone

The condenser microphone is biased by the resistor R163. The signal is applied to the mic. amplifier inside IC102A.

### 2. MCU

#### 2.1 Battery Detect

IC105 is a voltage detector which is used to detect battery low condition. The detecting accuracy of the voltage detector is  $\pm 0.15V$ . The detect pin, BAT\_LOW is connected to the pin 31 of the MCU (IC104).

#### 2.2 Carrier Detection

This 40 channels cordless has the features of auto-scanning. This is done by the detection of the RSSI at pin 28 of MCU of handset. During PHONE on or CHANNEL changing, the MCU will select the clearest channel for the RF communication.

### BASE

### 3. RF/Audio sections

The operation of the RF/Audio sections are similar to that of the handset.

### 4. Telephone Network

#### 4.1 Telephone Interface

Fuse FUSE1 is for over-voltage protection. Relay RLY1 controls the on/off hook state and pulse dialing. The Tip & Ring are isolated from the base circuit by the hybrid transformer HYB1, relay RE1, and the photo-coupler IC12.

## 4.2 Ring Detect

When ring signal is present on the Tip Ring, and envelope waveform of the ring pattern will transfer to pin 61 of MCU IC16 by the photo-coupler IC12 which is used as isolation between Tip Ring and the digital circuit. The MCU will read this waveform and determine whether it will connect the appropriate path.

## 4.3 Sidetone Cancellation Network

The sidetone cancellation is a hybrid circuit of the Tx and Rx paths of the telephone circuit formed by the hybrid transformer.

# 5. MCU

## 5.1 Charging Network

Base charging circuit provides a DC current for handset batter. Resistor R50 controls the current flow.

## 5.2 LED Display

Direct driving is employed in the control of LED indicators. The indicator are POWER, IN USE/CHARGE, ANSWER ON/OFF and SPEAKER, which were used to indicate the corresponding functions are activated.

## 5.3 Carrier Detection

This is similar to the handset counterpart.

# 6. Caller ID

The Caller ID information is transmitted from the telephone line in the form of FSK signal. The signal is coupled from the tip and ring into the pin 12, pin 13 of IC1D, it then passes through the CODEC (IC20) and DSP1609-ND (IC21). The MCU get the caller ID from IC21 through the data pins. Then MCU send the data to handset. The handset receive the caller ID data and display it in the LCD.

The IC21, DSP 1609-ND, has built in the digital telephone answering machine, caller ID circuit and digital speakerphone.

# 7. Speakerphone

The speakerphone function is built in the IC21. The audio signal from the microphone, to the amplifier (IC1) and to the CODEC (IC20) and then input to IC21. The signal that output to the speaker is passed through IC20 and amplifier (IC9).

## **8. Digital Telephone Answering Machine**

The digital telephone answering machine function is built in the IC21. The IC performs speech compression, adaptive acoustic and hybrid echo cancellation, digital automatic gain control in TAD mode, switched-loss control, Bell 202/V.23 demodulation, full DTMF digital generation, V.23 data transmission/reception, memory and message management, and HEC-enhanced line monitoring signal processing functions. The IC also provides the serial host interface for commands/status and control, flash memory (IC25) interface for message storage, codec (IC20) interface for analog-to-digital conversion, and the system and real-time clocks.

**Appendix****Table 1 : Channel Frequency Table**

CH	BASE (MHz)			HANDSET (MHz)		
	TX	RX	RX LOCAL	TX	RX	RX LOCAL
1	902.175	924.875	935.575	924.875	902.175	891.475
2	902.250	924.950	935.650	924.950	902.250	891.550
3	902.325	925.025	935.725	925.025	902.325	891.625
4	902.400	925.100	935.800	925.100	902.400	891.700
5	902.475	925.175	935.875	925.175	902.475	891.775
6	902.550	925.250	935.950	925.250	902.550	891.850
7	902.625	925.325	936.025	925.325	902.625	891.925
8	902.700	925.400	936.100	925.400	902.700	892.000
9	902.775	925.475	936.175	925.475	902.775	892.075
10	902.850	925.550	936.250	925.550	902.850	892.150
11	902.925	925.625	936.325	925.625	902.925	892.225
12	903.000	925.700	936.400	925.700	903.000	892.300
13	903.075	925.775	936.475	925.775	903.075	892.375
14	903.150	925.850	936.550	925.850	903.150	892.450
15	903.225	925.925	936.625	925.925	903.225	892.525
16	903.300	926.000	936.700	926.000	903.300	892.600
17	903.375	926.075	936.775	926.075	903.375	892.675
18	903.450	926.150	936.850	926.150	903.450	892.750
19	903.525	926.225	936.925	926.225	903.525	892.825
20	903.600	926.300	937.000	926.300	903.600	892.900
21	903.675	926.375	937.075	926.375	903.675	892.975
22	903.750	926.450	937.150	926.450	903.750	893.050
23	903.825	926.525	937.225	926.525	903.825	893.125
24	903.900	926.600	937.300	926.600	903.900	893.200
25	903.975	926.675	937.375	926.675	903.975	893.275
26	904.050	926.750	937.450	926.750	904.050	893.350
27	904.125	926.825	937.525	926.825	904.125	893.425
28	904.200	926.900	937.600	926.900	904.200	893.500
29	904.275	926.975	937.675	926.975	904.275	893.575
30	904.350	927.050	937.750	927.050	904.350	893.650
31	904.425	927.125	937.825	927.125	904.425	893.725
32	904.500	927.200	937.900	927.200	904.500	893.800
33	904.575	927.275	937.975	927.275	904.575	893.875
34	904.650	927.350	938.050	927.350	904.650	893.950
35	904.725	927.425	938.125	927.425	904.725	894.025
36	904.800	927.500	938.200	927.500	904.800	894.100
37	904.875	927.575	938.275	927.575	904.875	894.175
38	904.950	927.650	938.350	927.650	904.950	894.250
39	905.025	927.725	938.425	927.725	905.025	894.325
40	905.100	927.800	938.500	927.800	905.100	894.400

Note :

1<sup>st</sup> IF = 10.7MHz, 2<sup>nd</sup> IF = 450kHz, Channel Spacing = 75kHz.  
Ref. Osc. = 10.25MHz, FR = 25kHz.