

SANYO

FILE NO.

SUPPLEMENT OF SERVICE MANUAL

Microwave Oven

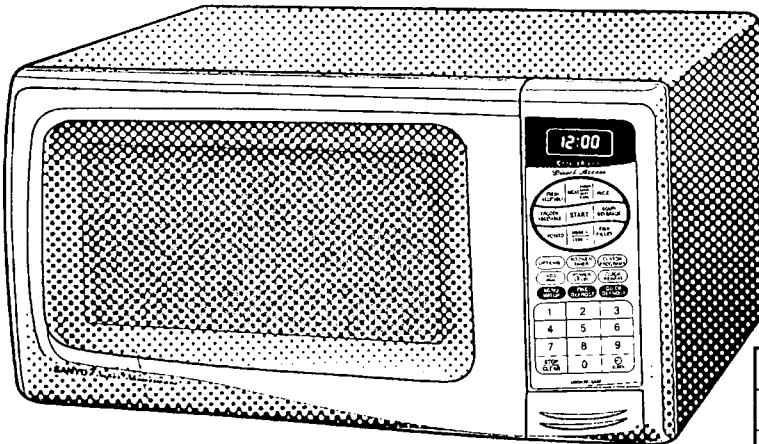
EM-X471S

EM-X471YS

EM-X471US

EM-X471SS

EM-X471BS (Australia/New Zealand)



MODEL NO.	PRODUCT CODE NO.
EM-X471S	437 450 47
EM-X471YS	437 450 48
EM-X471US	437 450 49
EM-X471SS	437 450 50
EM-X471BS	437 450 54

Foreword

See the Service Manual of EM-X670S (SM-860177) except the items described in this Service Manual.

Read this manual carefully, especially precaution on microwave energy, and follow the procedure strictly. Careless servicing and testing may expose yourself to the microwave energy leakage.

PRECAUTIONS

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

- Do not operate or allow the oven to be operated with the door open.
- Make the following safety checks on all ovens to be serviced before activating the magnetron or other microwave source, and make repairs as necessary:
 - 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.
- 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.
- 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.

REFERENCE NO. SS - 860264

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1. SPECIFICATIONS

Rated Power Consumption . . .	1500 W.
Microwave Output	1000 W.
Frequency	2450MHz $\pm$ 50MHz.
Power Supply	230 ~ 240V, 50Hz.
Rated Current	6.6 Amp.
Safety Devices	Temp. Fuse, Open at 167°C for Cavity. Thermal Protector, Open at 122°C for Magnetron. Fuse (Cartridge Type 8 A) Primary Interlock Switch. Door Sensing Switch and Relay 2. Interlock Monitor Switch.
Timer	Electronic Digital, up to 99 min, 99 sec.
Overall Dimensions	525 (W) X 425 (D) X 289 (H) mm.
Oven Cavity Size	351 (W) X 371(D) X 208 (H) mm.
Turn Table Diameter	275 mm.
Effective Capacity of Oven Cavity	28 liters.
Net Weight	Approx. 17 Kg.

2. POWER OUTPUT MEASUREMENT

NOTE

The Power Output specification 1000W on this model is measured with IEC measurement. The Power Output is measured with two (2) liters water is equivalent to 1000W in measurement with IEC, when measured with the following power output.

- (A) 1. Fill two test bowls with each 1 liter water respectively.
2. Use accurate thermometer and measure each water temperature respectively.
- (B) Place the two bowls on glass turntable.

- (C) 1. Set cooking time to two (2) minutes. ("2 00" appears in display)
2. Touch START key and operate oven for exactly two (2) minutes.
- (D) 1. Take out the two bowls at once.
2. Stir both water with thermometer and measure the water temperature rise respectively.
- (E) 1. Get temperature rise by calculation the difference (water temperature after cooking minus initial temperature) in each bowl.
2. Then calculate average value(t) of both temperature rise in degrees centigrade.
3. Then work out;
Power Output (watt) = $70 \times \Delta t$
- Where Δt is an Average Temperature Rise in degrees centigrade.
- (F) Power Output shall be in the following range:

Average Temperature Rise	Microwave Power Output
Minimum 11.2°C	784 W
Maximum 13.7°C	959 W

- (G) Power Output will be influenced by line voltage of power supply. Consequently, correct power output must be measured within 240V AC $\pm$ 2 volt while unit is operating.

