

# Service Manual

## Microwave Oven



MODELS	KKE	KNQ	SNM	ZPE	RPE	RPK
NN-S651WF	○	○	○	○		
NN-S541WF					○	○


### Specifications:

Specifications:	Models:	NN-S651WF	NN-S541WF
Power Source:	240V AC Single Phase, 50Hz ..... For KNQ Models 220V AC Single Phase, 50Hz ..... For KKE, RPE, ZPE Models 220V AC Single Phase, 50/60Hz ..... For SNM Models 220V AC Single Phase, 60Hz ..... For RPK Models		
Power Requirement:	1050W		1150W
Output(IEC705-88):	1000W		1100W
Microwave Frequency:	*2450MHz		
Timer:	*99 min. 99 sec.		
Outside Dimensions:	*20" (518mm)(W) x 16" (407mm)(D) x 11" (301mm)(H)		
Oven Cavity Dimensions:	*14" (375mm)(W) x 15" (386mm)(D) x 8" (225mm)(H)		
Weight:	*26.5 lbs. (12.0kg)		
Output power: IEC705-88 Test Procedure			
Specifications subject to change without notice.			

## WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

## WARNING

1. This product should be serviced only by trained, qualified personnel.
2. Check for radiation leakage before and after every servicing according to the "procedure for measuring radiation leakage."
3. If the unit cannot be repaired on site, advise the customer not to use until unit is repaired.
4. There are special components used in the microwave oven which are important for safety. These parts are marked with a  on the replacement parts list. It is essential that these critical parts should be replaced only with the manufacture's specified parts to prevent microwave leakage, shock, fire, or other hazards. Do not modify the original design.

This service manual covers products for following markets.

When troubleshooting or replacing parts, please refer to the country/area identifications shown below for your applicable product specification.

KKE .....	For UAE, Egypt, Iran
KNQ .....	For Kuwait, Doha, Qatar, Oman, Bahrain, Pakistan
SNM .....	For Saudi Arabia
RPE .....	For Peru
RPK .....	For Chile
ZPE .....	For CLS Countries

## PRECAUTIONS TO BE OBSERVED BEFORE AND DURING SERVICING TO AVOID POSSIBLE EXPOSURE TO EXCESSIVE MICROWAVE ENERGY

- |  |   |
|--|---|
| <p>(A) Do not operate or allow the oven to be operated with the door open.</p> <p>(B) Make the following safety checks on all ovens to be serviced before activating the magnetron or other microwave source, and make repairs as necessary:</p> <ul style="list-style-type: none"><li>(1) Interlock operation</li><li>(2) Proper door closing</li><li>(3) Seal and sealing surfaces (arcing, wear, and other damage)</li><li>(4) Damage to or loosening of hinges and latches.</li><li>(5) Evidence of dropping or abuse</li></ul> <p>(C) Before turning on microwave power for any service test or</p> | <p>inspection within the microwave generating compartments, check the magnetron, waveguide or transmission line, and cavity for proper alignment, integrity and connections.</p> <p>(D) Any defective or misadjusted components in the interlock, monitor, door seal, and microwave generation and transmission systems shall be repaired, replaced, or adjusted by procedures described in this manual before the oven is released to the owner.</p> <p>(E) A microwave leakage check to verify compliance with the Federal Performance Standard should be performed on each oven prior to release to the owner.</p> |
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## DANGER OF HIGH VOLTAGE AND HIGH TEMPERATURE (HOT/LIVE) OF THE INVERTER POWER SUPPLY (U)

### INVERTER WARNING

This Inverter board looks like a regular PCB. However, this PCB drives the magnetron tube with extremely high voltage and high current.

**NEW H.V.**

IT HAS: 1. Very high voltage and high current circuits.

It functions the same as the high voltage transformer and high voltage capacitor in ordinary microwave ovens.

2. Aluminum heat sink is energized with very high voltages and high heat energy.

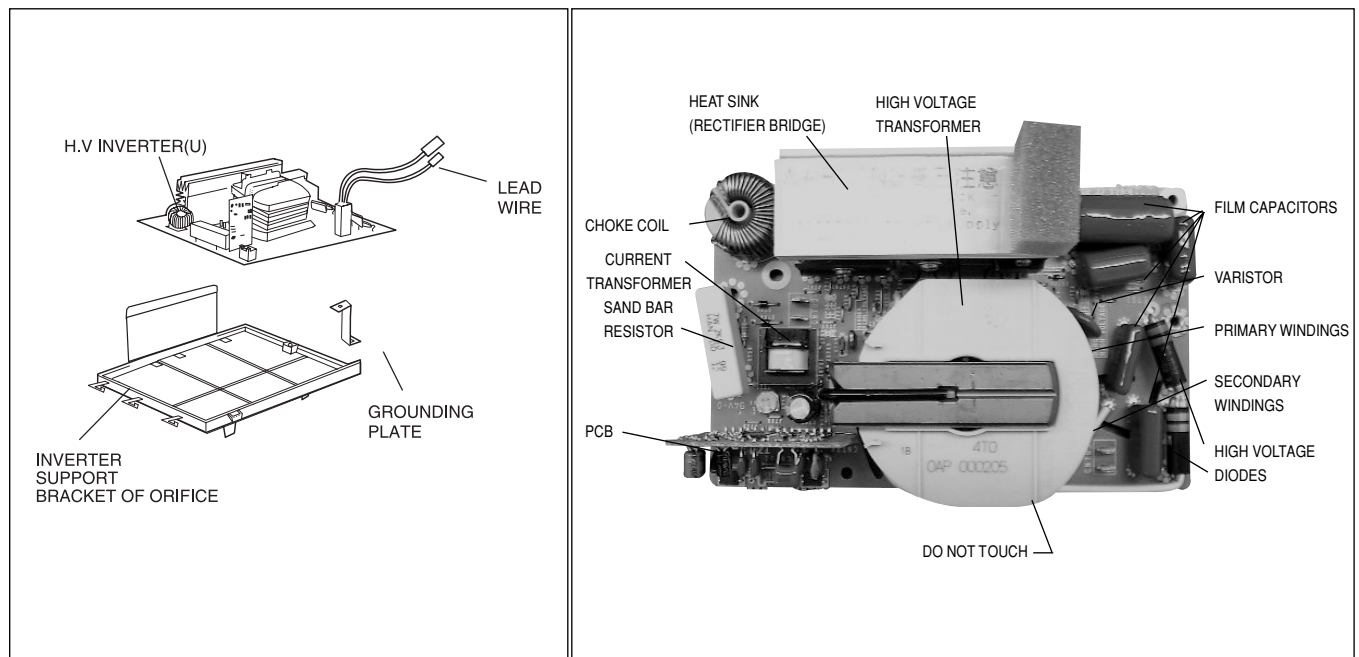
3. Very high voltage may remain in circuitry even when oven is off. High voltage may remain in the capacitors on the board.

DO NOT:

- \* 1. Do not touch circuitry because it has very hot (high voltage) circuitry. Even when replacing board, extreme care should be taken to avoid possible electric shock hazards. High voltage may remain in circuit.
- \* 2. Do not touch aluminum heat sink because it is very hot in high voltage and also very hot in high heat energy.
- \* 3. Do not try to adjust or tamper with preset volume on the Inverter board because it is very dangerous to adjust without proper test equipment.
- \* 4. Do not test oven while Inverter grounding plate or screws are loose. It is very dangerous to operate H.V. Inverter Circuit (U) with loose mounting screws or if improperly grounded.
- \* 5. For USA only:

Do not try to repair Inverter PCB because it is very dangerous to repair it. Replace as whole High Voltage Inverter Circuit unit and return fully re-packed with original shipping box and shipping materials.

### INVERTER POWER SUPPLY

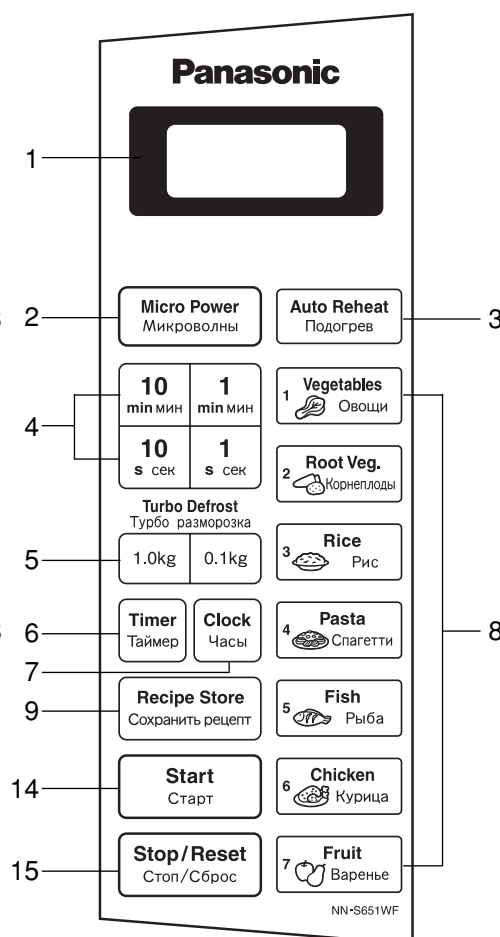
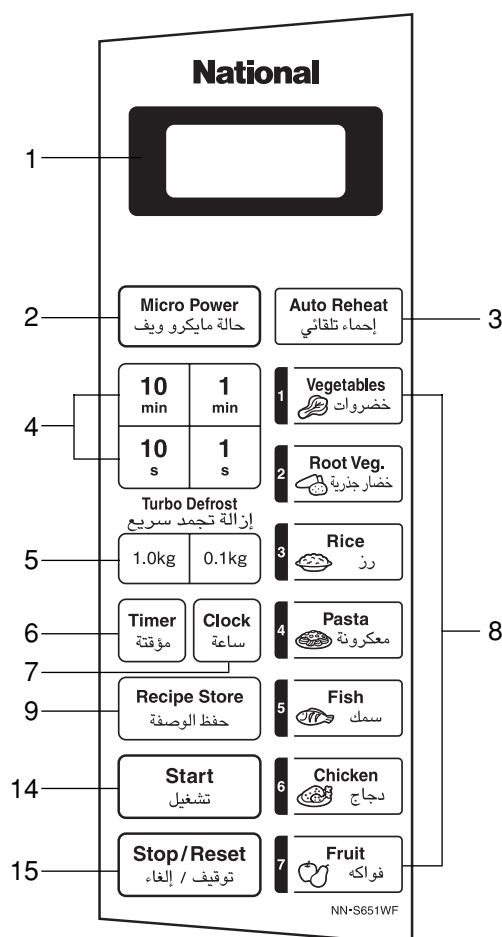


## FEATURE CHART

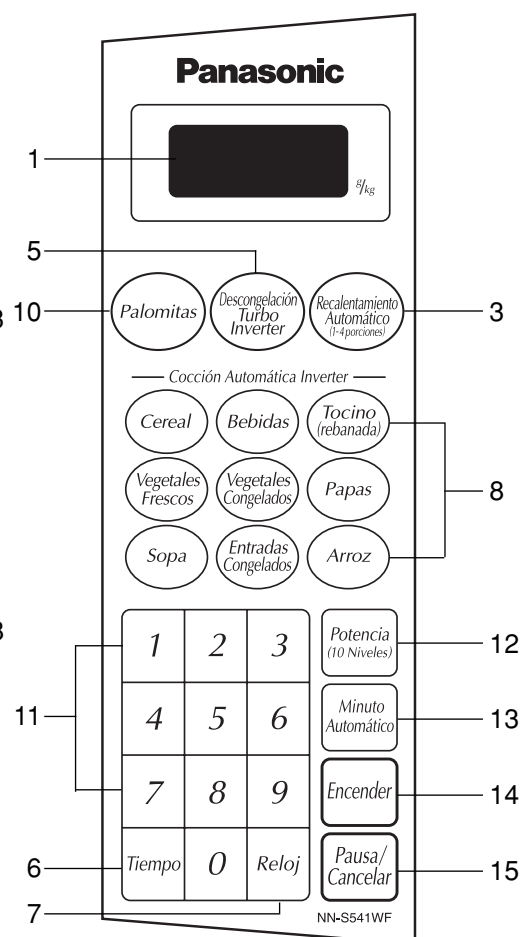
FEATURE \ MODEL	NN-S651WF	NN-S541WF
Five Stage Cooking	○	○
Inverter Turbo Defrost	○	○
Auto Reheat	○	○
Inverter Auto Cook	○	○
Timer	○	○
Digital Clock	○	○

## CONTROL PANEL

NN-S651WF



NN-S541WF



### 1. Display Windows

### 2. Micro Power Pad

### 3. Auto Reheat Pad

### 4. Time Pads

### 5. Turbo Defrost Pads

### 6. Timer Pad

### 7. Clock Pad

### 8. Auto Cooking Pads

### 9. Recipe Store Pad

### 10. Popcorn Pad

### 11. Number Pads

### 12. Power Level Pad

### 13. Quick Min Pad

### 14. Start Pad

One tap allows oven to begin functioning. If door is opened or STOP/RESET Pad is pressed once during oven operation, START Pad must again be pressed to restart oven.



### 15. Stop/Reset Pad

Before cooking: One tap clears your instructions.

