

Service Manual

PIONEER



DIGITAL TIMER

DT-400 KU,D,D/G

MODEL DT-400 COMES IN FOUR VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
KU	120V only	U.S.A. model
HG	220V and 240V (Switchable)	Europe or Oceania model
D	120V, 220V and 240V (Switchable)	General export model
D/G	120V, 220V and 240V (Switchable)	U.S. Military model

- This service manual is applicable to the DT-400/KU, D, D/G types. For servicing of the other types, please refer to the additional service manual.

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PRECAUTIONS IN REPLACING IC

Since the IC (LSI) employed in the DT-400 is of the CMOS type, it is prone to damage due to static electricity. Consequently, whenever replacing this component, always employ a soldering iron equipped with a ground lead.

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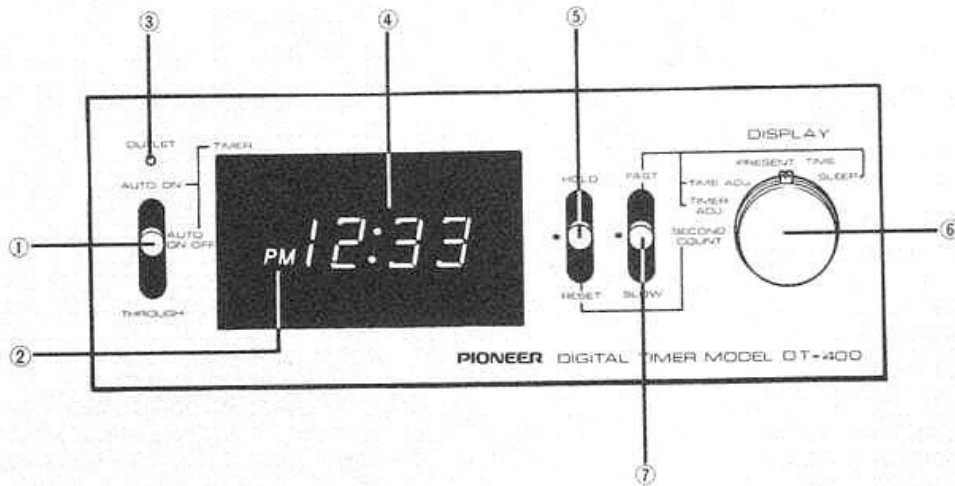
1. SPECIFICATIONS

Power Requirements 120V, AC, 60Hz (KU)
 Power Requirements 120V, 220V, 240V
 AC 50/60Hz (D, D/G)
 Display of Time Digital display of fluorescent display
 tube system
 (Switchable between hours and minutes,
 with display of seconds, and AM/PM)
 Timer Type 24-hour type (12-hour display)
 Operation; (1) ON after desired time
 (2) ON after desired time, and
 OFF 59 minutes later
 Sleep Timer Type ON time duration; 1 to 59 minutes
 Timer Setting Interval 1 minute
 Accuracy of Time Synchronized with line frequency
 Accuracy of Timer ON time accuracy; Delay time to
 displayed time (Max. +0.02 second)
 Accuracy of Sleep Timer Delay time for OFF to the
 preset time; 0 to 1 minute
 AC Outlet Capacity Power Total of two AC outlets
 500W max. (inductive load)

Other Functions ● Second adjusting function for
 present time, and second counter
 ● ON display (LED display), with power failure
 indication
 Power Consumption 7W (clock only)
 Dimensions 190(W) x 75(H) x 163(D) mm
 7-1/2 x 2-15/16 x 6-7/16 in.
 Weight 1.3kg (2.1b 14 oz)
 Furnished parts Operating instructions x 1

NOTE:
 Specifications and the design subject to possible modifi-
 cation without notice due to improvements.

2. FRONT PANEL FACILITIES



① TIMER SELECTOR SWITCH

AUTO ON:

Power to the AC outlets is turned ON (supplied) exactly at the time preset by the timer.

AUTO ON/OFF:

Power to the AC outlets is turned ON exactly at the time preset by the timer, and then turned OFF automatically 59 minutes later.

THROUGH:

Power to the AC outlets is always ON irrespective of the operation of the timer switch. Set this selector switch to this position when the timer operation is not needed.

② AM/PM INDICATOR

AM is indicated to the upper left, and PM is indicated to the lower left of the time display figure.

③ OUTLET ON LAMP

Lights up when power to the AC outlets on the rear panel of this unit is supplied.

