C600 CIRCUIT DESCRIPTION

CONTENT

1. Introduction

C600 is a 20 channel (2.4GHz) cordless telephone with CID (type I and II) and Message Waiting features..

This unit is made up of two parts:

   a. A Handset unit.

    b. A Base unit.

A security code of over 65,000 different combinations is used to prevent access by a different phone on a different line. This code is randomly and automatically changed each time the handset is placed in the cradle.

2. Functional Blocks of C600 Handset

The block diagram of C600 handset unit is as shown below. It is made up of the following parts:

2.1 Keyboard Matrix, Switches and Function LED

2.2 MCU and MCU Interface

2.3 RF Module

2.4 Compander

2.5 Data Shaper

2.6 Charge and Control

2.7 Low Battery Detector

2.8 Buzzer

2.9 Audio Circuit

C600 Handset Block Diagram
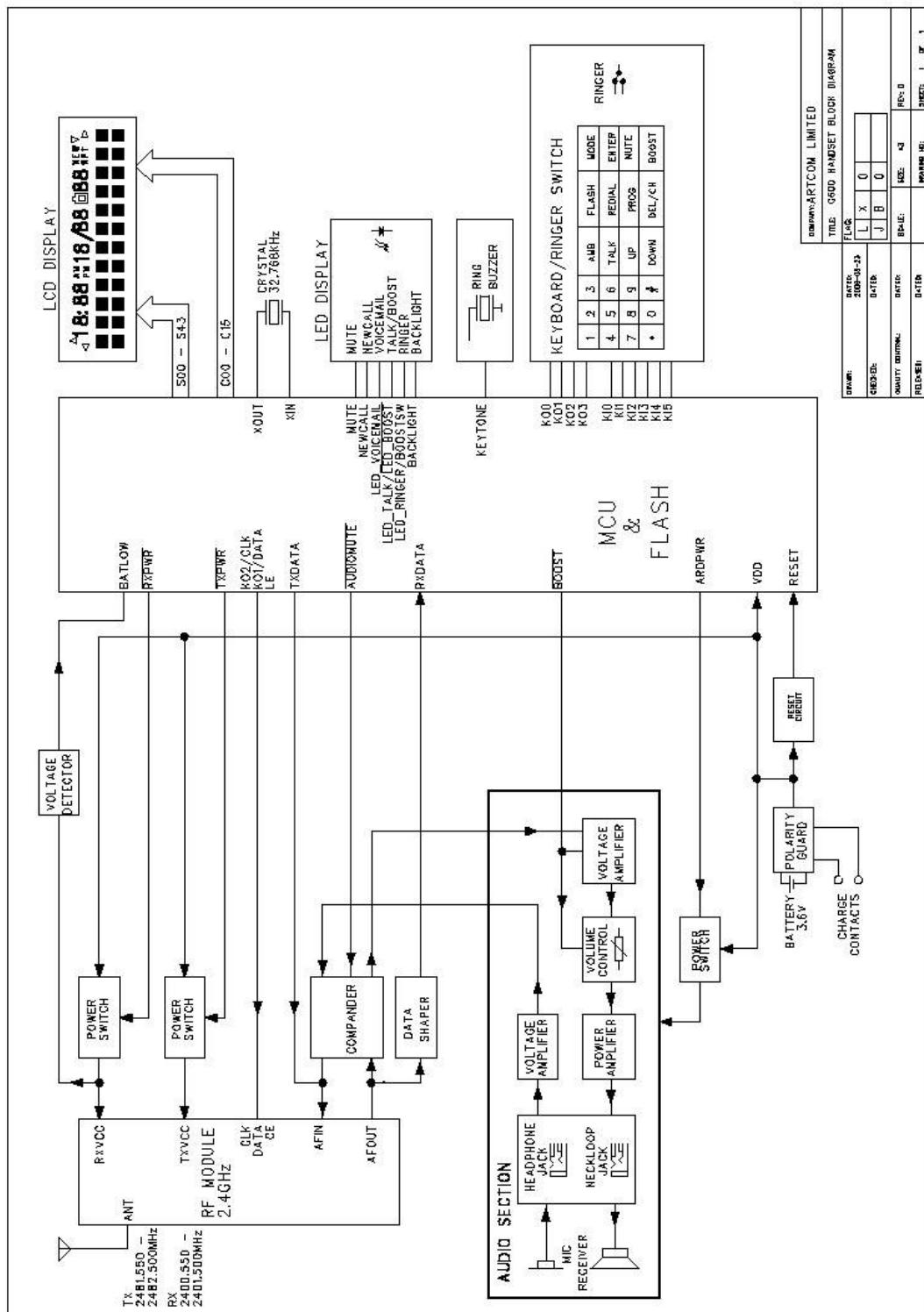
3. C600 Handset Unit Circuit Block Description

3.1 Keyboard Matrix, Switches and Function LED

The keyboard consists of the following keys:

- MUTE – turns on/off handset microphone
- UP/DOWN – for menu operation
- MODE – for menu operation
- TALK – for On/Off hook control
- ENTER – for voice mail operation
- PROG – for memory program and dialing
- 1, 2, 3, 4, 5, 6, 7, 8, 9, *, 0, # – numeric keys
- FLASH — provides timed On/Off hook function
- AMB – one touch memory key
- RD/P – redials the last number or provides a pause during dialing

The push switches consist of the followings:

- BOOST – for On/Off the receiver amplifier gain
- DEL/CH – for changing RF channel and CID/Memory operation

The function of the slide switch:

- RINGER ON/OFF – turns On/Off buzzer sound.

The keyboard, push switches and slide switch are connected to Pins 84 to 94 and pin 97 of the MCU (MCU1).

The jacks consist of the following:

- HEADSET – for connection of an external microphone and receiver
- NECKLOOP – for connection of an external receiver

The function LEDs consist of the followings:

- MICMUTE (LED19 - Red) – Located under the "MUTE" key. It is On/Off when microphone is Off/On.
- BOOST (LED13 – RED) – Located under the "TALK" key. It is On/Off when the receiver amplifier extra gain is On/Off.
- INUSE (LED13 – GREEN) – Located under the "TALK" key. It is On/Off when the handset is Off-hook/On-hook.
- BACKLIGHT (LED1 – LED12 - Orange) – Located under the keyboard. On for a short time when any key is pressed
- LCD backlight (LED20, LED21 – Green) – On for a short time when

any key is pressed

- NEWCALL (LED18 - Red) – Located under the "MODE" key.
  Blinks when there is incoming caller ID information to be reviewed.
- VOICEMAIL (LED17 - Blue) – Located under the "ENTER" key.
  Blinks when there is VOICEMAIL available.
- RINGER (LED16 - Red) – Located in the handset antenna. Flashes when the telephone line rings. Steady on/off when handset is off-hook/on-hook.

