Winbond Electronics Corp.

23-MEMORY TONE/PULSE DIALER WITH AUTOREDIAL RTC AND LCD DISPLAY FUNCTIONS

GENERAL DESCRIPTION

The W91570DN series ICs are Si-gate CMOS ICs that provide the signals needed for either pulse or tone dialing. They feature 23 number memories and a 16-digit LCD driver for displaying telephone numbers and calling time. A real time clock is included to display the time of day. The W91570DN series is fabricated using CMOS technology providing good performance in low voltage, low power applications.

FEATURES

- Three by 32 digits for redial, save and mercury memory
- Twenty by 16 digits for one-touch direct or two-touch indirect repertory memory
- Uses 6 × 10 keyboard
- Pause, Pulse-to-tone (*/T) and flash can be stored as a digit in memory
- Minimum tone output duration: 87 mS
- Minimum intertone pause: 87 mS
- Tone/Pulse mode pin selectable
- Make/Break ratio pin selectable
- Dialing rate (10 or 20 ppS) pin selectable
- Pause time (2.0 or 3.6 Sec) selectable by keypad
- Flash break time (100, 300, or 600 mS) selectable by keypad
- Built-in 12 or 16-digit LCD driver (1/4 duty, 1/3 bias) selectable by mask option
- Built-in calling timer from [00:00] to [59:59]
- Uses 3.579545 MHz TV quartz crystal or ceramic resonator
- Uses 32768 Hz crystal as RTC frequency base
- Packaged in 80-pin plastic QFP with RTC
- Provides one-key-redial and auto-redial functions
- Switchable 24-hour clock or 12-hour clock with p.m. mode
- 0 or 9 dialing inhibition pin for PABX systems or long distance dialing lock out
- On-hook debounce: 150 msec in normal mode and 20 msec in lock mode
- Off-hook delay 300 mS in lock mode (i.e. $\overline{DP}$ will keep low for 300 mS while off hook)
- First key-in delay: 300 msec in lock mode
- MUTE key for speech mute
- Cascade and mixed dialing allowed
- The functions of the different dialers in the W91570DN series are shown in the following table:

PRODUCT NO.	LCD DIGITS	LOCK	RTC BATTERY
W91572DNF	16	√	1.5V
W91574DNF	16	√	3V
W91576DNF	12	√	1.5V
W91578DNF	12	√	3V

PIN CONFIGURATION



PIN NAME	QFP-80	PIN NAME	QFP-80	PIN NAME	QFP-80	PIN NAME	QFP-80
SEG29	1	COL2	21	$\overline{\text{TESTL}}$	41	SEG9	61
SEG30	2	COL3	22	APSET	42	SEG10	62
SEG31	3	COL4	23	XT2	43	SEG11	63
SEG32	4	COL5	24	$\overline{\text{XT2}}$	44	SEG12	64
TEST	5	COL6	25	VLCD	45	SEG13	65
$\overline{\text{KMUTE}}$	6	COL7	26	VRTC2	46	SEG14	66
KT	7	COL8	27	CN	47	SEG15	67
$\overline{\text{TEST1}}$	8	COL9	28	CP	48	SEG16	68
VDD	9	ROW1	29	COM1	49	SEG17	69
NC/$\overline{\text{LOCK}}$	10	ROW2	30	COM2	50	SEG18	70
B/M	11	ROW3	31	COM3	51	SEG19	71
DTMF	12	ROW4	32	COM4	52	SEG20	72
$\overline{\text{SET}}$ RTC	13	ROW5	33	SEG1	53	SEG21	73
VSS	14	XT1	34	SEG2	54	SEG22	74
H/P MUTE	15	$\overline{\text{XT1}}$	35	SEG3	55	SEG23	75
T/P $\overline{\text{MUTE}}$	16	$\overline{\text{HKS}}$	36	SEG4	56	SEG24	76
HFO	17	$\overline{\text{HFI}}$	37	SEG5	57	SEG25	77
$\overline{\text{DP}}$ / $\overline{\text{C10}}$	18	VRTC1	38	SEG6	58	SEG26	78
MODE	19	$\overline{\text{TEST2}}$	39	SEG7	59	SEG27	79
COL1	20	ARD	40	SEG8	60	SEG28	80

PIN DESCRIPTION

SYMBOL	PIN NO.	I/O	FUNCTION
Row, Column Inputs	29–33 and 20–28	I	The keyboard inputs may be used with either the standard 6×10 keyboard, an inexpensive single contact (form A) keyboard or electronic input. A valid key entry is defined by a single row being connected to a single column.
XT1, $\overline{XT}$	34, 35	I, O	A built-in inverter provides oscillation with an inexpensive 3.579545 MHz crystal or ceramic resonater. The oscillator ceases when a keypad input is not sensed after chip enable and dialing is finished. The crystal frequency deviation is ±0.02%.
T/P $\overline{MUTE}$	16	O	The T/P $\overline{MUTE}$ is a conventional CMOS N-channel open drain output. The output transistor is switched on low level during the dialing sequence (both pulse and tone mode), one-key redial break, auto redial break and flash break. Otherwise, it is switched off.
H/P MUTE	15	O	The H/P MUTE is a conventional CMOS inverter output. During pulse dialing, one-key redial break, auto redial break, flash break, hold, and mercury functions, this pin will output an active high. It remains in a low state at all other times.
$\overline{KMUTE}$	6	O	The $\overline{KMUTE}$ is a CMOS N-channel open drain output. The output transistor is switched on only during mute function. Otherwise, it is switched off.
$\overline{HKS}$	36	I	Hook switch input. $\overline{HKS}$ = V_{DD} or floating: On-hook state. Chip in sleeping mode, no operation. $\overline{HKS}$ = V_{SS}: Off-hook state. Chip enable for normal operation. $\overline{HKS}$ pin is pulled to V_{DD} by internal resistor.

Pin Description, continued

<table>
<tr><th>SYMBOL</th><th>PIN NO.</th><th>I/O</th><th>FUNCTION</th></tr>
<tr><td>$\overline{HFI}$, HFO</td><td>37, 17</td><td>I, O</td><td>Handfree control pins. A low pulse on the $\overline{HFI}$ input pin toggles the handfree control state.
Status of the handfree control is listed in the following table:
<table>
<tr><th colspan="2">CURRENT STATE</th><th colspan="3">NEXT STATE</th></tr>
<tr><th>Hook SW.</th><th>HFO</th><th>Input</th><th>HFO</th><th>Dialing</th></tr>
<tr><td>–</td><td>Low</td><td>$\overline{HFI}$ ↓</td><td>High</td><td>Yes</td></tr>
<tr><td>On Hook</td><td>High</td><td>$\overline{HFI}$ ↓</td><td>Low</td><td>No</td></tr>
<tr><td>Off Hook</td><td>High</td><td>$\overline{HFI}$ ↓</td><td>Low</td><td>Yes</td></tr>
<tr><td>On Hook</td><td>–</td><td>Off Hook</td><td>Low</td><td>Yes</td></tr>
<tr><td>Off Hook</td><td>Low</td><td>On Hook</td><td>Low</td><td>No</td></tr>
<tr><td>Off Hook</td><td>High</td><td>On Hook</td><td>High</td><td>Yes</td></tr>
</table>
The $\overline{HFI}$ pin is pulled to V_{DD} by internal resistor.
Detailed timing diagrams are shown in Figure 4(a), 4(b).</td></tr>
<tr><td>$\overline{DP}$ / $\overline{C10}$</td><td>18</td><td>O</td><td>This pin is a CMOS N-channel open drain output. The flash key will cause $\overline{DP}$ / $\overline{C10}$ to go active in either pulse mode or tone mode. In lock mode, the $\overline{DP}$ / $\overline{C10}$ keeps low for 300 mS during off-hook delay time (If first off-hook occured after power-on reset, the $\overline{DP}$ / $\overline{C10}$ will keep high for 100ms then go low 200 mS. It will be recovered when first key-in was accepted). The timing diagram is shown as Figure 1(a), 1(b), 1(c), 1(d).</td></tr>
<tr><td>DTMF</td><td>12</td><td>O</td><td>In pulse mode, this pin remains in low state at all times.
In tone mode, it will output a dual or single tone. Detailed timing diagram for tone mode is shown in Figure 2(a), 2(b), 2(c), 2(d).
<table>
<tr><th colspan="4">OUTPUT FREQUENCY</th></tr>
<tr><th></th><th>Specified</th><th>Actual</th><th>Error %</th></tr>
<tr><td>R1</td><td>697</td><td>699</td><td>+0.28</td></tr>
<tr><td>R2</td><td>770</td><td>766</td><td>-0.52</td></tr>
<tr><td>R3</td><td>852</td><td>848</td><td>-0.47</td></tr>
<tr><td>R4</td><td>941</td><td>948</td><td>+0.74</td></tr>
<tr><td>C1</td><td>1209</td><td>1216</td><td>+0.57</td></tr>
<tr><td>C2</td><td>1336</td><td>1332</td><td>-0.30</td></tr>
<tr><td>C3</td><td>1477</td><td>1472</td><td>-0.34</td></tr>
</table></td></tr>
<tr><td>MODE</td><td>19</td><td>I</td><td>Pulling the mode pin to V_{SS} places the dialer in tone mode.
Pulling the mode pin to V_{DD} places the dialer in pulse mode and the dialing rate is 10 ppS.
Floating the mode pin places the dialer in pulse mode and the dialing rate is 20 ppS.</td></tr>
</table>

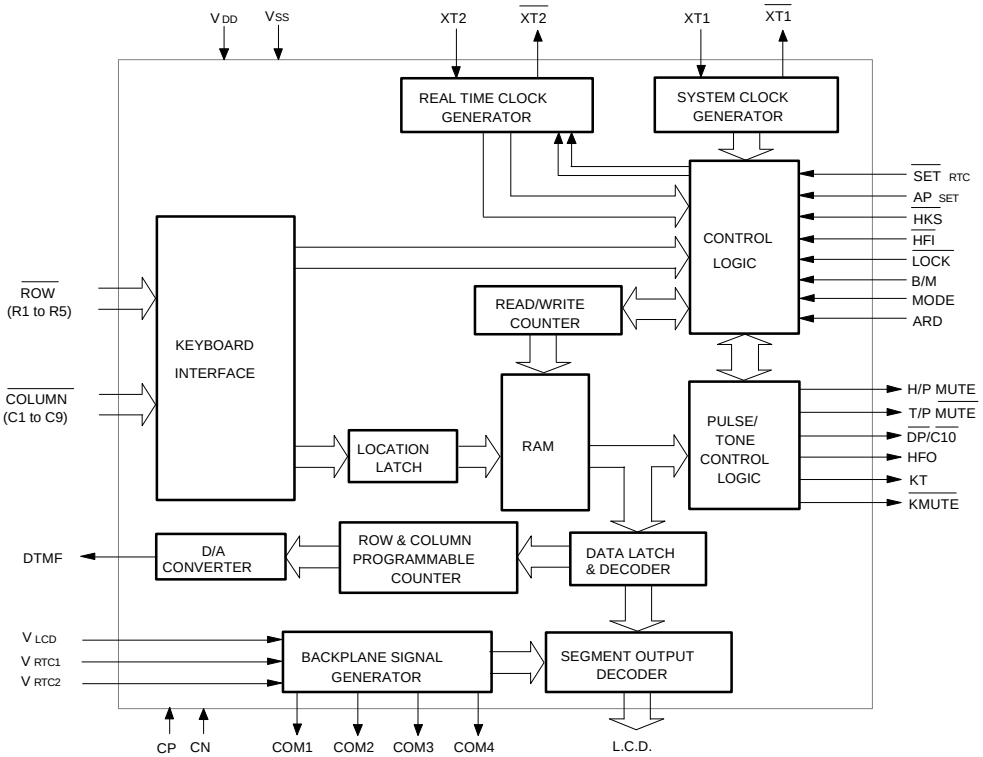
Pin Description, continued

<table>
<tr><th>SYMBOL</th><th>PIN NO.</th><th>I/O</th><th>FUNCTION</th></tr>
<tr><td>B/M</td><td>11</td><td>I</td><td>Make:Break ratio select pin.
If B/M = V_{DD}, the M/B ratio is 40:60.
If B/M = V_{SS}, the M/B ratio is 33.3:66.7.
The B/M pin is pulled to V_{DD} by internal resistor.</td></tr>
<tr><td>$\overline{LOCK}$</td><td>10
(for all lock version)</td><td>I</td><td>The $\overline{LOCK}$ pin is used to prevent "0" or "9" dialing under PABX system long distance call control. When the first key input after reset is "0" or "9", all the key inputs, including "0" or "9" key, become invalid, and the chip generates no output.
The telephone is reinitialized by a reset.
The following table describes the functions of the $\overline{LOCK}$ pin:
<table>
<tr><th>$\overline{LOCK}$ PIN</th><th>FUNCTION</th></tr>
<tr><td>Floating</td><td>Normal dialing</td></tr>
<tr><td>V_{DD}</td><td>"0", "9" dialing inhibited</td></tr>
<tr><td>V_{SS}</td><td>"0" dialing inhibited</td></tr>
</table></td></tr>
<tr><td>COM1 to COM4</td><td>49 to 52</td><td>O</td><td>COM1 to COM4 are the common signal output terminal for the 1/4 duty LCD.</td></tr>
<tr><td>SEG1 to SEG32</td><td>53 to 80, 1 to 4</td><td>O</td><td>SEG1 to SEG32 are the 16-digit segment signal outputs.</td></tr>
<tr><td>V_{LCD}</td><td>45</td><td>O</td><td>Power supply pin for LCD driver.
A 0.1 µF capacitor is connected between V_{LCD} and V_{SS}.</td></tr>
<tr><td>CP, CN</td><td>48, 47</td><td>I</td><td>CP is the voltage control capacitor positive pin.
CN is the voltage control capacitor negative pin.
A 0.1µF capacitor is connected between these two pins.</td></tr>
<tr><td>V_{DD}, V_{SS}</td><td>9, 14</td><td>I</td><td>Power input pins.</td></tr>
<tr><td>XT2, $\overline{XT2}$</td><td>43, 44</td><td>I, O</td><td>A quartz crystal oscillator provides an RTC frequency time base of 32.768 KHz.</td></tr>
<tr><td>V_{RTC1}, V_{RTC2}</td><td>38, 46</td><td>I</td><td>Either V_{RTC1} should be connected to a 1.5V battery (W91572DN/576DN) or V_{RTC2} should be connected to a 3.0V battery(W91574DN/578DN), which supplies the power source for the RTC.</td></tr>
<tr><td>$\overline{SET}_{RTC}$</td><td>13</td><td>I</td><td>In the chip enable state, pulling $\overline{SET}_{RTC}$ to V_{SS} toggles the RTC set function on/off, when the set function is toggled on, the RTC can be set using the "HOUR" and "MIN" keypads.</td></tr>
</table>

