

# Service Manual

Microwave Oven

Model No. **NN-C69KSMEPG**

30L

## **⚠ 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.

## **IMPORTANT SAFETY NOTICE**

There are special components used in this equipment which are important for safety. These parts are marked by ⚠ in the Schematic Diagrams, Circuit Board Diagrams, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without permission of manufacturer.

## Specifications

Power Requirement	230 Volts AC 50 Hz Microwave 1500W Grill 2400W Convection 2400W
Power Output	1000 Watts full microwave power
Microwave Frequency	2,450 MHz
Magnetron	2M319J
Timer	0 ~ 90 min
Outside Dimensions	327 (W) x 520 (H) x 520 (D) mm
Cavity Dimensions	240.5 (W) x 351 (H) x 351 (D) mm
Net Weight	19.5 kg (approx.)
Shipping weight	20.7 kg (approx.)
Specifications subject to change without notice.	

### WARNING

\* This product should be serviced only by trained, qualified personnel.  
This service manual covers products for following markets.  
When troubleshooting or replacing parts, please refer to the country identifications shown below for your applicable product specification.

### CAUTION

#### About lead free solder (PbF)

**Distinction of PbF PCB:** PCBs (manufactured) using lead free solder will have a PbF stamp on the PCB.

**Caution:** ● Pb free solder has a higher melting point than standard solder; Typically the melting point is 30 - 40°C higher.  
Please use a high temperature soldering iron. In case of the soldering iron with temperature control, please set it to  $370 \pm 10^{\circ}\text{C}$ .

● Pb free solder will tend to splash when heated too high (about 600°C)

## SAFETY PRECAUTIONS

This device is to be serviced only by properly qualified service personnel.  
Consult the service manual for proper service procedures to assure continued safety operation and for precautions to be taken to avoid possible exposure to excessive microwave energy.

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

- A) Do not operate or allow the oven to be operated with the door open.
- 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; (1) interlock operation, (2) proper door closing, (3) seal and sealing surfaces (arcing, wear, and other damage), (4) damage to or loosening of hinges and latches, (5) evidence of dropping or abuse.
- C) Before turning on microwave power for any service test or inspection within the microwave generating compartments, check the magnetron, wave guide or transmission line, and cavity for proper alignment, integrity, and connections.
- 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.
- 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.

### CAUTION

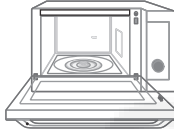
#### MICROWAVE RADIATION

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

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## POWER LEVEL & ACCESSORIES

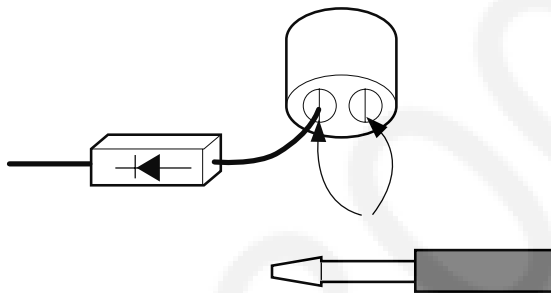
ITEM	DESCRIPTION
Control Complement	<p>Microwave Power for Variable Cooking Power level</p> <p><i>Max</i>           <b>1000 Watts</b></p> <p><i>Medium</i>       <b>750 Watts</b></p> <p><i>Low</i>           <b>470 Watts</b></p> <p><i>Defrost</i> **   <b>270 Watts</b></p> <p><i>Warm</i>          <b>100 Watts</b></p>
Rating Label Location	
Accessories	<p>Instruction manual Grill Tray Glass Tray Roller Ring Rack</p>
<p>This microwave oven is designed for household use only. It is not recommended for commercial purposes.</p>	



# CAUTIONS

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

- DO NOT operate on a 2-wire extension cord during repair and use.
- NEVER TOUCH any oven components or wiring during operation.
- BEFORE TOUCHING any parts of the oven, always remove the power plug from the outlet.
- For about 30 seconds after the oven stops, an electric charge remains in the high voltage capacitor. When replacing or checking, you must discharge the high voltage capacitor by shorting across the two terminals with an insulated screwdriver.

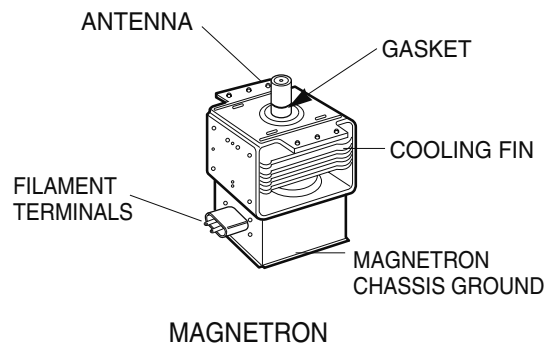


- Remove your watches whenever working close to or replacing the Magnetron.
- NEVER operate the oven with no load.
- NEVER injure the door seal and front plate of the oven cavity.
- NEVER put iron tools on the magnetron.
- NEVER put anything into the latch hole and the interlock switches area.

## MICROWAVE RADIATION

Personnel should not be exposed to the microwave energy which may radiate from the magnetron or other microwave generating device if it is improperly used or connection. All input and output microwave connections, waveguide, flange and gasket must be secure never operate the device without a microwave energy absorbing load attached. Never look into an open waveguide or antenna while the device is energized.

- Proper operation of the microwave oven requires that the magnetron be assembled to the waveguide and cavity. Never operate the magnetron unless it is properly installed.
- **Be sure that the magnetron gasket is properly installed around the dome of the tube whenever installing the magnetron.**



**THE OVEN IS TO BE SERVICED ONLY BY PROPERLY QUALIFIED SERVICE PERSONNEL.**

# INSTALLATIONS

**BEFORE YOU BEGIN, READ THE FOLLOWING INSTRUCTIONS COMPLETELY AND CAREFULLY.**

## INSTALLING

### Examine your microwave oven

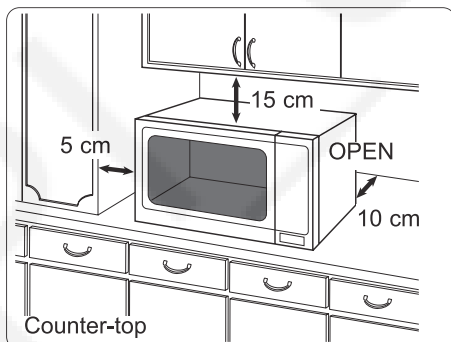
Unpack the oven, remove all packing material, and examine the oven for any damage such as dents, broken door latches or cracks in the door. If you find any damage, notify your dealer immediately. Do not install a damaged microwave oven.

### Placement of the Oven

1. This oven is intended for Household counter top use only. It is not intended for built-in use or for use inside a cupboard. Place the oven on a flat and stable surface more than 85 cm above the floor.
2. When this oven is installed, it should be easy to isolate the appliance from the electricity supply by pulling out the plug or operating a circuit breaker.
3. For proper operation, ensure a sufficient air circulation for the oven.

#### Counter-top use:

- a. Allow 15 cm of space on the top of the oven, 10 cm at the back, 5 cm on one side, and the other side must be opened.
- b. If one side of the oven is placed flush to a wall, the other side or top must not be blocked.



## EARTHING INSTRUCTIONS

**IMPORTANT:** THIS UNIT HAS TO BE PROPERLY EARTHED FOR PERSONAL SAFETY.

If your AC outlet is not grounded, it is the personal responsibility of the customer to have it replaced with a properly grounded wall socket.

**WARNING-**  
**THIS APPLIANCE**  
**MUST BE EARTHED**

### IMPORTANT

The wires in this mains lead are colored in accordance with the following code:

<b>Green-and-yellow:</b>	<b>Earth</b>
<b>Blue:</b>	<b>Neutral</b>
<b>Brown:</b>	<b>Live</b>

As the colors of the wires in the mains lead of this appliance may not correspond with the colored markings identifying the terminals in your plug, proceed as follows.

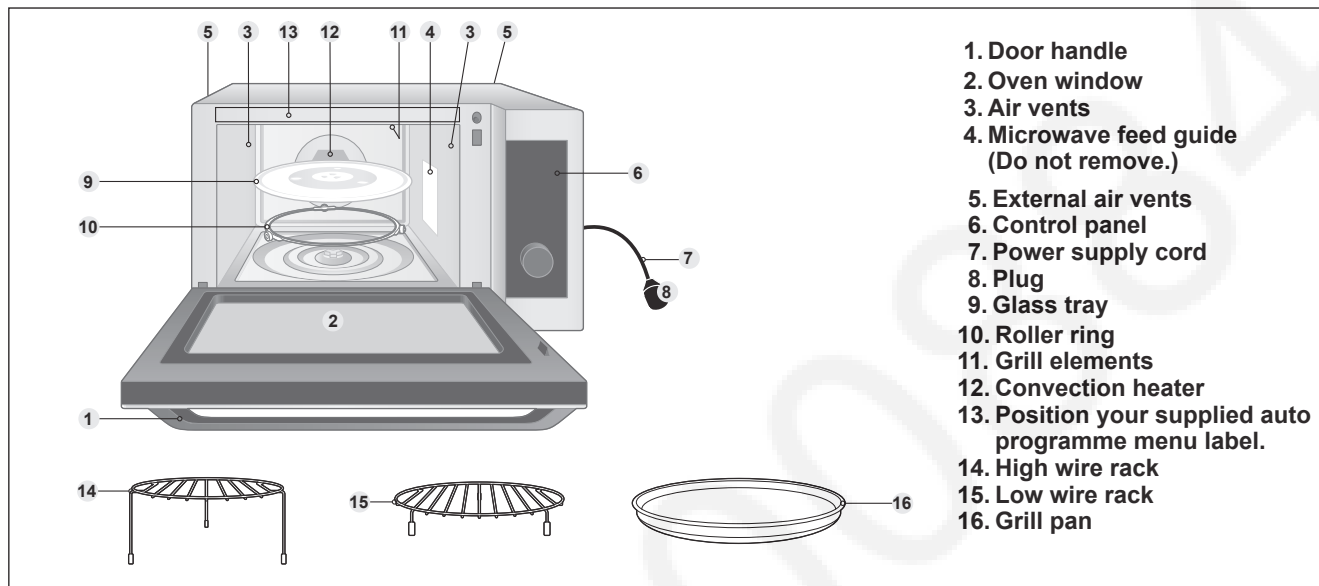
The wire which is colored **green-and-yellow** must be connected to the terminal in the plug which is marked with the letter **E** or by the **earth symbol** ( $\perp$ ) or colored **green** or **green-and-yellow**.

The wire which is colored **blue** must be connected to the terminal in the plug which is marked with the letter **N** or colored **black**.

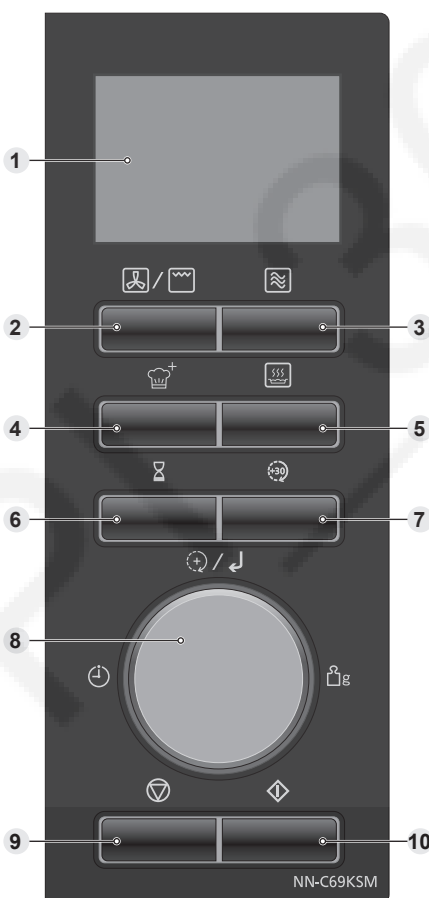
The wire which is colored **brown** must be connected to the terminal in the plug which is marked with the letter **L** or colored **red**.

# OPERATING INSTRUCTIONS

## FEATURES



## CONTROL PANEL



• Your control panel may have differences in appearance, but the words and functionality will be the same.

**1 Display window** (page 16)  
When the oven is first plugged in, "88.88" appears in display window.

**2 Convection/Grill button**

**3 Microwave button**

**4 Combination button**

**5 Auto Programme button**

**6 Timer / Clock button**

**7 Quick 30 button**

**8 Dial**

The dial has the following functions:

**Selecting values**

Select the setting value of each manual cooking mode and each AUTO PROGRAMME.


**Cooking time**

After selecting a manual cooking mode, enter time by turning the dial. Use the dial for the ADD TIME feature (page 32).

**Auto Programmes**

After pressing Auto Programme, turn the dial to select AUTO PROGRAMMES.

**Confirmation**

Press the dial to confirm the setting. CONFIRM indicator  flashes when the setting needs to be confirmed.

**9 Stop / Reset button**

**Before Cooking:**

One press clears your instructions.

**During Cooking:**

One press temporarily stops the cooking programme. Another press cancels all your instructions and the time of day will appear in the display.

**10 Start button**

One press allows oven to begin functioning. If door is opened or Stop/Reset is pressed once during oven operation, Start must be pressed again to restart oven.

■ **Beep sound**

When a button is pressed correctly a beep will be heard. If a button is pressed and no beep is heard, the unit has not or cannot accept the instruction. The oven will beep twice between programmed stages and at the point to stirring or turning the food in the AUTO PROGRAMME. After the completion of the preheating on CONVECTION or COMBINATION mode, three beeps sound. At the end of any complete programme, the oven will beep 5 times and "End" will be displayed.

■ **Note**

If Start is not pressed for 6 minutes after cooking programme setting, the oven will automatically cancel the cooking programme. The display will revert back to clock or colon.


# OPERATING SEQUENCE

The following is a description of component functions during oven operation.

## 1. Microwave Cooking

Press "Micro/Grill/Conv./Combi" once, the screen will display "P100".


Press "Micro/Grill/Conv./Combi" repeatedly to choose the power


Then press "START/+30SEC./CONFIRM" to confirm, turn "" to adjust the cooking time.

Press "START/+30SEC./CONFIRM" again to start cooking.

## 2. Grill or Combi. Cooking


Press "Micro/Grill/Conv./Combi" once, the screen will display "P100".

Press "Micro/Grill/Conv./Combi" repeatedly or turn the "" to choose the mode

Then press "START/+30SEC./CONFIRM" to confirm, turn "" to adjust the cooking time.

Press "START/+30SEC./CONFIRM" again to start cooking.

## 3. Convection Cooking

Press the "Micro/Grill/Conv./Combi" key once. Keep pressing "Micro/Grill/Conv./Combi" or turn "" to select the convection temperature.

Press the "START/+30SEC./CONFIRM" to confirm.


Turn "" to adjust the cooking time.

Press the "START/+30SEC./CONFIRM" to start cooking.

## 4. Multi-Stage Cooking

Press "Micro/Grill/Conv./Combi" repeatedly to choose the power;

Press "START/+30SEC./CONFIRM" to confirm;

Turn "" to adjust the defrost time;

Press "Micro/Grill/Conv./Combi" several times to choose Grill power and "G-1" displays;

Press "START/+30SEC./CONFIRM" to confirm;

Turn "" to adjust the cooking time of 7 minutes;

Press "START/+30SEC./CONFIRM" to start cooking.