These LEDs are controlled by pins 66, 91, 96, 98 and 99 of MCU.

The display format of the LCD is as shown below.
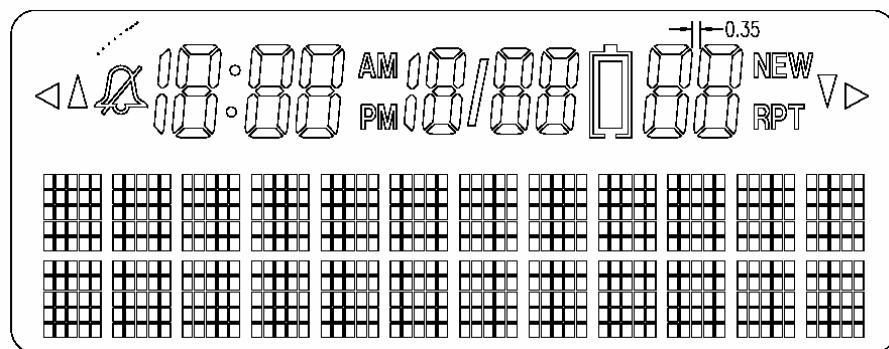
The display is controlled by pins 12 – 65 of MCU.

3.2 MCU and MCU Interface

The controller of the handset is MCU1. The frequency of the crystal used is 32.768 KHz. It controls the functions of the handset through the keyboard interface and signals from the base unit. The data to and from the base goes through pin 69 (data from base) and pin 71 (data to base).

The phone number memories are stored in U13.

3.3 RF Section

For operation and frequency see RF module section.

It receives the PLL data through pins 4, 5, 6 from MCU pins 95, 93 and 94.

The antenna located at the top of the unit and is permanent attached to RF module through a copper wire.

3.4 Compander

A compander U11 is used for improving the S/N of transmit and receive audio signals.

3.5 Data Shaper

The information which sent from base unit is recovered by the amplifier Q25 and Q26.

3.6 Charge and Control

ZD2, D14, D15, D16, D17, D21, D22 provide over-voltage and polarity protection during battery charging. The charge signal is detected by pin 87 of the MCU. When the handset is put into the base cradle, a negative pulse is sent to pin 74 of the MCU.

3.7 Low Battery Detector

The battery voltage is detected by U3-A and Q21. The signal is sent to pin 67 of MCU.

3.8 Buzzer

Q3 is the buzzer signal amplifier and driven by the MCU pins 72.

3.9 Audio Circuit

The main MCU controls the audio amplifier supply through Q20 and ARDPWR (pin 90). In addition, it also checks "MUTE" key and the "BOOST" switch.

The incoming speech is received through the RF module, the compander U11, the amplifier U4-A (LM358) and U2 (KA8602). When the "BOOST" function is on, Q5, Q11, Q12, Q13 and Q15 are off, inserting extra gain in the audio path. The high frequency is boosted with the increase in volume setting.

Speech signal is picked up by the internal microphone MIC1 and send to the telephone line through amplifier U4-B (LM358), the compander U11 and the RF module. The MCU1 looks at the "MUTE" key to turn on/off the compander U11 and LED19.

The headset jack is for external receiver and microphone. The neckloop jack is for external audio devices.

4.   Functional Blocks of C600 Base Unit

The block diagram of C600 base unit is as shown below. It is made up of the following parts:

- Power Supply
- MCU and MCU Interface
- RF Module
- Compander
- Data Shaper
- Charge and Control
- Telephone Line Interface
- Ring Signal Detector
- Base Ringer
- Keyboard Matrix, Switches and Function LED

C600 Base Unit Block Diagram
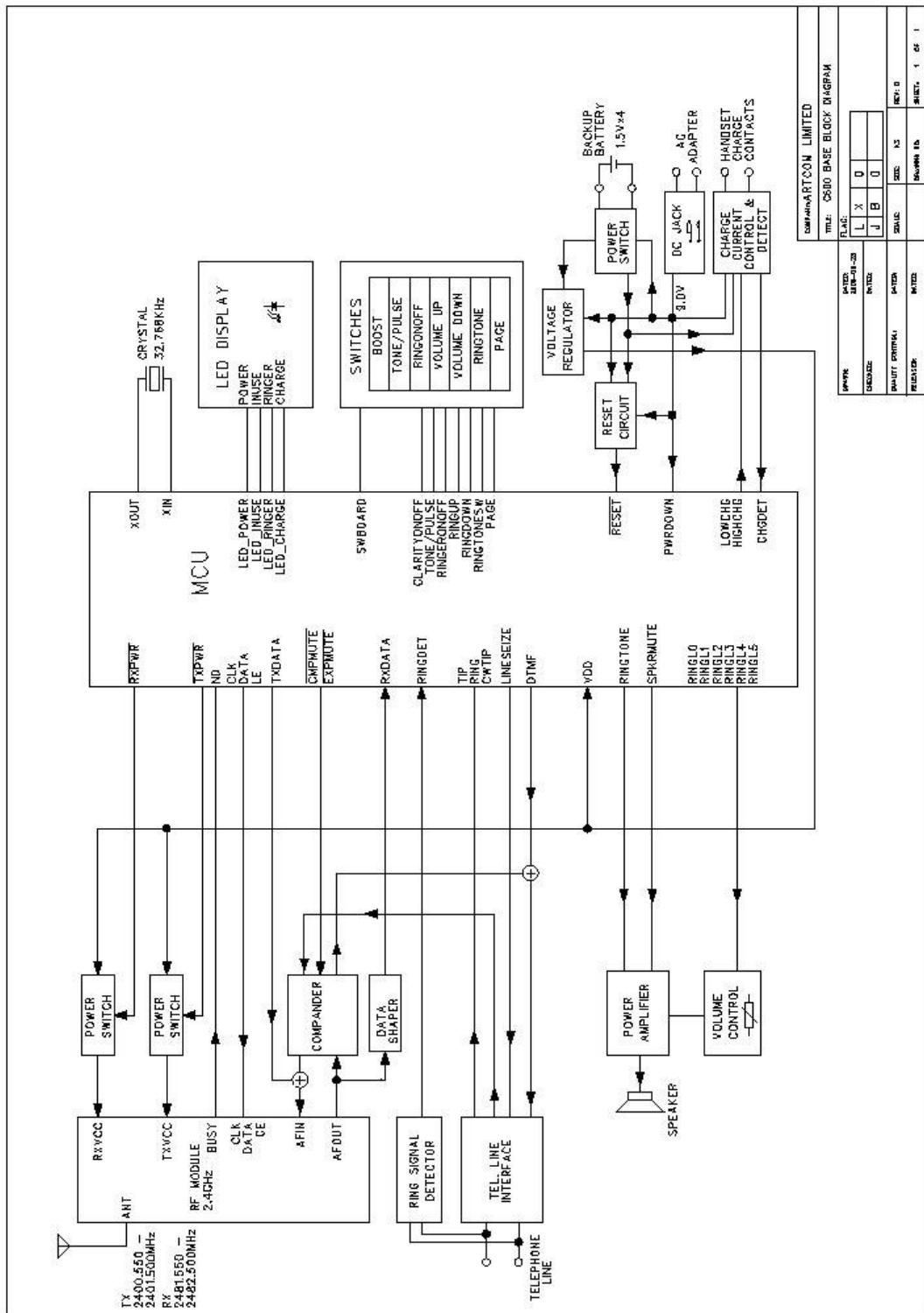
5. C600 Base Unit Circuit Block Description