3. CIRCUIT DIAGRAM

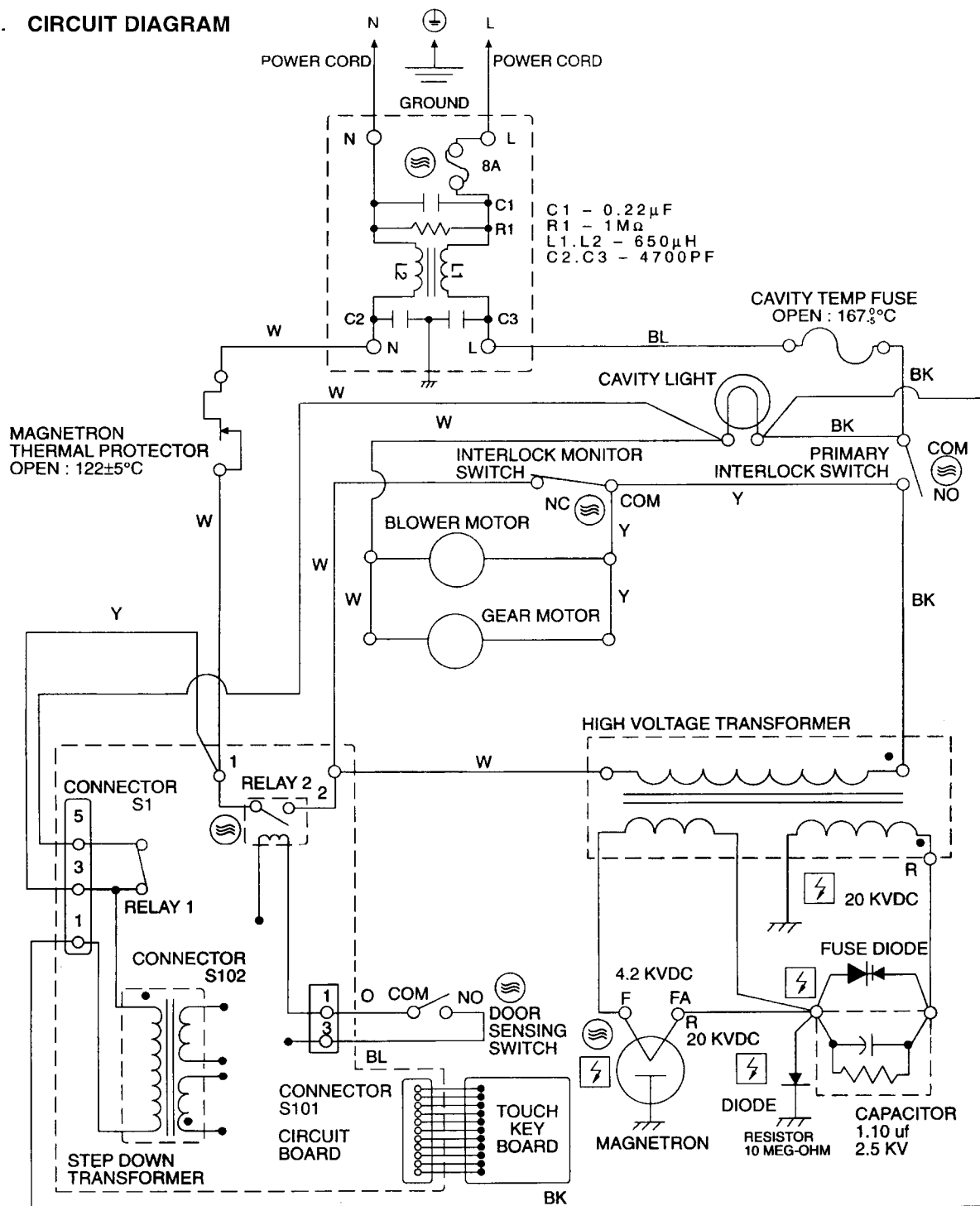


Figure 1

NOTES :

THE SIGN  Parts marked with this sign are supplied with High Voltage exceeding 250V.

THE SIGN  Parts marked with this sign have special characteristics important for microwave leakage. When replacing any of these parts use only manufacturer's specified parts.

WIRING COLOUR

BK : BLACK
BL : BLUE
W : WHITE
O : ORANGE
R : RED
Y : YELLOW

4. TEST PROCEDURES

COMPONENT	CHECKOUT PROCEDURE	RESULT																				
TOUCH KEY BOARD	Measure the resistance between terminals of FPC connector after removing it from S101. (Figure 2). NOTE - When reconnecting the FPC connector, make sure the holes on the connector are properly inserted in hooks of the plastic fastener in S101. MATRIX CIRCUIT FOR TOUCH KEY BOARD FPC CONNECTOR ohm-meter TERMINALS OF FPC CONNECTOR Figure 2	<table><tr><th rowspan="2">Resistance value</th><th>When touched</th><th>When not touched</th></tr><tr><td>Less than 1K Ohms</td><td>More than 1 MEG Ohm</td></tr></table> When checking "START" key, connect ohm-meter as illustration below.	Resistance value	When touched	When not touched	Less than 1K Ohms	More than 1 MEG Ohm															
Resistance value	When touched	When not touched																				
	Less than 1K Ohms	More than 1 MEG Ohm																				
CONTROL CIRCUIT BOARD	Measure the voltage: Between test points TP-1, TP-2, TP-3 or TP-4 and ground between TP-5 and TP-6. (See control circuit board on page 9). NOTE - Proceed with the check of the step-down transformer, to see if any one of the measured values is different from the specified values.	<table><tr><th>Test Point</th><th>TP-1</th><th>TP-2</th><th>TP-3</th><th>TP-4</th></tr><tr><th>Voltage</th><td>-5V DC</td><td>-22V DC</td><td>-25V DC</td><td>-37V DC</td></tr><tr><th>Test Point</th><td colspan="4">TP-5/TP-6</td></tr><tr><th>Voltage</th><td colspan="4">2.0V AC</td></tr></table>	Test Point	TP-1	TP-2	TP-3	TP-4	Voltage	-5V DC	-22V DC	-25V DC	-37V DC	Test Point	TP-5/TP-6				Voltage	2.0V AC			
Test Point	TP-1	TP-2	TP-3	TP-4																		
Voltage	-5V DC	-22V DC	-25V DC	-37V DC																		
Test Point	TP-5/TP-6																					
Voltage	2.0V AC																					

