SS0201

同时显示温度、湿度、时间并报警

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I. OVERVIEW

THE SS0201 is a clock IC with a temperature and humidity measuring function. The SS0201 has the following functions:

(1) Clock function displays "hour" , "minute" , and "AM/PM". Time format is switchable (12 hours format or 24 hours format).

(2) Temperature measuring function
Temperature measuring ranges : -50.0 to 70.0 degrees Celsius (-58 to 158 degrees Fahrenheit)
Resolution : 0.1 degree Celsius (0.1 or 0.2 degree Fahrenheit)
Precision : ±1 degree Celsius(over -10 degrees Celsius)
Measuring period : every 10 seconds or every 1 minute.

(3) Humidity measuring function
Humidity measuring ranges : 20 to 90% (Between 0 and 60 degrees Celsius)
Resolution : 1%
Precision : Now checking
Measuring period : every 10 seconds or every 1 minute.

(4) Daily alarm and hourly chime.

(5) 10 digits + 16 indicators, 1/4 duty 1/3 bias LCD drive

(6) Memorize Maximum / Minimum temperature and Maximum / Minimum humidity.

(7) Operating voltage : 1.5V

(8) Pakage 80pin QFP (SS0201 GS-K-F) or Chip form (SS0201 chip)

2 PIN DESCRIPTION

Table 2.1 shows the pins of the SS0201

Table 2.1 Pin List of the SS0201

Pin name in the user's manual	Pin name in this manual	Input/Output format	Function
P2.0	MODE	Input port with pull-down	To select mode, and to modify item.
P2.1	SET	Input port with pull-down	To change normal status and to modify status. Initialize the memorized data of Temp/Hum.
P2.2	UP	Input port with pull-down	To add modifying item. Change clock display format.
P2.3	Q_SMP	Input port with pull-down	To start measuring Temp/Hum.
P3.0	C/F	High impedance input port	To select unit of temperatue. (L .. Celsius, H .. Fhar.)
P3.1	SMP	High impedance input port	To select measuring period. (L .. 10seconds, H .. 1minute)
RS0,CS0,RT0, IN0	RS0,CS0,RT0, IN0		Temperature measuring circuit. (Connect Thermistor, registers and condenser)
RS1,CS1,RT1, IN1	RS1,CS1,RT1, IN1		Humidity measuring circuit. (Connect Humidity sensor, registers and condenser)
BD	BD	CMOS output port	Buzzer driver terminal
$\overline{\text{RESET}}$	$\overline{\text{RESET}}$	Input port with pull-up	System reset input terminal (MCU is initialized when this terminal change L to H.)
L0 to L23	L0 to L23		LCD driver terminal
P0.0 to P0.3	P0.0 to P0.3	Input port with pull-down	No use (No connect)
P1.0 to P1.3	P1.0 to P1.3	CMOS output port	No use (No connect)
P3.2 to P3.3	P3.2 to P3.3	Input port with pull-down	No use (No connect)
VDD,VSS1, VSS2,VSS3, C1,C2,VSSL	VDD,VSS1, VSS2,VSS3, C1,C2,VSSL		Power supply
XT,XT	XT,XT		Oscilator terminal(32kHz)
OSC1,OSC2	OSC1,OSC2		No use (No connect)

3. PIN LAYOUT

Figure 3.1 shows the pin layout diagram of the SS0201 GS-K-F. Figure 3.2 shows the external diagram of the SS0201 chip.