④ TIME DISPLAY

The present time (hour, minute, second) is displayed. The preset time of the timer or remaining time in SLEEP mode operation can also be displayed. This time display unit is provided with power failure indicating function; the time display will start flashing when the power cord of the timer is first connected to an AC outlet, or when power is shut off and then resupplied during operation of the timer.

⑤ "SECOND" ADJUSTING LEVER

Use this lever when adjusting the timer to the correct time to the "second" by setting the DISPLAY switch to SECOND COUNT.

The SECOND COUNT setting will also be utilized when using the timer as a time counter.

HOLD: Counting of seconds stops.

■ : Counting of seconds starts.

RESET: Second display is reset to zero.

When adjusting the timer to the time signal, wait for the time signal at RESET position, and move the lever to "■"

position the instant the time signal is heard. (For more detailed instructions, see "ADJUSTING TO PRESENT TIME".)

NOTES:

- If the "second" adjusting lever is moved to the HOLD or RESET position after the correct time adjustment is completed, the adjusted time will turn out to be wrong.
- This "second" adjusting lever does not function if the DISPLAY switch is set at any position except SECOND COUNT.

⑥ DISPLAY SWITCH

This switch is able to provide five different functions:

SECOND COUNT:

Use this position when displaying one figure of "minute" and full "second" of the present time, and when using this timer as a time counter.

TIMER ADJ.:

Use this position when setting the operating time of the timer. (The operating time is displayed.)

TIME ADJ.:

Use this position when setting the present time.

PRESENT TIME:

The present time (hour, minute) is displayed irrespective of the position of the time adjusting lever. Normally set this switch to this position.

SLEEP:

Set the DISPLAY switch to this position when setting the sleep time, or when adjusting (reducing) the ON duration time by using the time adjusting lever. This position does not function when the TIMER selector switch is at THROUGH.

⑦ TIME ADJUSTING LEVER

Use this lever when adjusting the timer to the correct or desired time with the DISPLAY switch set to TIME ADJ., TIMER ADJ., or SLEEP position.

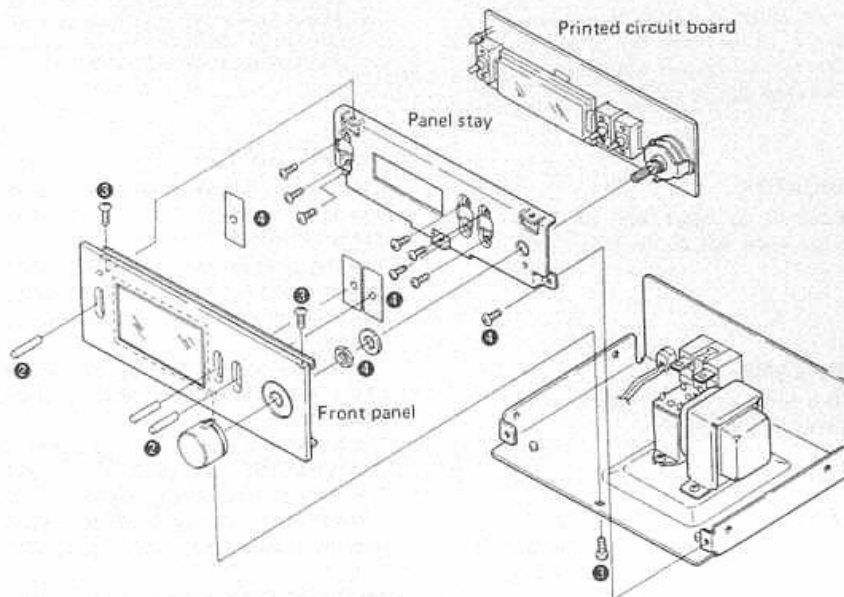
FAST: The displayed time advances quickly at the rate of approximately one hour per one second.

SLOW: The displayed time advances slowly at the rate of approximately two minutes per one second.

The lever will return to the middle "■" position when released, and the adjusted time is displayed. This time adjusting lever does not function if the DISPLAY switch is set to the SECOND COUNT or PRESENT TIME position.

3. REMOVAL OF P.C. BOARD

1. First remove the bonnet.
2. Remove the front panel knobs.
3. Undo the 3 screws securing the front panel.
4. After removing the masks, nut, and flat washer, the 8 screws securing the panel stay may be removed to release the printed circuit board.