During cooking: One tap temporarily stops the cooking process. Another tap cancels all your instructions and time of day or colon appears on the display window.

# OPERATION AND DIGITAL PROGRAMMER CIRCUIT TEST PROCEDURE

## 1. To Set Clock

OPERATION	SCROLL DISPLAY
1. Plug the power supply cord into wall outlet.	<b>8 8 . 8 8</b>
2. Press <b>Clock</b> pad.	
3. Enter time of day (TOD) by pressing appropriate <b>10 1 10 1</b> pads.	<b>1 1  2 5</b>
4. Press <b>Clock</b> pad. TOD has now been registered into the digital programmer circuit and will count up by minutes.	<b>1 1 : 2 5</b>

## 2. Time Cooking for Two Stage

OPERATION	SCROLL DISPLAY
1. Place a water load in the oven.	
2. Press <b>Micro Power</b> pad once to set High power. (1st stage)	<b>P 1 0</b>
3. Set for 5 seconds by pressing <b>10 1 10 1</b> pads.	<b>. 5</b>
4. Press <b>Micro Power</b> pad 6 times to set Medium power. (2nd stage)	<b>P 5</b>
5. Set for 1 minute by pressing <b>10 1 10 1</b> pads.	<b>1.0 0</b>
6. Press <b>Start</b> pad.	<b>. 5</b>
7. When 1st stage cooking time has elapsed. Oven beeps twice and automatically switches to 2nd stage cooking.	<b>1.0 0</b>

OPERATION	SCROLL DISPLAY
8. When 2nd stage cooking time has elapsed, oven beeps 5 times and shuts off.	Time of day or colon if set appears in the display.

## 3. Turbo Defrost

OPERATION	SCROLL DISPLAY
1. Set the weight for 1 kg by pressing <b>1.0 kg</b> pads.	<b>1.0 -</b>
2. Press <b>Start</b> Pad.	<b>9.23</b>
3. Press <b>Stop/Reset</b> Pad twice. Oven shuts off.	Time of day or colon if set appears in the display.

## 4. Auto Cook

OPERATION	SCROLL DISPLAY
1. Press <b>Vegetables</b> pad twice to select Vegetables for 2 servings.	<b>200</b>
2. Press <b>Start</b> pad.	<b>2.30</b>
When cooking time has elapsed, Oven beeps 5 times and shuts off.	Times of day or colon if set appears in the display.

## 5. Auto Reheat

OPERATION	SCROLL DISPLAY
1. Press <b>Auto Reheat</b> pad twice for two servings.	<b>400</b> —
2. Press <b>Start</b> pad. Auto Reheat cycle begins time counts down.	<b>3.30</b>
3. When cooking time has elapsed, Oven beeps 5 times and shuts off.	Time of day or colon if set appears in the display.

## 6. Power Level

Press Power Level	Power Level	Display Window
once	P 10 (HIGH)	P 10
twice	P 9	P 9
3 times	P 8	P 8
4 times	P 7 (MED. HIGH)	P 7
5 times	P 6 (MEDIUM)	P 6
6 times	P 5	P 5
7 times	P 4	P 4
8 times	P 3 (MEDIUM-LOW)	P 3
9 times	P 2	P 2
10 times	P 1 (LOW)	P 1

## 7. To set Child safety Lock

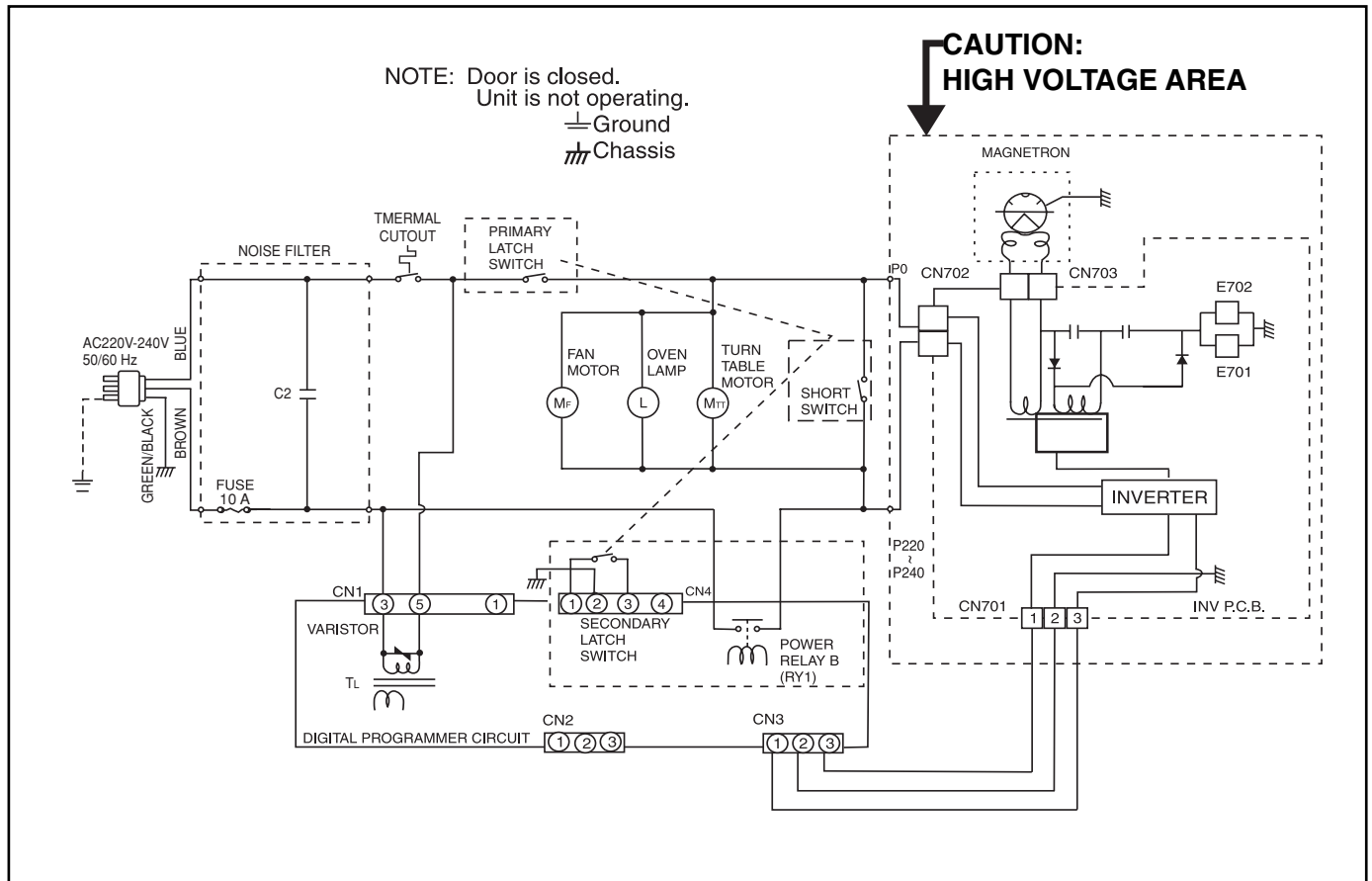
OPERATION	SCROLL DISPLAY
1. Press <b>Start</b> pad 3 times continuously. "Child" appears in the display.	<b>Child</b>

## 8. To Reset Child Lock

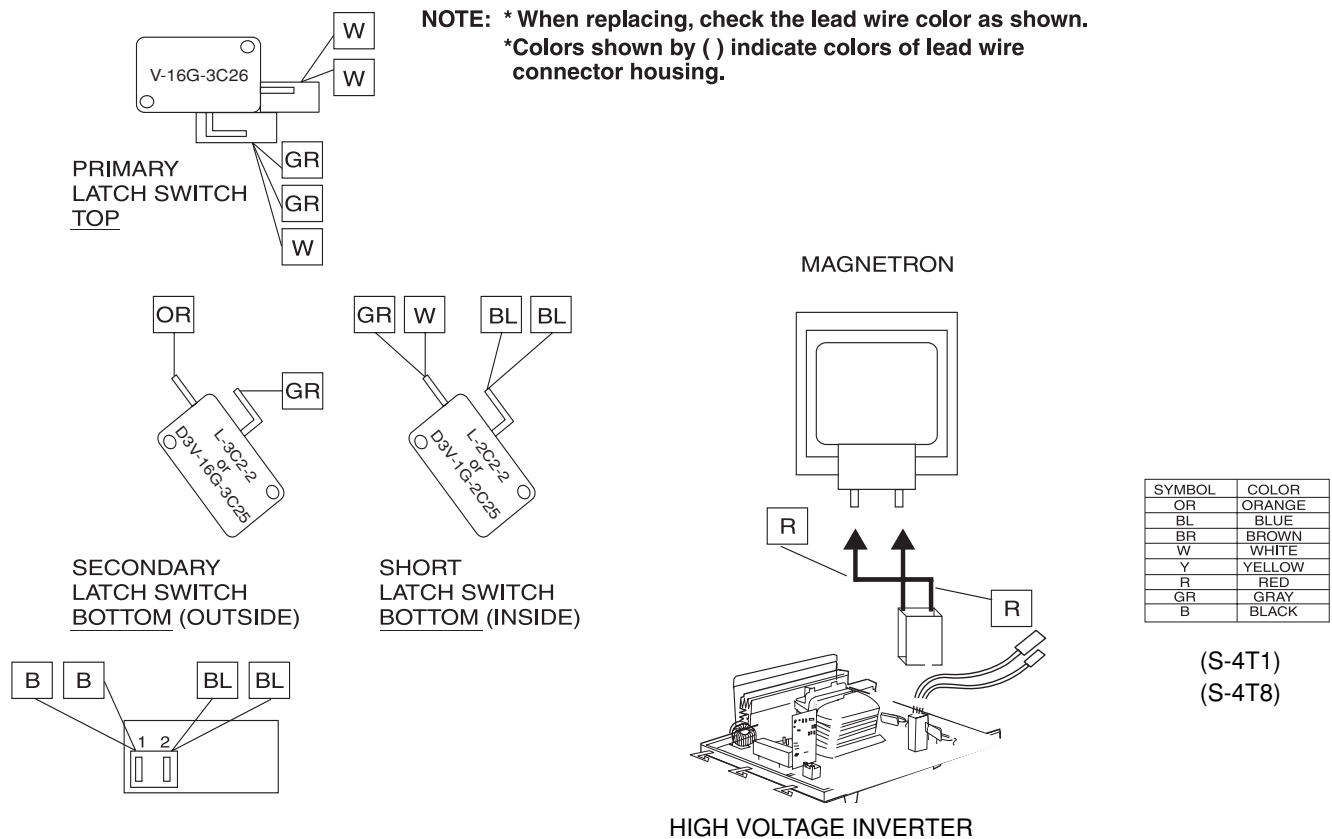
OPERATION	SCROLL DISPLAY
1. Press <b>Start / Reset</b> pad 3 times continuously.	Time of day or colon if set appears in the display.

