



T-75-07-07

UM91260/61



10 Memory Tone/Pulse Dialer

Features

- 32-digit redial memory (31 digits in tone mode)
- Ten indirect memories, 16 digits in pulse mode, 15 digits in tone mode
- Tone/Pulse mode switching via slide switch (4.1 second pause inserted automatically)
- Wide operating voltage: 1.8V ~ 5.5V
- Uses 480 KHz ceramic resonator
- Low memory retention current ($\leq 0.1 \mu A$ at $V_{DD} = 10V, \overline{HK} = 1$)
- Selectable Make/Break ratio
- Selectable dialing rate (UM91261 only)
- Key-in tone output for valid keypad entry recognition (UM91261 only)

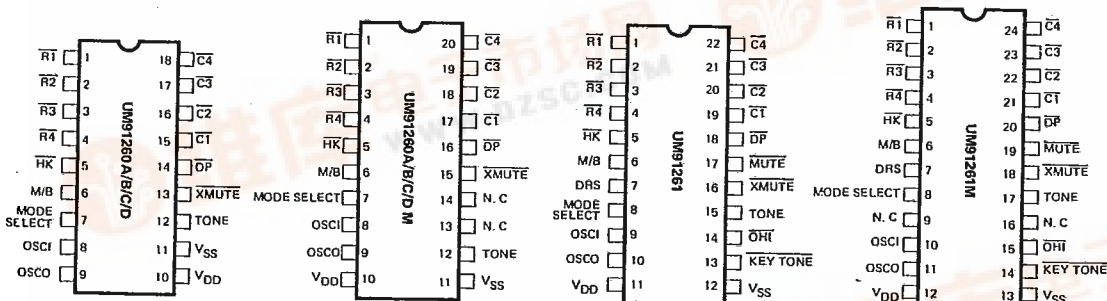
General Description

The products in the UM91260/61 series are tone/pulse switchable dialers with ten 16-digit number memories and 32-digit redial memory. Pulse to tone mode switching is performed via a slide switch. The dialing rate and storage mode for each version of the UM91260 is shown at right. The UM91261 is a 22-pin version of the 91260 with key-in tone output and selectable dialing rate and storage mode.

Ordering Information

| Part No. | Dialing rate | Storage mode | Package |
|---------------|----------------|----------------|----------------------|
| UM91260A/60AM | 10 pps | Off-hook only | P-DIP 18L/ SO 20L |
| UM91260B/60BM | 20 pps | On/Off-hook | P-DIP 18L/ SO 20L |
| UM91260C/60CM | 10 pps | On/Off-hook | P-DIP 18L/ SO 20L |
| UM91260D/60DM | 20 pps | Off-hook only | P-DIP 18L/ SO 20L |
| UM91261/61M | Pin Selectable | Pin Selectable | P-DIP 22L/ SO 24L |

