



13-MEMORY TONE/PULSE SWITCHABLE DIALER WITH SAVE FUNCTION

GENERAL DESCRIPTION

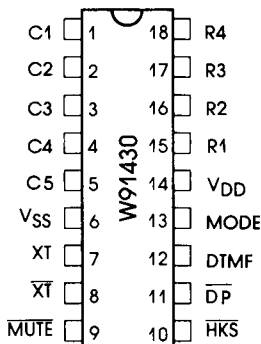
The W91430 series are monolithic integrated circuit. It contains 13 memories which can perform Tone/Pulse switchable dialing functions. It is fabricated in CMOS technology thus has good performance in low voltage, low power operations.

Three 16-digits direct dialing memories and two 32-digits Redial & Save memories are design for convenient operations.

FEATURES

- DTMF/PULSE switchable dialer.
- 2 by 32 digits for Redial and Save memory.
- 3 by 16 digits for one touch direct repertory memory.
- 10 by 16 digits for two touch indirect repertory memory.
- Tone key (* key) for Long Distance Call operation.
- Redial memory cascadable with normal dialing and dialing length is unlimit, but if dialing length overstep 32 digits the Redial is inhibited.
- Fully key-ined & key-released debounced 4 × 5 keyboard.
- Easy operation with Redial, Flash, Pause and P-T (*) keypads.
- Flash, Pause, P-T (*) can be stored as a digit in memory.
- Minimum tone output duration: 100mS.; Minimum inter tone pause: 100mS.
- Dial rate 10 or 20 pps is selectable by pin option.

PIN CONFIGURATION



TONE/PULSE
DIALER

- Typical inter digit pause (IDP): 800mS. (10 pps); 500 mS. (20 pps) in Pulse mode.
- Power on reset on chip.
- Long mute for Redial & Repertory dialing.
- Uses 3.579545 MHz TV quartz crystal or ceramic resonator.
- DIP plastic 18 PIN package
- Pulse number, Pause time, Flash time are selected by type number. (See TABLE 1)

TABLE 1

TYPE NO.	DIALING SEQ.	PAUSE	B:M	FLASH	FLASH PAUSE
W91432	10/20 pps (Normal)	2.0 SEC	3:2	600 mS	600 mS
W91433			2:1		
W91434	10/20 pps (Normal)	3.6 SEC	3:2	73 mS	140 mS
W91435			2:1		
W91436	10/20 pps (Normal)	3.6 SEC	3:2	600 mS	600 mS
W91437			2:1		
W91438	10 pps (N+1)	3.6 SEC	3:2	73 mS	140 mS
W91439	10 pps (10-N)	3.6 SEC	2:1	73 mS	140 mS

NORMAL

0--10 pulses
 1--1 pulses
 2--2 pulses
 3--3 pulses
 4--4 pulses
 5--5 pulses
 6--6 pulses
 7--7 pulses
 8--8 pulses
 9--9 pulses
 *-- Ignored
 #-- Ignored

N+1
SWEDISH/DANISH

0--1 pulses
 1--2 pulses
 2--3 pulses
 3--4 pulses
 4--5 pulses
 5--6 pulses
 6--7 pulses
 7--8 pulses
 8--9 pulses
 9--10 pulses
 *-- Ignored
 #-- Ignored

10-N
NEW ZELAND

0--10 pulses
 1--9 pulses
 2--8 pulses
 3--7 pulses
 4--6 pulses
 5--5 pulses
 6--4 pulses
 7--3 pulses
 8--2 pulses
 9--1 pulses
 *-- Ignored
 #-- Ignored

ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	RATING	UNIT
DC supply voltage	-0.3 ~ 7.0	V
Input voltage range	-0.3 ~ V _{DD} +0.3	V
Power dissipation per package	120	mW
Operation temperature	-20 ~ +70	°C
Storage temperature	-55 ~ +150	°C

D.C. CHARACTERISTICS
 $V_{DD}-V_{SS}=2.5V$, $F_{osc}=3.56\text{ MHz}$, $T_a=25^{\circ}\text{C}$ All output Unloaded

CHARACTERISTIC	SYM.	TEST	CONDITION	MIN.	TYP.	MAX.	UNIT
OP. Voltage	V_{DD}		-	2.0	-	5.5	V
OP. Current	I_{OP}	A	Tone	-	-	1.0	mA
			Pulse	-	-	0.5	
Standby Current	I_{SB}	A	HKS=0, No load & No key entry	-	-	15	μA
Memory Retention Current	I_{MR}	B	HKS=1, $V_{DD}=1.0V$	-	-	0.2	μA
Tone Output Voltage	V_{TO}	C	Row group, $R_L=10K\Omega$	130	150	170	mVrms
Pre-emphasis		D	Col/Row 2.0-5.5V	1	2	3	dB
DTMF Distortion	T_{HD}	D	$R_L=10K\Omega$ 2.0-5.5V	-	-30	-23	dB
Tone Output DC Level	V_{TDC}	D	2.0-5.5V	1.1	-	2.8	V
Tone Output Sink Current	I_{TL}	F	$V_{TO}=0.5V$	0.2	-	-	mA
Pulse Output Sink Current	I_{PL}	E	$V_{PO}=0.5V$	0.5	-	-	mA
Mute Output Sink Current	I_{ML}	E	$V_{MO}=0.5V$	0.5	-	-	mA
HKS pull high resister	R_{KH}			300	-	-	$K\Omega$
Keypad Input Drive Current	I_{KD}	F	$V_I=0V$	4	10		μA
Keypad Input Sink Current	I_{KS}	F	$V_I=2.5V$	200	400	-	
Keypad Input Resistance	R_{KH}			-	-	5.0	$K\Omega$