## 5. Speedy Cooking

In waiting state, press "START/+30SEC./CONFIRM" to cook with 100% power level for 30 seconds.

During microwave, grill, convection and combination states, cooking time can be increased by pressing "START/+30SEC./CONFIRM".


Turn "" to choose the cooking time directly.

Press "START/+30SEC./CONFIRM" to start cooking with full power.


## 6. Child Lock

Using this system will make the oven inoperable; however, the door can be opened. Child Lock can be set when the display shows a colon or the time.

### Lock

In waiting state, press "STOP/CLEAR" for 3 seconds, there will be a long "beep" denoting entering into the children-lock state and "" indicator will light. The screen will display current time or 0:00.

### Unlock

In locked state, press "STOP/CLEAR" for 3 seconds, there will be a long "beep" denoting that the lock is released, and "" indicator will disappear.

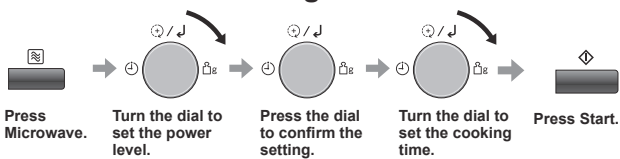
## 7. Specification

- (1) The buzzer will sound once when turning the knob at the beginning
- (2) "START/+30 SEC./CONFIRM" must be pressed again if the door is opened during cooking.
- (3) Once the cooking programmer has been set and "START/+30 SEC./CONFIRM" is not pressed in 5 minutes. The current time will be displayed. The setting will be cancelled.
- (4) The buzzer sounds once by efficient press, inefficient press will give no response
- (5) The buzzer will sound five times to remind you when cooking is finished.

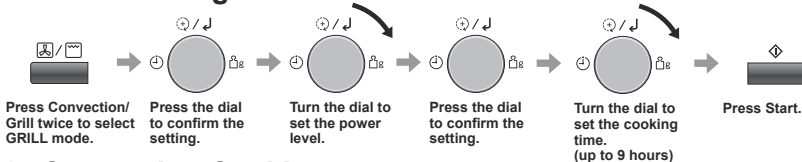
# OPERATING SEQUENCE

The following is a description of component functions during oven operation.

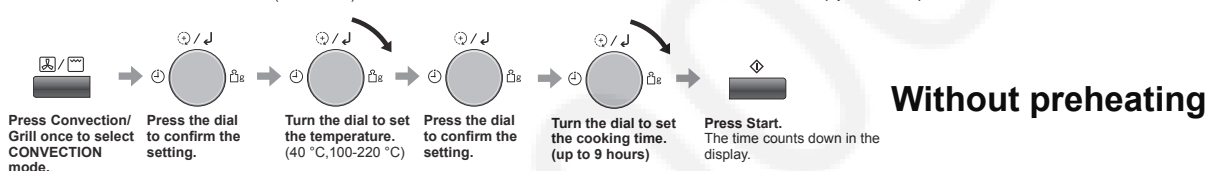
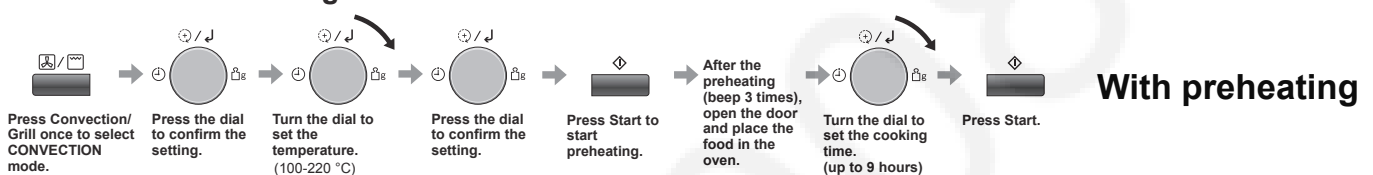
## 1. Microwave Cooking



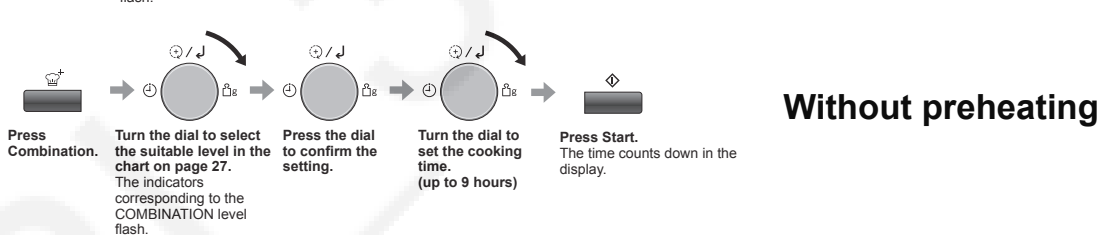
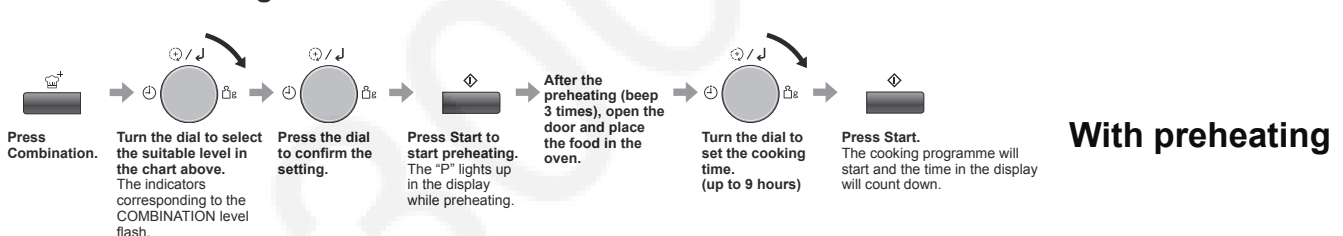
## 2. Grill Cooking



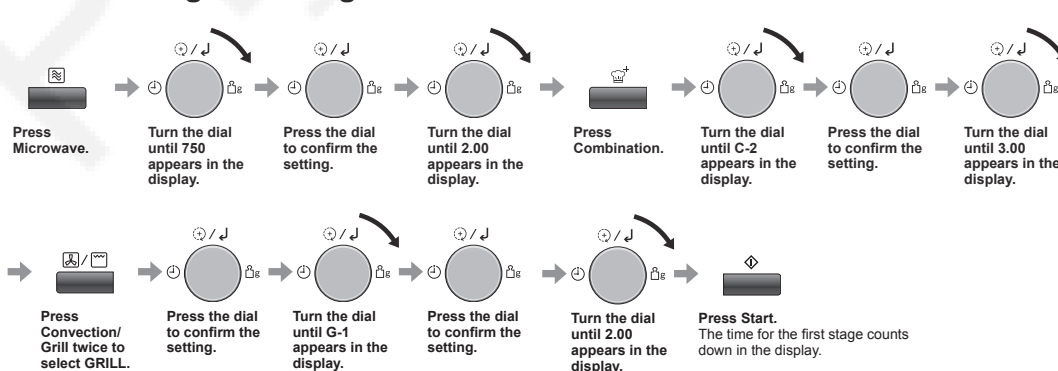
## 3. Convection Cooking



## 4. Combi. Cooking

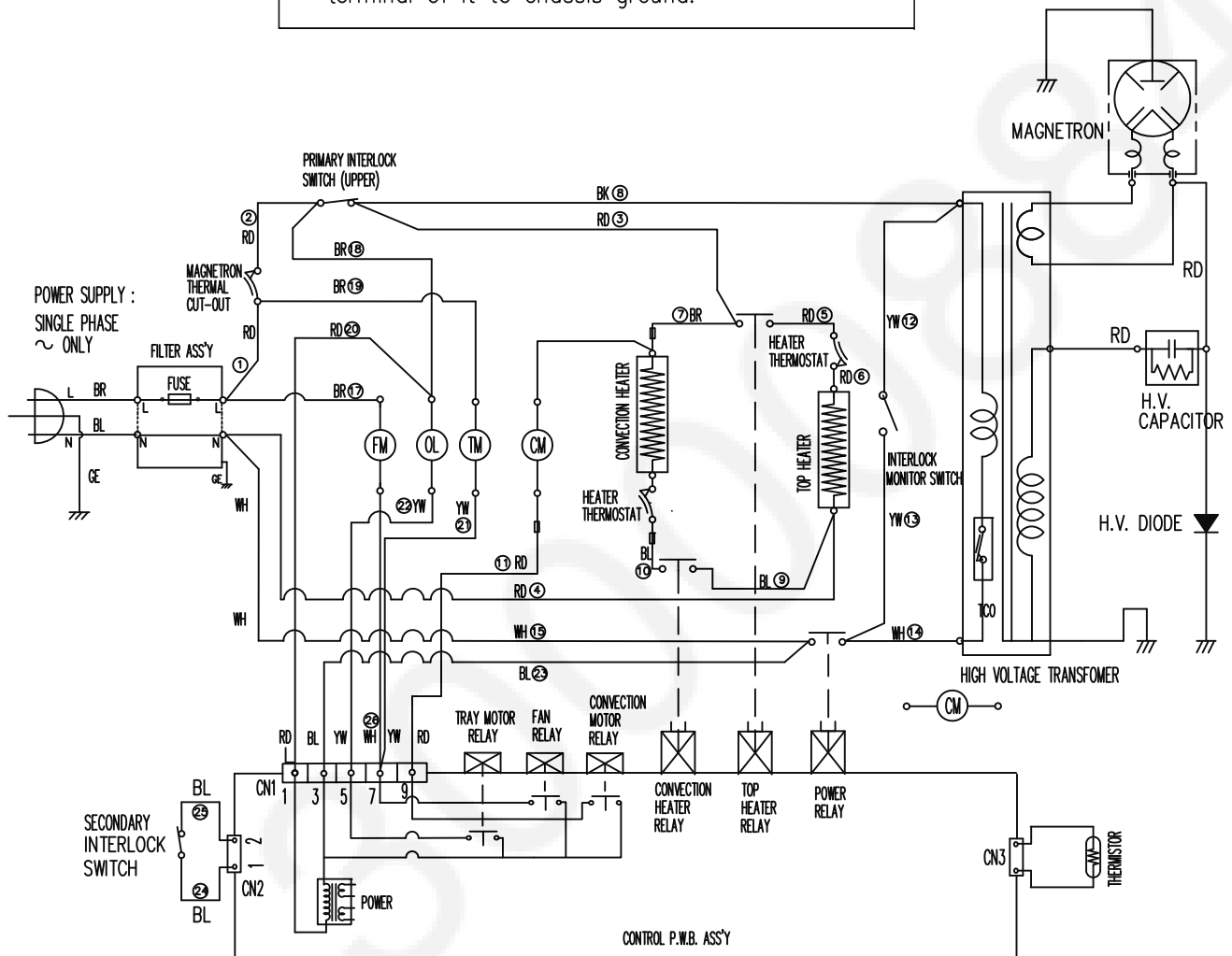


## 5. Multi-Stage Cooking



# SCHEMATIC DIAGRAM

BEFORE SERVICING Discharge the high voltage capacitor by shorting the negative high voltage terminal of it to chassis ground.



[ CONDITION ]  
DOOR : CLOSED  
COOK : OFF

NOTE :

⓪L : OVEN LAMP  
⓪M : FAN MOTOR  
⓪M : CONVECTION FAN MOTOR  
⓪M : TRAY MOTOR  
SMPS : Switching Mode Power Supply

BK : BLACK BL : BLUE  
RD : RED BR : BROWN  
WH : WHITE GE : GREEN/YELLOW  
YW : YELLOW

# CIRCUIT DESCRIPTION

## GENERAL DETAILS

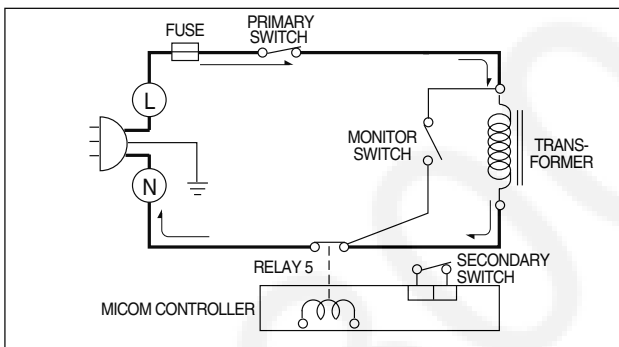
- The low voltage transformer supplies the necessary voltage to the micom controller when power cord is plugged in.
- When the door is closed, the primary switch is ON, the secondary switch is ON, and the monitor switch opens (contact COM and NO).

## WHEN SELECTING COOKING POWER LEVEL AND TIME

- The micom controller memorizes the function you set.
- The time you set appears in the display window.
- Each indicator light turns on to indicate that the stage has been set.

## WHEN TOUCHING THE START PAD

- The coil of the relay is energized by the micom controller.
- Power input is supplied to the high voltage transformer through the fuse to the primary switch and relay 5.
- Turntable rotates.



- The fan motor rotates and cools the magnetron by blowing the air (coming from the intake on the baseplate)
- The air is also directed into the oven to exhaust the vapor in the oven through the upper plate.
- Cooking time starts counting down.
- 3.2 volts AC is generated from the filament winding of the high voltage transformer. This 3.2 volts is applied to the magnetron to heat the magnetron filament through two noise preventing choke coils.
- A high voltage of approximately 2100 volts AC is generated in the secondary of the high voltage transformer which is increased by the action of the high voltage diode and charging of the high voltage capacitor.
- The negative 4,000 Volts DC is applied to the filament of the magnetron.

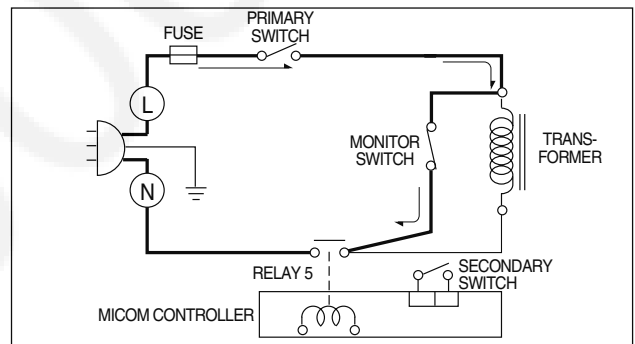
## WHEN THE OVEN IS SET AT ANY LEVEL EXCEPT MAXIMUM.