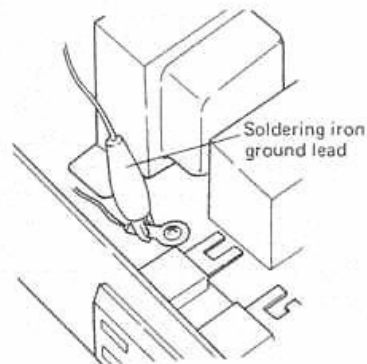


4. LSI REPLACEMENT PROCEDURE

Note that the IC (LSI) employed in the DT-400 is of the CMOS type, and is therefore prone to damage due to static electricity. Consequently, if this IC has to be replaced, take special note of the following precautions on IC handling.

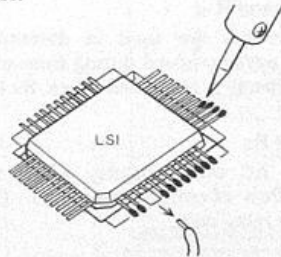
- Remove the power cord from the main socket.
- Ensure that the DT-400 chassis is well grounded.
- Connect the soldering iron ground to the chassis.
- Then touch the chassis by hand to draw off any remaining static electricity.
- When soldering IC (LSI) legs, complete the job as quickly as possible. Prolonged application of heat will not only most likely damage the IC itself, but may damage part of the printed circuit board pattern as well.

* It is strongly recommended that the soldering iron used for this work be equipped with a ground lead.



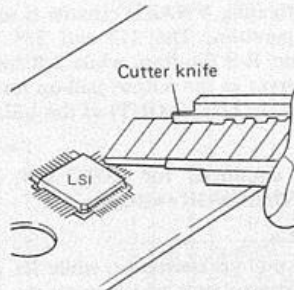
LSI REMOVAL

1. First reinforce (with solder) the connections between the legs of the LSI to be removed and the printed circuit board. If this is not done properly, there is danger of pulling off some of the copper foil, making the printed circuit board useless.



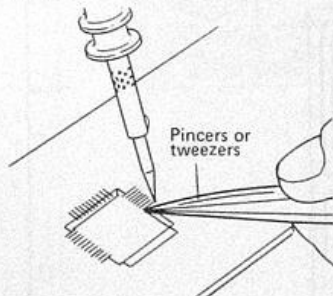
LSI leg connections reinforced with solder.

2. Cut the leg connections on all 4 sides with a cutter knife, and remove the LSI



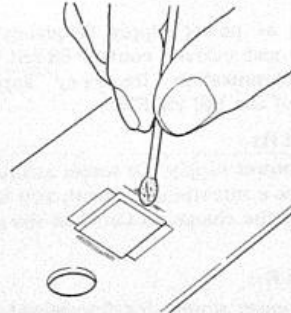
Cut the LSI leg connections with a cutter knife.

3. Remove the remaining stumps with the soldering iron.



Removing the remaining leg stumps from the printed circuit board.

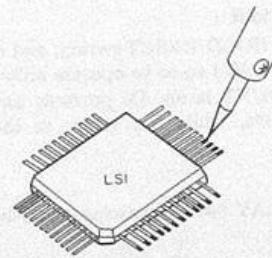
4. Remove solder smears with alcohol.



Cleaning the printed circuit board with alcohol.

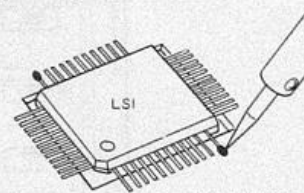
LSI MOUNTING

5. Add small amounts of solder to the tips of the legs of the new LSI.



Plating the LSI leg tips with solder.

6. Insert the LSI into place, and temporarily solder 2 legs as shown in the diagram.
7. Then proceeding carefully, solder each leg one at a time into the correct positions. Be particularly careful not to form short circuits between neighboring legs.



Temporary soldering of 2 LSI legs.

5. CIRCUIT DESCRIPTIONS

- **C₁ and R₁**

Employed as power supply frequency (50 or 60Hz) filter and current control circuit. Power supply synchronization frequency applied to terminal 46 of the LSI via SW₄.

- **D₃, C₄, and R₂**

The V_{DD} power supply. D₃ serves as a half-wave rectifier, C₄ as a smoothing element, and R₂ in the discharging of the charge on C₄ when the power is turned off.

- **D₄, C₃, and R₁₂**

The grid power supply for fluorescent display tube ignition, and the common source power (No. 42) for LSI display. R₁₂ serves as the LSI input protector circuit.