A.C. CHARACTERISTICS

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Key In Debounce	T _{KID}		-	20	-	mS
Key Release Debounce	T _{KRD}		-	20	-	mS
Pre-digit-pause (1)	T _{PDP1} 10pps	B/M=3:2	-	40	-	mS
		B/M=2:1	-	33.3	-	
Pre-digit-pause (2)	T _{PDP2} 20 pps	B/M=3:2	-	20	-	mS
		B/M=2:1	-	16.7	-	
Pulse Rate (1)	F _{PR1}	Pin option	-	10	-	pps
Pulse Rate (2)	F _{PR2}		-	20	-	
Inter Digit Pause	T _{IDP1}	10 pps	-	800	-	mS
	T _{IDP2}	20 pps	-	500	-	
Break/Make Ratio	B:M	B/M=3:2	-	60:40	-	%
		B/M=2:1	-	67:33	-	
Tone Output Duration	T _{TD}		-	100	-	mS
Inter Tone Pause	T _{ITP}		-	100	-	mS
Flash Time	T _F	TABLE 1	-	600	-	mS
			-	73	-	
Flash Pause	T _{FP}	TABLE 1	-	600	-	mS
			-	140	-	
Pause Time	T _P	TABLE 1	-	2.0	-	S
			-	3.6	-	
Row Group Frequency	F1	ROW 1	-	699	-	Hz
	F2	ROW 2	-	766	-	
	F3	ROW 3	-	848	-	
	F4	ROW 4	-	948	-	
Column Group Frequency	F5	COL 1	-	1216	-	Hz
	F6	COL 2	-	1332	-	
	F7	COL 3	-	1472	-	

PIN /FUNCTION DESCRIPTION

A. ROW-COLUMN INPUTS (pins 1-5 & 15-18)

The keyboards input is compatible with the standard 2-of-9 keyboard, the inexpensive single contact (Form A) keyboard, and electronic input.

In normal operation, any single button is pushed to produce dual tone, pulses or functions. Activation of two or more buttons will result in no response, except for single tone.

B. XT, $\overline{XT}$ (Pin 7 & 8)

An built in inverter provides oscillation with an inexpensive 3.579545 MHz TV color burst crystal. The oscillator ceases when a keypad input is not sensed. Most crystals do not vary more than $\pm 0.02\%$.

C. MUTE (pin 9)

The MUTE is a conventional CMOS N-Channel open drain output. The output transistor is switched on during dialing sequence (both Pulse and Tone mode). Otherwise, it is switched off.

D. $\overline{HKS}$ (pin 10)

The $\overline{HKS}$ (HOOK SWITCH) input is used to sense the state of handset in ON HOOK or OFF HOOK. In ON HOOK state, $\overline{HKS}=1$, or open the keyboard input is disabled, there is not any operation for any keyboard entry, to avoid the energy lose stored in capacitor. In OFF HOOK state, $\overline{HKS}=0$, all of the function work.

$\overline{HKS}$ pin is pulled to V_{DD} by internal resistor.

E. $\overline{DP}$ (pin 11)

This pin is an N-channel open drain output. The output is low (switched on) in the dial pulse "Break" operation during Off Hook Pulse. Otherwise, this output is "open" (switched off).

In Pulse mode, the output sends a chain of pulses to correspond the address keypad input, but keep open level for * and # entry and can not be stored in memory for # entry. In Pulse mode, the * key is a tone key, if * key is key-ined then it will be changed to Tone mode from Pulse mode.

Table-2 is the operation function table for* key.

Fig. - 1(a,b) shows the timing diagram in pulse mode. The pulses rate and inter digit pause are fixed, to be 10 pps (800 mS) and 20 pps (500 mS) respectively.

F. DTMF (pin 12)

This pin is used to output DTMF address signals. During pulse dialing, it always keep at low state regardless of keypad input. In tone mode, it will output dual or single tone. The detail timing diagram of tone mode is shown in Fig. - 2(a,b).

Output Frequency (Hz)			% Error
Specified		Actual	
R1	697	699	+0.28
R2	770	766	-0.52
R3	852	848	-0.47
R4	941	948	+0.74
C1	1209	1216	+0.57
C2	1336	1332	-0.30
C3	1477	1472	-0.34

G. MODE (pin 13)

Pulls pin 13 to V_{DD} or floating, the dialer is in pulse mode, the pulse rate is 10 pps or 20 pps respectively.

