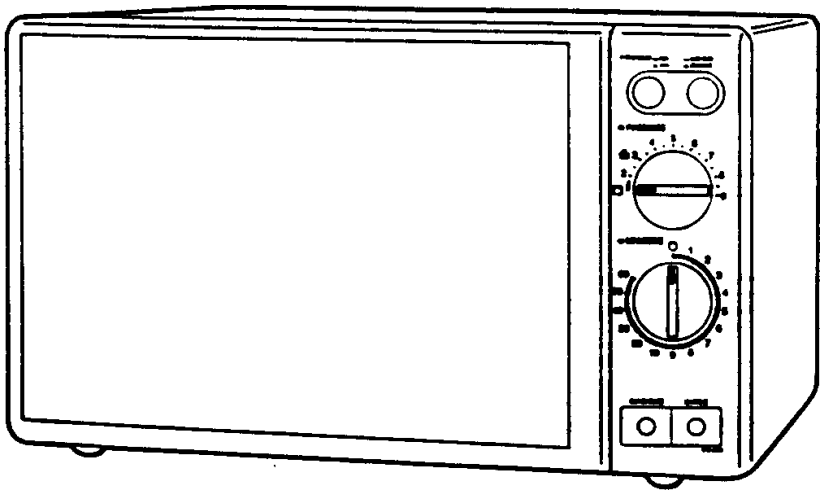
Electrolux

Technical Support Europe

BASIC TRAINING

Microwave Ovens



Microwave Ovens

Basics

Muggenhofer Straße 135
D-90429 Nürnberg
Germany

Fax +49 (0)911 323 1420

TSE-N / R.Kurzke
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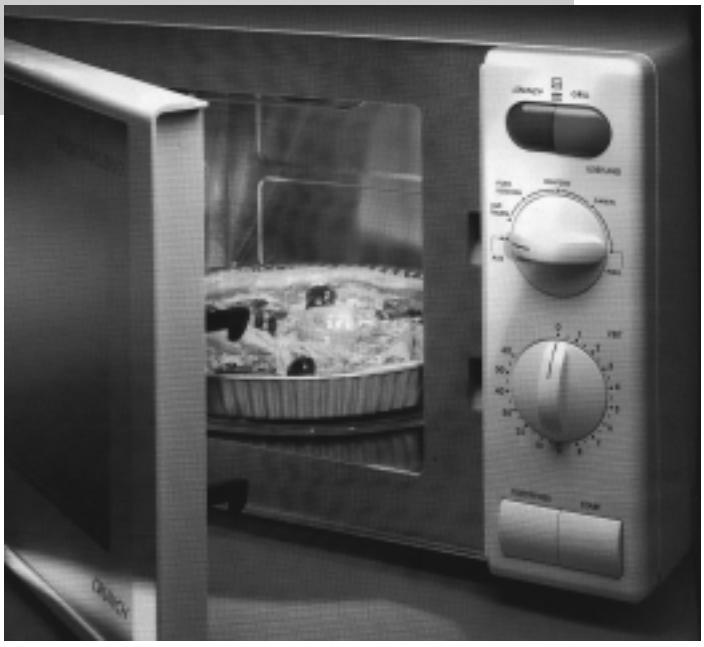
Welcome
to the
microwave basic training !

Microwave Technology - Advantages

- **time-saving cooking speed**
- **the taste (natural flower)**
- **healthy cooking, no fat used, no loss of vitamins**
- **energy saving, no pre-heating, time-saving speed**
- **quick and problem free defrosting**
- **less washing up, foot cooked in the serving dish**
- **easy to clean**
- **easy to use**



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FREQUENCY

The frequency indicates the number of oscillations (or periods) per second of an electric current and electromagnetic waves.

Usuall units :

- hertz	**(Hz)**	**=**	**1 period per second**
- kilohertz	**(KHz)**	**=**	**10^3 Hz**
- megahertz	(MHz)	**=**	**10^6 Hz**
- gigahertz	(GHz)	**=**	**10^9 Hz**
- terahertz	(THz)	**=**	**10^{12}Hz**

CLASSIFICATION OF FREQUENCY BANDS :

3 - 30	KHz VLF	**Very low frequency**	**telephone**
30 - 300	KHz LF	**Low frequency**	**ultrasounds**
300 - 3000	KHz MF	**Frequency modulation**	**radio**
3 - 30	MHz HF	**High frequency**	**radio, broadcasting**
30 - 300	MHz VHF	**Very high frequency**	**TV, broadcasting**
300 - 3000	MHz UHF	**Ultra high frequency**	**radar, *microwaves***
3 - 30	GHz SHF	**Super high frequency**	**satellites**

The broadcasting frequency for microwaves in the UHF band has been established by an international regulation.

To avoid any disturbance being caused to hertzian broadcasts, telecommunications or radio, the frequency of microwave ovens has to be:

2450 Mhz

WAVE LENGTHS

Whatever the frequency, all electromagnetic waves travel at the speed of light, which is :

300,000 Km/sec.

The wave length is the distance covered by a wave during a period.

For a microwave, this is :

$$\frac{\text{Speed of light(Km/s)}}{\text{Frequency (Hz)}} = \frac{300.000 \text{ Km/s}}{2.450.000.000 \text{ Hz}} = 0{,}0001224 \text{ Km} = \textbf{12,24cm wave lengths}$$

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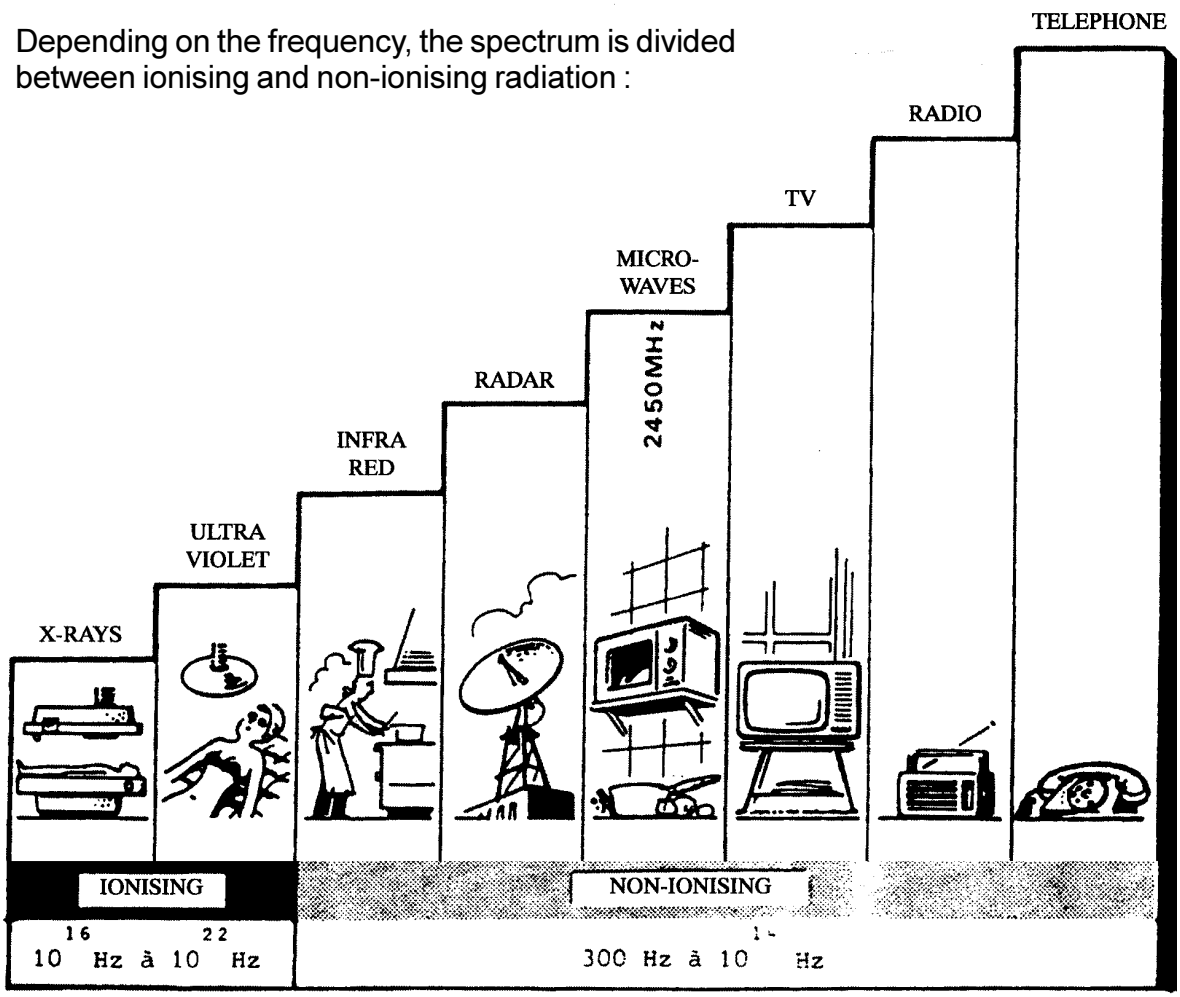
RADIATION SPECTRUM

Depending on the frequency, the spectrum is divided between ionising and non-ionising radiation :



Microwaves belong to the **NON-IONISING** group.

As a result, there is **no radioactive effect**, either on food products placed inside the oven or on people accidentally exposed to radiation.

The radioactive phenomena of ionising radiation are given off at much higher frequencies.

However, people accidentally exposed to microwaves may feel and localised harmless Sensation of warming. In any case, and whatever the power of emission, the temperature given off will not exceed : **100°C.**

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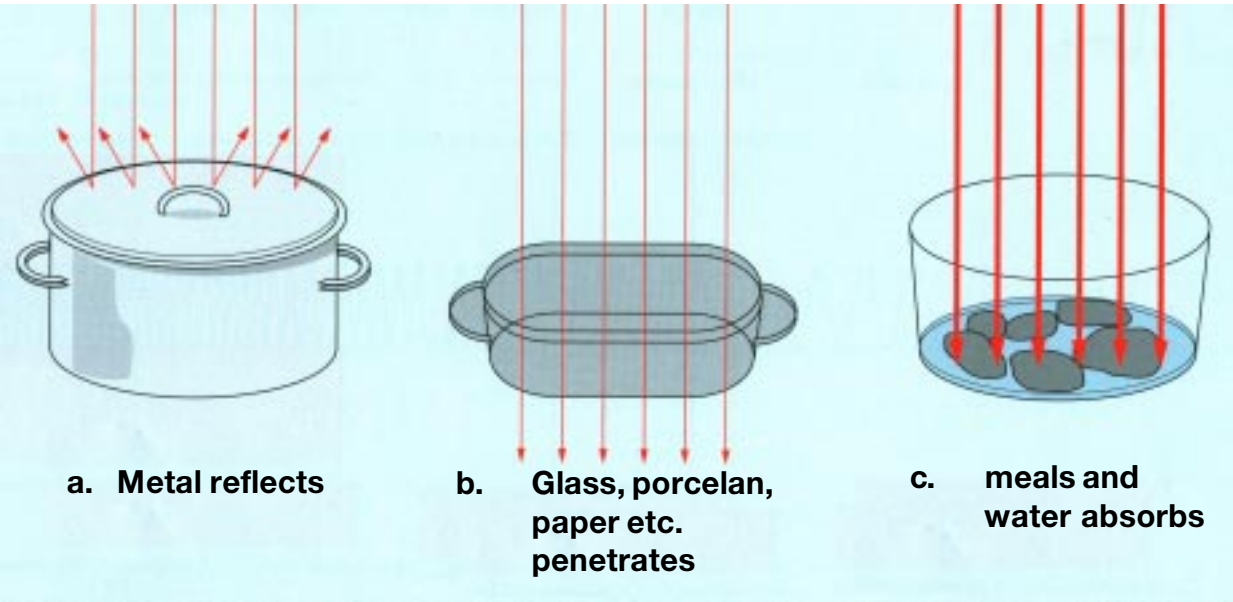
BASES

The energy used to heat and cook foods comes in the form of electromagnetic waves comparable to waves of the same type used in radio, television and radar.
Their emission frequency is **2450 Mhz.** It can be deduced that the energy transmitted vibrates **2,450,000,000** times per second.
When the microwaves come into contact with a substance, one of the following reactions can be observed, or a combination:



REFLECTION

The microwaves are reflected by metallic materials. This property is usefui in the cooking area. The reflected wave metal walls ensure better distribution on foodstuffs. On the other hand, metal Containers or accessories put inside the oven may cause damage. An arc phenomenon may occur reflected wave chassis or, more seriously, the waves may tum back towards the magnetron.

TRANSMISSION

The microwaves only go through a certain number of materials which offer no resistance to their passage and do not undergo any direct warming, such äs: paper, terracotta, china, ceramic and earthenware.

ABSORPTION

The microwaves are absorbed by materials forming charges with high dielectric coefficients. Water and most food products made up of organic substances are characterised by their dielectric constant with regards microwaves.

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Suitable ovenware

Ovenware material	Mode of Operation		
	Defrosting	Heating	Cooking
Ovenproof glass and ceramic dishes (without any metal parts, e.g. Pyrex, Oven-to-tableware)	X	X	X
Non ovenproof glass and porcetain (e.g. table crockery)[1])	X	-	-
Glass ceramic and vitro-ceramic made of fire/frost proof material (e.g. Arcoflam)	X	X	X
Ovenproof earthenware [2])	X	X	X
Plastic, heat-resistant up to 200°C [3])	X	X	X
Paper, cardboard	X	-	-
Clingfilm	X	-	-
Microwave ding film 3)	X	X	X
Black-lacquered orsilicone-coated baking tins	-	-	-

X suitable - non suitable

[1]) excluding silver, gold, platinum or metal decoration
[2]) does not include glaze containing metal
[3]) please note the maximum temperature stated by the manufacturer

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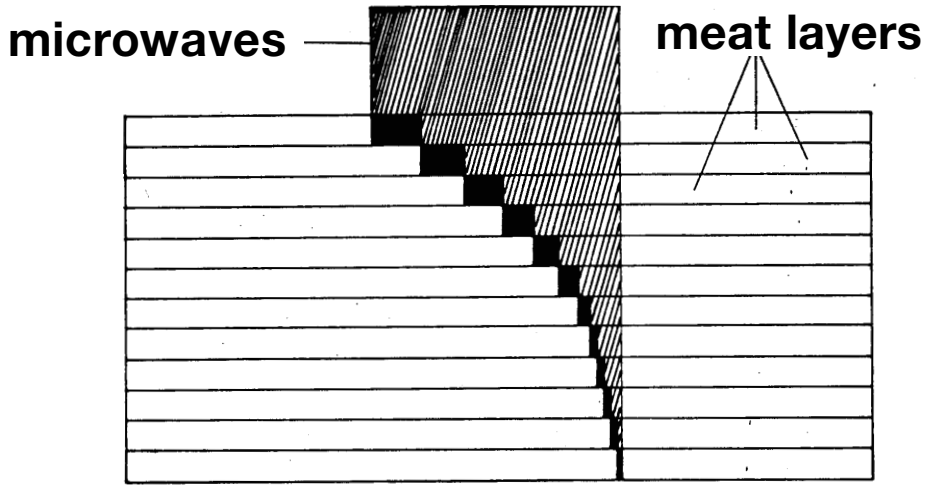
PENETRATION

The interaction between the electromagnetic field and the molecules in the substances causes a dielectric loss or energy loss, expressed in **W/cm^2.** Consecutively, the energy absorbed causes the molecules to move, and thus heat to be given off, which is required for cooking.

In the same way äs the electric current in a conductor circuit, the microwaves pass through the air and conductive materials until they meet a resistant charge with a high dielectric coefficient, such as water or food products.

The electromagnetic field develops intense molecular activity inside the foods. The energy, transmit-ted under **2450 Mhz** causes the molecules to vibrate which tend to line up in the field and invert **4,900,000,000** times per second.

HEAT IN GENERATED BY THE MOLECULES RUBBING TOGETHER.
This heat effect is therefore the result of the interaction between the microwaves and the water molecules contained in food products.
The extent to which microwaves penetrate food products is linked to the power of the transmitter. The direct heat action is very intense on the surfäce and in the first layers. As the thickness increases, pene-tration is progressively lower.



Heating continues to the core simply by the physical phenomenon of conduction.

Compared to other cooking principles. it should be noted that:

- foods are cooked directiy and instantly,
- The oven walls and Containers are not heated directiy by the microwave energy, but simply undergo heating by conduction.

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ELECTROMAGNETIC ACTION

The molecules of different bodies are made up of one or several positively charged cores and one or several negatively charged electrons, and are therefore polarised.

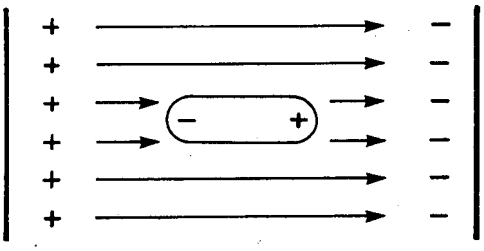
Let us place these molecules between two frames connected to a source of direct current.

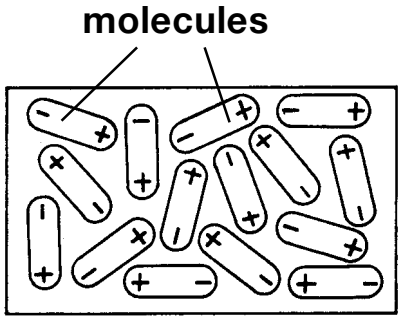
The molecules move in a certain direction depending on the direction of the electromagnetic field produced by the plates.

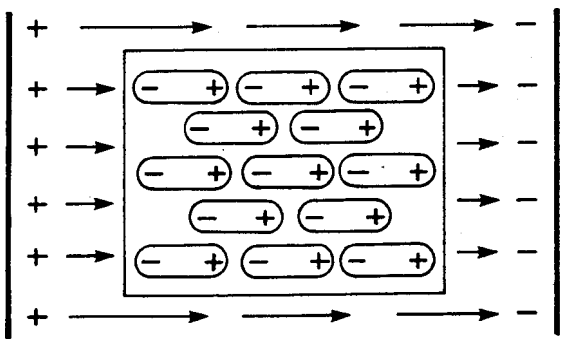
Let us replace the direct current with alternating current.

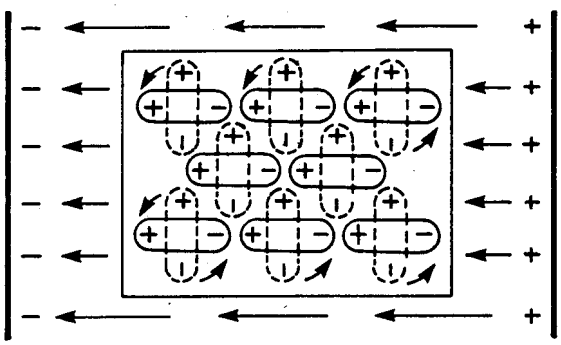
The higher the frequency, the faster the electrons move.

In a body the molecules are dose together and in high numbers. Thus when they rub together the matter will be heated.









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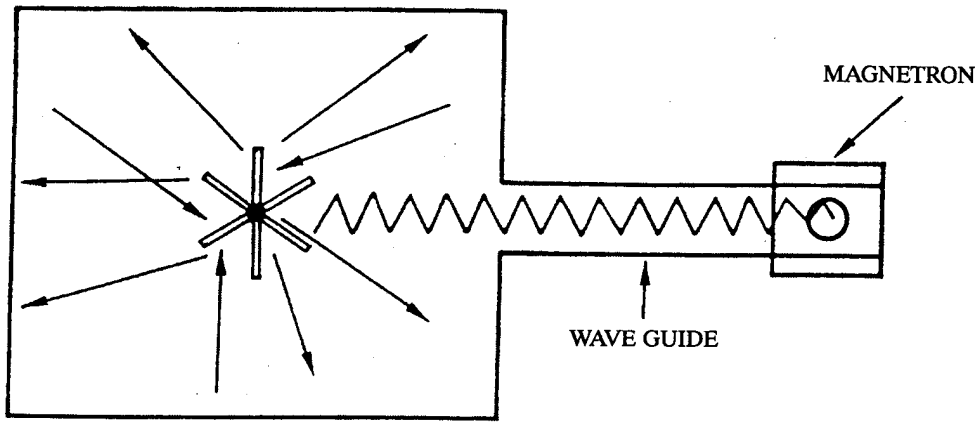
WAVE GUIDE

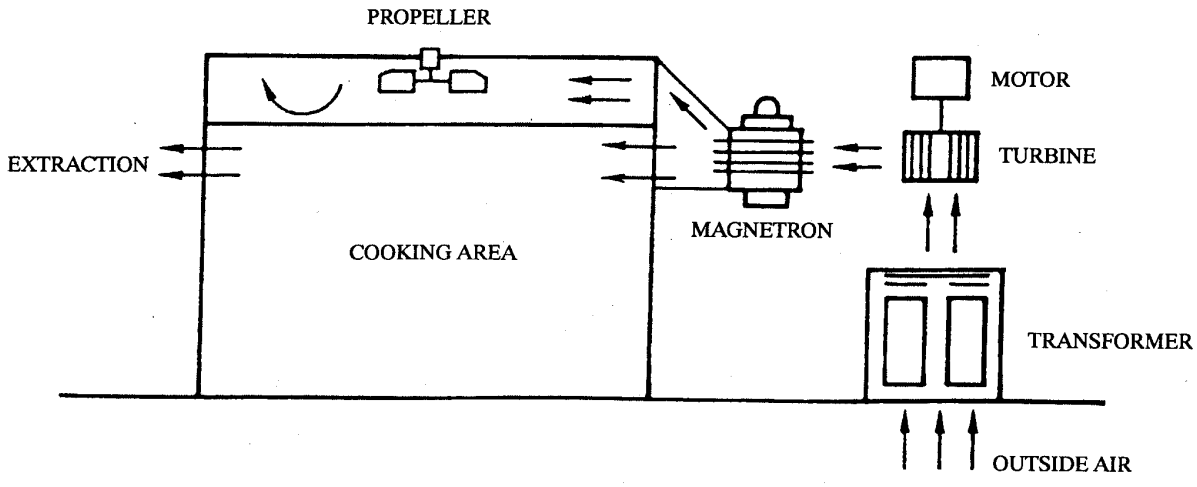
The microwaves generated by the magnetron are taken towards the cooking area via a duct knownas:

THE WAVE GUIDE.