- **D₅ and C₂**

For relay drive and lighting of the AC outlet, LED (D₁) display lamp.

- **SW₅, D₆, and R₁₁**

SW₅ is the HOLD/RESET switch, and is coupled to SW₂ (DISPLAY) so as to operate only when the SECOND COUNT is on. D₆ prevents any reverse flow of current, while R₁₁ serves as the pull-up resistance.

- **SW₂**

This DISPLAY switch switches over the various display modes.

- **SW₁**

This switch advances the display time for all SW₂ (DISPLAY) switch positions except PRESET TIME. In either the SLOW or FAST mode, the signal is

applied to terminal No. 5 of the LSI, with the display time thereby advanced. When SW₁ is set to the FAST position, R₉ is shorted out, resulting in a faster advance speed.

- **C₅, C₇, R₉, and R₁₀**

These elements are used in determining the display time advance speed during time adjustment operations. Speed is increased when R₉ is shorted out by SW₁.

- **D₁, D₂, and R₃**

D₁ is the AC outlet display LED, while R₃ controls the flow of current through D₁. D₂ is used to protect the relay coil.

- **Q₁**

For driving relays, and lighting up, the AC outlet display LED lamp.

- **IC and R₆**

This IC containing 3 NAND circuits is used for AUTO ON operation. The 1/3 and 2/3 NAND circuits form an R-S flip-flop, while 3/3 forms an OR gate. R₆ serves as the output pull-up resistance for terminal No. 1 (TIMER OUT) of the LSI.

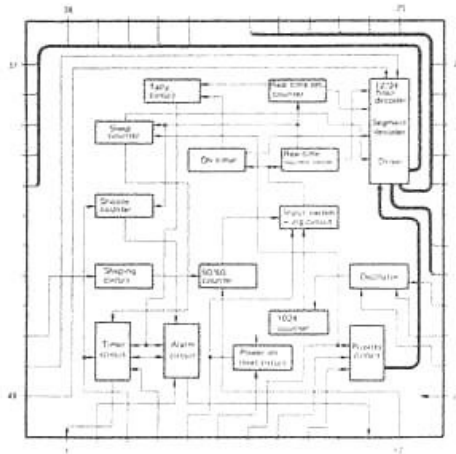
- **SW₃**

The switch employed for AUTO ON, AUTO ON/OFF, and THROUGH switching.

- **R₇, R₈, and C₆**

R₇ provides pull-up resistance, while R₈ and C₆ form an integrating circuit which resets the AUTO ON IC R-S flip-flop when the power supply is turned on.

LSI Block Diagram
(MB8724A)