Pulls pin 13 to V_{SS} , it is in DTMF mode.

H. V_{DD} , V_{SS} (pin 14, 6)

These are the power input pins for the Tone/Pulse dialer.

TONE/PULSE
DIALER

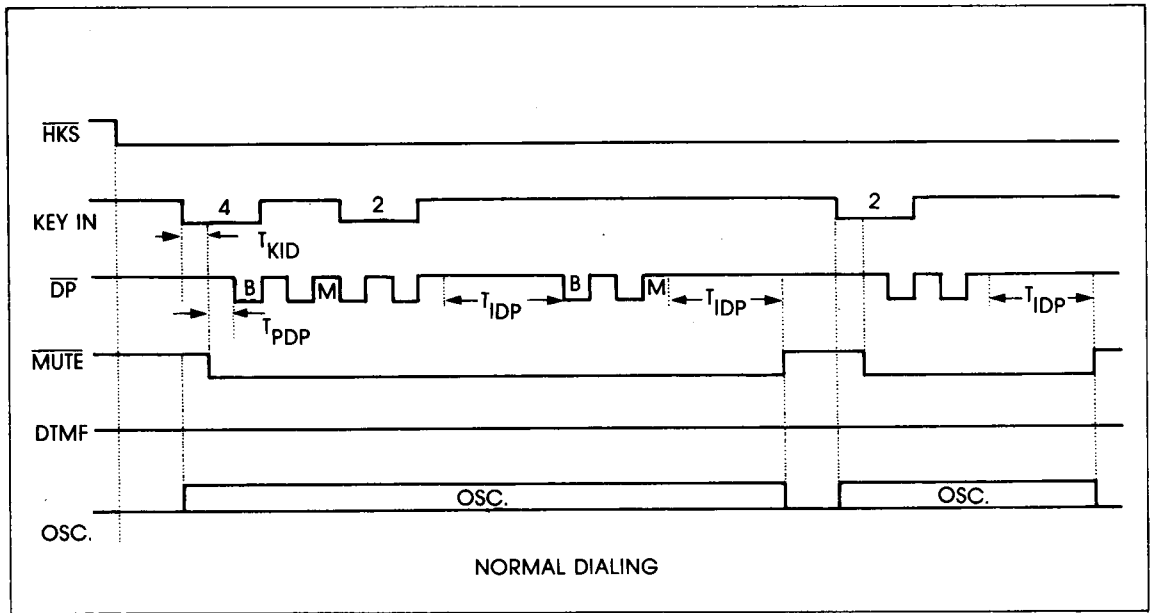


Figure.1-(a) Pulse Mode Timing Diagram

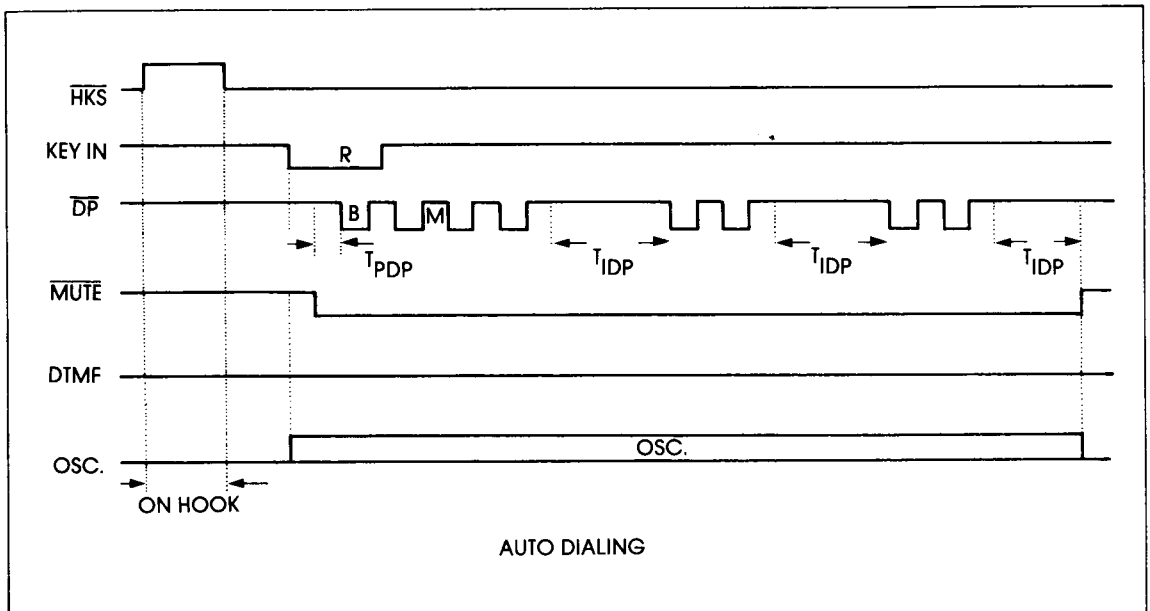


Figure.1-(b) Pulse Mode Timing Diagram

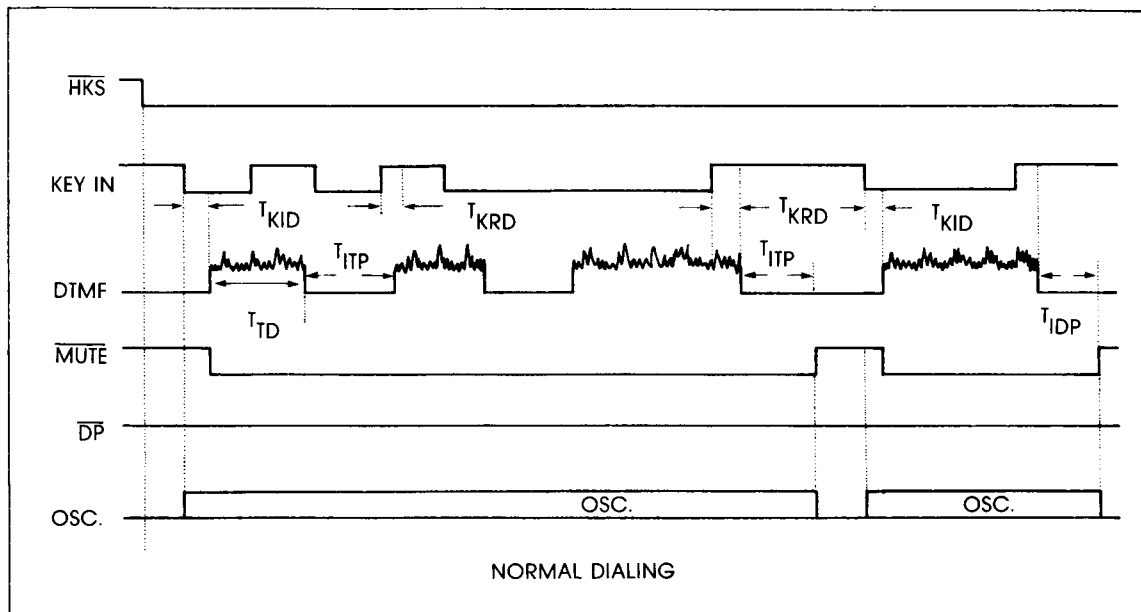


Figure.2-(a) Tone Mode Timing Diagram

