

Circuit Description

1. Introduction

The model BE900CHT is a 40 channel (902-927 ISM band) cordless telephone. The whole unit is divided into two main parts as follows:

One remote handset

One Base unit

2. Functional Blocks of Remote Handset

- Keyboard Matrix and function LED
- MCU and MCU interface
- Antenna
- RF module
- Audio Amplifier
- Compander
- Low battery detector
- Datashaper
- Charge detector
- Buzzer amplifier

3. Circuit Description

3.1 Keyboard matrix and Function LED

Pin4 to Pin11 of MCU form a keyboard

Talk LED is controlled by Pin13.

3.2 MCU and MCU interface

Pin 16 – Pin 18 of MCU 87C405-HM communicate with the PLL of the RF module.

Pin 12 and Pin 21 of MCU control the audio path of incoming and outgoing audio signal

Transmitter DC power is controlled by Pin 22 of MCU

Receiver DC power is controlled by Pin 15 of MCU

Data communication between Handset and Base is via Pin 24 and Pin 19 by the RF link.

3.3 Antenna

ANT is a transmit and receive signal antenna.

3.4 RF module

The RF module includes the following parts:

- a. Saw duplexer
- b. Receiver amplifier
- c. Demodulator
- d. Transmitter amplifier
- e. Transmitter oscillator and modulator
- f. 1st local oscillator
- g. Phase lock loop and loop filter
- h. Noise detector

3.5 Audio Amplifier

U1A (LM324) and U2 (MC34119D) is the receive audio amplifier

U1D (LM324) is the transmit audio amplifier

VR1 controls the receiving volume.

3.6 Comander

U3 (DBL5015) is a compander IC which compresses the transmitted signal via pin 3 and expands the received signal via pin 19.

3.7 Low battery detector

Low battery detect output is from pin 8 of U1C (LM324)

3.8 Datashaper

Pin 7 of U1B is a datashaper which send the information from BASE to the MCU pin 24 (RX_DATA)

3.9 Charge detector

KZD1, KD1, KD2, KD3 and KR32 form a charge detector to direct the charging signal to the pin 25 of MCU

3.10 Buzzer amplifier

KQ1 is a buzzer amplifier driven directly by the MCU pin 23.

4. Functional Blocks of the Base unit

Power supply
MCU and MCU interface
Antenna
Audio Amplifier
Comander
Datashaper
Noise detector
Charge detector
Line audio interface
Ringer detector
Function of LED
Power fail detector

5. Circuit Block description

5.1 Power supply

BU5 LM7805 regulate the input DC9V which provides 5VDC power to every part of the circuit.

5.2 MCU and MCU interface

Pin 19 – Pin 21 of MCU 87C405-BM communicate with the PLL of the RF module .

Pin 18 of MCU control the audio path of incoming and outgoing audio signal

Transmitter DC power is controlled by Pin 12 of MCU

Data communication between Handset and Base is via Pin 4 and Pin 24 by the RF link.

5.3 Antenna

ANT is a transmit and receive signal antenna.

5.4 RF module

The RF module includes the following parts:

- a. Saw Duplexer
- b. Receiver amplifier
- c. Demodulator
- d. Transmitter amplifier

- e. Transmitter oscillator and modulator
- f. 1st local oscillator
- g. Phase lock loop and loop filter
- h. Noise detector

5.5 Audio Amplifier

BU1A (LM324) and BU1D (LM324) is the receive audio amplifier

BU1C (LM324) is the transmit audio amplifier

5.6 Compander

BU2 (DBL5015) is a compander IC which performs compress at transmitted signal via pin 3 of U3 and expand the received signal via pin 19.

5.7 Datashaper

Pin 7 of BU1B is a datashaper which send the information from BASE to the MCU pin 4 (RX_DATA)

5.8 Noise detector

It can detect the high frequency noise and the signal is given out from pin10 of RF module and via a buffer BQ6 to pin16 of MCU

5.9 Charge detector

BQ2 is a charge detector to direct the charging signal to the MCU pin 25.

5.10 Line audio interface

BT1 line transformer are the audio interface to the telephone line. The transformer is also for telephone line isolation.

5.11 Ring detector

BR49, BR68, BU4 (TLP-521-1), BC19, BZ1 and BZ2 form a ring detector to control the pin 26 of MCU

5.12 Function of Led

BLED2 is for charge and in use.

5.13 Power failure detector

BQ3, BZ3, BR53, BR55 and BR58 form a power failure detector. The power failure signal is sent to pin 13 of MCU

PROTOCOL FOR MANUAL CHANGE CHANNEL

1. Handset sends "CHANNEL CHANGE" command code to base with information of next channel number, $N+4$, where N is the last channel.
2. Following the "CHANNEL CHANGE" command, there are two-way handshakes of ACK codes to and from base and handset to confirm the reception of the command. Then, both handset and base lock to the same new channel, $N+4$.
3. In the new channel, handset tests the channel by sending a dummy command to base. If the handshake of this command is success, both handset and base will stay in this new channel. If not, both will return to the previous channel, N .
4. The handset will try another channel, $N+8$, and re-do the same action starting from step 1. The selection of next channel follows sequence of $N+4$, $N+8$, $N+12$, If none of the channel is available, both handset and base will return to N .