6. SCHEMATIC DIAGRAM P.C. BOARD PATTERNS AND PARTS LIST

6.1 SCHEMATIC DIAGRAM

SW1 TIME ADJUSTING LEVEL

SW2 FAST-OFF-SLOW

SW3 TIMER ADJUST

SW4 HOLD-OFF-RESET

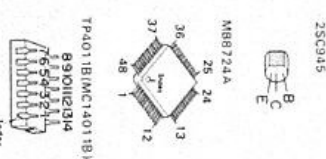
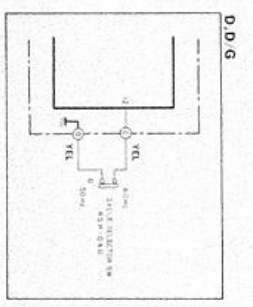
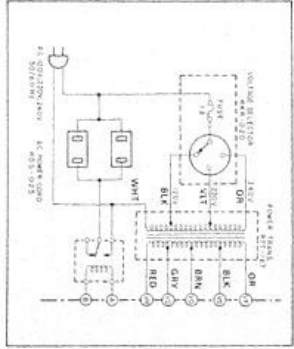
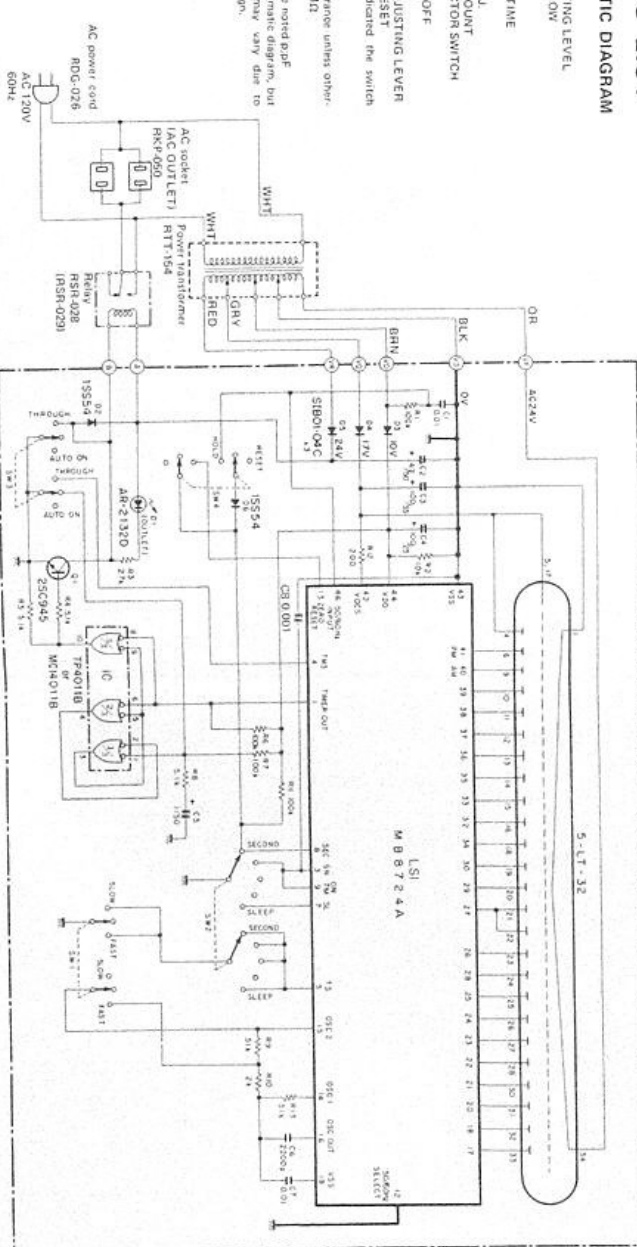
SW5 TIMER SELECTOR SWITCH

1. SLEEP
2. PRESENT TIME
3. TIME ADJ.
4. TIMER ADJUST

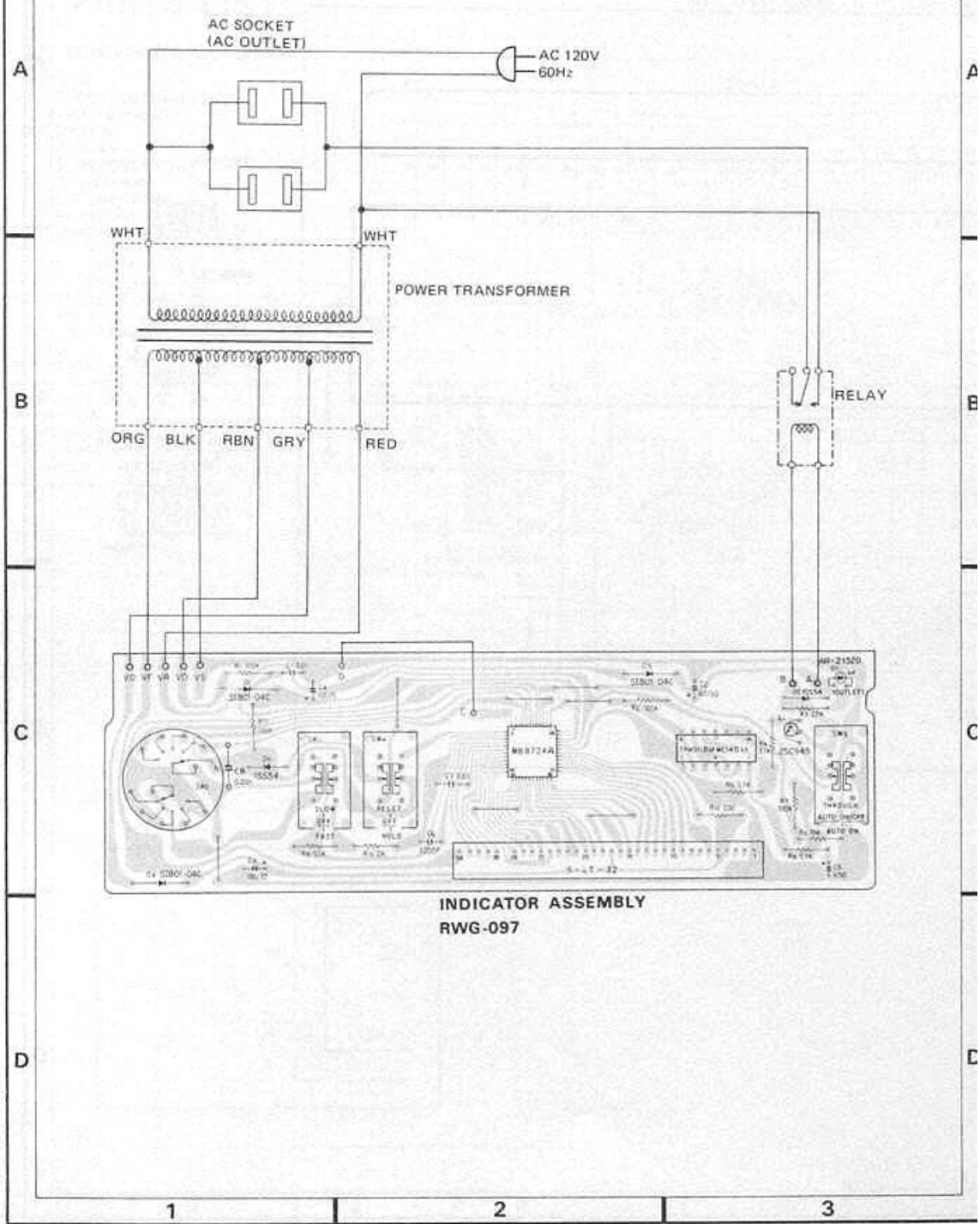
1. AUTO ON/OFF
2. THROUGH
3. SECOND ADJUSTING LEVER

