PRELIMINARY SPECIFICATION

NEC
ELECTRON DEVICE

MOS DIGITAL INTEGRATED CIRCUIT
μPD1703C-018

PLL FREQUENCY SYNTHESIZER AND CONTROLLER FOR LW,MW AND FM TUNERS

The μPD1703C-018 is CMOS LSI with built-in PLL and controller capable of receiving LW/MW/FM in U.S.A., Europe and Japan.

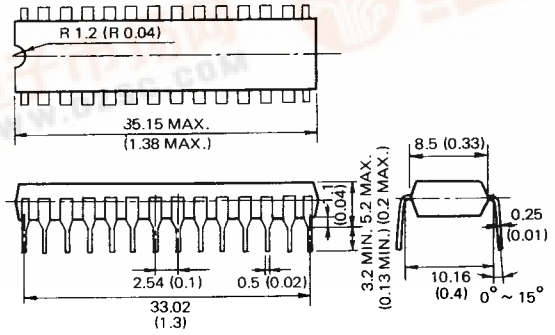
The μPD1703C-018 is provided in a shape of 28-pin Slim DIP (Dual In-Line Package) with less substrate occupying area.

In combination with a dedicated prescaler μPB553AC, μPD1703C-018 is capable of composing high-fidelity LW/MW/FM digital synthesizer tuners for stereo systems such as home stereo systems.

FEATURES

- FIP (Fluorescent Indicator Panel) direct drive capability (segment only).
- Built-in PLL, swallow counter and controller.
- Low data retention current (10 μA or less)
- Capable of preset station display (dot display by LED).
- FM reference frequency is as high as 25 kHz (the pulse swallowing method is employed).
- LW/MW/FM in U.S.A., Europe and Japan are selectable by the initialization switch.
- 9N/9N + 2 switching of LW is possible (9N . . . 153 – 351 kHz, 9N + 2 . . . 155 – 353 kHz).
- Seven (7) buttons-Fourteen (14) preset station memories (7 for FM and 7 for LW + MW).
- Momentary or alternate switches can be used as a preset station key and band selector key (MW·FM).
- Last channel memory is available for each LW/MW/FM band.
- AUTO and MANUAL UP/DOWN selection is possible (saw tooth wave tuning).
- FM IF offset capability (4 ways by 25 kHz step)
- Built-in frequency preset function for adjustment at time of mass production of a set.
- European FM band 4.1/2 digit display (other bands are displayed in 4 digits).
- 28-Pin Slim plastic DIP; saves board area.
- A single power supply of 5 V ± 10 %.

PACKAGE DIMENSIONS in millimeters (inches)



ABSOLUTE MAXIMUM RATINGS

Supply Voltage	V_{DD}	−0.3 to +6.0	V
Input Voltage	V_I	−0.3 to +V_{DD}	V
Output Voltage	V_O	−0.3 to +V_{DD}	V
Output Absorption Current	I_O	10	mA
Operating Temperature	T_{OPT}	−35 to +75	°C
Storage Temperature	T_{stg}	−55 to +125	°C
Output Breakdown Voltage	V_{BDS}	Sa-Sg terminals −35 (Drain source voltage)	V

RECOMMENDED OPERATION CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Supply Voltage	V_{DD}	4.5	5.0	5.5	V	
RAM Retention Voltage	V_{RAM}	2.5			V	CE terminal = 0
Output Breakdown Voltage	V_{BDS}			−30	V	Sa-Sg terminals (Drain source voltage) I_{OFF}=−5 μA
Supply Voltage Rise Time	T_{rise}			500	ms	V_{DD} = 0 to 4.5 V

ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
High Level Input Voltage	V_{IH1}	0.8V_{DD}		V_{DD}	V	SD terminal
"	V_{IH2}	0.7V_{DD}		V_{DD}	V	CE terminal
"	V_{IH3}	0.6V_{DD}		V_{DD}	V	K_0–K_3 terminals
Low Level Input Voltage	V_{IL1}	0		0.3V_{DD}	V	CE terminal
"	V_{IL2}	0		0.2V_{DD}	V	SD, K_0–K_3 terminal
High Level Output Voltage	V_{OH1}	4.0			V	PSC, MUTE, $\overline{D_1}$ – $\overline{D_5}$ terminal I_{OH} = −0.2 mA
"	V_{OH2}	4.0			V	EO_1, EO_2 terminals I_{OH} = −0.5 mA

High Level Output Voltage	V_{OH3}	3.0			V	Sa – Sg terminals I_{OH} = –0.5 mA
Low Level Output Voltage	V_{OL1}			0.5	V	EO_1, EO_2 terminals I_{OL} = 0.5 mA
"	V_{OL2}			0.5	V	MUTE, $\overline{D_1}$ – $\overline{D_5}$, PSC terminals I_{OL} = 0.2 mA
High Level Input Current	$+I_{IH1}$	5.0	25	100	μA	K_O – K_3 terminals $V_{IN} = V_{DD}$ = 5.0 V
"	$+I_{IH2}$		300		μA	X_1 terminal $V_{IN} = V_{DD}$ = 5.0 V
Low Level Input Current	$-I_{IL1}$		300		μA	AM, FM terminals V_{IN} = OV, V_{DD} = 5.0 V
Output Leakage Current	I_L		10^{-3}	1	μA	EO_1, EO_2 terminals $V_O = V_{DD}$ = 5.0 V
AC Input Voltage	Vin	1.0		V_{DD}	V_{P-P}	AM, FM terminals
Response Frequency	f_{AM}	0.5		2.5	MHz	AM terminal, V_{in}=1.0 V_{P-P} (MIN.), DC cut
"	f_{FM}	0.5		8.8	MHz	FM terminal, V_{in}=0.8 V_{P-P} (MIN.), square wave, DC cut
Operating current	I_{DD1}		3		mA	Normal operation (excluding display current)
"	I_{DD2}			10	μA	CE terminal = 0 Ta = 25 °C, V_{DD} = 5 V
RAM Retention Voltage	V_{RAM}	2.5			V	CE terminal = 0
Output Breakdown Voltage	V_{BDS}			–30	V	Sa – Sg terminals (Drain source voltage), I_{OFF}=–5 μA

OUTLINE OF FUNCTION

Receiving Frequency, Channel Spacing, Reference Frequency, Intermediate Frequency

		Frequency Range	Channel Spacing	Reference Frequency	IF
U.S.A.	MW1	530 ~ 1 620 kHz	10 kHz	10 kHz	450 kHz
	MW2	522 ~ 1 611 kHz	9 kHz	9 kHz	
	FM	87.9 ~ 107.9 MHz	200 kHz	25 kHz	10.650, 10.675, 10.700, 10.725 MHz
Europe	MW	522 ~ 1 611 kHz	9 kHz	9 kHz	450 kHz
	LW1	155 ~ 353 kHz	9 kHz	1 kHz	
	LW2	153 ~ 351 kHz	9 kHz	1 kHz	
	FM	87.50 ~ 108.00 MHz	50 kHz	25 kHz	10.650, 10.675, 10.700, 10.725 MHz
Japan	MW	522 ~ 1 611 kHz	9 kHz	9 kHz	450 kHz
	FM	76.1 ~ 89.9 MHz	100 kHz	25 kHz	10.675, 10.700, 10.725, 10.750 MHz

Tuning Functions

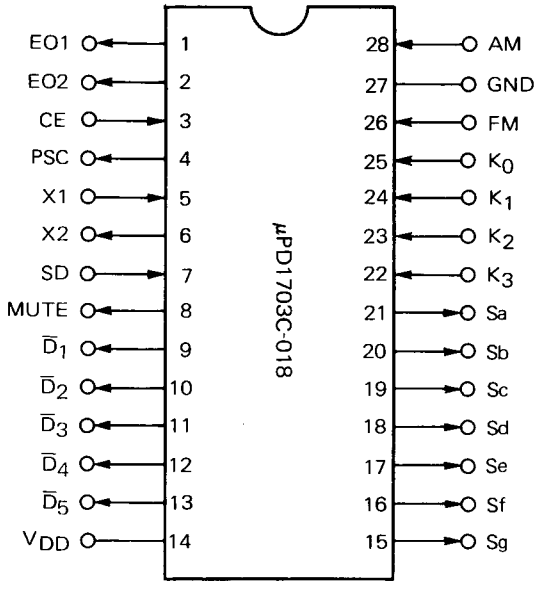
(1) AUTO UP/DOWN TUNING (Saw Tooth Wave Mode).
When a high level is input at SD terminal, the auto tuning is stopped and signal from that station is continuously received.