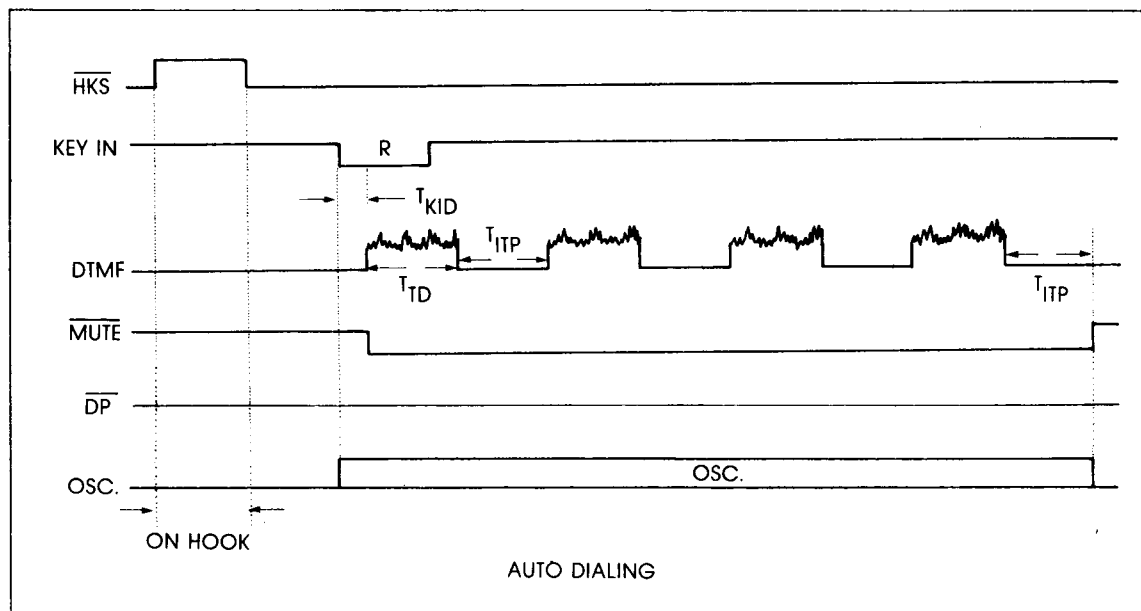


Figure.2-(b) Tone Mode Timing Diagram

KEYBOARD FUNCTION

C1	C2	C3	C4	C5	
1	2	3	STR	M1	R1
4	5	6	F	M2	R2
7	8	9	AUTO	M3	R3
(P [*] -T)	0	#	R/P	SAVE	R4

KEYBOARD OPERATION

Note:

- All the keyboard operations should be under OFF HOOK condition.
- D1-Dn: 0-9, *, #.
- Mn: M1-M3
- Ln: Memory location 0-9
- The number D1, D2, ---, Dn will be dialed out in Pulse or Tone mode as mode selected.