# SCHEMATIC DIAGRAM

## SCHEMATIC DIAGRAM (EXCEPT ZPE)

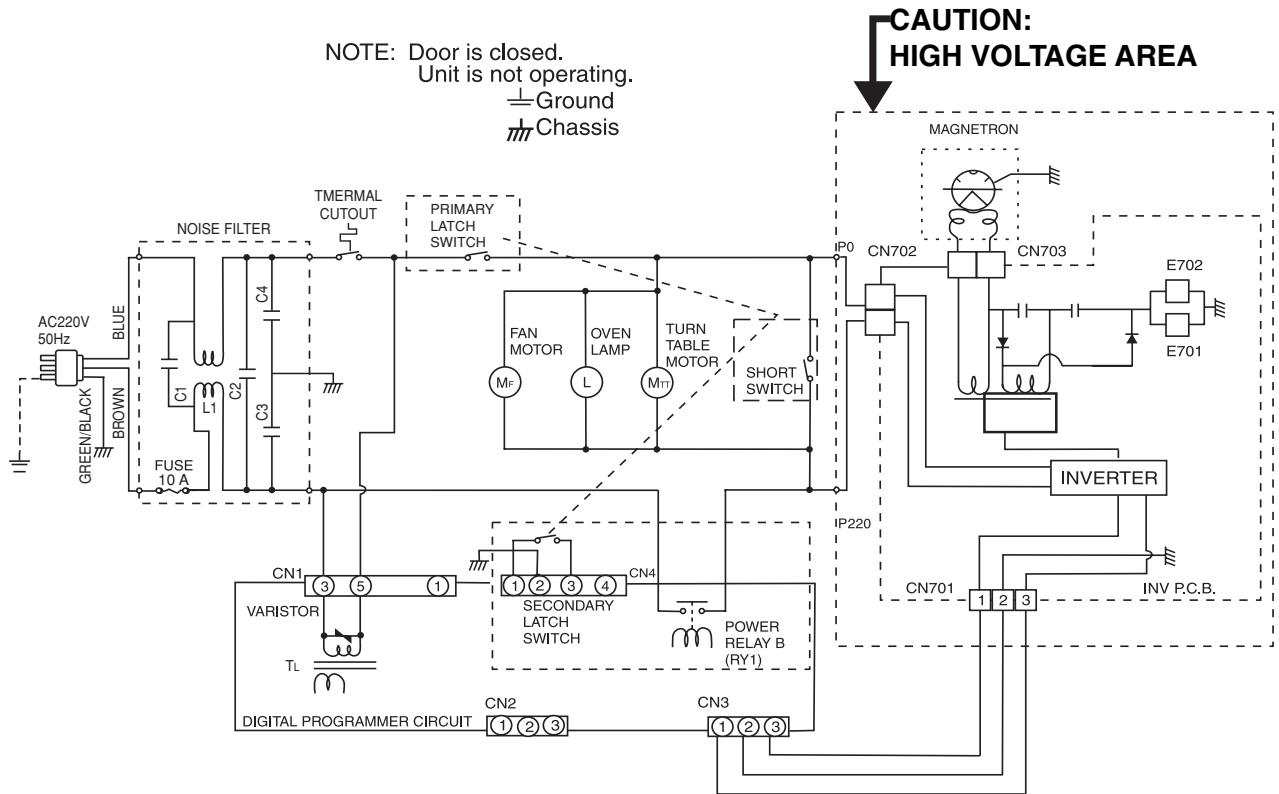


## WIRING DIAGRAM

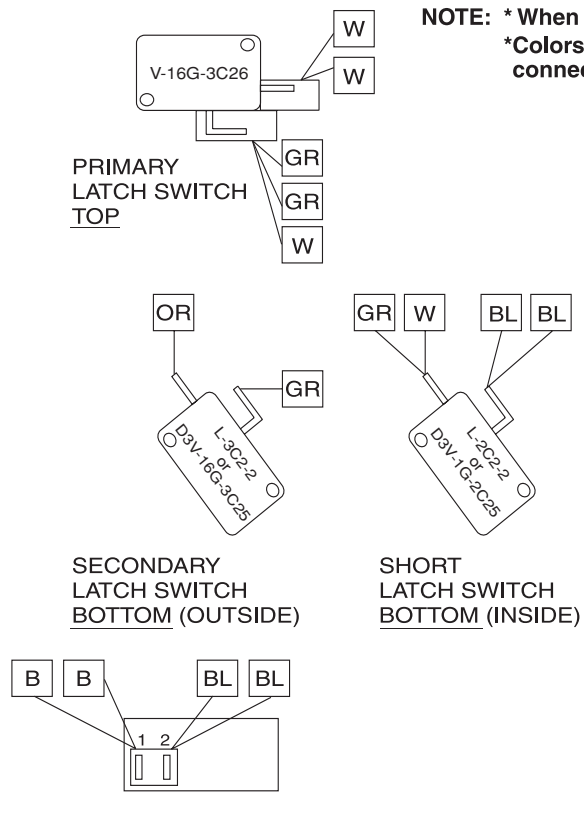


# SCHEMATIC DIAGRAM

## SCHEMATIC DIAGRAM (ZPE)



## WIRING DIAGRAM



SYMBOL	COLOR
OR	ORANGE
BL	BLUE
BR	BROWN
W	WHITE
Y	YELLOW
R	RED
GR	GRAY
B	BLACK

(S-4T1)  
(S-4T8)



# DESCRIPTION OF OPERATING SEQUENCE

## 1. Variable power cooking control

The coil of power relay B (RY1) is energized intermittently by the digital programmer circuit, when the oven is set at any power selection except for High power position. The digital programmer circuit controls the ON-OFF time of power relay B contacts in order to vary the output power of the microwave oven from "Low" to "High" power. One complete ON and OFF cycle of power relay B is 22 seconds. The relation between indications on the control panel and the output of the microwave oven is as shown in table.

**NOTE: The ON/OFF time ratio does not correspond with the percentage of microwave power since approximately 2 seconds are required for heating of magnetron filament.**

## 2. Inverter Power Supply Circuit **NEW H.V.**

This Inverter Power Supply Circuit supplies 4,000V DC to the magnetron tube from the line voltage, 220-240V 50Hz AC input. functions as the H.V. transformer, the H.V. capacitor and H.V. Diode.

1. The AC input voltage 220-240V 50Hz is rectified to DC voltage immediately.
2. DC voltage will be supplied to the switching devices called IGBT. These devices will be switched ON-OFF by the 20 to 40 kHz PWM. (pulse width modulation) signal from the microcomputer in the DPC.
3. This drives the High voltage transformer to increase up to 2,000V AC and approximately 3V AC by means of transformer.
4. Then the half-wave doubler voltage rectifier circuit, consisting of the HV diodes and Capacitors, generates the necessary 4,000V DC needed for the magnetron.
5. Output power of the magnetron tube is always monitored by the signal output from the current transformer built into the inverter circuit.
6. Then this signal will be fed back to the microcomputer in the DPC to determine operating conditions and output necessary to control PWM signal to the inverter Power Supply to control output power.

## 3. Inverter Turbo Defrost

When this Auto Control feature is selected and the Start Pad is tapped:

- (A) The digital programmer circuit determines the power level and cooking time to complete cooking and indicates the operating state in the display window. Table shows the corresponding cooking times for respective serving by categories.
- (B) When cooking time the display window has elapsed, the oven turns off automatically by a control signal from the digital programmer circuit.

## Variable Power Cooking

POWER SETTING	OUTPUT POWER(%) APPROX.	ON-OFF TIME OF POWER RELAY B (RY1)	
		ON (SEC)	OFF (SEC)
HIGH P10	100%	22	0
P9	90%	22	0
P8	80%	22	0
MEDIUM-HIGH P7	70%	22	0
MEDIUM P6	60%	22	0
P5	50%	22	0
P4	40%	22	0
MEDIUM-LOW P3	30%	17	5
P2	20%	11	11
P1	10%	6	16
DEFROST P3	30%	17	5

## Inverter Turbo Defrost

SELECTED WEIGHT	COOKING TIME
1.0KG	9 min.23 sec.

## CAUTIONS TO BE OBSERVED WHEN TROUBLESHOOTING

Unlike many other appliances, the microwave oven is high-voltage, high current equipment. Though it is free from danger in ordinary use, extreme care should be taken during repair.

### CAUTION

Servicemen should remove their watches whenever working close to or replacing the magnetron.

### 1. Check the grounding

Do not operate on a 2-wire extension cord. The microwave oven is designed to be used when grounded. When it is inoperative, make sure it is grounded properly before beginning repair work.

### 2. Inverter Warnings

#### NEW H.V.

#### DANGER OF HIGH VOLTAGE AND HIGH TEMPERATURE (HOT/LIVE) OF THE INVERTER POWER SUPPLY (U)

This High Voltage Inverter Power Supply circuit supplies very high voltage and very high current for the magnetron tube. Though it is free from danger in ordinary use, extreme care should be taken during repair. As you can see, it looks like a TV flyback transformer, however the current is extremely large and so danger exists because of its high current and high voltages.

The aluminum heat sink is also energized with high voltage (HOT), so do not touch when AC input terminal is connected to the power line because one of the IGBT switching power devices (Collector) is directly connected to the Aluminum heat sink.

The Aluminum heat sink may be HOT from heat energy; therefore, extreme care should be taken during servicing and replacing.

#### WARNING OF INVERTER POWER SUPPLY (U) GROUNDING

Check the High Voltage Inverter Power Supply circuit grounding. This High Voltage Inverter Power Supply circuit board must have a proper chassis ground by the grounding bracket to the chassis ground; otherwise, this H.V. Inverter circuit board will expose very high voltage and cause extreme DANGER! Be sure to have proper grounding by the grounding plate and screws.

#### WARNING OF DISCHARGING HIGH VOLTAGE CAPACITORS

Warning about the electric charge in the high voltage capacitors. For about 30 seconds after the oven is turned off, an electric charge remains in the high voltage capacitors in the inverter power supply circuit board.

When replacing or checking parts, remove the power plug from the outlet and short the Inverter output terminal of the magnetron filament terminals to the chassis ground with an insulated handle screwdriver to discharge. Please make sure to touch chassis ground side first then short to the output terminals.

### WARNING

There is high-voltage present, with high-current capabilities in the circuits of the primary, and secondary windings, choke coil and heat sink of the Inverter. It is extremely dangerous to work on or near these circuits with oven energized.

DO NOT measure the voltage in the high voltage circuit including filament voltage of magnetron.

### WARNING

Never touch any circuit wiring with your hand nor with an insulated tool during operation.

### 3. When parts must be replaced, remove the power plug from the outlet.

### 4. When the 10 Amp fuse is blown due to the operation of short switch:

### WARNING

When the 18 Amp. fuse is blown due to the operation of short switch, you must replace Primary latch switch and short switch. Also replace power relay B (RY1) when the continuity check reads shorted contacts (1-2).

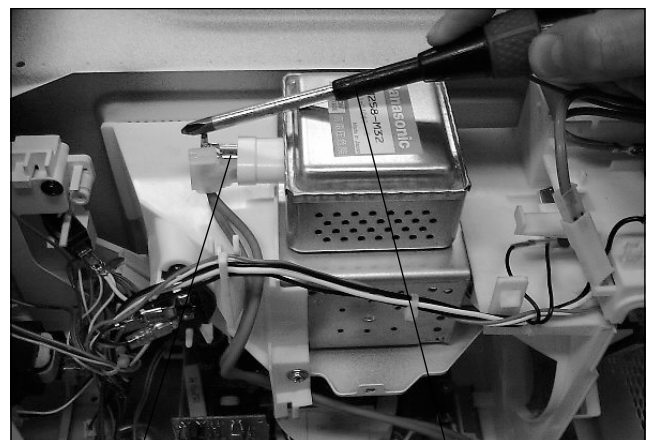
(A) This is mandatory. Refer to "Measurements and Adjustments" for these switches.

(B) When replacing the fuse, confirm that it has the appropriate rating for these models.

(C) When replacing faulty switches, be sure mounting tabs are not bent, broken or otherwise deficient in their ability to hold the switches.

### 5. Avoid inserting nails, wire, etc. through any holes in the unit during operation.

Never insert a wire, nail or any other metal object through the lamp holes on the cavity or any other holes or gaps, because such objects may work as an antenna and cause microwave leakage.

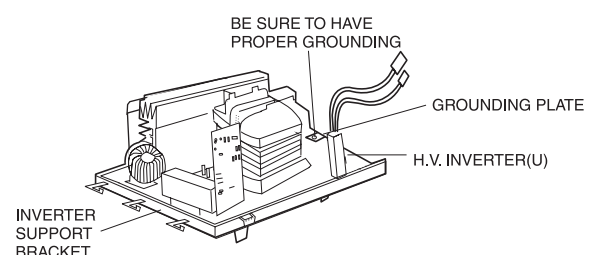


MAGNETRON

INSULATED HANDLE

FILAMENT TERMINAL SCREWDRIVER

Touch chassis side first then short to the terminal of the magnetron filament terminal.



## 6. Confirm after repair

- (A) After repair or replacement of parts, make sure that the screws of the oven, etc. are neither loose nor missing.  
Microwaves might leak if screws are not properly tightened.
- (B) Make sure that all electrical connections are tight before inserting the plug into the wall outlet.
- (C) Check for microwave energy leakage. (Refer to procedure for measuring microwave energy leakage.)

### **CAUTION** **MICROWAVE RADIATION**

DO NOT BECOME EXPOSED TO RADIATION FROM THE MICROWAVE GENERATOR OR OTHER PARTS CONDUCTING MICROWAVE ENERGY.

### **IMPORTANT NOTICE** **NEW H.V.**

1. The following components have potentials above 250V while the appliance is operating..
  - \* Magnetron
  - \* High voltage transformer (Located on Inverter (U))
  - \* High voltage diodes (Located on Inverter (U))
  - \* High voltage capacitors (Located on Inverter (U))Pay special attention on these portions.
2. When the appliance is operated with the door hinges or magnetron fixed incorrectly, the microwave leakage can reach more than 5mW/cm<sup>2</sup>. After repair or exchange, it is very important to check if magnetron and the door hinges are correctly fixed.

# DISASSEMBLY AND PARTS REPLACEMENT PROCEDURE

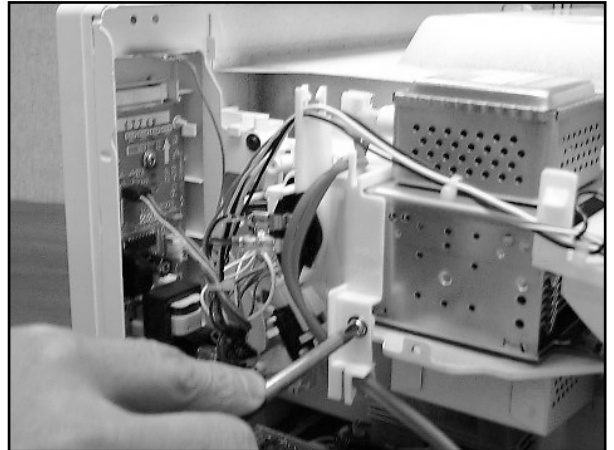
## 1. Magnetron

- (A) Discharge the high voltage capacitors, as mentioned and shown on page 11.
- (B) Remove 1 screw holding air guide c to magnetron.
- (C) Disconnect 2 high voltage lead wires from magnetron filament terminals.
- (D) Remove 4 screws holding the magnetron.