CAUTION

—DISCONNECT THE POWER SUPPLY CORD FROM THE WALL OUTLET WHENEVER REMOVING THE CABINET FROM THE UNIT. PROCEED WITH THE TESTS ONLY AFTER DISCHARGING THE HIGH VOLTAGE CAPACITOR AND REMOVING THE LEAD WIRES FROM THE PRIMARY WINDING OF THE HIGH VOLTAGE TRANSFORMER. (SEE FIGURE 3)

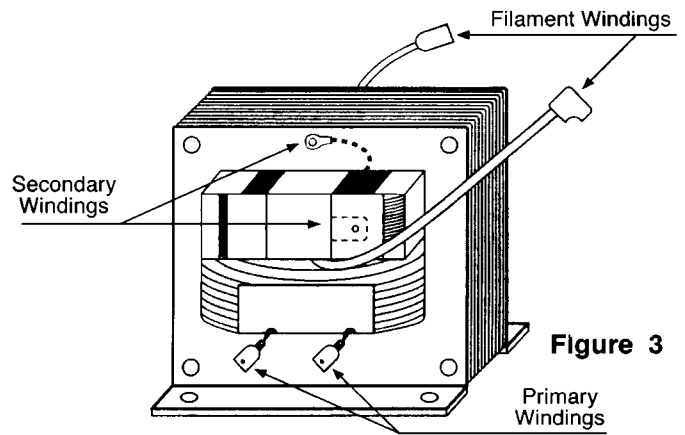
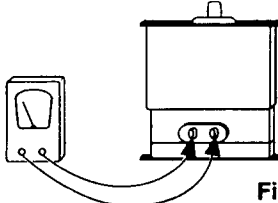
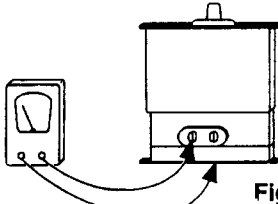
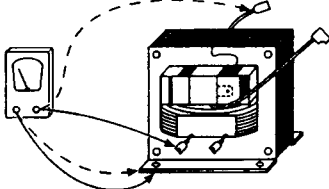