Pin Description, continued

<table>
<tr><th>SYMBOL</th><th>PIN NO.</th><th>I/O</th><th>FUNCTION</th></tr>
<tr><td>APSET</td><td>42</td><td>I</td><td>If APSET = VDD or floating, 24-hour clock mode.
If APSET = VSS, 12-hour clock with p.m. mode.</td></tr>
<tr><td>ARD</td><td>40</td><td>I</td><td>Auto redial function selection.
<table>
<tr><th>ARD</th><th>BREAK</th><th>PAUSE</th><th>WAIT INTERVAL</th><th>REPEAT TIMES</th></tr>
<tr><td>V_{DD}</td><td>4 secs</td><td>1 sec</td><td>25 secs</td><td>10</td></tr>
<tr><td>V_{SS}</td><td>30 secs</td><td>1 sec</td><td>30 secs</td><td>10</td></tr>
<tr><td>Floating</td><td>4 secs</td><td>1 sec</td><td>-</td><td>1</td></tr>
</table>
When ARD is left floating, the one-key redial function is enabled.</td></tr>
<tr><td>KT</td><td>7</td><td>O</td><td>The key tone output is a conventional CMOS inverter.
The key tone is generated as any valid key pressed, as the KT pin generates a 1.2 KHz square wave which keeps on 35 mS; otherwise, it remain in low state.</td></tr>
<tr><td>TEST, $\overline{\text{TEST1}}$, $\overline{\text{TEST2}}$, $\overline{\text{TESTL}}$</td><td>5, 8, 39, 41</td><td>I</td><td>For testing only.</td></tr>
<tr><td>NC</td><td>10
(for W91572/574/ W91576/578)</td><td>-</td><td>No connection.</td></tr>
</table>

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

Keyboard Operation

C1	C2	C3	C4	C5	C6	C7	C8	C9	$\overline{DP}$ / $\overline{C10}$	
1	2	3	E	HOUR	M0	M5	M10	M15	HOLD1	R1
4	5	6	MUTE	MIN	M1	M6	M11	M16	HOLD2	R2
7	8	9	A2	SAVE	M2	M7	M12	M17	MER	R3
*/T	0	#	R/P1	OKR	M3	M8	M13	M18	A1	R4
F1	F2	F3	CHK	TIM	M4	M9	M14	M19	RTC	R5
R/P2	-	ICON12	ICON13	ICON14	ICON15	ICON16				VDD/VX/R6

- E: Store digit
- MUTE: Mute key
- F1, F2, F3: Flash keys
- SAVE: Save memory key
- MER: Mercury memory key
- OKR: One-key redial function
- RTC: Real time clock toggle key
- HOLD1, HOLD2: Hold function keys
- R/P1, R/P2: Redial and pause function keys, P1 is 3.6 sec. and P2 is 2.0 sec.
- TIM: a. Display last calling time
  b. Start and/or stop counting up calling time
- HOUR and MIN: Active when setting mode is operated after off-hook
- A1, A2: Indirect repertory memory dialing function keys, A1 for page 1 and A2 for page 2
  If Lp = 0 to 9, Mp = M0 to M9, and Mq = M10 to M19, then
  a. A1 + Lp (or Mp) the memory location M0 to M9 will be selected
  b. A2 + Lp (or Mp) the memory location M10 to M19 will be selected
  c. A1 (or A2) + Mq the memory location M10 to M19 will be selected
- */T: * in tone mode and P→T in pulse mode
- CHK: a. Check dialing number
  b. Check last dialing time
  c. Memory check (except mercury)
- ICON12, ..., ICON16: Keys reserved for user, can be toggled on any time when the chip is enabled

Notes: D1, ..., Dn, D1', ..., Dn': 0, ..., 9, */T, #
R/P: R/P1 or R/P2
An: A1, A2
Ln: 0, ..., 9, map to indirect memory location 0, ..., 9
Mn: Direct memory location M0, ..., M19

Normal Dialing

OFF HOOK (or ON HOOK & HFI), D1 , D2 , ..., Dn

1. D1, D2, ..., Dn will be dialed out.
2. Dialing length is unlimited, but redial is inhibited if the length oversteps 32 digits in normal dialing.

Redialing

If ARD pin = floating, the one-key redial function is selected:

1. OFF HOOK (or ON HOOK & HFI), D1 , D2 , Check Memory (or Number Store), D3 , ..., Dn , Busy, ON HOOK , OFF (or

Come HOOK

ON HOOK & HFI), R/P

a. The R/P key can execute the redial function only as the first dialing after off-hook; otherwise, it will invoke the pause function.

b. The redial memory contents will be D3, ..., Dn.

c. Redial memory can be checked in memory check mode.

d. If redialing length oversteps 32 digits, the redialing function will be inhibited.

2. OFF HOOK (or ON HOOK & HFI), D1 , D2 , ..., Dn , Busy, OKR

a. If the dialing D1 to Dn is finished, pressing the OKR key will cause the pulse output of pin DP / C10 to go low for 2.2 seconds break time and 0.6 seconds pause time will be added automatically.

b. If the pulses of the dialed digits D1 to Dn have not finished, OKR will be ignored.

c. The one-key redialing function timing diagram is shown in Figure 3.

Number Entry

1. OFF HOOK (or ON HOOK & HFI), D1 , D2 , ..., Dn , E (many times same as one time), Mn (or An , Ln), ON HOOK

D1, D2, ..., Dn will be stored in memory location Mn (or Ln) and will be dialed out.

2. OFF HOOK (or ON HOOK & HFI), E , D1 , D2 , ..., Dn , E (could be skipped), Mn (or An , Ln), ON HOOK

3. OFF HOOK (or ON HOOK & HFI), E , D1 , D2 , ..., Dn , Mn (or An , Ln), ON HOOK

a. D1, D2, ..., Dn will be stored in memory location Mn (or Ln) but will not be dialed out.

b. R/P and */T keys can be stored as a digit in memory, in store mode, R/P is the pause function key.

c. The store mode is released after the store function is executed or when the state of the hook

switch changes is executed.

4. [OFF HOOK] , [E] , [Mn] (or [An] , [Ln])

The redial content excluding memory dialing will be copied to memory location Mn (or Ln).

5. The first 16 digits will be stored into memory, if the key-in number over 16 digits.

Save

1. [OFF HOOK] (or [ON HOOK] & [HFI ī õ_]), [D1] , [D2] , ..., [Dn] , CONVERSATION,

[E] , [D1'] , [D2'] , ..., [Dn'] , [SAVE]

D1', D2', ..., Dn' will be stored in save memory but will not be dialed out.

2. [OFF HOOK] (or [ON HOOK] & [HFI ī õ_]), [D1] , [D2] , ..., [Dn] , [SAVE]

a. If the dialing sequence D1, D2, ..., Dn has not finished, SAVE will be ignored.

b. If the sequence off hook, D1, D2, ..., Dn (dialing finish), SAVE, SAVE is keyed in, D1, D2, ..., Dn

will be copied to save memory and D1, D2, ..., Dn will be dialed out again.

c. If the sequence off hook, D1, D2 (dialing finish), SAVE, D3, D4 (dialing finish), SAVE is keyed in,

D1, D2 will be copied to save memory and D3, D4 will not be copied to save memory.

d. All above sequences will be displayed on LCD.

Mercury

1. [OFF HOOK] (or [ON HOOK] & [HFI ī õ_]), [D1] , [D2] , ..., [Dn] , CONVERSATION,

[E] , [D1'] , [D2'] , ..., [Dn'] , [MER]

D1', D2', ..., Dn' will be stored in mercury memory and display on the LCD, but will not be dialed out.

2. MERCURY memory content = D1', D2', ..., Dn'

[OFF HOOK] (or [ON HOOK] & [HFI ī õ_]), [D1] , [D2] , ..., [Dn] , [MER] ,

[ON HOOK] , Come, [OFF HOOK] (or [ON HOOK] & [HFI ī õ_]), [MER]

a. The dialing sequence will be D1, D2, ... Dn, on hook, off hook, D1', D2', ..., Dn'.

b. The MER key can be used to execute the mercury function only when it is the first key-in in dialing

mode after off-hook or first priority flash operation.

c. The contents of mercury memory will not be displayed on the LCD except for mercury mark.

d. If the sequence D1, D2, ..., Dn, MER, on-hook, off-hook, MER is keyed in, D1, D2, ..., Dn will not be copied to mercury memory, D1', D2', ..., Dn' will be dialed out, and the mercury mark (icon 10) will be blinking after off-hook. Detailed timing diagram is shown in Figure 5.

e. Mercury memory cannot be checked in memory check mode.

Repertory Dialing

1. One-touch direct repertory dialing.
   a. OFF HOOK (or ON HOOK & HFI), Mn (or R/P)
   b. OFF HOOK (or ON HOOK & HFI), SAVE (or MER)
   c. OFF HOOK (or ON HOOK & HFI), Mn (or R/P), SAVE
2. Two-touch indirect repertory dialing.
   OFF HOOK (or ON HOOK & HFI), An , Ln (or Mn)

Access Pause

OFF HOOK (or ON HOOK & HFI), D1 , D2 , R/P , D3 , ..., Dn , Busy, Come, ON HOOK , OFF HOOK (or ON HOOK & HFI), R/P

1. The first R/P functions as a pause key and the second as a first key-in redial key.
2. The pause function can be stored in memory, and only one R/P key can be released to the user.
3. The pause function is executed in normal dialing, redialing, or memory dialing.
4. The pause duration of 2.0 or 3.6 seconds per pause is selected through the keypad.
5. The default pause duration is 3.6 seconds after power on.
6. The pause function timing diagram is shown in Figure 6.

Pulse- to-tone (*/T)

OFF HOOK (or ON HOOK & HFI), D1 , D2 , ..., Dn , */T , D1' , D2' , ..., Dn'

1. If the mode switch is set to pulse mode, then the output signal will be:

   D1, D2, ... Dn, Pause (2.0 sec/3.6 sec), D1', D2', ..., Dn'
   (Pulse) (Tone)

2. If the mode switch is set to tone mode, then the output signal will be:

   D1, D2, ... Dn, *, D1', D2', ..., Dn'
   (Tone) (Tone)

3. The dialer remains in tone mode after the digits have been dialed out and can be reset to pulse mode only by going on-hook.
4. The pause time of pulse-to-tone is default to 3.6 seconds.
5. The pulse-to-tone function timing diagram is shown in Figure 7.

Flash (F = F1, F2, F3)

OFF HOOK (or ON HOOK & HFI), F

1. The dialer will execute a flash break time of 600 mS (F1), 300 mS (F2), or 100 mS (F3) and pause time of 1S before the next digit (except flash key) is dialed out.
2. Flash keeps first priority in normal dialing but insert flash can be stored into memory when flash is the first digit in memory. In this condition, only one flash key can be released to the user.
   a. E, F1, D1, D2, D3, E, Mn then the digit stored in Mn will be F1, D1, D2, D3.
   b. E, D1, F1, D2, D3, E, Mn then the digit stored in Mn will be D1, D2, D3.
   c. F1, D1, D2, D3, E, Mn then the digit stored in Mn will be D1, D2, D3.
3. The system will return to the initial state after the flash pause time is finished.
4. Keyboard functions are inhibited when flash break is being executed.
5. The flash timing diagram is shown in Figure 8.

Mute

OFF HOOK (or ON HOOK & HFI), MUTE

1. The MUTE is switched on and off by a toggle switch.
2. The function timing diagram is shown in Figure 9.

Hold Key

OFF HOOK (or ON HOOK & HFI), HOLD1 (or HOLD2)

1. The hold function is toggled on and off by Hold1 or Hold2 key. When the hold function is toggled on, the hold mark (icon 4) will be lit and all key-ins (except hold keys and icon keys) will be ignored.
2. The following are examples of hold function toggled on and off:
   a. OFF HOOK , HOLD1 (or HOLD2), HOLD1 (or HOLD2)
   b. OFF HOOK , HOLD1 (or HOLD2), HFI
   c. OFF HOOK , HOLD1 (or HOLD2), ON HOOK , HFI
   d. ON HOOK & HFI , HOLD1 (or HOLD2), HFI
3. Hold1 and Hold2 have the same function in off-hook state. The difference between Hold1 and Hold2 are shown as follows:
   a. If OFF HOOK , HOLD1 (or HOLD2), ON HOOK , HOLD1 is entered, then the dialer will be off-line.

If [OFF HOOK] , [HOLD1] (or [HOLD2]), [ON HOOK] , [HOLD2] is entered, then the dialer stay at hold function.

b. If [ON HOOK] & [HFI] , [HOLD1] (or [HOLD2]), [HOLD1] is entered, then the dialer will be off-line.

If [ON HOOK] & [HFI] , [HOLD1] , (or [HOLD2]), [HOLD2] is entered, then the dialer stay at hold function.