Pin Configurations





UM91260/61

T-75-07-07

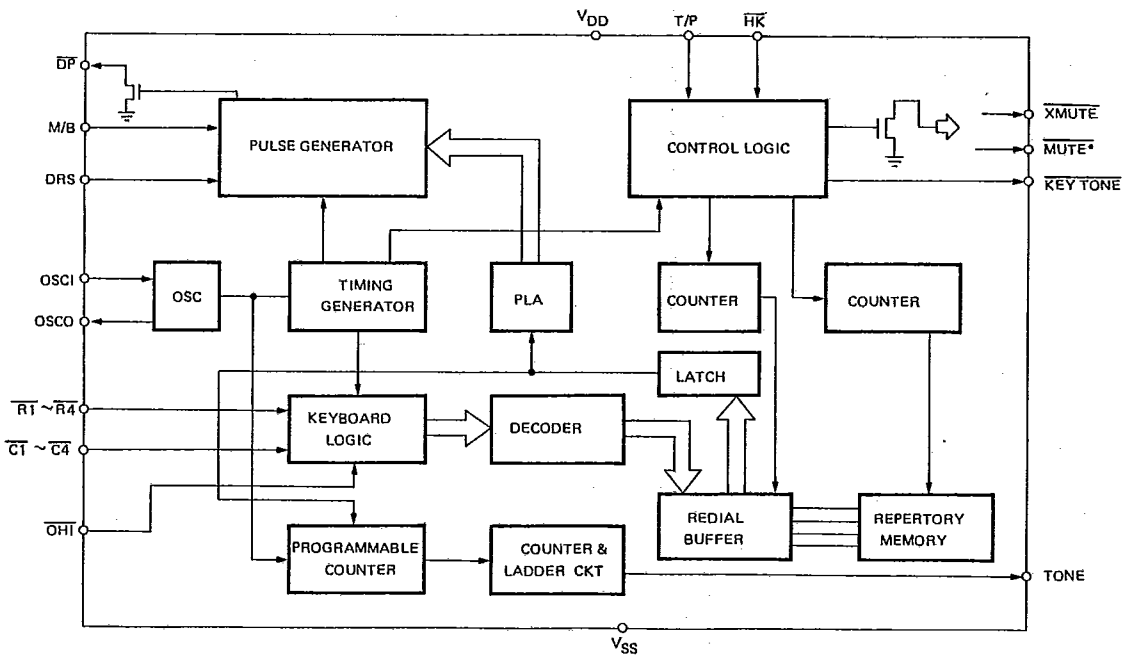
Keyboard Assignments

| | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1 | 2 | 3 | S | $\overline{R1}$ |
| 4 | 5 | 6 | A/L | $\overline{R2}$ |
| 7 | 8 | 9 | P | $\overline{R3}$ |
| * | 0 | # | R | $\overline{R4}$ |
| $\overline{C1}$ | $\overline{C2}$ | $\overline{C3}$ | $\overline{C4}$ | |

S: Store
 A/L: Auto/Location
 P: Pause
 R: Redial

Tone/Pulse Dialer

Block Diagram





UM91260/61

T-75-07-07

Absolute Maximum Ratings*

Power Supply Voltage -0.3V to +6.0V
 Input Voltage -0.3V to V_{DD} + 0.3V
 Maximum Power Dissipation (at 25°C) 500 mW
 Operating Temperature (T_{OP}) -20°C to +70°C
 Storage Temperature (T_{STG}) -55°C to +150°C

***Comments**

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Characteristics (V_{DD} = 3.5V, V_{SS} = 0V, F_{OSC} = 480 KHz, T_{OP} = 25°C, unless otherwise specified)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions | Test Ckt. |
|--|-------------------|------|------|------|-------------------|---|-----------|
| Operating Voltage | V _{DD} | 1.8 | | 5.5 | V | Pulse mode | A |
| | | 1.8 | | 5.5 | | DTMF Mode | |
| Memory Retention Voltage | V _{MR} | 1 | | | V | | - |
| Memory Retention Current | I _{MR} | | 0.05 | 0.4 | μA | V _{DD} = 1.0V All outputs unloaded HK = V _{DD} | - |
| Supply Operating Current | I _{DDP} | | 0.25 | 0.5 | mA | Oscillator running; all outputs unloaded | A |
| | I _{DDT} | | 0.46 | 1.0 | | | |
| Standby Current | I _{SD} | | 1.0 | 5.0 | μA | HK = V _{SS} V _{DD} = 2.5V All outputs unloaded | A |
| Output Sink Current DP, MUTE, XMUTE | I _{OL1} | 1.0 | 2 | | mA | V _{OL} = 0.4V | B |
| | I _{OL2} | 0.4 | 1 | | mA | V _{OL} = 0.4V V _{DD} = 2.0V | |
| Input Voltage Range | V _{IH} | 0.8 | | 1 | V _{DD} | | - |
| | V _{IL} | 0 | | 0.2 | | | |
| Row Input Current | I _R | 5 | 10 | 20 | μA | V _{IN} = 0V All outputs unloaded | C |
| Column Input Current | I _C | 0.6 | 1.4 | 2.0 | mA | V _{IN} = 3.5V All outputs unloaded | C |
| Single Column Tone Output Amplitude | V _{OC} | 540 | 590 | 640 | mV _{P-P} | R _{LOAD} = 10 KΩ V _{DD} = 2.5V | D |
| | | 100 | 1200 | 1300 | | R _{LOAD} = 10 KΩ V _{DD} = 5.5V | D |
| Single Row Tone Output Amplitude | V _{OR} | 410 | 450 | 490 | mV _{P-P} | R _{LOAD} = 10 KΩ V _{DD} = 2.5V | D |
| | | 850 | 920 | 990 | | R _{LOAD} = 10 KΩ V _{DD} = 5.5V | D |
| Pre-emphasis | T _{WIST} | 1 | 2 | 3 | dB | | D |
| Valley of Single Tone | V _V | 0.40 | 0.46 | 0.52 | V _{DD} | | D |
| Distortion | DIS% | | 1 | 5 | % | *Note 1 | D |