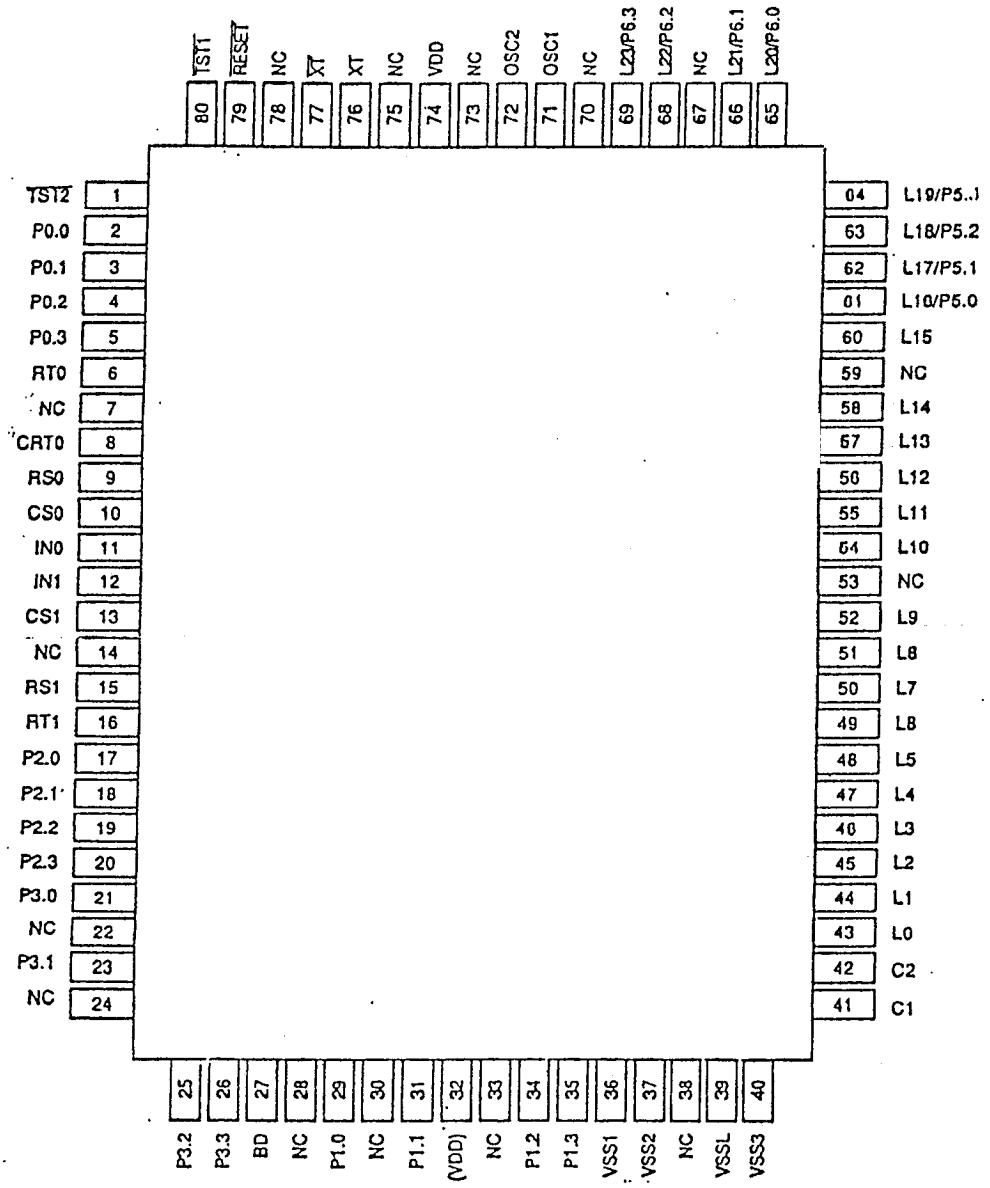
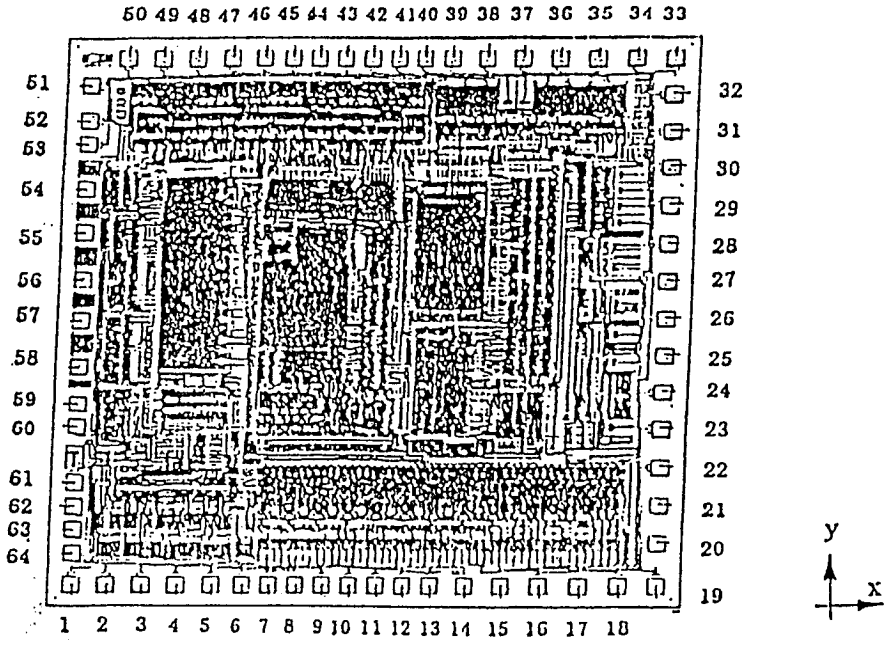


Figure 3.1 Pin layout of the SS0201 GS-K-F

Pin Layout and Pad No.