- The micom controller controls the ON-OFF time of relay 5 by the applied signal to vary the average output

power of microwave oven as POWER LEVEL.  
(refer to page 1-1)

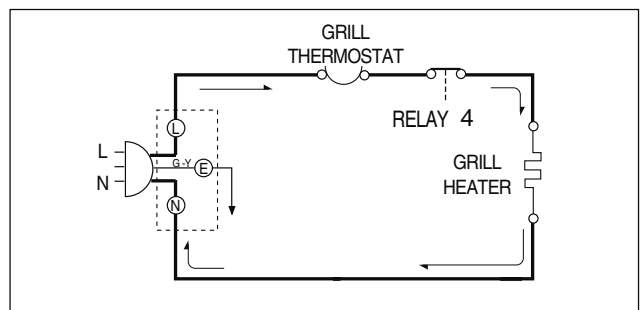
## WHEN THE DOOR IS OPENED DURING COOKING

- Both the primary switch and relay 5 are cut off primary winding voltage of the high voltage transformer.
- ON-OFF of relay 5 is coupled electrically with opening and closing of the secondary switch.
- When the door is opened, the secondary switch is opened and when the door is closed, the secondary switch is closed.
- The cooking time stops counting down.
- Relay stops functioning.
- As the door is opened, if the contact of primary switch and relay 5 and/or secondary switch fails to open, the fuse opens due to the large current surge caused by the monitor switch activation, which in turn stops magnetron oscillation.



## WHEN TOUCHING THE START KEY WITH THE GRILL COOKING FUNCTION SELECTED

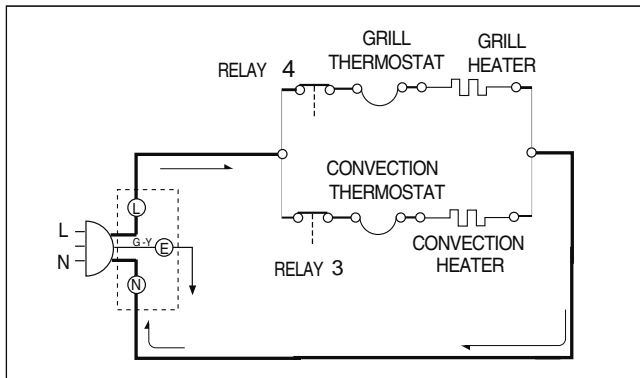
- The contacts of the primary switch and the secondary switch close the circuit.
- A.C.voltage is applied to the grill heater through grill thermostat as shown by the solid line.



- Turntable rotates.
- The fan motor rotates.
- The air is also directed into the oven to exhaust the vapor in the oven through the base plate and upper plate.

**WHEN TOUCHING THE START KEY  
WITH THE CONVECTION COOKING  
FUNCTION SELECTED**

- The contacts of the primary switch and the secondary switch close the circuit.
- A.C. voltage is applied to the grill heater and convection heater through each thermostat as shown by the solid line.



- Turntable rotates.
- The fan motor and convection fan motor rotates.
- The air is also directed into the oven to exhaust the vapor in the oven through the back plate and upper plate.



# SERVICE INFORMATION

## TOOLS AND MEASURING INSTRUMENTS

### NECESSARY TOOLS

Tools normally used for TV servicing are sufficient.  
Standard tools are listed below.

- Diagonal pliers
- Long nose pliers
- Phillips screwdriver
- Flat blade screwdriver
- Wrench (size 5mm)
- Nutdriver (size 5mm)
- Adjustable wrench
- Soldering iron
- Solder
- Vinyl insulation tape
- Polishing cloth

### NECESSARY MEASURING INSTRUMENTS

- TESTER(VOLTS-DC, AC., Ohmmeter)
- Microwave survey meter
  - Holaday HI-1500  
HI-1501
  - Narda 8100  
8200
- Inch scale
- 600 cc non conductive material beaker (glass or plastic),  
inside diameter: approx. 8.5 cm(3<sup>1</sup>/<sub>2</sub> in.)
- Cylindrical and made of borosilicate glass vessel.  
max. thickness: 3 mm  
outside diameter: approx. 190mm  
height: approx. 90mm
- Glass thermometer: 100°C or 212°F (1 deg scale)

## MICROWAVE LEAKAGE TEST

### CAUTIONS

- Be sure to check microwave leakage prior to servicing the oven if the oven is operative prior to servicing.
- The service personnel should inform the manufacture importer, or assembler of any certified oven unit found to have a microwave emission level in excess of 5 mW/cm<sup>2</sup> and should repair any unit found to have excessive emission levels at no cost to the owner and should ascertain the cause of the excessive leakage. The service personnel should instruct the owner not to use the unit until the oven has been brought into compliance.
- If the oven operates with the door open, the service personnel should:
  - Tell the user not to operate the oven.
  - Contact the manufacturer.
- The service personnel should check all surface and vent openings for microwave leakage.
- Check for microwave leakage after every servicing.  
The power density of the microwave radiation leakage emitted by the microwave oven should not exceed 4 mW/cm<sup>2</sup>. Always start measuring of an unknown field to assure safety for operating personnel from radiation leakage.

### MEASURING MICROWAVE ENERGY LEAKAGE

- Pour 275±15cc of 20±5°C(68±9°F) water in a beaker which is graduated to 600 cc, and place the beaker on the center of the turntable.
- Set the energy leakage monitor to 2450 MHz and use it following the manufacturer's recommended test procedure to assure correct result.
- When measuring the leakage, always use the 2-inch (5cm) spacer supplied with the probe.
- Operate the oven at its maximum output.
- Measure the microwave radiation using and electromagnetic radiation monitor by holding the probe perpendicular to the surface being measured

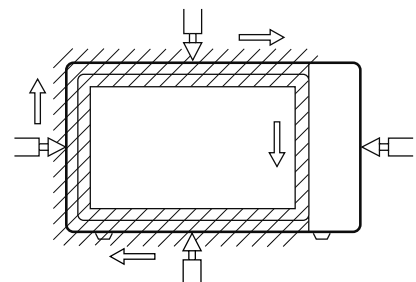
Move probe along shaded area

////////////////////

Probe scanning speed

Less than 2.5 cm/sec

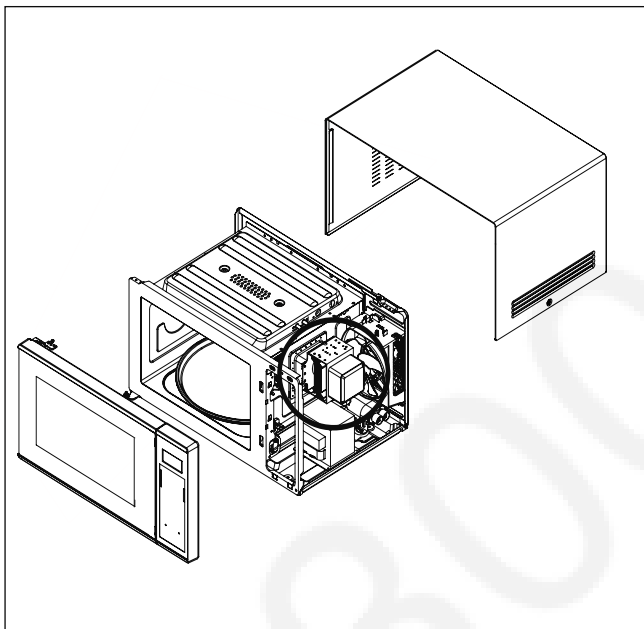
( 1in/sec)



## **MEASUREMENT WITH OUTER CASE REMOVED**

- When you replace the magnetron, measure for microwave energy leakage before the outer case is installed and after all necessary components are replaced or adjusted.  
Special care should be taken in measuring the following parts. (Circled area of below Fig.)
  - Around the magnetron
  - The waveguide

**WARNING : AVOID CONTACTING ANY HIGH VOLTAGE PARTS**



## **MEASUREMENT WITH A FULLY ASSEMBLED OVEN**

- After all components, including the outer case, are fully assembled, measure for microwave energy leakage around the door viewing window, the exhaust opening, and air inlet openings.
- Microwave energy leakage must not exceed the values prescribed below.

**NOTE:** Leakage with the outer case removed less than 5 mW/cm<sup>2</sup>.sq. Leakage for a fully assembled oven (Before the latch switch (primary) is interrupted) with the door in a slightly opened position less than 2 mW/cm<sup>2</sup>.sq.

## **NOTES WHEN MEASURING**

- Do not exceed meter full scale deflection.
- The test probe must be removed no faster than 1 inch/sec (2.5 cm/sec) along the shaded area, otherwise a false reading may result.
- The test probe must be held with the grip portion of the handle.  
A false reading may result if the operator's hand is between the handle and the probe.
- When testing near a corner of the door, keep the probe perpendicular to the surface making sure the probe horizontally along the oven surface, this may possibly cause probe damage.

## **RECORD KEEPING AND NOTIFICATION AFTER MEASUREMENT**

- After adjustment and repair of any microwave energy interruption or microwave energy blocking device, record the measured values for future reference. Also enter the information on the service invoice.
- The microwave energy leakage should not be more than 4 mW/cm<sup>2</sup>.sq. after determining that all parts are in good condition, functioning properly and genuine replacement parts which are listed in this manual have been used.
- At least once a year, have the electromagnetic energy leakage monitor checked for calibration by its manufacturer.

# MEASUREMENT OF MICROWAVE POWER OUTPUT

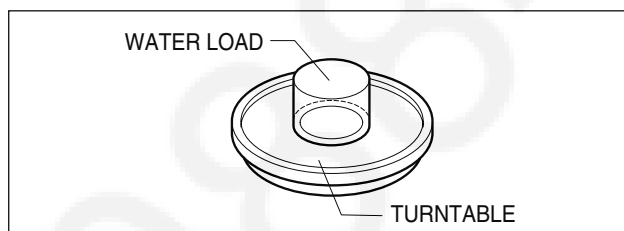
- Microwave power output measurement is made with the microwave oven supplied at its rated voltage and operated at its maximum microwave power setting with a load of (1000±5) g of potable water.
- The water is contained in a cylindrical borosilicate glass vessel having a maximum material thickness of 3 mm and an outside diameter of approximately 190mm.
- The oven and the empty vessel are at ambient temperature prior to the start of the test.
- The initial temperature (T<sub>1</sub>) of the water is (10±2)°C. It is measured immediately before the water is added to the vessel. After addition of the water to the vessel, the load is immediately placed on the center of the turntable which is in the lowest position and the microwave power switched on.
- The time T for the temperature of the water to rise by a value ΔT of (10±2)°K is measured, where T is the time in seconds and ΔT is the temperature rise. The initial and final water temperatures are selected so that the maximum difference between the final water temperature and the ambient temperature is 5°K.
- The microwave power output P in watts is calculated from the following formula :

$$P = \frac{4187 \times (\Delta T) + 0.55 \times (T_2 - T_0) \times M}{T}$$

- T<sub>2</sub>: Temperature after heating
- T<sub>0</sub>: Temperature of bowl
- M: Weight of bowl

is measured while the microwave generator is operating at full power. Magnetron filament heat-up time is not included. (about 3 sec)

- The water is stirred to equalize temperature throughout the vessel, prior to measuring the final water temperature.
- Stirring devices and measuring instruments are selected in order to minimize addition or removal of heat.



## NOTES:

For simple tests of microwave power output, conduct it by heating one litre water for one minute, minimum temperature rise should be 7.7 °C

## DISASSEMBLY AND ADJUSTMENT

### A. OUTER CASE REMOVAL

- 1) Disconnect the power supply cord from the outlet.
- 2) Remove the screws from the rear and along side edges of the case.  
The outer case must be moved backward to be lifted off.

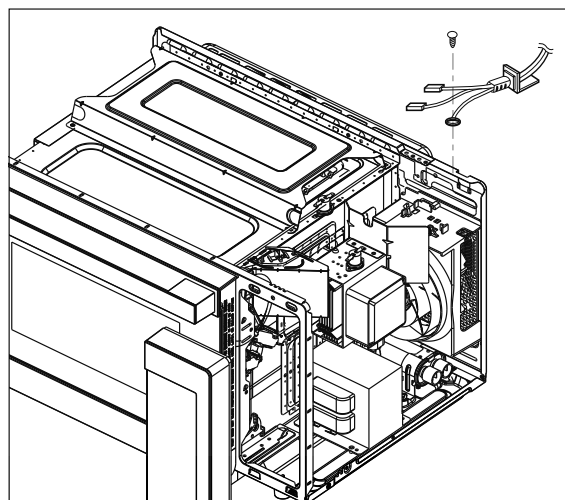
### B. POWER SUPPLY CORD

- 1) Remove the outer case.
- 2) Disconnect two terminals, and remove one screw of the earth terminal.

**CAUTION: DISCHARGE THE HIGH VOLTAGE CAPACITOR BEFORE SERVICING**  
(refer to page 2-1)

### C. CONTROL PANEL ASSEMBLY

- 1) Disconnect the leadwire from the PCB SUB ASS'Y.
- 2) Remove the screws for the earth and securing the control panel.
- 3) Lift control panel ASS'Y from the oven by the tab unhooked.



## D. DOOR ASSEMBLY REMOVAL

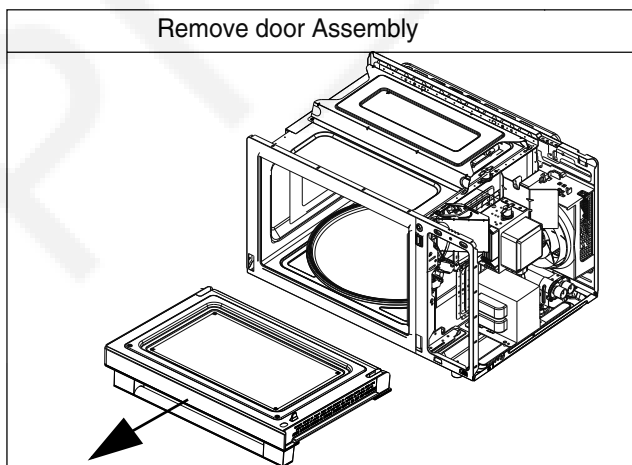
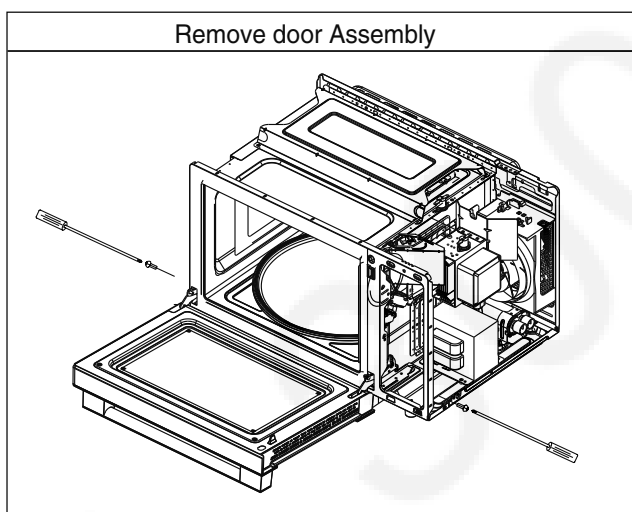
- 1) Open the door.
- 2) Remove two screws holding the Hinge to the Cavity Ass'y.

**CAUTION : Be careful not to damage Door C by screwdriver.**

- 3) Lift up and pull the door.

### NOTE:

1. After replacing the door, be sure to check that the primary switch, monitor switch, and secondary switch operate normally.
2. After replacing the door, check for microwave energy leakage with a survey meter. Microwave energy must be below the limit of 5 mW/cm<sup>2</sup>. (with a 275 ml water load)
3. When mounting the door assembly to the oven assembly, be sure to adjust the door assembly parallel to the chassis. Also adjust so the door has no play between the inner door surface and oven frame assembly. If the door assembly is not mounted properly, microwaves may leak from the clearance between the door and the oven.