A. NORMAL DIALING

[OFF HOOK] [D1] [D2] ---, [Dn]

D1, D2 ---, Dn will be dialed out.

Dialing length is unlimit, but if dialing length overstep 32 digits the Redial is inhibited.

B. REDIALING

[OFF HOOK] [R/P]

The [R/P] key can execute Redial function only in first key in after OFF HOOK, otherwise will be Pause function.

C. NUMBER STORE

- [OFF HOOK] [D1] [D2] --- [Dn] [S] [S] [Mn] or [Ln] [ON HOOK]

D1, D2, ---, Dn will be stored in Mn memory location and they will be dialed out.

- [OFF HOOK] [S] [D1] [D2] ---, [Dn] [S] [Mn] or [Ln] [ON HOOK]

D1, D2, ---, Dn will be stored in Mn memory location but they will not be dialed out.

[F] [R/P] and [P-T] keys can be stored as a digit in memory, but [R/P] key can not be occupied in first digit. The store mode can be released after the store function is executed or the present state of hook switch is changed.

TABLE 2.

Function Mode	Normal Dialing	Redialing	Repertory Dialing	Save Dialing
Tone Mode	.	.	Pause	Pause
Pulse Mode	P-T Pause	P-T Pause	P-T Pause	P-T Pause

D. MEMORY DIALING

- [OFF HOOK] [Mn]
- [OFF HOOK] [AUTO] [Ln]

E.ACCESS PAUSE

OFF HOOK [D1], [D2], [R/P], [D3], ..., [Dn],

BUSY ON HOOK

Come OFF HOOK [R/P]

The Pause function is executed in Normal dialing or Memory dialing. Auto Pause 2.0 or 3.6 sec per Pause, that selects by type number. Pause function timing diagram is shown in Fig.-3.

F.PULSE TO TONE (* key)

OFF HOOK [D1], [D2], ..., [Dn], [P→T], [Di], [Dj],

[P→T], [D1'], [D2'], ..., [Dn']

If the mode switch is set in Pulse mode, then the output signal will be:

D1, D2, - - -, Dn, (Pulse) Pause (2.0s/3.6s), Di, Dj, DTMF(*), D1', D2', - - -, Dn' (Tone)

If the mode switch is set in Tone mode, then the output signal will be:

D1, D2, - - -, Dn, (Tone) DTMF(*), Di, Dj, DTMF(*), D1', D2', - - -, Dn' (Tone)

It can be reset to Pulse mode only in operation of ON HOOK, because it's still in Tone mode when the digits have been dialed out. P→T function timing diagram is shown in Fig-4.

G.FLASH

OFF HOOK [F]

It will execute ON HOOK 600 msec (or 73 msec), and pause for 600 msec (or 140 mS) before the next digit is dialed out. Flash key can be stored as a digit in memory. The Flash function timing diagram is shown in Fig.-5.

H.SAVE KEY

1. OFF HOOK [D1] [D2] ..., [Dn] SAVE

ON HOOK Come OFF HOOK SAVE

D1, D2, - - -, Dn will be dialed out after SAVE key is keyed.

2. OFF HOOK [D1] [D2] ..., [Dn] or [Mn]

CONVERSATION

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

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

3. OFF HOOK [S] SAVE

It will copy redial buffer content to SAVE memory.