5.1 Power Supply

The base unit is powered by an AC adapter (9 Vdc). The voltage regulator (BU3) regulates the input DC to 5V. This provides power to every part of the unit. When there is no AC power, BQ18 and BQ19 are turned on to connect the backup batteries to power the base while BZD2 controls the regulated battery output voltage to approximately 5V. The backup batteries voltage is checked periodically by U1A and this signal is connected to pin 39 of the MCU.

5.2 MCU and MCU Interface

The controller of the base is BMCUX1 and controls the function of the unit.
On the telephone side,

    A. It monitors telephone line ring signal at pin 7.
    B. It monitors parallel phone hook status (MEI) at pin 5 through U1-B (LM358).
    C. Decodes CID (Type 1 and Type II) and Message Waiting signals through pin 8 and pin 9.
    D. It provides DTMF signal at pin 2.

The keyboard interface is provided by pins 17 – 24.
It communicates with the handset through the RF module. PLL data to the RF module BMD1 is sent through pins 29, 37 and 44.
The data between Handset and Base is via the pin 41 (data from handset) and pin 43 (data to handset) through the RF module.
The transmitter and receiver powers are controlled by the signals from U6-pin5 and U6-pin6 which are programmed by BMCUX1.
The frequency of the crystal used is 32.768 KHz.

5.3 RF Module

For operation and frequency see RF module section..
It receives the PLL data through pins 4, 5, 6 from MCU pins 44, 29 and 37.
The antenna located inside the base of the unit is permanent attached to RF module.

5.4 Compander

The compander BU1 is used for improving the S/N of the transmit and receive audio signals.

5.5 Data Shaper

The information sent from handset unit is recovered by the amplifier BQ28 and BQ29.

5.6 Charge and Control

BQ4 detects the handset charging current and sends signal to MCU pin 38. BQ2, BQ13, BQ36 and BQ16 control the charging current delivered to the handset. Resistors BR108 and BR109 provide current limiting function. BQ20 and BQ5 detect the 9V supply and send a negative pulse to MCU pin 40 if the 9V supply fails.

5.7 Telephone Line Interface

BL1, BL2, BF1, BVAR1, BR149 and BC61 provide telephone line surge protection. BQ3, BD24, BD25, BD26, BD27, BU6 provide telephone On/Off hook function. BD3, BR34 and BT1 line transformer are the audio interface to the telephone line. The transformer BT1 is also used for telephone line isolation.

5.8 Ring Signal Detector

BL1, BC57, BR31, BZD6, BZD5, BD2, BU5, BF1 and BL2 form the ring signal detector. The signal is sent to pin 7 of MCU.

5.9 Base Ringer

BU11 and speaker BSPK1 provide base ringer sound output. MCU pin 42 provides ringer tones (six types), and this is set by MCU pin 20 (RING STYLE), The level is controlled by pin 18 (VOLUME UP), or pin 19 (VOLUME DOWN). The MCU then sets the output pins 15, 1 – 5 of U2 (74HC595) which controls transistors BQ30 – BQ35.

5.10 Keyboard Matrix, Switches and Function LEDs

The keyboard and switches consist of the followings:

- PAGE – for base to page handset
- STYLE – for changing Ringer sound frequency
- VOLUME DOWN – for reducing Ringer sound output volume
- VOLUME UP – for increasing Ringer output sound volume
- RINGER CONTROL ON/OFF – turns On/Off the ringer output
- BOOST ON/OFF – turns On/Off handset receiver extra gain
- T/P – for selecting Tone or Pulse mode dialing

The switches are connected to pins 17 - 24 of MCU (BMCU1).

The function LEDs consist of the followings:

- RINGER (BLED6, BLED7 – Red) – Located under the red lens. They are controlled by transistor BQ11 and pin 36 of MCU (BMCU1).
- INUSE (BLED21 – Green) – Green when C600 is talking to the telephone line. It is controlled by transistor BQ6 and pin 15 of U6 which is set by BMCU1.
- CHARGE (BLED31 – Red) – Red when handset is the cradle. It is controlled by transistor BQ10 and pin 7 of U6 which is set by BMCU1.
- POWER (BLED11, BLED12 – Red/Green) – Indicates base power conditions. This is controlled by transistors BQ23, BQ27 and U6-pin 1 which is set by MCU1.
  - Green – when the base is powered by AC adapter and good batteries.
  - Red – when the base is powered by AC adapter only.
  - Blinking Red/Green – when the base is powered AC adapter with bad batteries.
  - Blinking Red – when the base is powered by good batteries only.
  - Flashing Red – when the base is powered by batteries and the battery voltage is low.

6.   Functional Blocks of the RF Modules

The block diagram of RF Module is as shown below. It is made up of the
following parts:

6.1   Power Supply

6.2   PLL and MCU Interface

6.3   RF Transmitter

6.4   RF Receiver

6.5   Audio Detector

RF Module (Base) Block Diagram
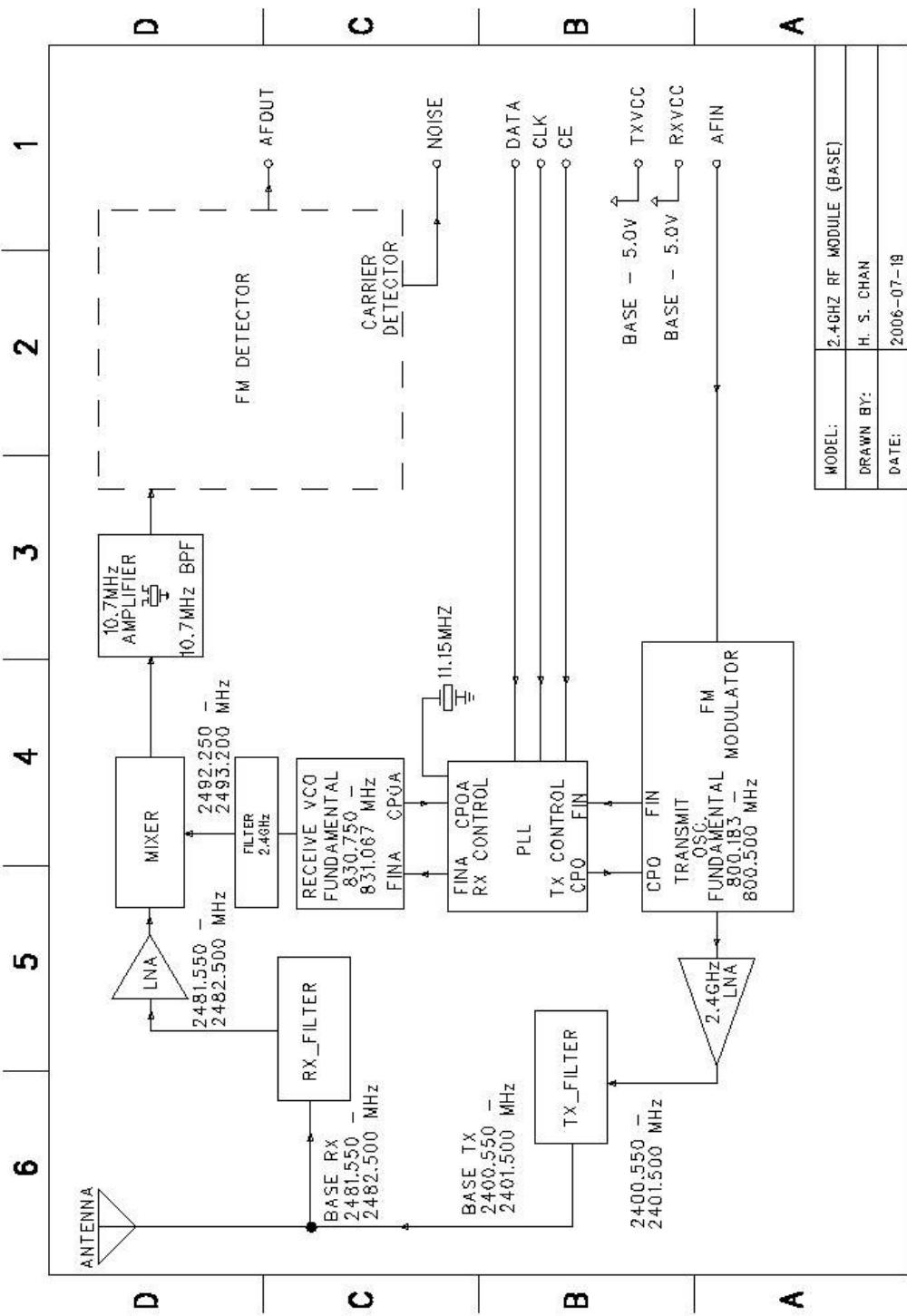
MODEL: 2.4GHZ RF MODULE (BASE)
DRAWN BY: H. S. CHAN
DATE: 2006-07-19

RF Section (Handset) Block Diagram
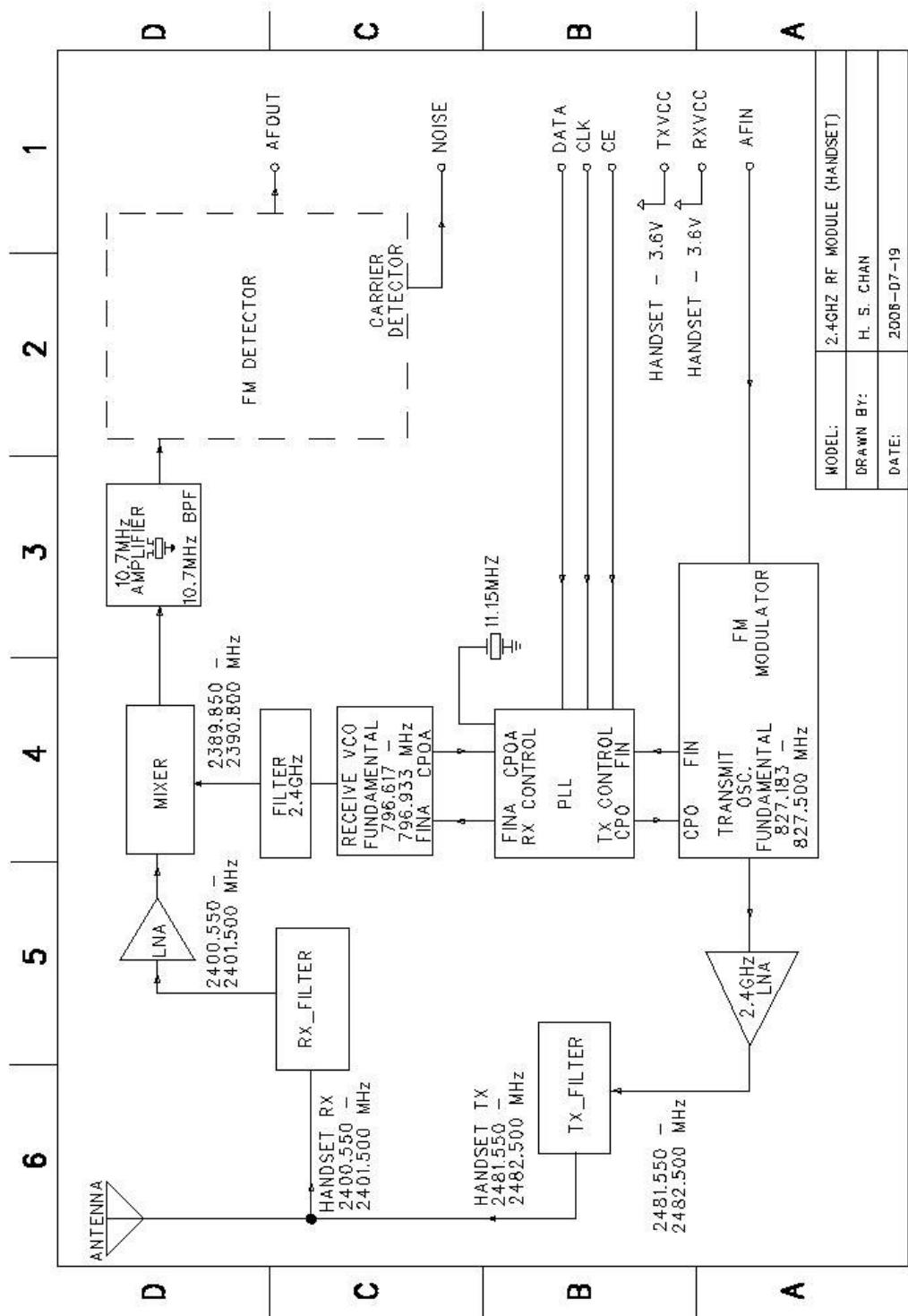
7. RF Module Circuit Block Description

7.1 Power Supply

The RF transmitter (Q6, Q7 and Q1) receives power from TXVCC. This voltage is 5V for the base unit and 3.6V for the handset unit. For the base unit, TXVCC is enabled only during TALK or RINGING mode. For the handset unit, TXVCC is enabled only during TALK mode.