(2) MANUAL UP/DOWN TUNING (Saw Tooth Wave Mode)
Step forwarding by the momentary switch. Further, when the switch is kept depressed for more than 0.5 sec., the receiving frequency is continuously forwarded till the switch is released.

(3) Preset Memory Calling
FM . . . . . 7 channels (M1 – M7)
LW + MW . . . . . 7 channels (M1 – M7)
FM and LW+MW are of 7 channels independent preset type. LW and MW are of total 7 channels random access preset type.

DESCRIPTION OF TERMINALS

Terminal Configuration Diagram (Top View)



Terminal No.	Symbol	Terminal Name	Description
1 2	EO_1 EO_2	Error Out	Charge pump output from the phase detector composing PLL. When the divided oscillation frequency is higher than the reference frequency, these terminals go high, and when lower than reference frequency, low level is output. When both are in accord with each other, the terminal become floating. As the same signal is simultaneously output on EO_1 and EO_2, these terminals may be connected to either LPF (Low Pass Filter) of MW, LW or FM.
3	CE	Chip Enable	Activation of this device is controlled by this terminal. When the device is to be normally operated, set this terminal at the high level, and when the device is not used, set at the low level. High level . . . Normal operation Low level . . . Memory retantion state (stand-by current is 10 μA or less. Display is OFF, PLL is stopped functioning, internal clock generator is stopped.) Note that CE terminal only accepts the pulse that is longer than 134 μs. Be sure to force this terminal high after the V_{DD} terminal is 4.5 V or above.
4	PSC	Prescaler Control	This terminal outputs a signal to switch the modulo of the two-modulus prescaler when a pulse swallowing method is used for frequency division (in case of FM). This terminal should be connected to PSC terminal of a dedicated two-modulus prescaler μPB533AC.
5 6	X1 X2	X'tal	The X'tal oscillator terminals. A 4.5 MHz X'tal should be connected to these terminals. (Toyo Tsushinki: TQC-231A-8A is recommended)
7	SD	Station Detector	When this terminal is forced to high level in AUTO TUNING (AUTO UP/DOWN) mode, the scanning is quitted. A high level signal should be input within 75 ms after PLL is locked.
8	MUTE	MUTE	This terminal outputs an active-high signal for muting shock noise when PLL is out of lock. When CE terminal is forced to low level (back-up state), this terminal is forced to low level unconditionally. The length of the muting signals are as follows. At time of LW/MW/FM switching . . . 700 ms (TYP.) At time of MANUAL UP/DOWN . . . 200 ms (TYP.) (1 step operation) At time of AUTO UP/DOWN . . . 200 ms (TYP.) (after SD terminal is forced to high level.) At time of Preset Memory calling . . . 450 ms (TYP.) Above show the muting signal which is output just after PLL data are changed. Actually, premuting time of 50 ms (before PLL data change) is added for. (For details, see MUTE Timing Chart on Page 20.)

9 ~ 13	$\overline{D}_1 - \overline{D}_5$	Digit Outputs	These terminals are the display digital signal outputs and are active-low. (For details, see the display connection diagram on Page 15.)
14	V_{DD}	V_{DD}	This is the power supply terminal of the device. When the device is in operation, 5 V±10 % should be supplied. Under the preset memory back-up condition, supply voltage can be reduced to 2.5 V. Note that the rise time of supply voltage V_{DD} must be 500 ms or less. If the rise time is excessively long, the initialization will not be operate properly.
15 ~ 21	Sa – Sg	Segment Outputs	These terminals are the display segment signal outputs and key return signal source terminals, and are active-high. (For configuration of key matrix see Page 6.) As these terminals withstand voltage up to −30 V, they can be directly connected to the segment terminal of FIP (Fluorescent Indicator panel). (For details see the display connection diagram on Page 15.)
22 – 25	$K_0 - K_3$	Key Return Signal Inputs	These terminals are the input terminals of key return signals from the external key matrix. (For details see the key matrix configuration shown on Page 7.)
26	FM	FM Local Oscillator Signal Inputs	FM local oscillator divided in 1/16 or 1/17 by the prescaler μPB553AC is input into this terminal. As an AC amplifier is built in, signals should be input after DC is cut by a capacitor.
27	GND	GND	This terminal should be connected to a system ground.
28	AM	AM Local Oscillator Signal Inputs	Signals from MW and LW local oscillator are input to this terminal. As an AC amplifier is built in, signals should be input after DC is cut.

1. CONFIGURATION OF KEY MATRIX

1-1 Arrangement of Key Matrix

Input Terminal / Output Terminal	K0 (25)	K1 (24)	K2 (23)	K3 (22)
Sa (21)	DOWN	UP	MEMORY	TRACKING POINT PRESET
Sb (20)	M4	M3	M2	M1
Sc (19)		M7	M6	M5
Sd (18)		LW	FM	MW
Se (17)				
Sf (16)	9 kHz/10 kHz	9N/9N + 2	AUTO/MANUAL	
Sg (15)	BAND0	BAND1	IF1	IF0

( ) is Terminal No.

: Momentary Switch

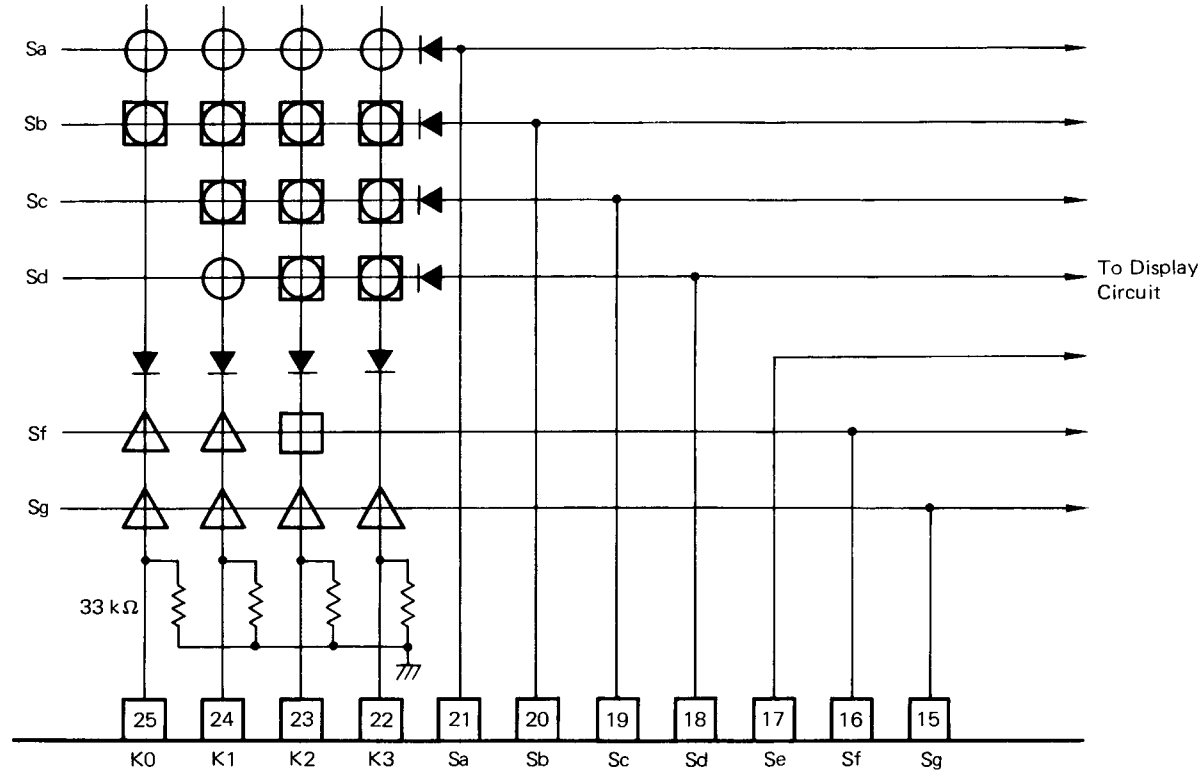
: Momentary or Alternate Switch

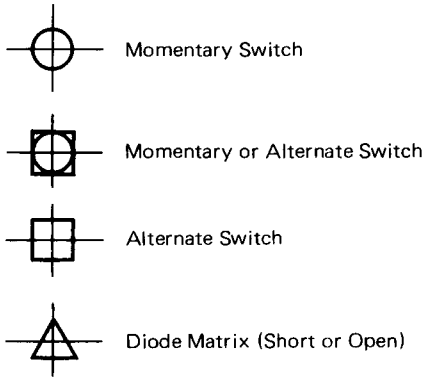
: Alternate Switch

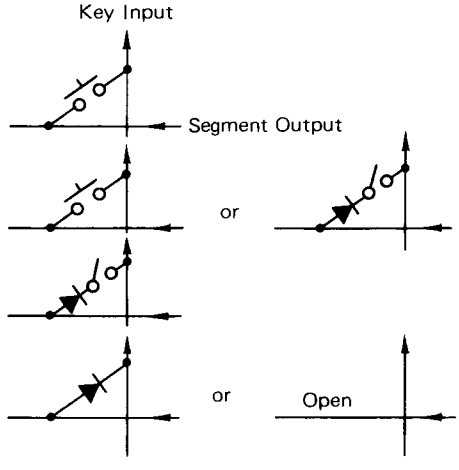
: Diode Matrix (Short or Open by Diode)