Note 1: $DIS(\%) = \frac{100 \cdot (V_1^2 + V_2^2 + \dots + V_n^2)^{1/2}}{(V_{IL}^2 + V_{IH}^2)^{1/2}}$

- a. V₁ V_n are the intermodulation or the harmonic frequencies in the 500 Hz to 3400 Hz band.
- b. V_{IL}, V_{IH} are the individual frequency components of the DTMF signal.



UM91260/61

T-75-07-07

AC Characteristics

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------------|-------------|-----------------------------------|-----------|------|------|------|
| PULSE | | | | | | |
| Make/Break Ratio | M/B | M/B Terminal = V_{DD} | | 1/2 | | |
| | | M/B Terminal = V_{SS} | | 2/3 | | |
| Dial Pulse Rate | DR | DRS = V_{DD} (20 pps Selection) | | 20 | | PPS |
| | | DRS = V_{SS} (10 pps Selection) | | 10 | | |
| Make Time | T_M | 10 pps | MB = 1/2 | | 33.3 | ms |
| | | | MB = 2/3 | | 40.0 | |
| | | 20 pps | M/B = 1/2 | | 16.7 | |
| | | | M/B = 2/3 | | 20.0 | |
| Break Time | T_B | 10 pps | M/B = 1/2 | | 66.6 | ms |
| | | | M/B = 2/3 | | 60 | |
| | | 20 pps | M/B = 1/2 | | 33.3 | |
| | | | M/B = 2/3 | | 30 | |
| Inter-Digit Pause Time | T_{IDP} | 10 pps | M/B = 1/2 | | 806 | ms |
| | | | M/B = 2/3 | | 800 | |
| | | 20 pps | M/B = 1/2 | | 523 | |
| | | | M/B = 2/3 | | 520 | |
| Pre-Digit Pause | T_{PDP} | 10 pps | M/B = 1/2 | | 840 | ms |
| | | | M/B = 2/3 | | 840 | |
| | | 20 pps | M/B = 1/2 | | 540 | |
| | | | M/B = 2/3 | | 540 | |
| \overline{XMUTE} MUTE DELAY Time | T_{MDP} | 10 pps | M/B = 1/2 | | 0 | ms |
| | | | M/B = 2/3 | | 0 | |
| | | 20 pps | M/B = 1/2 | | 0 | ms |
| | | | M/B = 2/3 | | 0 | |
| TONE | | | | | | |
| Minimum Tone Duration | T_{MFD} | | | 110 | | ms |
| Min. Tone Inter-Digit Pause | T_{TIDP} | | | 110 | | ms |
| Tone Output Pre-Digit Pause | T_{TPDP} | | | 130 | | ms |
| \overline{XMUTE} Delay Time | T_{MDT} | | | 110 | | ms |
| Auto Pause Time | T_{AP} | | | 4.1 | | S |
| Oscillator Start-up Time | T_{START} | | | 8 | | ms |

Tone/Pulse Dialer



UM91260/61

T-75-07-07

AC Characteristics (Continued)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------------|---------------|--|------|------|------|------|
| X MUTE, MUTE Start-up Time | T_{MS} | | | 30 | | ms |
| KEY-IN | | | | | | |
| Keypad Debounce Time | T_{KD} | | | | | |
| Key Scan Frequency | F_{KS} | $\overline{C1} \sim \overline{C4}, \overline{R1} \sim \overline{R4}$ | | 22 | | ms |
| KEY-IN TONE | | | | 377 | | Hz |
| KT, Duration Time | T_{KTD} | | | | | |
| KT Frequency | F_{KT} | | | 42 | | ms |
| KT Start-up Time | $T_{KTSTART}$ | | | 1.2 | | KHz |
| | | | | 30 | | ms |

| R/C | Conditions | Spec. | Actual | Error (%) | Unit |
|-----------------|-----------------------------|-------|---------|-----------|------|
| $\overline{R1}$ | $F_{OSC} = 480 \text{ KHz}$ | 697 | 695.65 | -0.19 | HZ |
| $\overline{R2}$ | | 770 | 769.23 | -0.1 | HZ |
| $\overline{R3}$ | | 852 | 851.06 | -0.11 | HZ |
| $\overline{R4}$ | | 941 | 941.18 | +0.02 | HZ |
| $\overline{C1}$ | | 1209 | 1212.12 | +0.26 | HZ |
| $\overline{C2}$ | | 1336 | 1333.33 | -0.2 | HZ |
| $\overline{C3}$ | | 1477 | 1481.48 | +0.3 | HZ |

