EXHIBIT 1
GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The FF680 is a 25 Channel Cordless Phone with Answering Machine. The unit is capable of either tone or pulse dialing. The internal power supply's isolation is accomplished through a power transformer having an adequate dielectric rating. The circuit wiring is consistent under the requirement of part 68.

The handset unit consists of a keypad with twelve standard keys (0,...9,*,#), three function keys (Flash, Memory & Redial), and one channel switch key. A talk key is provided to control pick/release telephone line in a toggle base.

The base unit has a page key, which is used to page the handset unit. And there are seven keys used for answering Machine.

The circuit description is listed in the following page.

Connection between the device and the telephone network is accomplished through the use of USOC RJ11C in the 2-wire loop calling central office line.

TELEFIELD LTD

MODEL : FF680 **DATE : Apr 20, 1998**

CIRCUIT DESCRIPTION

BASE UNIT (RF Part)

1.0 Power Supply

The regulation circuit (Q342) generates DC 5V to all RF and audio circuit. The RF transmit power is controlled by the electronic switch (Q204). The transmit power is off when TALK OFF.

1.1 RF Transmit Circuit

The Voltage Controlled Oscillator VCO (Q205) generates the required frequency (43-46MHz, it also act as a modulator. Digital data from base unit MCU (IC301) for remote unit and base unit communication is feed into the modulator through a resistor network. Audio signal from tel. line are feed into the modulator through the buffer amplifier of the Combo chip TB31224 (IC201).

1.2 RF Receiver Circuit

The LNA (Q201) together with the duplexer and the tune circuit (IFT201) amplify the wanted RF signal while suppress the unwanted RF signal. This RF signal together with the RF signal from the Local Oscillator of the Combo chip TB31224 (IC201) are feed into the Mixer of the Combo chip TB31224 (IC201), the Mixer is work at non-linear conditions such that a series of mixed frequencies of the incoming RF signal are generated. The 10.7MHz ceramic filter (CF201) filtered out the wanted Intermediate Frequency (IF). This IF is demodulated by the narrow band FM receiver of the Combo chip TB31224 (IC201) to get the wanted audio signal.

1.3 Frequency Synthesizer

Frequency synthesize of the RF Transmit frequency and the LO frequency is done by the Phase Locked Loop of the Combo chip TB31224 (IC201).

The PLL divide the transmit frequency by a factor "n" with a reference 5kHz frequency (generated from the 10.24 MHz reference frequency), any phase difference between these two frequencies will produce a net DC output at Pin47 of the Combo chip TB31224 (IC201). This DC signal is feed at the varator diode (VD202 and VD203) to its capacitance in a way that will decrease the phase error unit zero. That is, the transmit frequency is locked.

Change channel is easily done by vary the factor "n" which is controlled by the MCU (IC301) through the 3 input port CLK, DATA and STB (Pin 6, 7, and 8) of the Combo chip TB31224 (IC201).

LO frequency synthesize is done in the same way.

1.4 Telephone Line Interface

The telephone line input (Tip / Ring) is connected to the hybrid transformer and couple to the Secondary coil. The circuit is also protected by a 10 OHM fusible resistor (R381)and the varistor. (MOV381) The Line seizure is performed by the transistor (Q341) to turn on the Reed relay. Transistor switching is controlled by the RELAY (Pin 14) of the base MCU(IC301).

1.5 Ringer Detection Circuit
When the ring signal come from the telephone line, it is detected by the RINGIN port of the MCU (IC301) through the Photo Coupler IC (IC208).

1.6 Charge Detection Circuit
When the battery is under charging, It turn on the transistor (Q353) ,and the low level is detected by the CHG port (Pin 1) of the MCU (IC301) . During charging, the CHARGE LED will be lit up.

1.7 Data Recovery
The function of the D-COMP-IN and DATA-OUT (Pin23 and Pin24) of the Combo chip TB31224 (IC201) is to shape the recovered digital code signal to clean square pulse chain with correct duty cycle which can be recognized by the base MCU.

1.8 Compressor Circuit
The compressor of the Combo chip TB31224 (IC201) will take a signal with an 80 dB dynamic range (100uV to 1.0 mVrms). and reduce that to a 40 dB dynamic range by attenuating strong signals, while amplifying low level signals .

1.9 Expander
The expander of the Combo chip TB31224 (IC201) does the opposite in that the 40dB signal is increased to a dynamic range of 80 dB by amplifying strong signals and attenuating low level signals.