Chip size : 4.69mm x 4.41mm
Thick ness : 350μm(TYP)



Pad Coordinates

Chip center: x = 0, y = 0

Pad No.	Pad Name	(μm) x	(μm) y	Pad No.	Pad Name	(μm) x	(μm) y	Pad No.	Pad Name	(μm) x	(μm) y	Pad No.	Pad Name	(μm) x	(μm) y
1	L0	-2168	-2042	19	L18	2168	-2042	33	P0.0	2168	2042	51	P3.1	-2168	1829
2	L1	-1918		20	L19		-1714	34	P0.1	1899		52	P3.2		1563
3	L2	-1669		21	L20		-1424	35	P0.2	1628		53	P3.3		1382
4	L3	-1426		22	L21		-1134	36	P0.3	1364		54	BD		1017
5	L4	-1170		23	L22		-844	37	RT0	1100		55	P1.0		688
6	L5	-934		24	L23		-554	38	CRT0	829		56	P1.1		328
7	L6	-727		25	OSC1		-264	39	RS0	565		57	P1.2		8
8	L7	-519		26	OSC2		26	40	CS0	349		58	P1.3		-353
9	L8	-312		27	VDD		316	41	IN0	141		59	VSS1		-645
10	L9	-104		28	XT		606	42	IN1	-67		60	VSS2		-826
11	L10	104		29	$\overline{XT}$		896	43	CS1	-274		61	VSSL		-1254
12	L11	311		30	$\overline{RESET}$		1186	44	RS1	-482		62	VSS3		-1435
13	L12	527		31	$\overline{TST1}$		1476	45	RT1	-689		63	C1		-1616
14	L13	791		32	$\overline{TST2}$		1766	46	P2.0	-911		64	C2		-1798
15	L14	1062						47	P2.1	-1100					
16	L15	1340						48	P2.2	-1410					
17	L16	1618						49	P2.3	-1666					
18	L17	1897						50	P3.0	-1916					

Figure 3.2 External diagram of the SS0201 chip

4. LCD FORMAT

Figure 4.1 shows the LCD format that the SS0201 uses.

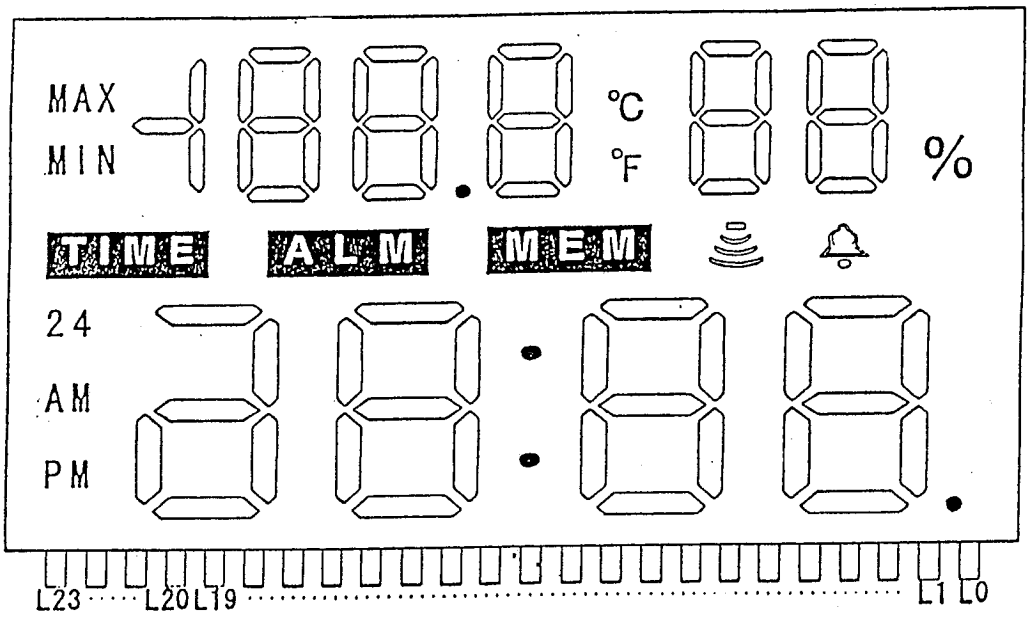


Figure 4.1 LCD format of the SS0201
(This LCD is LM-1284C producted by CITIZEN WATCH Co.,Ltd.)