Pin Description

| Pin No. | | Designation | Description |
|---------|-------|--|--|
| 91260 | 91261 | | |
| 1 | 1 | $\overline{R1} \sim \overline{R4}$ $\overline{C1} \sim \overline{C4}$ | Key inputs. When a row and a column are connected, a key operation is activated. If the On-Hook Store pin is inhibited, the row and column pins remain at high impedance in the On-Hook state. If the On-Hook Store pin is available, the column input is pulled low and the row input is pulled high. Scanning signals are present on both the row and column pins during a valid key-in condition. The key-in debounce time is typically 22 ms. |
| 2 | 2 | | |
| 3 | 3 | | |
| 4 | 4 | | |
| 15 | 19 | | |
| 16 | 20 | | |
| 17 | 21 | | |
| 18 | 22 | | |
| 5 | 5 | \overline{HK} | Hook switch input. When $\overline{HK} = V_{DD}$, an On-Hook state exists. When $\overline{HK} = V_{SS}$, an Off-Hook state exists. |
| 6 | 6 | M/B | Dial pulse Make/Break ratio select input. If $M/B = V_{DD}$, the Make/Break ratio is 1/2. If $M/B = V_{SS}$, the Make/Break ratio is 2/3. |



T-75-07-07

Pin Description (Continued)

| Pin No. | | Designation | Description |
|----------|----------|------------------------------------|---|
| 91260 | 91261 | | |
| - | 7 | DRS | Dialing rate select input. If DRS = V _{DD} , the dialing rate is 20 pps. If DRS = V _{SS} , the dialing rate is 10 pps. |
| 7 | 8 | MODE SELECT | Pulse/DTMF mode select input. If MODE SELECT = V _{DD} , Pulse mode is in effect. If MODE SELECT = V _{SS} , DTMF mode is in effect. |
| 8 9 | 9 10 | OSCI OSCO | Oscillator I/O. A 480 KHz ceramic resonator and two 100 pF serial loading capacitors form a complete oscillator circuit. The circuit is activated when \overline{HK} is low. Oscillator start-up time is typically 10 ms. |
| 10 11 | 11 12 | V _{DD} V _{SS} | Positive power supply. Negative power supply. Operating voltage range: Pulse mode = 1.8V to 5.5V DTMF mode = 1.8V to 5.5V |
| - | 13 | $\overline{\text{KEY-TONE}}$ | Key-in tone output. This output is valid for both Pulse and Tone modes. Output frequency is 1.5 KHz and has a duration of 42.6 ms after a valid key-in is detected. This function is only available on the UM91261. |
| - | 14 | $\overline{\text{OHI}}$ | On-Hook store. On-hook store function is available when this input is high, inhibited when this input is low. |
| 12 | 15 | TONE | DTMF signal output. Pull-down load resistance is 10,000Ω. The minimum tone and IDP durations are built-in for both normal dialing and redialing. |
| 13 | 16 | $\overline{\text{X MUTE}}$ | Transmit mute output. This is an N-channel open drain output. The output transistor is switched on while a sequence of digits is being dialed (for both Pulse and Tone modes). Otherwise, it is switched off. |
| - | 17 | MUTE | Mute output. This is an N-channel open drain output. The output transistor is switched on while a sequence of pulse digits is being dialed. Otherwise, it is switched off. |
| 14 | 18 | DP | Dial pulse output. This pin is an N-channel open drain output. When $\overline{\text{DP}}$ output is low (switched on), it serves as a break signal in Pulse dialing. For other operations, $\overline{\text{DP}}$ output is normally high impedance (switched off). |

Tone/Pulse Dialer



UM91260/61
T-75-07-07

Operational Procedures

9-1 Symbol definitions

- a. D_p : Pulse digit, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0
- b. D_t : tone digit, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, #
- c. LOC_i : $i = 1, 2, 3, 4, 5, 6, 7, 8, 9, 0$
- d. ZiZiZi: Conversation mode
- e. $0-0 \uparrow$: OFF-HOOK
- f. $0-0 \downarrow$: ON-HOOK
- g. : Input Level from Low to high
- h. : Input Level from High to Low.