I.MIX DIALING

1. Normal dialing + Memory dialing +

Normal dialing

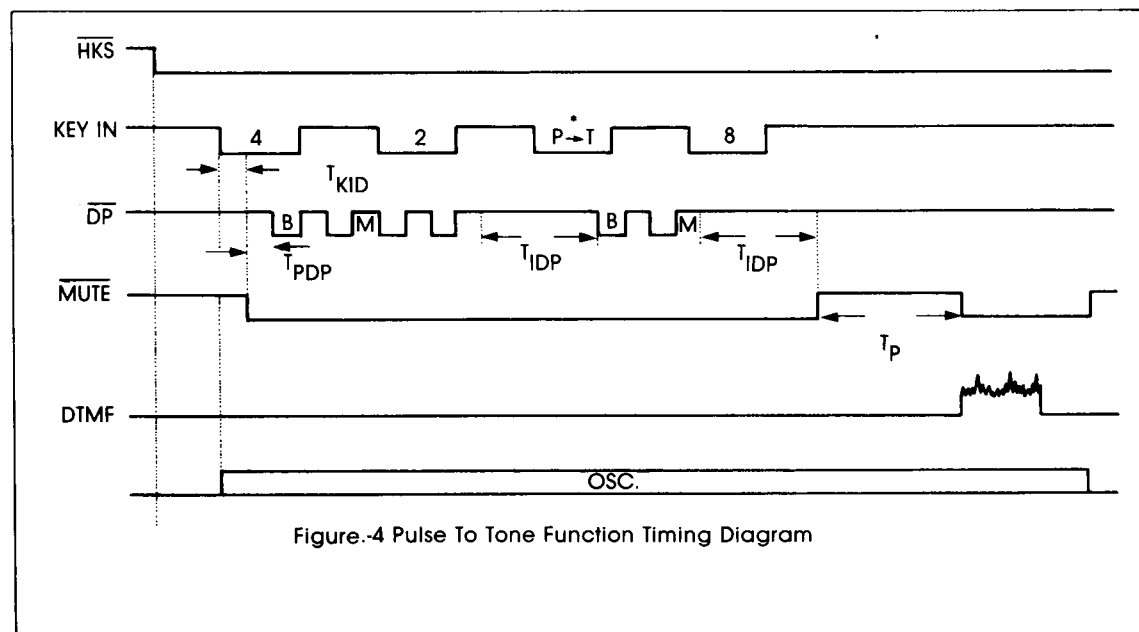
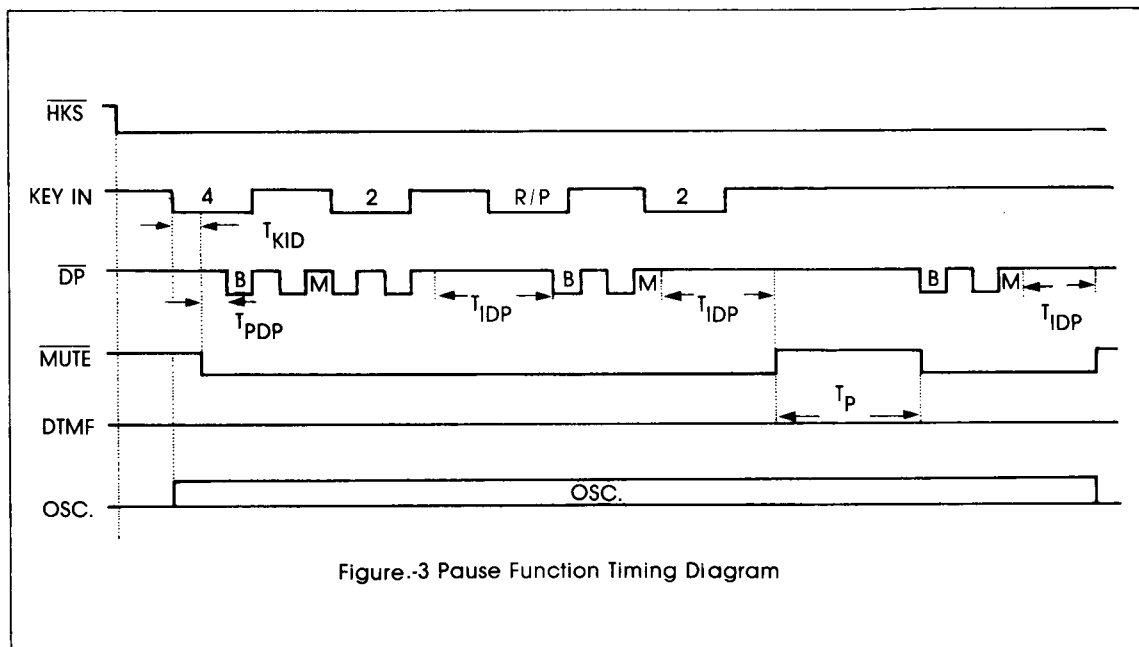
2. Memory dialing + Normal dialing +

Memory dialing

3. Redialing + Normal dialing +

Memory dialing

Redialing and Save dialing valid just for first key-in.