Fig 4.2 Shows the LCD element name.

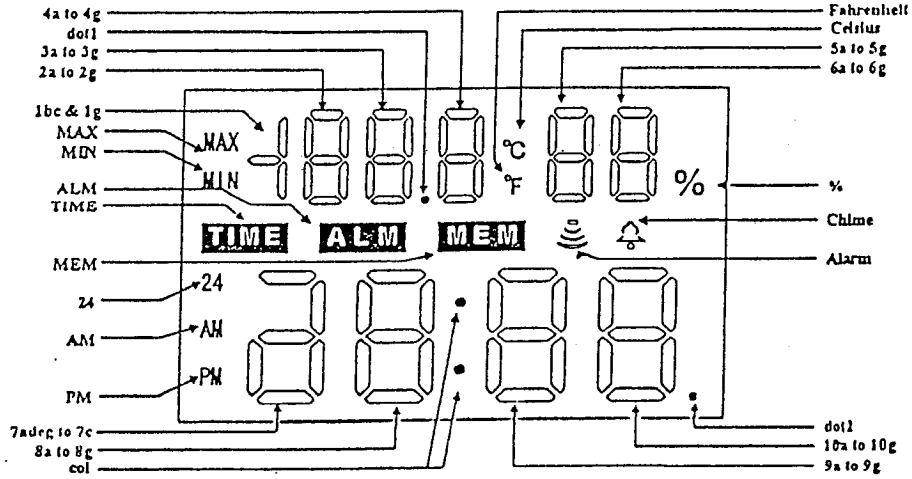


Figure 4.2 LCD Element name

Table 4.1 shows LCD segment assignment of the SS0201

Table 4.1 Segment Assignment of the SS0201

Pin	COM1 Group	COM2 Group	COM3 Group	COM4 Group
L0	%	6c	6b	5a
L1	Chime	6d	6g	6a
L2	-	Alarm	6e	6f
L3	dot2	10a	5c	5b
L4	10b	10f	5d	5g
L5	10c	10g	5e	5f
L6	10d	10e	MEM	4a
L7	-	9a	Fahrenheit	Celsius
L8	9b	9f	4c	4b
L9	9c	9g	4d	4g
L10	9d	9e	4e	4f
L11	colon	8a	ALM	dot1
L12	8b	8f	3c	3b
L13	8c	8g	3d	3g
L14	8d	8e	3c	3f
L15	-	7b	2c	2b
L16	7c	7adeg	2d	2g
L17	PM	TIME	2e	2f
L18	AM	MIN	1bc	2a
L19	24	MAX	1g	3a
L20	COM1	-	-	~~COM4~~
L21	-	COM2	~~COM3~~	-
L22	-	~~COM2~~	COM3	-
L23	~~COM1~~	-	-	COM4

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5. *REFERENCE CIRCUIT DIAGRAM*

Figure 5.1 shows the reference circuit diagram of the SS0201
The temperature unit is Celsius.