9-2 Recommended dialing, redialing, mixed dialing and storing operations

1. Normal dialing in pulse mode
 $0-0 \uparrow, D_p \dots D_p, ZiZiZi 0-0 \downarrow$
2. Normal dialing in tone mode
 $0-0 \uparrow, D_t \dots D_t, ZiZiZi 0-0 \downarrow$
3. Mixed dialing in pulse-to-tone mode
 $0-0 \uparrow, D_p \dots D_p \text{ MODE SELECT.}$
 $D_t \dots D_t, ZiZiZi 0-0 \downarrow$
4. Redialing
 $0-0 \uparrow, D_p \dots D_p \cdot 0-0 \downarrow, 0-0 \uparrow,$
 $R, ZiZiZi, 0-0 \downarrow$
 $0-0 \uparrow, D_t \dots D_t \cdot 0-0 \downarrow, 0-0 \uparrow,$
 $R, ZiZiZi, 0-0 \downarrow$

5. Storing Numbers to Repertory Memory
 - (i) Off-hook Store $0-0 \uparrow, [S], D_p \dots D_p \text{ or } D_t \dots D_t$
 $[A/L], LOC_i, 0-0 \downarrow$
 - (ii) On/Off-hook store: $0-0 \downarrow, [S], D_p \dots D_p \text{ or } D_t \dots D_t$
 $[A/L], LOC_i,$
6. Dialing from Repertory Memory
 $0-0 \uparrow, [A/L], LOC_i, ZiZiZi 0-0 \downarrow$

Functional Description

1. N-Channel Open Drain Output – $\overline{DP}, \overline{XMUTE}, \overline{MUTE},$

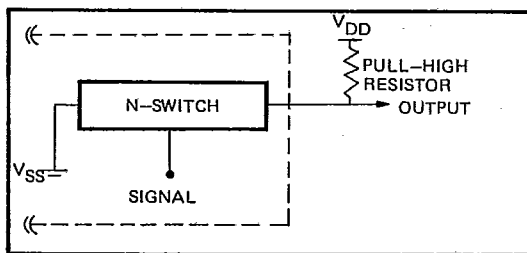


Figure. 1

2. DTMF Generator
The digitally synthesized sinewave of the UM91260 series is well designed, with a 6 level, 12 segment, $1/2 V_{DD}$ reference voltage (see Fig. 2). The THD (Total Harmonic Distortion) of the DTMF output is typically 1%, when $V_{DD} = 2.5V$ to $5.5V$ and frequency is in the 500 HZ to 3400 HZ band.
DTMF Signal THD vs. operating voltage and DTMF output amplitude vs. operating voltage is shown in figures 3 and 4.