NOTE: After replacement of the magnetron, tighten mounting screws in an X pattern, properly making sure there is no gap between the waveguide and the magnetron to prevent microwave leakage.

### CAUTION

When replacing the magnetron, be sure the antenna gasket is in place.



## 2. Digital Programmer Circuit (DPC) and membrane key board.

NOTE: Be sure to ground any static electric charge built up on your body before handling the DPC.

- (A) Disconnect all connectors from D.P.C.
- (B) Slide the escutcheon base upward slightly.
- (C) Remove 1 screws holding DPC

### To replace membrane key board

- (F) Push the upper part of key board (display window portion) from back of escutcheon base and peel off escutcheon sheet and membrane key board completely from escutcheon base.

NOTE: 1. The membrane key board is attached to the escutcheon base with double faced adhesive tape. Therefore, applying hot air such as using a hair dryer is recommended for smoother removal.

2. When installing new membrane key board, make sure that the surface of escutcheon base is cleaned sufficiently so that any problems (shorted contacts or uneven surface) can be avoided.

3. Alignment position of membrane key board is as follows;

Membrane key board: Right and upper edges

Escutcheon sheet: Right and upper edges

## 3. Low voltage transformer and/or power relays (RY1, RY2)

NOTE: Be sure to ground any static electric charge built up on your body before handling the DPC.

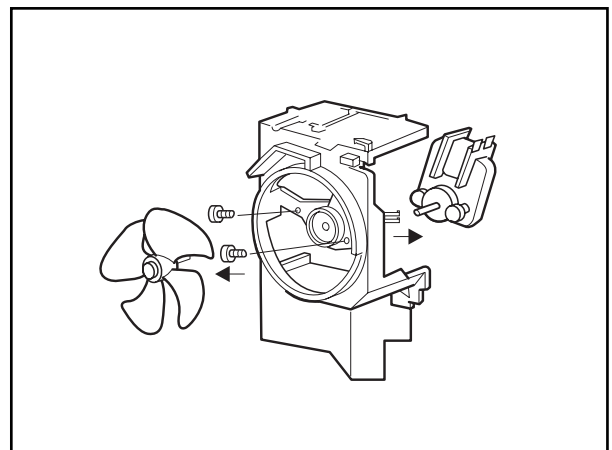
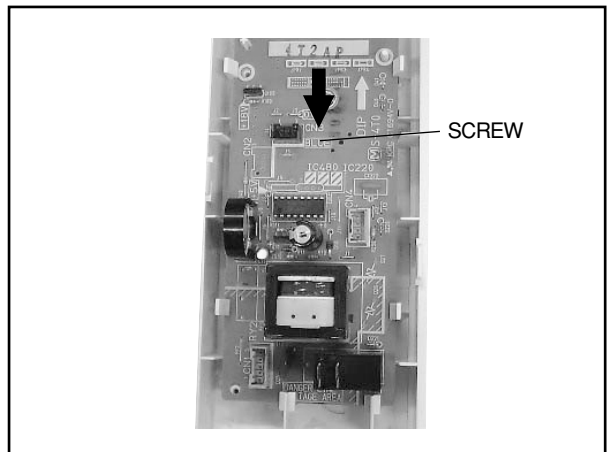
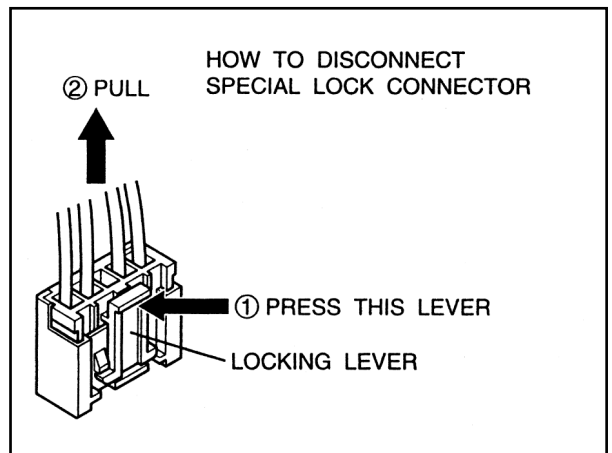
- (A) Using solder wick or a desoldering tool and 30W soldering iron, carefully remove all solder from the terminal pins of the low voltage transformer and/or power relays.

NOTE: Do not use a soldering iron or desoldering tool of more than 30 watts on DPC contacts.

- (B) With all the terminal pins cleaned and separated from DPC contacts, remove the defective transformer/power relays and install new transformer/relays making sure all terminal pins are inserted completely. Resolder all terminal contacts carefully.

## 4. Fan motor

- (A) Disconnect 2 lead wires from fan motor terminals.
- (B) Remove 1 screw at located on oven attaching orifice assembly.
- (C) Remove orifice assembly/Inverter power supply (U) from oven assembly. (Refer page 15)
- (D) Remove fan blade from the fan motor shaft by pulling it straight out.
- (E) Remove 2 screws holding fan motor to orifice.
- (F) Separate the fan motor from the orifice assembly by freeing 2 catch hooks on the orifice assembly.



## 5. Door assembly

- (A) Remove door C from door E by carefully pulling outward starting from upper right hand corner using a flat blade screwdriver.
- (B) Separate door E from tabs on door A and remove door A.
- (C) Open Door E at the opening angle of approximately 10° (Note: The door cannot be removed if the opening angle is greater than 10°).
- (D) Remove the door from its hinges by pushing the door's lower hinge pin upward and out.
- (E) Remove door screen B from door A.
- (F) Remove door key and door key spring.
- (G) When reassembling door hold door E at the opening angle of approximately 10°.
- (H) Place the door's lower hinge pin into the bottom hinge hole.
- (I) Use your left index finger to support the door's lower hinge pin while guiding the door's upper hinge pin into the top hinge hole.
- (J) Lower your finger to seat the door onto the hinges.
- (K) Replace other components.
- (L) **Door alignment is crucial. If door is misaligned, apply pressure until alignment is achieved.**

**After replacement of the defective component parts of the door, reassemble, install, and perform microwave leakage test.**

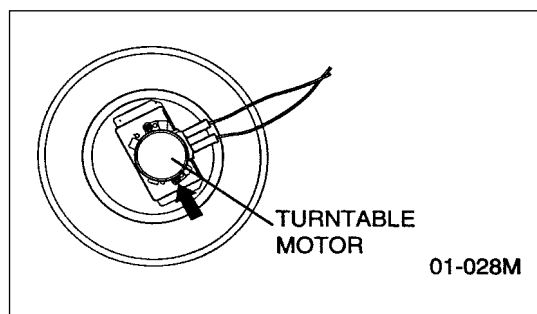
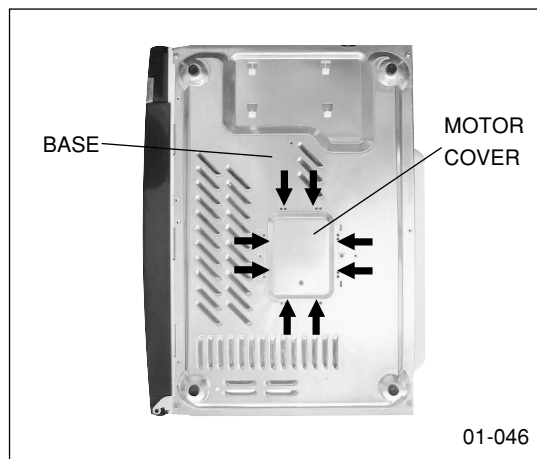
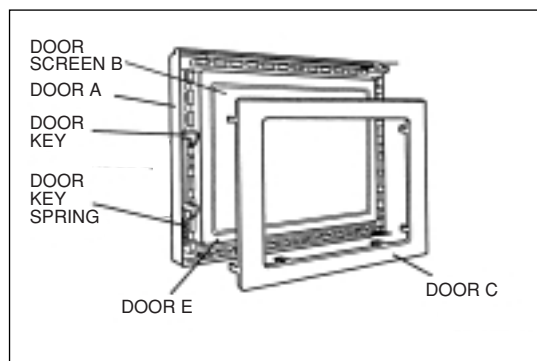
## 6. Turntable motor

- (A) Remove the motor cover by breaking off at the 8 spots indicated by arrows with a cutter or the like. (See Figure)

NOTE: After breaking off the motor cover, make sure that cut-off portions are properly trimmed off or bend to inside so that no sharp edge will expose to outside.

- (B) Disconnect 2 lead wires connected to the turntable motor.
- (C) Remove the turntable motor by removing 1 screw.

NOTE: After reinstalling the new turntable motor and reconnecting the two lead wires, reinstall the motor cover by rotating it around 180°, tucking the tabs under the base into the 2 provided slots, then screw the single tab to the base using a 4mm X 6mm screw (not provided).



## 8. Inverter Power Supply (U)

### CAUTIONS WHILE REPLACING INVERTER POWER SUPPLY (U)

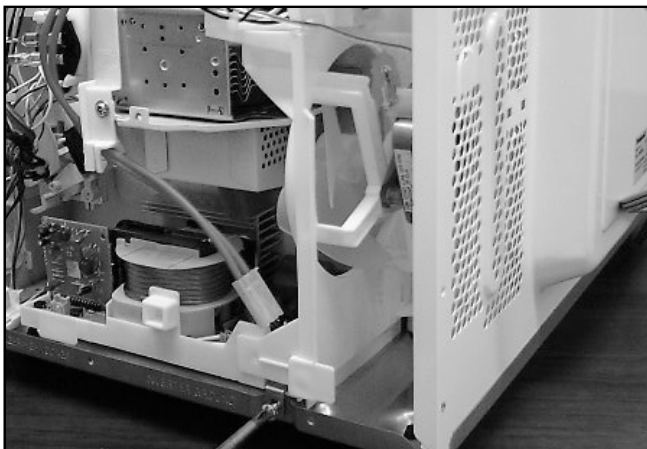
1. Make sure to leave the grounding plate in its place.
2. Make sure to securely tighten grounding screw from the bottom of chasis (base).
3. Securely connect 3 lead wire connectors.
4. Make sure the heat sink has enough space (gap) from the oven. Take special care not to touch any lead wire to the aluminum heat sink because it is hot.



1. Take off outer panel.

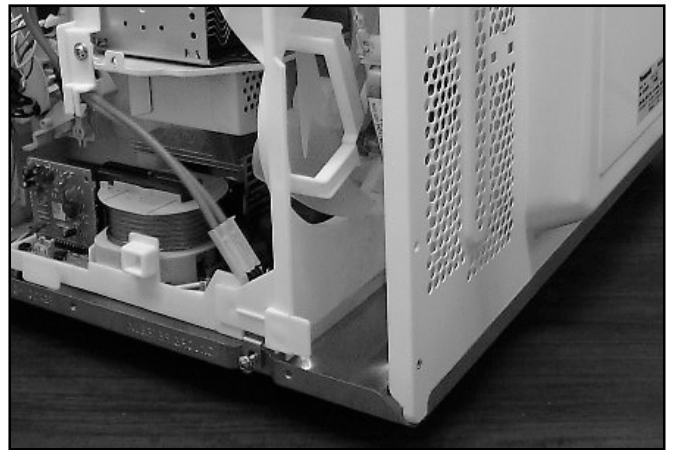


2. Remove screw

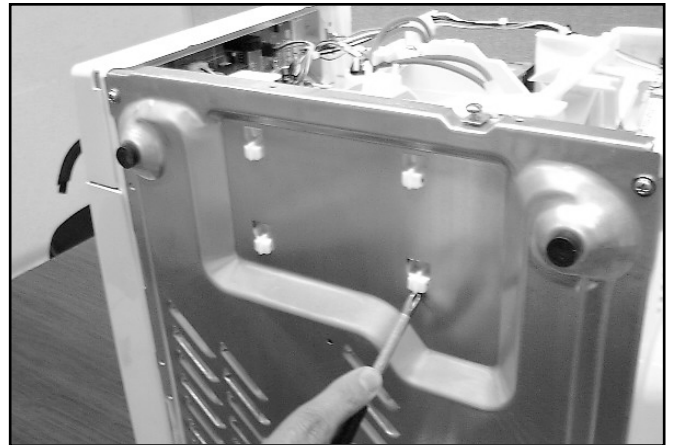


3. Remove screw

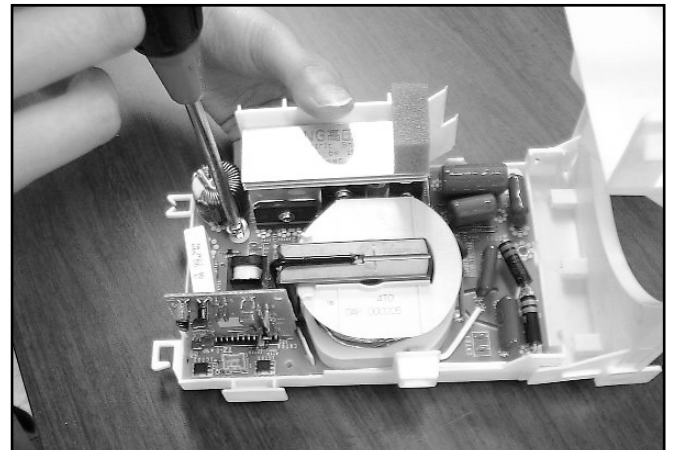
4. Disconnect all wires from inverter. Detach turntable wires from inverter bracket.