The under lined indicated the switch RESISTORS:
In ohm, SW45%, tolerance unless otherwise noted k-k.Ω, M-MΩ.

CAPACITORS:
In μF unless otherwise noted D.D.F. This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.



6.2 P.C. BOARD CONNECTION DIAGRAM (KU)
 (D, D/G Type see page 15)



INDICATOR ASSEMBLY
 RWG-097

6.3 PARTS LIST OF INDICATOR ASSEMBLY RWG-097(KU), RWG-094(D,D/G)

CAPACITORS

Part No.	Symbol & Description
CKDYF 103Z 50	C1
CEA 470P 50	C2
CEA 101P 35	C3
CEA 101P 25	C4
CEA 010P 50	C5
COEA 222J 50	C6
COEA 103J 50	C7
COEA 104K 50	C8

RESISTORS

Part No.	Symbol & Description
RD%PS 104J	R1, R6, R7, R11
RD%PS 103J	R2
RD%PS 272J	R3
RD%PS 512J	R4, R5, R8
RD%PS 513J	R9
RD%PS 202J	R10
RD%PS 201J	R12
RD%PS 513J	R13

SEMICONDUCTORS

Part No.	Symbol & Description
2SC945	Q1
AR-2132D	D1
1SS54	D2, D6
S1B01-04C	D3-D5
MC14011B (TP4011)	IC
5-LT-32	Fluorescent indicator tube
MB8724A	LSI

SWITCHES

Part No.	Symbol & Description
RSK-049	SW1
RSK-050	SW3, SW4
RSB-019	SW2

OTHERS

Part No.	Symbol & Description
RTT-154	Power transformer
RSR-028 (RSR-029)	Relay
RKP-050	AC socket (AC OUTLET)
RDG-026	AC power cord

6.4 DISPLAY TUBE (SEGMENTS) TERMINALS

The display tubes are divided into 4 blocks (numbered from right to left), and each block is further divided into 7 segments (coded "a" to "g" in a clockwise direction).



Display Tube Terminal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
Segment Position	F	-	-	-	G	P	M	-	-	A	M	4b 4c	3f	3g	3a	3b	3d	3c	G