4. The function timing diagram is shown in Figure 10(a), 10(b), 10(c).

Adjusting Time Setting

[OFF HOOK] (or [ON HOOK] & [HFI]), [SET RTC] , [HOUR] , [MIN] , [SET RTC] (or [ON HOOK])

1. Only HOUR and MIN keys are valid in set RTC mode.
2. Hours and minutes count forward as long as the HOUR or MIN key is pressed.
3. The on/off function of $\overline{\text{SET}}_{\text{RTC}}$ is toggled, and the dialer will go back to a previous state after the toggle off $\overline{\text{SET}}_{\text{RTC}}$ function.
4. If the dialing sequence D1, D2, ..., Dn (including flash and pause) has not finished, $\overline{\text{SET}}_{\text{RTC}}$ (or 'RTC' key pressed) will be ignored.

RTC Display Mode

[OFF HOOK] (or [ON HOOK] & [HFI]), [RTC]

1.The real time clock display mode can be toggled on and off by RTC key.
2. The icon display will not be changed when enter RTC display mode and set RTC mode.

Check Key

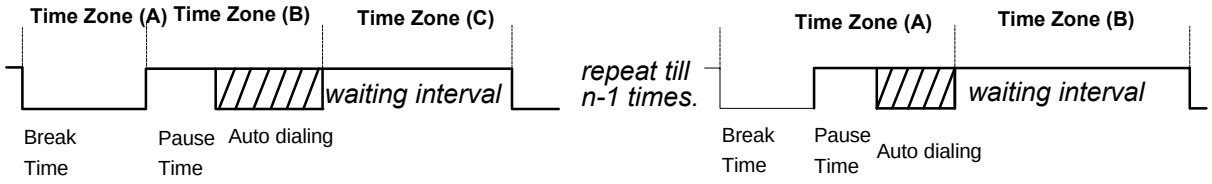
[OFF HOOK] (or [ON HOOK] & [HFI]), [CHK] , [R/P] (or [OKR] , [SAVE] , [Mn] , ..., etc.)

The redial (or memory) content will be displayed on the LCD when either [R/P] or [OKR] is keyed in.

Auto Redial

If ARD pin = V_{DD} or V_{SS}, the auto redial function is selected:

OFF HOOK (or ON HOOK & $\overline{HFI}$), OKR



1. During time zone (B) the keypads are inhibited, and in time zone (A), (C) the auto redial can be interrupted by pressing any keypad or by going off-hook.
2. The visible dialing number will be blinking during the waiting time interval.
3. If OKR is the first key-in after off-hook or handfree then the first break and pause time will be ignored.
4. The following show examples to interrupt auto redial function:

   OFF HOOK (or ON HOOK & $\overline{HFI}$), OKR , Any Keypad (at break time and waiting interval)

5. If ON HOOK & $\overline{HFI}$, OKR , OFF HOOK

   a. When in time zome (A) or (C), the auto-redial function will be interrupted and changed to hook mode after OFF HOOK

   b. When in time zome (B), the auto-redial functiion will continue and changed to hook mode after OFF HOOK

6. If ON HOOK & $\overline{HFI}$, OKR , $\overline{HFI}$ (any time) is entered, the dialer will be off-line.
7. The auto redial function timing diagram is shown in Figure 11(a), 11(b).
8. The calling time will auto-count when the auto-redial function is interrupted in break time zone (A) and (C).

TIM

OFF HOOK (or ON HOOK & $\overline{HFI}$), D1 , D2 , ..., Dn (or Redialing or Repertory dialing 1), CONVERSATION

1. If no key is pressed after dialing is finished, the LCD will display counting time after 6 seconds.
2. If the dialing sequence D1, D2, ..., Dn has not finished, TIM will be ignored.
3. The timer will be initialized by flash and auto redial.

Cascaded and Mixed Dialing

Cascaded Dialing

1. Definition of cascaded dialing:

   In cascaded dialing, a new sequence may be pressed before the previous sequence has been sent out completely. The following are examples of cascaded dialing:

   Example 1: [Normal dialing] + [Repertory dialing 1] + [Repertory dialing 2] +...

   Example 2: [Repertory dialing 1] + [Normal dialing] + [Repertory dialing 2] +...

   Example 3: [Redialing] + [Normal dialing] + [Repertory dialing 1] +...

2. Normal dialing, redialing, or repertory dialing as represented by each rectangle above is treated as one sequence.

3. At most 64 digits are allowed in cascaded dialing, but there is no limitation on the number of sequences.

4. The content of cascaded dialing may a combination of normal dialing, redialing, and repertory dialing. Redialing is vaild only as the first key-in, however.

5. If [ON HOOK] , [OFF HOOK] , [OKR] is entered, then the cascaded dialing sequence described in the above examples will be dialed out only if there are not more than 32 digits. If the sequence exceeds 32 digits then the redialing is inhibited.

Mixed Dialing

1. Definition of mixed dialing:

   The examples of cascaded dialing given above are also examples of mixed dialing except that in mixed dialing a new sequence may be accepted only when the previous sequence has been dialed out completely.

2. There is no limitation on the number of digits and sequences in the mixed dialing.

3. The content of mixed dialing may be a combination of normal dialing, memory dialing, or one-key redialing.

4. If [ON HOOK] , [OFF HOOK] , [OKR] is entered, then the mixed dialing sequence described in the above examples will be dialed out only if the total number of digits does not exceed 32. If the total exceeds 32 digits, then redialing is inhibited.

Combining of Cascaded and Mixed Dialing

1. Cascaded dialing and mixed dialing may be combined, and each follows the rules described above.

2. To apply redialing to combinations of cascaded and mixed dialing:

   [ON HOOK] , [OFF HOOK] , [OKR] then redialing will be executed only if the total number of digits does not exceed 32. Otherwise, the redialing is inhibited.

3. If there had been n cascaded sequences with a total of 60 digits dialed, then for the (n+1)th cascaded sequence, one 4-digit normal dialing sequence or one complete repertory dialing sequence (length up to 32 digits) can be dialed. The (n+2)th sequence will not be accepted for cascaded dialing.
4. After a total of 64 digits of cascaded dialing have been completed, mixed dialing can be added.

ABSOLUTION MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}–V_{SS}	-0.3 to +7.0	V
Input/Output Voltage	V_{IL}	V_{SS} – 0.3	V
	V_{IH}	V_{DD} + 0.3	
	V_{OL}	V_{SS} – 0.3	
	V_{OH}	V_{DD} + 0.3	
Power Dissipation	P_D	120	mW
Operating Temperature	T_{OPR}	-0.5 to +70	°C
Storage Temperature	T_{STG}	-55 to +125	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

(V_{DD}–V_{SS} = 2.5V. F_{OSC} = 3.58 MHz, T_A = 25° C, all outputs unloaded.)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V_{DD}	-	2.0	-	5.5	V
Operating Current	I_{OP}	Tone, Unloaded	-	0.5	0.7	mA
		Pulse, Unloaded	-	0.4	0.5	
Standby Current	I_{SB}	$\overline{HKS}$ = 0, Unloaded and no key entry	-	-	15	µA
Memory Retention Current	I_{MR}	$\overline{HKS}$ = 1 V_{DD} = 1.0V	-	-	0.5	µA
Tone Output Voltage	V_{TO}	Row group R_L = 10 KΩ	130	150	170	mVrms
Pre-emphasis		Col/Row V_{DD} = 2.0 to 5.5V	-	2	3	dB

DC Characteristics, continued

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
DTMF Distortion	THD	R_L = 10 KΩ V_{DD} = 2.0 to 5.5V	-	-30	-23	dB
DTMF Output DC Level	V_{TDC}	V_{DD} = 2.0 to 5.5V	1.0	-	3.0	V
DTMF Output Sink Current	I_{TL}	V_{TO} = 0.5V	0.2	-	-	mA
$\overline{DP}$ Output Sink Current	I_{PL}	V_{PO} = 0.5V	0.5	-	-	mA
Common Output Voltage	V_{CH}	-	4.2	4.5	4.8	V
	V_{CL}	-	-	0	0.3	
Common Output Current	I_{CH}	-	-20	-	-	µA
	I_{CL}	-	20	-	-	
Segment Output Voltage	V_{SH}	-	4.2	4.5	4.8	V
	V_{SL}		-	0	0.3	
Segment Output Current	I_{SH}	-	-5	-	-	µA
	I_{SL}	-	5	-	-	
RMS Voltage Across a Segment	V_{ON}	-	2.34	2.6	-	Vrms
	V_{OFF}	-	-	1.5	1.65	
Average DC Offset Voltage	V_{DC}	-	-	-	100	mV
$\overline{HFI}$ High Voltage	V_{HFIH}	-	0.8 V_{DD}	-	V_{DD}	V
$\overline{HFI}$ Low Voltage	V_{HFIL}	-	-	-	0.2 V_{DD}	V
T/P $\overline{MUTE}$ Output Sink Current	I_{TML}	V_{TMO} = 0.5V	0.5	-	-	mA
H/P MUTE Output Drive Current	I_{HMH}	V_{HMO} = 2.5V	0.5	-	-	mA
H/P MUTE Output Sink Current	I_{HML}	V_{HMO} = 0.5V	0.5	-	-	mA
K $\overline{MUTE}$ Output Sink Current	I_{KML}	V_{TMO} = 0.5V	0.5	-	-	mA
Keypad Input Drive Current	I_{KD}	V_I = 0V	4	-	80	µA
Keypad Input Sink Current	I_{KS}	VI = 2.5V	200	-	400	µA
Keypad Resistance	R_K	-	-	-	5	KΩ
Control Input Pull Up/Down Resistor	R_{CIP}	B/M, $\overline{HFI}$	100	-	-	KΩ
$\overline{HKS}$ Input Pull High Resistor	R_{HK}	-	-	500	2000	KΩ

AC CHARACTERISTICS

(VDD–VSS = 2.5V, FOSC. = 3.58 MHz, TA = 25° C, all outputs unloaded.)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Key-in Debounce	TKID	-	-	20	-	mS
Key Release Debounce	TKRD	-	-	20	-	mS
Off Hook Delay Time	TOFD	-	-	300	-	mS
First Key-in Delay Time	TFKD	-	-	300	-	mS
On Hook Debounce Time	TOHD	Unlock	-	150	-	mS
		Lock	-	20	-	
Key Tone Frequency	FKT	-	-	1.2	-	KHz
Key Tone Duration	TKTD	-	-	35	-	mS
Key Tone Delay	TKD	-	-	20	-	mS
Pulse Mute Delay	TMD	B/M = VDD	-	40	-	mS
		B/M = VSS	-	33.3	-	
Pre-digit-pause (1)	TPDP1	B/M = VDD	-	40	-	mS
10 ppS		B/M = VSS	-	33.3	-	
Pre-digit-pause (2)	TPDP2	B/M = VDD	-	20	-	mS
20 ppS		B/M = VSS	-	16.7	-	
Inter-digit Pause	TIDP1	10 ppS	-	800	-	mS
(Auto Dialing)	TIDP2	20 ppS	-	500	-	
Make/Break Ratio	M:B	B/M = VDD	-	40:60	-	%
		B/M = VSS	-	33:67	-	
Tone Output Duration	TTD	-	-	87	-	mS
Inter-tone Pause	TITP		-	87	-	mS
Flash Break Time	TFB	F1	-	600	-	mS
		F2	-	300	-	
		F3	-	100	-	
Flash Pause Time	TFP	F1, F2, F3	-	1	-	S
Pause Time	TP	R/P1	-	3.6	-	S
		R/P2	-	2.0	-	
One Key Redialing Break Time	TRB	-	-	4	-	S
One Key Redialing Pause Time	TRP	-	-	1	-	S

AC Characteristics, continued

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Auto Redialing Break Time	T_{ARB}	ARD = V_{DD}	-	4	-	S
		ARD = V_{SS}	-	30	-	
Auto Redialing Pause Time	T_{APR}	ARD = V_{DD}	-	1	-	S
		ARD = V_{SS}	-	1	-	
Auto Redialing Waiting Interval	T_{WI}	ARD = V_{DD}	-	25	-	S
		ARD = V_{SS}	-	30	-	
LCD Frame Frequency	F_{LCD}	-	-	32	-	Hz

RTC DC CHARACTERISTICS

(V_{RTC} = 1.5V, V_{SS} = 0V , $F_{OSC.}$ = 32,768 Hz, T_A = 25° C, all outputs unloaded.)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{RTC}	-	1.2	1.5	1.8	V
Supply Current	I_{RTC}	No Load	-	2.0	4.0	µA
OSC. Starting Time	T_{OSC}	-	-	-	3	S
OSC. Output Built-in Cap.	C_O	Cl = 12.5 pF	-	25	-	pF
OSC. in Trimmer Cap.	C_{TRIM}	-	5	-	35	pF
Frequency Stability	Δf/f	V_{DD}–V_{SS} = 1.3 to 1.6V	-	-	1	ppM
$\overline{SET}_{RTC}$ Input High Voltage	V_{SETH}	-	V_{DD} -0.3	-	V_{DD}	V
$\overline{SET}_{RTC}$ Input Low Voltage	V_{SETL}	-	V_{SS}	-	V_{SS} +0.3	V

Notes :

1. Crystal parameters suggested for proper operation are Rs < 100Ω, Lm = 96 mH , Cm = 0.02 pF , Cn = 5 pF , Cl = 18 pF, and Fosc. = 3.579545 MHz ±0.02%