## E. HIGH VOLTAGE TRANSFORMER REMOVAL

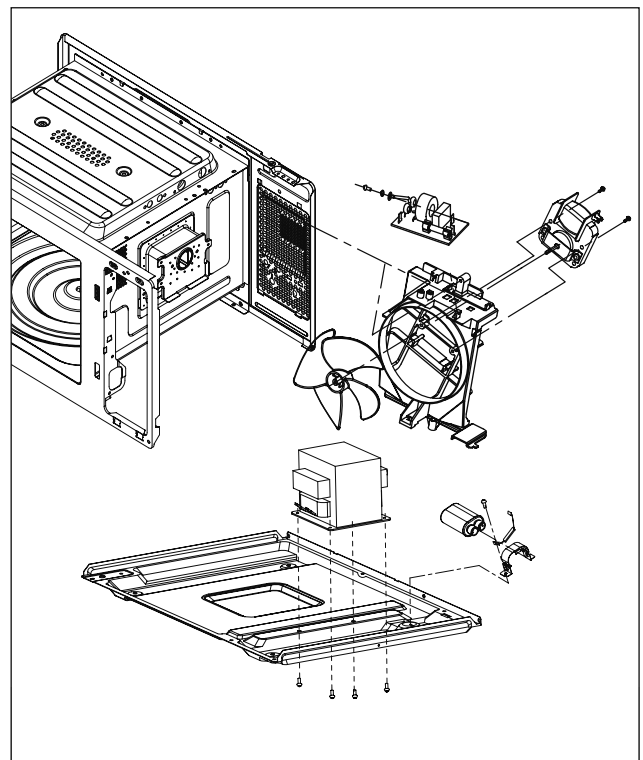
- 1) Discharge the high voltage capacitor.
- 2) Disconnect the leadwire from magnetron, high voltage transformer, and capacitor.
- 3) Remove the screw holding the high voltage transformer to the baseplate.

## F. ORIFICE ASSEMBLY REMOVAL

- 1) Discharge the high voltage capacitor.
- 2) Disconnect the leadwire from fan motor, noise filter and high voltage capacitor.
- 3) Remove the two screws holding the orifice ASS'Y to the oven cavity and remove the high voltage diode earth screw.
- 4) Remove the screw of the capacitor bracket.
- 5) Remove the two screws holding the fan motor ASS'Y to the Orifice ASS'Y.

## G. HIGH VOLTAGE CAPACITOR AND DIODE REMOVAL

- 1) Discharge the high voltage capacitor.
- 2) Disconnect the leadwire from fan motor, noise filter and high voltage capacitor.
- 3) Remove the screw holding the Orifice ASS'Y to the oven cavity and remove the high voltage diode earth screw.
- 4) Remove the screw holding the high voltage capacitor bracket.



## H. AIR GUIDE ASSEMBLY REMOVAL

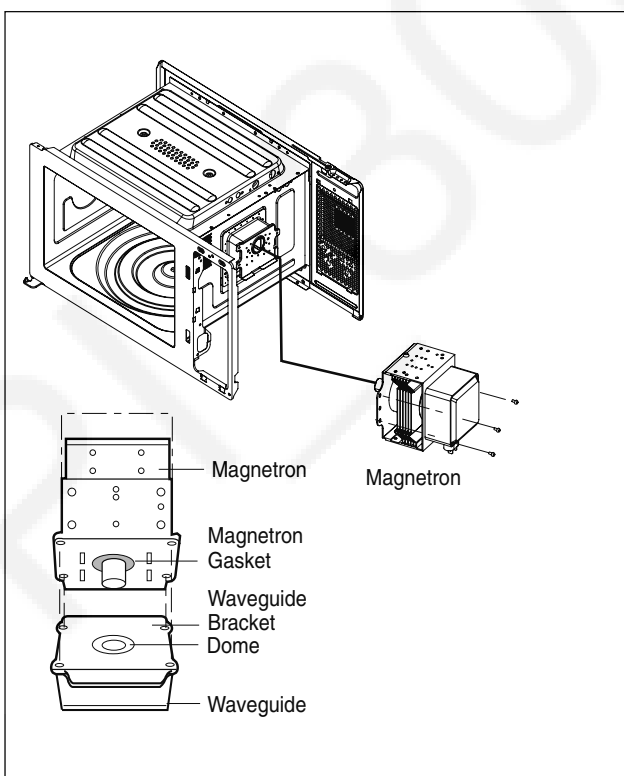
- 1) Disconnect the leadwire from lamp, A.C Relay and monitor resistor and magnetron.
- 2) Remove the screw to the cavity.

## I. MAGNETRON REMOVAL

- 1) Disconnect the leadwire from the high voltage transformer and high voltage capacitor.
- 2) Remove the air guide.
- 3) Carefully remove the mounting screws holding the magnetron and the waveguide.
- 4) Remove the magnetron until the tube is clear from the waveguide.

### NOTE:

1. When removing the magnetron, make sure its dome does not hit any adjacent parts, or it may be damaged.
2. When replacing the magnetron, be sure to install the magnetron gasket in the correct position and **be sure that the gasket is in good condition.**
3. After replacing the magnetron, check for microwave leakage with a survey meter around the magnetron. Microwave energy must be below the limit of 5 mW/cm<sup>2</sup>. (With a 275 ml. water load).  
**Make sure that gasket is rigidly attached to the magnetron.** To prevent microwave leakage, tighten the mounting screws properly, making sure there is no gap between the waveguide and the magnetron.

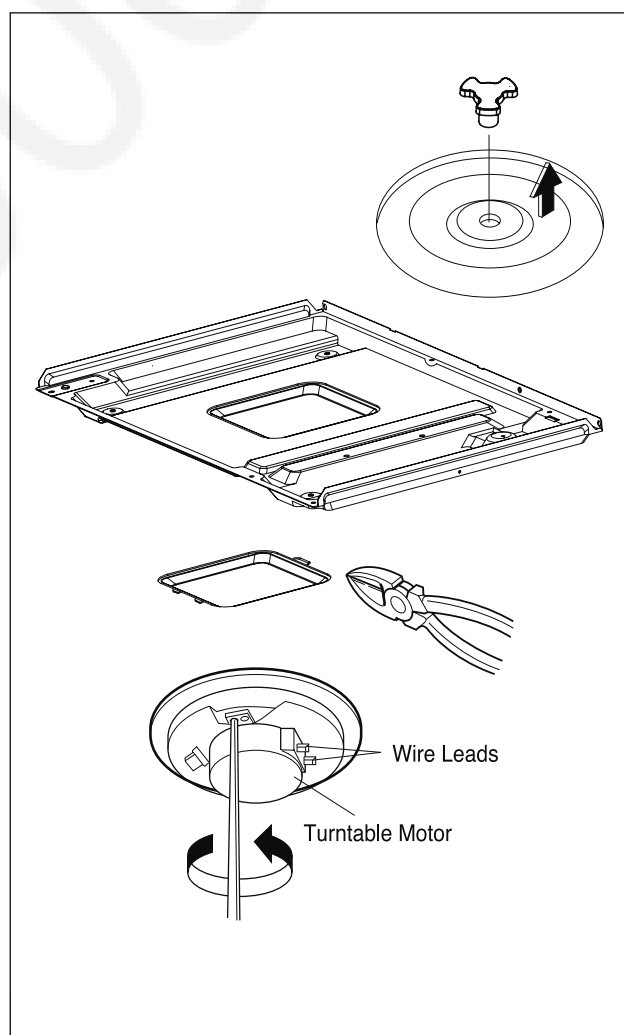


## J. REMOVING THE TURNTABLE MOTOR

- 1) Remove the glass tray.
- 2) Remove the pulley shaft VERY CAREFULLY
- 3) Lay the unit down on its back.
- 4) Remove the turntable motor cover.  
The turntable base cover is easily removed by pinching the six parts with a wire cutting.
- 5) Disconnect the leadwire from the turntable motor terminals.
- 6) Remove the screw securing the turntable motor to the oven cavity ASS'Y
- 7) After replacing the motor, rotate the removed turntable motor cover.
- 8) Fit the turntable motor cover's projecting part to the base plate slit.

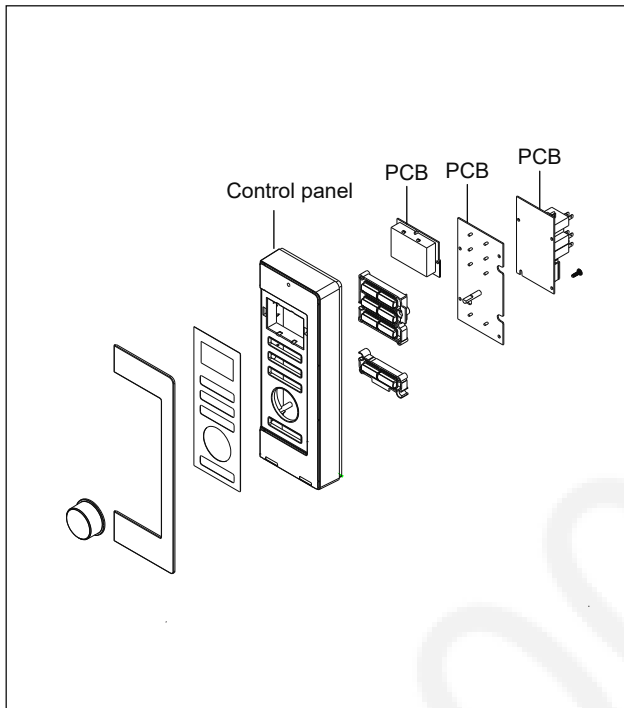
### NOTE:

1. Remove the wire lead from the turntable motor VERY CAREFULLY.
2. Be sure to grasp the connector, not the wires, when removing



## K. PCB ASSEMBLY REMOVAL

- 1) Remove the control panel assembly from the cavity.
- 2) Remove screws which hold the PCB to the control panel.
- 3) Disconnect the flat cable from the PCB and take off the PCB .

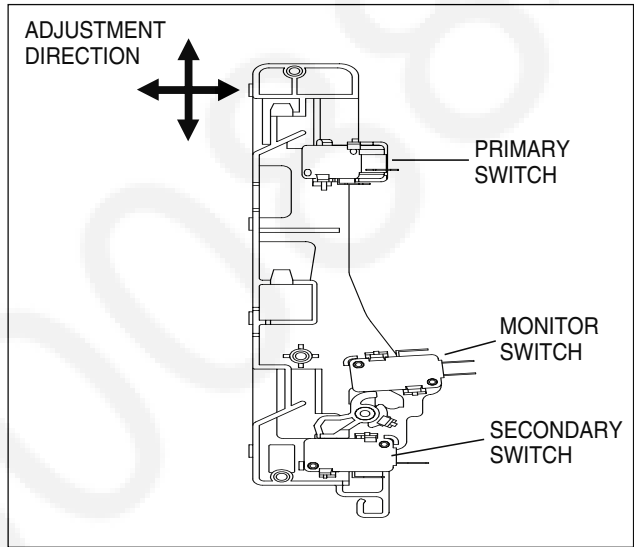


## L. INTERLOCK SYSTEM

### 1) INTERLOCK MECHANISM

The door lock mechanism is a device which has been specially designed to eliminate completely microwave activity when the door is opened during cooking and thus to prevent the danger resulting from the microwave leakage.

### 2) MOUNTING OF THE PRIMARY/MONITOR/SECONDARY SWITCHES TO THE LATCH BOARD



### 3) INSTALLATION AND ADJUSTMENT OF THE LATCH BOARD TO THE OVEN ASSEMBLY

- Mount the latch board to the oven assembly.
- Adjust the latch board in the arrow direction so that oven door will not have any play in it when the door is closed.
- Tighten the mounting screw.
- **Check for play in the door by pushing the door release button. Door movement should be less than 0.5 mm. (1/64 inch)**

Don't push the door release button while making adjustment. Make sure that the latch moves smoothly after adjustment are completed and that the screws are tight. Make sure the primary, monitor, and secondary switches operate properly by following the continuity test procedure.

# INTERLOCK CONTINUITY TEST

**WARNING : FOR CONTINUED PROTECTION AGAINST EXCESSIVE RADIATION EMISSION, REPLACE ONLY WITH IDENTICAL REPLACEMENT PARTS.**

TYPE NO. KW3A FOR SWITCHS

## A. PRIMARY INTERLOCK SWITCH TEST

When the door release button is depressed slowly with the door closed, an audible **click** should be heard at the same time or successively at intervals. When the button is released slowly, the latches should activate the switches with an audible **click**.

If the latches do not activate the switches when the door is closed, the switches should be adjusted in accordance with the adjustment procedure. Disconnect the wire lead from the primary switch. Connect the ohmmeter leads to the common (COM) and normally open (NO) terminal of the switch. The meter should indicate an open circuit in the door open condition. When the door is closed, the meter should indicate a closed circuit.

When the primary switch operation is abnormal, make the necessary adjustment or replace the switch only with the same type of switch.

## B. SECONDARY INTERLOCK SWITCH TEST

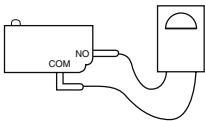


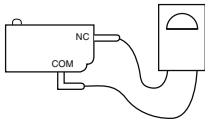


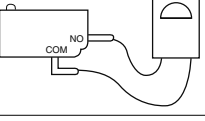


Disconnect the wire lead from the secondary switch.

Connect the ohmmeter leads to the common (COM) and normally open (NO) terminals of the switch. The meter should indicate a open circuit in the door open condition. When the door is closed, meter should indicate an closed circuit. When the secondary switch operation is abnormal, make the necessary adjustment or replace the switch only with the same type of switch.

## C. MONITOR SWITCH TEST

Disconnect the wire lead from the monitor switch. Connect the ohmmeter leads to the common (COM) and normally closed (NC) terminals of the switch. The meter should indicate closed circuit in the door open condition. When the door is closed, meter should indicate an open circuit. When the monitor switch operation is abnormal, replace with the same type of switch.

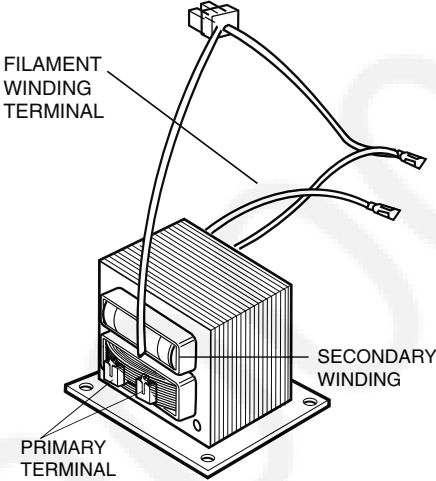
**NOTE: After repairing the door or the interlock system, it is necessary to do this continuity test before operating the oven.**

COMPONENTS	TEST PROCEDURE		RESULTS	
SWITCHES (Wire leads removed)	Check for continuity of the switch with an Ohm-meter		Door open	Door closed
	Primary Switch Type No.KW3A			
	Monitor Switch Type No.KW3A			
	Secondary Switch Type No.KW3A			
<b>NOTE :</b> After checking for the continuity of switches, make sure that are correctly connected.				