The RF receiver (Q3) receives power from RXVCC. This voltage is 5V for the base unit and 3.6V for the handset unit.

For the base unit, RXVCC is enabled all the time when there is AC power. When running on backup batteries, it is on only while scanning for "TALK" signal from the handset.

For the handset unit, RXVCC is enabled only during TALK or scanning for ringing signal from the base unit.

7.2 PLL and MCU Interface

The frequencies of the RF transmitter and RF local oscillator are controlled by a PLL IC (U1). It receives the frequency data through DATA, CLK and CE signal lines from the MCU. The basic clock frequency of the PLL is derived from an 11.15MHz crystal (X1) inside the RF module.

7.3 RF Transmitter

The RF transmitter frequency for the base is 2400.550 MHz – 2401.500 MHz and the handset is 2481.550 MHz – 2482.500 MHz.

The RF transmitter signal is derived from Q1 which consists of a fundamental (1/3 the frequency of the transmitter) and its 3rd harmonic. The transmit frequency is controlled by the signal pin CPO of the PLL IC (U1). The PLL samples the RF frequency through FIN. The audio input signal AFIN is fed to this RF oscillator through the FM modulator VD1.

The third harmonic of RF oscillator output is amplified through the "2.4GHz LNA" (Q7, Q6) and coupled to the RF antenna through the TX_FILTER (DF1).

7.4 RF Receiver

The incoming RF signal is coupled from the antenna through RX_FILTER (DF2) to a LNA (Q3) where it is amplified and fed to the 1st mixer (Q4). Q2 is the local oscillator and its signal output is a fundamental (1/3 frequency of the required local oscillator) and its 3rd harmonic. The 3rd harmonic is selected by the filter "FILTER 2.4GHz" (C50, C26, C25, ML13, ML11 and C28).

The frequency of the output from Q2 is controlled by the signal pin CPOA of

the PLL IC (U1). The PLL samples the local oscillator RF frequency through FINA.

For the base unit, the operating local oscillator frequency is 3xVCO
(Received RF + 10.7MHz).

For the handset unit, the operating local oscillator frequency is 3xVCO
(Received RF – 10.7MHz).

7.5 Audio Detector

The audio detector receives the incoming signal from the 10.7MHz filter and amplifier (Q5). The audio signal is recovered by a FM detector (U2) and sent to AFOUT. The quality of the incoming RF signal is indicated by logic output NOISE.

8. C600 Operation (Base)

8.1 Setting the Ringers

The RINGER OFF/ON switches on the side of the handset and base set the base ringer off/on.

Pressing the "UP" key on the base increases the ringer sound by one level while pressing the "DOWN" key reduces the sound by one level. There are a total of six levels from maximum to minimum.

There are six types of ringer sound output. To change the tone, press the "STYLE" key once.

The speaker will output a sample of two seconds with the latest selection of tone frequency and output level when any of these keys are pressed.

The relationship between the handset and base ringer sound outputs are as shown in the following table.

Charge State	Ringer Switch		Base		Handset	
	Base	Handset	Sound	LED	Sound	LED
Off	Off	Off	Off	On	Off	On
Off	Off	On	Off	On	On	On
Off	On	On	On	On	On	On
Off	On	Off	On	On	Off	On
On	Off	Off	Off	On	Off	On
On	Off	On	On	On	Off	On
On	On	On	On	On	Off	On
On	On	Off	On	On	Off	On

8.2 PULSE/TONE SWITCH (Base)

It is a 2-position switch for setting dialing mode.

T – TONE (DTMF)

P – PULSE (10pps, 40/60).

The dialing mode is determined while going from on-hook to off-hook.

8.3 BOOST ON/OFF SWITCH (Base)

When set to "OFF", the handset will go off-hook with the amplifier off.

When set to "ON", the handset will go off-hook with the amplifier on.

8.4   PAGE KEY (BASE)

Only the base can page the handset while the unit is in standby mode.

Press the base "PAGE" button once and the handset will beep for 15 seconds.

Press and hold for 5 seconds, the handset will beep for 60 seconds.

The handset LCD displays "PAGING".

Press any key on the handset to stop paging.

If there is no response from handset, the LCD display will revert back to
normal.

9. C600 Operation (Handset)

9.1 Setting Parameters

When handset battery is installed, the handset enters setup mode automatically.

While in standby mode, press and hold "MODE" button for 3 seconds to enter setup mode

a. Set Language

After entering setup mode, the LCD display will show "SEL LANGUAGE" and then "1.ENG   2.SPA", "3.FRE" alternately with a tick mark against the selected language.

Press "1", "2" or "3" button once to change the language. The tick mark will move against the new selection.

Press "UP(▲)" to go to the next menu.

If there is no input within 30 seconds, the language will be set to the last selected one and go back to standby mode.

b. Set Contrast

There are 4 contrast levels and the default is set to level 2.

After setting the language, press "UP(▲)" key to begin setting contrast.

The LCD display will show "LCD CONTRAST" and "1   2   3   4".

Press "1", "2", "3" or "4" key to change the level. The current selected level will be highlighted

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will set to last selected value and go back to standby mode.

c. Set AREA CODE 1

After setting Contrast, press "UP(▲)" button to set Area Code 1.

The LCD display will show "AREA CODE 1" and "XYZ" with "X" digit blinking.

Enter the area code number using the numeric keys on the handset.

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will set the area code to last selected value and go back to standby mode.

d. Set AREA CODE 2

After setting Area Code 1, press "UP(▲)" button to set Area Code 2.

The LCD display will show "AREA CODE 2" and "XYZ" with "X" digit blinking.

Enter the area code number using the numeric keys on the handset.

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will set the area code to last selected value and go back to standby mode.

e. Set LDS CODE

After setting Area Code 2, press "UP(▲)" button to set LDS (Long Distance Service) Code.

The LCD display will show "LDS CODE" and "X" with "X" digit blinking.

Enter the LDS number using the numeric keys on the handset.

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will set the area code to last selected value and go back to standby mode.

f. Set EASY MODE

After setting LDS Code, press "UP(▲)" button to set the Easy Mode.

The LCD display will show "EASY MODE" and "1.ON   2.OFF".

Press "1" or "2" to change the mode. The tick mark will move against the selected mode.

Press the "UP(▲)" or "DOWN(▼)" button to change the mode.