: Open

1-2. Connection of Key Matrix and Type of Switch



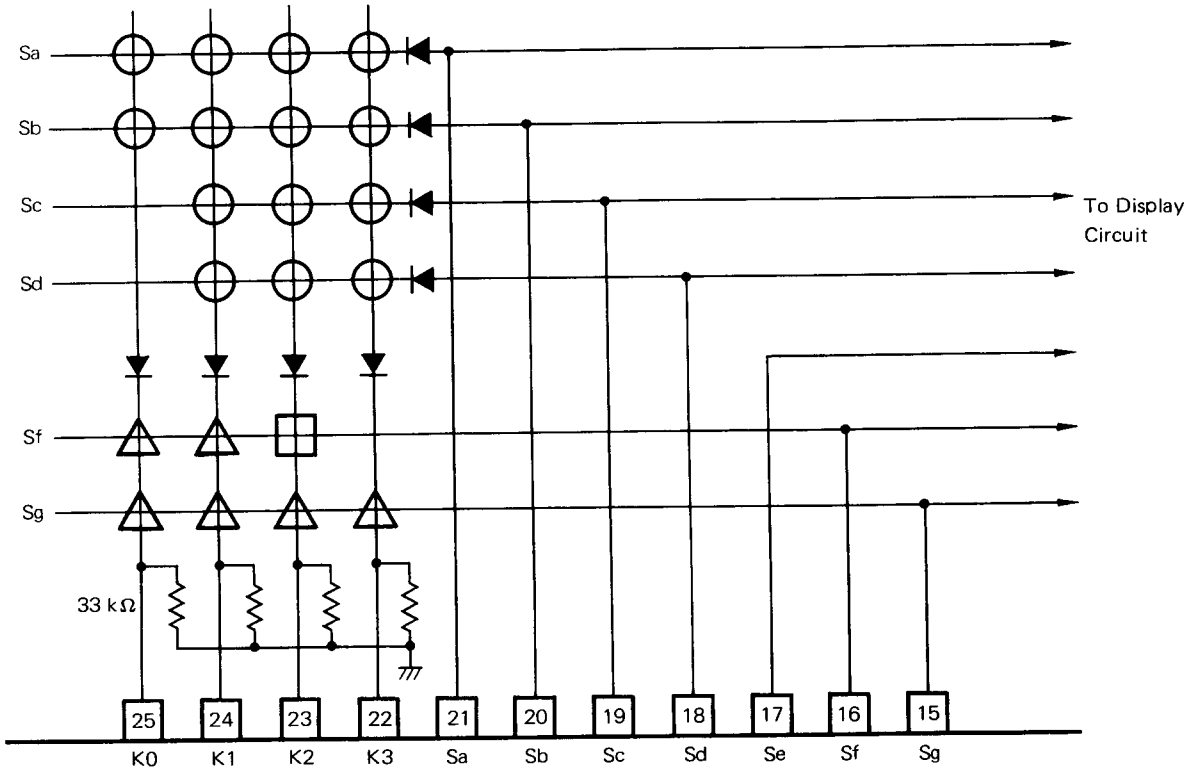




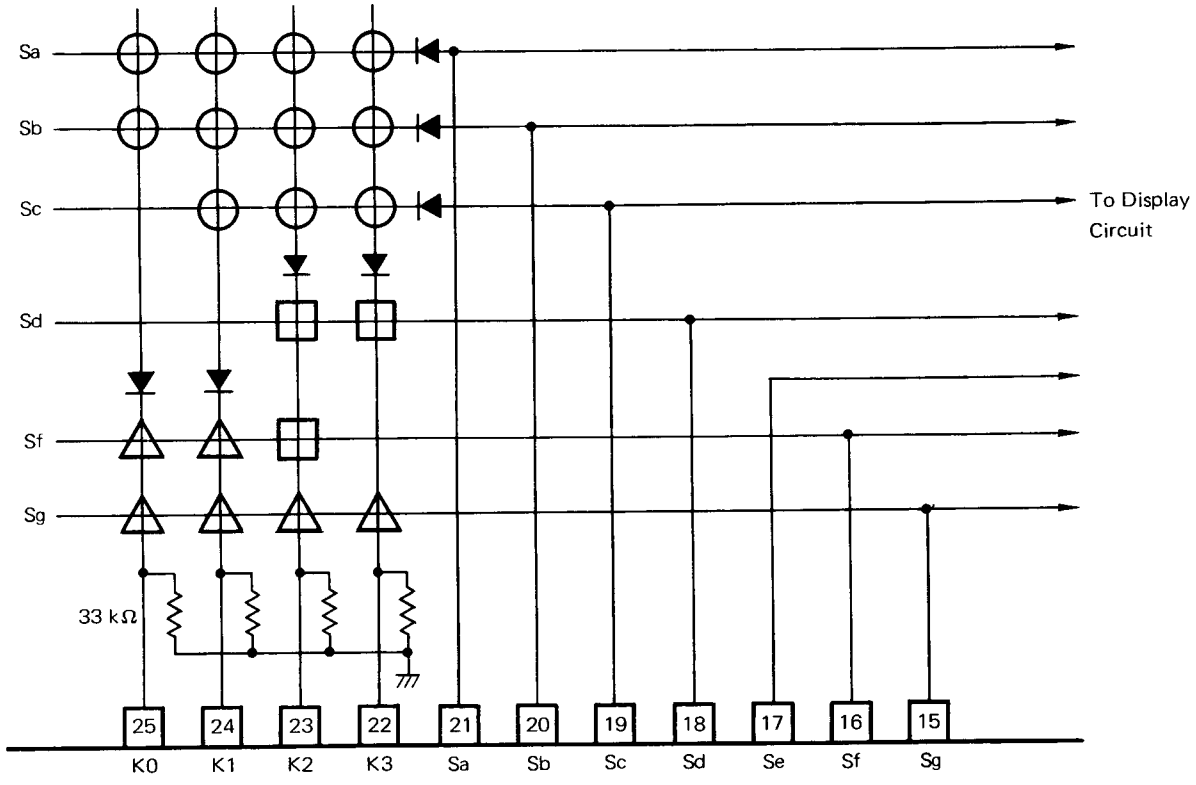
As the preset station Keys (M1 – M7) and Band Selector Keys (FM, MW), either Momentary or Alternate Switch can be used. However depending upon which switch is used, an inserting position of diodes (for preventing turn-around of key return signal) may differ.