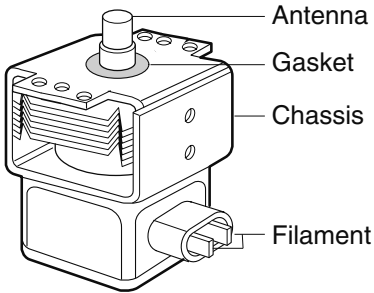
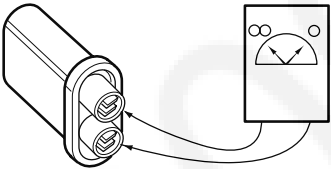
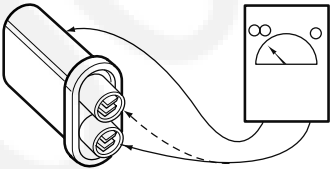
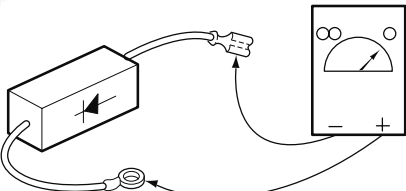
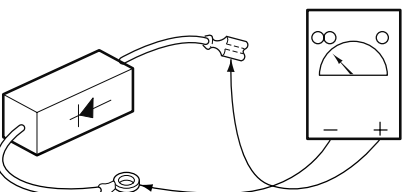
# COMPONENT TEST PROCEDURE

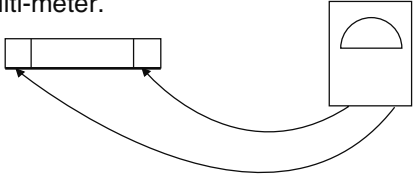
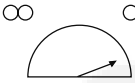
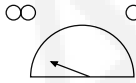
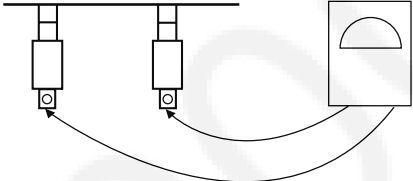
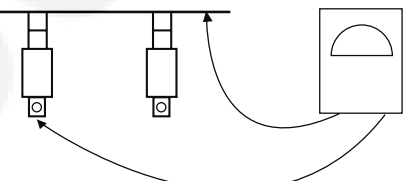
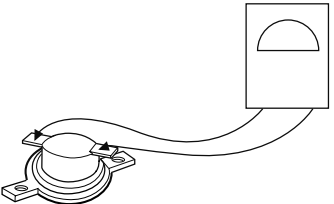


## CAUTIONS

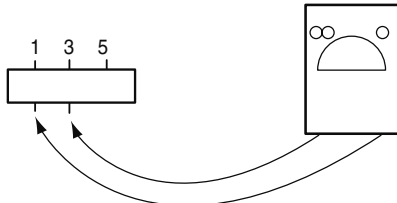


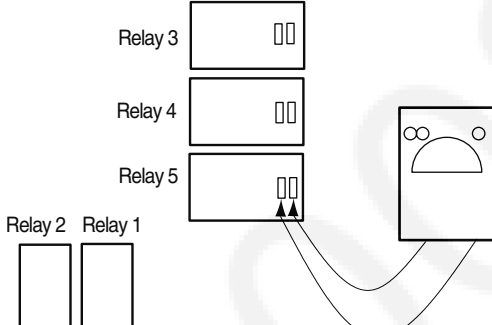


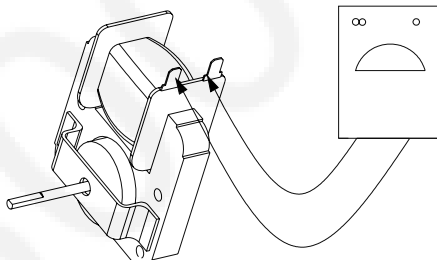
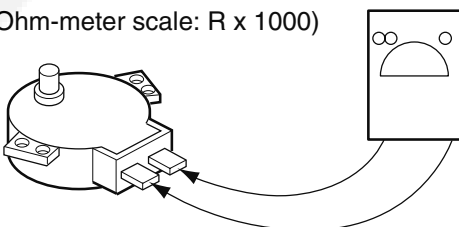
- 1. DISCONNECT THE POWER SUPPLY CORD FROM THE OUTLET WHENEVER REMOVING THE OUTER CASE FROM THE UNIT. PROCEED WITH THE TEST ONLY AFTER DISCHARGING THE HIGH VOLTAGE CAPACITOR AND REMOVING THE WIRE LEADS FROM THE PRIMARY WINDING OF THE HIGH VOLTAGE TRANSFORMER. (SEE PAGE 2-1)
- 2. ALL OPERATIONAL CHECKS WITH MICROWAVE ENERGY MUST BE DONE WITH A LOAD (1 LITER OF WATER IN CONTAINER) IN THE OVEN.

COMPONENTS	TEST PROCEDURE	RESULTS
HIGH VOLTAGE TRANSFORMER (Wire leads removed)	<div></div> <div><p>1. Measure the resistance. (Ohm-meter scale: Rx1)</p><ul style="list-style-type: none"><li>• Primary winding</li><li>• Secondary winding</li><li>• Filament winding</li></ul><p>2. Measure the resistance. (Ohm-meter scale: Rx1000)</p><ul style="list-style-type: none"><li>• Primary winding to ground</li><li>• Filament winding to ground</li></ul></div>	<div><p>Approx.: 1.4 ohm Approx.: 90 ohm Less than: 1 ohm</p><p>Normal: Infinite Normal: Infinite</p></div>
MAGNETRON (Wire leads removed)	<div><p>1. Measure the resistance. (Ohm-meter scale: Rx1)</p><ul style="list-style-type: none"><li>• Filament terminal</li></ul><p>2. Measure the resistance. (Ohm-meter scale: Rx1000)</p><ul style="list-style-type: none"><li>• Filament to chassis</li></ul></div>	<div><p>Normal: Less than 1 ohm</p><p>Normal: Infinite</p></div>



COMPONENTS	TEST PROCEDURE	RESULTS
	 <p>NOTE: When testing the magnetron, be sure to install the magnetron gasket in the correct position and be sure that the gasket is in good condition.</p>	
HIGH VOLTAGE CAPACITOR	<p>Measure the resistance. (Ohm-meter scale: Rx1000)</p> <ul style="list-style-type: none"> <li>• Terminal to terminal.</li> </ul> 	Normal: Momentarily indicates several ohms, and then gradually returns to 10M ohms.
	<p>Measure the resistance. (Ohm-meter scale: Rx1000)</p> <ul style="list-style-type: none"> <li>• Terminal to case.</li> </ul> 	Normal: $\infty$
HIGH VOLTAGE DIODE	<p>Measure the continuity (Forward). (Ohm-meter scale: Rx10000)</p> 	Normal: Continuity. Abnormal: $\infty$ *
<p>*NOTE : Some inexpensive meters may indicate infinite resistance in both direction.</p>	<p>Measure the continuity (Reverse). (Ohm-meter scale: Rx10000)</p> 	Normal: $\infty$ Abnormal: Continuity.

COMPONENTS	TEST PROCEDURE	RESULTS	
FUSE	Check for continuity of the fuse with an multi-meter. 	Normal	Abnormal
	NOTE: If the fuse is blown, check the primary, the secondary, and the monitor switches, H.V.D. and H.V.C. before replacing the fuse. If the fuse is blown by improper switch operation replace the defective switch and the fuse at the same time. Replace just the fuse if the switches operate normally.		
HEATER ELEMENT (Wire leads removed.)	Measure the resistance. (Multi-meter scale: Rx1) 	Normal: *Grill heater Approx. 50 ohm (at 20 ~ 30°C)	
		Normal: *Convection heater Approx. 50 ohm (at 20 ~ 30°C)	
	Measure the resistance with 500V-100M ohm insulation resistance meter. 	Normal: more than 0.5 Mohm	
THERMOSTAT		Below specified temperature	Above specified temperature
			

COMPONENTS	TEST PROCEDURE	RESULTS	
L.V. Transformer of P.C.B (Refer to schemetic diagram)	Check for P.C.B. connector. *Disconnect the 3 pin connector from P.C.B.  	Normal	Abnormal
			
RELAY 2, RELAY 3 OF P.C.B. (Wire leads removed.) Note: Relay Relay 1: Lamp Turntable motor Relay 2: Fan motor Relay 3: Convection Relay 4: Grill Relay 5: Microwave		Cooking Start	OFF
			
FAN MOTOR (Wire leads removed)	Measure the resistance. (Ohm-meter scale: R x 1)  	Normal: 100~500 $\Omega$ Abnormal: $\infty$ or several $\Omega$	
TURNTABLE MOTOR (Wire leads removed)	Measure the resistance. (Ohm-meter scale: R x 1000)  	Normal: Approx. 100~200K $\Omega$ Abnormal: $\infty$ or several $\Omega$	
NOTE : • A MICROWAVE LEAKAGE TEST MUST ALWAYS BE PERFORMED WHEN THE UNIT IS SERVICED FOR ANY REASON. • MAKE SURE THE WIRE LEADS ARE IN THE CORRECT POSITION. • WHEN REMOVING THE WIRE LEADS FROM THE PARTS, BE SURE TO GRASP THE CONNECTOR, NOT THE WIRES.			

# TROUBLE SHOOTING

WHEN YOU GET A COMPLAINT FROM YOUR CUSTOMER, EVALUATE THE COMPLAINT CAREFULLY. IF THE FOLLOWING SYMPTOMS APPLY, PLEASE INSTRUCT THE CUSTOMER IN THE PROPER USE OF THE MICROWAVE OVEN. THIS CAN ELIMINATE AN UNNECESSARY SERVICE CALL.

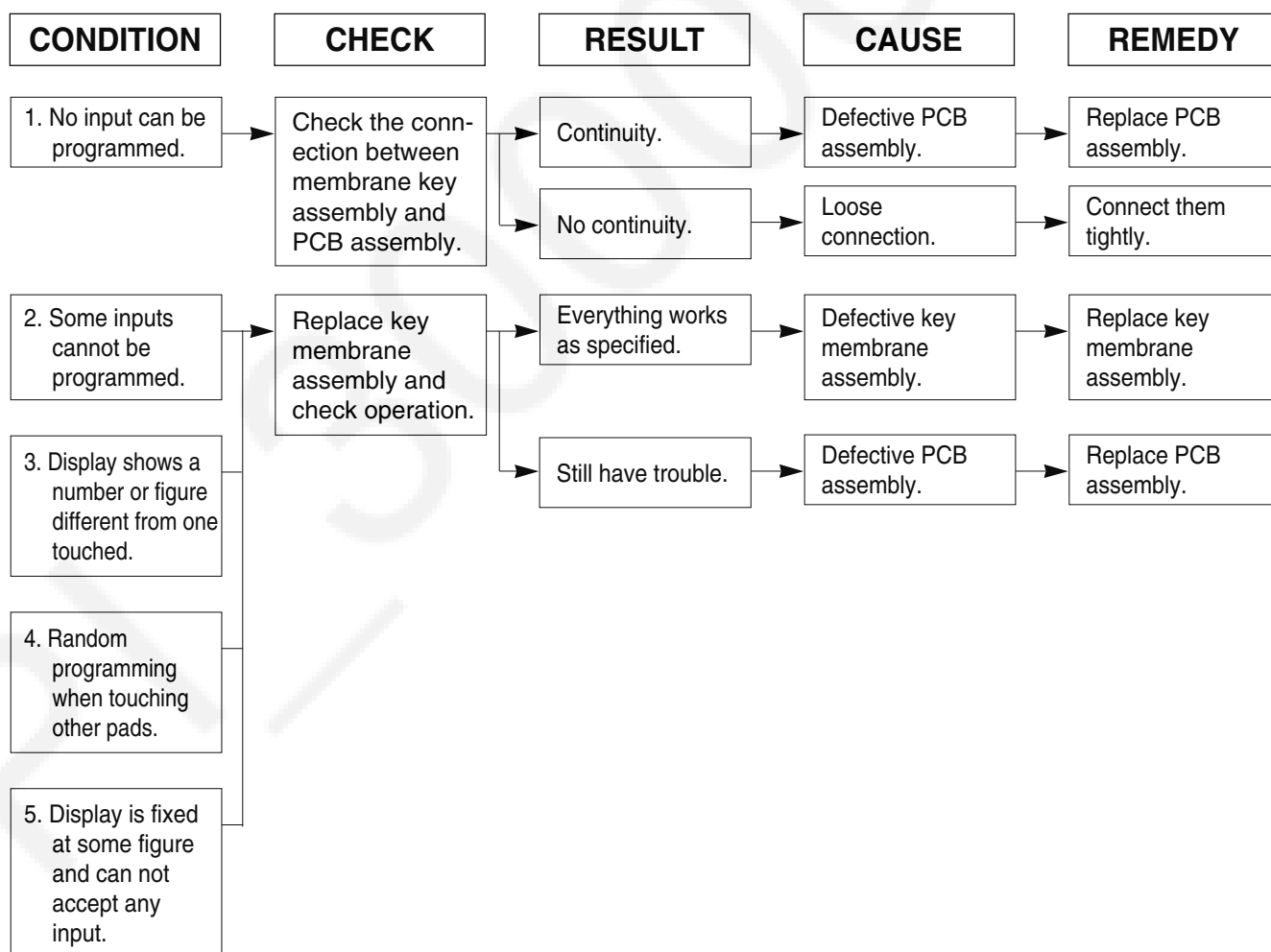
## CAUTIONS

1. Check grounding before checking for trouble.
  2. Be careful of the high voltage circuit.
  3. Discharge the high voltage capacitor. (See page 2-1)
  4. When checking the continuity of the switches or of 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.
  5. Do not touch any part of the circuitry on the digital programmer circuit since static electric discharge may damage this control panel.
- Always touch yourself ground while working on this panel to discharge any static charge built up in your body.