5. Remove screw and slide orifice toward you, then lift up and out.



6. Slide four locking of orifice at the bottom of the base slightly



7. Remove 2 screws holding inverter to inverter bracket.

8. Replace inverter and reassemble to inverter bracket A.

9. Retighten 2 screw

10. Slide and place assembly to the correct location of a completed unit.

11. Push Inverter Assembly until locking tabs are locked.

12. Retighten inverter screws and orifice screws.

13. Reconnect all wires to correct location and redress turntable wires.



## COMPONENT TEST PROCEDURE

### CAUTION [NEW: H.V.]

1. High voltage is present at the high voltage terminal of the High Voltage Inverter (U) including aluminum heat sink during any cook cycle.
2. It is neither necessary nor advisable to attempt measurement of the high voltage.
3. Before touching any oven components, or wiring, always unplug the oven from its power source and discharge the high voltage capacitors.

### 1. Primary Latch Switch, Secondary (Secondary Latch Switch and Power Relay B) Interlocks.

- (A) Unplug the lead connectors to Power Relay B and verify continuity of the power relay B 1-2 terminals.
- (B) Unplug lead connectors to Primary Latch Switch and Secondary Latch Switch.
- (C) Test the continuity of switches at door opened and closed positions with ohm meter (low scale).

Normal continuity readings should be as follows.

	Door Closed	Door Opened
Primary Latch Switch	0 $\Omega$ (close)	$\infty \Omega$ (open)
Secondary Latch Switch	0 $\Omega$ (close)	$\infty \Omega$ (open)
Power Relay B	$\infty \Omega$ (open)	$\infty \Omega$ (open)

### 2. Short Switch & Monitor

- (A) Unplug lead wires from Inverter Power Supply (U) primary terminals.
- (B) Connect test probes of ohm meter to the disconnected leads which were connected to Inverter Power Supply (U).
- (C) Test the continuity of short switch with door opened and closed positions using lowest scale of the ohm meter.

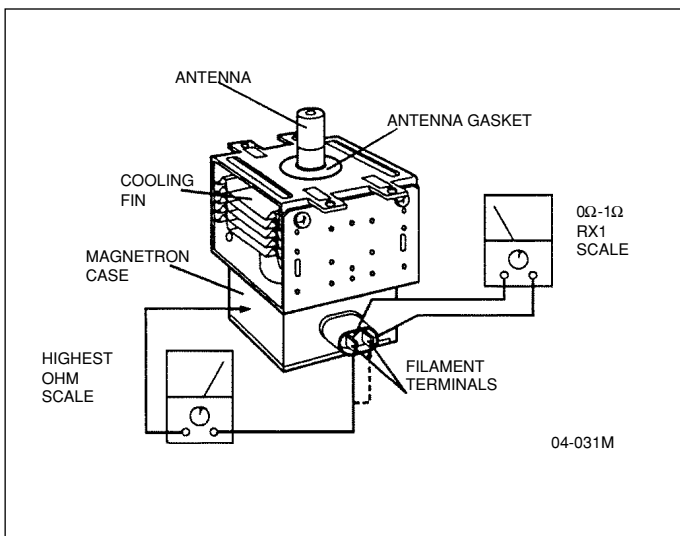
Normal continuity readings should be as follows.

Door Opened	Door Closed
0 $\Omega$	$\infty \Omega$

### 3. Magnetron

Continuity checks can only indicate an open filament or a shorted magnetron. To diagnose for an open filament or shorted magnetron.

- (A) Isolate magnetron from the circuit by disconnecting the leads.
- (B) A continuity check across magnetron filament terminals should indicate one ohm or less.
- (C) A continuity check between each filament terminal and magnetron case should read open.

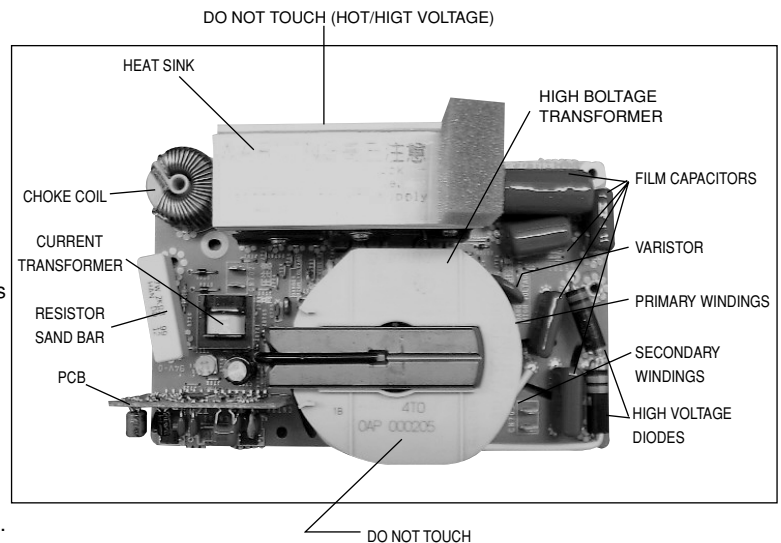


### 4. Membrane key board (Membrane switch assembly)

Check continuity between switch terminals, by tapping an appropriate pad on the key board. The contacts assignment of the respective pads on the key board is as shown in digital programmer circuit.

### 5. Inverter Power Supply (U)

**DO NOT try to REPAIR this H.V. Inverter power supply (U). Replace as whole H.V. Inverter(U) Unit.**



### DANGER HIGH VOLTAGE

Test if failure codes of H97 or H98 appears by doing the following procedure. It is recommended to use an AC line input current Ampere meter for testing.

#### Test 1

- A. Place 1 liter of water load into oven cavity.
- B. Unplug 2 pin H.V. lead wire connector CN703 from magnetron tube.
- C. Program oven at High power for 1 minute and press start.
  1. After approximately 23 seconds, oven stops.
  2. During oven operation, input current is approximately 0.5 to 1A. If input current is OK, please proceed to test 2.

	INPUT AMPERE	SYMPTOM
Unplug CN703	0.5 to 1A	Oven stops in 23 seconds after started.

#### Test 2.

Continued from Test 1

- A. Unplug 3 pin connector CN701, CN703 remain unplug.
- B. Set oven at High power for 1 minute and start.
  1. After approximately 3 seconds, oven stops.
  2. During oven operation, input current should be less than 0.4A.

	INPUT AMPERE	SYMPTOM
Unplug CN701	< 0.4A	Oven stops in 3 seconds after started.

If both 1 and 2 are OK, the Inverter Power Supply (U) can be determined OK.

## MEASUREMENTS AND ADJUSTMENTS

### WARNING

- \* For continued protection against radiation hazard, replace only with identical replacement parts (For touch models Part No. ANE6142-1450, Type No. V-16G-3C26-M for Primary latch switch; Part No. A61425180AP, Type No. L-3C2-2 for Secondary latch switch; Part No. A61785180AP, Type No. L-2C2-2 for short switch and Part. No. AEG5J1EG12B/AEG5J1EG18B, Type No. G5J-1-TP for power relay B(RY1))
- \* When the 10 Amp. fuse is blown due to the operation of the short switch, you must replace power relay B. Primary latch switch and the short switch. Then follow the installation procedures below.
- \* Interlock switch replacement—In replacing faulty switches, be sure mounting tabs are not bent, broken or otherwise deficient in their ability to hold the switches.
- \* Refer to schematic diagram to ensure proper connection.

### 1. Adjustment of Primary latch switch, Secondary latch switch and Short switch.

- (A) When mounting Primary latch switch, Secondary latch switch and short switch to door hook assembly, mount the Primary latch switch, the Secondary latch switch and the short switch to the door hook assembly as shown in table.

**NOTE: No specific adjustment during installation of Primary latch switch, Secondary latch switch and short switch to the door hook is necessary.**

- (B) When mounting the door hook assembly to the oven assembly, adjust the door hook assembly by moving it in the direction of arrow in the illustration so that the oven door will not have any play in it. Check for play in the door by pulling the door assembly. Make sure that the latch keys move smoothly after adjustment is completed. Completely tighten the screws holding the door hook assembly to the oven assembly.
- (C) Reconnect the short switch and check the continuity of the monitor circuit and all latch switches again by following the components test procedures.

### 2. Measurement of microwave output

The output power of the magnetron can be determined by performing IEC standard test procedures. However, due to the complexity of IEC test procedures, it is recommended to test the magnetron using the simple method outlined below.

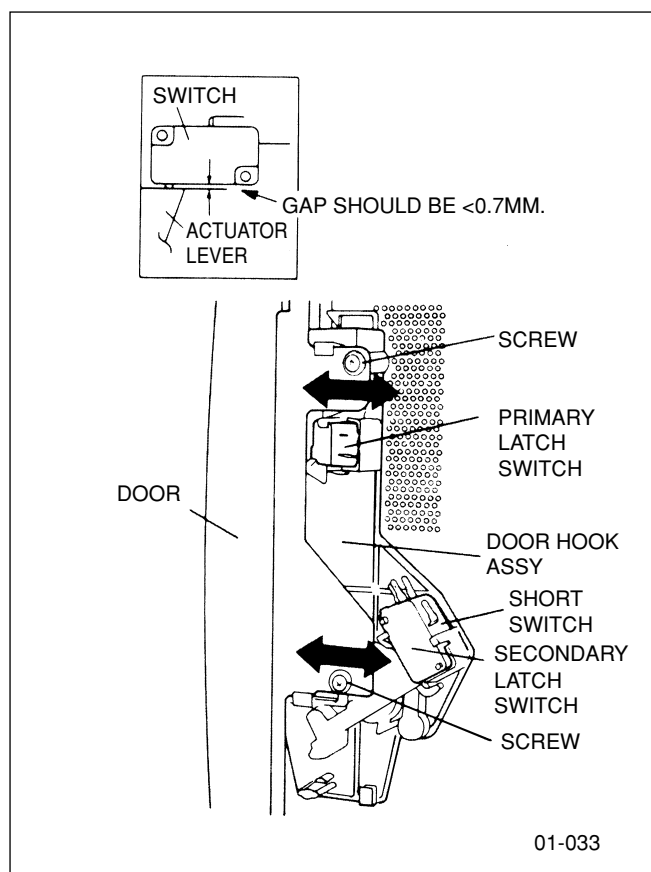
Necessary Equipment:

\*1 liter beaker \*Glass thermometer

\*Wrist watch or stopwatch

**NOTE: Check the line voltage under load. Low voltage will lower the magnetron output. Take the temperature readings and heating time as accurately as possible.**

- (A) Fill the beaker with exactly one liter of tap water. Stir the water using the thermometer and record the beaker's temperature. (recorded as T1).
- (B) Place the beaker on the center of glass cook plate. Set the oven for High power and heat it for exactly one minute.
- (C) Stir the water again and read the temperature of the beaker. (recorded as T2).
- (D) The normal temperature rise at High power position for each model is as shown in table.




**TABLE (1L-1min. test)**

RATED OUTPUT	TEMPERATURE RISE
1000W(IEC705-88)	Min. 15.4°F(8.6°C)
1100W(IEC705-88)	Min. 16.9°F(9.4°C)



# TROUBLESHOOTING GUIDE

## CAUTION

1. Check grounding before checking for trouble.
2. Be careful of high voltage circuit.
3. Discharge high voltage capacitor.
4. When checking the continuity of the switches or the high voltage transformer, disconnect one lead wire from these parts and then check continuity with the AC plug removed. To do otherwise may result in a false reading or damage to your meter. When disconnecting a plastic connector from a terminal, you must hold the plastic connector instead of the lead wire and then disconnect it, otherwise lead wire may be damaged or the connector cannot be removed.
5. Do not touch any parts of the circuitry on the digital programmer circuit, since static electric discharge may damage this control panel.  
Always touch yourself to ground while working on this panel to discharge any static charge in your body.
6. 220V/240V AC is present at the shaded area  of the digital programmer circuit (Terminals of power relay's and primary circuit of low voltage transformer). When troubleshooting, be cautious of possible electrical shock hazard.

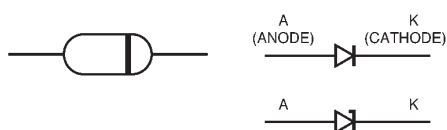
First of all operate the microwave oven following the correct operating procedures in order to find the exact cause of any trouble.