The following shows the examples;

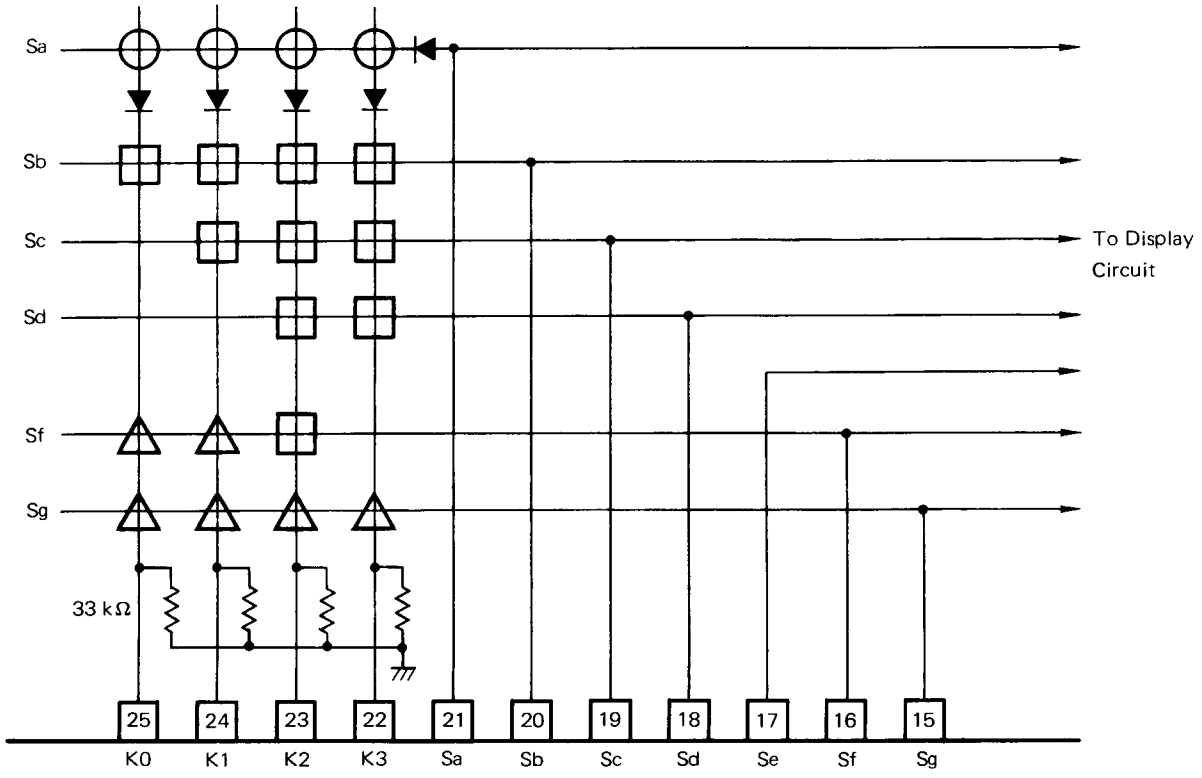
Example 1: When Momentary switches are used as Preset station Keys and Band Selector Keys.



Example 2: When Alternate Switches are used as Band Selector Switches.



Example 3: When Alternate Switches are used as Preset station Keys and Band Selector Keys.



(Note) LW Key cannot be used as Alternate Switch.

2. DESCRIPTION OF KEY MATRIX

2-1. Initialization Diode Matrix

Initialization Diode Matrix is available in 4 types as shown below. These matrixes are read in when power is initially supplied to V_{DD} (initialize) and when CE terminal is changed from low level to high level. However, the 9 kHz/10 kHz and 9N/9N+2 Switches are constantly read in. Even in this case, PLL data and display are changed only when a momentary switch (UP, DOWN, M1 – M7 Switches) is depressed.

(1) Switches for specifying IF offset of FM

IF1, IF0

(2) Switches for specifying FM band area (U.S.A., Europe, Japan)

BAND 1, BAND 0

(3) Switches for specifying MW band channel spacing and reference frequency

9 kHz/10 kHz

(4) Switche for selecting LW band frequency range

9N/9N+2

These initializations will be performed by shorting or opening the intersecting points on the matrix by Diode. (In the following table, "1" means shorting by Diode and "0" means opening.)

<table>
<tr><th>Symbol</th><th>Description of Function</th></tr>
<tr><td>IF1

IF0</td><td>Switches for specifying IF offset frequency of FM.
IF offset can be varied in 4 levels, as shown below, by 25 kHz step without changing indicated frequency:
<table>
<tr><th>IF1</th><th>IF0</th><th>U.S.A. Band</th><th>European Band</th><th>Japanese Band</th></tr>
<tr><td>0</td><td>0</td><td>10.700 MHz</td><td>10.700 MHz</td><td>10.700 MHz</td></tr>
<tr><td>0</td><td>1</td><td>10.725</td><td>10.725</td><td>10.675</td></tr>
<tr><td>1</td><td>0</td><td>10.650</td><td>10.650</td><td>10.750</td></tr>
<tr><td>1</td><td>1</td><td>10.675</td><td>10.675</td><td>10.725</td></tr>
</table></td></tr>
<tr><td>BAND1

BAND0</td><td>Switches for specifying FM band areas.
One of FM bands of U.S.A., Europe and Japan can be selected.
<table>
<tr><th>BAND1</th><th>BAND0</th><th>Band Area</th><th>Frequency Range</th><th>Channel Spacing</th></tr>
<tr><td>0</td><td>0</td><td>U.S.A. Band</td><td>87.9 – 107.9 MHz</td><td>200 kHz</td></tr>
<tr><td>0</td><td>1</td><td>European Band</td><td>87.50 – 108.00 MHz</td><td>50 kHz</td></tr>
<tr><td>1</td><td>0</td><td>Japanese Band</td><td>76.1 – 89.9 MHz</td><td>100 kHz</td></tr>
<tr><td>1</td><td>1</td><td>Prohibited *</td><td></td><td></td></tr>
</table>
*Both BAND1 and BAND0 must not be ON (1). If both are ON, the band area will not be properly set.</td></tr>
<tr><td>9 kHz/10 kHz</td><td>Switch for specifying MW band channel spacing, reference frequency and frequency range.
The setting can be independently made regardless of FM band areas (BAND1, BAND0).
<table>
<tr><th>9 kHz/10 kHz</th><th>Frequency Range</th><th>Channel Spacing</th><th>Reference Frequency</th></tr>
<tr><td>0</td><td>530 – 1 620 kHz</td><td>10 kHz</td><td>10 kHz</td></tr>
<tr><td>1</td><td>522 – 1 611 kHz</td><td>9 kHz</td><td>9 kHz</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td>This switch is always read in. However, PLL data and indication will change only when a momentary switch (UP, DOWN, M1 – M7, etc.) is depressed.</td></tr>
<tr><td>9N/9N + 2</td><td>Switch for selecting LW band frequency range.
<table>
<tr><th>9N/9N+2</th><th>Frequency Range</th><th>Channel Spacing</th><th>Reference Frequency</th></tr>
<tr><td>0</td><td>155 – 353 kHz</td><td>9 kHz</td><td>1 kHz</td></tr>
<tr><td>1</td><td>153 – 351 kHz</td><td>9 kHz</td><td>1 kHz</td></tr>
</table>
This switch is always read in. However, PLL data and indication will change only when a momentary switch (UP, DOWN, M1 – M7, etc.) is depressed.</td></tr>
</table>

2-2 Alternate Switch

Symbol	Description of Function
AUTO/ MANUAL	This is an AUTO/MANUAL tuning selector switch. ON (1) . . . AUTO Tuning OFF (0) . . MANUAL Tuning AUTO/MANUAL tuning starts when UP or DOWN momentary switch is depressed after this switch is set at ON or OFF position. (For details see Momentary and Alternate Switches on Page 13.) (Note 1) AUTO tuning operation does not stop even when this switch is changed to MANUAL Tuning during AUTO Tuning operation. If it is desirable to stop AUTO tuning simultaneously with the switching to MANUAL tuning, a system should be so configured that high level signal is constantly supplied to SD terminal during MANUAL tuning. (Note 2) In Auto tuning mode, the μPD1703–018 increases or decreases frequency step by step corfirming that the PLL system is completely locked, in order to scan the band as fast as possible. Therefore if the PLL system is malfunctioning and is not locked, the μPD1703–018 halts the AUTO tuning operation and waites for the PLL to be locked. In this condition, all the keys are not accepted. To escape this condition, force CE terminal to low level then high level, and the frequency can be varied by manual tuning. In the recomended application, the CE terminal is to be connected to the main-power-supply of the set. So the end user can vary the frequency after operating the power-supply-switch, even if the above malfunction occurs.

2.3 Momentary and Alternate Switches

Either momentary Switch or Alternate Switches can be used as Preset Keys (M1 – M7) or Band Selector Keys (MW, FM).

When Alternate Switches are used for Preset station Key, the interlocking including UP and DOWN Keys is required.