2. Crystal oscillator accuracy directly affects these times.

TIMING WAVEFORMS

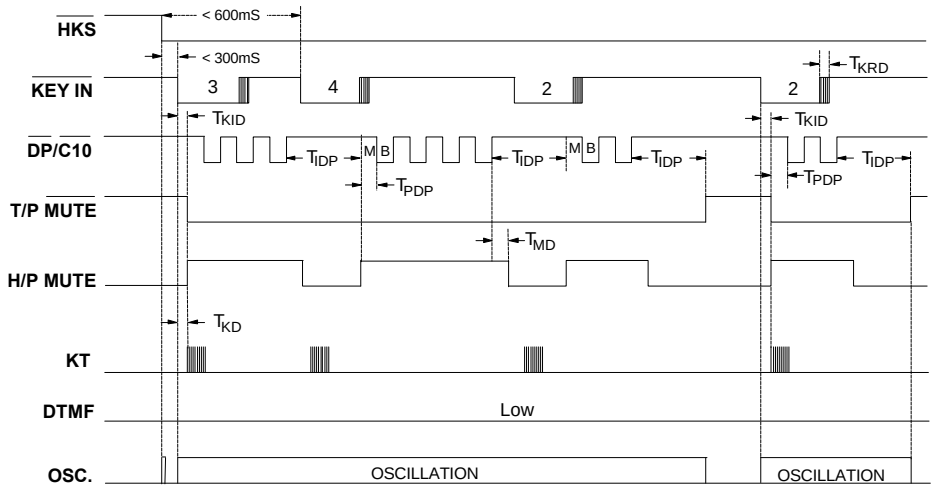


Figure 1(a). Normal Dialing Timing Diagram (Pulse Mode without Lock Function)

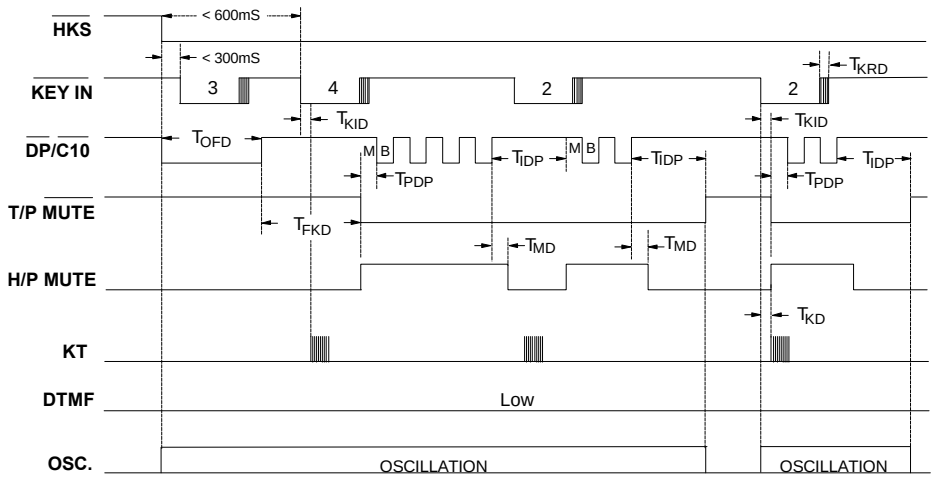


Figure 1(b). Normal Dialing Timing Diagram (Pulse Mode with Lock Function)

Timing Waveforms, continued

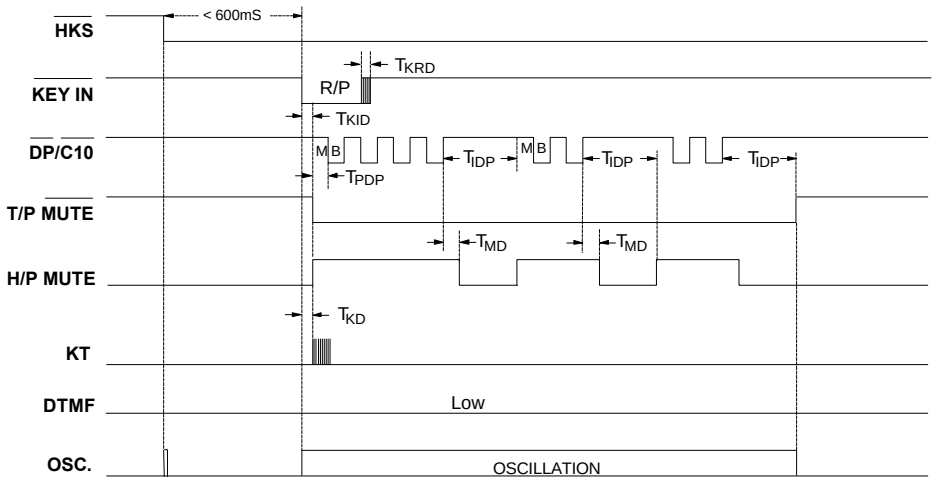


Figure 1(c). Auto Dialing Timing Diagram (Pulse Mode without Lock Function)

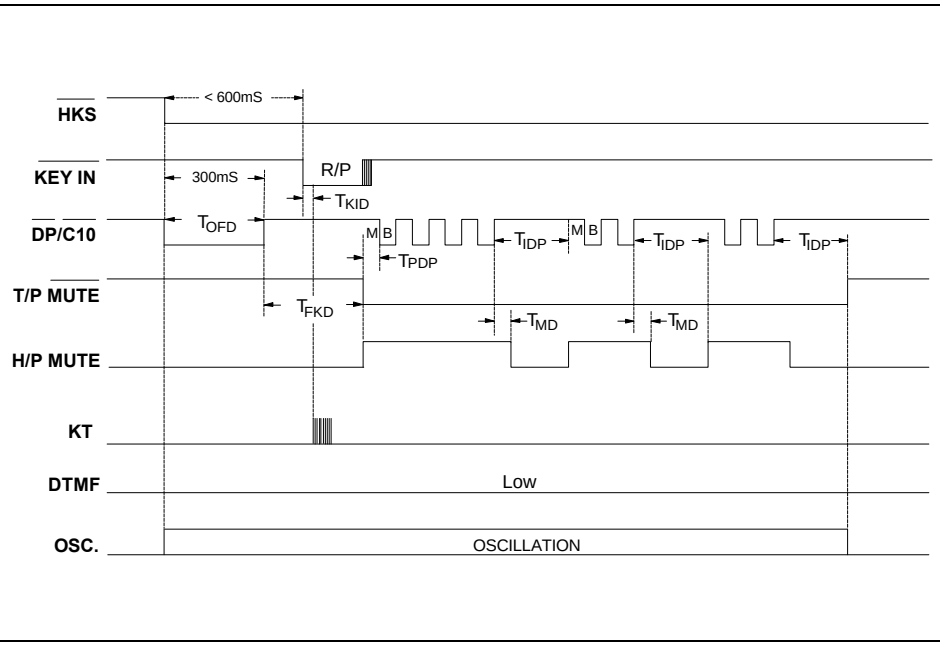


Figure 1(d). Auto Dialing Timing Diagram (Pulse Mode with Lock Function)

Timing Waveforms, continued

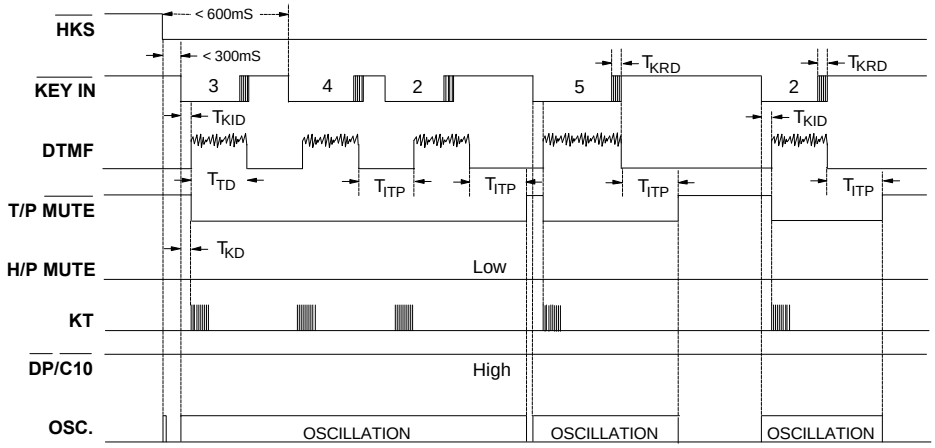


Figure 2(a). Normal Dialing Timing Diagram (Tone Mode without Lock Function)

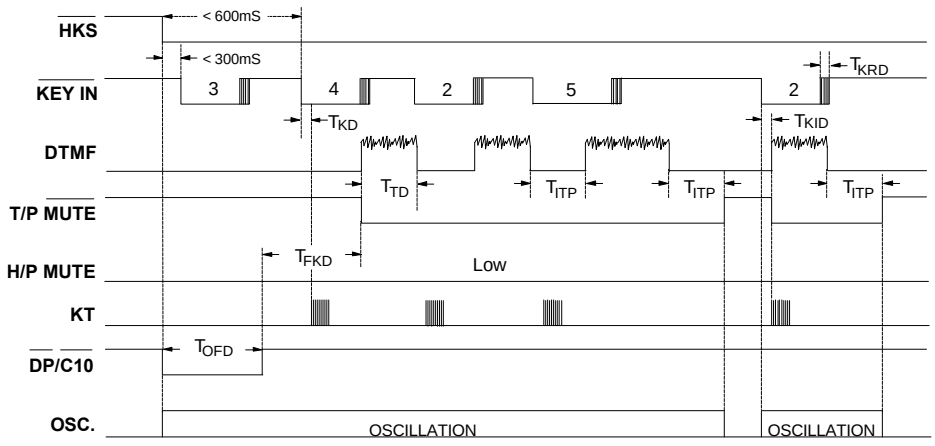


Figure 2(b). Normal Dialing Timing Diagram (Tone Mode with Lock Function)

Timing Waveforms, continued

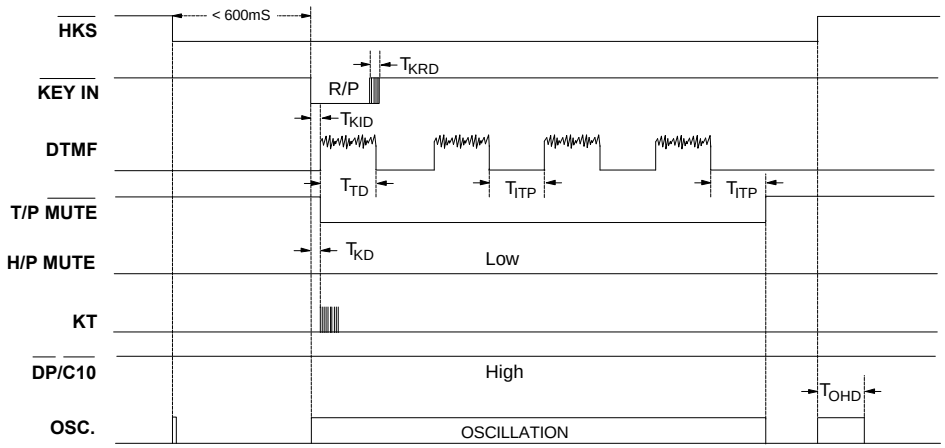


Figure 2(c). Auto Dialing Timing Diagram (Tone Mode without Lock Function)

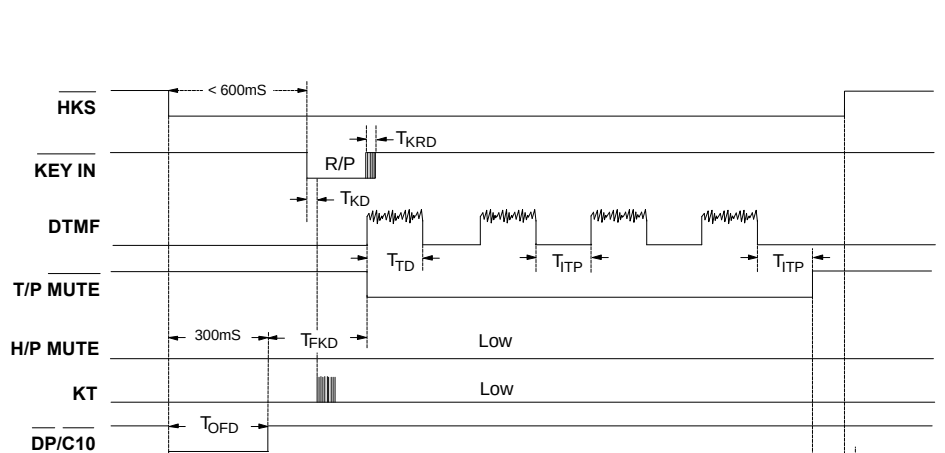


Figure 2(d). Auto Dialing Timing Diagram (Tone Mode with Lock Function)