	SYMPTOM	CAUSE	CORRECTIONS
1.	Oven is dead. Fuse is OK. No display and no operation at all.	<ol style="list-style-type: none"> <li>1. Open or loose lead wire harness</li> <li>2. Open thermal cutout (Cavity)</li> <li>3. Open low voltage transformer</li> <li>4. Defective DPC</li> </ol>	Check fan motor when thermal cutout is defective.
2.	No display and no operation at all. Fuse is blown.	<ol style="list-style-type: none"> <li>1. Shorted lead wire harness</li> <li>2. Defective primary latch switch (NOTE 1)</li> <li>3. Defective short switch (NOTE 1)</li> <li>4. Defective Inverter Power Supply (U)</li> </ol> <p>Refer to component test procedure</p> <p>NOTE 1: All of these switches must be replaced at the same time. Check continuity of power relay (RY1)'s contacts (between 1 and 2) and if it has continuity, replace power relay B (RY-1) also.</p>	<p>Check adjustment of primary, secondary latch switch and short switch including door.</p> <p>Refer to Inverter PCB Troubleshooting.</p>
3.	Oven does not accept key input(Program)	<ol style="list-style-type: none"> <li>1. Key input is not in sequence</li> <li>2. Open or loose connection of membrane key pad to DPC (Flat cable)</li> <li>3. Shorted or open membrane key board</li> <li>4. Defective DPC</li> </ol>	<p>Refer to operation procedure.</p> <p>Refer to DPC troubleshooting.</p>
4.	Fan motor turn on when oven is plugged in with door closed.	<ol style="list-style-type: none"> <li>1. Misadjustment or loose wiring of secondary latch switch</li> <li>2. Defective secondary latch switch</li> </ol>	Adjust door and latch switches.
5.	Timer starts count down but no microwave oscillation. (No heat while oven lamp and fan motor turn on)	<ol style="list-style-type: none"> <li>1. Off-alignment of latch switches</li> <li>2. Open or loose connection of high voltage circuit especially magnetron filament circuit</li> </ol> <p>NOTE: Large contact resistance will bring lower magnetron filament voltage and causing magnetron to lower output and/or be intermittent.</p> <ol style="list-style-type: none"> <li>3. Defective high voltage component HV Inverter Power Supply (u) Magnetron</li> <li>4. Open or loose wiring of power relay B (RY-1)</li> <li>5. Defective primary latch switch</li> <li>6. Defective DPC or power relay B (RY-1)</li> </ol>	<p>Adjust door and latch switches.</p> <p>Check high voltage component according to component test procedure and replace if it is defective.</p> <p>Refer to DPC troubleshooting Adjust door and latch switches.</p>
6.	Oven can program but timer does not start count-down.	<ol style="list-style-type: none"> <li>1. Open or loose wiring of secondary latch switch</li> <li>2. Off-alignment of secondary latch switch</li> <li>3. Defective secondary latch switch</li> </ol>	
7.	Microwave output is low. Oven takes longer time to cook food.	<ol style="list-style-type: none"> <li>1. Decrease in power source voltage</li> <li>2. Open or loose wiring of magnetron filament circuit.(Intermittent oscillation)</li> <li>3. Aging change of magnetron</li> </ol>	Consult electrician
8.	Turntable motor turns on when door is opened.	<ol style="list-style-type: none"> <li>1. Shorted primary latch switch</li> </ol>	

9.	Oven does not operate and return to plugged in mode as soon as start pad is pressed.	1. Defective DPC	Check tighten screws on escutcheon base bracket, D.P.C. board.
10.	Loud buzzing noise can be heard.	1. Loose fan and fan motor	
11.	Turntable motor does not rotate.	1. Open or loose wiring of turntable motor 2. Defective turntable motor	
12.	Oven stops operation during cooking.	1. Open or loose wiring of primary and secondary latch switch 2. Operation of thermal cutout	Adjust door and latch switches.
13.	Oven returns to plugged in mode after 10 seconds elapses on the Auto sensor cooking mode.	1. Open or loose wiring of sensor terminal from DPC 2. Open steam sensor 3. Defective DPC	

## HOW TO CHECK SEMICONDUCTORS USING AN OHM METER

### Diode



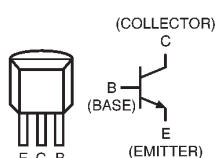
	FORWARD	REVERSE
A-K	SMALL	$\infty$

### Transistor

#### NPN Transistor

2SC.....

2SD.....

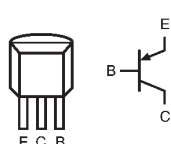


	FORWARD	REVERSE
B-E	SMALL	$\infty$
B-C	SMALL	$\infty$
C-E	$\infty$	$\infty$

#### PNP Transistor

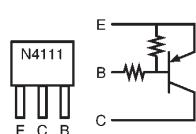
2SA.....

2SB.....



	FORWARD	REVERSE
B-E	SMALL	$\infty$
C-B	SMALL	$\infty$
C-E	$\infty$	$\infty$

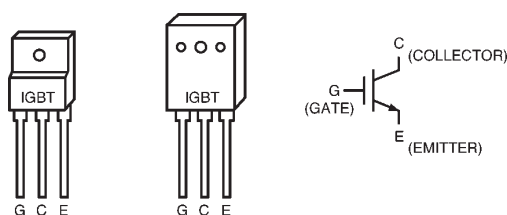
### Digital Transistor PNP Transistor



	FORWARD	REVERSE
E-B	10k $\Omega$ ~ 30k $\Omega$	10k $\Omega$ ~ 30k $\Omega$
C-B	50k $\Omega$ ~ 90k $\Omega$	$\infty$
C-E	40k $\Omega$ ~ 80k $\Omega$	$\infty$

### IGBT

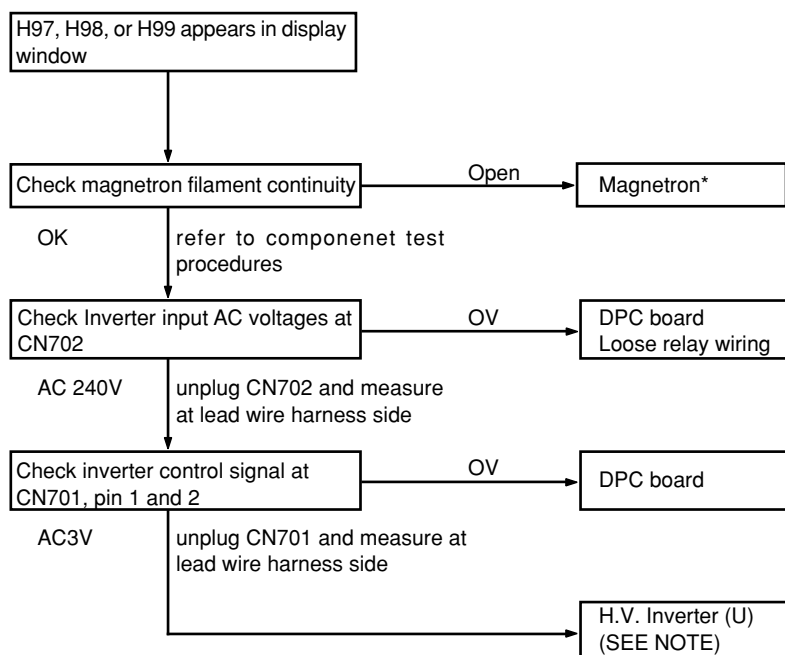
(INSULATED GATE BIPOLAR TRANSISTOR)



	FORWARD	REVERSE
E-C	SMALL	$\infty$
E-G	$\infty$	$\infty$
C-G	$\infty$	$\infty$

## Troubleshooting of Inverter Circuit (U) and Magnetron **NEW H.V.**

This oven is programmed with a self diagnostics failure code system which will help for troubleshooting. H97, H98, and H99 are the provided failure codes to indicate magnetron and inverter circuit problem areas. This section explains failure codes of H97, H98, and H99. First, you must program the DPC by pressing [Clock], [Time], [Start], [Micro Power]. Program unit for operation. H97, H98, H99 appears in display window a short time after start key is pressed and there is no microwave oscillation.



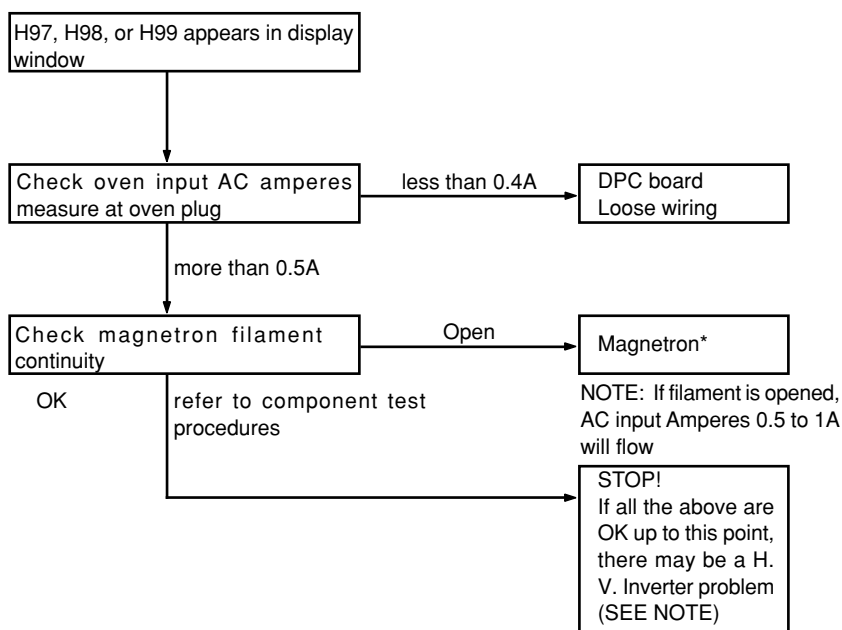
**NOTE:** After check, unplug unit to reset to normal operation mode.

**NOTE:** DO NOT try to repair this Inverter Power Supply (U) and also DO NOT RE-ADJUST PRESET VOLUME on the board. It is very dangerous to repair or adjust without sufficient test equipment because this circuit handles very high voltage and very large current. Off alignment of inverter board operation is dangerous. Operating a misaligned Inverter circuit is dangerous due to the very high voltage and current that is produced by this board. Defective boards must be replaced with a new one.

\* Check magnetron filament for open or short to casing before proceeding to determine a good magnetron.

### Alternate way to troubleshoot oven with AC Ampere meter used

H97, H98, H99 appears in display window a short time after start key is pressed and no microwave oscillation with AC Ampere meter used for troubleshooting



**NOTE:** After check, unplug unit to reset to normal operation mode.

**NOTE:** DO NOT try to repair this Inverter Power Supply (U) and also DO NOT

RE-ADJUST PRESET VOLUME on the board. It is very dangerous to repair or adjust without sufficient test equipment because this circuit handles very high voltage and very large current. Off alignment of inverter board operation is dangerous. Operating a misaligned Inverter circuit is dangerous due to the very high voltage and current that is produced by this board. Defective boards must be replaced with a new one.

\* Check magnetron filament for open or short to casing before proceeding to determine a good magnetron.

## Trouble Related to Digital Programmer Circuit

SYMPTOM	STEP	CHECK	RESULT	CAUSE/CORRECTIONS
No display when oven is first plugged in. Oven is dead.	1	Fuse pattern of DPC	Normal Open (NOTE)	STEP 2 Shorted Circuit of ZNR, L.V.T., Oven Lamp etc. Replace DPC
	2	Low voltage transformer (LVT) secondary voltage	Abnormal 0V Normal	LVT → Step 3
	3	IC-1 pin 8 voltage (Emitter of Q10)	Abnormal Normal = 5V	ZD10, Q10 → Step 4
	4	IC-1 pin 10 voltage (15 pin of IC-220)	Abnormal Normal	IC-220 → IC-1, CX320

### NOTE

Procedure of fuse pattern repairing is as follows:

1. When the fuse pattern (PF2) opens.

(1) Remove the jumper wire (PF1).

(2) Insert the removed jumper wire (PF1) to "(PF2)" position and solder it. If both "PF1" and "PF2" fuse patterns are open, please replace DPC.

2. When the fuse pattern (PF4) opens.

(1) Remove the jumper wire (PF3).