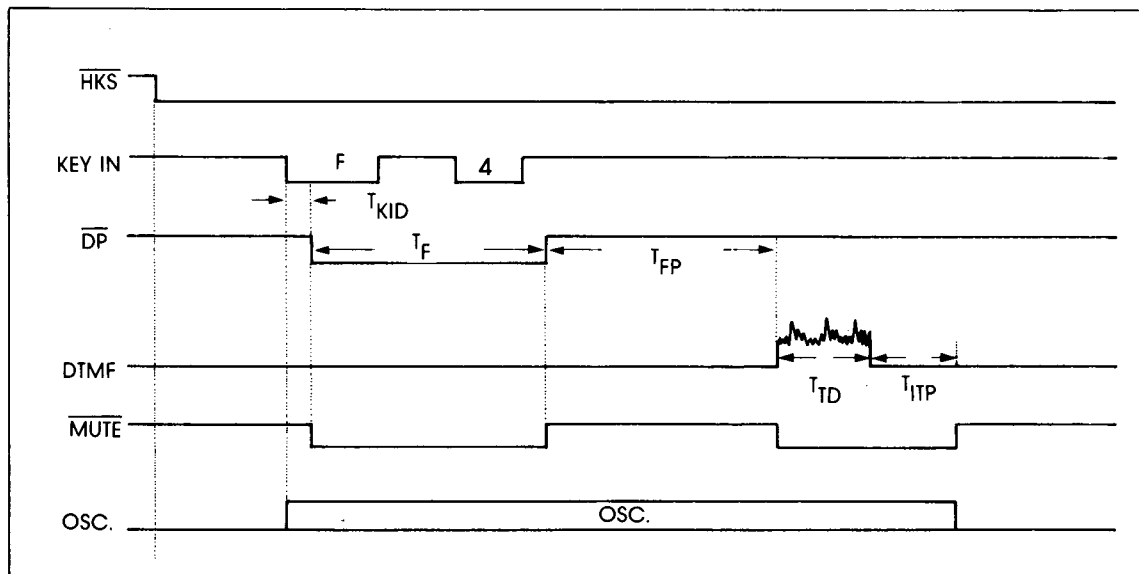
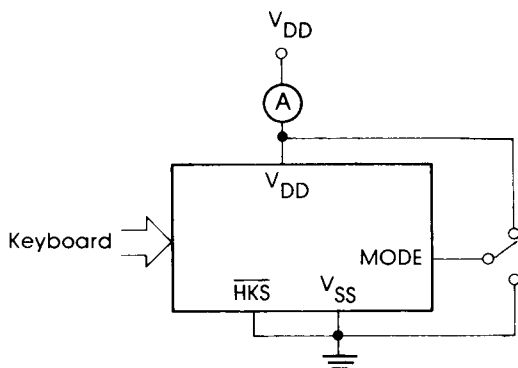