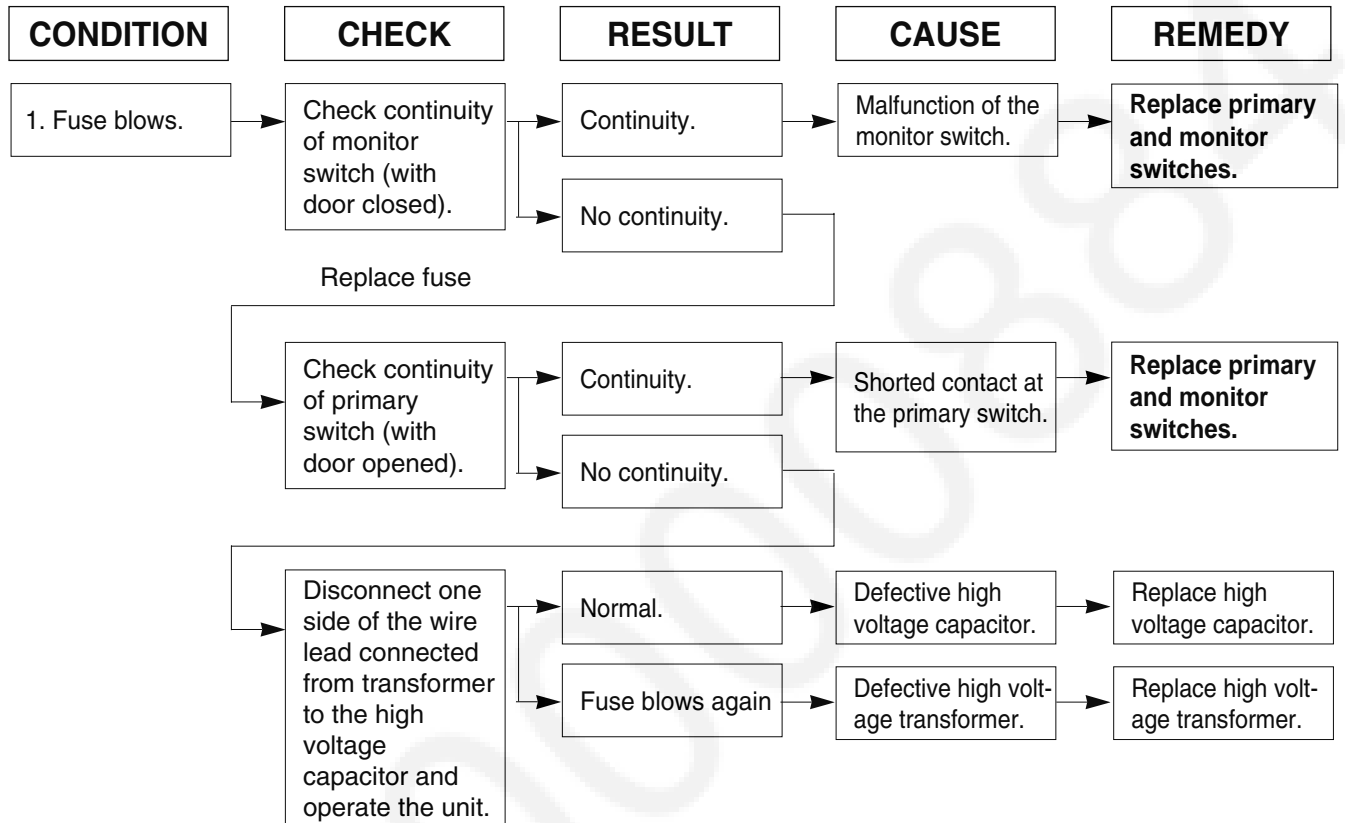
CONDITION	CAUSE	REMEDY
Microwave oven does not work.	Inserting many plug into one plug outlet and using them at the same time (causes overloading).	Avoid using other electrical appliances when you use the microwave oven.
	Microwave oven plug is not inserted tightly.	Insert microwave oven plug securely.
Output power is too low.	Low AC input voltage.	Use the microwave oven at adequate line voltage.
	Food temperature is too low.	This may not be a defect. It is possible that the food should be cooked for a longer time period.
Sparks occurring.	Using metallic ware and allowing it to touch the oven wall.	Do not use metallic ware for cooking except where noted in the cooking guide.
	Ceramic ware trimmed in gold or silver powder is used.	Do not use any type of cookware with metallic trimming.
Uneven cooking.	Inconsistent intensity of microwave by their characteristics.	<ol style="list-style-type: none"> <li>1. Wrap the thinner part with aluminum foil.</li> <li>2. Use plastic wrap or lid.</li> <li>3. Stir once or twice while cooking soup, cocoa or milk, etc.</li> </ol>
Turntable drags or makes noise.	Excessive weight on tray or improperly balanced.	Distribute food evenly. Cook smaller portions and, or use lighter weight cookware.

**(TROUBLE 1) The following visual conditions indicate a probable defective control circuit.**

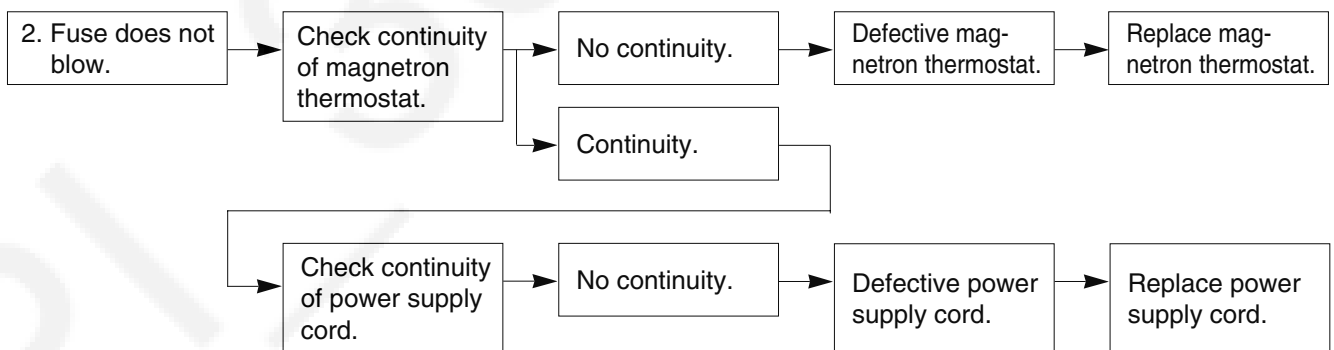
1. Incomplete segments.
  - Segment missing.
  - Partial segment missing.
  - Digit flickering (NOTE: Slight flickering is normal.)
2. Colon does not turn on or blink.
3. A distinct change in the brightness of one or more numbers in display.
4. One or more digits in the display are not lighting.
5. Display indicates a number different from one touched, for example, key in **5** and **3** appears in the display.
6. Specific numbers (for example 7 or 9) will not display when key pad is touched.
7. Display does not count down with time blinking or up with clock operation.
8. Display obviously jumps in time while counting down.
9. Display counts down too fast while cooking.
10. Each indicator light does not turn on after setting cooking cycle.
11. Display time of day does not reappear when cooking is finished.
12. Beep sound is not heard when correct key is touched.



**(TROUBLE 2) Oven does not operate at all ; Display window does not display any figures and no input is accepted.**



**NOTE : All these switches must be replaced at the same time. Refer to page 5-6, 5-7**



**(TROUBLE 3) Display shows all figures set, but oven does not start cooking while desired program times are set and START pad is touched.**

CONDITION	CHECK	RESULT	CAUSE	REMEDY
1.Setting time does not count down when touching START pad.	Check continuity of secondary switch (with door closed).	No continuity.	Defective secondary switch.	Replace secondary switch.
		continuity.		
	Check the connection between connector and P.C.B assembly.	No continuity.	Defective P.C.B assembly.	Replace P.C.B assembly.
		Continuity.	Loose connection.	Connection then tightly.
2. Fan motor or oven lamp do not turn on.	Check fan motor.	Abnormal.	Defective fan motor.	Replace fan motor.
	Check oven lamp.	Abnormal.	Defective oven lamp.	Replace oven lamp.
		Normal.		

**(TROUBLE 4) Oven seems to be operation but output power is low.**

CONDITION	CHECK	RESULT	CAUSE	REMEDY
Output is low.	Check the power source voltage.	Lower than 90% of rating voltage.	Decrease in power source voltage with load.	Suggest customer contact local electric power utility co. or qualified electrician.
		Normal.		
	Disconnect the wire leads from relay 2 and check on and off time with multitester.	Abnormal.	Defective P.C.B assembly.	Replace P.C.B assembly.
		Normal.		
	Measure the output power.	Abnormal.	Defective magnetron.	Replace magnetron.

**NOTE: Refer to Page 5-3 for measuring of microwave power output.**

**(TROUBLE 5) No microwave oscillation even though oven lamp and fan motor run  
(Display operates properly)**

CONDITION	CHECK	RESULT	CAUSE	REMEDY
No microwave oscillation.	Disconnect the wire leads from relay 5 and check continuity of relay 5. (Operate the unit)	No continuity.	Defective P.C.B assembly	Replace P.C.B assembly
		Continuity.		
	Check H.V. transformer.	Abnormal	Defective high voltage transformer.	Replace high voltage transformer .
		normal		
	Check H.V. capacitor.	Abnormal	Defective high voltage capacitor.	Replace high voltage capacitor.
		normal		
	Check H.V. diode.	Abnormal	Defective high voltage Diode.	Replace high voltage Diode.
		normal		
	Check Magnetron.	Abnormal	Defective magnetron.	Replace magnetron .



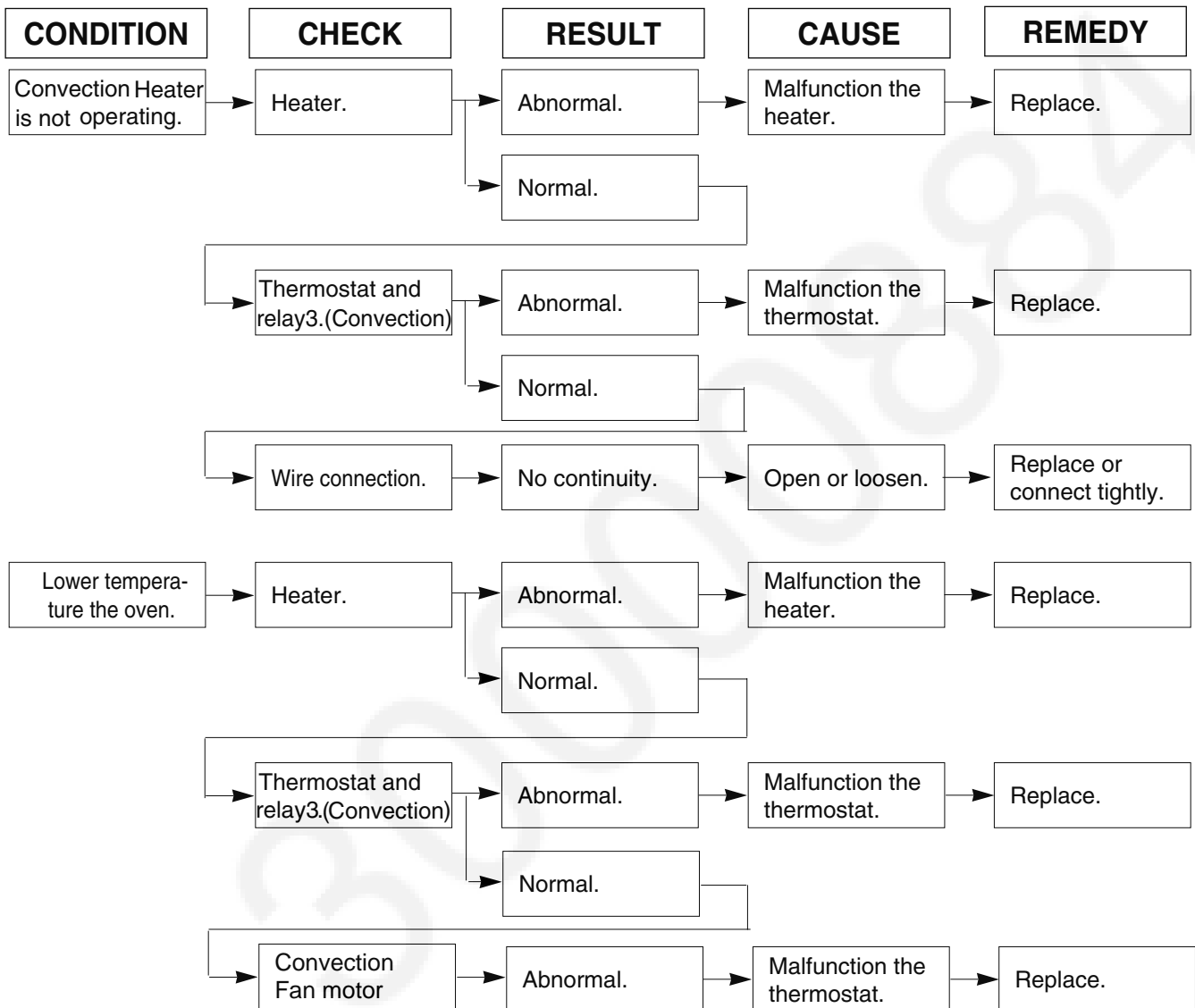
**(TROUBLE 6) Oven does not cook properly when programmed for the set power level  
(Operates properly on HIGH)**

CONDITION	CHECK	RESULT	CAUSE	REMEDY
Output is full when you set lower power level.	Disconnect the wire leads from relay 5 and check continuity relay 5. (Operate the unit)	Abnormal.	Defective P.C.B. assembly.	Replace P.C.B. assembly.

**(TROUBLE 7) Grill**

CONDITION	CHECK	RESULT	CAUSE	REMEDY
1. Grill Heater is not operating.	Heater.	Abnormal.	Malfunction the heater.	Replace.
		Normal.		
	Thermostat and relay 4.(Grill)	Abnormal.	Malfunction the thermostat.	Replace.
		Normal.		
	Wire connection.	No continuity.	Open or loosen.	Replace or connect tightly.
1. Lower temperature the oven.	Heater.	Abnormal.	Malfunction the heater.	Replace.
		Normal.		
	Thermostat and relay 4.(Grill)	Abnormal.	Malfunction the thermostat.	Replace.

## (TROUBLE 8) Convection



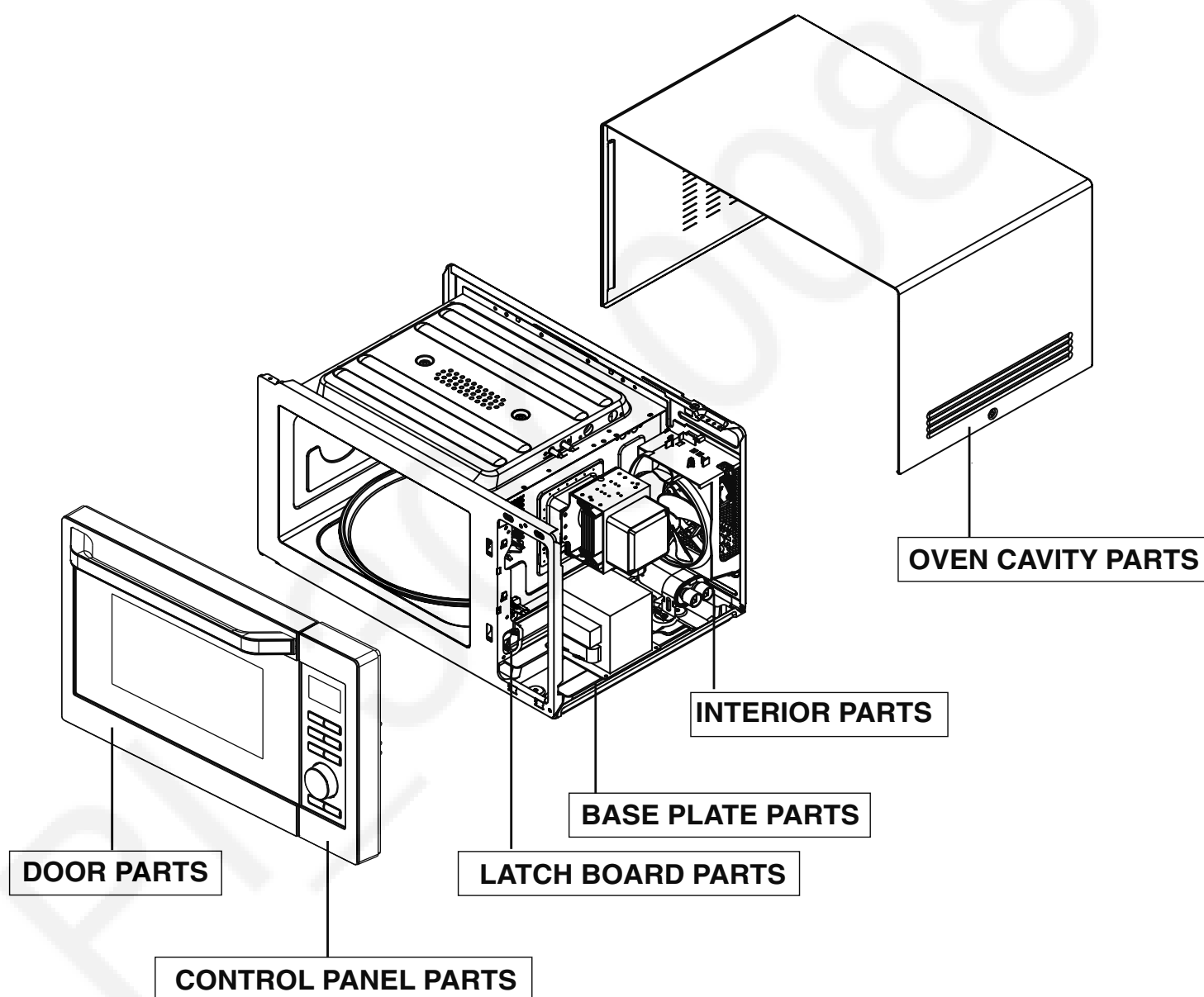
NOTE: \* Make sure the wire leads correct position.