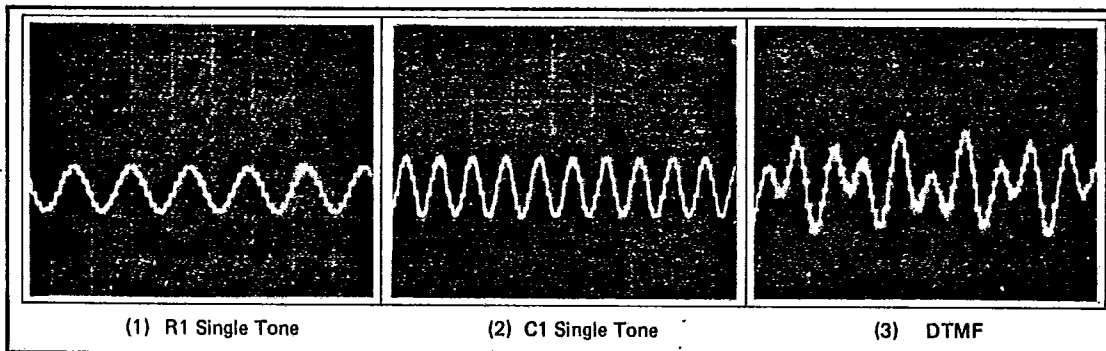


Figure 2 Waveforms



UM91260/61

T-75-07-07

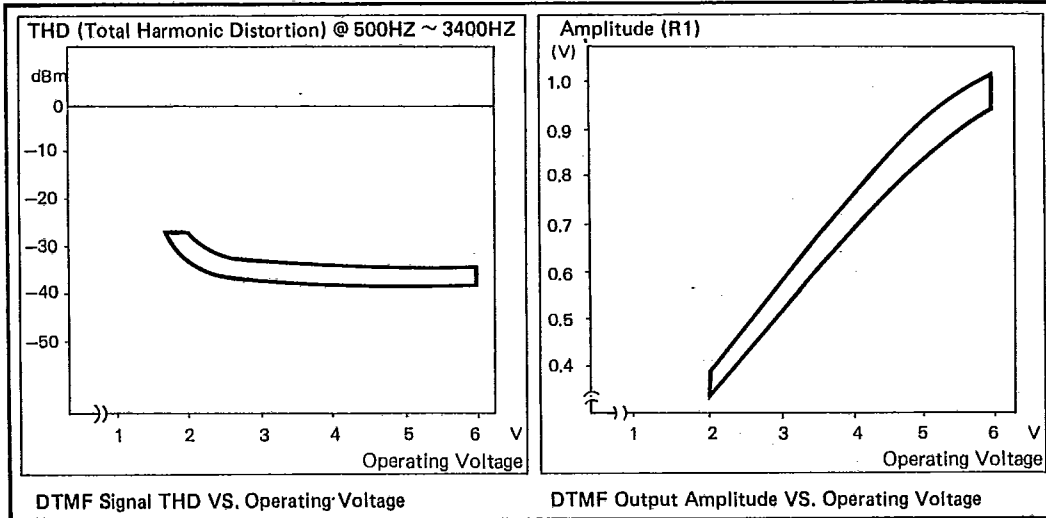
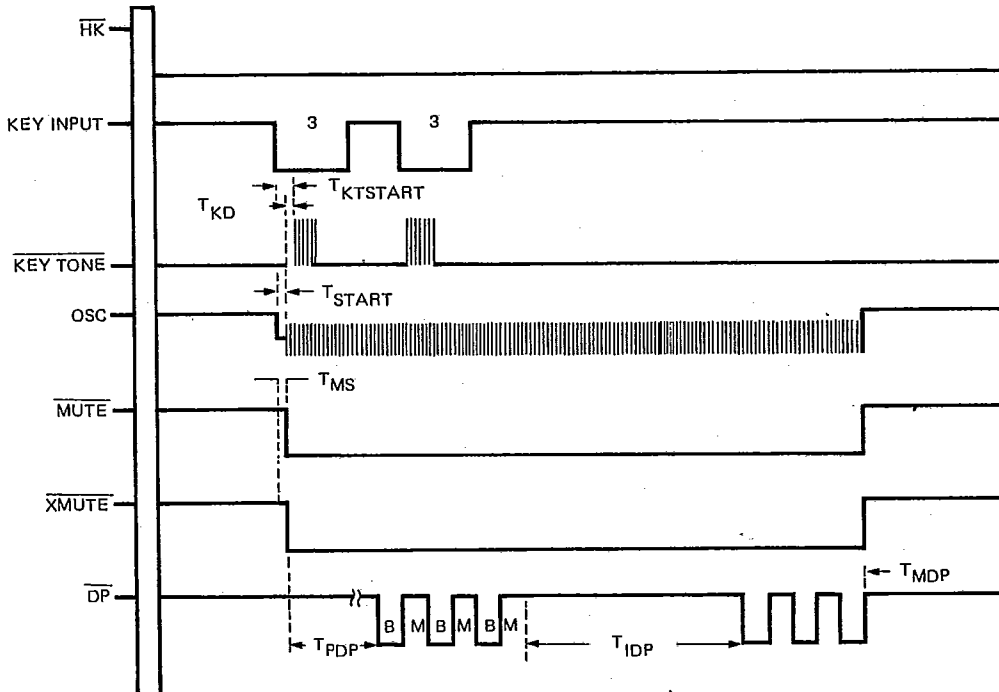