WAVE MIXER

The wave mixer ensures that the electromagnetic field is distributed inside the cooking area. Its action is completed by the oven walls which reflect the waves. It is made up of an aluminium propeller with six blades, whose shape is specific to each of the three symmetrical pairs. It is fixed to the top by means of a plastic hub. It is caused to rotate (at a speed of about 50 rpm) by the 'draught' coming from the fan.



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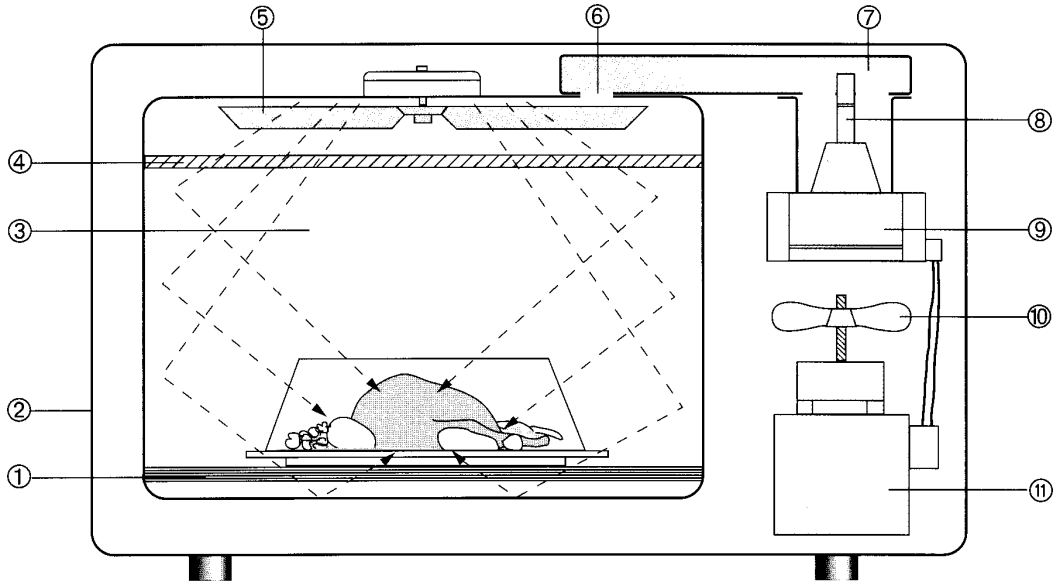
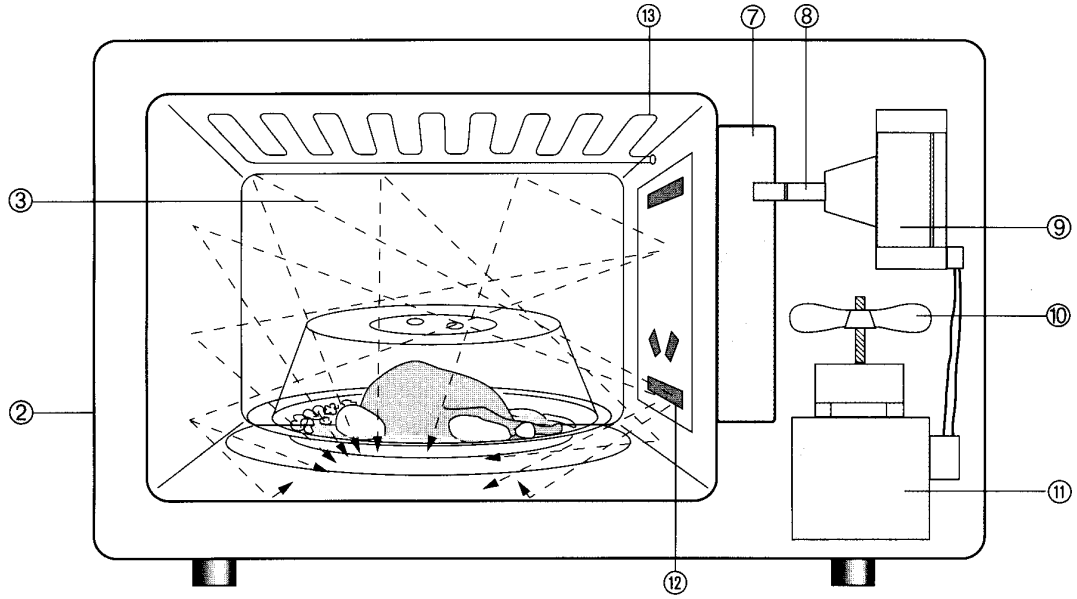


① **base**
② **housing**
③ **cavity**
④ **cover**
⑤ **stirrer**
⑥ **MW input**
⑦ **MW channel**
⑧ **antenna**
⑨ **magnetron**
⑩ **ventilator**
⑪ **HV transformer**



① **base**
② **housing**
③ **cavity**
④ **cover**
⑤ **stirrer**
⑥ **MW input**
⑦ **MW channel**
⑧ **antenna**
⑨ **magnetron**
⑩ **ventilator**
⑪ **HV transformer**
⑫ **MW input at the side**
⑬ **grill element**

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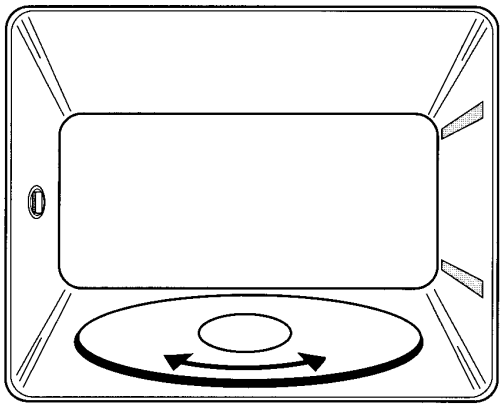
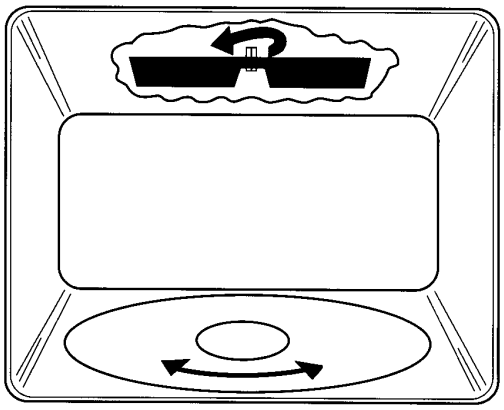
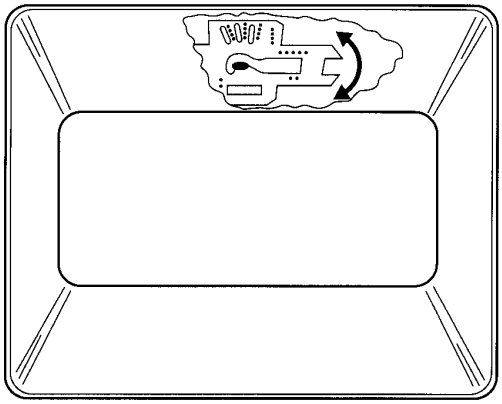
Mikrowave Distribution



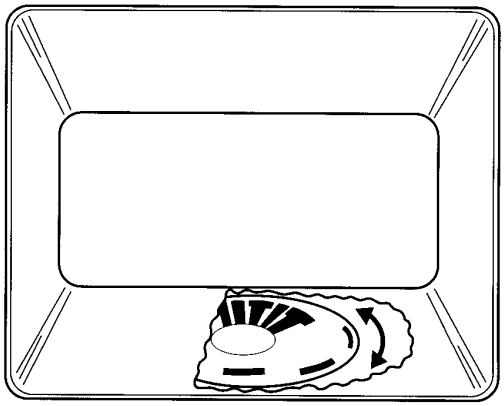
- turntable with reflector
- input from the side



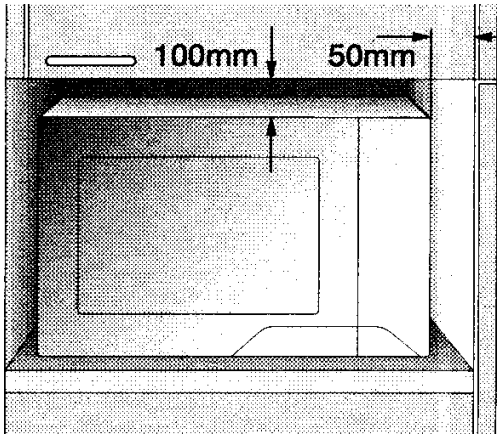
- turntable
- stirrer above



- stirrer above



- stirrer below



Ventilation

A gap all arround the oven is necessary in order to ensure perfect ventilation !

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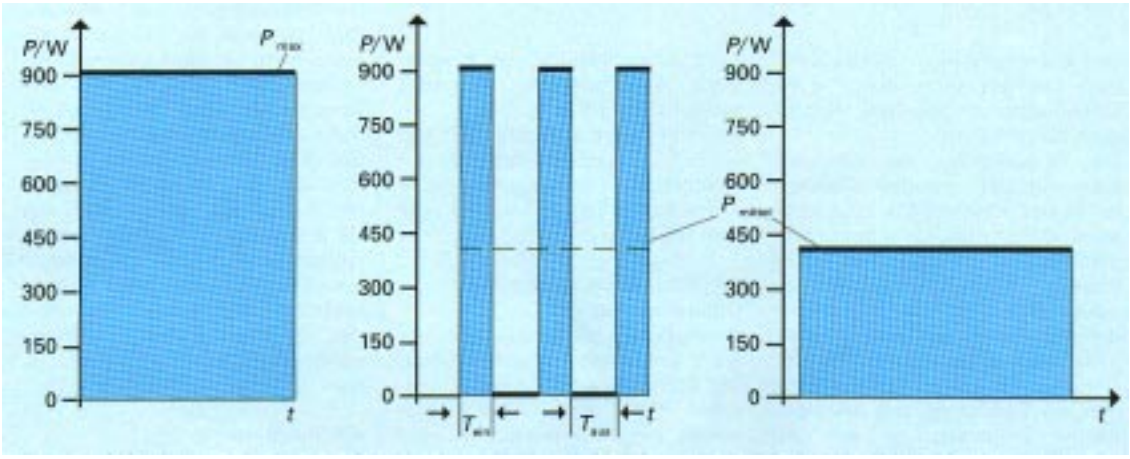
Power

A magnetron only works „full poiwer".

To get a regulation, the power cycles (on/off).

The effective result is like a continuous power.



a. maximal power **b. cycled power** **c. continuous power**

POWER LEVEL	OUTPUT POWER AGAINST FULL POWER	RELAY "1" TURN ON, OFF TIME
0	0/29 (0%)	ON 29S OFF
1	3/29 (10%)	ON 3S OFF
2	5/29 (17%)	ON 5S OFF
3	8/29 (28%)	ON 8S OFF
4	11/29 (38%)	ON 11S OFF
5	14/29 (48%)	ON 14S OFF
6	17/29 (59%)	ON 17S OFF
7	20/29 (69%)	ON 20S OFF
8	23/29 (79%)	ON 23S OFF
9	26/29 (90%)	ON 26S OFF
HI	29/29 (100%)	ON 29S OFF

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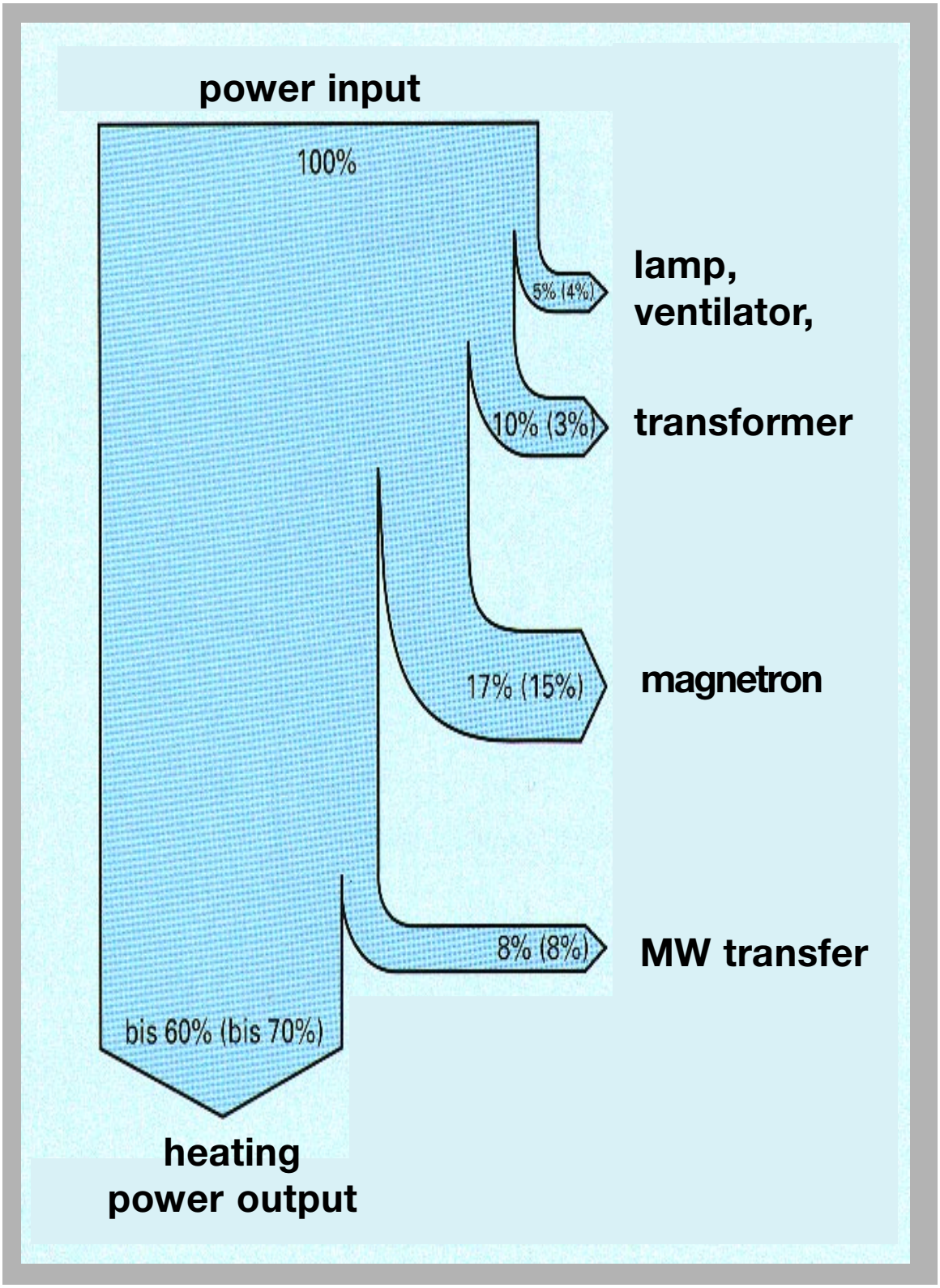
Flow of Power



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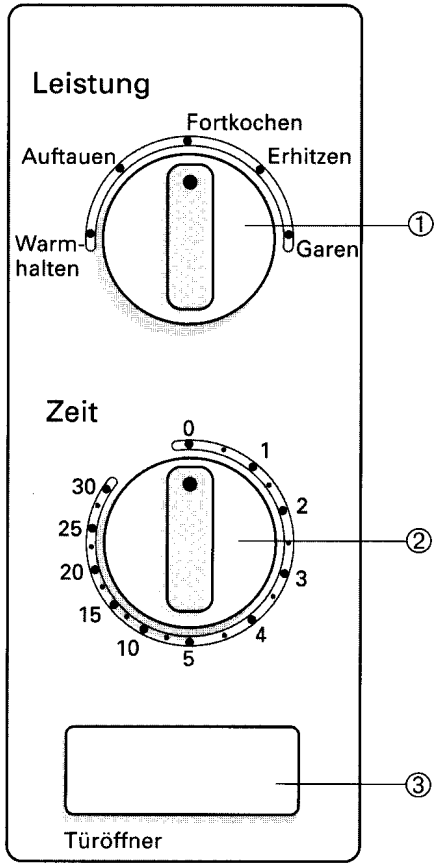
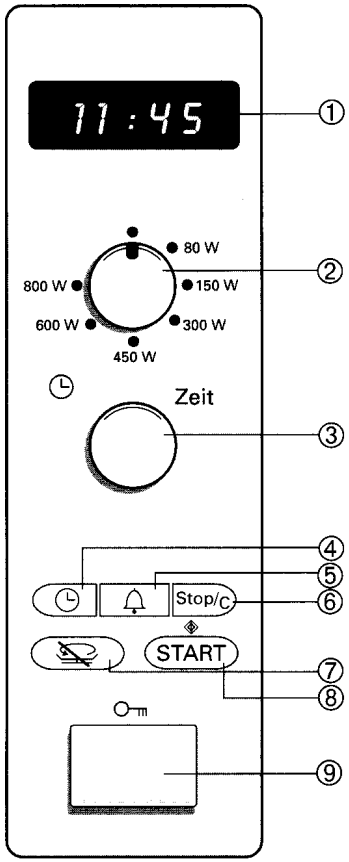
Different Switch-Panels



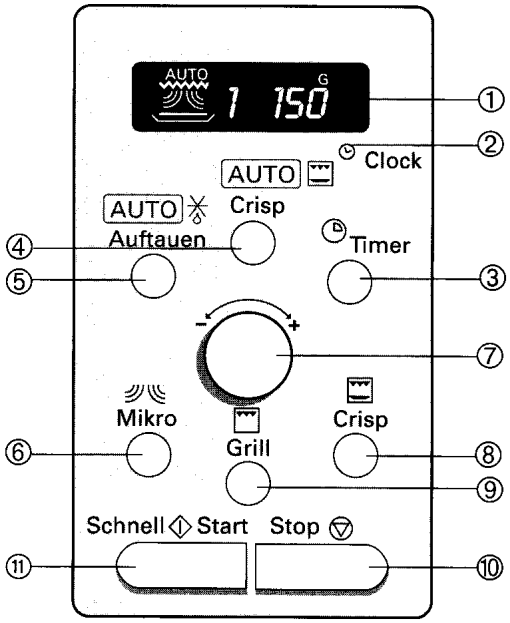
mechanic timer

1. power
2. timer
3. door opener



„easy to use“ electronic

1. display
2. power
3. timer
4-8. start knob + features
9. door opener

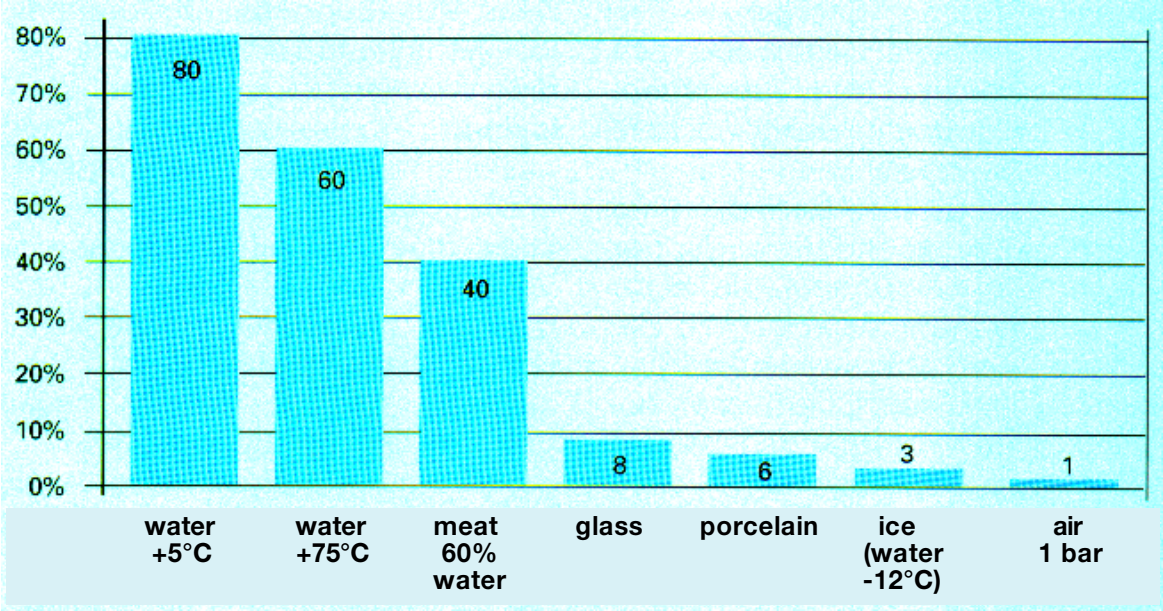


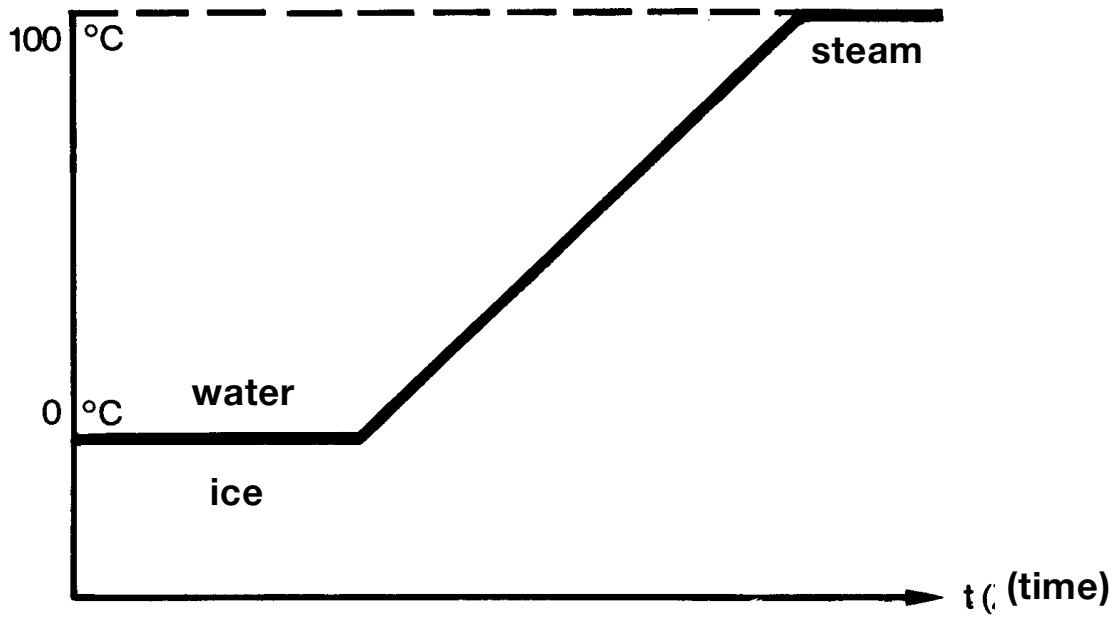
electronic with grill

1. display
2. clock
3-5. features
6. power
7. timer
8+9. features
10. stop
11. start