<table>
<tr><th>Symbol</th><th>Description of Function</th></tr>
<tr><td>TRACKING
POINT
PRESET</td><td>
This switch is used to write frequencies for tracking adjustment at factory into the preset memories. When this switch is depressed, following frequencies are written into the preset memories (M1 – M7):
FM
(1) When U.S.A. Band (BAND1=0, BAND0=0) is set:
<table>
<tr><th>M1</th><th>M2</th><th>M3</th><th>M4</th><th>M5</th><th>M6</th><th>M7</th></tr>
<tr><td>89.7 MHz</td><td>101.7 MHz</td><td>87.9 MHz</td><td>87.9 MHz</td><td>92.9 MHz</td><td>–</td><td>–</td></tr>
</table>
(2) When European Band (BAND1=0, BAND0=1) is set:
<table>
<tr><th>M1</th><th>M2</th><th>M3</th><th>M4</th><th>M5</th><th>M6</th><th>M7</th></tr>
<tr><td>88.40 MHz</td><td>94.40 MHz</td><td>100.40 MHz</td><td>106.0 MHz</td><td>90.0 MHz</td><td>–</td><td>–</td></tr>
</table>
(3) When Japanese Band (BAND1=1, BAND0=0) is set:
<table>
<tr><th>M1</th><th>M2</th><th>M3</th><th>M4</th><th>M5</th><th>M6</th><th>M7</th></tr>
<tr><td>77.0 MHz</td><td>83.0 MHz</td><td>89.0 MHz</td><td>76.1 MHz</td><td>78.6 MHz</td><td>–</td><td>–</td></tr>
</table>
MW
(1) When Channel Spacing 9 kHz (9 kHz/10 kHz=1) is set:
<table>
<tr><th>M1</th><th>M2</th><th>M3</th><th>M4</th><th>M5</th><th>M6</th><th>M7</th></tr>
<tr><td>612 kHz</td><td>1503 kHz</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
</table>
(2) When Channel Spacing 10 kHz (9 kHz/10 kHz=0) is set:
<table>
<tr><th>M1</th><th>M2</th><th>M3</th><th>M4</th><th>M5</th><th>M6</th><th>M7</th></tr>
<tr><td>630 kHz</td><td>1620 kHz</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
</table>
– indicates "Don't Care" (previously stored content is called).
</td></tr>
<tr><td>MEMORY</td><td>
This switch is used to write the currently received frequency into Preset Memory.When either one of M1 – M7 Keys is pushed within 5 sec. after this key is pressed, the frequency displayed is written into a memory corresponding to the key pressed.
To release the memory-write-enable state before the 5 sec. push UP/DOWN key or switch LW, MW, FM Bands.
</td></tr>
</table>

M1 – M7	These are the preset memory writing and calling keys. It is possible to store FM and MW or LW stations per one button. As MW and LW are of random preset type, storage in optional location in total 7 channels M1 – M7 is possible. (1) Write When either one of M1 – M7 keys is pushed within 5 sec. after MEMORY key is pressed, the frequency currently received is written into a memory corresponding to the key pressed. (2) Calling When either one of M1 – M7 keys is pressed, content (frequency) of a memory corresponding to the key pressed is called out. When a preset key is pressed, a mute signal of approximately 450 ms is output. And when frequency bands are switched (LW ⟶ MW or MW ⟶ LW), a mute signal of approximately 750 ms is output. (For details see MUTE Timing Chart on Page 19.)
UP DOWN	These are AUTO and MANUAL tuning keys. When these keys are pressed, the following operations are executed: (1) When AUTO/MANUAL Switch is set at AUTO: ○When UP key is pressed, frequency is continuously kept going up in saw tooth wave form. If a high level is input in SD terminal at this time, AUTO UP operation is stopped. When DOWN key is pressed during AUTO UP mode, the mode changes to AUTO DOWN operations. ○The operation of DOWN key is almost the same as UP key. The only difference is that this key decreases the frequency. *1. In AUTO UP or DOWN operation, frequency is going up or down at the speed of 80 ms/step. *2. When UP key is pressed in AUTO UP operation or DOWN key in AUTO DOWN operation, AUTO UP/DOWN operation is kept continued. In addition, when UP or DOWN key is kept pressed, AUTO UP or DOWN operation does not stop even when the SD terminal is forced to highllevel.
MW FM LW	These are FM, MW and LW band selector switches. Alternate Switches may be used for FM and MW. (Alternate Switch cannot be used for LW.) When the bands are switched, a MUTE signal of approx. 750 ms is output through MUTE terminal.

3. DESCRIPTION OF DISPLAY

3-1 Desplay Connection Diagram

The display connection diagram is shown below. D1 – D5 and Sa – Sg correspond to the digit terminals ($\overline{D1}$ – $\overline{D5}$) and the segment terminals (Sa – Sg) of μPD1703C-018.

The segment terminals of μPD1703C-018 are capable of withstanding voltage up to −30 V (P-ch open drain output) and it is therefore possible to connect these terminals direct to FIP (Fluorescent Indicator Panel).

The digit lines should be connected to FIP via one-stage buffers (PNP transistor), because those outputs are CMOS-complementary-type and active-low.

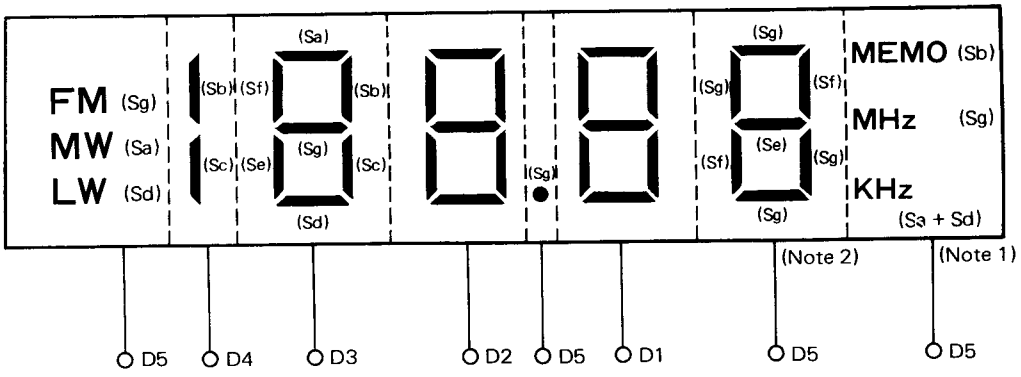


Fig. 1 Display Connection Diagram

(Note 1) Display of "kHz" is made by OR signal of Sa and Sd. If no LW is available, "kHz" can be displayed by Sa only.

(Note 2) This is the digit for "50 kHz" in Europe an FM. Note that this digit is controlled by only 3 segment lines; Se, Sf and Sg, and organized the number "5" and "0".
In MW and LW, nothing is displayed here. For FM in U.S.A. and Japan, don't connect the D5 or Sg line in this digit.

3-2 Examples of Display

Shown below are examples of display when FIP shown in Fig. 1 is used.

(1) FM in U.S.A.

(2) FM in Europe

(3) FM in Japan

(4) **MW** (Channel Spacing 10 kHz)

(5) **MW** (Channel Spacing 9 kHz)

(6) LW in Europe

* MEMO Display lights up for 5 sec. after the momentary key MEMORY is pressed.

When Preset Station key M1 – M7 is pressed following the MEMORY key, the currently received frequency is written and then the MEMO display disappears.

4. PRESET STATION INDICATORS*

An example of the preset station indicator circuit is shown in Fig. 2. The timing chart at this time is shown in Fig. 3.