Figure 3

Figure 4

Timing Diagrams

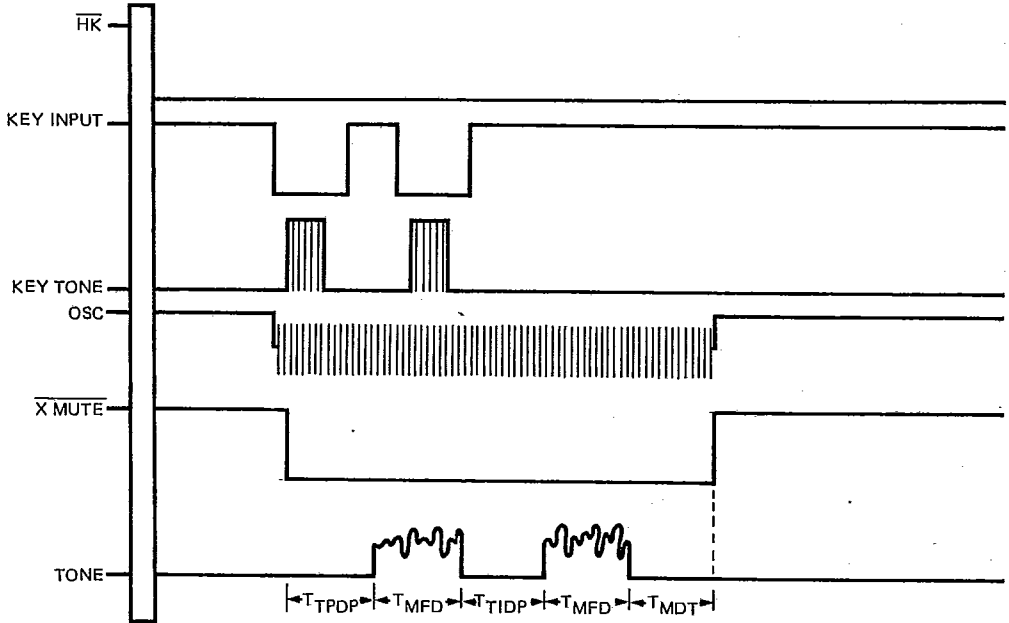
(1) PULSE MODE TIMING DIAGRAM



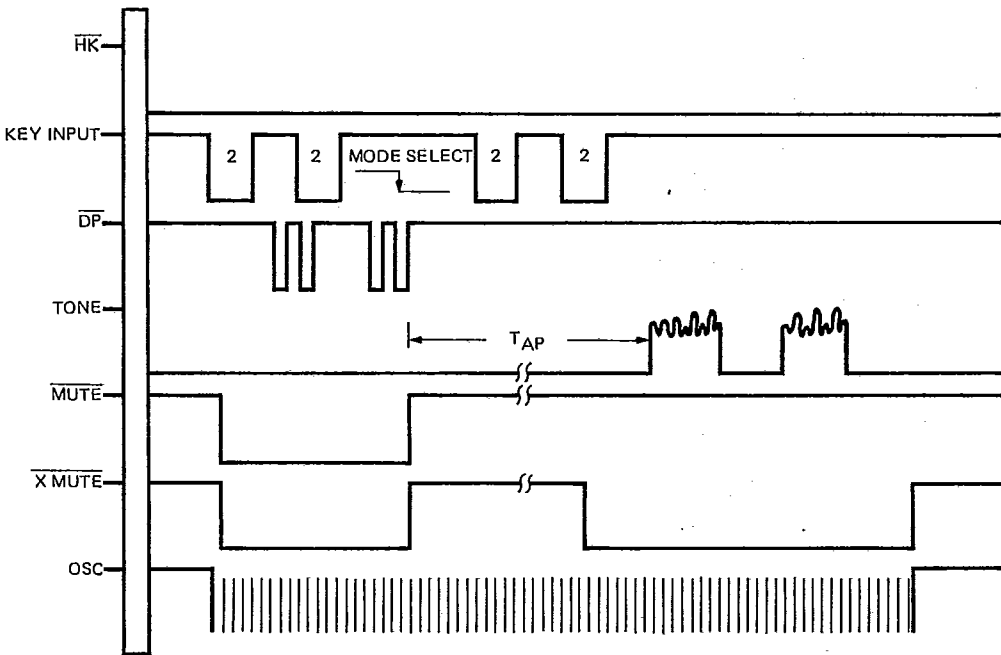


UM91260/61
T-75-07-07

(2) TONE MODE TIMING DIAGRAM