Timing Waveforms, continued

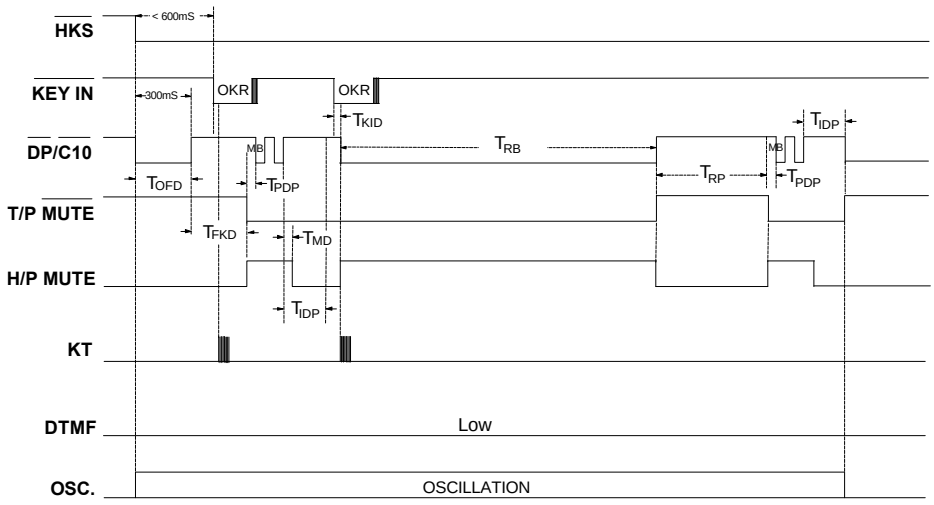


Figure 3. One-key Redial Timing Diagram

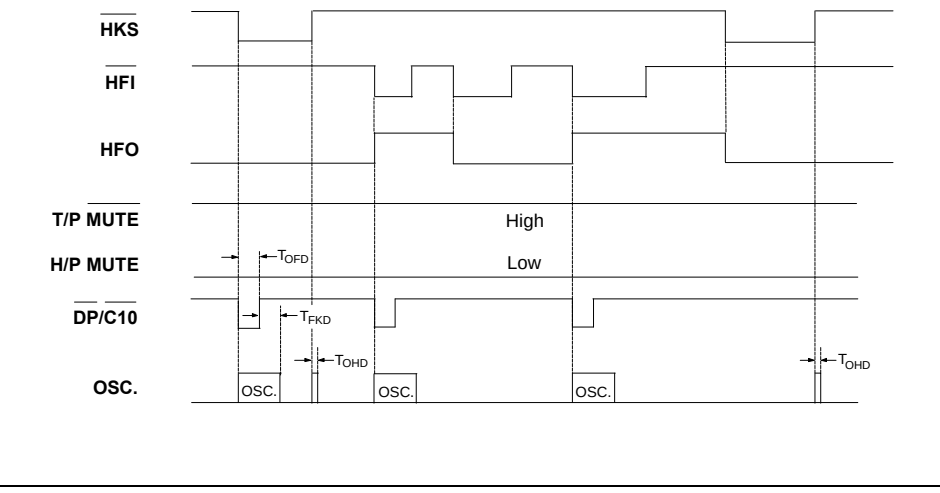


Figure 4(a). Handfree Timing Diagram (with Lock Function)

Timing Waveforms, continued

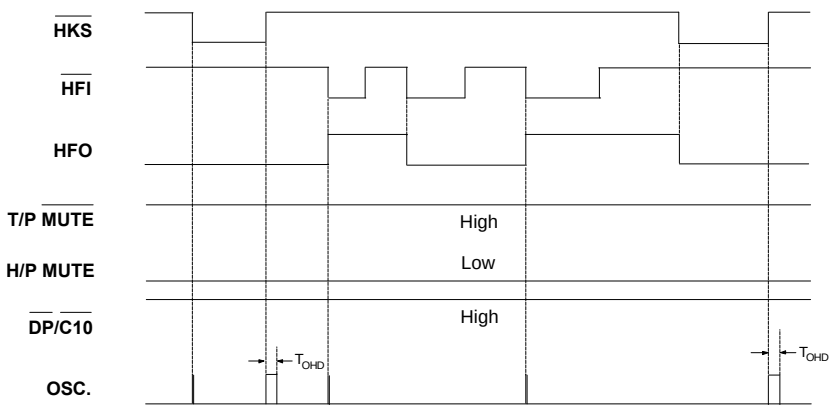


Figure 4(b). Handfree Timing Diagram (without Lock Function)

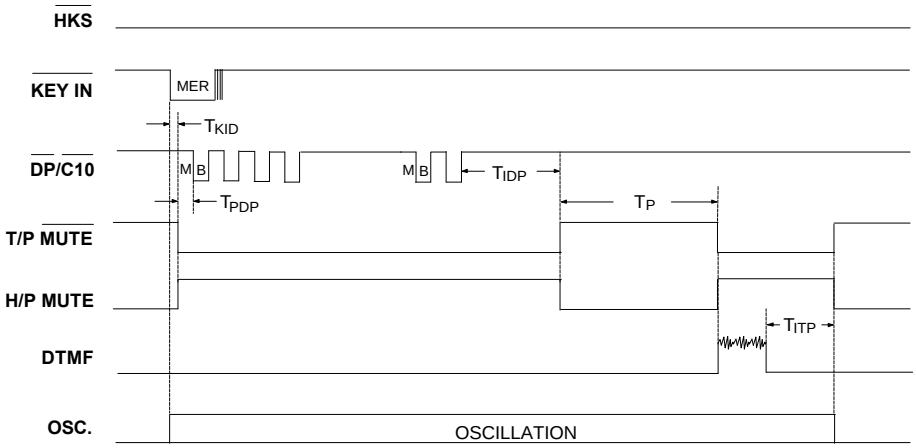


Figure 5. Mercury Function Timing Diagram

Timing Waveforms, continued

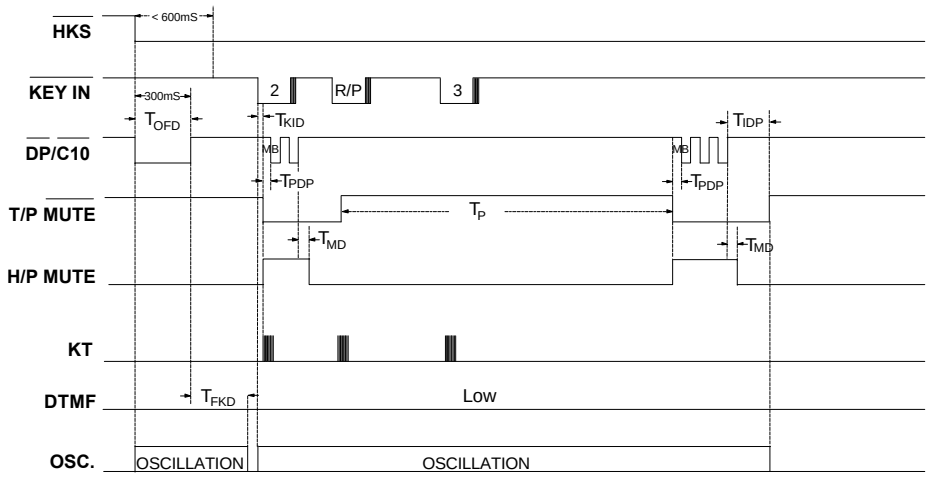


Figure 6. Pause Function Timing Diagram (Pulse Mode)

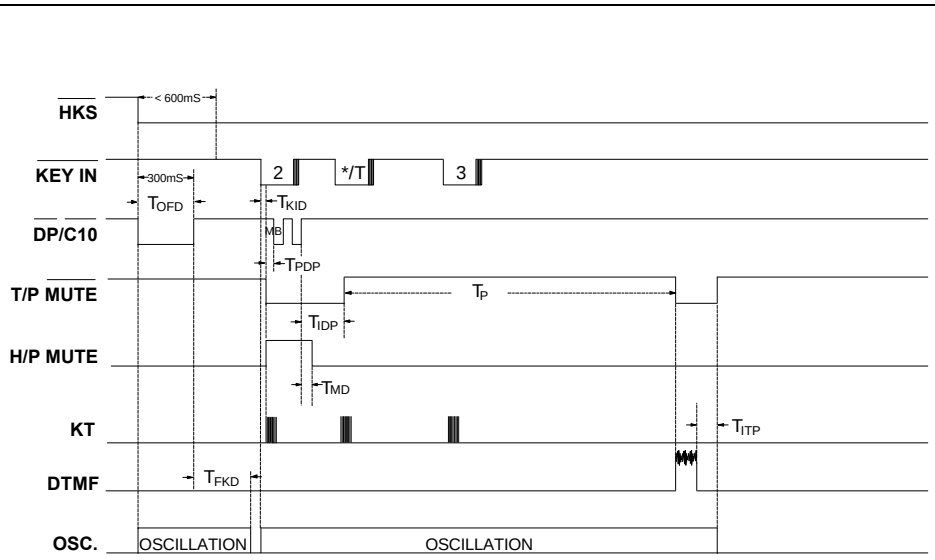


Figure 7. Pulse to Tone Timing Diagram

Timing Waveforms, continued

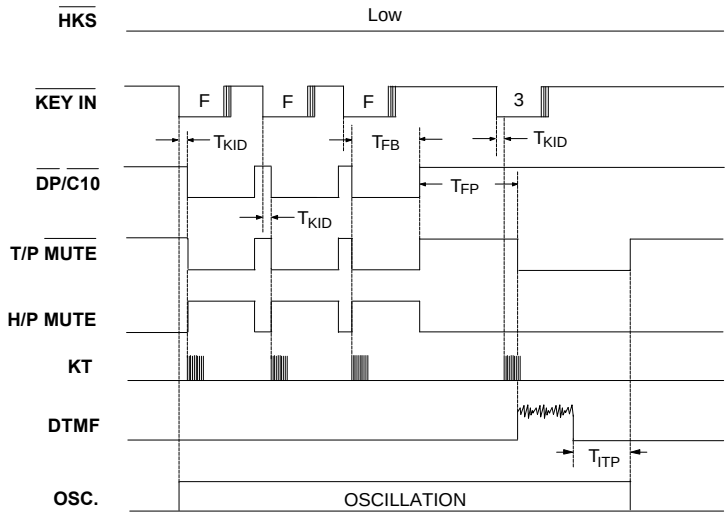


Figure 8. First Priority Flash Timing Diagram

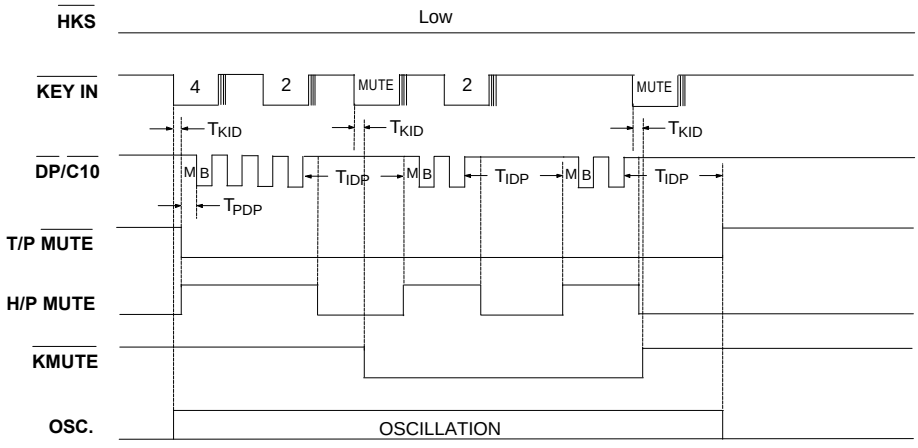


Figure 9. Mute Timing Diagram

Timing Waveforms, continued

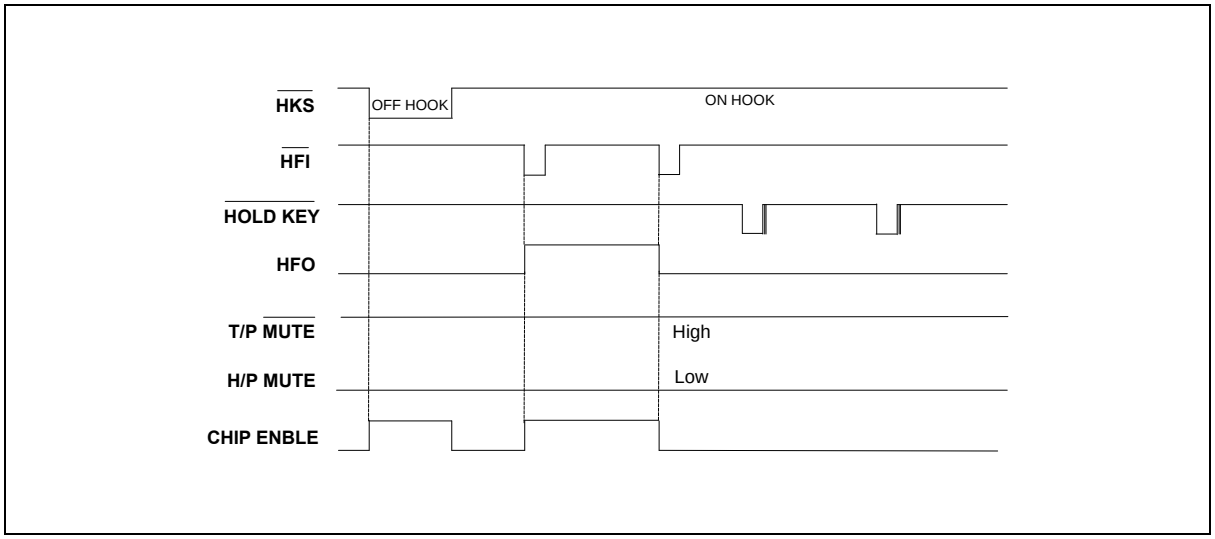


Figure 10(a). Hold and Handfree Timing Diagram

Note: The $\overline{\text{HOLD KEY}}$ cannot be enabled when the chip is disabled.

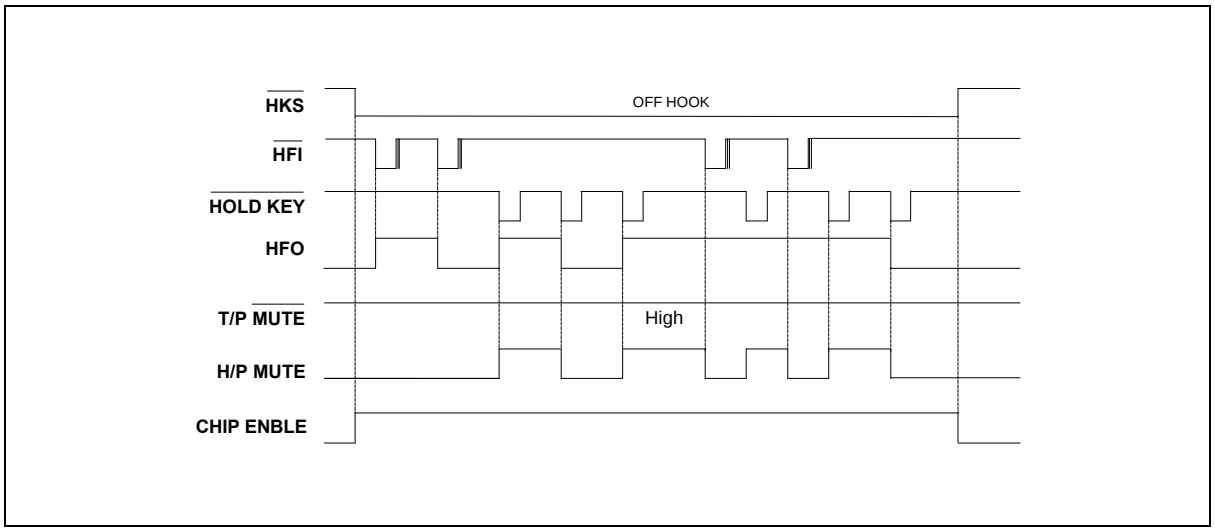


Figure 10(b). Hold and Handfree Timing Diagram

Note: The $\overline{\text{HFI}}$ and $\overline{\text{HOLD KEY}}$ inputs will toggle the HFO signal; as soon as either $\overline{\text{HFI}}$ or $\overline{\text{HOLD KEY}}$ is activated, the HFO signal will go high and previous activate inputs will be ignored.