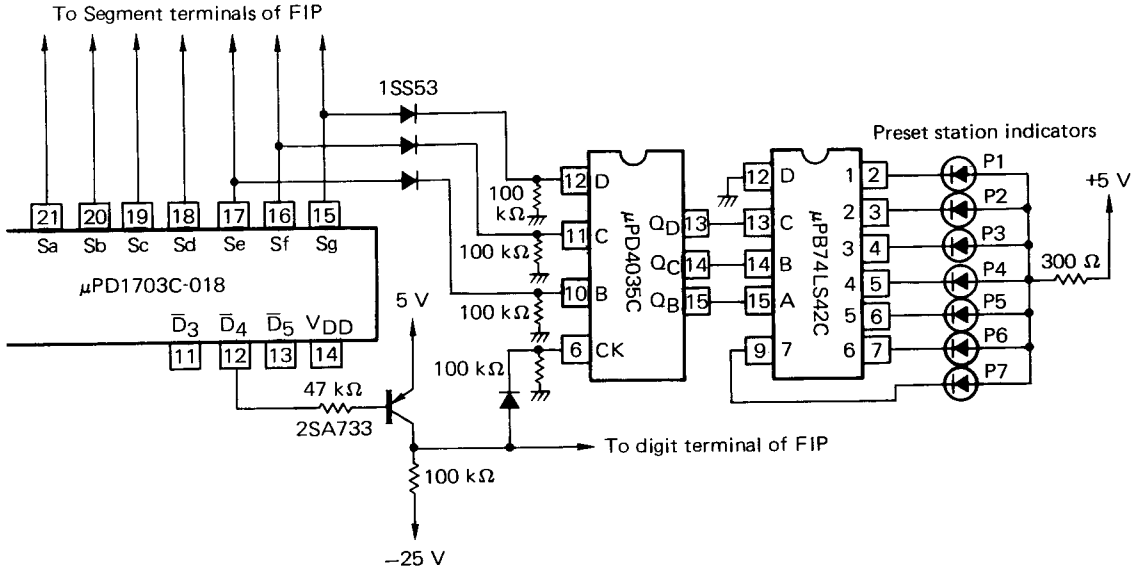


Fig. 2 Example of Preset Station Display Connection

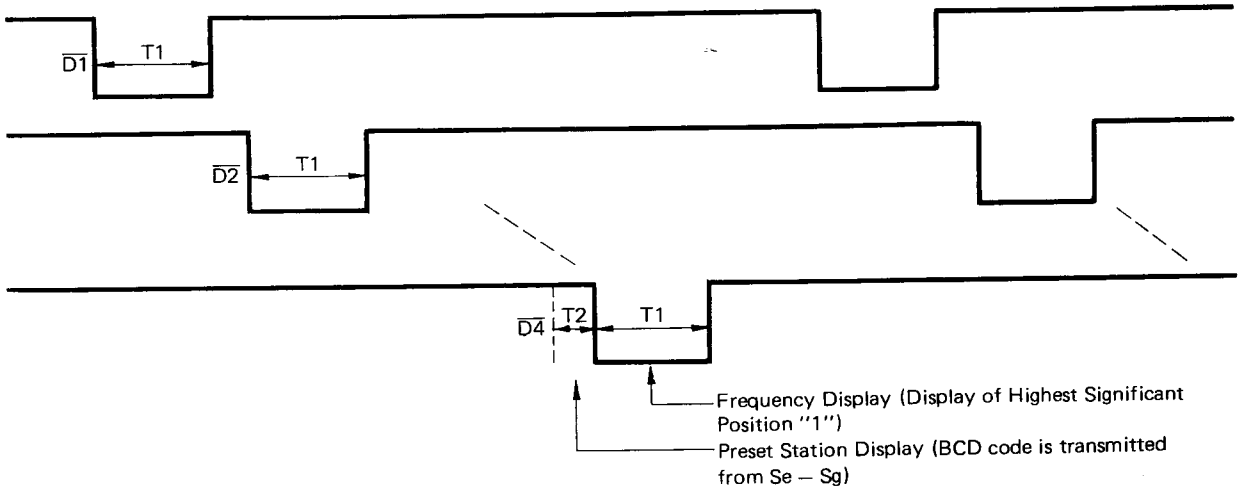


Fig. 3 Timing Chart

In this system, the most significant digit of display is to be connected to two segment lines Sb and Sc, and it displays "1" or blank

By using the remaining segment lines at the most significant digit timing, data for the preset station indicator are output. The preset data are output on the Se-Sg lines at the rising edge of $\overline{D4}$ (most significant digit signal) in BCD form. The μPD4035C in Fig. 2 latches the BCD preset station data at the rising edge of $\overline{D4}$, and the μPB74LS42 decodes the BCD data and then drives the LEDs. Consequently preset station indicators are displayed in static.

* Preset station indicator shows which preset memory is selected.

Output Status Through Segment Terminals Sa – Sg
at Timing T1 and T2 of Digit Signal D4

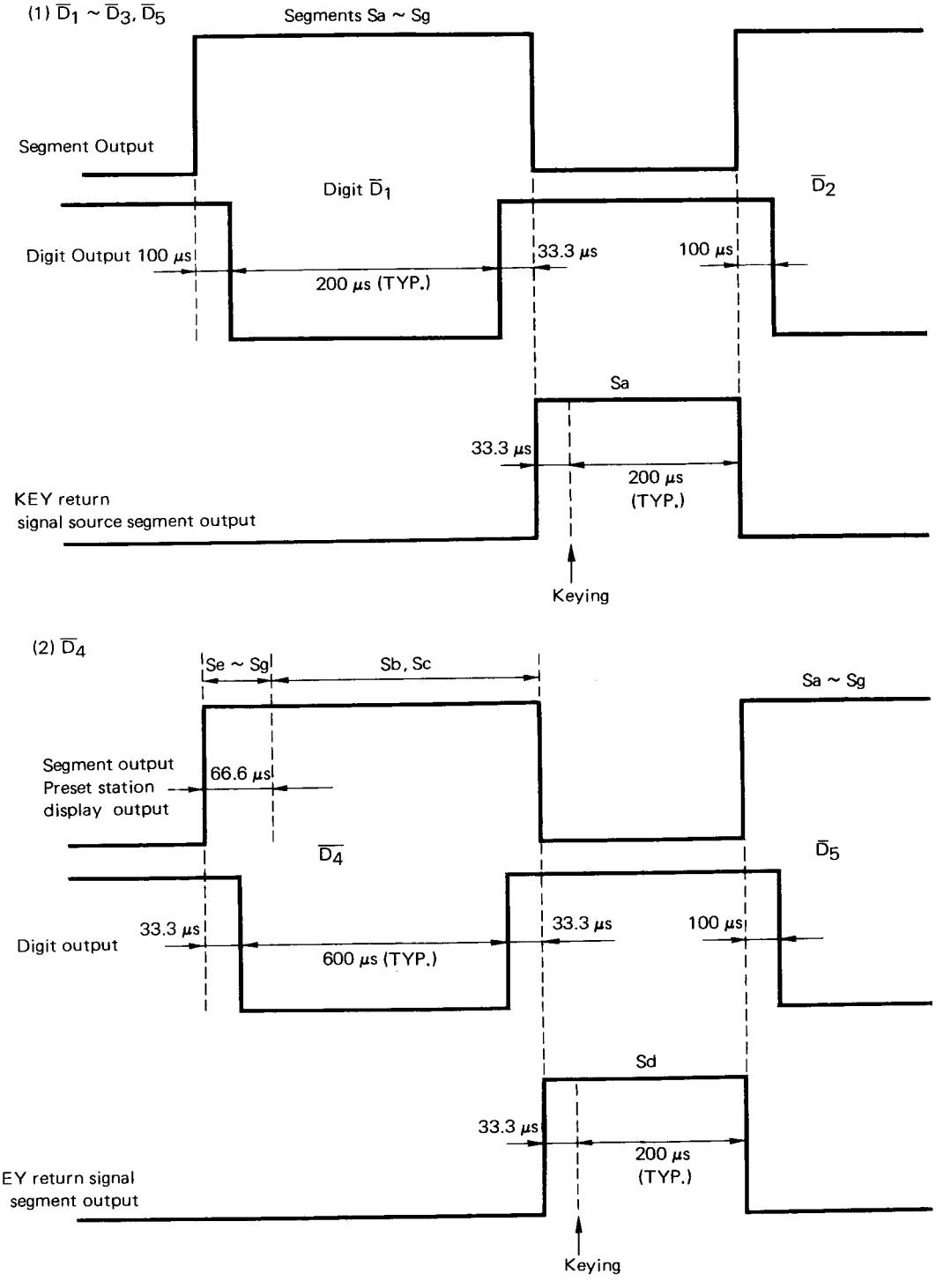
Timing \ Segment	Sa	Sb	Sc	Sd	Se	Sf	Sg
T1	Blank	Highest Significant Position "I" Display or Blank		Blank	Blank	Blank	Blank
T2	Blank	Blank	Blank	Blank	BCD Code Output		

Preset Station BCD Code Output

Sg	Sf	Se	Preset Station
0	0	1	P1 (M1 Key)
0	1	0	P2 (M2 Key)
0	1	1	P3 (M3 Key)
1	0	0	P4 (M4 Key)
1	0	1	P5 (M5 Key)
1	1	0	P6 (M6 Key)
1	1	1	P7 (M7 Key)