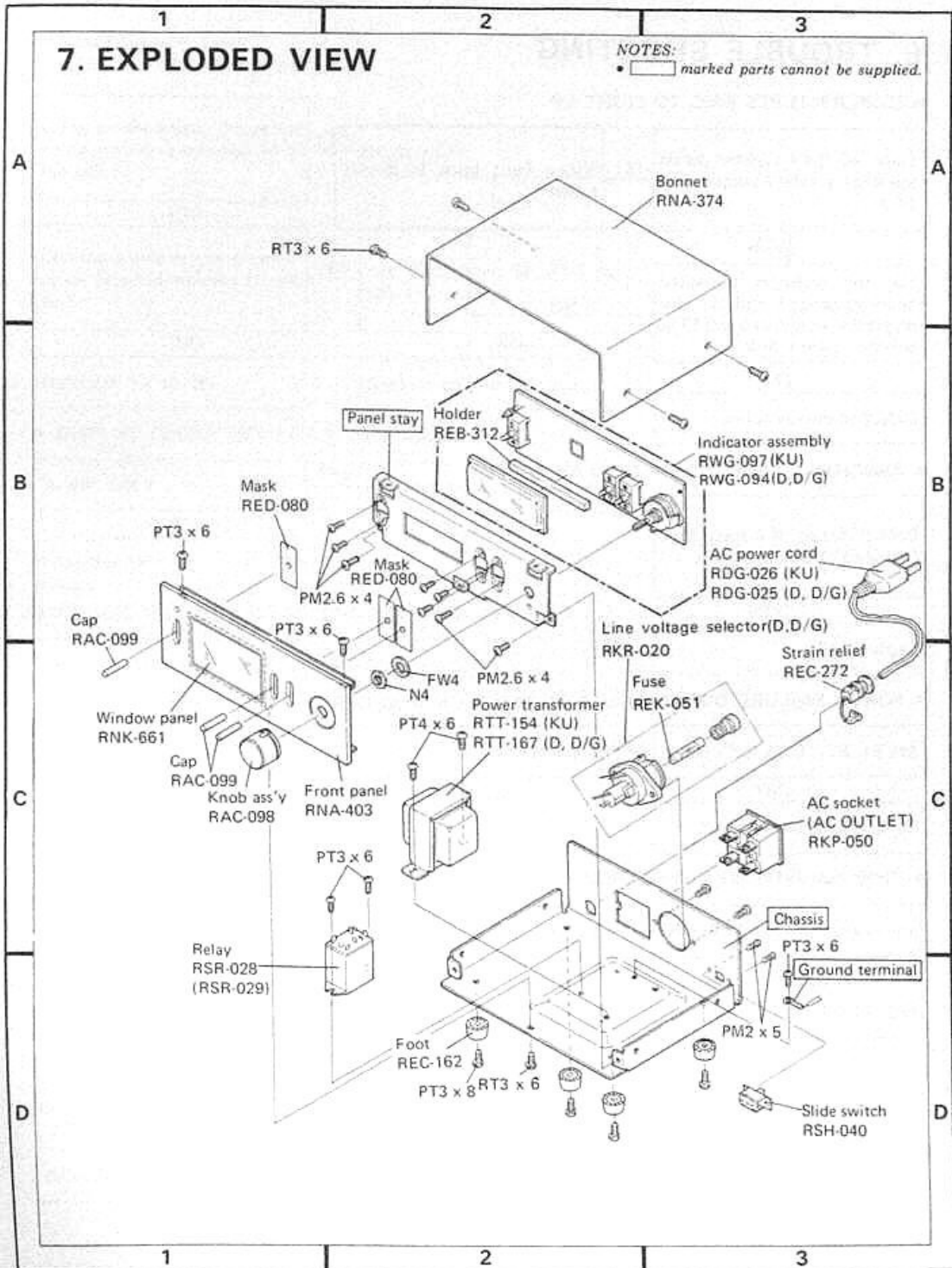
F --- Filament
G --- Grid

Display Tube Terminal	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Segment Position	3e	2f	2g	2d	2a	2b	2e	2c	1f	1g	1a	-	1b	1c	1e	1d	F

7. EXPLODED VIEW

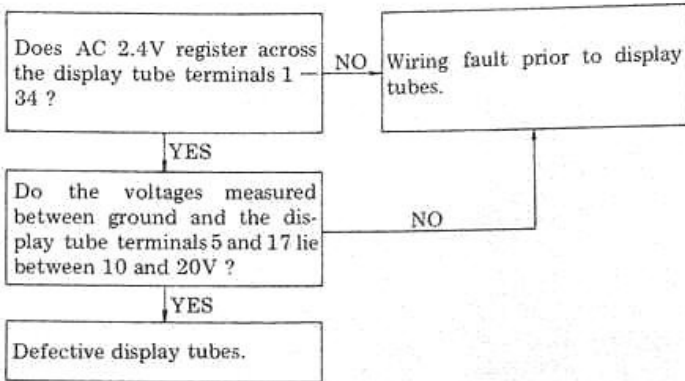
NOTES:

• marked parts cannot be supplied.