Timing Waveforms, continued

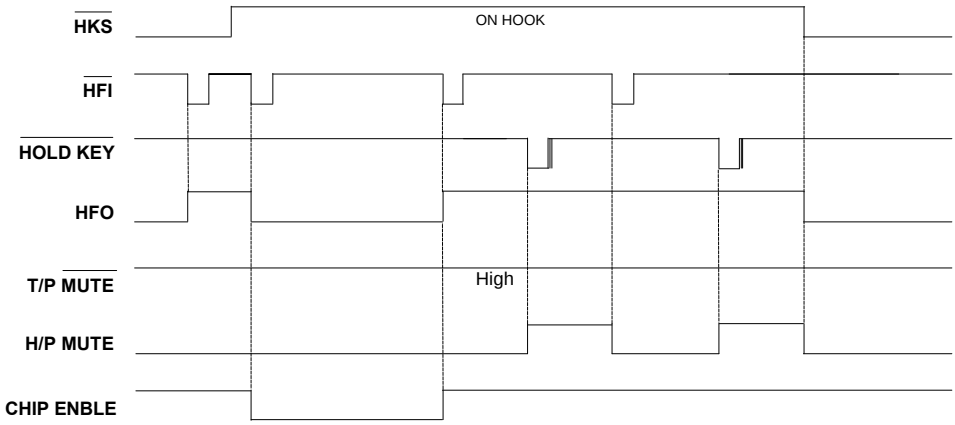


Figure 10(c). Hold and Handfree Timing Diagram

Note: Changing the state of the $\overline{\text{HKS}}$ signal from high to low will initialize the HFO and HPM MUTE signals.

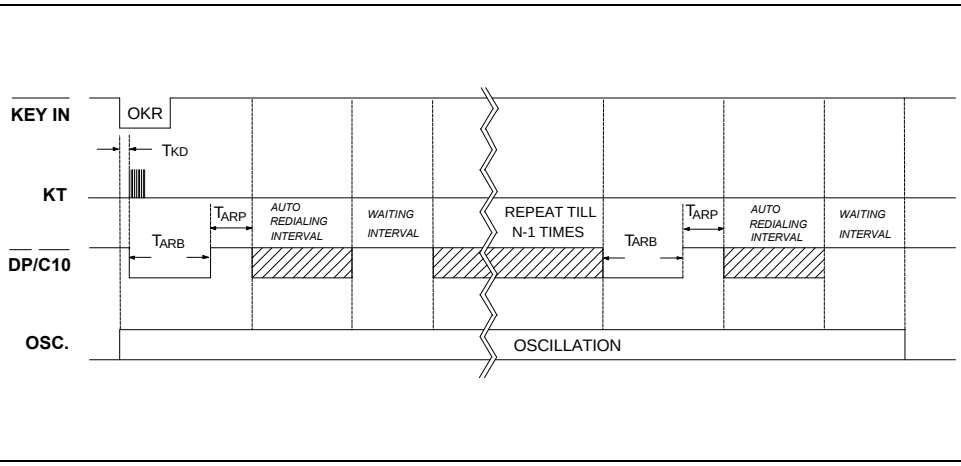


Figure 11(a). Auto Redialing Timing Diagram

Notes:

1. The auto redial function is enabled in off-hook or handfree state.
2. If OKR is the first key-in after off-hook or handfree then the first TARB and TARP will be ignored.

Timing Waveforms, continued

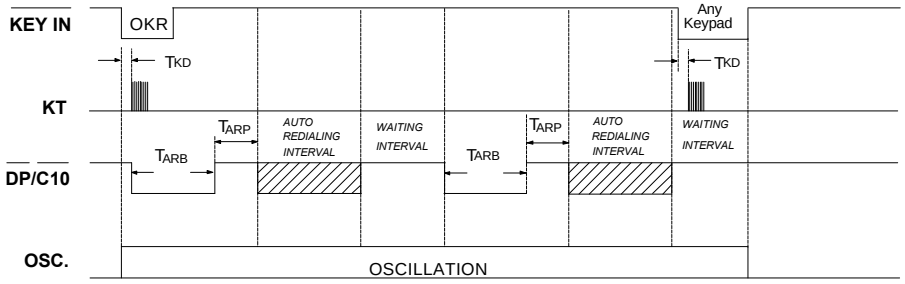
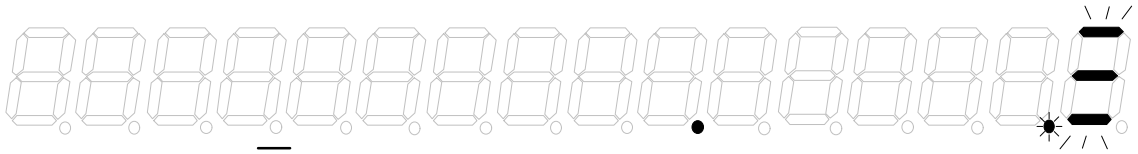


Figure 11(b). Auto Redialing Timing Diagram

LCD DISPLAY FORMAT

A. Normal Dialing



Off hook or press the "$\overline{\text{HFI}}$" switch
(Here tone mode was selected).

Blinking

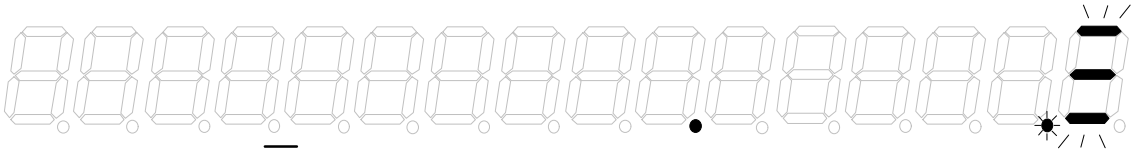


Dial" 0123456789123456"



and "78"

B. Redialing, Save Dialing, One Touch Dialing



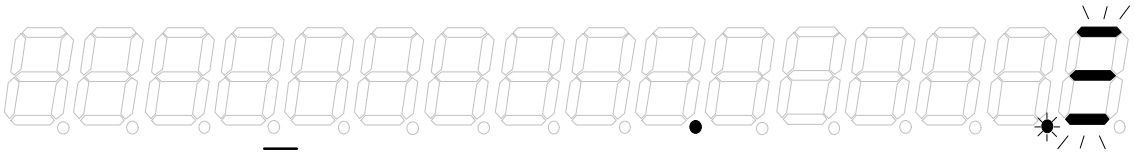
Off hook or press the "$\overline{\text{HFI}}$" switch
(Here tone mode was selected).

Blinking

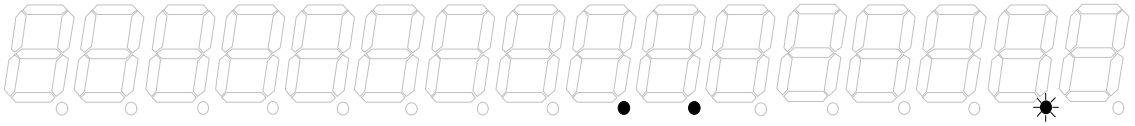


Press the "R/P", "OKR", "SAVE" or "Mn" key
(Redial or SAVE or Mn = "8123456789")

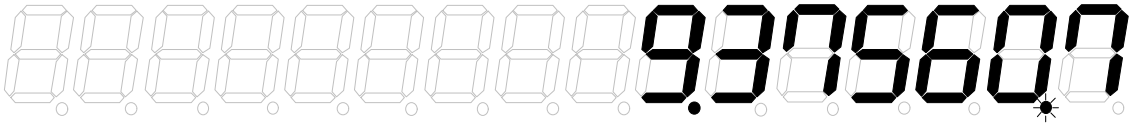
C. Abbreviated Auto Dialing



Off hook or press the "$\overline{\text{HFI}}$" switch
(Here tone mode was selected).



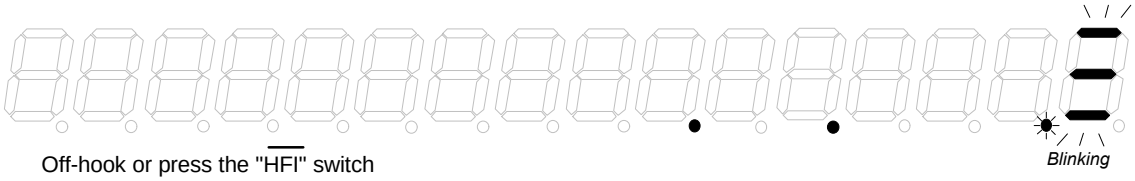
Press the "A1" key in chip enable condition
(L5 = "9375607", here L5 is the fifth memory)



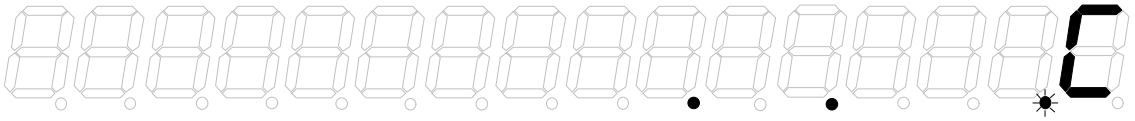
Press the "5" key

D. Memory Check

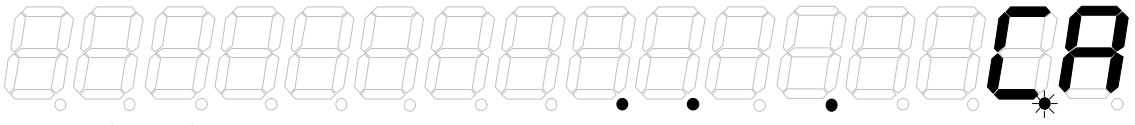
a.



Off-hook or press the "$\overline{\text{HFI}}$" switch
(L6 = "314P4430256", and here handfree and tone mode were selected)



Press the "CHK" key

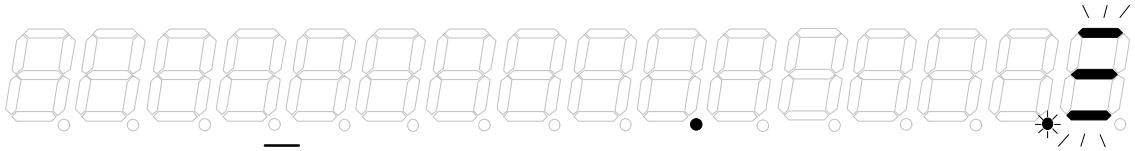


Press the "A1" key
(The auto(A) is shown on check and store mode)

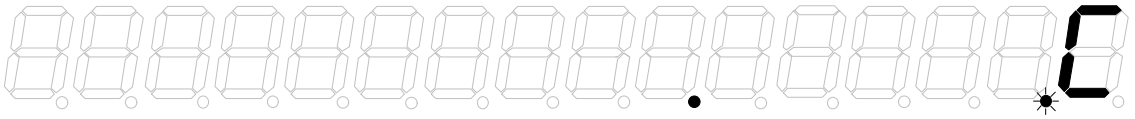


Press the "6" key

b.



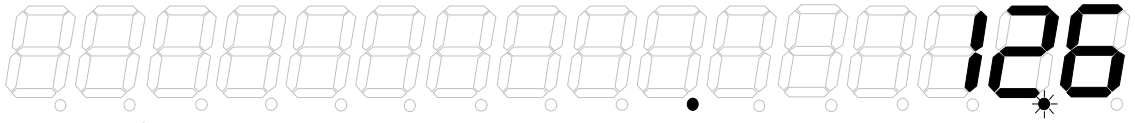
Off-hook or press the "$\overline{\text{HFI}}$" switch
(M1= "886P35P770066PP7126", and here pulse mode was selected)



Press the "CHK"



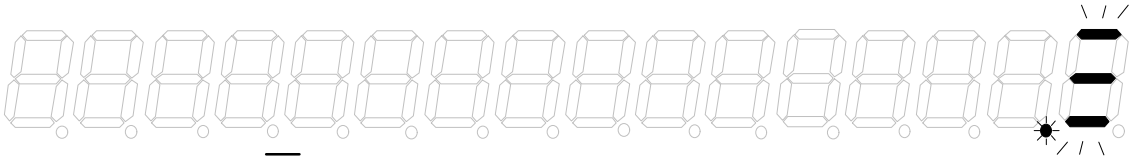
Press the "M1" key
(Display 1 to 16 digits)



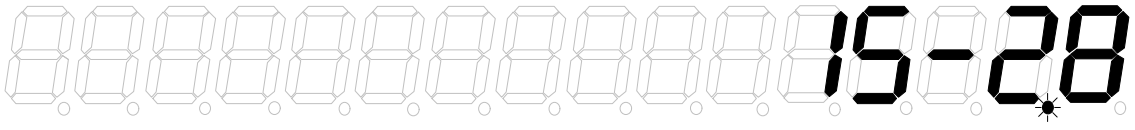
Press "any key"
(Display 17 to 19 digits)

E. Timer Function

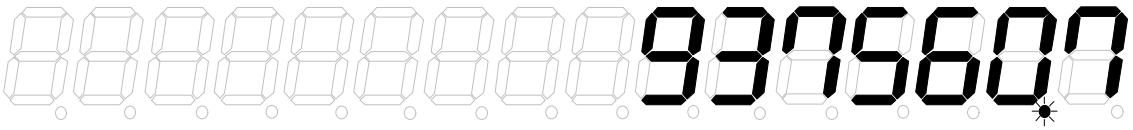
a.