5. TIMING CHART

5-1 Display and Keying



5-2 MUTE Timing Chart

(1) KEY ON chattering preventing time

(2) MUTE first-out time

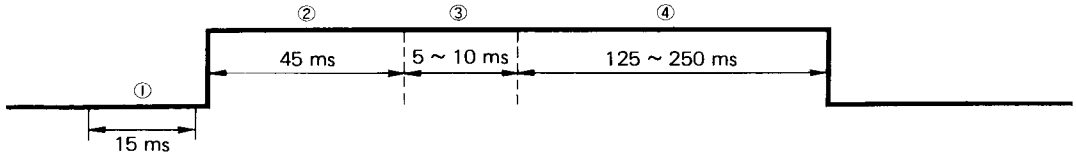
(3) Division ratio setting and display content updating time

(4) MUTE last-out time

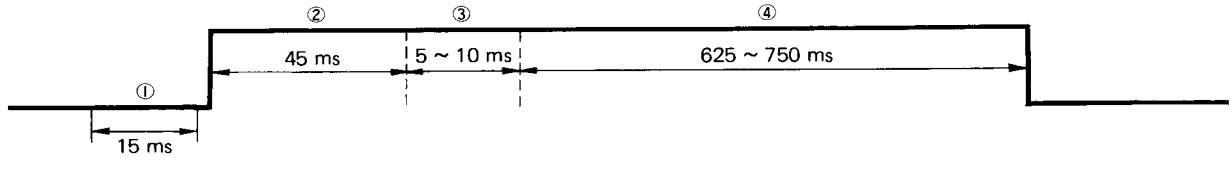
(5) Scan time

(6) PLL lock time

(1) MANUAL UP/DOWN

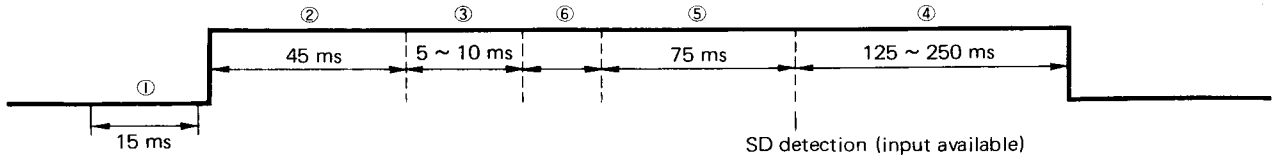


Band Edge (Max. Frequency → Min. Frequency, Min. Frequency → Max. Frequency)

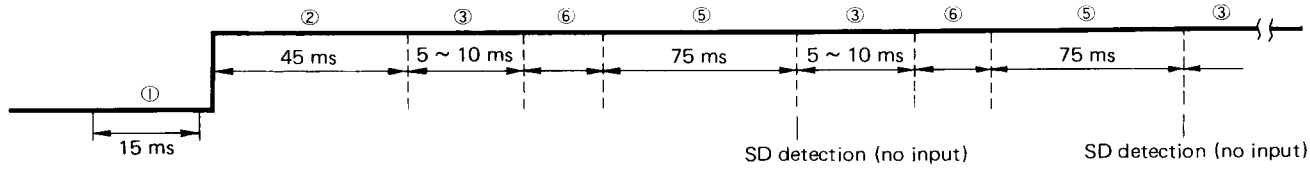


(2) AUTO UP/DOWN

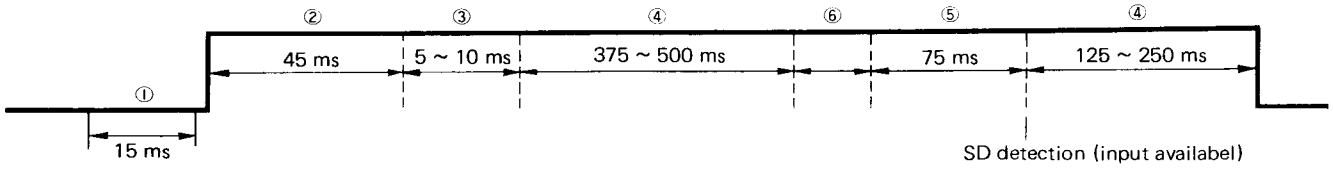
When SD signal is input



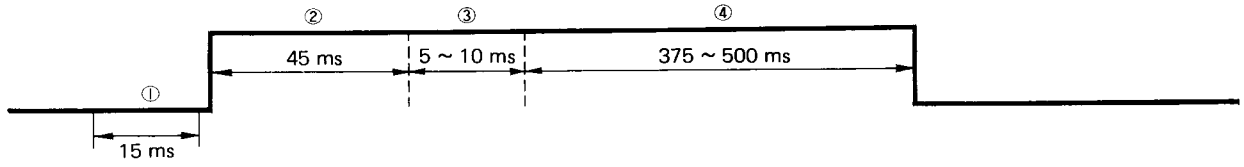
When no SD signal is input.



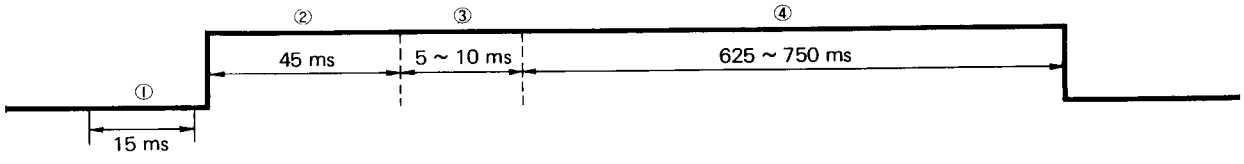
Band Edge (Max. Frequency → Min. Frequency, Min. Frequency → Max. Frequency)



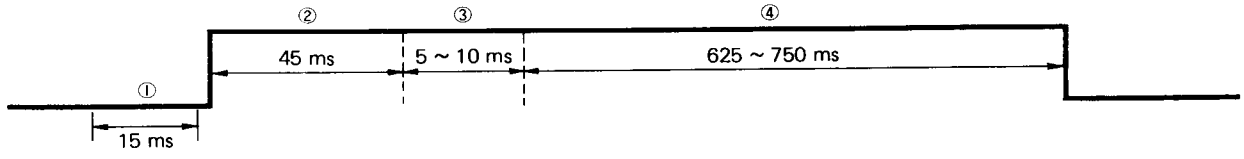
(3) PRESET MEMORY CALL



When the band is changed (MW → LW, LW → MW)



(4) When FM/MW/LW are switched and Power is ON (CE = Low → High)