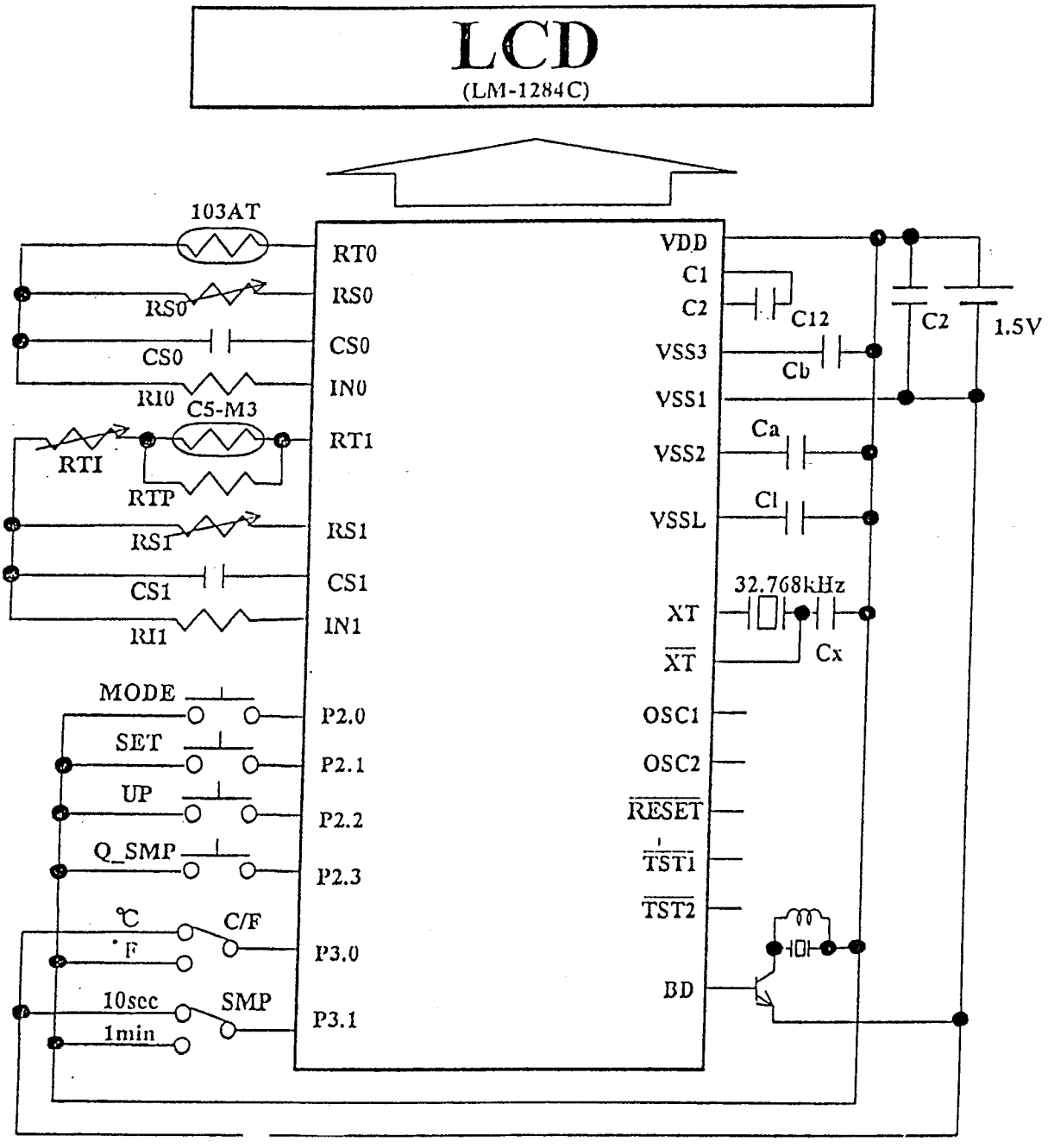

Figure 5.1 Reference circuit diagram of the SS0201 circuit.

6. TEMPERATURE MEASURING FUNCTION

6.1 Setting of Temperature Measuring Function

The SS0201 has one temperature measuring circuit. Temperature is measured by RT0, RS0, CS0 and IN0. The temperature measuring range of the SS0201 is from -50 to 70 degrees Celsius (-58 to 158 degrees Fahrenheit).

Temperatures can be displayed by either Celsius or Fahrenheit. Display is determined by the state of C/F switch as follows :

C/F = L level : degree Celsius display

C/F = H level : degree Fahrenheit display

Temperatures measuring period is determined by the state of SMP switch as follows.

SMP = L level : 10 seconds

SMP = H level : 1 minute

However, temperature measuring is suspended when buzzer outputs or the SS0201 is in time/alarm correction state.

6.2 Recommended Value for Temperature Measuring Circuit

The following shows recommended value of registers, capacitor and Thermistor that are connected to oscillation circuit of the SS0201 for measuring temperature.

RS0 = RI0 = 10 k ohm ±5%

CS0 = 820 pF ±10%

Thermistor : 103AT (Isituka electronics)

6.3 Measuring Timing

The SS0201 measures temperature when the time becomes sampling timing determinded by SMP switch. when Q_SMP is pressed, SS0201 starts to measure temperature even if time is not regular cycl(Note that pressing Q_SMP is no meaning in time/alarm correction state.

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7. HUMIDITY MEASURING FUNCTION

7.1 Setting of Humidity Measuring Function

The SS0201 has one humidity measuring circuit. Humidity is measured by RT1, RS1, CS1 and IN1. The humidity measuring range of the SS0201 is from 20 to 90 %.

Humidity measuring period is determined by the state of SMP switch as follows :

SMP = L level : 10 seconds

SMP = H level : 1 minuite

However, humidity measuring is suspended when buzzer outputs or the SS0201 is in time/alarm correction state.