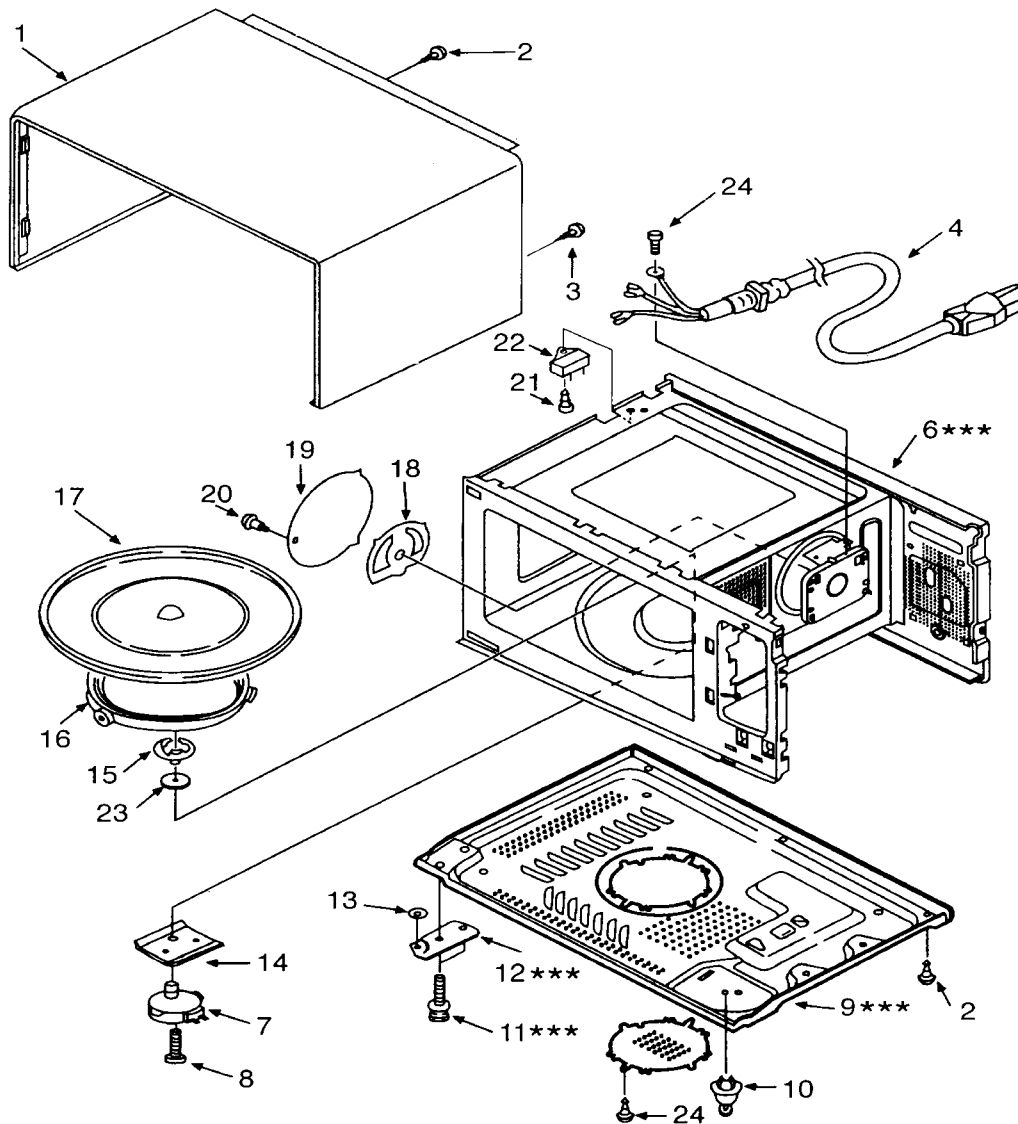
Figure 3

A. TEST PROCEDURES

COMPONENT	CHECKOUT PROCEDURE	RESULT
MAGNETRON	1) Check for resistance: Across the filament terminals of the magnetron with an ohm-meter on R x 1 scale.  Figure 4 2) Check for resistance: Between each filament terminal of the magnetron and the chassis ground with an ohmmeter on highest scale.  Figure 5	Normal reading: Less than 1 ohm. Normal reading: Infinite ohms.
HIGH-VOLTAGE TRANSFORMER	1) Measure the resistance: With an ohm-meter on R x 1 scale. - Primary winding; - Filament winding; - Secondary winding; 2) Measure the resistance: With an ohm-meter on highest scale. - Primary winding to ground. - Filament winding to ground;  Figure 6 Note: Remove varnish of measured point	Normal readings: Approximately 1.53 ohms Less than 1 ohm. Approximately 97.2 ohms Normal readings: Infinite ohms Infinite ohms.

5. EXPLODED VIEW AND PART LIST

CAVITY PARTS



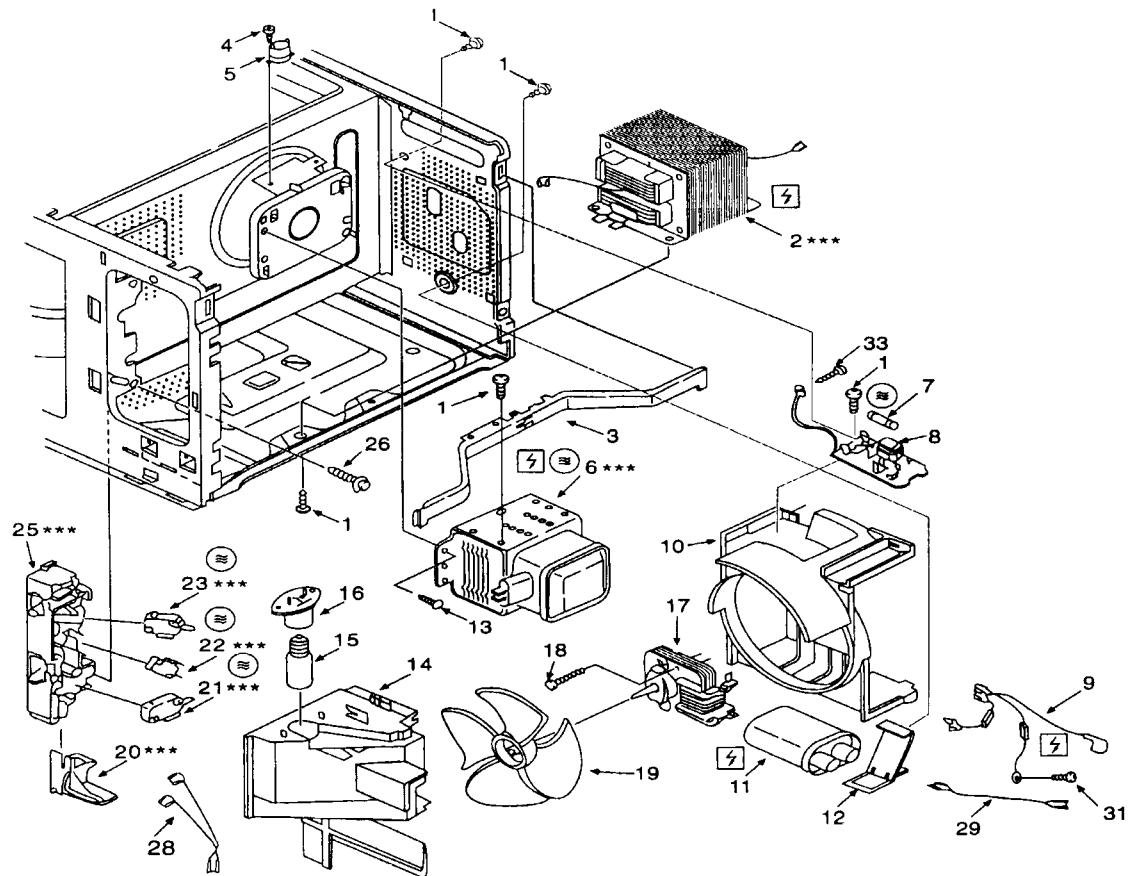
*** ALL SERVICE ON MICROWAVE OVENS SHOULD BE PERFORMED BY A QUALIFIED TECHNICIAN USING APPROVED TESTING EQUIPMENT. CUSTOMERS SHOULD NOT ATTEMPT TO REPLACE PARTS IDENTIFIED BY A TRIPLE ASTERISK (***).