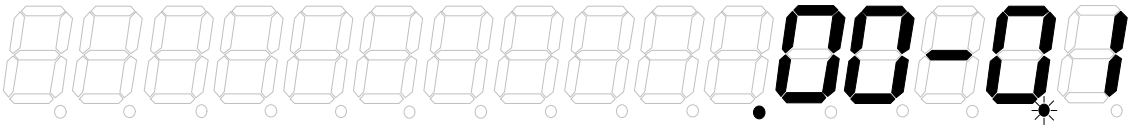
Off-hook or press the "$\overline{\text{HFI}}$" switch
(here pulse mode was selected)



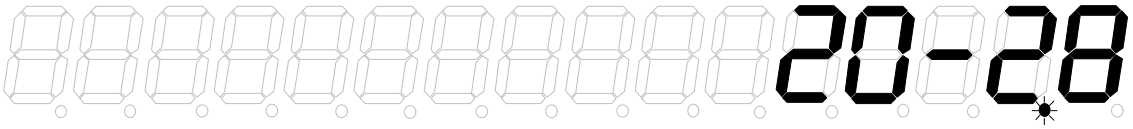
Press the "TIM" key
(Display last calling time)



Dial "9375607"

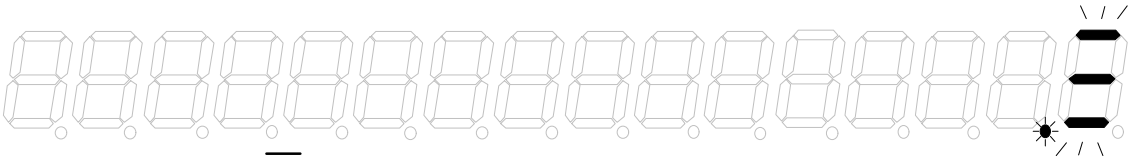


If "9375607" is dialed completed, the system will start timer after 6 seconds
(Timer will start counting up)



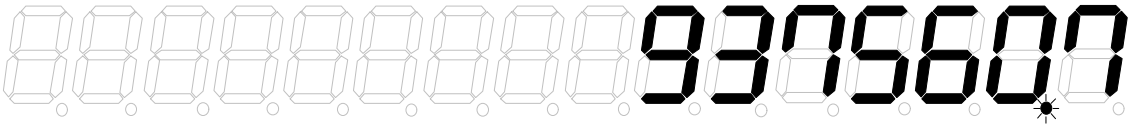
Press the "TIM"
(Timer will stop)

b.

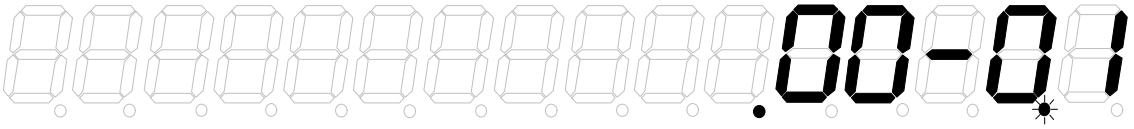


Off-hook or press the "$\overline{\text{HFI}}$" switch
(here pulse mode was selected)

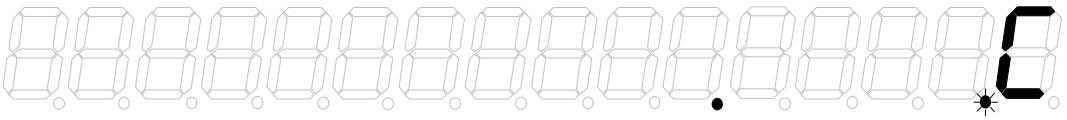
Blinking



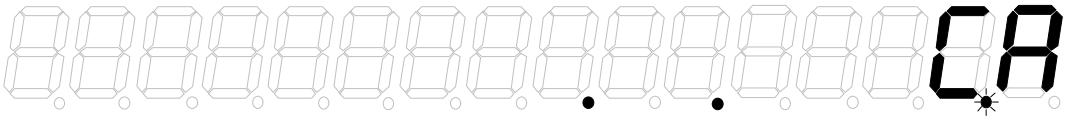
Dial "9375607"



If "9375607" is dialed completed
press the "TIM" key
(Timer will start counting up)



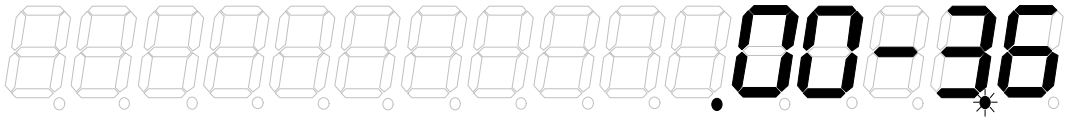
Press the "CHK" key
(L6 = "314P4430256")



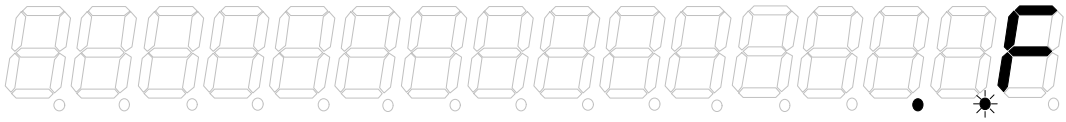
Press the "A1" key



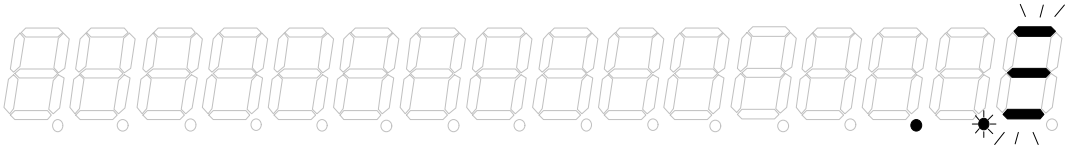
Press the "6" key



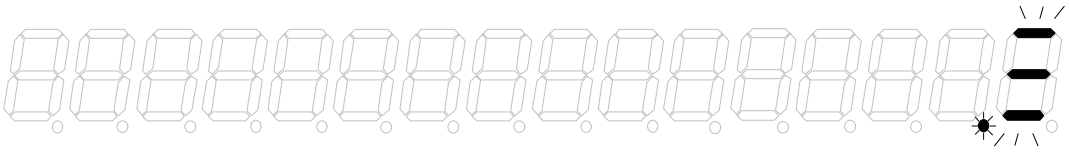
The system will go back to timer mode after 6 seconds
(Timer count up continuously)



Press the "F1", "F2" or "F3" key
(The timer will stop and LCD will display a flash mark and flash pattern)

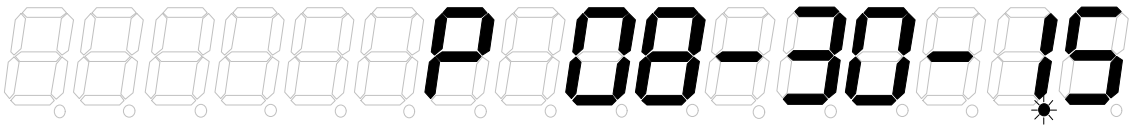


After flash break is executed

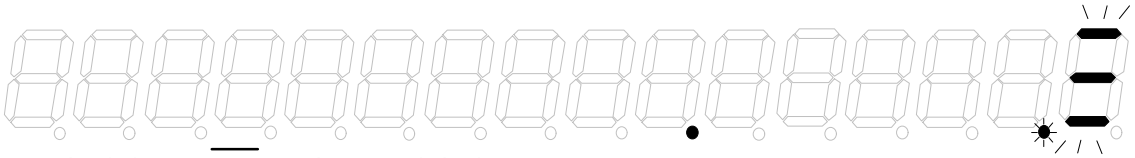


After flash pause is

F. RTC Setting Function



On-hook
(Display real time)



Off-hook, before $\overline{SET}_{RTC}$ pin was switched ON
(Here tone mode was selected)

Blinking

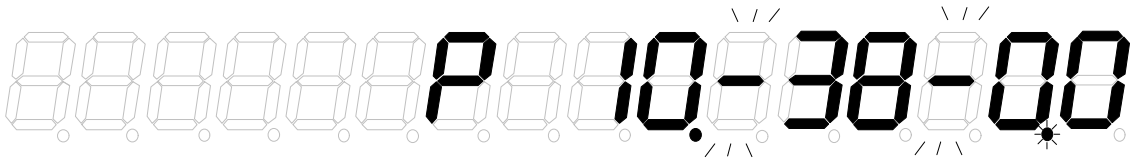


Entering "Setting Mode"

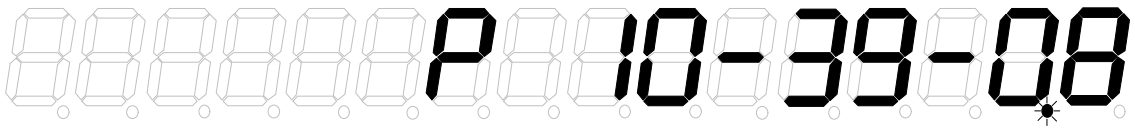


Adjusting "Hour"
(Hour counts forward as long as pressing)

Blinking



Adjusting "Minute"
(Minute counts forward as long as pressing)

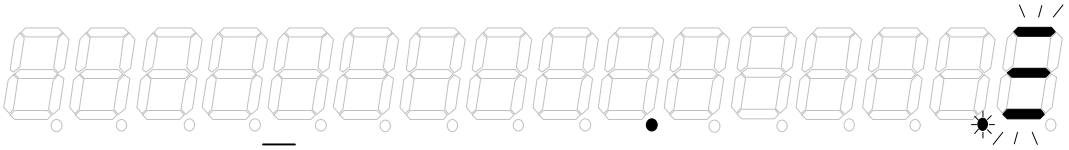


On-hook or switching $\overline{SET}_{RTC}$ pin OFF
(Here on-hook was selected)

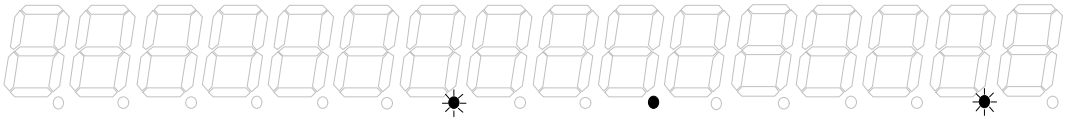
G. RTC Display Function



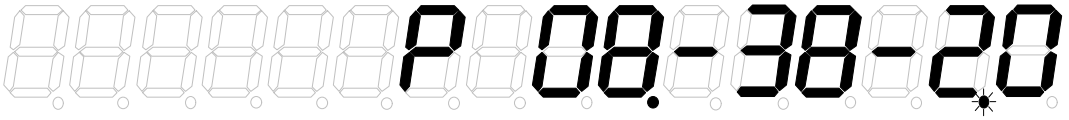
On-hook
(Display real time)



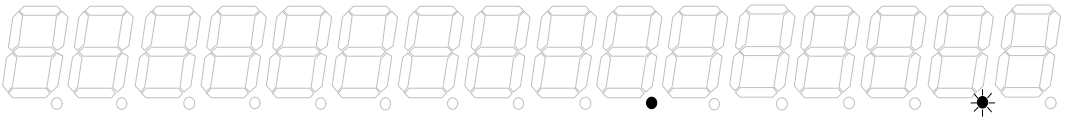
Off-hook or press the "$\overline{\text{HFI}}$" switch
(Here off-hook and tone mode was selected)



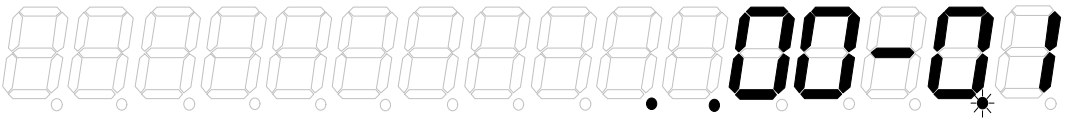
Press the "MER" key
(MER = "035PP770066")



Press the "RTC" key when "MER" dialing
is completed within 6 seconds.