REMOTE UNIT

2.1 Power Supply
The power is supplied by a 3.6 Volt battery.. The RF transmitted power is controlled by the electronic switch(Q3). On the other hand, the power of receiver part is controlled by the transistor (Q2).

2.2 RF Transmit Circuit
The Voltage Controlled Oscillator VCO (Q5) generates the required frequency (49MHz), it also act as a modulator. Digital data from handset MCU (IC2) for remote unit and base unit communication is feed into the modulator through a resistor network. Audio signal from the TAD or tel. line are feed into the modulator through the compressor of the Combo chip TB31224 (IC1).

2.3 RF Receiver Circuit
The LNA (Q1) together with the duplexer and the tune circuit (T1) amplify the wanted RF signal while suppress the unwanted RF signal. This RF signal together with the RF signal from the Local Oscillator of the Combo chip TB31224 (IC1) are feed into the Mixer of the Combo chip TB31224 (IC1), the Mixer is work at non-linear conditions such that a series of mixed frequencies of the incoming RF signal are generated. The 10.7MHz ceramic filter (F1) filtered out the wanted Intermediate Frequency (IF). This IF is demodulated by the narrow band FM receiver of the Combo chip TB31224 (IC1) to get the wanted audio signal.

2.4 Frequency Synthesizer
Frequency synthesize of the Transmit frequency and the LO frequency is done by the Phase Locked Loop of the Combo chip TB31224 (IC1).

The PLL divide the transmit frequency by a factor "n" with a reference 5kHz frequency (generated from the 10.24 reference frequency), any phase difference between these two frequencies will produce a net DC output at TX-OUT (Pin47) of the Combo chip TB31224 (IC1). This DC signal is feed at the varator diode (D11) to its capacitance in a way that will decrease the phase error unit zero. That is, the transmit frequency is locked.
Change channel is easily done by vary the factor "n" which is controlled by the MCU through the 3 input port CLK, DATA and STB (Pin6, 7, and 8) of the Combo chip TB31224 (IC1).
LO frequency synthesize is done in the same way.

2.5 Charge Detection Circuit
When the handset put into the cradle ,the handset MCU CHGIN (Pin8) pull low and it reset the MCU.

2.6 Data Recovery
The function of the D-COMP-IN and DATA-OUT (Pin23 and Pin24) of the Combo chip TB31224 (IC201) is to shape the recovered digital code signal to clean square pulse chain with correct duty cycle which can be recognized by the handset MCU.

2.7 Compressor Circuit
The compressor of the Combo chip TB31224 (IC201) will take a signal with an 80 dB dynamic range (100uV to 1.0 mVrms). and reduce that to a 40 dB dynamic range by attenuating strong signals, while amplifying low level signals .

2.8 Expander
The expander of the Combo chip TB31224 (IC201) does the opposite in that the 40dB signal is increased to dynamic range of 80 dB by amplifying strong signals and attenuating low level signals.

BASE UNIT (TAD PART)

3.1 Power Supply & Low Battery Detection

The power is supplied from an cordless phone part which regulates the to 6VDC, this voltage supplies power to all the audio circuitry of the circuit. The zener DZ1 & Q2 further derive this voltage to around 5V and all the digital circuit uses this voltages as its power supply.

The circuit is backed up by one 9V alkaline battery, the battery is disconnected from the supply rail when the ac mains is presented detected by rectifier D4 by detecting the voltage developed at D1. When there is a power failure, D1 is turned ON and the 9V is regulated down to 5V by Q2(9014) & DZ1 (5.6V zener) which together form a voltage regulator. The back up voltage will only supplied to the digital part circuit which will back up all messages stored in the ARAM.