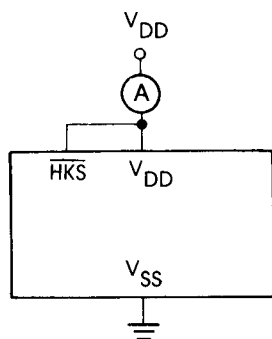
Figure -5 Flash Function Timing Diagram

TEST CIRCUIT

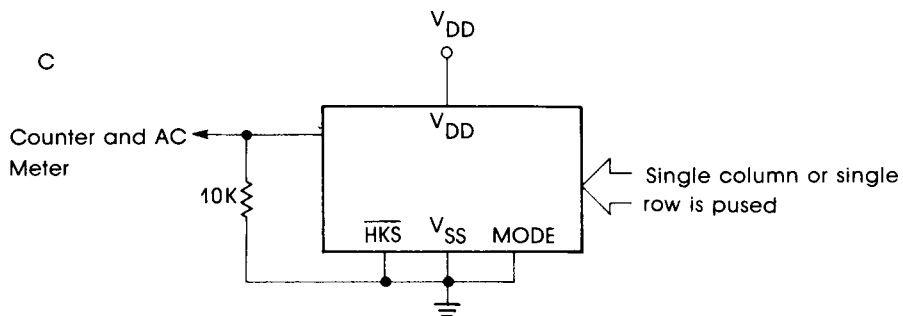
A



B

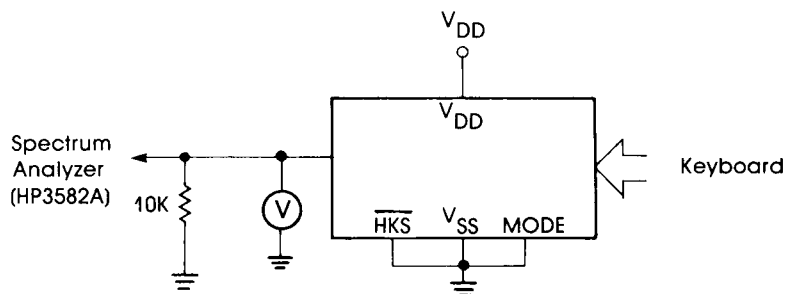


C

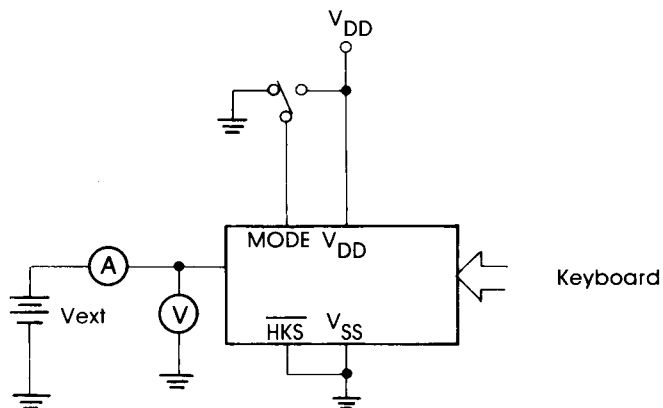


TEST CIRCUIT

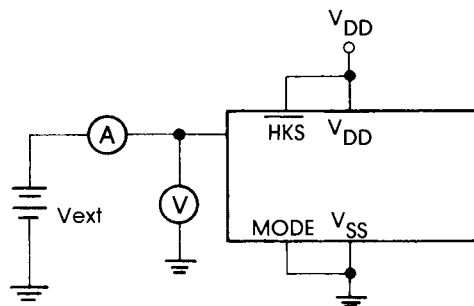
D



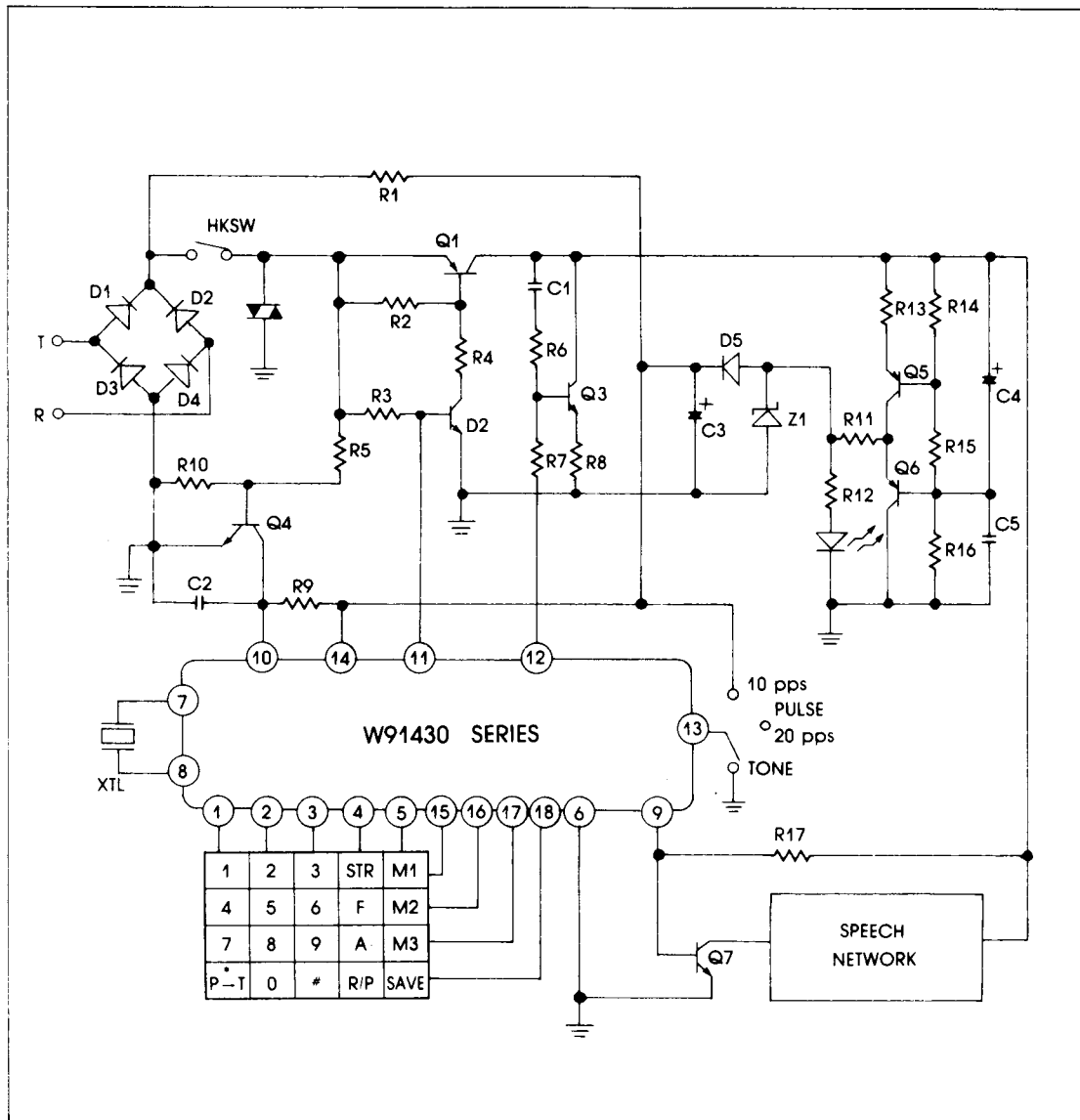
E



F



APPLICATION CIRCUIT DIAGRAM



COMPONENT SELECTION TABLE

R1	20MΩ	R14	1.5KΩ	D5	1N4148
R2	33KΩ	R15	1.2KΩ	TNR	TNR680K
R3	220KΩ	R16	4.7KΩ	Z1	1N4731
R4	3.9KΩ	R17	220KΩ	Q1	MPSA92
R5	1MΩ	C1	0.01μF	Q2	2N5551
R6	100KΩ	C2	0.1μF	Q3	2N5551
R7	10KΩ	C3	100μF/10V	Q4	2N9014
R8	68Ω	C4	2.2μF/10V	Q5	2N4403
R9	470KΩ	C5	0.01μF	Q6	2N4403
R10	100KΩ	D1	1N4002	Q7	MPSA13
R11	100Ω	D2	1N4002	XTL	3.579545MHz
R12	100Ω	D3	1N4002		
R13	10Ω	D4	1N4002		

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