Key No.	Part No.	Description	Q'ty.
1	617 214 9172	Cabinet, EM-X471S	1
1	617 224 2262	Cabinet, EM-X471YS	1
1	617 224 2125	Cabinet, EM-X471US	1
1	617 224 4082	Cabinet, EM-X471SS	1
1	617 214 9998	Cabinet, EM-X471BS	1
2	411 082 5201	SCR TPG TRS 4 x 10 Z1	8
3	411 160 6007	SCR TPG TRS + SRT 4 x 10 Z1	4
4	617 225 0724	Power Cord	1
5			
6	617 204 9366	Oven Cavity*** (Not Service Part)	1
7	617 151 2458	Gear Motor	1
8	411 010 5808	SCR EVR PAN 4 x 10 Z1	2
9	617 138 5601	Bottom Plate*** (Not Service Part)	1
10	617 221 6089	Plastic Foot with Canoe Clip	4

Key No.	Part No.	Description	Q'ty.
11	411 011 0802	Bolt Hex + SW + W 5 x 14 Z1***	2
12	617 180 6137	Hinge Lower***	1
13	411 089 2500	Washer F5 x 10 x 0.8	1
14	617 120 8481	Insulation Sheet	1
15	617 144 4476	Turn Table Shaft	1
16	617 204 9489	Roller	1
17	617 073 5889	Rotating Tray	1
18	617 204 9403	Antenna Complete	1
19	617 162 1938	Cavity Cover	1
20	411 069 1707	SCR TPG TRS 4 x 6 DA	1
21	411 006 6604	SCR TPG PAN 3 x 6 Z1	2
22	617 200 0381	Thermal Fuse 167°C	1
23	617 080 5315	Special Washer	1
24	411 160 6106	SCR S-T TRS + SRT 4 x 10 Z1	2

NOTE :Also order Circuit Diagram when replacing Cabinet

SWITCHES AND MICROWAVE PARTS



Parts marked with this sign are supplied with high voltage exceeding 250V.



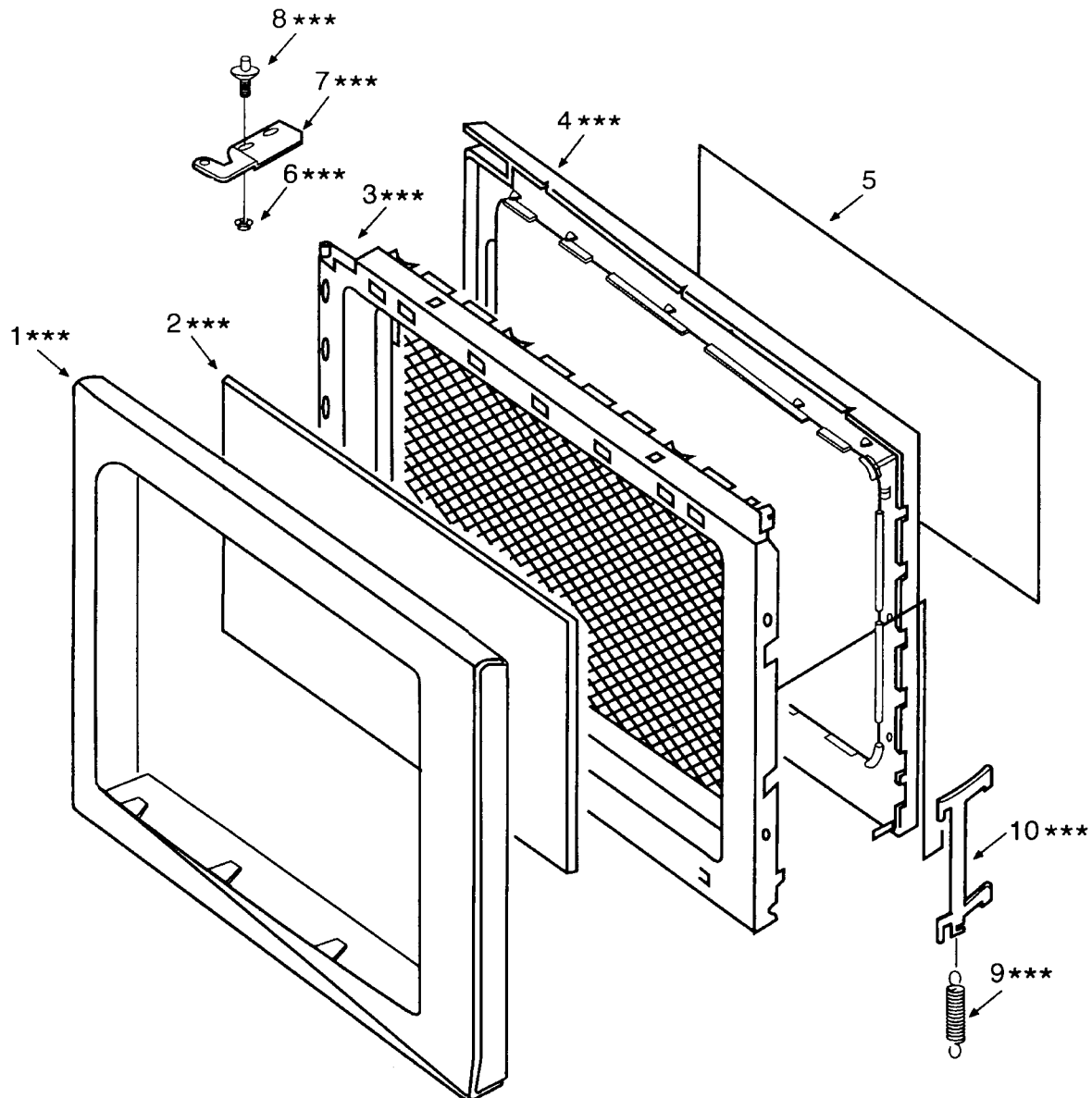
Parts marked with this sign have special characteristics important for microwave leakage. When replacing any of these parts use only manufacturers specified parts.