If there is no input within 30 seconds, the program will set to last selected value and go back to standby mode.

g. Set VOICEMAIL NO

After setting Easy Mode, press "UP(▲)" button to set Voice Mail Number.

The LCD display will show "VOICE MAIL NO" and "XXX-XXX-XXXX" with the last digit blinking.

Enter the voicemail number using the numeric keys on the handset. Press "DEL/CH" key to delete and move cursor back one place.

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will set the voicemail
   no to the last selected value and go back to standby mode.

h. Set MESSAGE WAITING ON/OFF

After setting Voicemail No, press "UP(▲)" button to set Message Waiting
   function on/off.

The LCD display will show "MESSAGE WAITING", and "1.ON   2.OFF"
   with a tick mark against the selected item.

Press "1" or "2"button to change the mode.

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will save the last
   selected value and go back to standby mode.

i. Set Message Waiting Light Off

After setting Message Waiting, press "UP(▲)" button to set message waiting
   light off.

The LCD display will show "MESSAGE", "LIGHT OFF ?".

Press "ENTER" to turn the message waiting light off. The display will be back
   to standby mode.

<p style="text-align:center">Or</p>

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will save the last
   selected value and go back to standby mode.

j. Set AUTOCONNECT ON/OFF

After setting Message Waiting Light Off, press "UP(▲)" button to set
   AutoConnect ON/OFF (default to ON).

The LCD display will show "AUTOCONNECT", "1.ON   2.OFF".

Press "1" or "2" to change or current selected value. The tick mark will move
   against the selected value.

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu.

If there is no input within 30 seconds, the program will set to last selected
   value and go back to standby mode.

k. Set Time/Date

After setting AUTOCONNECT ON/OFF, press "UP(▲)" button to set the date and time. The LCD display will show the current time and date on the top line, e.g. "12:05^{AM} 12/20" with the month digits blinking.

Press "*", "#" button to change the month digits. Press "ENTER" button once to enter.

After the month digits, the date digits will blink. Press "*" or "#" button to change the date digits. Press "ENTER" button once to enter.

After the date digits, the hour digits will blink. Press "*" or "#" button to change the hour digits. Press "ENTER" button once to enter.

After the hour digits, the minute digits will blink. Press "*" or "#" button to change the minute digits. Press "ENTER" button once to enter.

After the minute digits, the AM/PM digits will blink. Press "*" or "#" button to change the AM/PM digits. Press "ENTER" button once to enter.

The month digits will blink again.

Press the "UP(▲)" or "DOWN(▼)" button to go to the next menu. Or press "MODE" key to exit setup menu.

If there is no input within 30 seconds, the program will set to last updated time and go back to standby mode.

9.2   Receiving/Terminating/Making A Call

a. Receiving a Call

When the phone rings, the handset LCD displays "RINGING".

- If the handset is out of the cradle, press the "TALK" button.
- If the handset is in the cradle with AutoConnect mode - ON, lift the handset. The handset will be in receiver mode.
- If the handset is in the cradle with AutoConnect mode - OFF, lift the handset. The handset will still be in standby mode. Press "TALK" button to receive the call.

The handset LCD displays "TALK" and "00:00:XX".

b. Terminating a Call

Putting the handset back into the cradle will terminate the call on the handset. Or, press "TALK" button.

The handset will mute the audio, off the lighted LED. The LCD will
   display "OFF" for 2 seconds and go back to standby.

c. Making a Call

The handset must be out of the cradle in order to make a call.

- Press the "TALK" button. Handset will go off-hook in receiver mode.
   The handset LCD displays "TALK".
- Press numeric keys to dial the numbers.
   In Pulse dialing mode, press "*" will change to Tone dialing mode.

   Or

- Press numeric keys to be dialed. The display will show "PREDIAL"
   and the numeric keys pressed.
- Press "TALK" key. Handset will go off-hook and dial the number
   displayed.

When the handset is in receiver mode, press "BOOST" button will
   add extra gain in the receiver output. Adjust "VOLUME" control
   to vary the receiver output level.

9.3   Memory Operations

a. Review Memory Information

  i. Unit must be in standby mode only.

 ii. Press "MODE" key twice. The LCD will show "PHONEBOOK"

iii. If the phonebook is empty, after ~1 second the display shows "- NO
      RECORDS -".

 iv. Otherwise, the display will show the first alphabetical record with the
      record number on the top icon line. The record number may not be the
      first one.

  v. Press the "UP(▲)" or "DOWN(▼)" button to go to the next record. Or
      select any other alphabetical list by pressing "2" to "9" key.

 vi. When at the end of phonebook list, pressing "DOWN(▼)" button will
      show "END OF" and "RECORD". Press "UP(▲)" button to go to the
      last record.

b. Adding a Memory Number

  i. Unit must be in standby mode only.

ii. Press "MODE" key twice. The display will show "PHONEBOOK" for ~1 second and then display the first available record.

iii. Press "PROG" key to add new phone record.

iv. If the phonebook is full, the display will show "PHONEBOOK", "FULL" for ~1 second together with an error keynote. Then return to review mode.

v. If memory is available, the display will show "SAVE NEW NUM" and then "ENTER NUMBER".

vi. Press any numeric key. The second line will change to "ENTER TO END" and the third line shows the key pressed. Enter phone number up to 23 digits ("RED/P" treated as Pause, counted as one digit, shown as "P"). Press "DEL/CH" to erase any mistake.

vii. Press "ENTER" to confirm number. The LCD will display "ENTER NAME" and then the second line is blanked. Enter name up to 21 characters using key "2" to "9".
Press "2" once for "A" and twice for "B".
Press "#" to insert "#" and punctuation marks.
Use "RD/P" key to insert a space between alphabets.
Press "DEL/CH" key to erase any mistake.

viii. Press "ENTER" to confirm name. The LCD will display "SAVE TO", "PHONEBOOK". Then it displays the just entered information.

c. Dial-Out Sequence

i. Unit must be in standby mode and display is showing a phonebook record.

ii. Press "TALK" button to dial the displayed number in TONE or PULSE mode determined by the base "T/P" switch while on-hook to off-hook.

Or

iii. While handset is in TALK mode, press "PROG" key once.

iv. Press "UP(▲)" or "DOWN(▼)" button to go the display the right record.

v. Press "ENTER" key and the displayed number will be sent out.

d. Deleting a Stored Number

i. Unit must be in standby mode and display is showing a phonebook record.

ii. Press "DEL/CH" key once. The LCD will show "DELETE MEMO?".

iii. Press "DEL/CH" to confirm.

iv. The display will show "MEMO" and "DELETED" for ~2 seconds together with a success keynote.

v. The display will show the next available record or "-NO RECORDS-".