Dielectricity

Warm up reaction in contact with microwaves





MW absortion only 1/4 comparing to water

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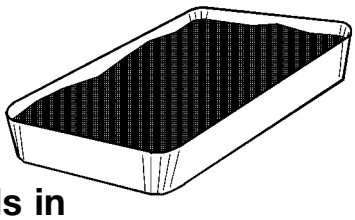
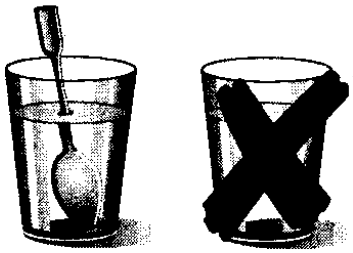
Metal in the cavity ?



meals in
aluminium bowl/dish



no delayed boiling

protect against dry out

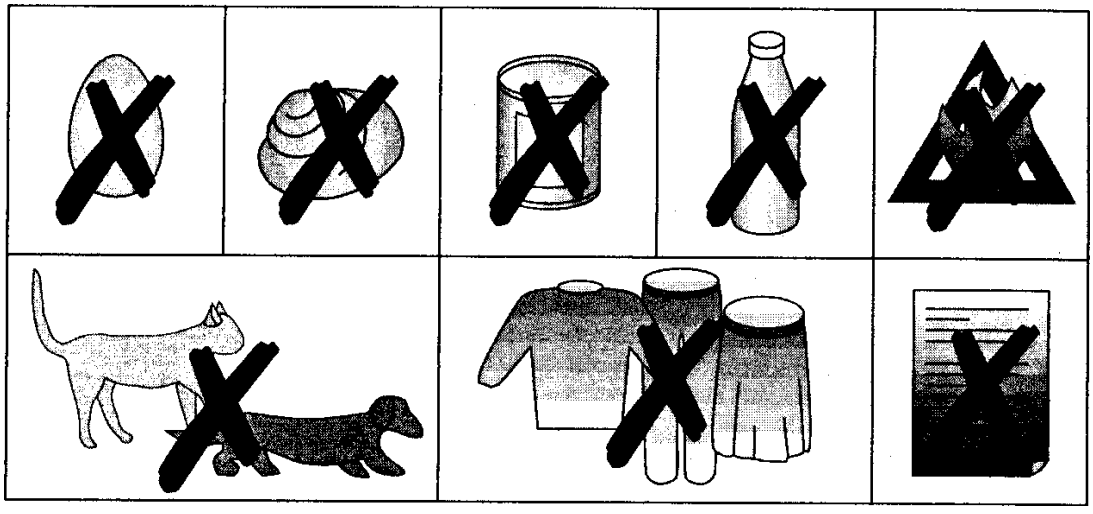
Keep distance of 20 mm !

crunch - crisp - pizza etc.

Whenever heating liquid, please also place a teaspoon in the container to avoid delayed boiling. During delayed boiling, the boiling temperature is attained without the typical steam bubbles rising. When the Container is shaken, even but slightly, the liquid may then suddenly vigorously boil over or spurt - with the **risk of scalding the user.**

Food with «skin» or «peel», such as potatoes, tomatoes, sausages, and the like, should be pierced with a fork so that any steam present can escape and the food will not burst.

Make sure that a minimum temperature of 70°C is attained for the cooking/heating of food. Never use a mercury or liquid thermometer for measuring the temperature of the food.



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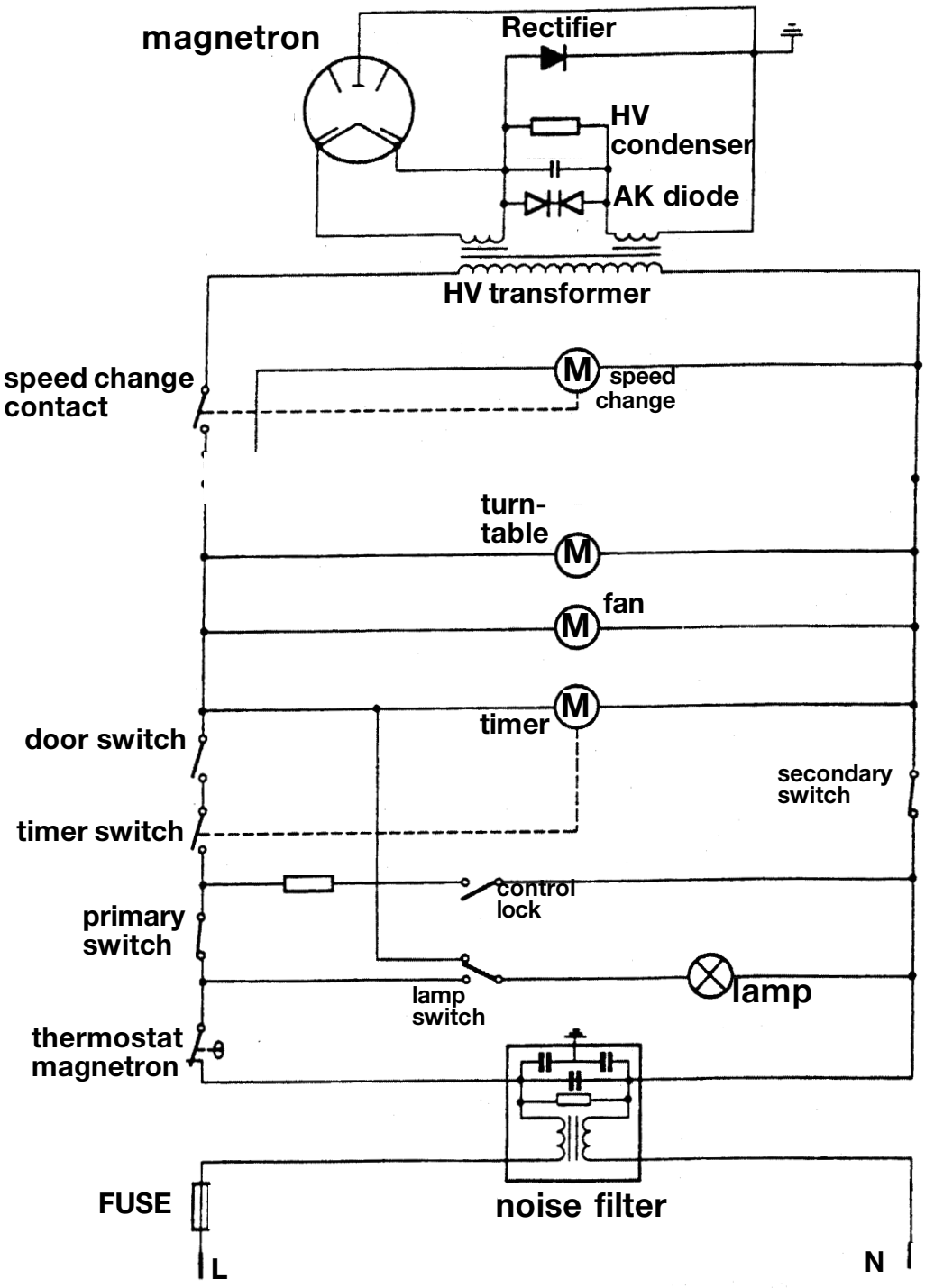
Basics electric



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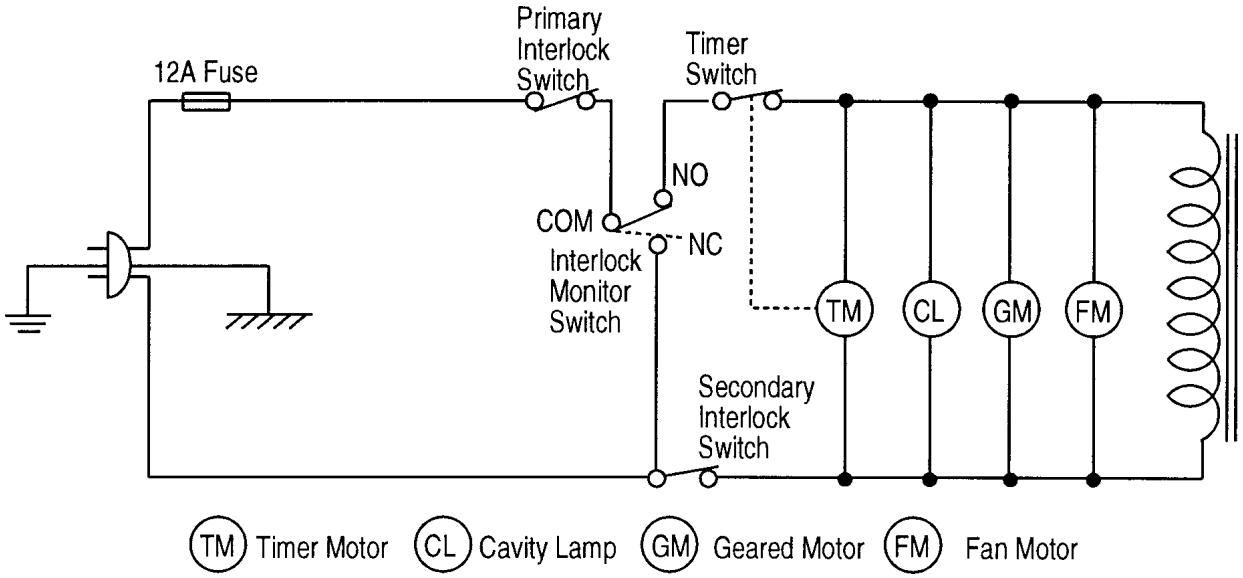
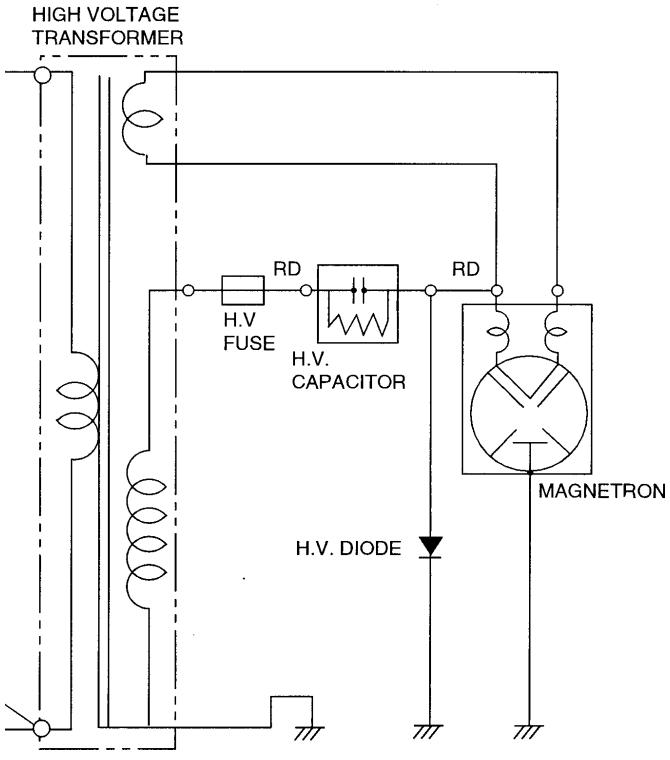
The Primary Circuit



The Secondary (High Voltage) Circuit



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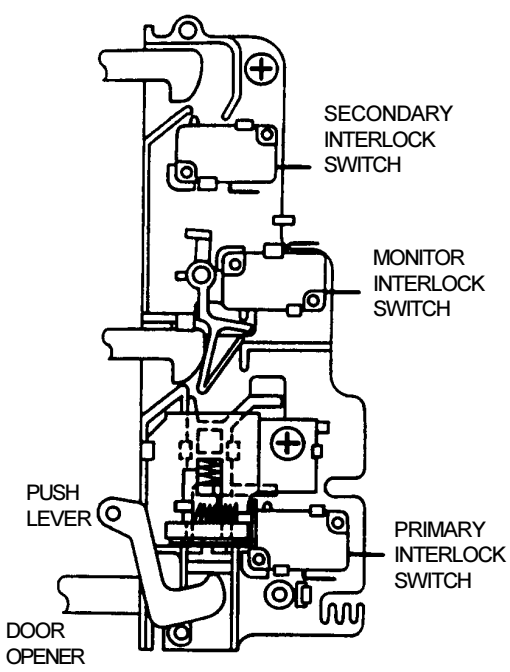
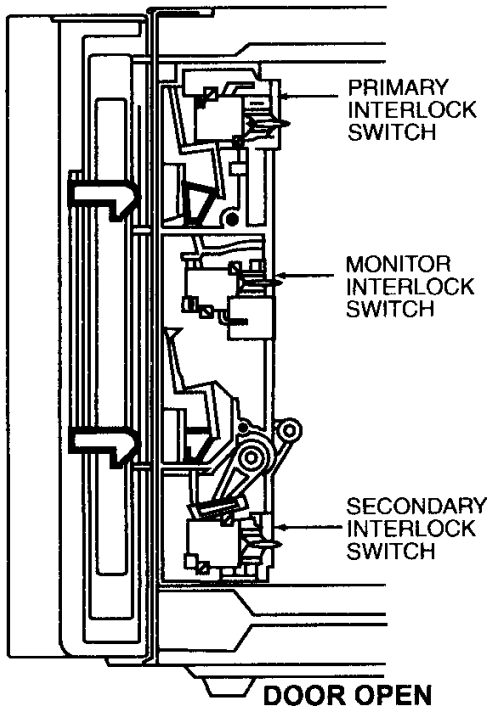
Security

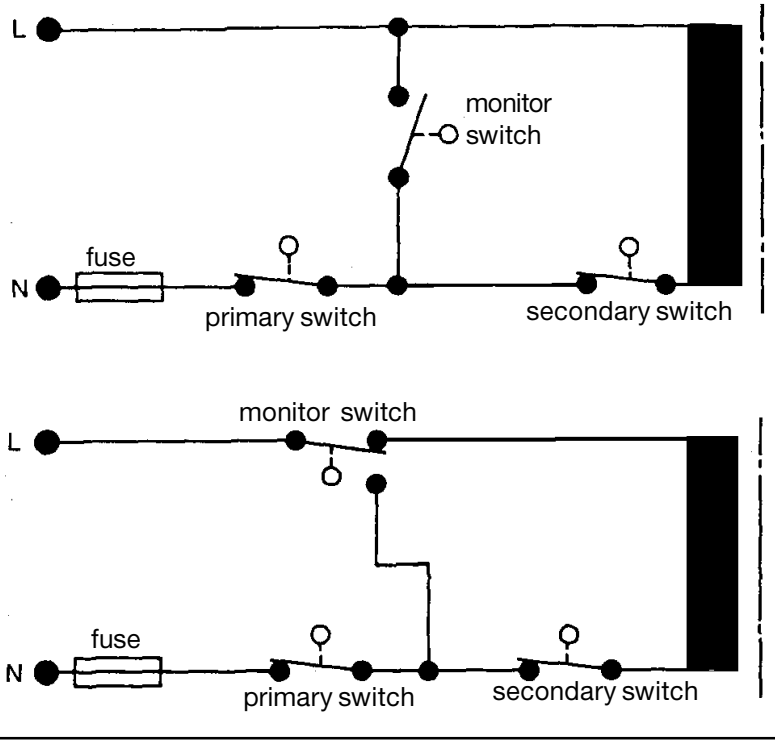




Electric safety Systems.
Opening the door from the closed position should operate at least two locks. These locks control two different parts of the door so äs to reduce the effects of warping. These locks should cut off the microwave generator supply.

Interlock switch safety system

- primary
- secondary
- monitor



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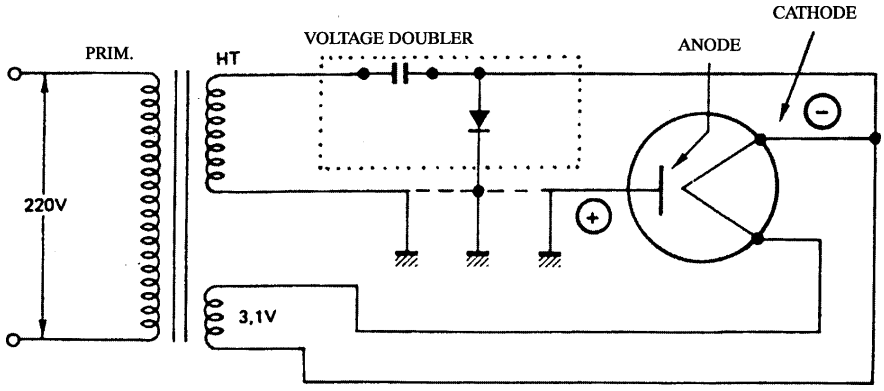
TRANSFORMER

This is made up of three coils :

- one primary coil,
- one secondary high voltage coil (HT),
- one secondary low voltage coil (LT).

When the transformer primary coil is supplied with 220V, two types of voltage are generated in the secondary coil:

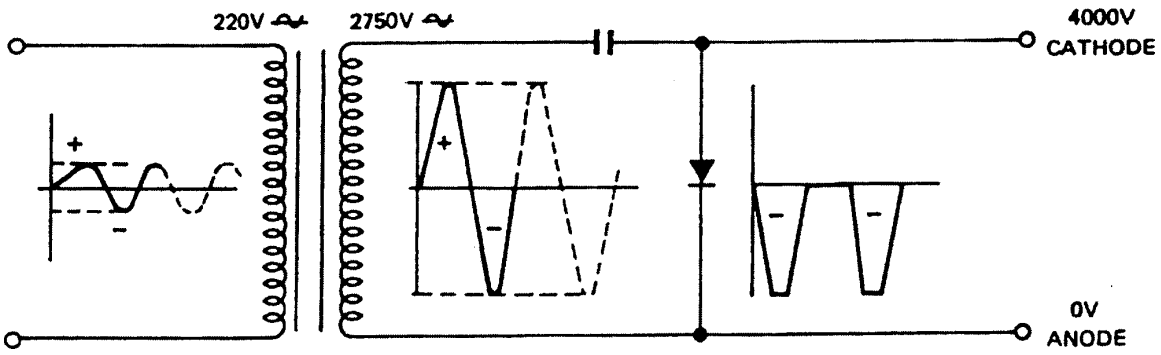
- **3,1 V at LT,** which is applied to the magnetron terminais. This voltage ensures that the cathode filament is heated.
- **2750 V at HT**, which is applied to the voltage doubler and the magnetron. One end of this coil and the magnetron anöde are connected to the oven earth.



THE VOLTAGE DOUBLER

This doubler transforms the 2750 V alternative current into negative pulsated current of about 4000V. It is made up of two components :

- a condenser which Stores electrical energy for half a period.
- a diode which, together with the condenser, enables the altemating high voltage to be converted into negative voltage. It is installed opposite to the magnetron anodic current.



During the >0 (+) wave, the magnetron does not operate. The diode, polarised in the same direction äs the current, enables the condenser to be charged.

During the < 0 (-) wave, the magnetron operates. The condenser Charge is added to the transformer's high voltage to provide **4000V** to the cathode.