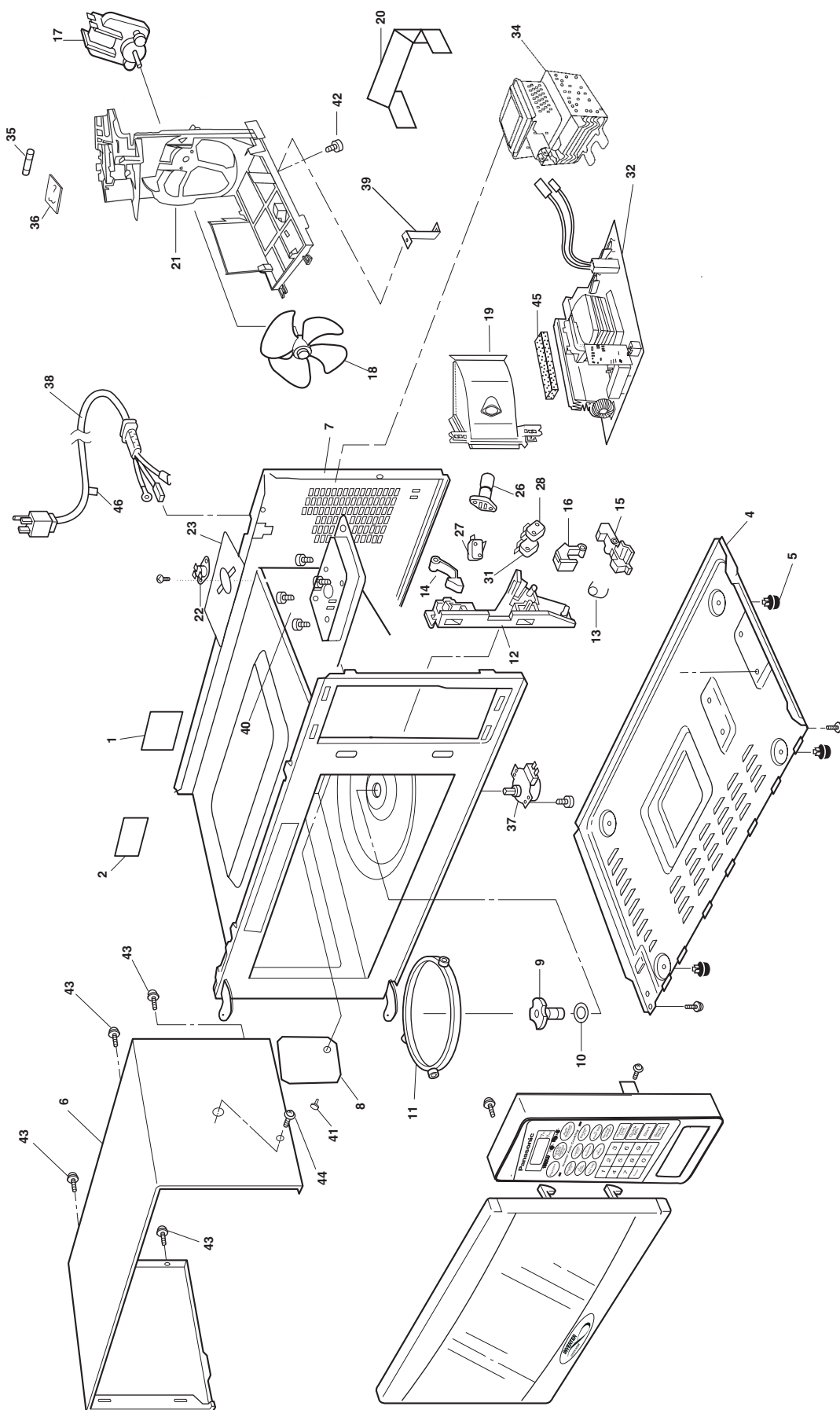
(2) Insert the removed jumper wire (PF3) to "(PF4)" position and solder it. If both "PF3" and "PF4" fuse patterns are open, please replace DPC.

NOTE:\* At the time of these repairs, make visual inspection of the varistor for burning damage and examine the transformer with tester for the presence of layer short-circuit (check primary coil resistance).


If any abnormal condition is detected, replace the defective parts.

SYMPTOM	STEP	CHECK	RESULT	CAUSE/CORRECTIONS
No key input	1	Membrane switch continuity	Abnormal	Membrane switch
			Normal	IC-1
No beep sound	1	IC-1 pin 31 voltage	Abnormal	IC-1
			Normal	BZ, IC-220
Power relay A(RY-2) does not turn on even though the program has been set and the start pad is tapped	1	IC-1 pin 32 voltage while operation	Abnormal	IC-1
			Normal = 5V	→ Step 2
	2	Short circuit between pin 6 and pin 16 of IC-220	Still not turn on	RY-2
			RY-2 turns on	IC-220
No microwave oscillation at any power setting	1	IC-1 pin 38 and pin 39 voltages while operation at high power	Abnormal	IC-1
			Normal 5---5V, 15---5V	→ Step 2
	2	Q220 transistor	Abnormal	Q220
			Normal	IC-220, RY-1
Dark or unclear display	1	Replace display and check operation	Normal	DISPLAY
			Abnormal	IC-1
Missing or lighting of unnecessary segment	1	Replace IC-1 and check operation	Normal	IC-1
			Abnormal	DISPLAY
H97/H98 appears in window and oven stops operation. Program High power for 1 minute and conduct following test quickly, unless H97/H98 appears and oven stops. <span style="border: 1px solid black; padding: 2px;">NEW H.V.</span>	1	Unplug CN702(2 pin) connector and measure voltage between terminals	0V	1. Latch Switch 2. DPC/Power Relay
			AC line voltage of 120V	→ Step 2
	2	Unplug CN701(3 pin) connector and measure pin 1 voltage	0V	DPC
			Approx. AC 3V	Magnetron














# EXPLODED VIEW AND PARTS LIST



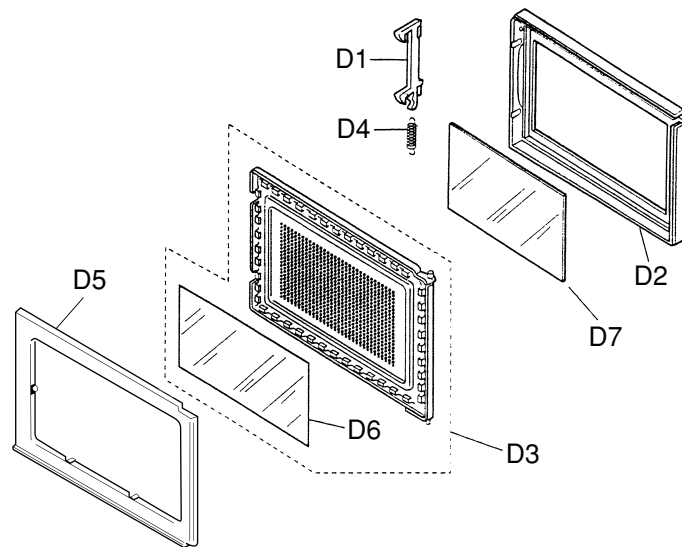
## PARTS LIST

- NOTE 1: When ordering replacement part(s), please use part number(s) shown in this part list.  
Do not use description of the part.
- 2: Important safety notice:  
Components identified by  mark have special characteristics important for safety.  
When replacing any of these components, use only manufacture's specified parts.

- NOTE "A" parts are supplied by MOD (Japan)  
"F" parts are supplied by SIMMC (China)

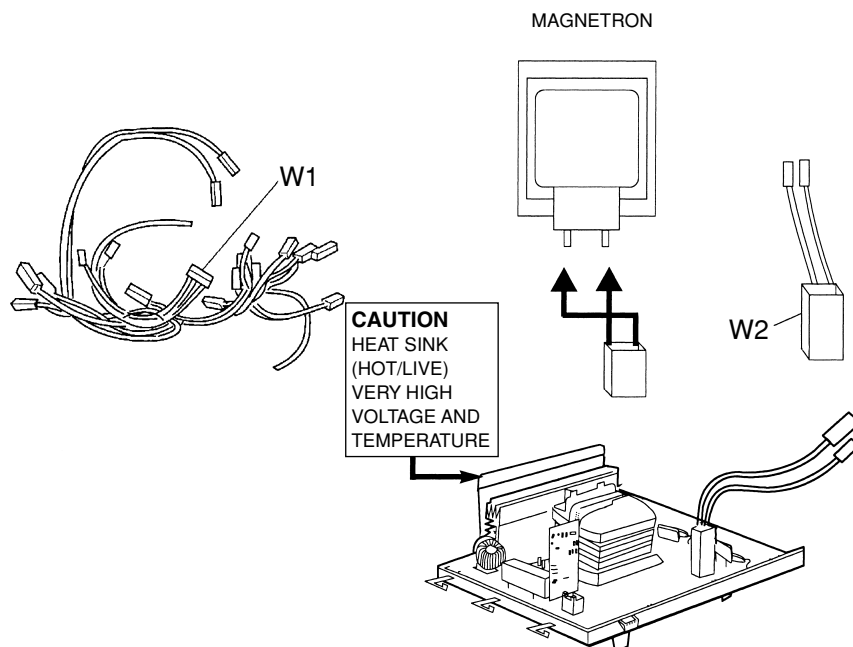
Ref.No.		Part No.	Part name & Description	Pcs/ Set	Remarks
1		F00068100HN	CAUTION LABEL	1	KKE, KNQ, SNM
1		F00065E90ZP	CAUTION LABEL	1	ZPE
1		F00065E90RP	CAUTION LABEL	1	RPE, RPK
2		F00074T10HKK	NAME PLATE	1	KKE
2		F00074T10HKN	NAME PLATE	1	KNQ
2		F00074T10HSN	NAME PLATE	1	SNM
2		F00074T10HZP	NAME PLATE	1	ZPE
2		F00074T80HRE	NAME PLATE	1	RPE
2		F00074T80HRK	NAME PLATE	1	RPK
4		F10014T00AP	BASE	1	
5		F10084T00AP	RUBBER FOOT	4	
6		F110D4T00HAP	CABINET BODY	1	
7		F200A4T10AP	OVEN	1	
8		F20554T00AP	COVER	1	
9		F21314W00AP	PULLY SHAFT	1	
10		F2177-F80	WASHER	1	
11		F290D9330AP	ROLLER RING (U)	1	
12		F30208790XN	DOOR HOOK	1	
13		F3097-1480	LATCH SPRING	1	
14		F31368790XN	HOOK LEVER A	1	
15		F31378790XN	HOOK LEVER B	1	
16		F31388790XN	HOOK LEVER C	1	
17		F400A4T10QP	FAN MOTOR	1	KKE, KNQ, ZPE, RPE
17		F400A4T10SN	FAN MOTOR	1	SNM
17		F400A4T00LN	FAN MOTOR	1	RPK
18		F40084T00AP	FAN BLADE	1	
19		F40254T00AP	AIR GUIDE A	1	
20		F40264T60AP	AIR GUIDE B	1	
21		F41444T00AP	ORIFICE	1	
22		F61454T00CP	THERMAL CUTOFF	1	
23		F66264T00CP	THERMAL CUTOFF MOUNT	1	
26		F612E4J50XN	INCANDESCENT LAMP (U)	1	
27		J61424T00AP	MICRO SWITCH	1	(V-16G-3C25-L) (PRIMARY LATCH SWITCH)
28		J61414T00AP	MICRO SWITCH	1	(D3V-16G-3C25) (SECONDARY LATCH SWITCH)
31		J61784T00AP	MICRO SWITCH	1	(D3V-1G-2C25) (SHORT SWITCH)
32		A606Y4V00GP	H.V.INVERTER (U)	1	
34		2M261-M32F	MAGNETRON	1	
35		A62304210BP	FUSE	1	
36		J692Y4T00YN	NOISE FILTER	1	EXCEPT ZPE
36		J692Y4T00QP	NOISE FILTER	1	ZPE
37		F63264760JP	TURNTABLE MOTOR	1	
38		F900C8790YK	AC CORD W/PLUG	1	KKE, KNQ
38		F900C5E90SN	AC CORD W/PLUG	1	SNM
38		F900C5E90ZP	AC CORD W/PLUG	1	ZPE
38		F900C5E90RP	AC CORD W/PLUG	1	RPE
38		F900C9620TN	AC CORD W/PLUG	1	RPK
39		F61844T00AP	GROUNDING PLATE	1	
40		XTWFNE4+12T	SCREW	4	FOR MAGNETRON
41		XTTFNE4+6BN	SCREW	1	FOR COVER
42		XYD4+EE12F	SCREW	1	FOR H.V.INVERTER EARTH
43		XTWAFE4+12D	SCREW	4	FOR CABINET BODY
44		XTCA4+12AFW	SCREW	1	FOR CABINET BODY SIDE
45		F0926000BB	CUSHION RUBBER	1	(H.V.INVERTER HEAT SINK)
46		F02395E20KN	CORD LABEL	1	KKE, KNQ, SNM

## DOOR ASSEMBLY



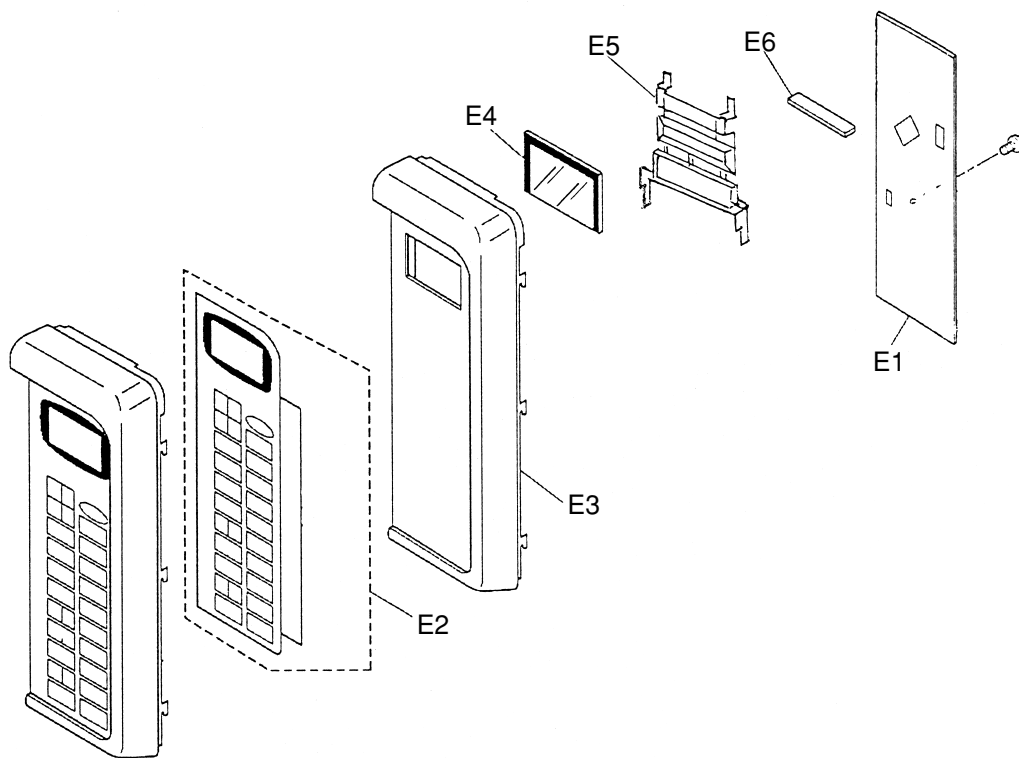
Ref.No.		Part No.	Part name & Description	Pcs/ Set	Remarks
D1		F30184Y30XN	DOOR KEY A	1	
D2	△	F30014T00HAP	DOOR A	1	
D3	△	F302K4T00AP	DOOR E (U)	1	
D4		F30214000AP	DOOR KEY SPRING	1	
D5	△	F30854T00AP	DOOR C	1	
D6	△	F31454T00AP	DOOR SCREEN A	1	
D7		F31464T00BAP	DOOR SCBEEN B	1	