- If the memory location is empty, pressing "DEL" key will have no action.
- This sequence will time-out after 30 seconds if no key is pressed.

e. Deleting All Stored Number

  i. Unit must be in standby mode and display is showing a valid phone record.

  ii. Press and hold "DEL/CH" button for 3 seconds to delete all phonebook records. Display will show "DELETE ALL ?".

  iii. Press "DEL/CH" to confirm. Display will show "-NO RECORDS-" for ~2 seconds together with a success keynote.

- If the memory location is empty, pressing "DEL" key will have no action.
- This sequence will time-out after 30 seconds if no key is pressed.

f. Changing a Memory Number

  i. Unit must be in standby mode.

  ii. Press "MODE" key twice. The display will show "PHONEBOOK" for ~1 second and then display the first available record.

  iii. Press "UP(▲)" or "DOWN(▼)" button to go to the record to be changed, e.g. "ABC", "567".

  iv. Press "MODE" key to start changing the phone record.

  v. The display will show "ENTER TO END" and the stored number "567" with the blinking cursor after the digit 7.

  vi. Press any numeric key to add extra numbers.   Or
  Press "DEL/CH" key to move cursor to the digit "7". Then press any other numeric key to replace this digit.

  vii. Press "ENTER" to confirm the numbers.

  viii. The display will show "ENTER NAME" and then the stored name "ABC" with the blinking cursor after the character "C".

  ix. Press "2" … "9" to add extra character.   Or

  x. Press "DEL/CH" key to move the cursor to the character "C". Then press any numeric key to change the "C". Press "DEL/CH" to erase any mistakes.

  xi. Press "ENTER" to finish. The modified characters and numbers will replace the original phone record.

- This sequence will time-out after 30 seconds if no key is pressed

g. Adding the EMERGENCY Number

   i. Unit must be in standby mode.

  ii. Press "MODE" key twice. The display will show "PHONEBOOK" for ~1 second and then display the first available record.

 iii. Press "UP(▲)" or "DOWN(▼)" button to go to the record to be stored to the EMERGENCY key.

  iv. Press and hold the EMERGENCY key for 2 seconds.

   v. The phone number is copied to the EMERGENCY key and gives a success keynote.

h. Dialing the EMERGENCY Number

   i. Unit must be in standby mode.

  ii. Press the EMERGENCY key once.

 iii. The display will show the stored name and number for ~5 seconds. Otherwise it will show "-NO RECORDS-".

  iv. Then the handset goes off-hook and dial out the stored numbers.

        Or

   v. Press "TALK" key to make handset goes off-hook.

  vi. Press the EMERGENCY key once. The display will show the stored name and number for ~1 sec. Then the handset dials out the stored numbers.

i. Deleting the EMERGENCY Number

   i. Unit must be in standby mode.

  ii. Press the EMERGENCY key once.

 iii. If this key has been programmed, the display will show the stored name and number. Otherwise it will show "-NO RECORDS-".

  iv. Press "DEL/CH" key once to delete this number.

   v. The display will show "DELETE MEMO?".

  vi. Press "DEL/CH" to delete. The handset will give a success keynote.

9.4 MESSAGE WAITING Information

The C600 will detect for Message Waiting signal:

  A. Automatically ~30 seconds after handset had been off-hook for longer than 30 seconds and then on-hook;

  B. Automatically ~6 minutes after a ringing signal has not been answered.

  C. Automatically for valid FSK data format with/without the ringing signal;

This function is turned off if "MESSAGE WAITING" is set to "OFF"
during setup.

If C600 finds that there is voice message to be retrieved, it will turn on the
Message Waiting Indicator (behind "ENTER" key). Otherwise, it will
turn it off. This indicator can also be turned off manually by going into
setup menu "MESSAGE LIGHT OFF ?" and press "ENTER".

To retrieve this message, press the "ENTER" key while the indicator is on.
The handset will go off-hook and dial the stored VOICEMAIL number.

9.5 CALLER ID Information

Type I + Type II (Caller ID with Call Waiting capability)

This function is turned off when "EASY MODE" is set to "ON"
during setup.

a. Caller Information

When somebody calls, the received caller information is displayed on the
LCD. If the call is answered by this phone, this caller information is
considered "old". Otherwise, the CID information will be stored in the call
log. Information which has not been reviewed will be considered as "new
call". The "NewCall" LED will blink.
The top row will display the time and date of call.
The second row will display the caller's ID or blank if there is no
information.
The third row will display the incoming telephone number. If the number is
longer than 12 digits, press [*] or [#] to scroll left or right to review the
number. If the number of digits is 10, it will be displayed as
XXX-XXX-XXXX.

Maximum 12 characters and 16 digits will be stored in the call log.
If you answer the incoming call before the second ring, the unit will not
display the call information.

b. Receiving Call Waiting Caller ID

When you are on an existing call, you will hear a beep and the display will
show incoming call waiting caller ID information.
If you access the call waiting call, the Caller ID information will disappear
and the Time/Day screen will appear.

If you do not access the call waiting call, the Caller ID information will be transferred into the Caller log. This caller information is considered "old".

c. **Unknown Call**

If a call is from another country or caller's number is not available, "UNKNOWN" and "----------" are displayed and stored in Caller ID log.

d. **Blocked Call**

If the number is blocked or withheld, "PRIVATE" and "------------" are displayed. It will be stored in Caller ID log.

e. **Repeated Call**

If this is a repeated call, it means the same number called before and has not been reviewed.

9.6   CALLER ID LIST

a. **Caller ID Review**

If there is new call information, the "MODE" key will blink.

During standby mode, press "MODE" button once. LCD will display "CID MODE" and then the last CID information.

Press "UP(▲)" or "DOWN(▼)" again to view the CID content. Press "DOWN(▼)" to scroll the caller ID information from the most recent record. Or, press the "UP(▲)" button scroll the caller ID information from the oldest record.

If the caller's number is more than 12 digits, press "*" or "#" to scroll left or right to view the number.

While it scrolls over the list, "-- END --" is shown.

If the CID list is empty, the display will show "- NO CALLS -".

- At anytime, user can press "FLASH" button one time to go back to standby mode. Or
- It will go back to standby automatically at 30 seconds time out if there is no action.

b. **Saving Caller ID Information to Phonebook**

 i. While reviewing Caller information, press "PROG" key once.

 ii. The display shows "SAVE TO", "PHONEBOOK". Then it changes to "ENTER TO END", and the Caller number on the third line with the blinking cursor at the end of the number.

iii. Use numeric key to add extra numbers. Press "DEL/CH" to erase any mistakes.   Or

Press "DEL/CH" to move cursor back one digit. Then press any other numeric key to replace the number.

iv. Press "ENTER" to confirm the number.

v. The display shows "ENTER NAME" first and then the Caller's name on the second line with blinking cursor at the end. The entered number is displayed on the third line.

vi. Press "2" … "9" keys to add extra characters. Press "DEL/CH" to erase any mistakes.   Or

Press "DEL/CH" to move cursor back one character. Then press any other numeric key to replace the character.

vii. Press "ENTER" to confirm the name.

viii. The display will show "NUMBER SAVED" first. Then it shows the name and number just saved.