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CIRCUIT HAUTE TENSION

The transformer

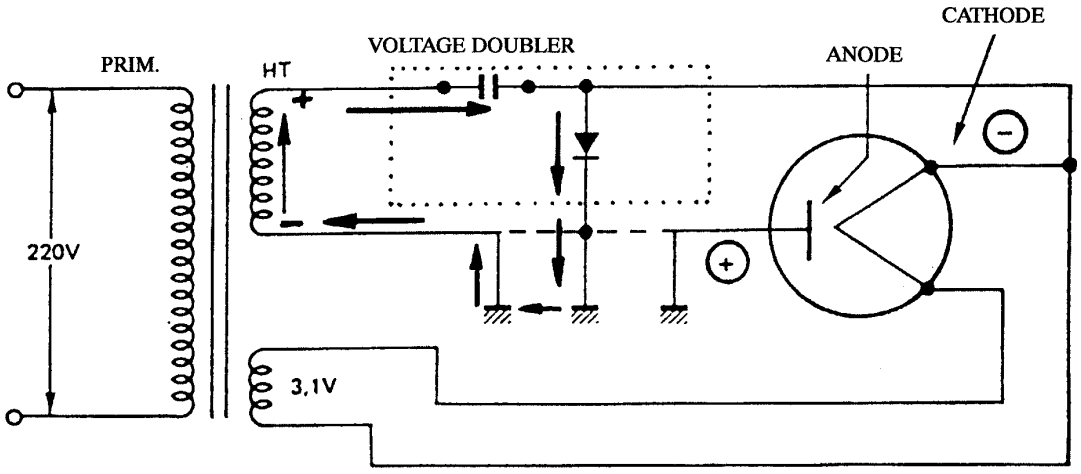
- 3 coils
- 1 primary (220V)
- 1 secondary LT (3,1V)
- 1 secondary HT (2750V)

The voltage doubler

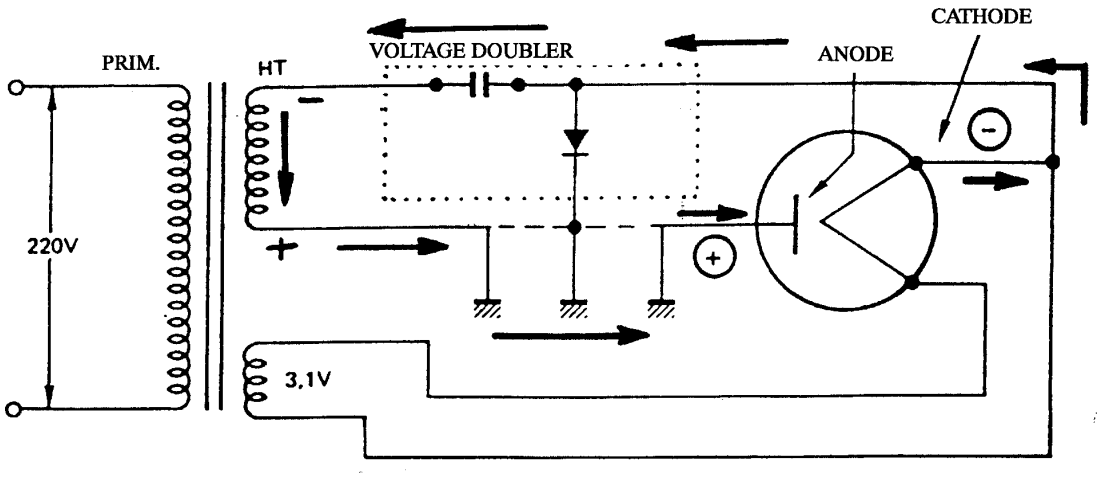
- 1 condensateur
- 1 diode

OPERATION

1st wave (positive) : the condenser is charged through the diode.



2nd wave (negative) : the diode is blocked but the voltage from the condenser is added to that of the transformer. The 'double' voltage is applied to the magnetron, making the anode positive.



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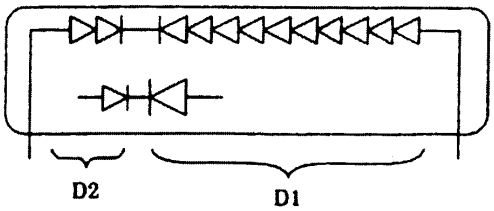
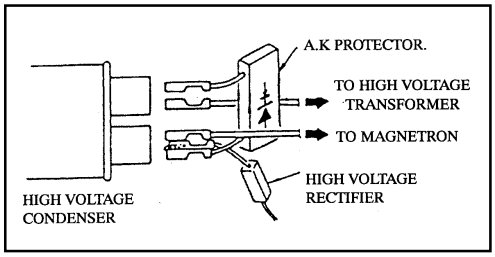
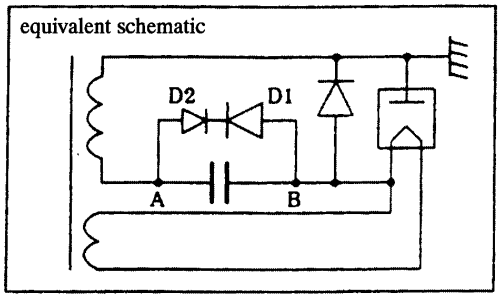
DIODE AK

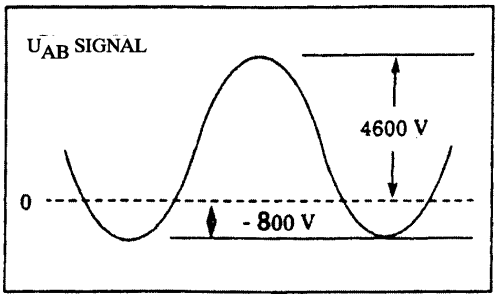




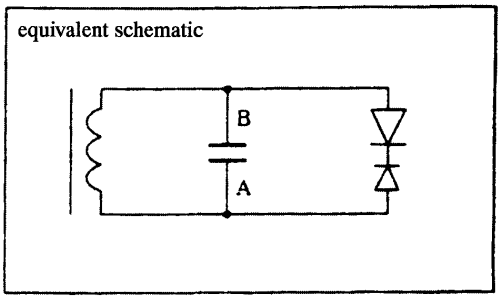
Reverse strain voltage:
Vr2 = 1200 V, Vr1 = 6000 V

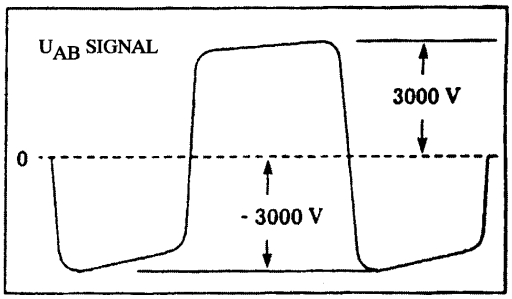
NORMAL OPERATION





SHORT-CIRCUITED DIODE





Negatives waves

- U_{AB} max = -800 Volts
- D1 : Passing direction
- D2 : Reverse voltage lower than Vr2

Positives waves

- U_{AB} max = + 4600 Volts
- D2 : Passing direction
- Di : Reverse voltage lower than Vri

OPERATION NOT DISTURBED

Negatives waves

- U_{AB} max = -3000 Volts
- D1 : Passing direction
- D2 : Reverse voltage over Vr2 (1200 V)
- D2 strain causing it to short-circuit
- Current in D1 too high, causing it to short-circuit
- Secondary coil short-circuited
- current too strong in the primary coil and fusion of the primary fuse

TRANSFORMER PROTECTED

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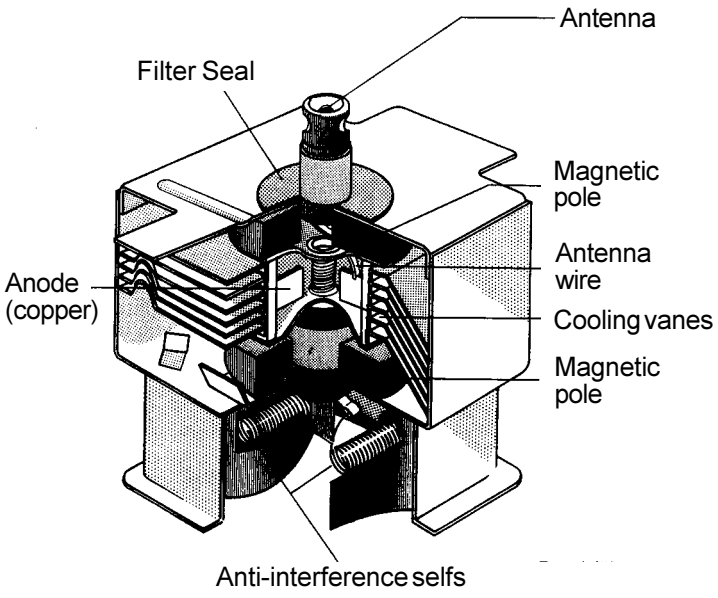
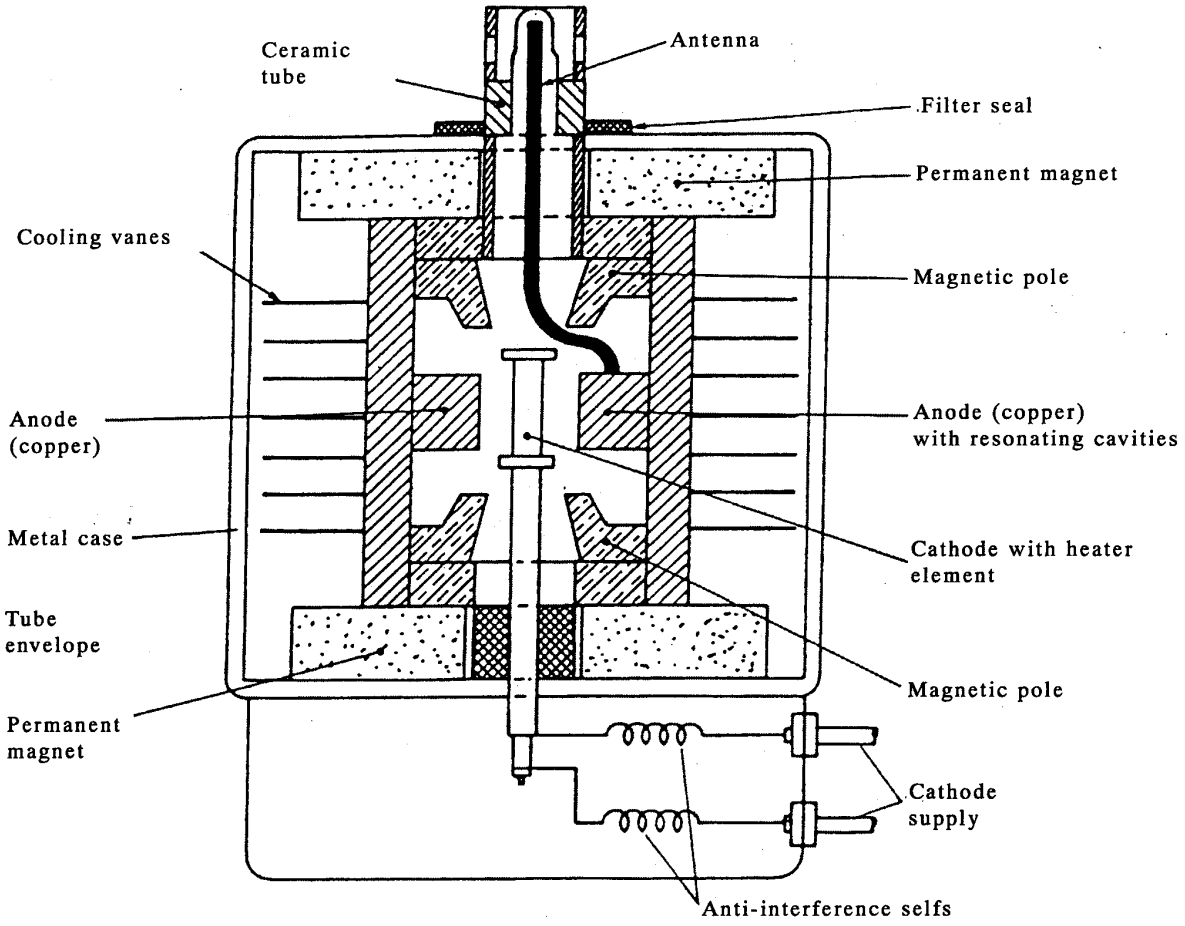


THE MAGNETRON

To produce the microwaves forming the energy supply required for cooking, a magnetron is used. It is associated with an upstream electrical supply and a downstream transfer circuit. It is an oscillator emitting electromagnetic energy at a frequency of 2450 Mhz.



Note : **a two-bladed type heat safety device, fixed to the outside of the magnetron, cuts off the electrical supply if the temperature exceeds 120°C.**

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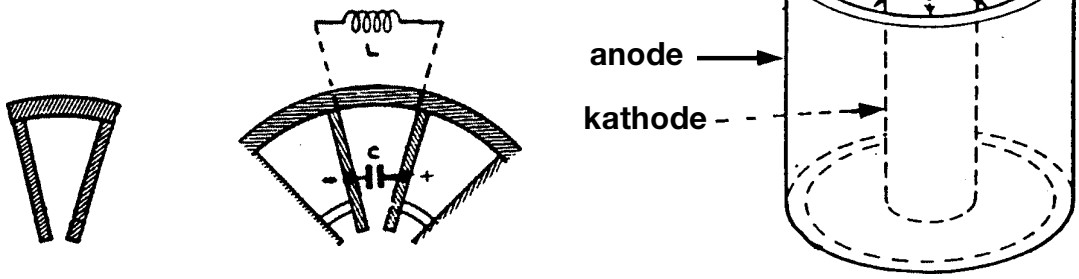
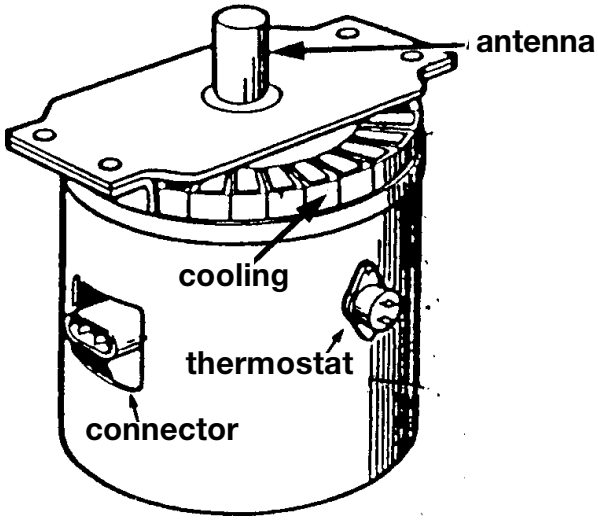
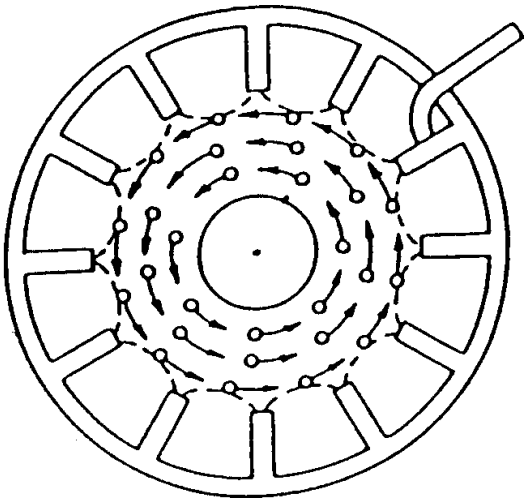
Magnetron







THE MAGNETRON

The magnetron unit combines the functions of a diode and an oscillator.

If there were no magnetic field, the electrons would move along a straight, even trajectory.

The presence of a permanent magnetic field (made up of two magnets) perpendicular to the electronic field, bends the electrons' trajectory and determines an orbital movement in the cathode space.

The curve radius is constant when the magnetic flow B is constant: The electron makes a circle arc.

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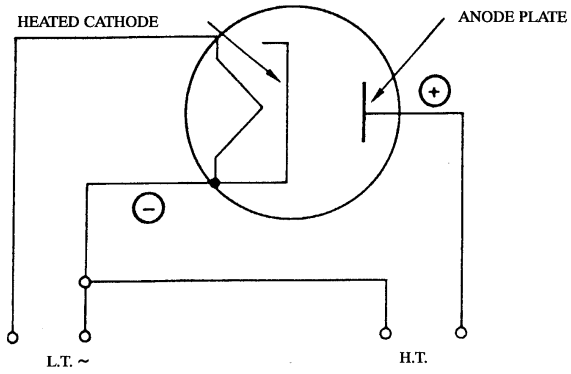
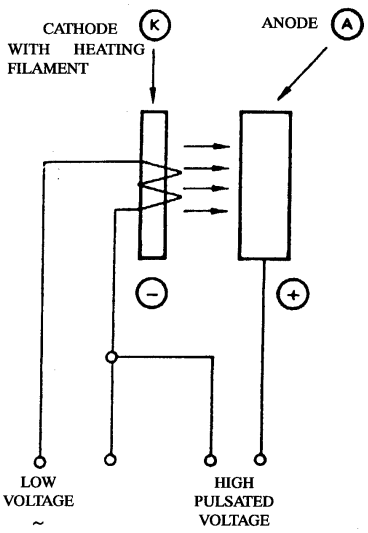


THE MAGNETRON

Because of its basic design, the magnetron may be defined äs an empty diode. The cathode, heated by a low voltage filament, emits electrons (negative electric charges).



An electronic current Starts up between the cathode and the anöde when a high voltage (HV) is applied.

Considering the principle of a diode, the current is established when the cathode is negative in relation to the anöde. As a result, the current circulates in the negative half periods.

POTENTIAL OSCILLATOR FUNCTION

The magnetron is an oscillator capable of supplying electromagnetic energy at very high frequencies. The emissions are made by very short Impulses, followed by relatively long rests.

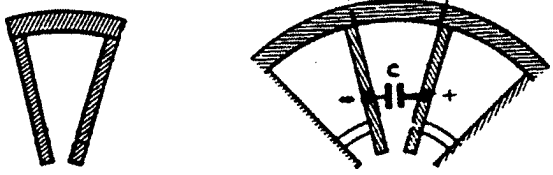
To emit, the magnetron uses :

- on the one hand, the movement of the electrons in the electromagnetic field,

- on the other hand, the anöde's resonating cavities.

The frequency is determined by the resonating cavities broken down into even numbers in the anöde terminal. These cavities form oscillating circuits.

In considering the resonating cavity, it can be thought of äs a certain number of spirals connected in parallel or as one large Spiral. The two ends, which are dose to one another at the narrow end of the cavity, engender a low value capacitance effect.



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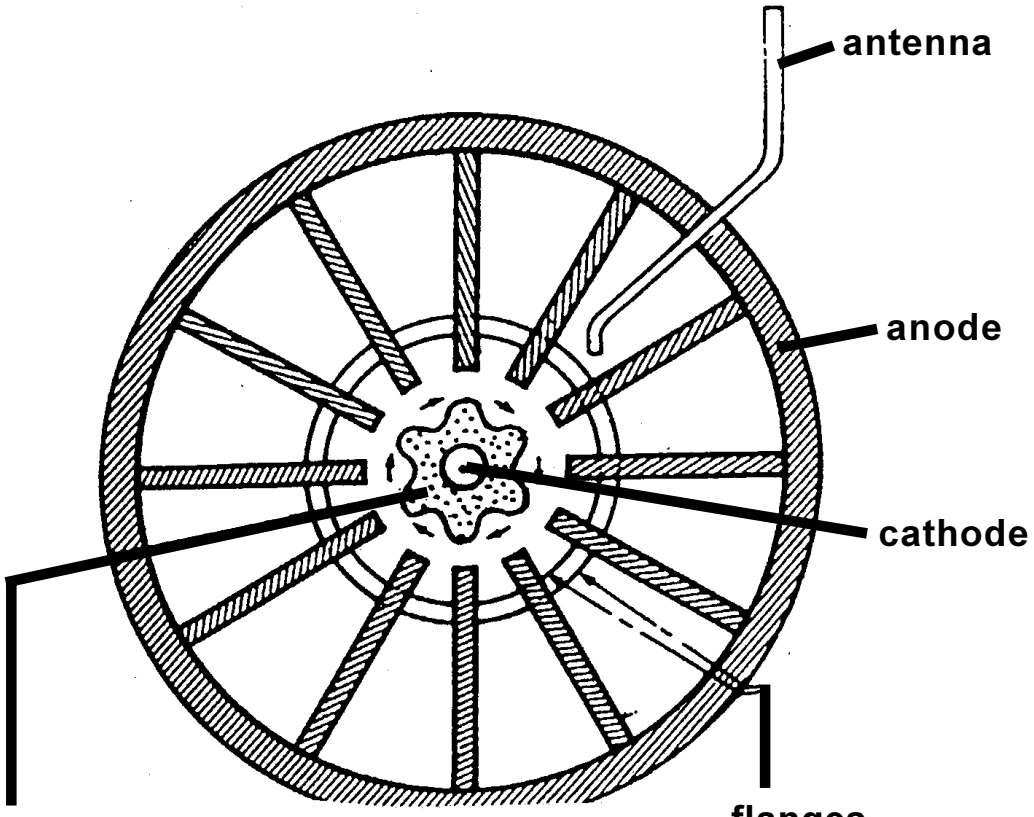
THE MAGNETRON

The electronic field in the cathode-anode space creates a field in the slots separating the poles.
These poles are altemately positive and negative; the electrons group together in beams and turn.
The number of beams corresponds to half the number of poles in the anode.

The interaction between the electronic field and the resonating cavities generates high frequency oscillations (2450 Mhz), which are recovered by a coupling ring and emitted outside by the antenna.



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Measuring and Inspection - Important Notice

PRECAUTION TO BE TAKEN BEFORE REPAIR WORK

Microwave technology involves the presence, when in Operation, of **high voltages** and radiation demanding special precautions during repair work.

- **The door safety devices must never be put out of action.**

- Operating tests must be carried out with something inside the oven : e.g. a Container of water.
- Never put metal Containers or objecfs inside the oven.
- When carrying out repair work with the casing removed, there are high voltages present during the cooking cycle.
- Extreme care should be taken at all times.
- Do not touch any of the components or electrical harnesses while the oven is operating.
- It is neither necessary nor advisable to measure the high voltages.
- When inspecting with the oven switched on, all measuring apparatus should be connected to the circuits by means of clamps or other suitable devices.
- Before touching any part of the oven's electrical circuit:

UNPLUG THE MAINS SUPPLY

- **DISCHARGE THE H. V. CONDENSER** by short-circuiting the terminais with insulated pliers.
- Avoid exposure to microwave radiation when in operating mode or in the event of faulty connections.
- While disassembling :
  Never look inside a wave guide while the generator is operating
- While reassembling :
  Make sure the connections, wave guide, seals and sealing are in good repair and reliable.
- Do not operate an oven with a faulty door (e.g. after an impact).
- After repairing, it is essential to inspect for microwave leakage using suitable apparatus.