7.2 Recommended Value for Humidity Measuring Circuit

The following shows recommended value of registers, capacitor and humidity sensor that are connected to oscillation circuit of the SS0201 for measuring humidity.

RS1 = 33 k ohm ±1%

RTI =.3.9 k ohm ±1%

RTP = 680 k ohm ±1%

RI1 = 10 k ohm ±1%

CS1 = 680pF ±5%

Humidity sensor : HPR-C5-M3 (Shinei Kaisha)

7.3 Measuring Timing

The SS0201 measures humidity when the time becomes sampling timing determinded by SMP switch. When Q_SMP is pressed, the SS0201 starts to measure humidity even if time is not regular cycle. Note that pressing Q_SMP is no meaning in time/alarm correction state.

8. DESCRIPTION of FUNCTIONS

8.1 Mode Transition Diagram

Figure 8.1 shows the mode transition of the SS0201

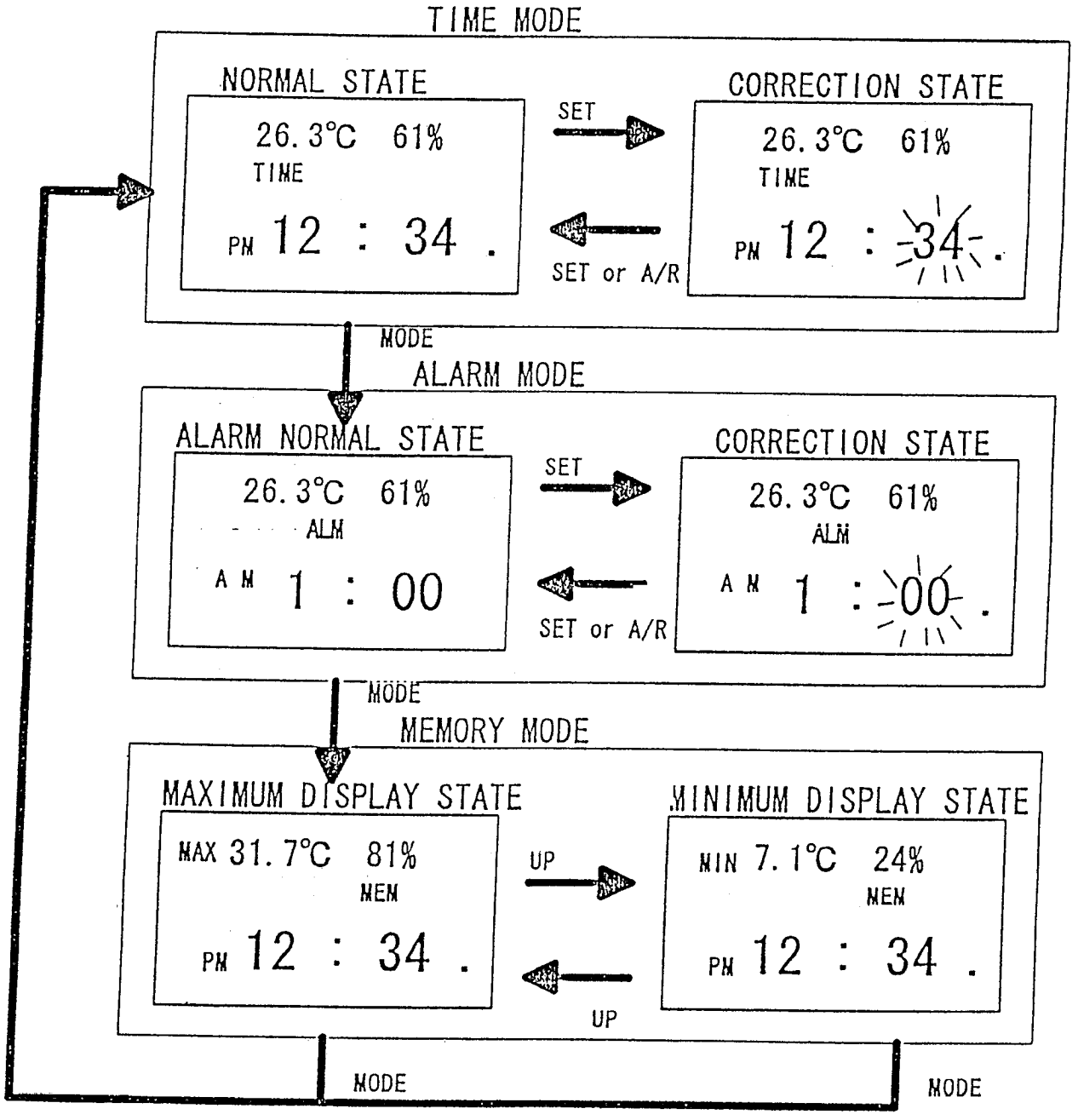

Figure 8.1 Mode Transition Diagram of the SS0201

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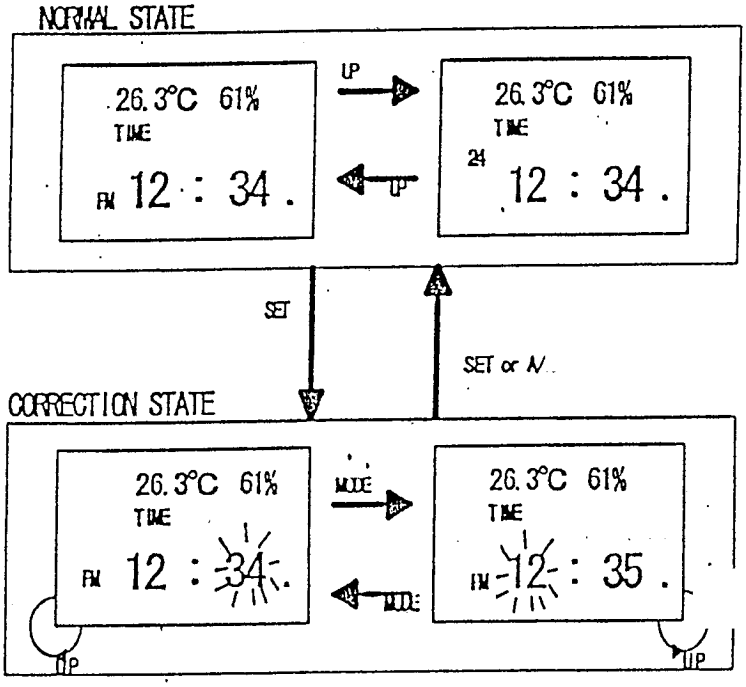
8.2 Description of Operation

8.2.1 Time Mode

In time mode, (1) clock display and correction , (2) temperature measurement and display, and (3) humidity measurement and display are performed.