## WIRING MATERIALS



Ref.No.		Part No.	Part name & Description	Pcs/ Set	Remarks
W1		F030A4T10XN	LEAD WIRE HARNESS	1	EXCEPT ZPE
W1		F030A4T00QP	LEAD WIRE HARNESS	1	ZPE
W2		F030E4T00AP	H.V.LEAD WIRE	1	EXCEPT ZPE
W2		F030E4T00CP	H.V.LEAD WIRE	1	ZPE

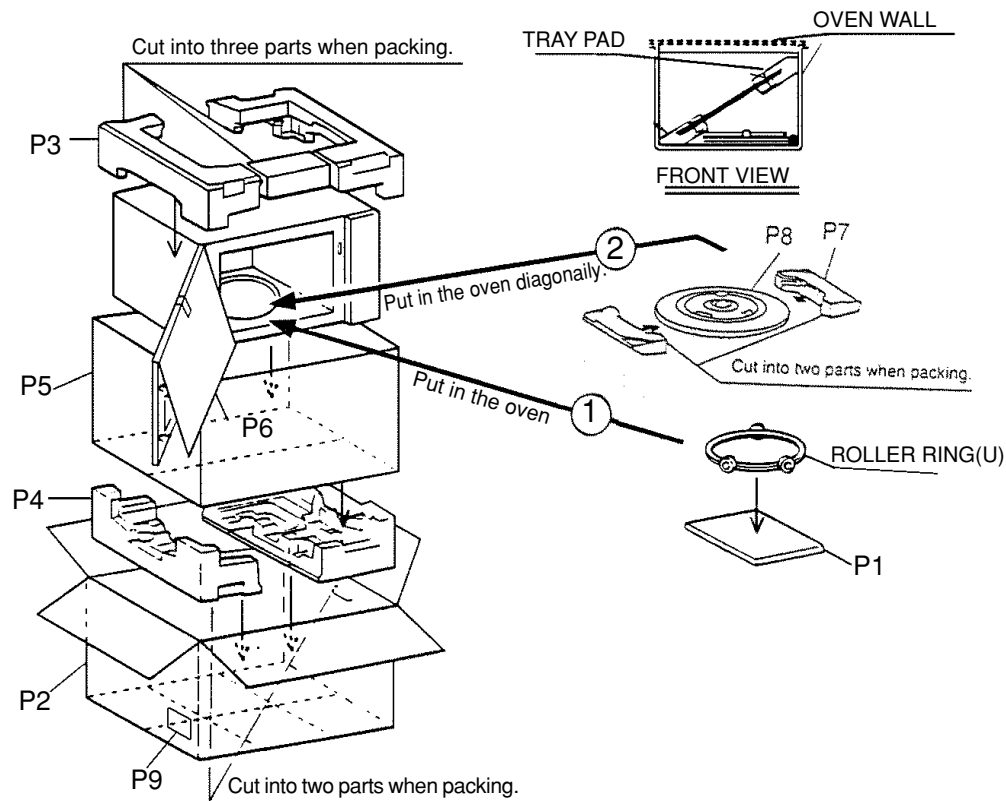
## ESCUTCHEON BASE ASSEMBLY



Ref.No.	Part No.	Part name & Description	Pcs/ set	Remarks
E1	F603L4T10KK	D.P.CIRCUIT	1	KKE
E1	F603L4T10KN	D.P.CIRCUIT	1	KNQ
E1	F603L4T10SN	D.P.CIRCUIT	1	SNM
E1	F603L4T10ZP	D.P.CIRCUIT	1	ZPE
E1	F603L4T80RP	D.P.CIRCUIT	1	RPE, RPK
E2	F630Y4T10HKK	MEMBRANE SWITCH	1	KKE, KNQ, SNM
E2	F630Y4T10HZP	MEMBRANE SWITCH	1	ZPE
E2	F630Y4T80HKN	MEMBRANE SWITCH	1	RPE, RPK
E3	F80344T00HAP	ESCUTCHEON BASE	1	
E4	AEDDTM4T00AP	DISPLAY	1	
E5	F66174T00AP	DISPLAY TUBE COVER	1	
E6	A67004T00AP	RUBBER CONNECTOR	1	



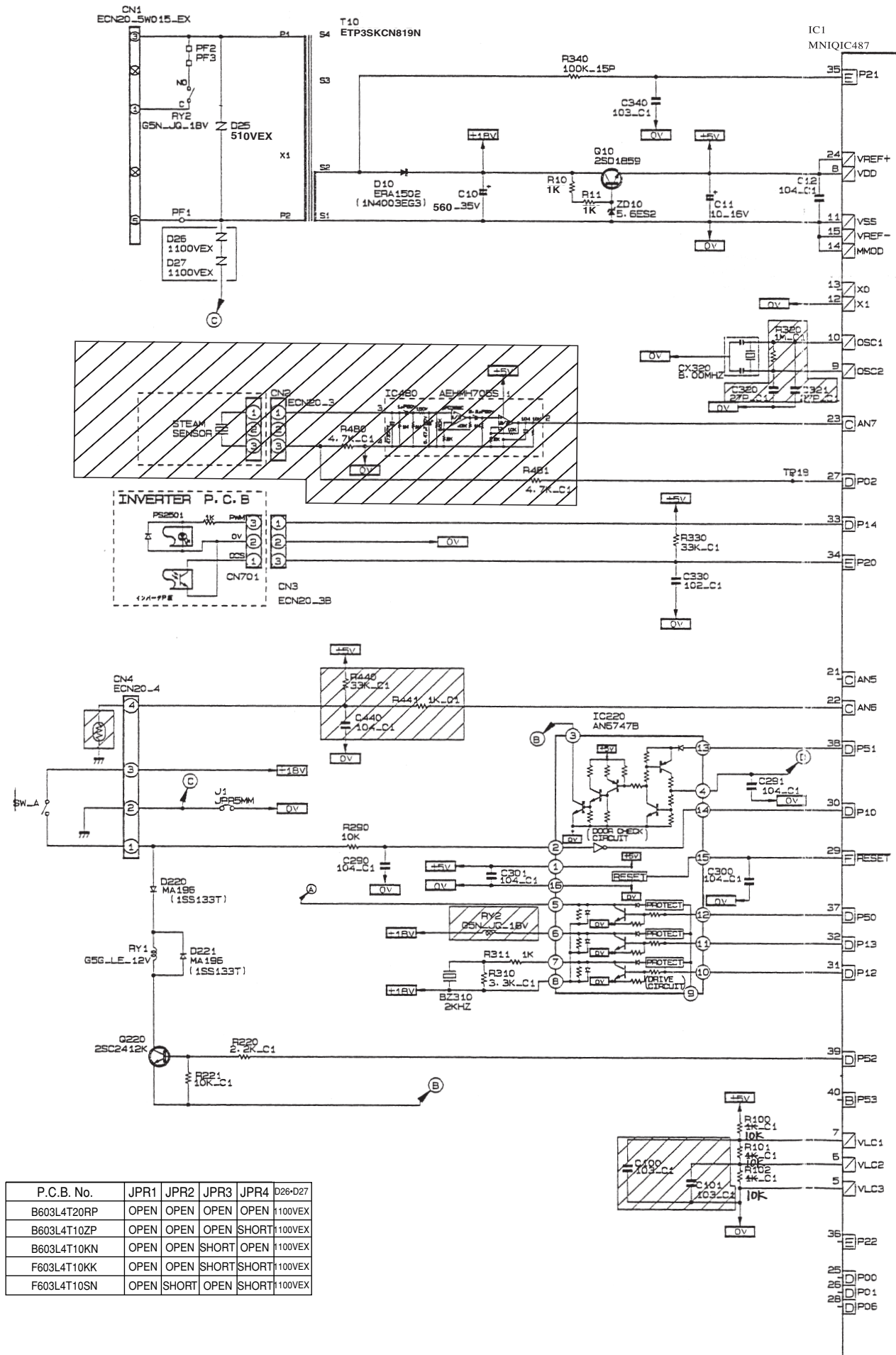
## PACKING AND ACCESORIES



Ref.No.	Part No.	Part name & Description	Pcs/set	Remarks
P1	F00034T10KN	INSTRUCTION MANUAL	1	KKE, KNQ, SNM
P1	F00034T10ZP	INSTRUCTION MANUAL	1	ZPE
P1	F00034T80RP	INSTRUCTION MANUAL	1	RPE, RPK
P2	F01024T10HKN	PACKING CASE, PAPER	1	KKE, SNM
P2	F01024T10HKQ	PACKING CASE, PAPER	1	KNQ
P2	F01024T10HZP	PACKING CASE, PAPER	1	ZPE
P2	F01024T80HRP	PACKING CASE, PAPER	1	RPE, RPK
P3	F01044T10KN	UPPER FILLER	1	
P4	F01054T10KN	LOWER FILLER	1	
P5	F01068100XN	P.E.BAG	1	
P6	F01078100XN	DOOR SHEET	1	
P7	F01134T00AP	TRAY STYROL	1	
P8	A06014T00AP	COOKING TRAY	1	
P9	F01115E90ZP	G LABEL	1	ZPE

# DIGITAL PROGRAMMER CIRCUIT

## SCHEMATIC DIAGRAM





# DIGITAL PROGRAMMER CIRCUIT

## PARTS LIST

Ref.No.	Part No.	Part name & Description	Pcs/ Set	Remarks
BZ310	AEFB22EP20TL	BUZZER	1	2.0KHz
C12, C290, C291, C300, C301	AECU82F104ZK	CAPACITOR	5	0.1μF/25V
C330	AECU85C102KK	CAPACITOR	1	0.001μF/50V
C340	AECU85F103ZK	CAPACITOR	1	0.01μF/50V
C320, C321	ECJ1VC1H270J	CAPACITOR	2	27PF/50V (ZPE)
C10	ECEA1VU561YE	AL CHEM CAPACITOR	1	560μF/35V
C11	AECESS1C100A	AL CHEM CAPACITOR	1	10μF/16V
CN1	AEEMXF01505W	CONNECTOR	1	
CN3	AEEMXF00703B	CONNECTOR	1	
CN4	AEEMXF00F04W	CONNECTOR	1	
CX320	AEFOS800MG06	CRYSTAL RESONATOR	1	8.00MHz (EXCEPT ZPE)
CX320	AEYXAT49-8MA	CERAMIC RESONATOR	1	8.00MHz (ZPE)
D180, D181, D182, D183	AESQSML210MT	CHIP LED	4	
D10	AEDNERA1502	DIODE	1	
D40, D220, D221	AESS133T-77	DIODE	3	
D25	AERZ511NS10D	VARISTOR	1	
D26, D27	AERZB00NS10D	VARISTOR	2	
IC1	MN101C487DP	L.S.I	1	
IC220	AN6747B	IC	1	
Q181, Q40, Q220	2SC2412KT146	CHIP TRANSISTOR	3	
Q10, Q180	2SD1859TV2Q	TRANSISTOR	2	
R100, R101, R102, R221	AERJ3GSYJ103	CHIP RESISTOR	4	10K, 1/16W, 5%
R40-R48	AERJ3GSYJ104	CHIP RESISTOR	9	100K, 1/16W, 5%
R320	AERJ3GSYJ105	CHIP RESISTOR	1	1000K, 1/16W, 5% (ZPE)
R49	AERJ3GSYJ154	CHIP RESISTOR	1	150K, 1/16W, 5%
R220	AERJ3GSYJ222	CHIP RESISTOR	1	2.2K, 1/16W, 5%
R310	AERJ3GSYJ332	CHIP RESISTOR	1	3.3K, 1/16W, 5%
R330	AERJ3GSYJ333	CHIP RESISTOR	1	33K, 1/16W, 5%
R181	AERJ3GSYJ360	CHIP RESISTOR	1	36Ω, 1/4W, 5%
R10, R11, R311	RD16ST102J	RESISTOR	3	1K, 1/4W, 5%
R180, R290	RD16ST103J	RESISTOR	2	10K, 1/4W, 5%
R340	RD16ST104J	RESISTOR	1	100K, 1/4W, 5%
RY1	AEGG5G1A12	POWER RELAY	1	
T10	AETP4T00QP	LOW VOLTAGE TRANSFORMER	1	
ZD10	AESZMTZJ5R6B	ZENER DIODE	1	