- At anytime, user can press "FLASH" button one time to go back to standby mode. Or
- It will go back to standby automatically at 30 seconds time out if there is no action.

c. **Callback from Caller ID Information**

To callback from incoming call information, the base "T/P" switch should be set at "T".

While reviewing the incoming call list, press "ENTER" and "UP(▲)"/"DOWN(▼)"will format the number with the following dialing variations:

i. **7 digits without a 1 prefix**:

If the area code of the Caller ID number matches to the setting of the stored area code, the dialed numbers can be 7 digits only.

ii. **Area Code + 7 digits without a 1 prefix**:

If the area code of the Caller ID number matches to the setting of the stored area code, the dialed numbers can be Area Code + 7 digits.

iii. **10 digits without a 1 prefix**:

If the area code of the Caller ID number is different from the stored area code, the dialed numbers can be 10 digits without a "1" prefix.

iv. **10 digits with a 1 prefix:**

If the area code of the Caller ID number is different from the stored area code, the dialed numbers can be "1" + 10 digits.

When reviewing the Caller ID information, press "ENTER" will cause the LCD to display the formatted numbers in sequence.

Example 1:

Stored LDS code: 1.

Stored area code: 770.

Stored incoming call number 770-123-4567.

a. Press "ENTER" key will show blinking "123-4567".

b. Press "TALK" or "ENTER" key again will dial out "1234567".

OR

c. Press "UP" key will show blinking "770-123-4567". Then press "TALK" or "ENTER" key again will dial out "7701234567".

OR

d. Press "UP" key will show blinking "1-7701234567". Press "TALK" or "ENTER" key will dial out "17701234567".

OR

e. Press "UP" key will show blinking "123-4567" again.

Example 2:

Stored LDS code: 1.

Stored area code: 770.

Stored incoming call number 413-456-7890.

a. Press "ENTER" key will show blinking "413-456-7890".

b. Press "TALK" or "ENTER" key again will dial out "4134567890".

OR

c. Press "UP" key will show blinking "1-4134567890". Press "TALK" or "ENTER" key will dial out "14134567890".

OR

d. Press "UP" key will show blinking "413-456-7890" again.

d. Delete Caller ID Information

While reviewing the Caller ID, press "DEL/CH" button to delete the displayed caller information. LCD will display flashing "DELETE ?". Press "DEL/CH" to confirm. "CID DELETED" will be displayed for 2 seconds.

The next record is shown automatically or "- NO CALLS -" if the list is empty.

- At anytime, user can press "FLASH" button one time to go back to standby mode. Or
- It will go back to standby automatically at 30 seconds time out if there is no action.

e. Delete All Caller ID Information

While reviewing the Caller ID, press and hold the "DEL/CH" button for two seconds. LCD will display flashing "DELETE ALL ?".
Press "DEL/CH" to confirm.
LCD will display "ALL CID" and "DELETED" for 2 seconds and then
"-- NO CALLS --".

- At anytime, user can press "FLASH" button one time to go back to standby mode. Or
- It will go back to standby automatically at 30 seconds time out if there is no action.

10. Test Mode Operation

10.1 Handset

1. Power up the handset while press and hold "1".

2. After entering test mode, the display will show "CH M S A DA"

where

CH = channel no.

M = mute state (0/1 = Mute/Un-mute)

S = speaker state (0/1 = Disable/Enable)

A = amplifier state (0/1 = Enable/Disable)

DA = Tx test

The function keys:

Key 0 = LCD testmode

Key 1 = Set RF inactive

Key 2 = Set RF receive

Key 3 = Set RF transmit/receive

Key 4 = Channel increase

Key 5 = Channel decrease

Key 8 = Start Tx test

Key 9 = Stop Tx test

Key * = Toggle ARDPWR power

Key BOOST = Toggle amplifier pin

Key ENTER = Toggle VMWI LED

Key MODE = Toggle NEWCALL LED

Key MUTE = Toggle MICMUTE and MUTE

Key FLASH = Quit test mode and reset

10.2 Base

1. Select "PULSE" mode. Press and hold "PAGE" while power-up base.

2. After entering test mode, the base will generate happy tone.

3. In-Use LED will indicate the RF state:

```
2 second On/Off=inactive;
1 second On/Off=receive;
0.5 second On/Off=transmit.
```

The default settings are:

channel no. = 15.

receive mode.

off-hook.

```
ringer led will blink if receive handset tx_test.
power led will on in batlow = 1.
charge led will on in chgdet = 1.
```

The function key:

Key PAGE = press once within 2 seconds for inactive -> receive -> active

(In-Use LED will blink, 2, 1, 0.5, flash)

```
press and hold 2 seconds enable/disable tx_test
(in test mode newcall led will blink)
```

Key VOLUME UP = Press once will cycle the following:

```
1. High lineseize, low other
2. High spkrmute, low other
3. High battest, low other
4. High lowchg, low other
5. High highchg, low other
6. High audiomute, low other
7. High bat_inst, low other
8. High bat_cap, low other
```

Key VOLUME DOWN = Press once next channel

Key RINGER STYLE = Quit test mode.

11. RF Channels

RF CHANNEL	HANDSET (KHz)		BASE (KHz)	
	TX	RX	TX	RX
01	2,481,550	2,389,850	2,400,550	2,492,250
02	2,481,600	2,389,900	2,400,600	2,492,300
03	2,481,650	2,389,950	2,400,650	2,492,350
04	2,481,700	2,390,000	2,400,700	2,492,400
05	2,481,750	2,390,050	2,400,750	2,492,450
06	2,481,800	2,390,100	2,400,800	2,492,500
07	2,481,850	2,390,150	2,400,850	2,492,550
08	2,481,900	2,390,200	2,400,900	2,492,600
09	2,481,950	2,390,250	2,400,950	2,492,650
10	2,482,000	2,390,300	2,401,000	2,492,700
11	2,482,050	2,390,350	2,401,050	2,492,750
12	2,482,100	2,390,400	2,401,100	2,492,800
13	2,482,150	2,390,450	2,401,150	2,492,850
14	2,482,200	2,390,500	2,401,200	2,492,900
15	2,482,250	2,390,550	2,401,250	2,492,950
16	2,482,300	2,390,600	2,401,300	2,493,000
17	2,482,350	2,390,650	2,401,350	2,493,050
18	2,482,400	2,390,700	2,401,400	2,493,100
19	2,482,450	2,390,750	2,401,450	2,493,150
20	2,482,500	2,390,800	2,401,500	2,493,200