(3) NORMAL PULSE TO TONE MIXED DIALING VIA SLIDE SWITCH

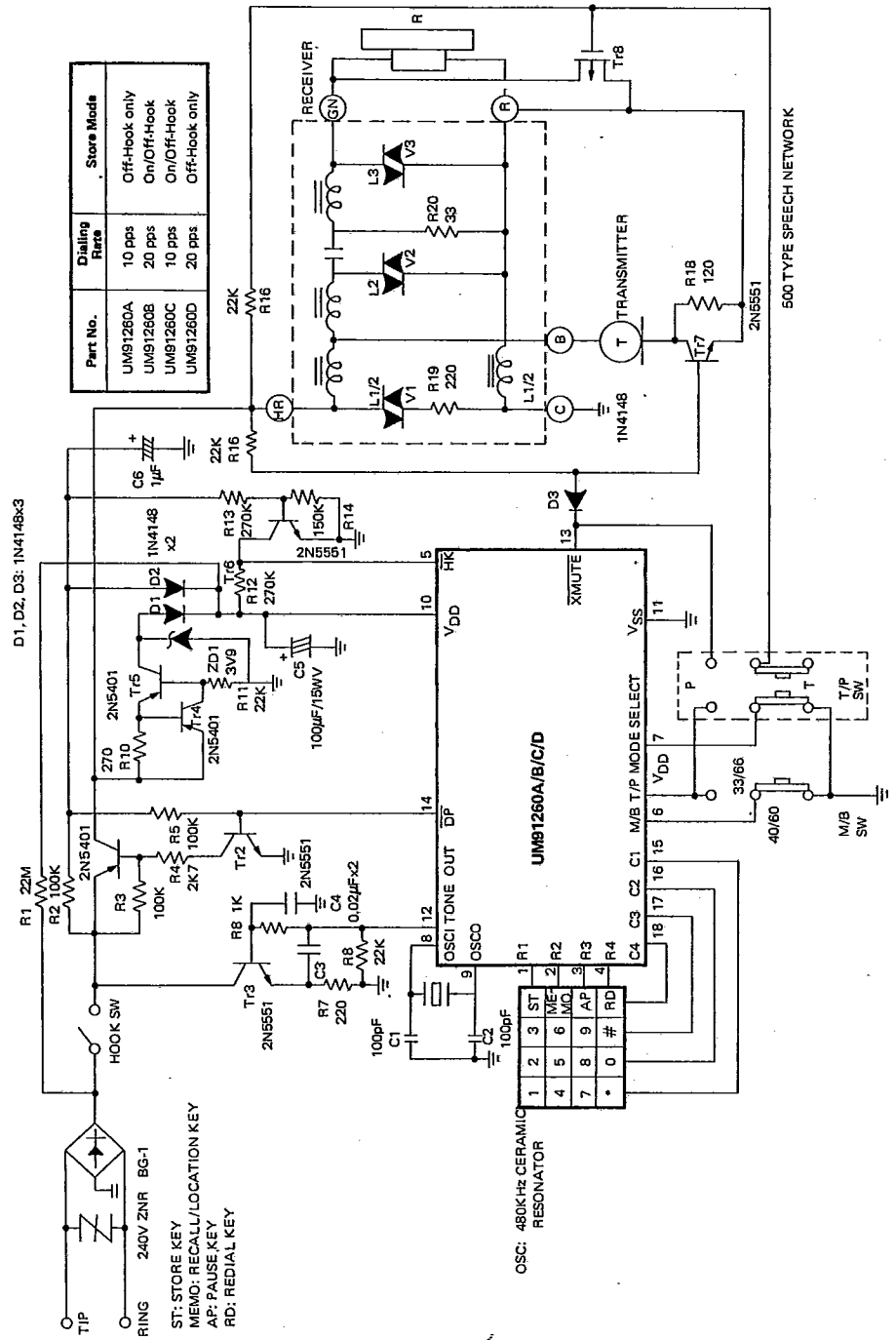




UM91260/61

Typical Application Circuit

T-75-07-07



Tone/Pulse Dialer



UM91260/61

T-75-07-07

Test Circuits