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Key No.	Part No.	Description	Q'ty.
1	411 082 5201	SCR TPG TRS 4 x 10 Z1	8
2	617 208 0260	H.V.Transformers,***YS-X670SAP	1
3	617 199 8283	Stay, Cavity & Magnetron	1
4	411 006 6604	SCR TPG PAN 3 x 6 Z1	1
5	617 124 1235	Thermostat, Magnetron 122°C	1
6	415 002 6101	Magnetron, 2M219H(B)A-***	1
7	423 022 7503	Fuse, 250V 8A	1
8	617 213 3416	Power PCB	1
9	617 225 8553	Lead Wire Ass'y, with Diode	1
10	617 162 1990	Space Partition (Blower)	1
11	617 212 9013	H.V.Capacitor including Resistor, 1.10uf 2.5KV.	1
12	617 182 2373	Capacitor Band	1
13	411 011 5609	Bolt Hex 4 x 10 Z1	4
14	617 198 4996	Duct, Magnetron Exhaust	1
15	617 110 3618	Lamp, 240V 25W	1
16	617 124 1280	Lamp Socket	1
17	617 167 0592	Blower Motor	1
18	411 082 5201	SCR TPG TRS 4 x 10 Z1	2

Key No.	Part No.	Description	Q'ty.
19	617 196 8507	Blower Fan	1
20	617 124 1181	Latch Lever ***	1
21	617 221 4078	Micro Switch, Primary Interlock AM51630C53F2***	1
22	617 221 4061	Micro Switch, Interlock Monitor AM50620C53***	1
23	617 221 4078	Micro Switch, Door Sensing AM51630C53F2***	1
24			
25	617 124 1174	Lever Stopper ***	1
26	411 102 5907	SCR ETG TRS 4 x 10 N2	2
27			
28	617 117 3505	Harness (Door Sensing)	1
29	617 124 3796	Lead Wire Ass'y	1
30			
31	411 001 4704	SCR S-T PAN 4 x 10 Z1	1
32			
33	411 160 6106	SCR S-T TRS + SRT 4 x 10 Z1	1

DOOR PARTS

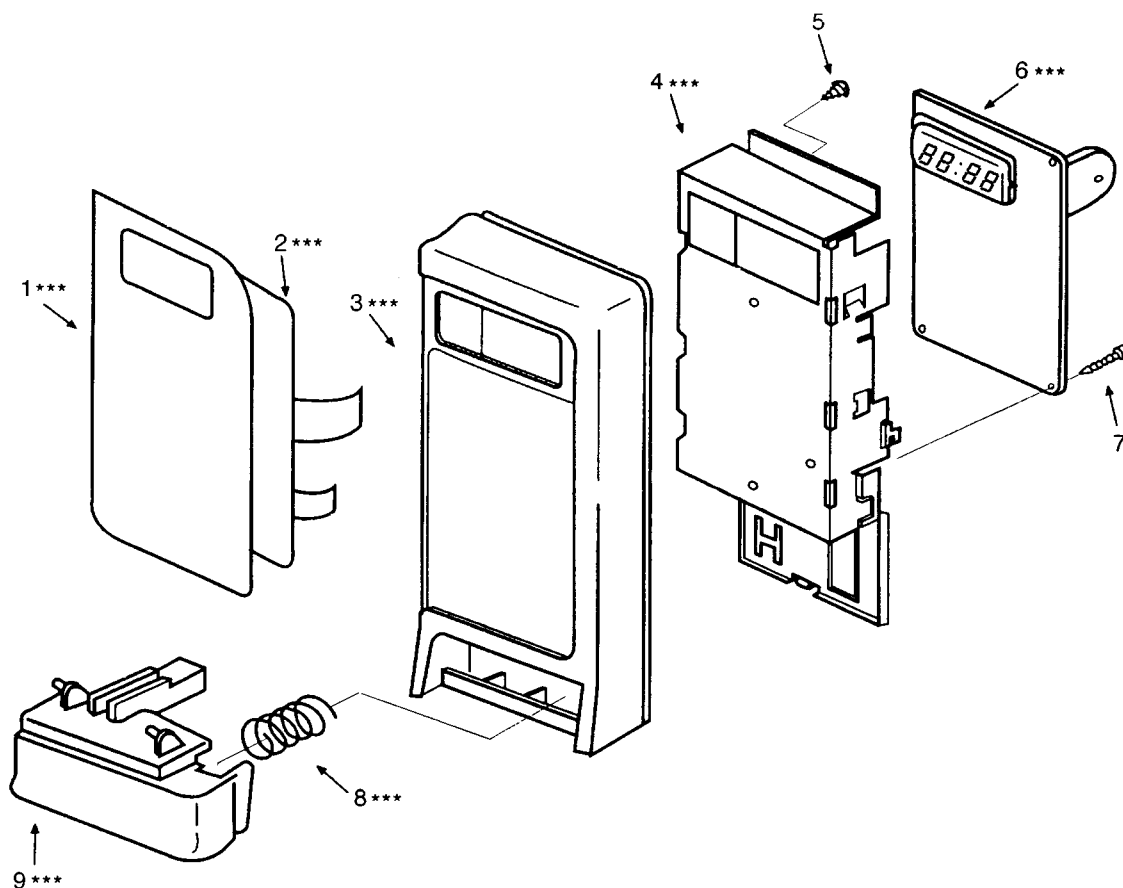


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Key No.	Part No.	Description	Q'ty.
1	617 207 6294	Door Cover ***EM-X471S	1
1	617 224 2286	Door Cover ***EM-X471YS	1
1	617 224 2149	Door Cover ***EM-X471US	1
1	617 224 4105	Door Cover ***EM-X471SS	1
1	617 210 7271	Door Cover ***EM-X471BS	1
2	617 210 7592	Door Panel ***	1