The following is the transition diagram of time mode.



<Change Time System>

Pressing UP in normal state, time system is exchanged (12-hour/24-hour).

<Minute Correction>

Pressing SET in normal state, state becomes in minute correction state. During the correction, minute flashes by 1Hz period.

When pressing UP in correction state, minute is increased by 1 and second is set to 0.

When keeping to press UP, minute is increased by 1 on 8Hz period automatically.

When pressing SET, normal state is restored.

And when no switch is pressed for 1 to 2 minute, normal state is restored (A/R function).

<Hour Correction>

Pressing MODE in minute correction state, state becomes in hour correction state. During the correction, hour and "AM" flag or "PM" flag or "24" flag flash by 1Hz period.

When pressing UP in correction state, hour is increased by 1.

When keeping to press UP, hour is increased by 1 on 8Hz period automatically.

When pressing SET , normal state is restored.

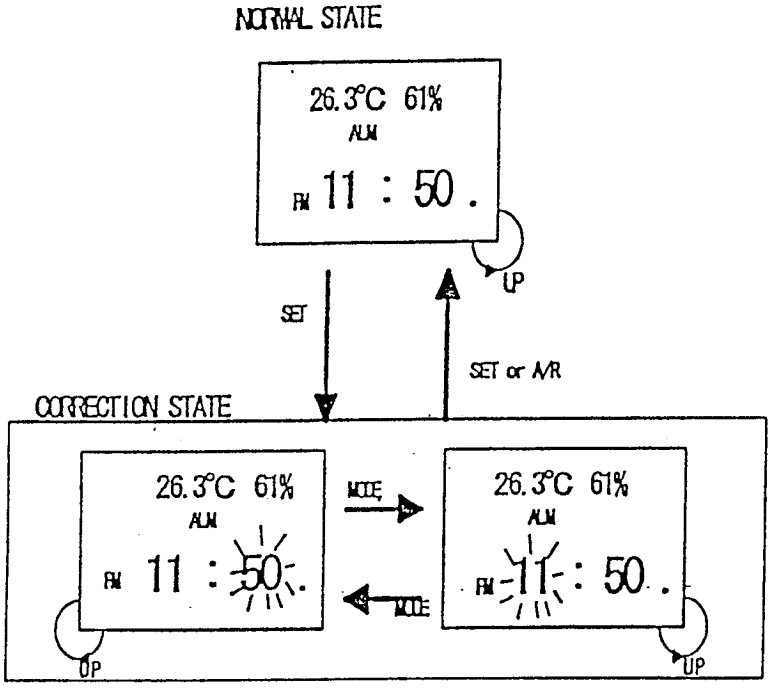
And when no switch is pressed for 1 to 2 minute, normal state is restored (A/R function).