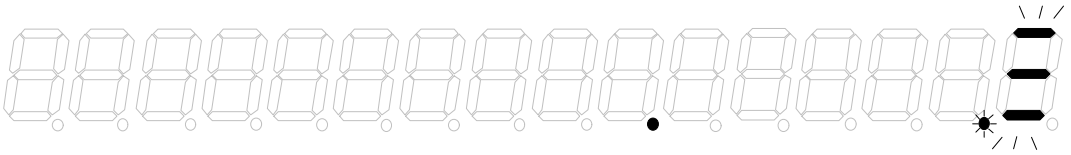


Press the "RTC" key again

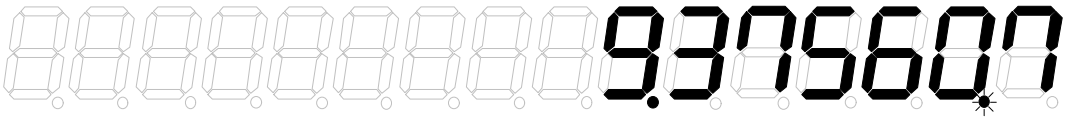


If the "MER" is dialed completed for 6 seconds

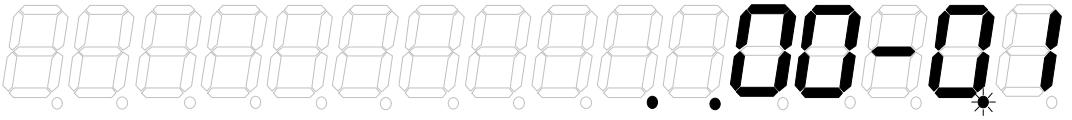
H. Mute Function



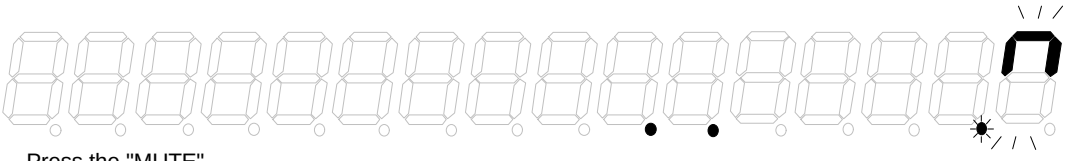
Off-hook or press the "$\overline{\text{HFI}}$" switch



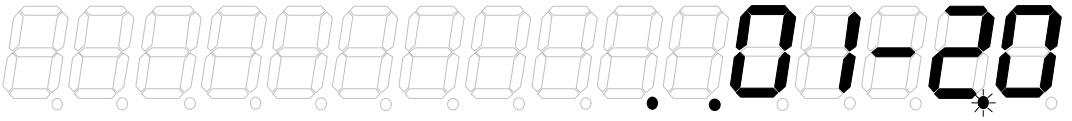
Dial "9375607"



If "9375607" is dialed completed
Press the "TIM" key
(Timer will start counting up)

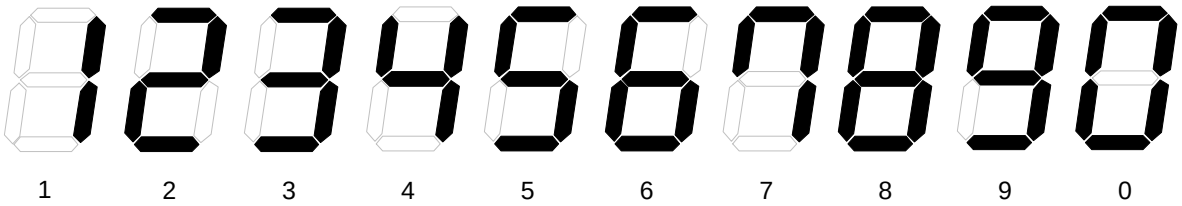


Press the "MUTE"

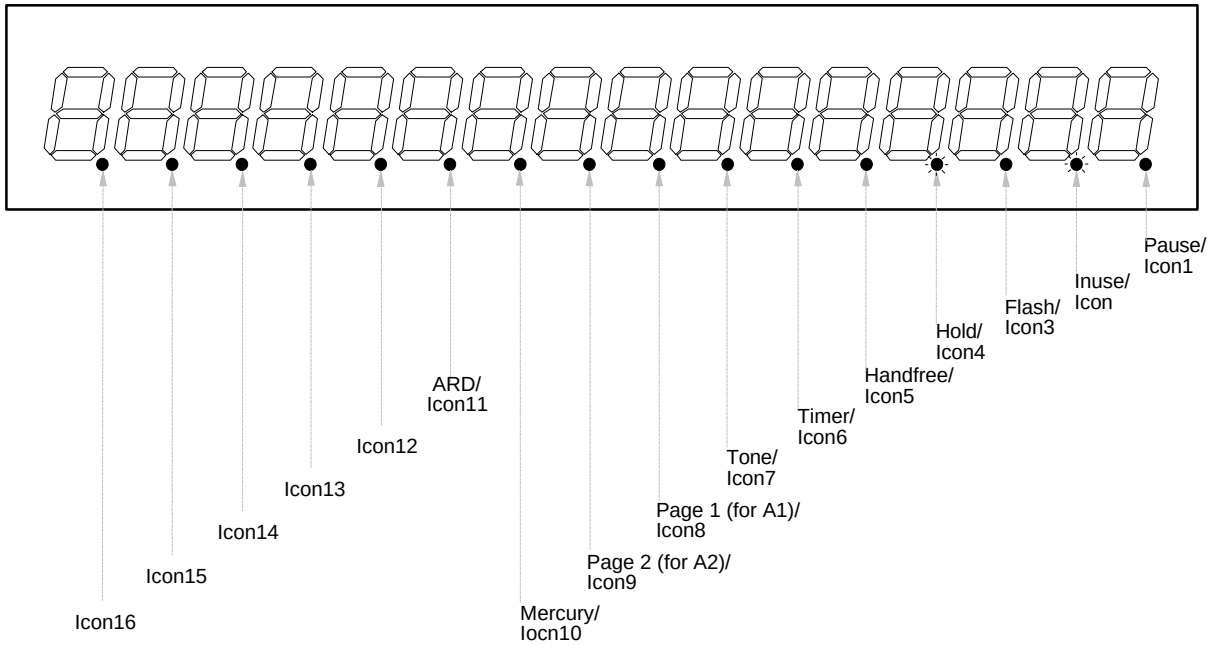


Press the "MUTE" key again

LCD PATTERN FOR DATA



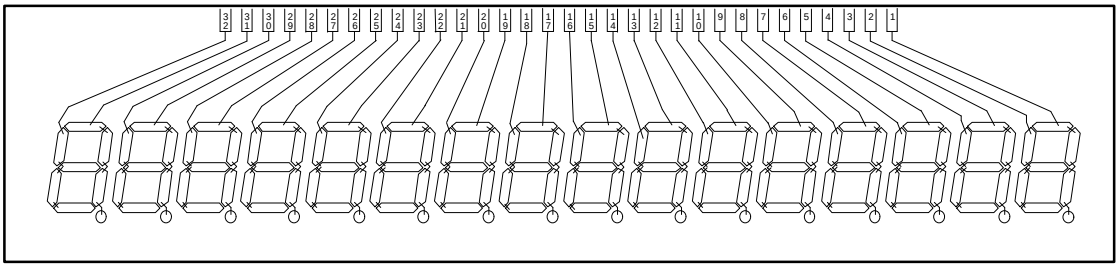


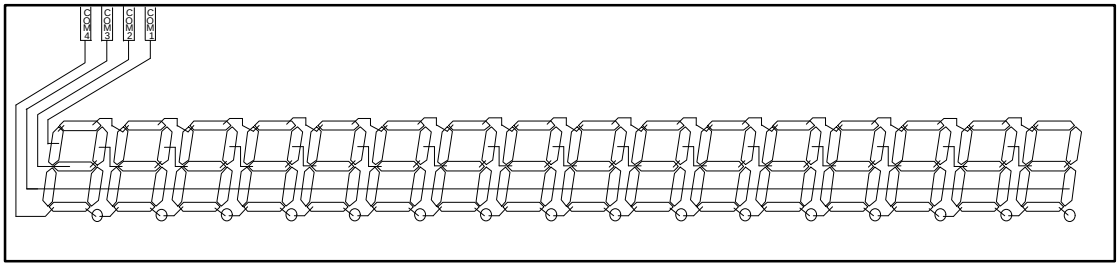


Notes:

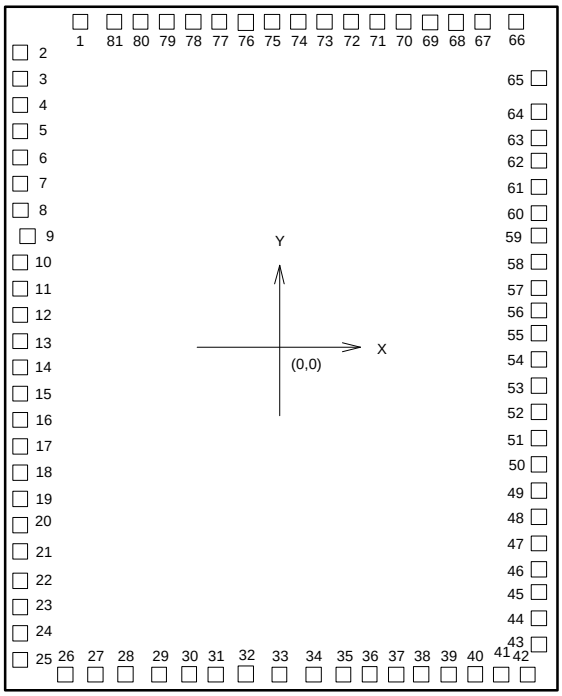
1. The icon1 to icon 10 are controlled by function operation.
2. The icon 12 to icon16 can be toggled on/off individually, irrespective of keypad function.
3. The off-hook (or hand free) state of icon12 is on, the other icons are off.
4. The icon2 always blinked after power on.

LCD PANEL PATTERN





BONDING PAD DIAGRAM



Notes:

1. The substrate must be connected to Vss

2. The chip size is 3450 × 4280 μm^2

Bonding Pad List

PAD NO.	PAD NAME	PIN NAME	X	Y	PAD NO.	PAD NAME	PIN NAME	X	Y
1	SEG29<15>	1	-1205.80	1988.70	42	$\overline{\text{TESTL}}$	41	1514.90	-2009.80
2	SEG30<15>	2	-1581.90	1871.70	43	APSET	42	1589.40	-1805.40
3	SEG31<16>	3	-1581.90	1716.70	44	XT2	43	1589.40	-1638.20
4	SEG32<16>	4	-1581.90	1561.70	45	$\overline{\text{XT2}}$	44	1589.40	-1488.20
5	TEST	5	-1581.90	1389.40	46	VLCD	45	1589.40	-1333.60
6	$\overline{\text{K MUTE}}$	6	-1581.90	1231.40	47	VRTC2	46	1589.40	-1179.00
7	KT	7	-1581.90	1073.20	48	CN	47	1589.40	-996.00
8	$\overline{\text{TEST1}}$	8	-1581.90	915.20	49	CP	48	1589.40	-844.00
9	VDD	9	-1546.90	749.00	50	COM<1>	49	1589.40	-668.90
10	NC/ $\overline{\text{LOCK}}$	10	-1581.90	579.10	51	COM<2>	50	1589.40	-513.90
11	B/M	11	-1581.90	421.10	52	COM<3>	51	1589.40	-358.90
12	DTMF	12	-1581.90	248.00	53	COM<4>	52	1589.40	-203.90
13	$\overline{\text{SET}}$ RTC	13	-1581.90	67.00	54	SEG1<1>	53	1589.40	-48.90
15	VSS	14	-1581.90	-241.00	55	SEG2<1>	54	1589.40	106.10
16	H/P MUTE	15	-1581.90	-391.00	56	SEG3<2>	55	1589.40	261.10
17	T/P $\overline{\text{MUTE}}$	16	-1581.90	-549.20	57	SEG4<2>	56	1589.40	416.10
18	HFO	17	-1581.90	-707.20	58	SEG5<3>	57	1589.40	571.10
19	$\overline{\text{DP}}$ / $\overline{\text{C10}}$	18	-1581.90	-865.40	59	SEG6<3>	58	1589.40	726.10
20	MODE	19	-1581.90	-1023.40	60	SEG7<4>	59	1589.40	881.10
21	COL1	20	-1581.90	-1194.10	61	SEG8<4>	60	1589.40	1036.10
22	COL2	21	-1581.90	-1377.10	62	SEG9<5>	61	1589.40	1191.20
23	COL3	22	-1581.90	-1560.30	63	SEG10<5>	62	1589.40	1346.20
24	COL4	23	-1581.90	-1743.30	64	SEG11<6>	63	1589.40	1501.20
25	COL5	24	-1581.90	-1926.50	65	SEG12<6>	64	1589.40	1720.60
26	COL6	25	-1196.70	-2009.80	66	SEG13<7>	65	1407.40	1987.70
27	COL7	26	-1013.70	-2009.80	67	SEG14<7>	66	1158.00	1987.70
28	COL8	27	-830.50	-2009.80	68	SEG15<8>	67	1003.00	1987.70
29	COL9	28	-647.50	-2009.80	69	SEG16<8>	68	848.00	1987.70
30	ROW1	29	-464.30	-2009.80	70	SEG17<9>	69	693.00	1987.70
31	ROW2	30	-281.30	-2009.80	71	SEG18<9>	70	538.00	1987.70
32	ROW3	31	-98.10	-2009.80	72	SEG19<10>	71	383.00	1987.70
33	ROW4	32	84.90	-2009.80	73	SEG20<10>	72	228.00	1987.70
34	ROW5	33	268.10	-2009.80	74	SEG21<11>	73	72.90	1987.70
35	XT1	34	435.60	-2009.80	75	SEG22<11>	74	-82.10	1987.70
36	$\overline{\text{XT1}}$	35	585.60	-2009.80	76	SEG23<12>	75	-237.10	1987.70
37	$\overline{\text{HKS}}$	36	735.60	-2009.80	77	SEG24<12>	76	-392.10	1987.70

Bonding Pad List, continued

PAD NO.	PAD NAME	PIN NAME	X	Y	PAD NO.	PAD NAME	PIN NAME	X	Y
38	$\overline{HFI}$	37	885.60	-2009.80	78	SEG25<13>	77	-547.10	1987.70
39	V_{RTC1}	38	1040.70	-2009.80	79	SEG26<13>	78	-702.10	1987.70
40	TEST2	39	1198.80	-2009.80	80	SEG27<14>	79	-857.10	1987.70
41	ARD	40	1356.80	-2009.80	81	SEG28<14>	80	-1012.10	1987.70
14	DISP		-1581.90	-91.00					

Note: Pad 14 is for 12-digit LCD display bonding only.

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Note: All data and specifications are subject to change without notice.