\* When removing the wire leads from parts be sure to grasp the connector not the wires.

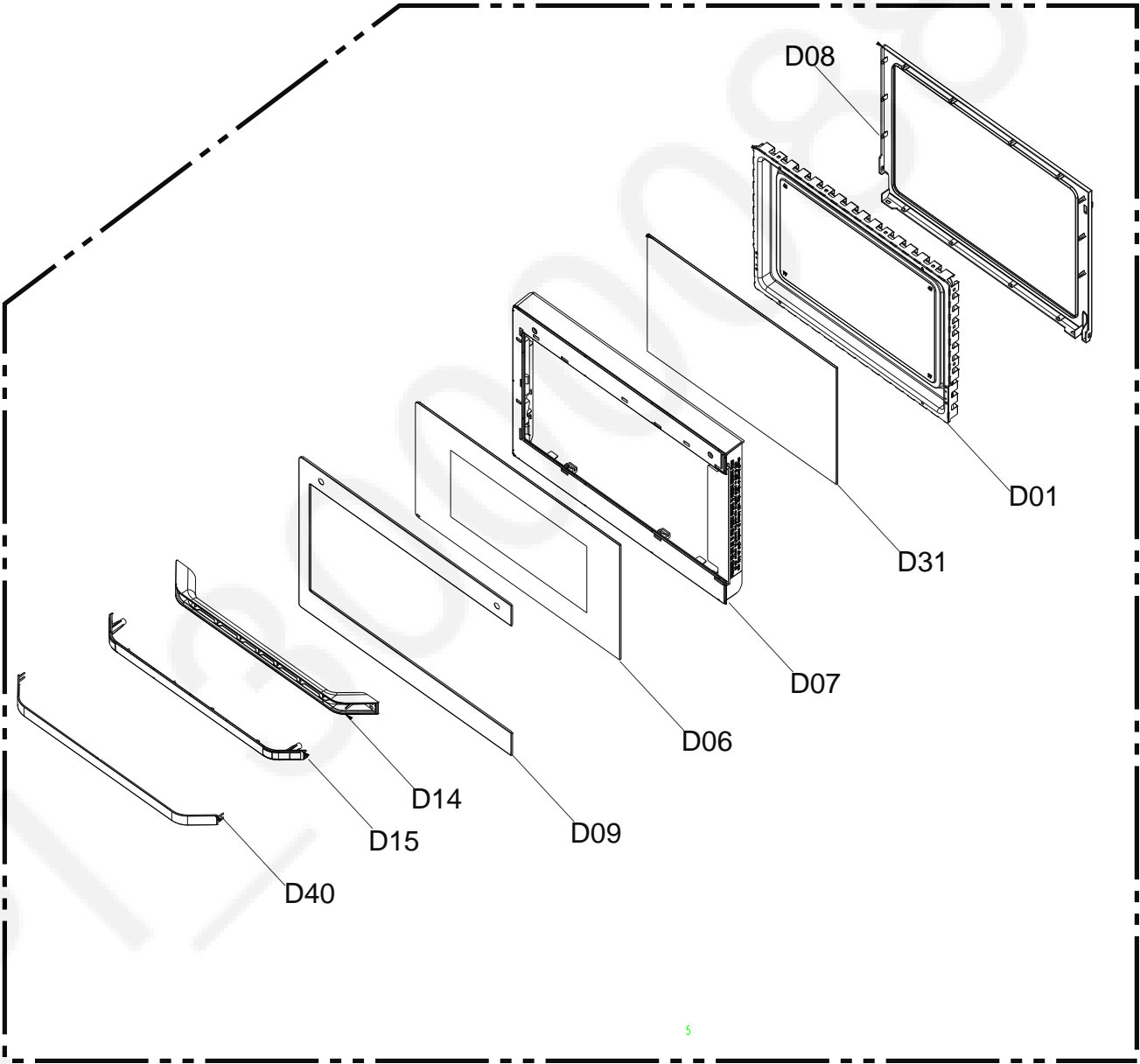
\* When removing the magnetron, be sure to install the magnetron gasket in the correct position and in good condition.

# EXPLODED VIEW

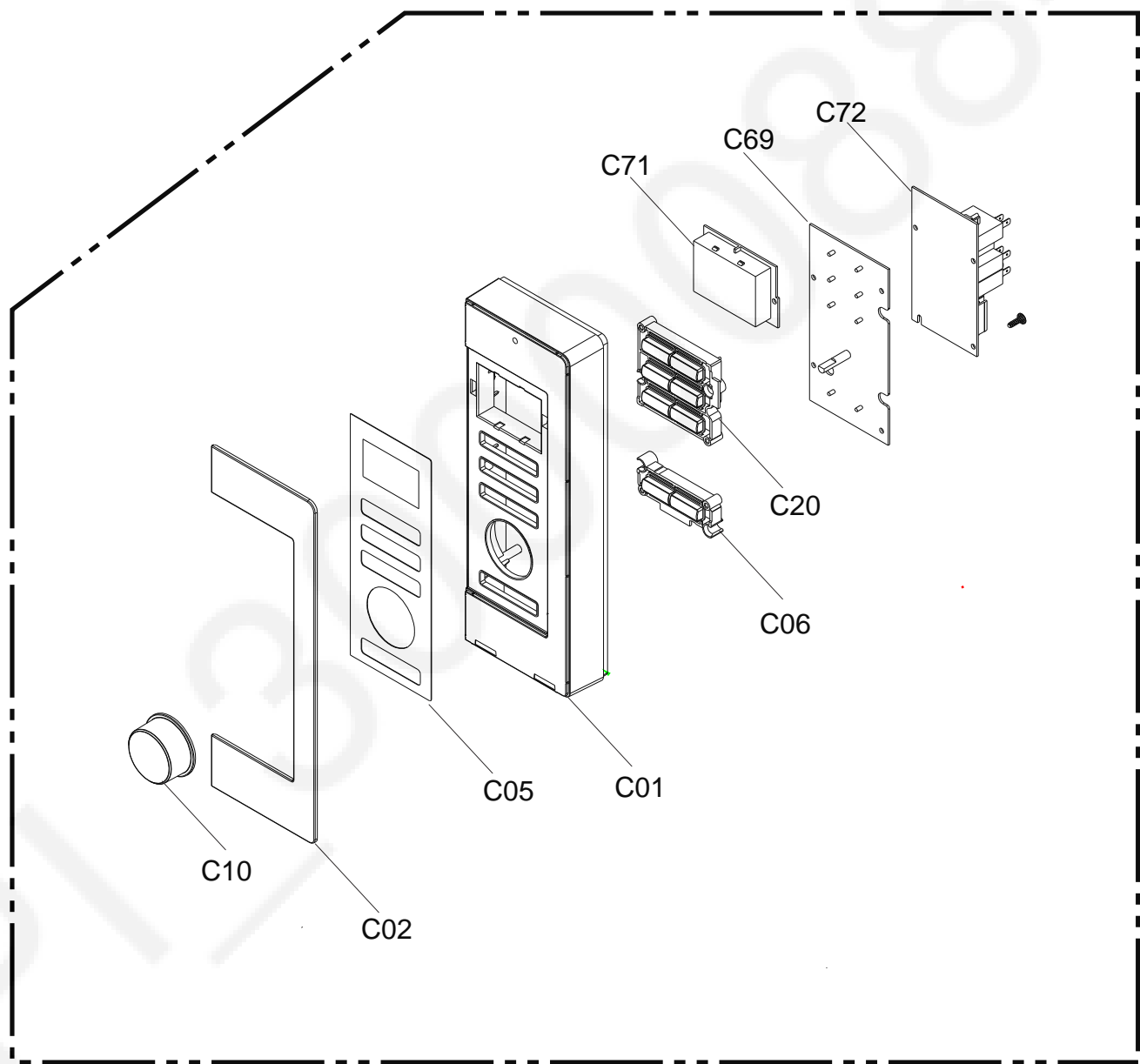
## INTRODUCTION



DOOR PARTS



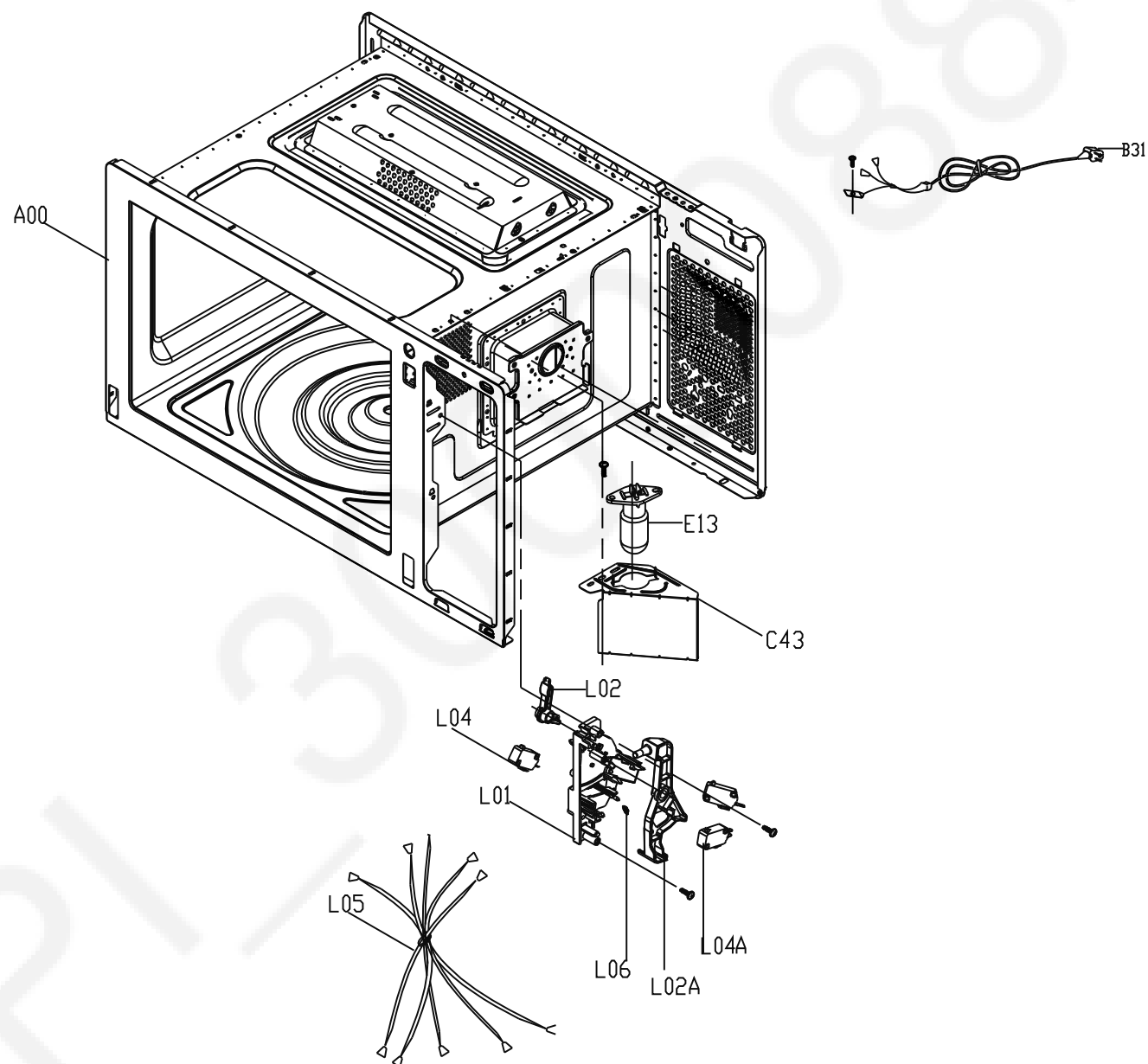
# CONTROL PANEL PARTS



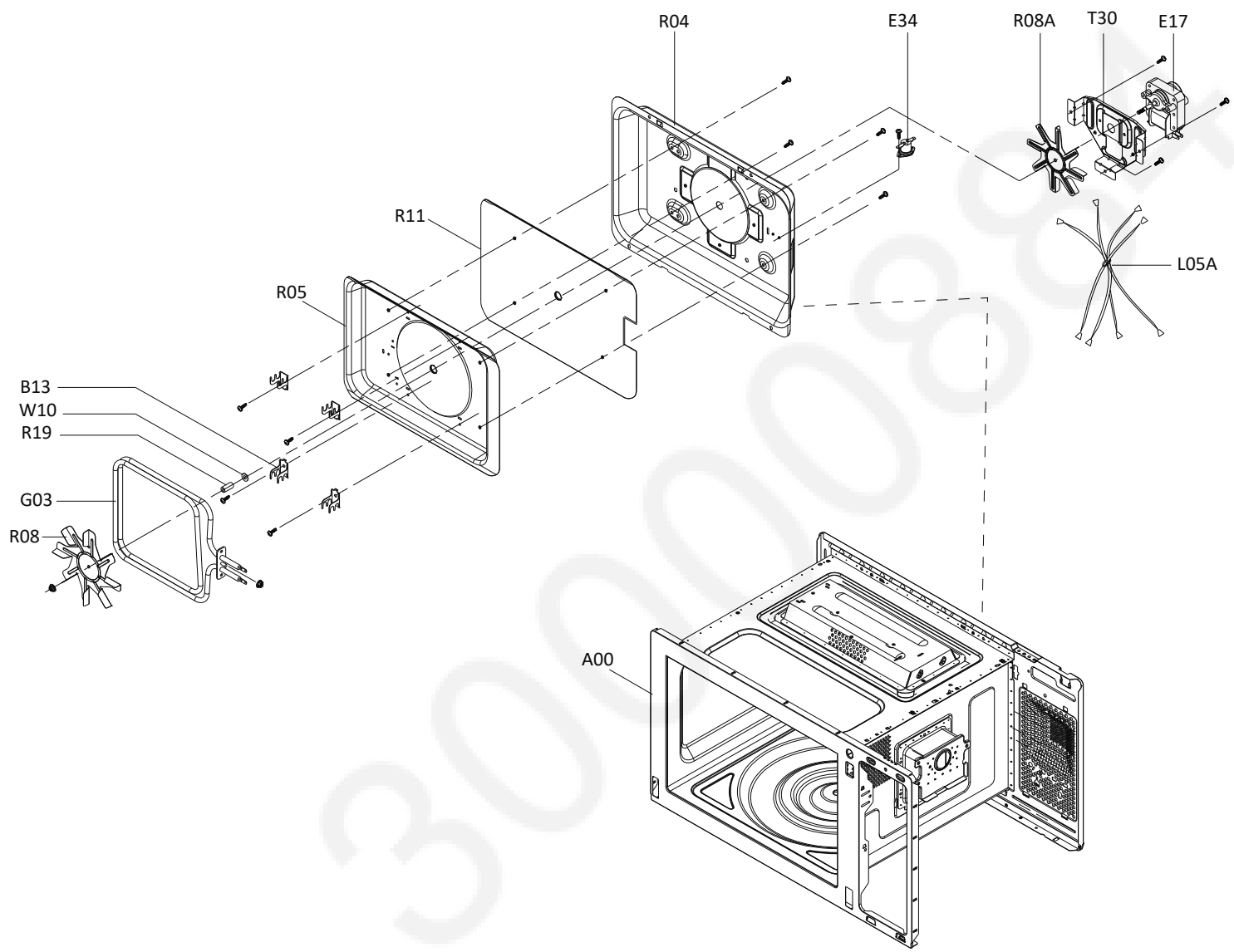
This exploded view diagram illustrates the assembly of a microwave oven. The main components and their labels are as follows:

- Top Housing:** Z24 (Top outer shell), T36B (Top inner panel), R10 (Top inner panel support).
- Door Assembly:** W05 (Door hinge), A00 (Door frame), B11 (Door latch), G09 (Door seal), G09A (Door seal support), G02 (Door hinge pin), G02A (Door hinge pin support).
- Interior Components:** A01 (Turntable support), T04 (Turntable), T02 (Turntable ring), T03 (Turntable ring support), C16 (Turntable support ring), T01 (Turntable support pin), E13 (Turntable support pin support), C43 (Turntable support pin support).
- Control Panel:** Y30 (Control panel), T36 (Control panel support), E31 (Control panel support pin), E36 (Control panel support pin support), W20 (Control panel support pin support).
- Motor and Fan Assembly:** E11 (Motor), E10 (Motor support), W03 (Motor support pin), W01 (Motor support pin support), W02 (Motor support pin support).

# LATCH BOARD PARTS



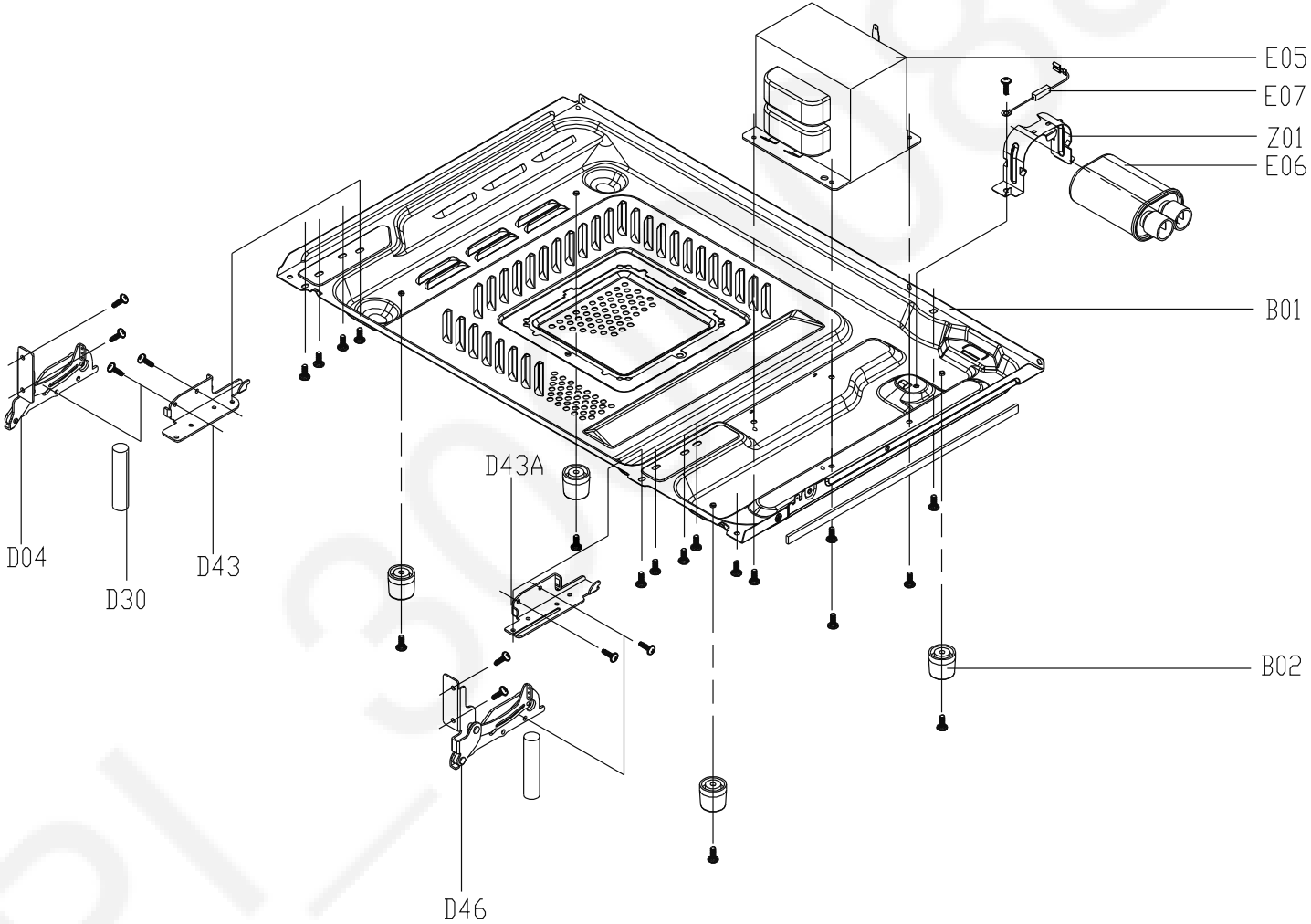
OVEN CAVITY PARTS





BASE PLATE PARTS

1



# REPLACEMENT 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  $\Delta$  mark have special characteristics important for safety.  
When replacing any of these components, use only manufacture's specified parts.

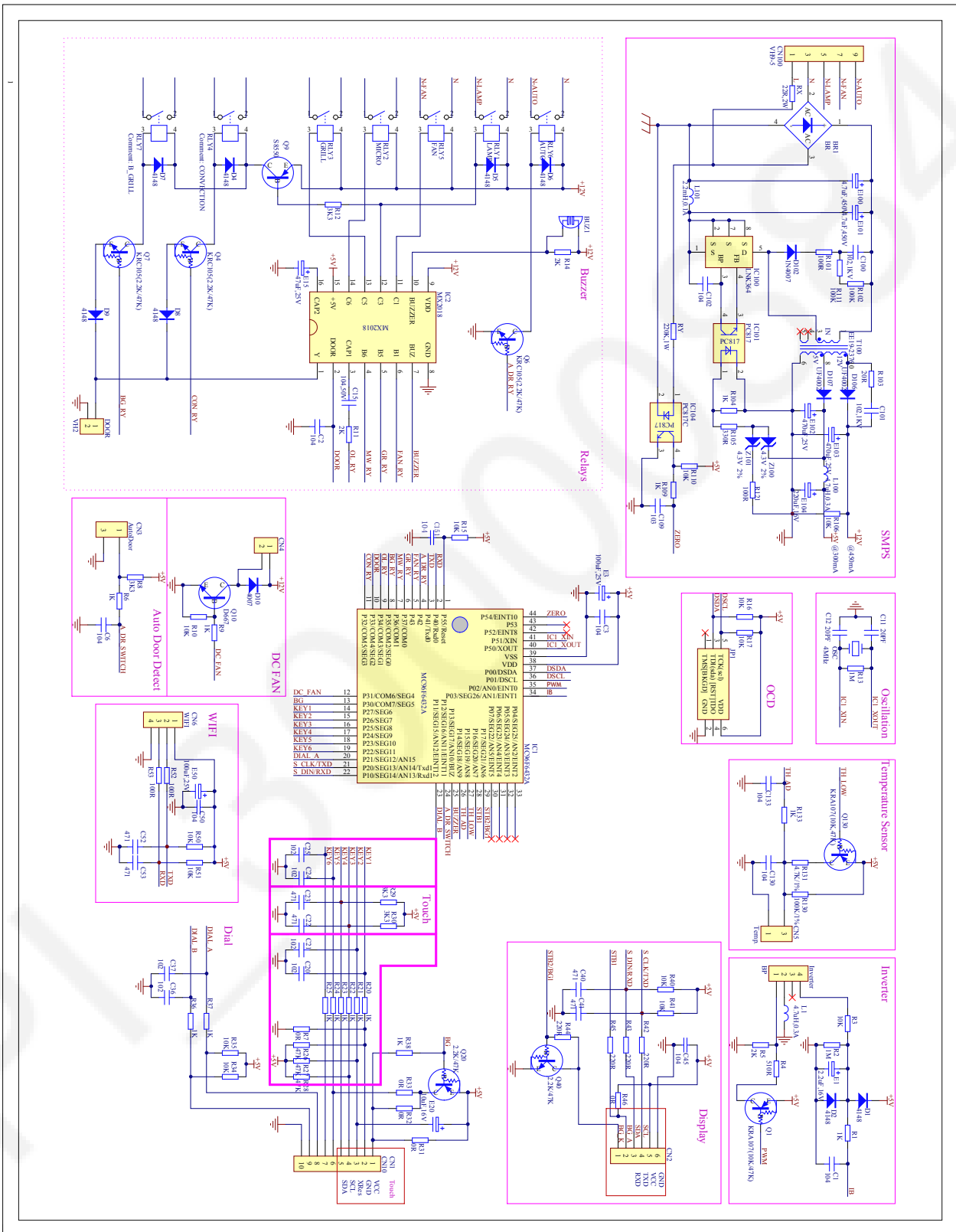
For Model: NN-C69KSMEPG

Safety	Ref.No.	Part No.	Part Name&Description	Pcs/Set
	A00	12270000032561	Cavity Assembly	1
	A01	12570000001036	Splash Cover	1
	B01	12270000032276	Baseplate	1
	B02	12170000000197	Foot	4
	B11	12270000008094	Heater Bracket	1
	B13	12270000008096	Heater Bracket	4
	B31	17470000004583	Power Cord	1
	C01	12170000025028	Control Panel	1
	C02	12270000032286	C/Panel Decoration	1
	C05	16070000010532	Membrane Decoration	1
	C06	12170000025027	Button	1
	C10	12170000030990	Dial Knob	1
	C16	12170000003653	Decoration Ring	1
	C20	12170000025026	Button	1
	C69	17170000019364	MI Assembly	1
	C71	17170000024249	Program Chip	1
	C72	17170000024183	Display Assembly	1
	D01	12270000032558	Door Frame Drop Glue Assembly	1
	D04	12270000033402	Hinge Assembly	1
	D06	12570000A28092	Door Glass	1
	D07	12170000025029	Door Panel	1
	D08	12170000025030	Door Gasket	1
	D09	12270000037128	Door Decoration	1
	D15	12170000030994	Handle Cover	1
	D16	12170000030989	Handle Pad	1
	D30	12970000000359	Hinge Spring	2
	D31	12570000007951	Door Screen	1
	D40	12270000037369	Handle Decoration	1
	D43	12270000008146	Hinge Bracket	1
	D43A	12270000008145	Hinge Bracket	1
	D46	12270000033403	Hinge Assembly	1
	E01	17470000000805	Magnetron	1
	E05	17470000003518	H.V.Transformer	1
	E06	17470000000687	H.V.Capacitor	1
	E07	17470000008946	H.V.Diode	1
	E10	17170000004625	Noise Fliter	1
	E11	17470000001551	Fuse	1
	E13	17470000009104	Integrated Lamp	1

## REPLACEMENT PARTS LIST

**For Model: NN-C69KSMEPG**

	E17	11002017000377	Brushless DC Motor	1
	E31	17470000009125	Thermostat	1
	E34	17470000001471	Thermostat	1
	E36	17470000001486	Thermostat	1
	G02	17470000001130	Quartz Heater	1
	G02	17470000008483	Quartz Heater	1
	G03	17470000001040	Heater	1
	G09	12270000006238	Heat Insulator	1
	G09A	122700000032279	Heat Insulator	1
	L01	12170000003416	Latch Board	1
	L02	12170000007332	Interlock Lever	1
	L02A	12170000007307	Interlock Lever	1
	L04	17470000008423	Microswitch	2
	L04A	17470000008424	Microswitch	1
	L05	17470000010625	Main Wire Harness	1
	L05A	17470000010624	Main Wire Harness	1
	L06	12970000000376	Spring	1
	R04	12270000006314	Heat Insulator	1
	R05	12270000006375	Heater Cover	1
	R08	12270000005055	Metal Fan	1
	R08A	12270000005062	Metal Fan	1
	R10	12270000006331	Heat Insulator	1
	R11	12470000000025	Heat Insulation Cotton	1
	R19	12970000000613	Pin Cover	1
	T01	11002014000772	Synchronous Motor	1
	T02	12170000000430	Coupler	1
	T03	12170000004316	Swivel Assembly	1
	T04	12570000001002	Glass Turntable	1
	T30	12270000004607	Motor Bracket	1
	T36	121700000030992	Waterproof Bracket	1
	T36B	121700000030993	Plastic Bracket	1
	W01	121700000021325	Fan Guide	1
	W02	12170000000209	Fan	1
	W03	11002017A00267	Brushless DC Motor	1
	C43	12270000000175	Wind Guide Cover	1
	W05	122700000032278	Heat Insulator	1
	W20	12270000008425	Air Duct	1
	Y30	11201007000271	Temperature Sensor	1
	Z01	12270000006211	Capacitor Holder	1
	Z15	12170000007363	Lamp Cover	1
	Z24	122700000029739	Cover	1
		12270000003346	Metal Turntable	1
		12970000000292	Rack	1
		12970000000295	Rack	1
		16170000A72358	User Manual	1
		16270000A63801	Packing Box	1
		16370000002108	Packing *Lower	1
		16370000002109	Packing *Upper	1



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