Key No.	Part No.	Description	Q'ty.
3	617 205 7163	Door Main Frame*** (Also order -Door Sheet when replacing -Door Main Frame)	1
4	617 124 0948	Choke Dielectric***	1
5	617 124 0931	Door Sheet	1
6	411 054 1903	Nut Hex + Flg W/SRT 5***	2
7	617 180 6151	Hinge, Upper***	1
8	411 011 0802	Bolt Hex + SW + W 5 x 14***	2
9	617 101 1494	Spring ***	1
10	617 179 2478	Door Latch ***	1

CONTROL PANEL PARTS



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Key No.	Part No.	Description	Q'ty.
1	617 225 6054	Control Sheet*** EM-X471S	1
1	617 225 8423	Control Sheet*** EM-X471YS	1
1	617 225 8430	Control Sheet*** EM-X471US	1
1	617 225 8447	Control Sheet*** EM-X471SS	1
1	617 225 9963	Control Sheet*** EM-X471BS	1
2	617 224 8189	Touch Key Board***	1
3	617 207 6317	Control Frame*** EM-X471S	1
3	617 224 2323	Control Frame*** EM-X471YS	1
3	617 224 2194	Control Frame*** EM-X471US	1
3	617 224 4143	Control Frame*** EM-X471SS	1
3	617 210 7301	Control Frame*** EM-X471BS	1

Key No.	Part No.	Description	Q'ty.
4	617 207 0377	Control Base***	1
5	411 160 6205	SCR TPG TRS + SRT 4 x 10 Z1	1
6	617 222 7016	Power & Control Circuit Board***	1
7	411 129 5805	SCR TPG BIN 3 x 10 Z1	2
8	617 080 9559	Spring, Door Release Lever***	1
9	617 207 0353	Door Release Lever***EM-X471S	1
9	617 224 2316	Door Release Lever***EM-X471YS	1
9	617 224 2187	Door Release Lever***EM-X471US	1
9	617 224 4136	Door Release Lever***EM-X471SS	1
9	617 210 7288	Door Release Lever***EM-X471BS	1

NOTE : Also order Touch Key Board when replacing Control Sheet and vise versa

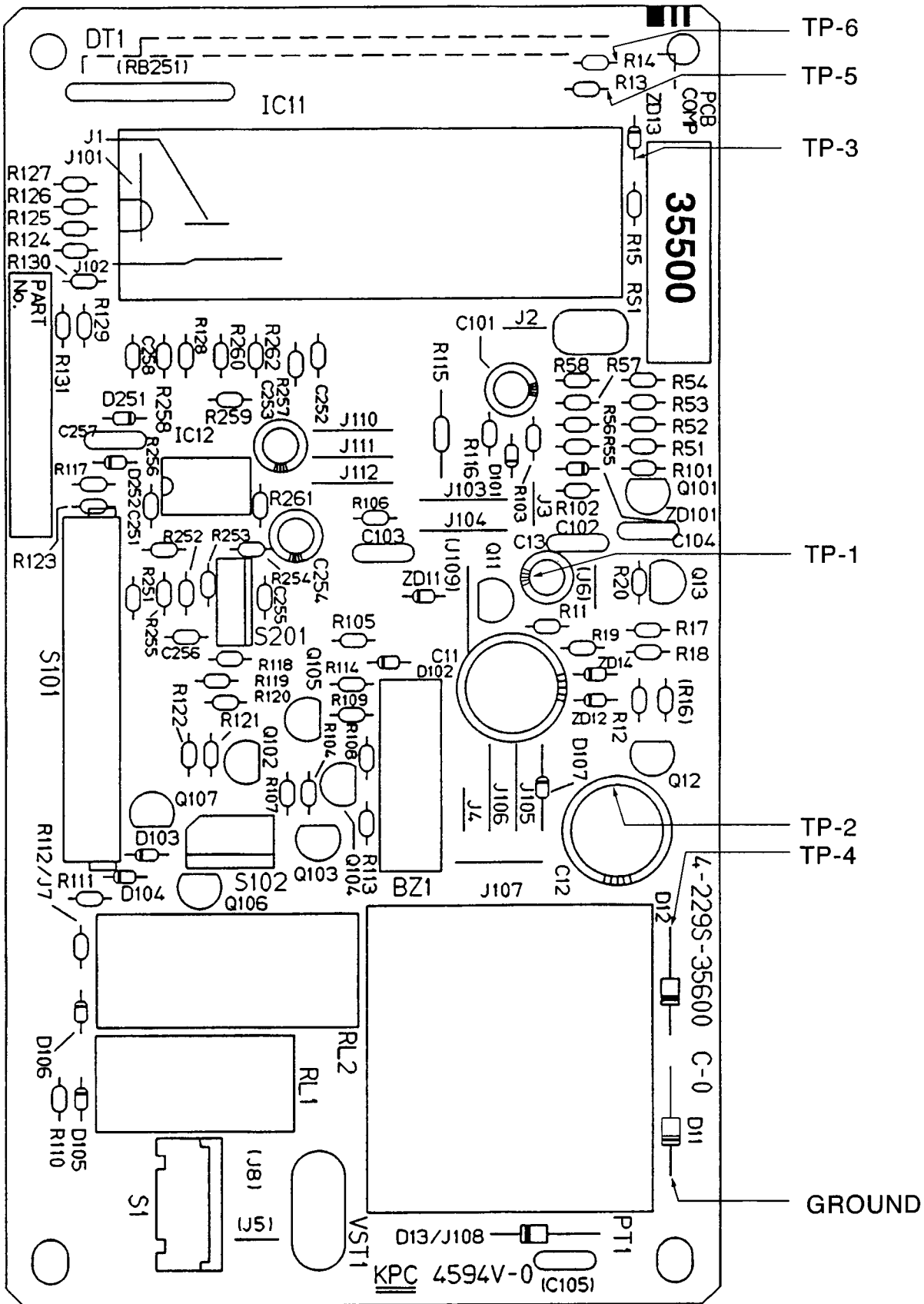
PRINTED MATTER (Items Not Illustrated)