Inspection for leakage is essential when carrying out work on the turntable motor, the doors, the hinges, the lock and the magnetron.

- **In the event of repair work being carried out on the magnetron, (L. V. cathode inspection), put the H. V. out of action by disconnecting the condenser cable.**

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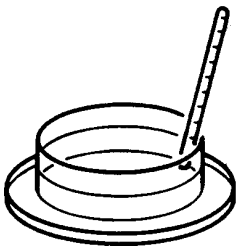
Power measuring

„Easy way“:



1 liter of water (17-24°C)
62 seconds full power

temperature difference (C°)	MW-output power (W)
7	490
8	560
9	630
10	700
11	770
12	840
13	910
14	980
15	1050
16	1120
17	1190

Important:

- **use a thin material container**
- **start temperature if possible 20°C**
- **exact time**
- **thermometer showing tenth of degrees**
- **move water before measuring**

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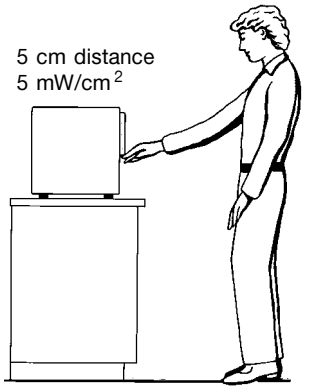
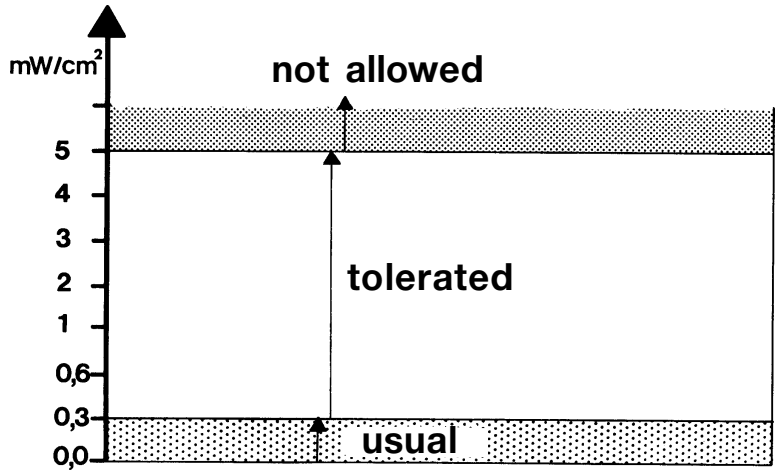
Inspection for leakage

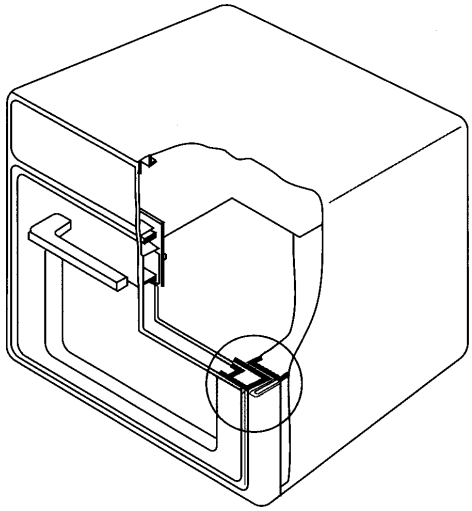


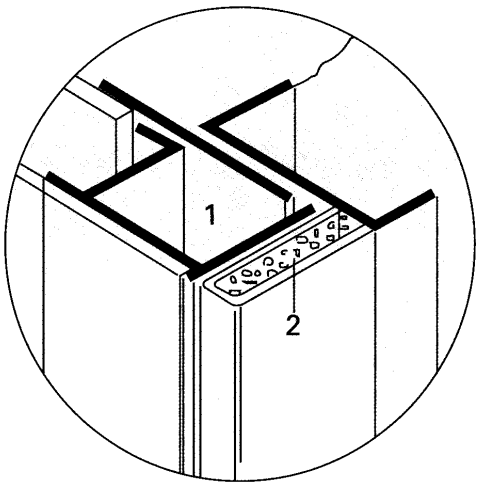


Mechanical safety system

The purpose of these Systems is to limit as far as possible wave leakage between the door and the cooking area.

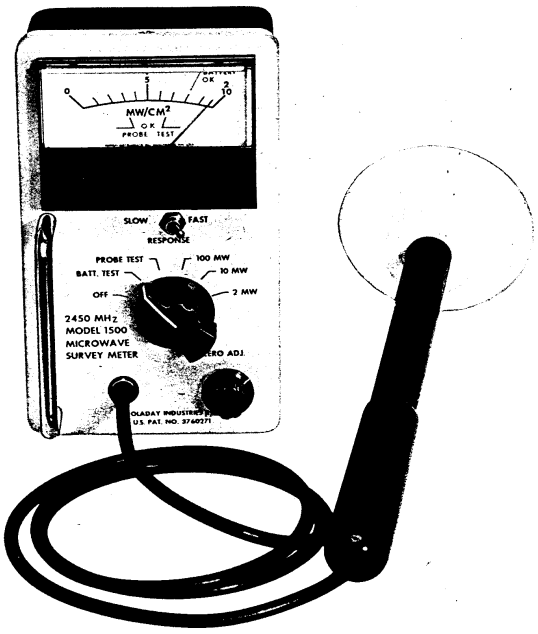
- flexible seal
- capacitive seal forming an electric field
- direct metal contact
- wave trap

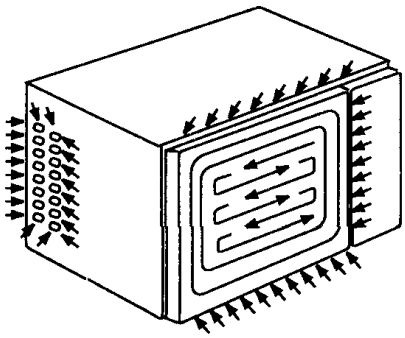


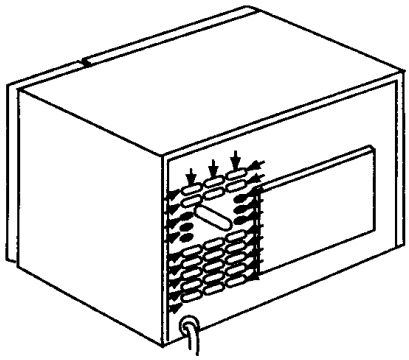


① **quarter wave trap**
② **ferrit seal**

Inspection for leakage







REGULATIONS

In many countries, the accepted level of radiation through leakage, outside an oven is :

5 mW/cm² max at a distance of 5 cm.

It should be noted that the vast majority of ovens made neverleak. In the event of a leak occurring, it is very unusual for it to exceed **1.5 mW/cm-.** This is very slight if one considers that the maximum density of a whole human body is :

100 mW/cm- for 24 hours exposure.

SAFETY MEASURES

So as to ensure risk-free Operation, microwave ovens share several safety devices :

- the appliance cannot be operated if the door is not locked,
- opening the door during Operation cuts off the electrical supply,
- to avoid leakage, the door has several protective devices :
  - a selfic block filter,
  - a mesh which forms a Faraday cage with the cooking area
  - the door opening is fitted with a ferrite rubber seal which acts as a residual energy absorber-dissipater.

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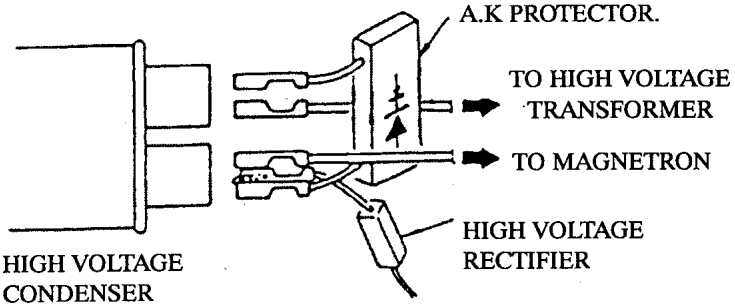
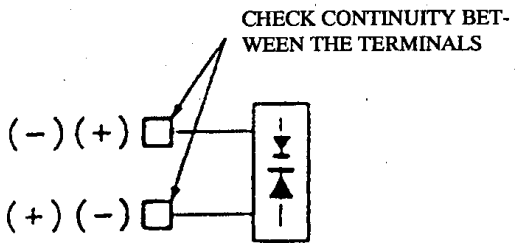
AK DIODE

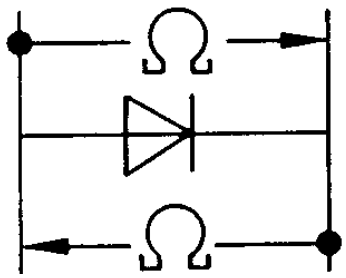
The high voltage wires should be connected to the condenser as shown in the following diagram:



WARNING: The AK protector should be connected to the high voltage condenser in the direction shown. If wrongly connected, the AK protector and füse may be damaged.



- Before carrying out any work, make sure the appliance is disconnected from the mains.
- Short-circuit the condenser using insulated pliers.
- Check the continuity of the AK protector in both directions using a megohmmeter.
- If there is continuity in any direction (R = 0 ohm), the AK protector is faulty.



DIODE

- Disconnect the mains supply
- Check the condenser discharge
- Disconnect the diode to measure it

Remark: **Since the trigger threshold for the diode is 9V, it is impossible to measure the with a conventional checker.**

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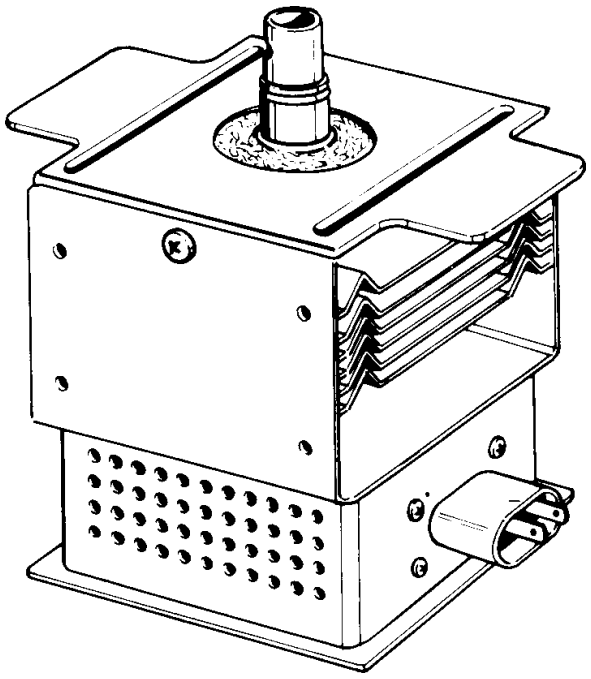
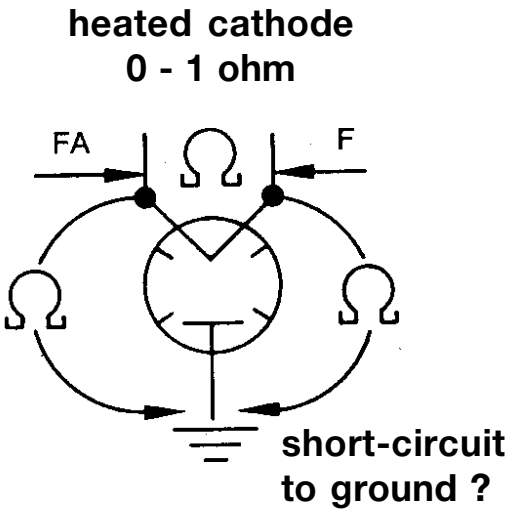
Magnetron





Inspecting the magnetron (cathode filament)

- Disconnect the mains supply.
- Check that the condenser is discharged.
- Disconnect the magnetron.
- Measure the resistance between the disconnected terminais.
- The resistance of the cathode filament is about 0.5 ohm.
- Measure the resistance between the supply terminal and earth.
- The resistance should be infinite.

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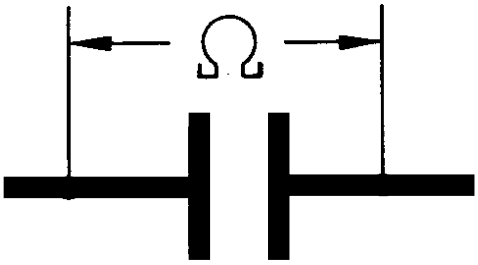
High voltage condenser



low resistance to high resistance	**=**	**OK**
continuous low resistance	**=**	**short circuit**
continuous very high resistance	**=**	**interruption**

• Checking the microwave condenser Charge

The voltage at the condenser terminals is measured in the following way :

U = Z x I

where Z represents the capacitance. This capacitance is equal to :

Z = 1 / Cw

and w = 2 x phi x F , where F represents the mains frequency (here 50 Hz).

We can therefore associate these formulae so äs to obtain a general equality :

U = I / C x 2 x phi x F

if we submit the microwave condenser to a voltage of 230V we can calculate its Charge current, that is :

I = U x C x 2 x phi x F

$I = 230 \times 0{,}9 .10^{-6} \times 2 \times 3{,}14 \times 50$

I = 0,065 A

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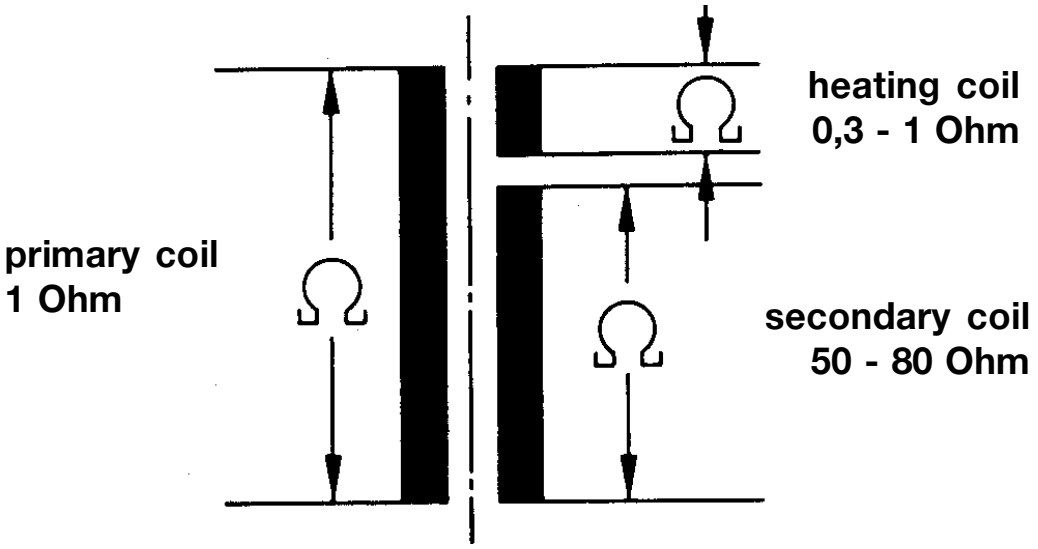
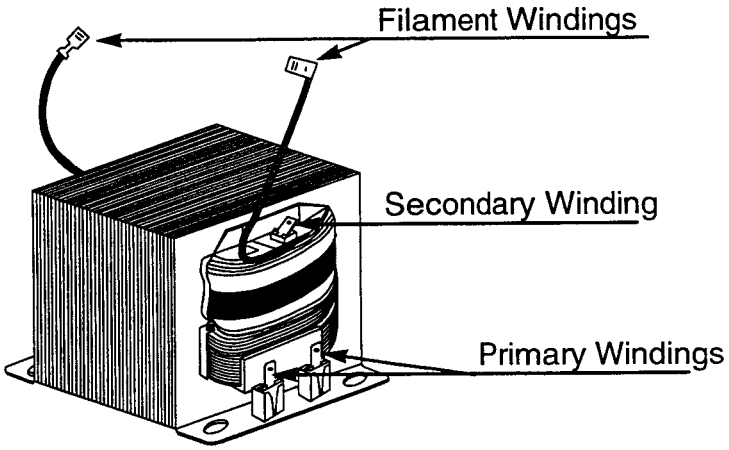
High voltage transformer





CHECKOUT PROCEDURE	RESULTS
1) Measure the resistance : With an ohmeter on Rx1 scale. a. Primary Winding ; b. Filament Winding ; c. Secondary Winding ; 2) Measure the resistance : With an ohm-meter on highest scale. a. Primary winding to ground ; b. Filament winding to ground ;	Normal readings : Approximately 1.7 ohms. Less than 1 ohm. Approximately 92 ohms. Normal readings : Infinite ohms Infinite ohms Note : Remove varnish of measured point.