3.2 MPU & MPU Interface

The heart of this circuit block is a MPU for TAD, U7 SV9601-B. Its functions are as follows:-

- Low Battery detection (see section 3.1)

- TAD MPU & Cordless MCU I/O port (see section 3.3)

- Line In/Out path, record/play path control (see section 3.4)

- VOX detection (see section 3.4.1)

- Function key interface (see section 3.4.2)

- LED display interface (section 3.4.3)

- DTMF Decoder (section 3.4.4)

- Voice chip interface (see section 3.5)

- DAY/TIME stamp (section 3.8)

3.3 Digital I/O port

- MPU (TAD part) & Cordless MCU interface port consists of the following:

-: SK (SERIAL CLOCK port) to U7 PIN53
-: SI (SERIAL INPUT port) to U7 PIN55
-: SO (SERIAL OUTPUT port) from U7 PIN54
-: RXRDY (MPU READY port) from U7 PIN52
-: RING DETECTION to U7 PIN36

3.4 Paths Control

The TAD MPU will provide control for the following paths through suitable controls (namely the Mic. enable U7 PIN98, speaker enable U7 PIN97 to the desired analogue switches for the corresponding paths. The controls can be divided into the following areas:-

- OGM recording

The microphone MIC1 is enabled, the Speaker/ Line In/Line Out is disabled.

- OGM/ICM Play back

Speaker/Line Out enabled, Line In/Mic disabled.

- ICM recording

Speaker/Line In enabled. Mic./Line Out disabled.

3.4.1 VOX Detection

The voice signal is passed from R44 (20K) to the VOX comparator (U1B) from amplifier (U5 PIN15). The comparator will take the reference voltage as derived using the potential divider R42, R41 (3.3K & 150K respectively). If signal level is lower than this level, the comparator will output a high signal to TAD

MPU. Conversely, it will output a low signal to the MPU. The MPU will use this signal to determine when to drop the line.

3.4.2 Function Key Interface

The MPU will accept input and perform corresponding functions from the following function keys:-

- ON/OFF (SW6)

This key input will inform the MPU to turn the unit into or out of the Answer Ready mode.

- ANNOUNCE (SW1)

This key input will inform the MPU that OGM record or Play shall be performed and the desired paths shall be controlled.

- STOP/SAVE (SW4)

The MPU will perform the stop/save function when this particular key input is sensed.

- PLAY (SW3)

This key will inform the MPU to play the ICM message or skip the message.

- TIME/REPEAT (SW5)

When this key input is sensed, the MPU will repeat the message being played or the MPU will play the current time and day.

3.4.3 LED Display interface

The LED display is controlled by MPU PIN83. The LED display will display the following:-

- POWER INDICATE

- INUSE/CHG

- Battery Low

The LED display will flash rapidly to indicate that the battery is low.

- Message receive After the first incoming message, the LED will change from 0 to indicate 1 and so on.

3.4.4 DTMF Decoder

DTMF signal is detected by MS8870 (U2). A valid DTMF tone will sent to TAD MCU (U7) TOE (PIN51), Q1 (PIN72), Q2 (PIN73), Q3 (PIN74), and Q4 (PIN75).

3.5 Voice Recording/Reproducing IC & Interface

The OGM/ICM message is stored in the one ARAMs (U8, S4004SB1 4M x 4) via the TAD MCU SV9601 (U7). The voice signal is input to the ADI terminal of the voltage comparator (U1D, PIN9), the voice chip U11 will always try to generate a signal equal to the signal present at ADI. The TAD MCU constantly check the O/P of the comparator (U1D, PIN8) to know the signal information.

The ARAMs' interface is also performed by the TAD MCU (U7) with its internal refresh counter providing refresh cycles to the ARAMs.

3.6 Automatic Level Control

The signal to the TAD MCU is controlled by the ALC circuit. The signal from the KA221307 ADI (U5, PIN15) is fed to the ALC-IN (U5, PIN14) and then accounts for the decade time of ALC loop. The voltage output is ALC-OUT (U5, PIN3), and when signal is higher than approx. 0.5V, it will start to conduct and mute the signal to ADI and a ALC loop is formed.

3.7 Amplifier

The heart of the block is the power amplifier inside the KA22130 (U3). Signal passes from DAO, after its level is adjusted by variable resistor R62A (20K), is passed to the PW-IN (U5, PIN13) of the amplifier via resistor R39. The amplified signal is then coupled to the speaker through C27 (220U 10V).

3.8 Day/Time Stamp

The voice of the seven days and the 24 hours are pre-stored in the ROM IC (U9). The current day/time clock can be manually set through the buttons TIME/REPEAT, ON/OFF and PLAY. The time of ICM messages will be stamped and it can be played associated with the ICM messages. The EPROM's interface is also performed by the TAD MCU (U7).

SECURITY CODE GENERATION

When the handset was put on cradle for a while, a 16bit random security code is generated on the base MCU and it will be transmitted from base to handset through CH8. A beep will sound from the handset buzzer to confirm the successful security code transformation.