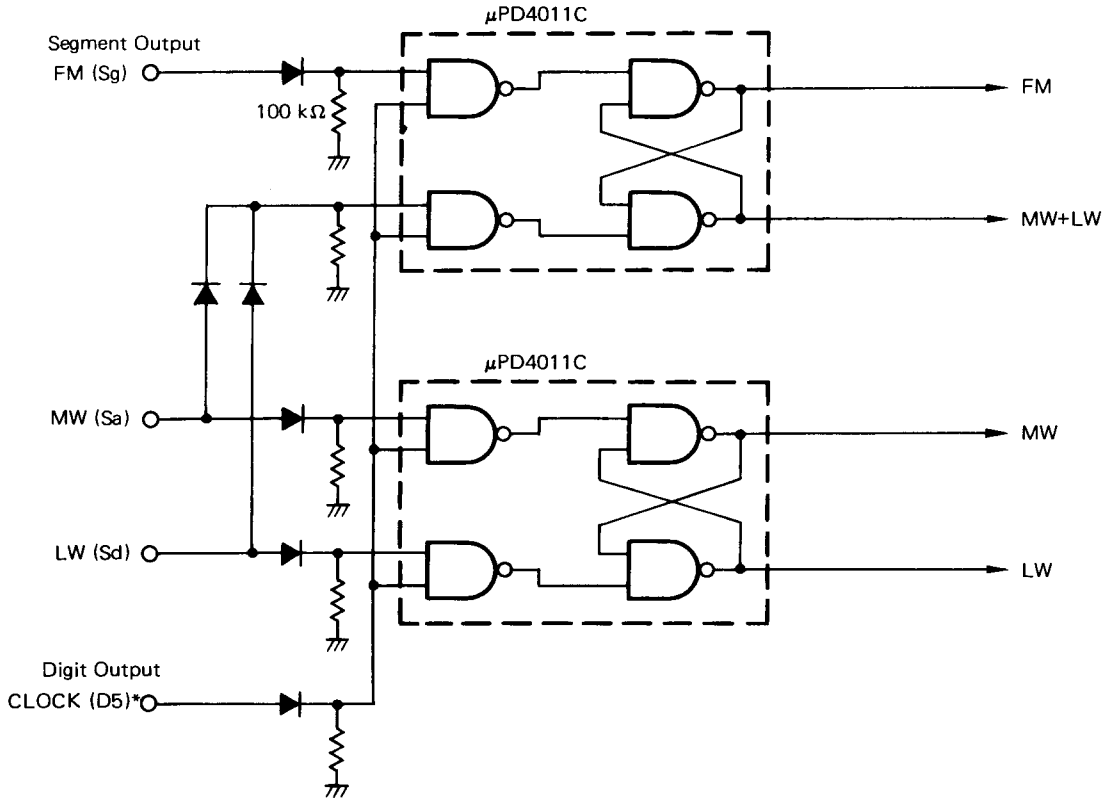


6. EXAMPLES OF FM/MW/LW POWER SUPPLY SWITCHING CIRCUIT

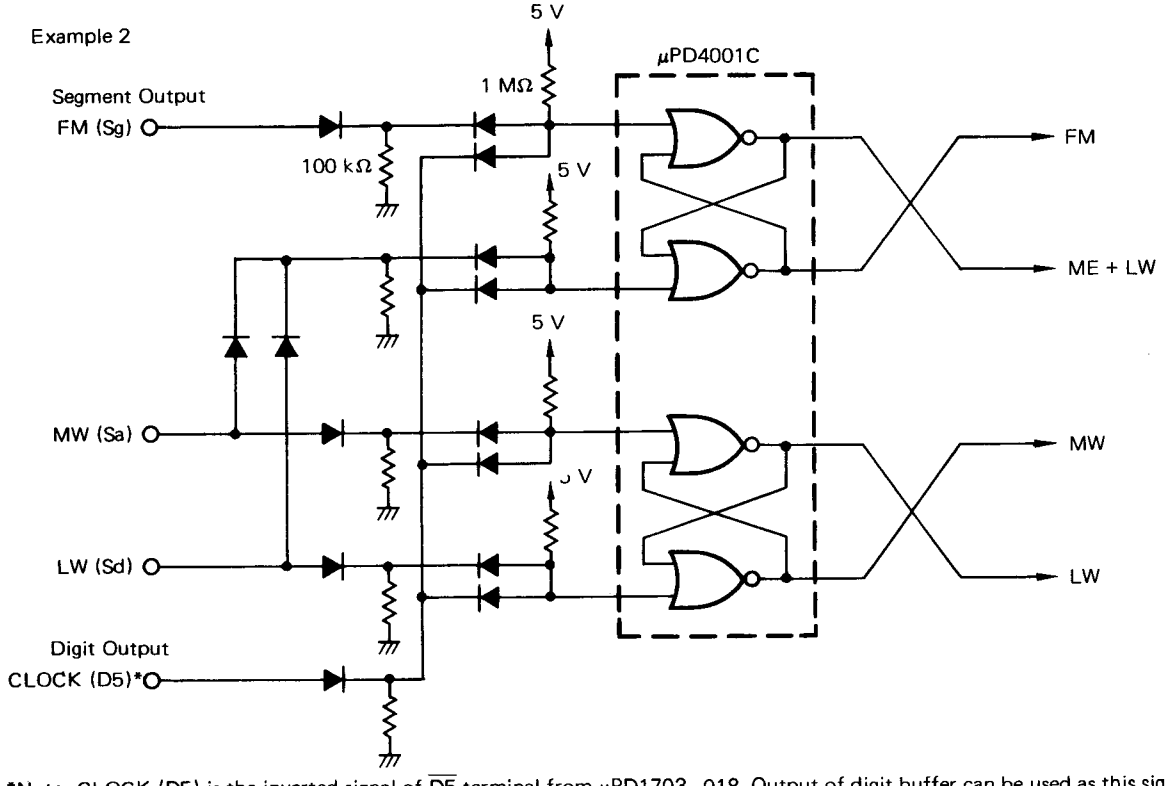
When Momentary Switch is used as a FM, MW, LW band selector switch, the tuner side power supply switching should be performed externally by the circuits shown below.

Input signal in the following diagram utilizes symbol of display ("FM", "MW", "LW") signals.

Example 1

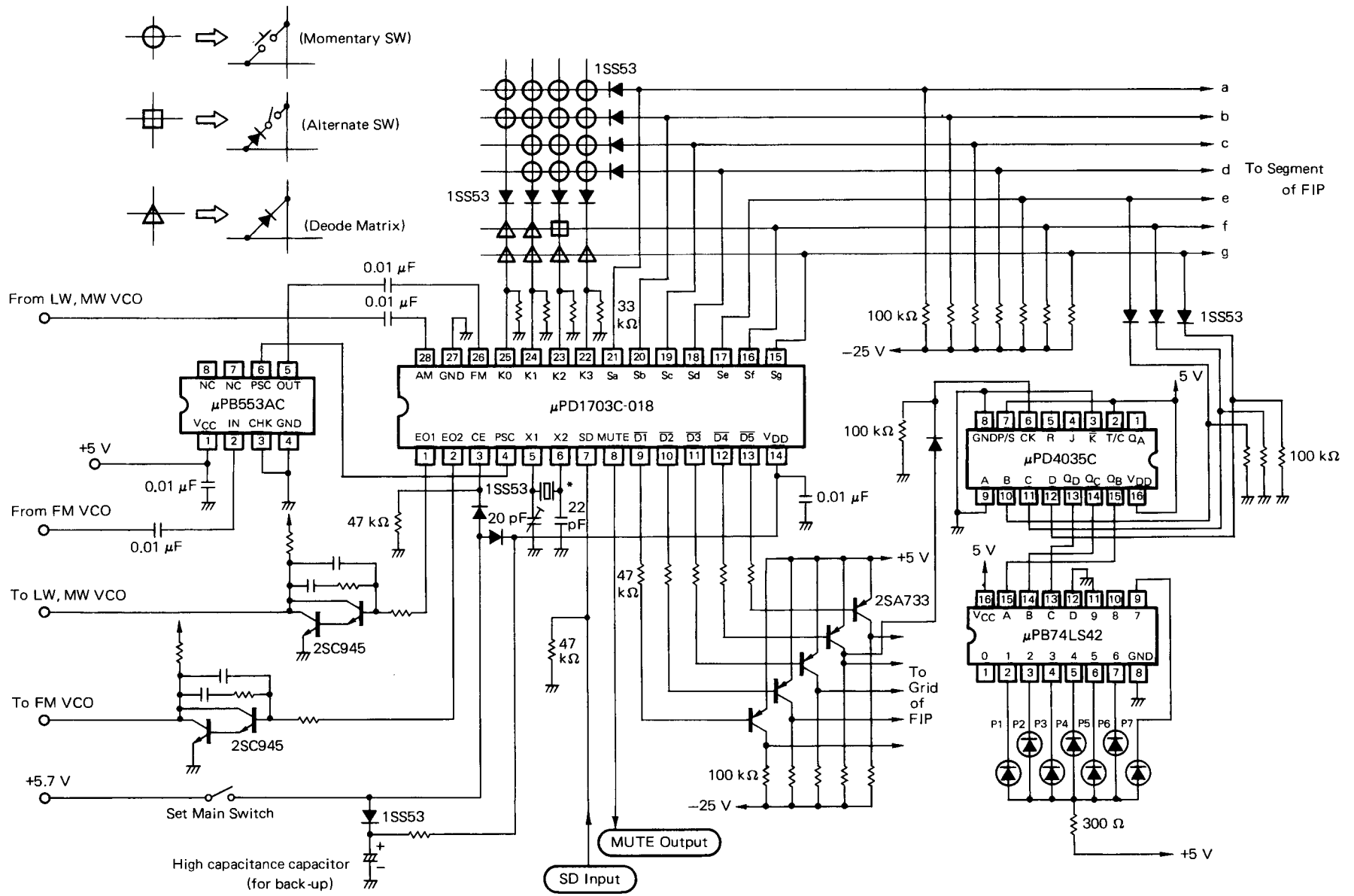


Example 2



*N.B. CLOCK (D5) is the inverted signal of $\overline{D5}$ terminal from μPD1703-018. Output of digit buffer can be used as this signal.

APPLICATION EXAMPLE OF CIRCUIT DIAGRAM



*4.5 MHz X'tal (Toyo Tsuhinki: TQC-231A-8C)

The applied circuits and circuit constants listed in this material are not intended for mass production design with deviations and temperature characteristics of component parts considered. Further, this company will not assume any responsibllity as regards the patents on the circuits listed in this material.