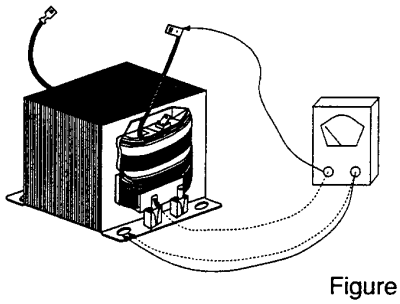


Figure 7

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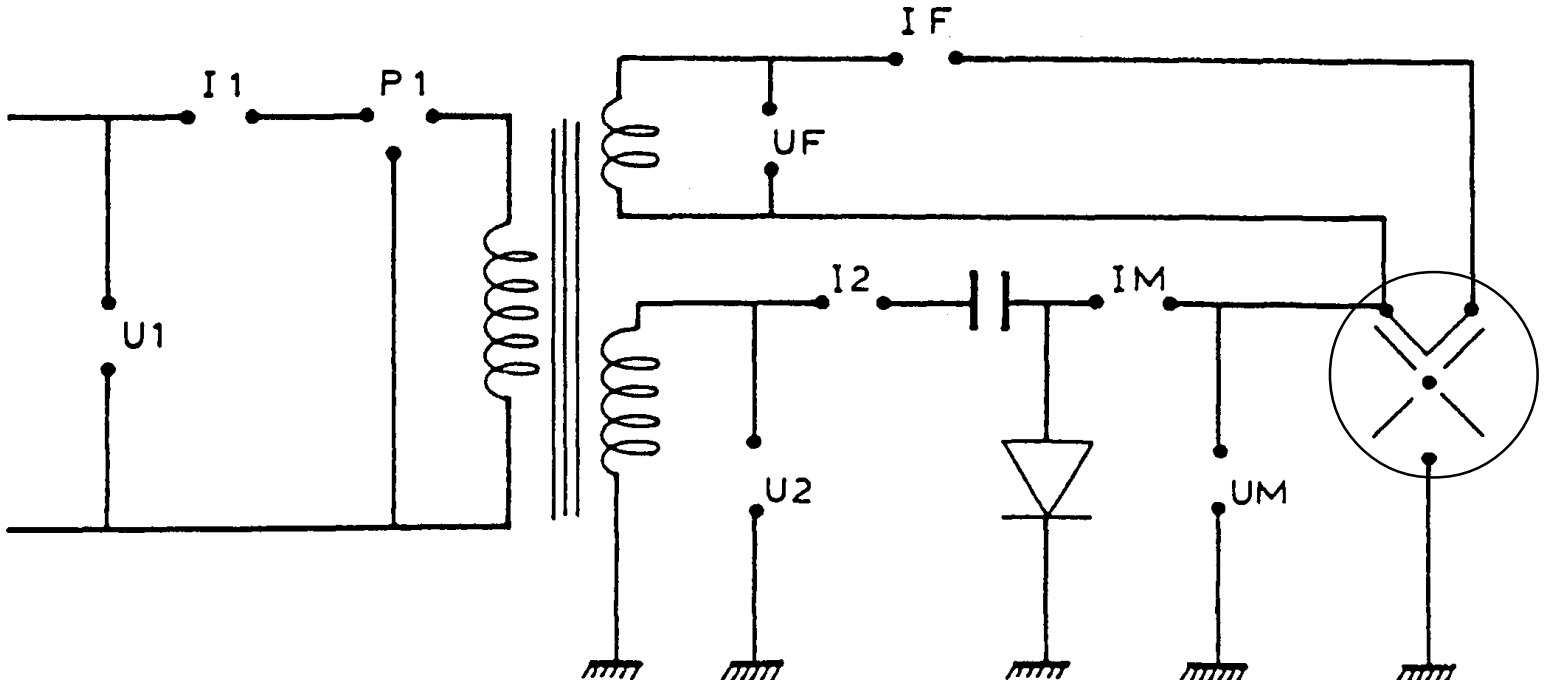
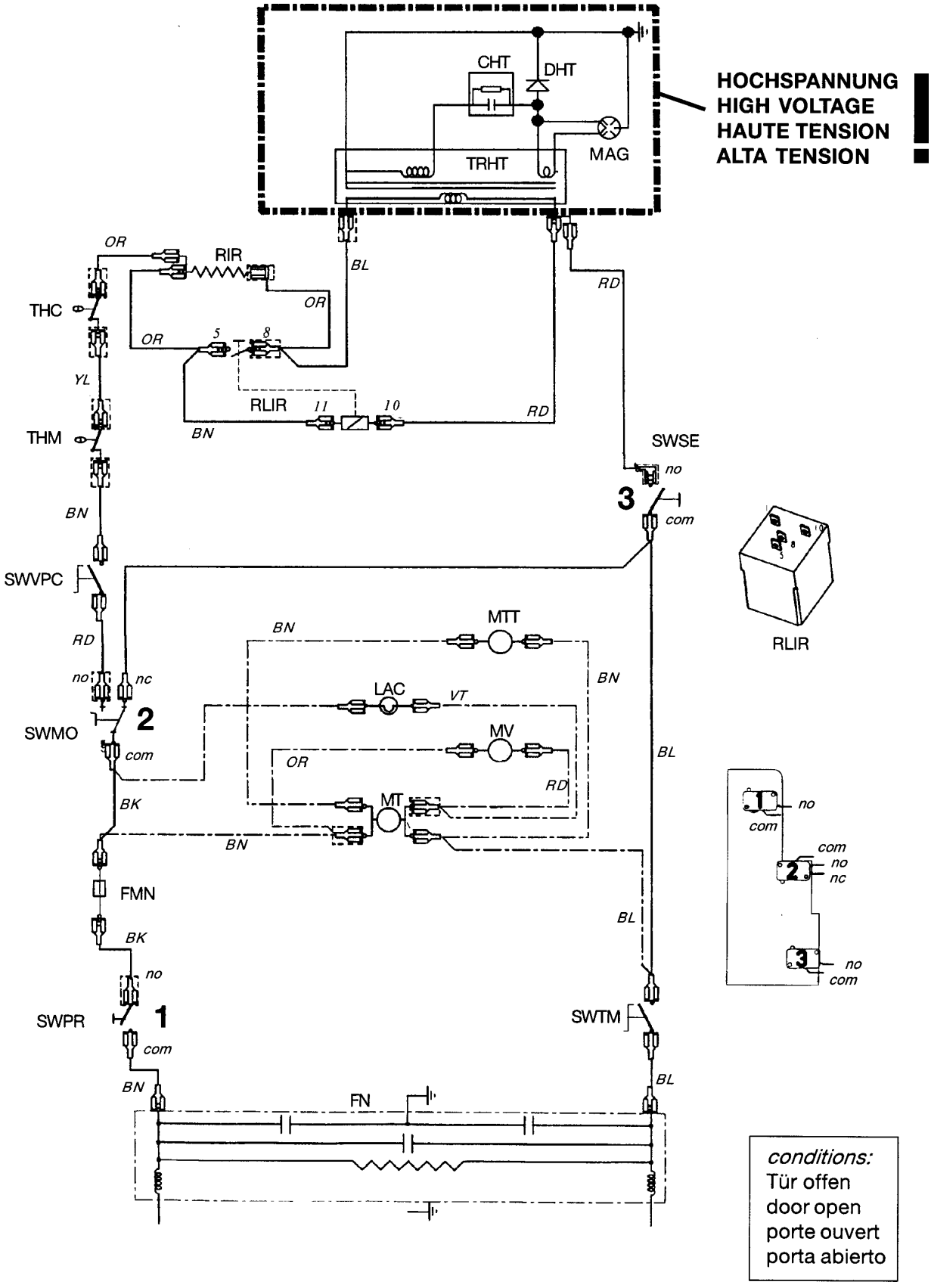
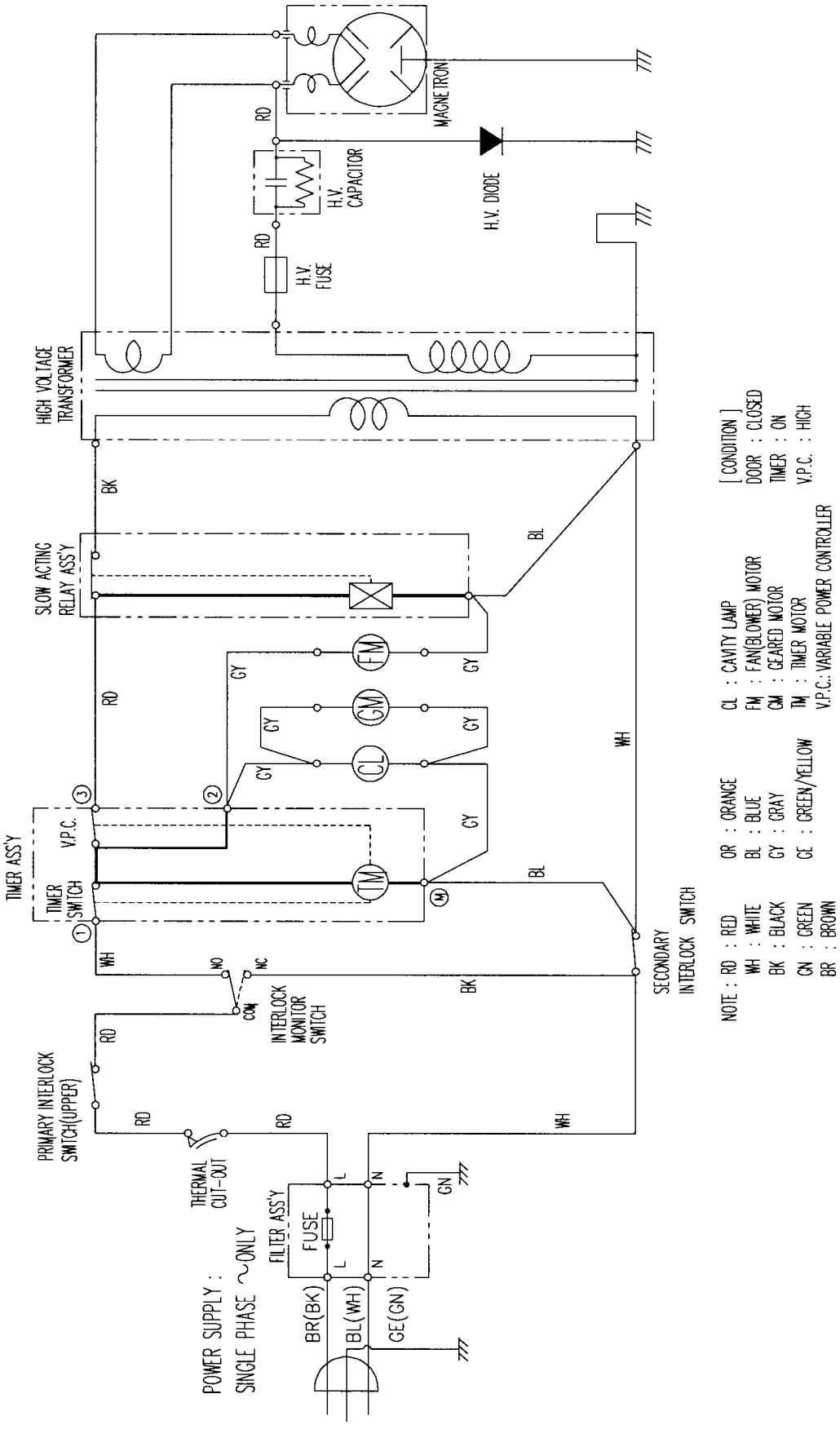
Measurements



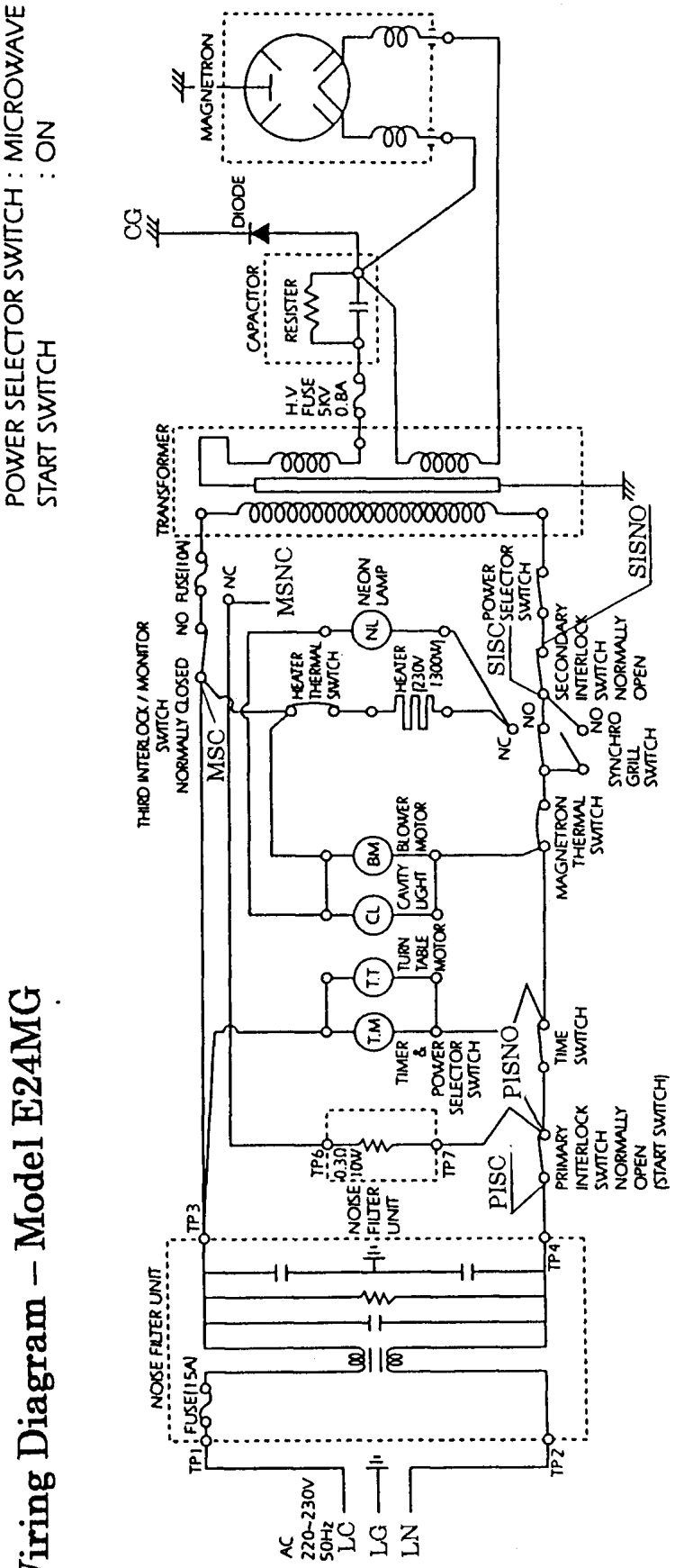
U1	**230 V**	**UF**	**3,15 V**	**I 2**	**0,6 A**
I 1	**5,5 A**	**I F**	**13,5 A**	**UM**	**4000 V**
P1	**1250 W**	**U2**	**2500 V**	**I M**	**0,25 A**

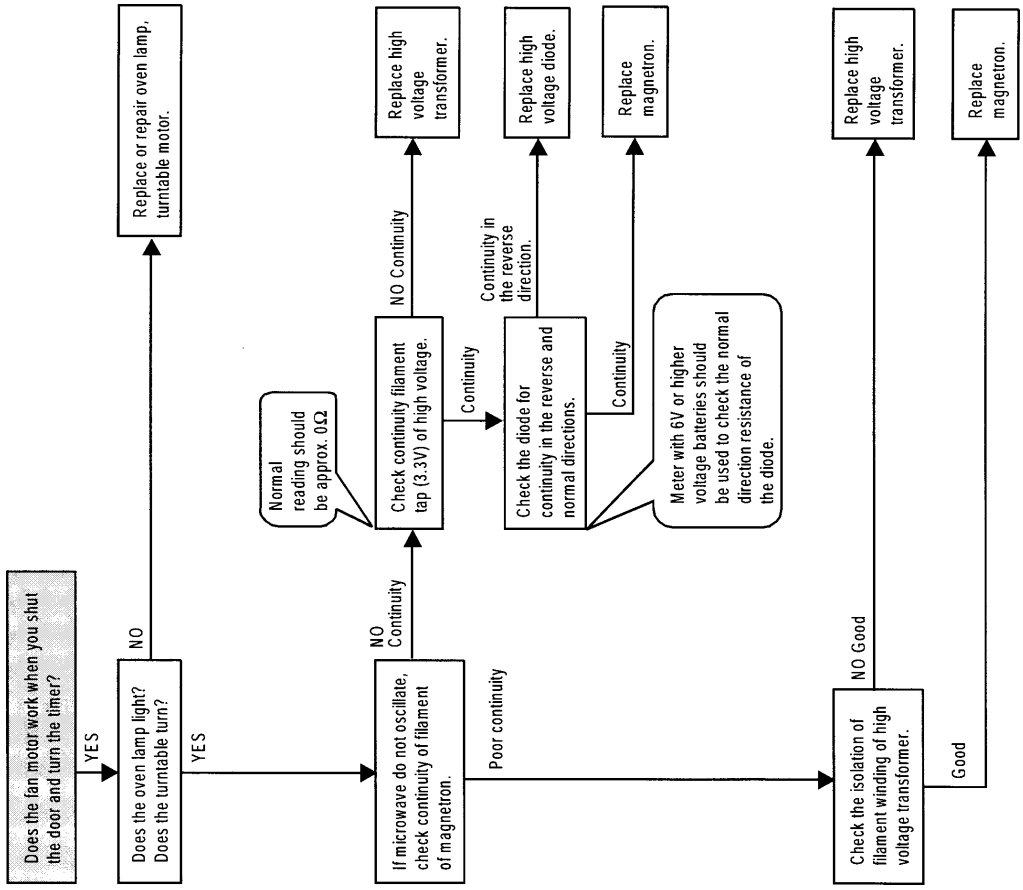

CHT
DHT
MAG
TRHT
HOCHSPANNUNG
HIGH VOLTAGE
HAUTE TENSION
ALTA TENSION
OR
RIR
BL
RD
THC
OR
OR
5
8
YL
RLIR
11
10
RD
THM
BN
SWSE
no
3
com
BN
RLIR
SWVPC
MTT
BN
RD
BN
no
nc
LAC
VT
2
SWMO
MV
com
BL
OR
RD
BK
MT
BN
no
com
com
no
nc
FMN
BL
BK
no
SWPR
1
SWTM
com
BL
BN
FN
conditions:
Tür offen
door open
porte ouvert
porta abierto

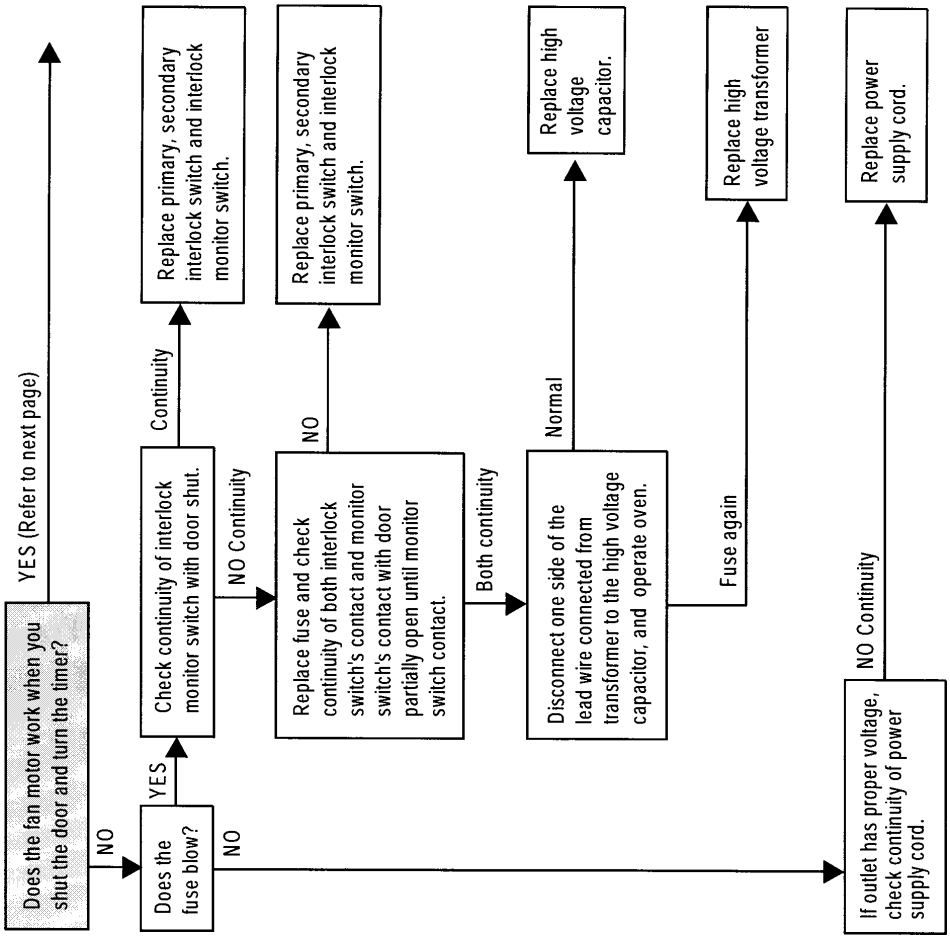

MAGNETRON
H.V. DIODE
H.V. CAPACITOR
H.V. FUSE
HIGH VOLTAGE TRANSFORMER
SLOW ACTING RELAY ASS'Y
TIMER ASS'Y
TIMER SWITCH
V.P.C.
PRIMARY INTERLOCK SWITCH(UPPER)
INTERLOCK MONITOR SWITCH
SECONDARY INTERLOCK SWITCH
THERMAL CUT-OUT
FILTER ASS'Y
FUSE
POWER SUPPLY : SINGLE PHASE ~ONLY
BR(BK)
BL(WH)
GE(GN)
FM
GM
CL
TM
NOTE : RD : RED
WH : WHITE
BK : BLACK
GN : GREEN
BR : BROWN
OR : ORANGE
BL : BLUE
GY : GRAY
GE : GREEN/YELLOW
CL : CAVITY LAMP
FM : FAN(BLOWER) MOTOR
GM : GEARED MOTOR
TM : TIMER MOTOR
V.P.C.: VARIABLE POWER CONTROLLER
[CONDITION]
DOOR : CLOSED
TIMER : ON
V.P.C. : HIGH

Wiring Diagram – Model E24MG

CONDITION :
DOOR : CLOSED
TIMER : ON
POWER SELECTOR SWITCH : MICROWAVE
START SWITCH : ON




Does the fan motor work when you shut the door and turn the timer?
YES
Does the oven lamp light? Does the turntable turn?
NO
Replace or repair oven lamp, turntable motor.
YES
If microwave do not oscillate, check continuity of filament of magnetron.
NO Continuity
Normal reading should be approx. 0Ω
Check continuity filament tap (3.3V) of high voltage.
NO Continuity
Replace high voltage transformer.
Continuity
Check the diode for continuity in the reverse and normal directions.
Continuity in the reverse direction.
Replace high voltage diode.
Continuity
Replace magnetron.
Meter with 6V or higher voltage batteries should be used to check the normal direction resistance of the diode.
Poor continuity
Check the isolation of filament winding of high voltage transformer.
NO Good
Replace high voltage transformer.
Good
Replace magnetron.


Does the fan motor work when you shut the door and turn the timer?
YES (Refer to next page)
NO
Does the fuse blow?
YES
Check continuity of interlock monitor switch with door shut.
Continuity
Replace primary, secondary interlock switch and interlock monitor switch.
NO Continuity
Replace fuse and check continuity of both interlock switch's contact and monitor switch's contact with door partially open until monitor switch contact.
NO
Replace primary, secondary interlock switch and interlock monitor switch.
Both continuity
Disconnect one side of the lead wire connected from transformer to the high voltage capacitor, and operate oven.
Normal
Replace high voltage capacitor.
Fuse again
Replace high voltage transformer
NO
If outlet has proper voltage, check continuity of power supply cord.
NO Continuity
Replace power supply cord.