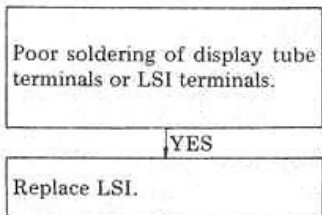


8. TROUBLE SHOOTING

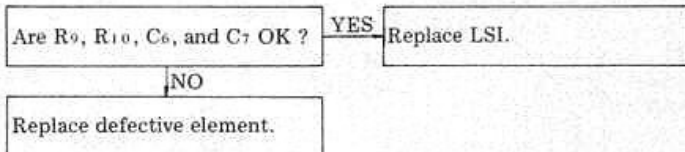
• DISPLAY TUBES FAIL TO LIGHT UP



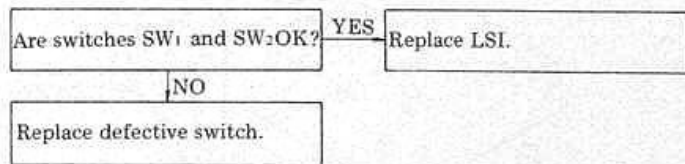
• ABNORMAL LIGHTING OF DISPLAY TUBES



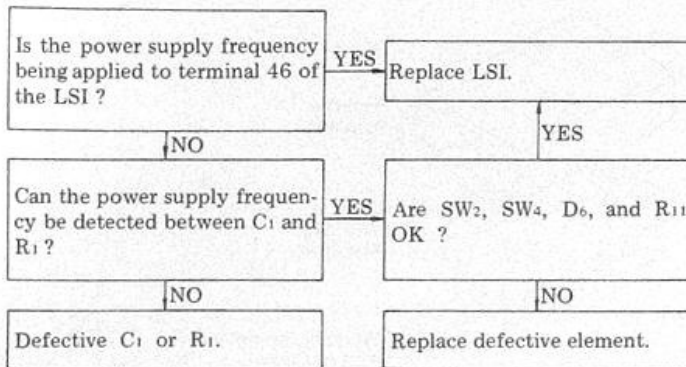
• POWER FAILURE DISPLAY FAILS TO BLINK ON AND OFF



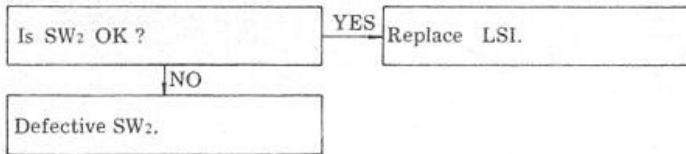
• TIME ADJUSTMENT OUT OF ORDER



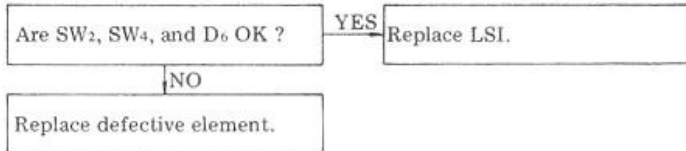
• INACCURATE TIME
(CHECK FREQUENCY SWITCH)



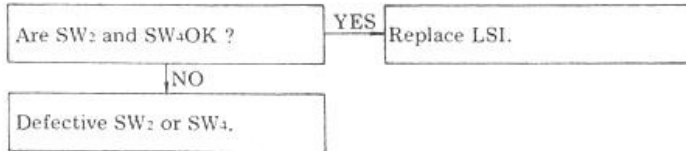
• DISPLAY OPERATION FAILS TO CHANGE



• NO HOLDING DURING SECOND COUNT DISPLAY

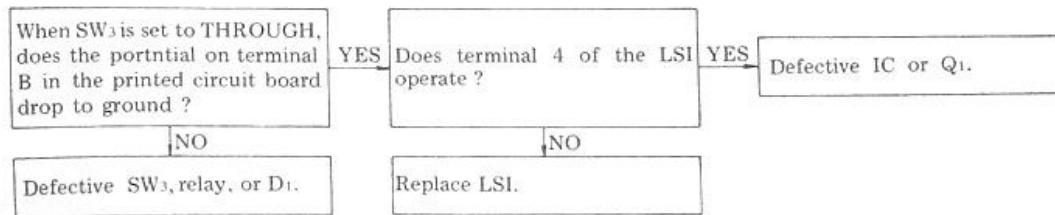


• NO RESETTING DURING SECOND COUNTMODE



• TIMER FAILS TO OPERATE

* Neither LED nor AC outlet are active.



9. PACKING