When pressing MODE, minute correction state is restored.

8.2.2 Alarm Mode

In alarm mode, (1) alarm time display and correction , (2) temperature measurement and display, and (3) humidity measurement and display are performed. Time system is same as time mode.

The following is the transition diagram of alarm mode.



<Minute Correction>

Pressing SET in normal state, state becomes in alarm minute correction state. During the correction state, minute flashes by 1Hz period.

When pressing UP in correction state, minute is increased by 1.

When keeping to press UP, minute is increased by 1 on 8Hz period automatically.

When pressing SET, normal state is restored.

And when no switch is pressed for 1 to 2 minute, normal state is restored (A/R function).

<Hour Correction>

Pressing MODE in alarm minute correction state, state becomes in alarm hour correction state. During the correction, hour and "AM" flag or "PM" flag or "24" flag flash by 1Hz period.

When pressing UP in correction state, hour is increased by 1.

When keeping to press UP, hour is increased by 1 on 8Hz period automatically.

When pressing SET , normal state is restored.

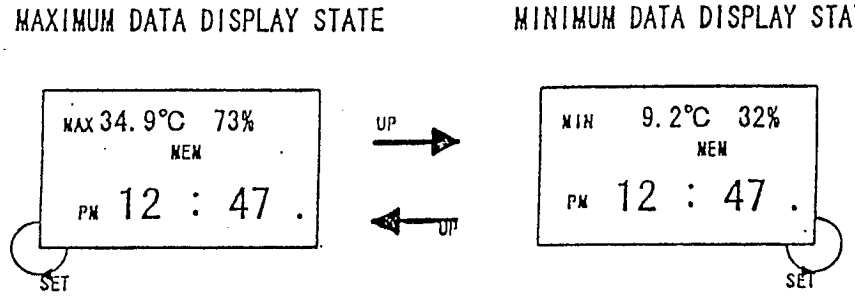
And when no switch is pressed for 1 to 2 minute, normal state is restored (A/R function).

When pressing MODE, minute correction state is restored.

8.2.3 Memory Mode

In memory mode, (1) maximum temperature and humidity display and clear, (2) minimum temperature and humidity display and clear, (3) humidity measurement and display, and (4) time display are performed. Time system is the same as time mode.

The following is the transition diagram of memory mode.



<Maximum data display & clear>

Pressing MODE in alarm mode and normal state, or pressing UP in minimum data display state, mode becomes in memory mode and maximum data display state. During the state, maximum temperature data and maximum humidity data are displayed. (there is no relationship between maximum temperature and maximum humidity.)

When pressing SET in state, all data is cleared and the SS0201 sounds to confirm. The sound is the same as chime. And temperature and humidity in that time become new maximum data.

<Minimum data display & clear>

Pressing UP in maximum data display state, mode becomes in minimum data display state. During the state, minimum temperature data and minimum humidity data are displayed. (there is no relationship between minimum temperature and minimum humidity.)

When pressing SET in state, all data is cleared and the SS0201 sounds to confirm. The sound is the same as chime. And current temperature and humidity in that time become new minimum data.

8.2.4 LCD Test mode

When the SS0201 is reset, starts LCD test mode (all LCD segments are put on). And any switches are pressed, the SS0201 finishes the LCD test mode and starts the time mode.

<Setting Alarm / Hourly Chime>

Pressing UP in alarm normal state, settng status (alarm and hourly chime) is changed. When alarm symbol is appeared, alarm is set. And chime symbol is appeared, hourly chime is set.

<Alarm Sound>

When the alarm time set is the same as clock time, the SS0201 starts to sound 4kHz 50% duty wave form. Time passes 20 seconds or any switch is pressed, alarm sound stops immediately. The pressing switch does not work normally when the sound is stopped by switch. When the SS0201 is in time correction status or alarm correction status, never sounds.

<Chime Sound>

When time becomes each 00 minute and chime is set, the SS0201 sounds 2kHz 50% duty wave form. It sounds for 2 seconds. But the SS0201 is in time correction status or alarm correction status, never sounds.

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