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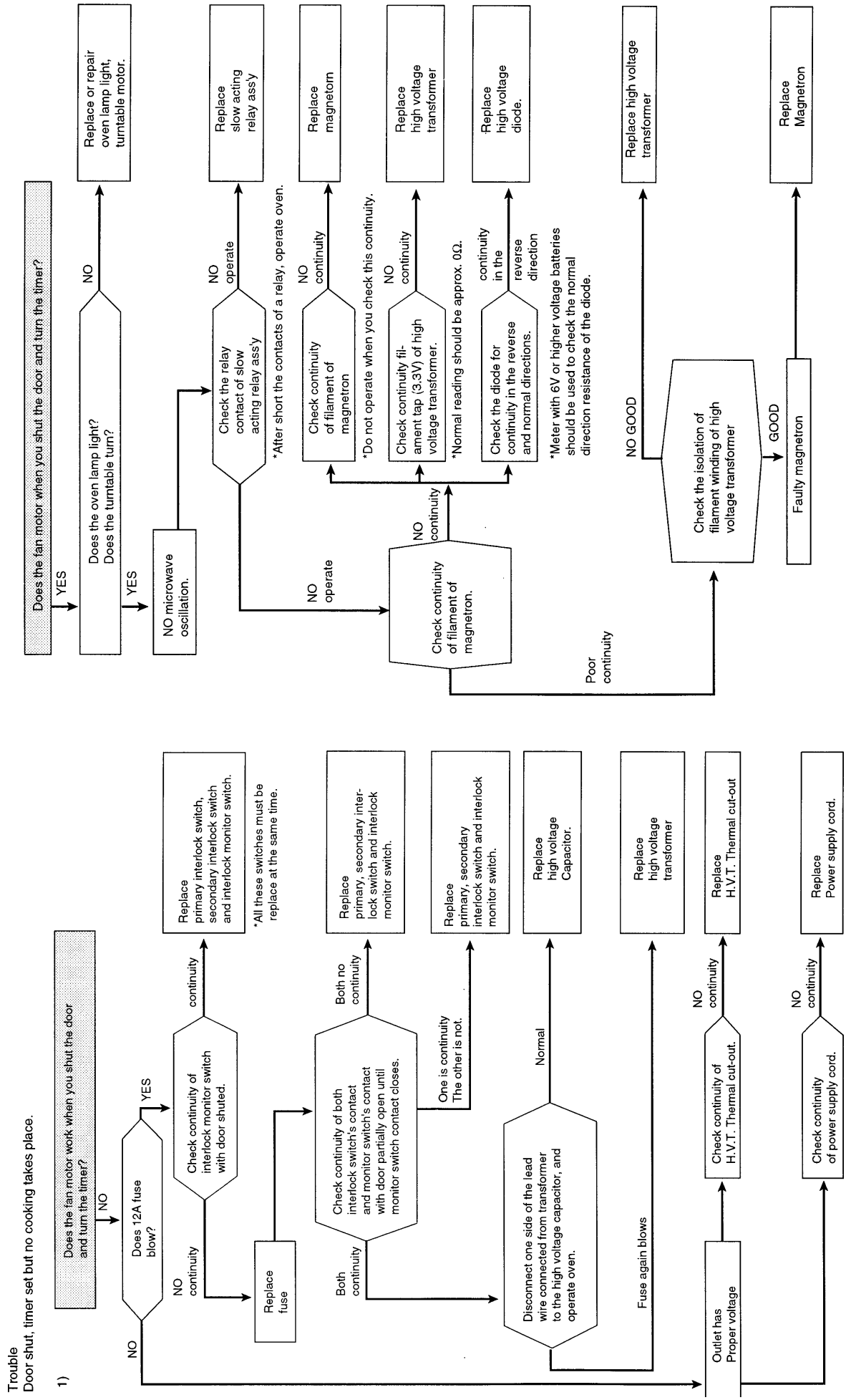
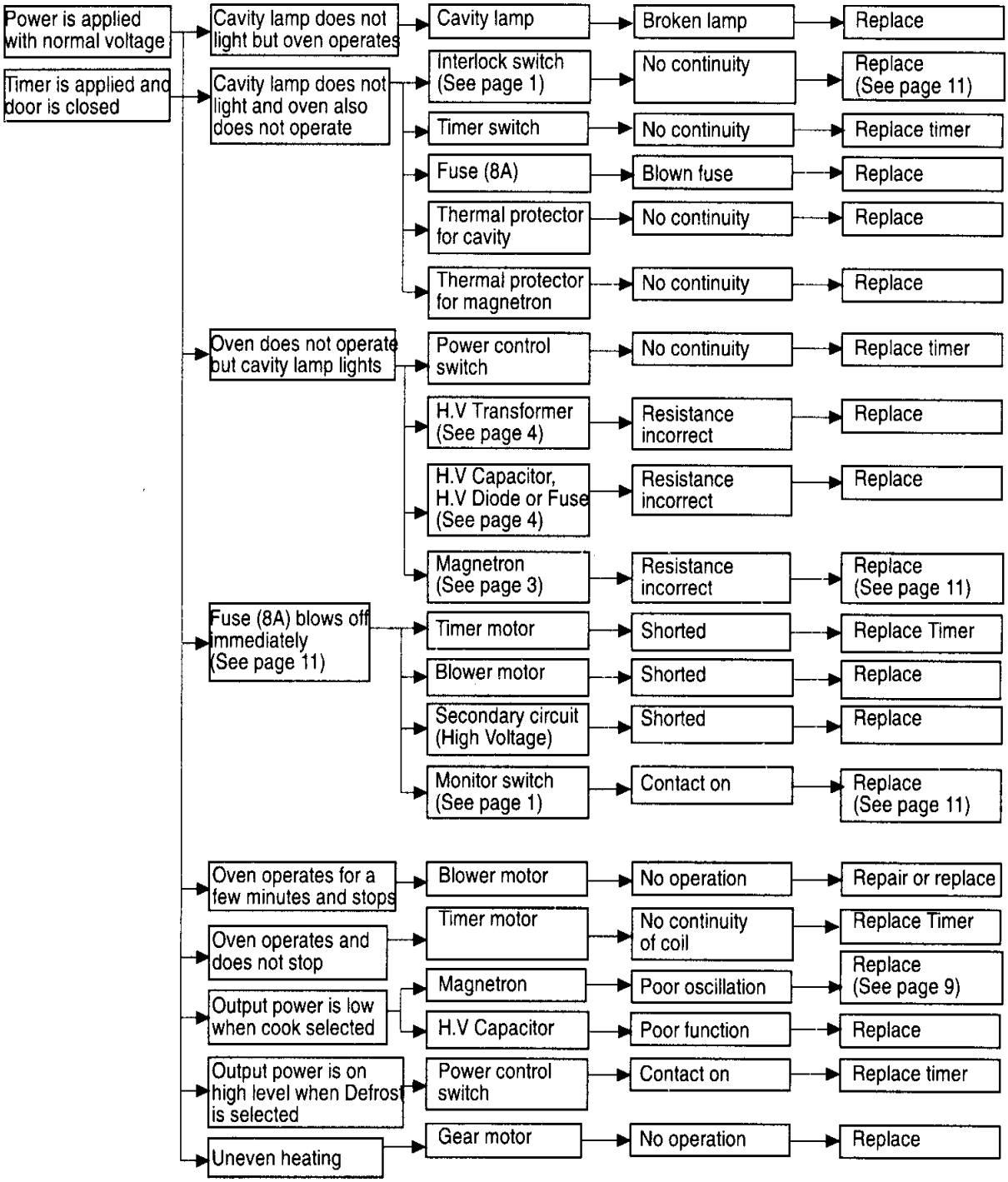
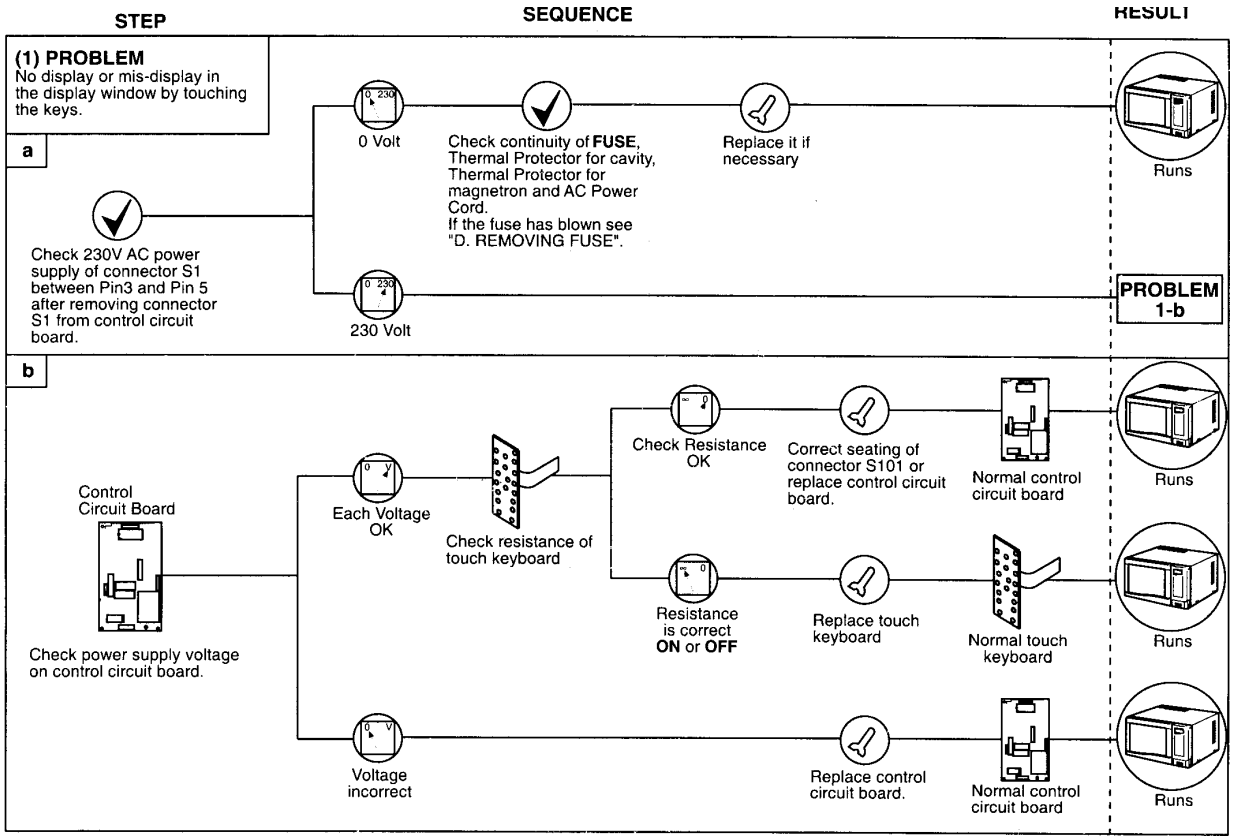
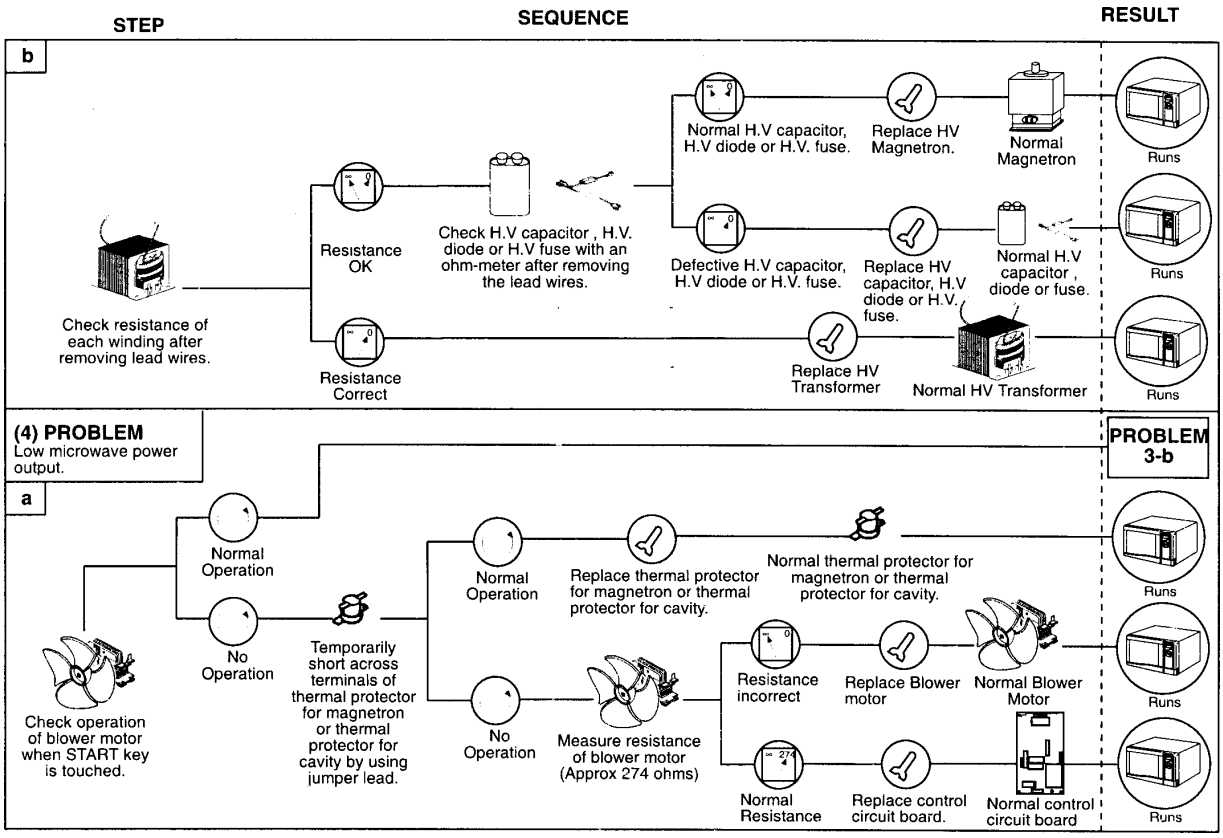


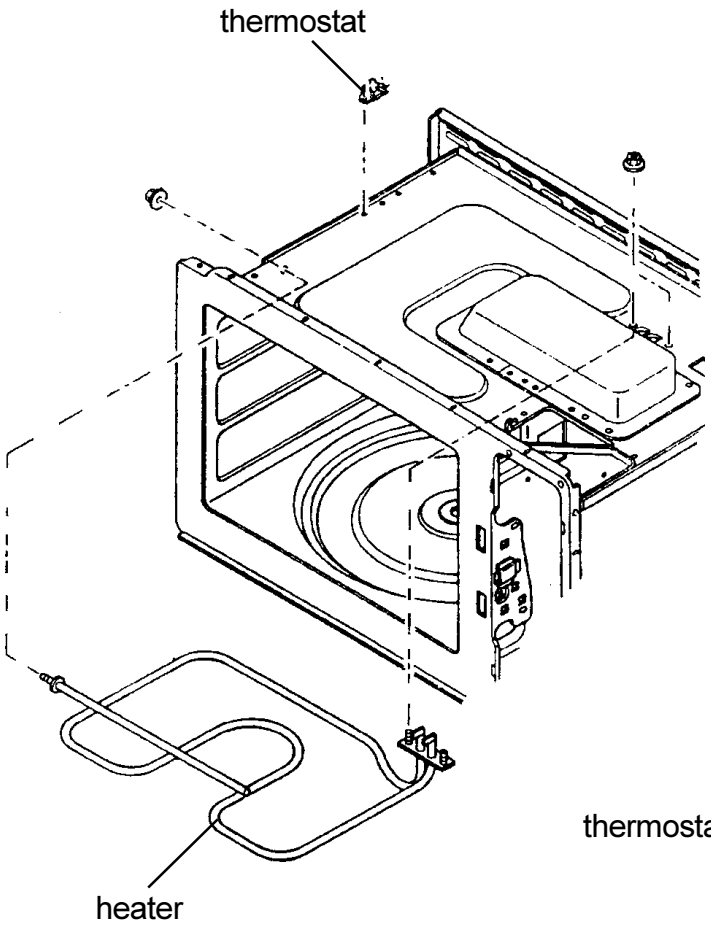
6. TROUBLESHOOTING FOR MODEL TYPES 5.70/5.70G/6.70/6.70G.




STEP
SEQUENCE
RESULT
(1) PROBLEM
No display or mis-display in the display window by touching the keys.
a
Check 230V AC power supply of connector S1 between Pin3 and Pin 5 after removing connector S1 from control circuit board.
0 Volt
230 Volt
Check continuity of FUSE, Thermal Protector for cavity, Thermal Protector for magnetron and AC Power Cord.
If the fuse has blown see "D. REMOVING FUSE".
Replace it if necessary
Runs
PROBLEM 1-b
b
Control Circuit Board
Check power supply voltage on control circuit board.
Each Voltage OK
Check resistance of touch keyboard
Check Resistance OK
Correct seating of connector S101 or replace control circuit board.
Normal control circuit board
Runs
Resistance is correct ON or OFF
Replace touch keyboard
Normal touch keyboard
Runs
Voltage incorrect
Replace control circuit board.
Normal control circuit board
Runs


STEP
SEQUENCE
RESULT
b
Check resistance of each winding after removing lead wires.
Resistance OK
Resistance Correct
Check H.V capacitor , H.V. diode or H.V fuse with an ohm-meter after removing the lead wires.
Normal H.V capacitor, H.V diode or H.V. fuse.
Replace HV Magnetron.
Normal Magnetron
Runs
Defective H.V capacitor, H.V diode or H.V. fuse.
Replace HV capacitor, H.V diode or H.V. fuse.
Normal H.V capacitor , diode or fuse.
Runs
Replace HV Transformer
Normal HV Transformer
Runs
(4) PROBLEM
Low microwave power output.
PROBLEM 3-b
a
Check operation of blower motor when START key is touched.
Normal Operation
No Operation
Temporarily short across terminals of thermal protector for magnetron or thermal protector for cavity by using jumper lead.
Normal Operation
Replace thermal protector for magnetron or thermal protector for cavity.
Normal thermal protector for magnetron or thermal protector for cavity.
Runs
No Operation
Measure resistance of blower motor (Approx 274 ohms)
Resistance incorrect
Replace Blower motor
Normal Blower Motor
Runs
Normal Resistance
Replace control circuit board.
Normal control circuit board
Runs

Microwave ovens with grill

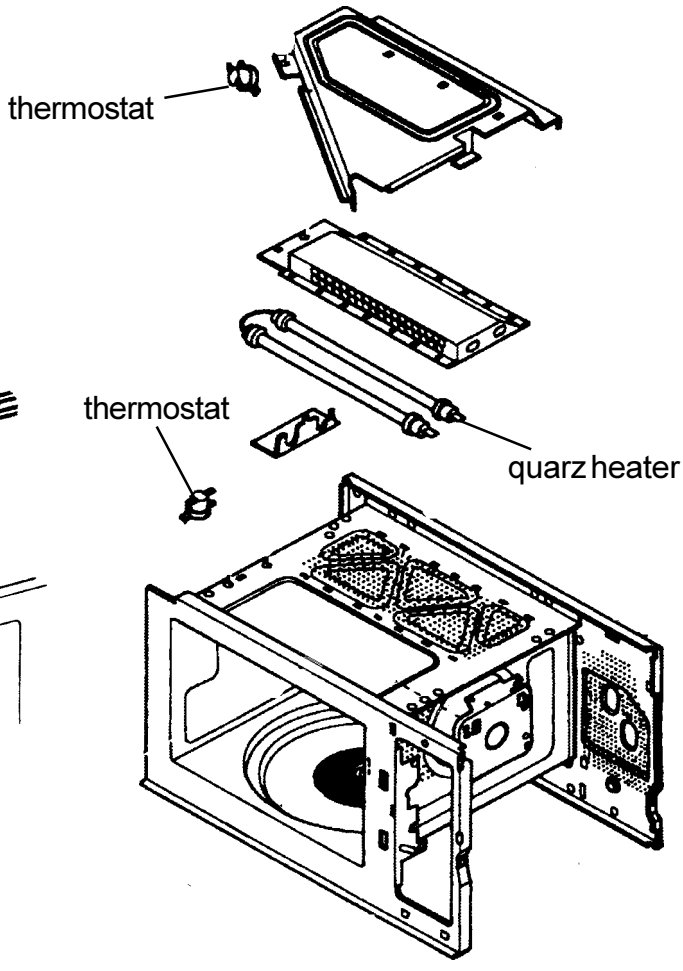


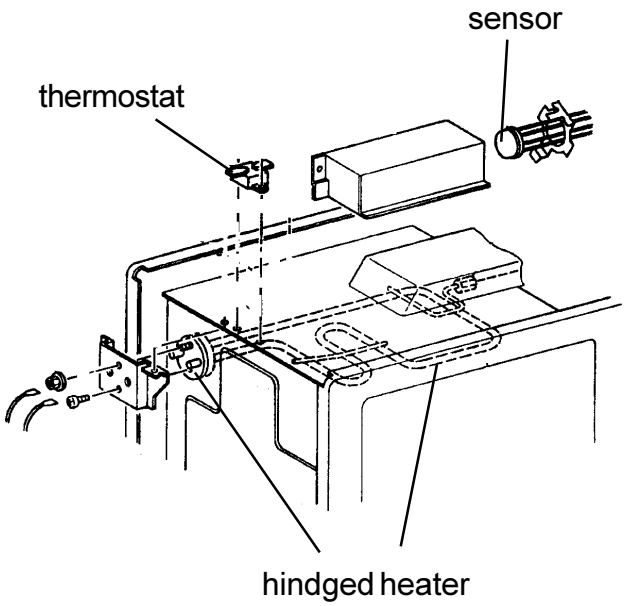
Microwave ovens with grill allowes the customer, to operate with microwave energy in combination with grill power.

We find

- convetional heaters
- conventional hindged heaters
- quarz heaters.

Special thermostats or sensors are placed on the base cavity.