PROTOCOL FOR TALK CONNECT

1. The handset locks to data channel and sends "TALK" command to base. And the base checks the validity of 16-bit random security code and sends back "CHANNEL NUMBER" command to handset, which contains channel number, N . It is followed by the two-way handshake of ACK code to confirm the reception of the command.
2. Once the handset receives the "CHANNEL NUMBER" command, both handset and base lock to the channel N and turn off transmit power. Then, both units check the channel clearance by carrier detect. After certain time for carrier detect, both units lock back to data channel.
3. If the channel is clear on handset side, handset will send a "CHANNEL READY"

command to base, followed by two-way handshake of ACK codes. If the channel is also clear on base side, base will complete the ACK handshakes with handset. Then both units lock to voice channel N. If the channel is not clear on base side, base will not complete the ACK handshake and send another "CHANNEL NUMBER" command with information of next channel, N+4. It then follows step 2 again.

4. If the channel is not clear on handset side, handset will send a "CHANNEL BUSY" command to base. Base then will send another "CHANNEL NUMBER" command with contents of next channel, N+4. It follows step 2 again.

5. The selection of next channel follows the sequence of N, N+4, N+8,..... If none of the channel is ready, both units will return to standby mode.

4. FREQUENCY TABLE

| CH NO | BASE | | | HAND | | |
|-------|--------|--------|--------|--------|--------|--------|
| | RX | LOCAL | TX | RX | LOCAL | TX |
| CH1 | 925.30 | 936.00 | 902.80 | 902.80 | 892.10 | 925.30 |
| CH2 | 925.35 | 936.05 | 902.85 | 902.85 | 892.15 | 925.35 |
| CH3 | 925.40 | 936.10 | 902.90 | 902.90 | 892.20 | 925.40 |
| CH4 | 925.45 | 936.15 | 902.95 | 902.95 | 892.25 | 925.45 |
| CH5 | 925.50 | 936.20 | 903.00 | 903.00 | 892.30 | 925.50 |
| CH6 | 925.55 | 936.25 | 903.05 | 903.05 | 892.35 | 925.55 |
| CH7 | 925.60 | 936.30 | 903.10 | 903.10 | 892.40 | 925.60 |
| CH8 | 925.65 | 936.35 | 903.15 | 903.15 | 892.45 | 925.65 |
| CH9 | 925.70 | 936.40 | 903.20 | 903.20 | 892.50 | 925.70 |
| CH10 | 925.75 | 936.45 | 903.25 | 903.25 | 892.55 | 925.75 |
| CH11 | 925.80 | 936.50 | 903.30 | 903.30 | 892.60 | 925.80 |
| CH12 | 925.85 | 936.55 | 903.35 | 903.35 | 892.65 | 925.85 |
| CH13 | 925.90 | 936.60 | 903.40 | 903.40 | 892.70 | 925.90 |
| CH14 | 925.95 | 936.65 | 903.45 | 903.45 | 892.75 | 925.95 |
| CH15 | 926.00 | 936.70 | 903.50 | 903.50 | 892.80 | 926.00 |
| CH16 | 926.05 | 936.75 | 903.55 | 903.55 | 892.85 | 926.05 |
| CH17 | 926.10 | 936.80 | 903.60 | 903.60 | 892.90 | 926.10 |
| CH18 | 926.15 | 936.85 | 903.65 | 903.65 | 892.95 | 926.15 |
| CH19 | 926.20 | 936.90 | 903.70 | 903.70 | 893.00 | 926.20 |
| CH20 | 926.25 | 936.95 | 903.75 | 903.75 | 893.05 | 926.25 |
| CH21 | 926.30 | 937.00 | 903.80 | 903.80 | 893.10 | 926.30 |
| CH22 | 926.35 | 937.05 | 903.85 | 903.85 | 893.15 | 926.35 |
| CH23 | 926.40 | 937.10 | 903.90 | 903.90 | 893.20 | 926.40 |
| CH24 | 926.45 | 937.15 | 903.95 | 903.95 | 893.25 | 926.45 |
| CH25 | 926.50 | 937.20 | 904.00 | 904.00 | 893.30 | 926.50 |
| CH26 | 926.55 | 937.25 | 904.05 | 904.05 | 893.35 | 926.55 |
| CH27 | 926.60 | 937.30 | 904.10 | 904.10 | 893.40 | 926.60 |
| CH28 | 926.65 | 937.35 | 904.15 | 904.15 | 893.45 | 926.65 |
| CH29 | 926.70 | 937.40 | 904.20 | 904.20 | 893.50 | 926.70 |
| CH30 | 926.75 | 937.45 | 904.25 | 904.25 | 893.55 | 926.75 |
| CH31 | 926.80 | 937.50 | 904.30 | 904.30 | 893.60 | 926.80 |
| CH32 | 926.85 | 937.55 | 904.35 | 904.35 | 893.65 | 926.85 |
| CH33 | 926.90 | 937.60 | 904.40 | 904.40 | 893.70 | 926.90 |
| CH34 | 926.95 | 937.65 | 904.45 | 904.45 | 893.75 | 926.95 |
| CH35 | 927.00 | 937.70 | 904.50 | 904.50 | 893.80 | 927.00 |
| CH36 | 927.05 | 937.75 | 904.55 | 904.55 | 893.85 | 927.05 |
| CH37 | 927.10 | 937.80 | 904.60 | 904.60 | 893.90 | 927.10 |
| CH38 | 927.15 | 937.85 | 904.65 | 904.65 | 893.95 | 927.15 |
| CH39 | 927.20 | 937.90 | 904.70 | 904.70 | 894.00 | 927.20 |
| CH40 | 927.25 | 937.95 | 904.75 | 904.75 | 894.05 | 927.25 |

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