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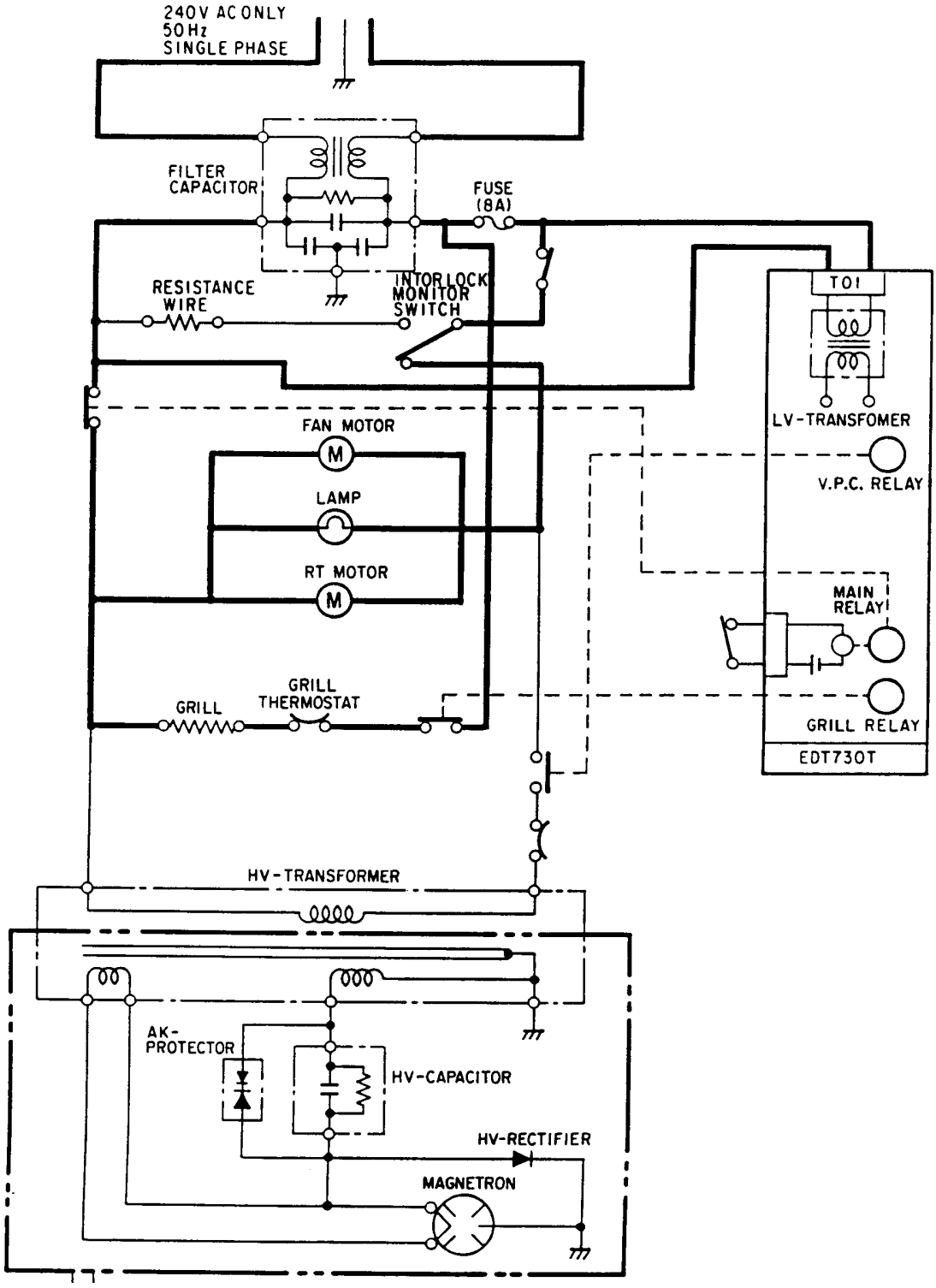
Microwave ovens with grill

Grill Cooking Condition

CONDITION OF OVEN
DOOR: CLOSED



Example for models with PC Board

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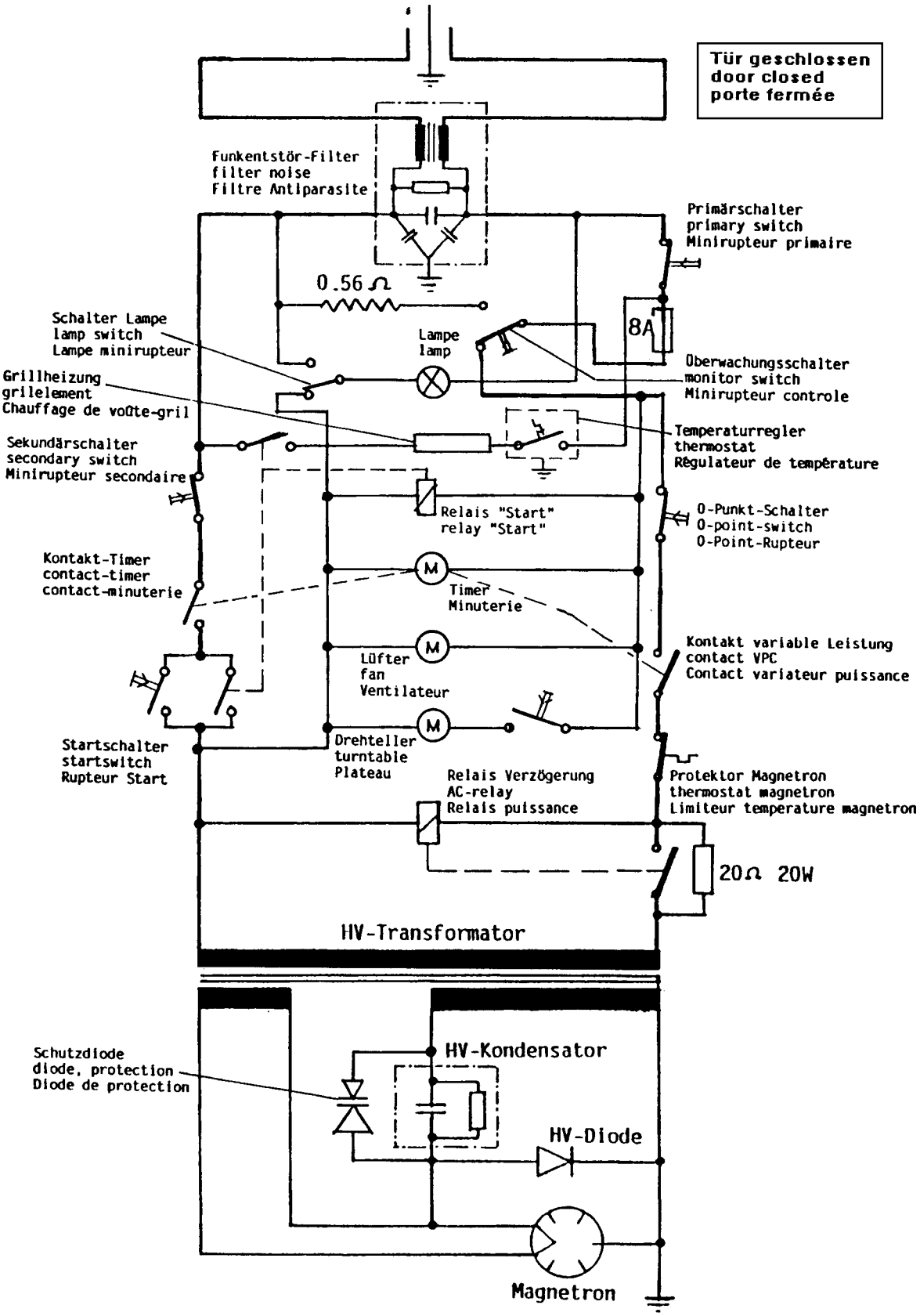
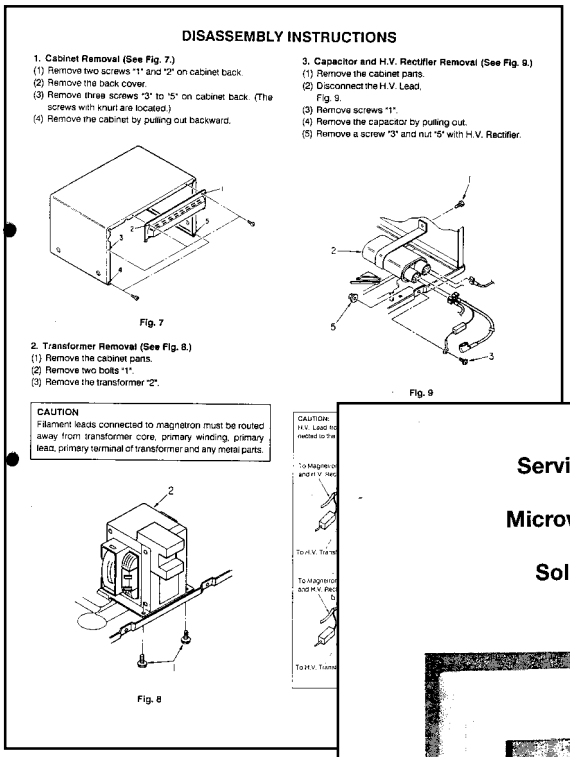
Microwave ovens with grill



Example for models with Timer

Service Manuals .....

.....your „first aid“


DISASSEMBLY INSTRUCTIONS

1. Cabinet Removal (See Fig. 7.)
(1) Remove two screws "1" and "2" on cabinet back.
(2) Remove the back cover.
(3) Remove three screws "3" to "5" on cabinet back. (The screws with knurl are located.)
(4) Remove the cabinet by pulling out backward.

Fig. 7

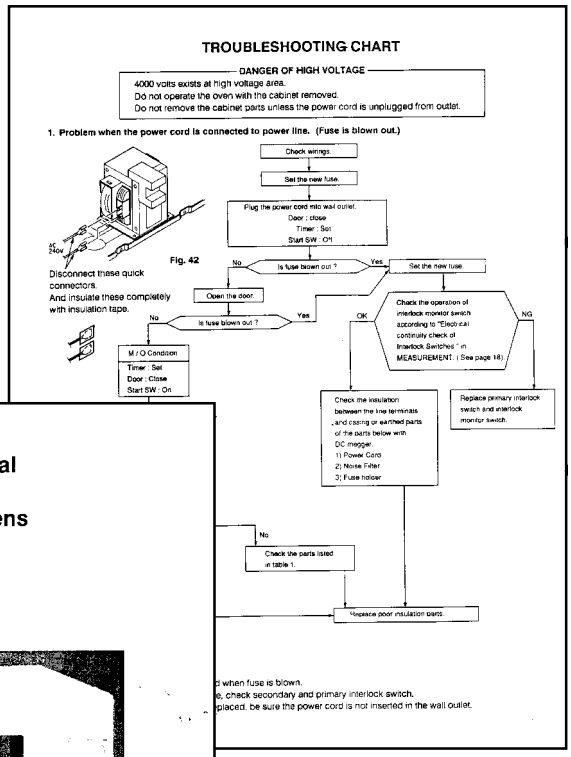
2. Transformer Removal (See Fig. 8.)
(1) Remove the cabinet parts.
(2) Remove two bolts "1".
(3) Remove the transformer "2".

CAUTION
Filament leads connected to magnetron must be routed away from transformer core, primary winding, primary lead, primary terminal of transformer and any metal parts.

Fig. 8

3. Capacitor and H.V. Rectifier Removal (See Fig. 9.)
(1) Remove the cabinet parts.
(2) Disconnect the H.V. Lead.
Fig. 9.
(3) Remove screws "1".
(4) Remove the capacitor by pulling out.
(5) Remove a screw "3" and nut "5" with H.V. Rectifier.

Fig. 9


TROUBLESHOOTING CHART

DANGER OF HIGH VOLTAGE
4000 volts exists at high voltage area.
Do not operate the oven with the cabinet removed.
Do not remove the cabinet parts unless the power cord is unplugged from outlet.

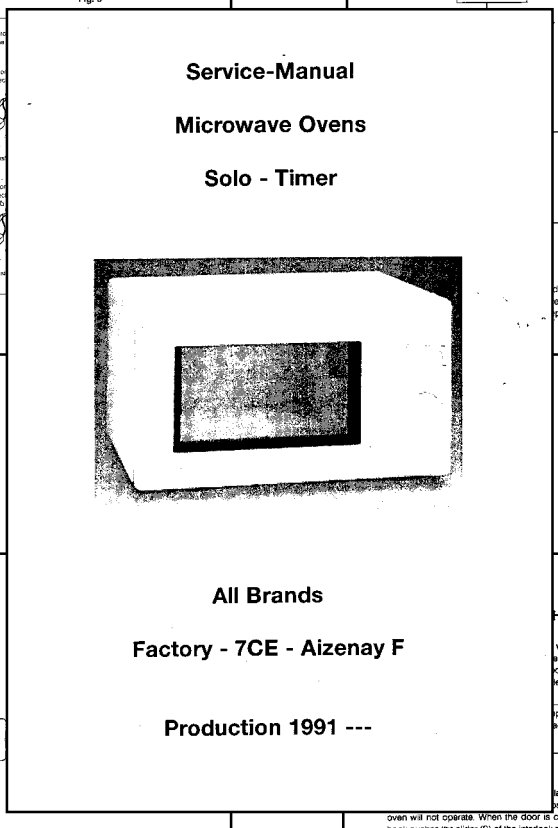
1. Problem when the power cord is connected to power line. (Fuse is blown out.)

Fig. 42

Disconnect these quick connectors.
And insulate these completely with insulation tape.

Check wirings.
Set the new fuse.
Plug the power cord into wall outlet.
Door : close
Timer : Set
Start SW : On
Is fuse blown out ?
Set the new fuse.
Open the door.
Is fuse blown out ?
M / O Condition
Timer : Set
Door : Close
Start SW : On
Check the operation of interlock monitor switch according to "Electrical continuity check of Interlock Switches " in MEASUREMENT. (See page 18)
Check the insulation between the line terminals and casing or earthed parts of the parts below with DC megger.
1) Power Cord
2) Noise Filter
3) Fuse holder
Replace primary interlock switch and interlock monitor switch.
Check the parts listed in table 1.
Replace poor insulation parts.

when fuse is blown.
, check secondary and primary interlock switch.
placed, be sure the power cord is not inserted in the wall outlet.


Service-Manual

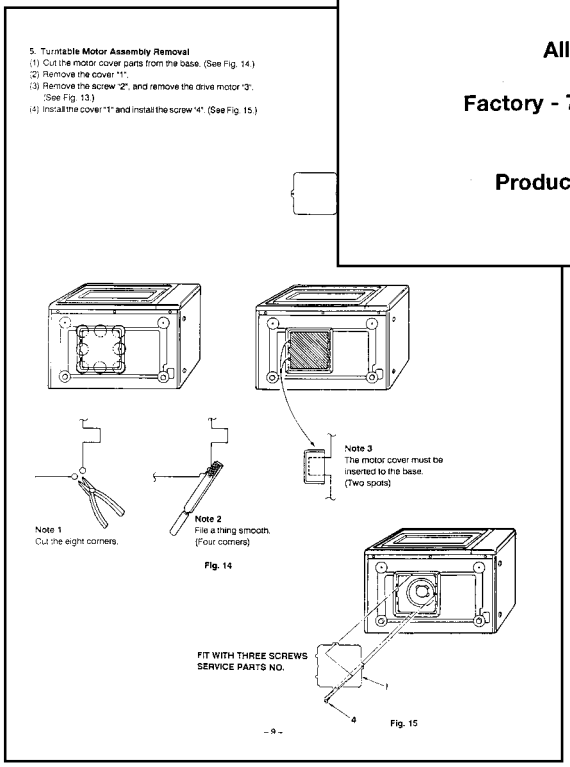
Microwave Ovens

Solo - Timer

All Brands

Factory - 7CE - Aizenay F

Production 1991 ---


5. Turntable Motor Assembly Removal
(1) Cut the motor cover parts from the base. (See Fig. 14.)
(2) Remove the cover "1".
(3) Remove the screw "2", and remove the drive motor "3". (See Fig. 13.)
(4) Install the cover "1" and install the screw "4". (See Fig. 15.)

Note 1
Cut the eight corners.

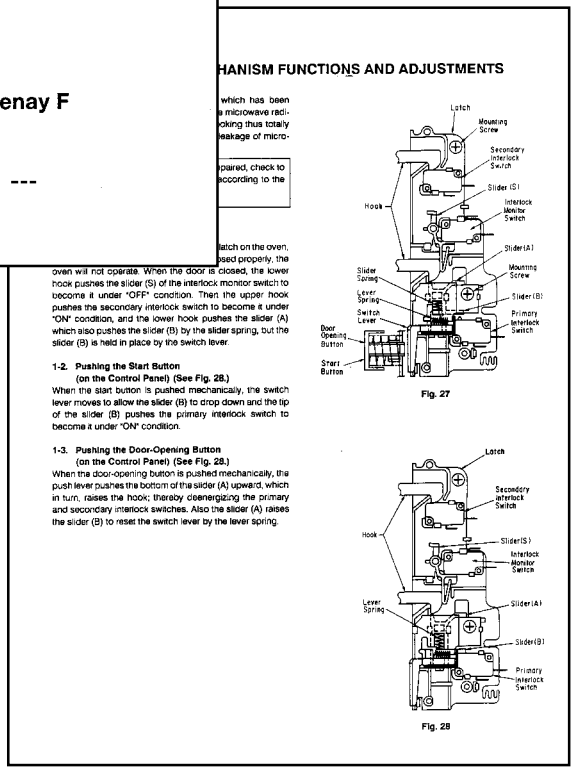
Note 2
File a thing smooth.
(Four corners)

Fig. 14

Note 3
The motor cover must be inserted to the base.
(Two spots)

FIT WITH THREE SCREWS
SERVICE PARTS NO.

Fig. 15


HANISM FUNCTIONS AND ADJUSTMENTS

which has been
microwave radi-
oking thus totally
eakage of micro-

paired, check to
according to the

latch on the oven,
osed properly, the
oven will not operate. When the door is closed, the lower hook pushes the slider (S) of the interlock monitor switch to become it under "OFF" condition. Then the upper hook pushes the secondary interlock switch to become it under "ON" condition, and the lower hook pushes the slider (A) which also pushes the slider (B) by the slider spring, but the slider (B) is held in place by the switch lever.

1-2. Pushing the Start Button
(on the Control Panel) (See Fig. 28.)
When the start button is pushed mechanically, the switch lever moves to allow the slider (B) to drop down and the tip of the slider (B) pushes the primary interlock switch to become it under "ON" condition.

1-3. Pushing the Door-Opening Button
(on the Control Panel) (See Fig. 28.)
When the door-opening button is pushed mechanically, the push lever pushes the bottom of the slider (A) upward, which in turn, raises the hook; thereby deenergizing the primary and secondary interlock switches. Also the slider (A) raises the slider (B) to reset the switch lever by the lever spring.

Latch
Mounting Screw
Secondary Interlock Switch
Slider (S)
Hook
Interlock Monitor Switch
Slider (A)
Slider Spring
Mounting Screw
Lever Spring
Slider (B)
Switch Lever
Primary Interlock Switch
Door Opening Button
Start Button

Fig. 27

Latch
Secondary Interlock Switch
Hook
Slider (S)
Interlock Monitor Switch
Lever Spring
Slider (A)
Slider (B)
Primary Interlock Switch

Fig. 28

Custoumers support

Practical tips for use

General

- After switching off your appliance, let food stand inside for a few minutes to allow even heat distribution **(standing time).**
- Remove any aluminium foil or metal containing packaging before preparing the food.
- Metal objects must be placed at least 2 cm away from the cooking space walls and door. Otherwise arcing can occur, resulting in damage to the appliance.

Cooking

- Whenever possible cook covered. Only pastry dishes with crust should be cooked uncovered.
- Refrigerated or frozen food require longer cooking times.
- Foods containing sauces should be stirred from time to time.
- Cook sott vegetables such äs carrots, peas and cauliflower with a little water.
- Cook soft vegetables such äs mushrooms, peppers and tomatoes without liquid.
- Increase cooking time by approximately 50 % for (arger pieces. Whenever possible, cut vegetables into equal-sized pieces.

Defrosting of meat, poultry and fish

- Place frozen, unpacked meat on an inverted plate in a glass or porcelain Container, or use a sieve, so that the meatjuice can drain.
- Haifway through defrosting, turn the food, dividing it where possible and removing the pieces that have defrosted.

Defrosting of butter, pieces of layer cake and cottage cheese

- Do not fully defrost in the appliance, but leave to adjust outside. This will give a more even result.
- Remove any metal or aluminium foil packaging and/or accessories before defrosting

Defrosting of fruit and vegetables

- Fruit and vegetables that are to be used raw later should not be fully defrosted in the appliance, but left to complete defrosting at room temperature outside.
- Fruit and vegetables that are to be cooked immediately afterwards can be cooked straight from frozen using a higher power level.

Ready made meals

- Ready made meals in metal packages or plastic Containers with metal lids should be heated or defrosted in your microwave oven only if they are explicitly marked as being suitable for microwave use. Please follow the operating instructions printed on the packages (e.g. remove the metal lid and prick the plastic foil).

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What else to note...

- Whenever heating liquid, please also place a teaspoon in the container to avoid delayed boiling. During **delayed boiling**, the boiling temperature is attained without the typical steam bubbles rising. When the Container is shaken, even but slightly, the liquid may then suddenly vigorously boil over or spurt - with the **risk of scalding the user.**

- Food with «skin» or «peel», such as potatoes, tomatoes, sausages, and the like, should be pierced with a fork so that any steam present can escape and the food will not burst.

- Make sure that a **minimum temperature of 70°C** is attained for the cooking/heating of food. Never use a mercury or liquid thermometer for measuring the temperature of the food.

- Food comes in all shapes, sizes and textures.The quantities also vary. For these reasons the time and amount of energy needed to defrost, heat or cook will also vary. As a general ruie :

Double the food = nearly double the time

- Please refer to the cooking charts. To be on the safe side, always select the shorter cooking time. Then extend the time as necessary.

- Microwaves work by making the food heat itself up. Because of this, not all areas of the food will be heated at the same time. When heating larger quantities of food, it is particularly important to stir or turn them over.

- „Standing time“ is referred to in the cooking charts. This is the time you should leave the food to stand without power (either inside or outside the appliance). This ensures even distribution of heat throughout

- The f**ood is too dry.** Set a shorter cooking time or reduce the microwave power Output.

- **The food is not yet defrosted.** Select a longer programme time heated through or cooked on or a higher microwave power completion of programme time. setting. Note that larger food will require a longer time.
- **The food is overcooked**. On the Next time, try a lower power outside and undercooked in the setting for a longer time. Stir middle on completion of cooking liquids, such as soup, periodically. time.

Please find more support in the users manuals and servive manuals!

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Notes on microwave power levels

The following list shows you the power settings and what they can be used for during microwave Operation :

750 Watt - Heating liquids

700 Watt - to start a cooking sequence, Start roasting,
- stewing, etc.
- cooking vegetables
- cooking dishes

600 Watt - defrosting and heating of deep frozen ready made meals

500 Watt - heating refrigerated ready made meals
- finish cooking casseroles
- cooking egg based dishes

450 Watt - finish cooking dishes

350 Watt - cooking ofdelicate dishes

250 Watt - heating baby food in glassjars
- soaking rice
- heating delicate dishes
- melting of gelatin

150 Watt - defrosting meat, fish and bread

80 Watt - defrosting cheese, cream and butter
- defrosting cakes with cream or butter icing
- to let dough rise
- warming cold dishes, drinks, softening butter

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