Key No.	Part No.	Description	Q'ty.
	617 198 7324	Cook Book	1
	617 224 8219	Operating Instructions	1
	617 212 9006	Circuit Diagram	1
	617 224 8202	Carton Box Comp. EM-X471S	1
	617 225 1943	Carton Box Comp. EM-X471YS	1

Key No.	Part No.	Description	Q'ty.
	617 225 1998	Carton Box Comp. EM-X471US	1
	617 225 2049	Carton Box Comp. EM-X471SS	1
	617 225 9956	Carton Box Comp. EM-X471BS	1
	617 224 8158	Name Plate EM-X471S	1
	617 225 1899	Name Plate EM-X471YS	1
	617 225 1950	Name Plate EM-X471US	1
	617 225 2001	Name Plate EM-X471SS	1
	617 225 9871	Name Plate EM-X471BS	1

CONTROL CIRCUIT BOARD

(Part N0. 617 222 7016)



CONTROL CIRCUIT BOARD
(Part NO. 617 222 7016)

Key No.	Order Part No.	Description	Q'ty
INTEGRATED CIRCUIT.			
IC11	409 441 4606	IC LM8796C-360SP	1
TRANSISTORS.			
Q11, 12	405 004 3010	2SA564A-Q-TP	2
Q101	405 082 4619	DTA123YS-TP	1
Q102, 105, 107	405 000 1812	DTA143XS-TP	3
Q104	405 035 4819	2SC1685-Q-TP	1
Q106	405 000 3113	DTC114ES-TP	1
Q103	405 000 5612	DTC143XS-TP	1
DIODES.			
D11, 12	407 012 0220	1N4002-TP	2
D101-107	407 012 4426	1SS133-TP	7
ZD14	407 051 4415	GZS13Y-AT1	1
ZD11	407 057 0510	RD5.6ESB3	1
ZD12	407 160 6713	RD27ESB1	1
ZD13,101	407 132 2316	HZS3.9NB2	2
CAPACITORS.			
C102	403 002 4728	Ceramic,0.1mfd, +-5%, 25V.	1
C103, 104	403 069 8355	Ceramic, 0.01mfd, +-5%, 50V.	2
C101	403 147 8837	Electrolytic,1mfd, +-20%, 50V.	1
C11	403 152 7327	Electrolytic, 100mfd, +-20%, 35V.	1
C13	403 147 8629	Electrolytic,47mfd, +-20%, 10V.	1
C12	403 160 8729	Electrolytic,470mfd, +-20%, 25V.	1

Key No.	Order Part No.	Description	Q'ty
RESISTORS.			
R101, 107, 114,123-127	401 012 5639	Carbon, 1K ohms + -5%, 1/4W.	8
R15, 102, 108,109,116	401 012 6953	Carbon, 10K ohms + -5%, 1/4W.	5
R128, 130, 131	401 012 8056	Carbon, 100K ohms + -5%, 1/4W.	3
R16, 52, 55, 58	401 013 6338	Carbon, 12K ohms + -5%, 1/4W.	4
R13,14	401 016 2555	Carbon, 220 ohms + -5%, 1/4W.	2
R105	401 016 3750	Carbon, 2.2K ohms + -5%, 1/4W.	1
R104,106	401 016 4757	Carbon, 22K ohms + -5%, 1/4W.	2
R111, 112	401 016 9653	Carbon, 27 ohms + -5%, 1/4W.	2
R115	401 017 1735	Carbon, 2.7K ohms + -5%, 1/4W.	1
R110	401 018 2751	Carbon, 330 ohms + -5%, 1/4W.	1
R113	401 018 3738	Carbon, 3.3K ohms + -5%, 1/4W.	1
R117-122, 11	401 020 1957	Carbon, 4.7K ohms + -5%, 1/4W.	7
R103,53	401 020 2835	Carbon, 47K Ohms + -5%, 1/4W.	2
R12	401 021 2953	Carbon, 5.6K ohms + -5%, 1/4W.	1
MISCELLANEOUS.			
BZ1	420 000 6800	Buzzer, PKM22EPT-2001	1
VST1	407 118 5505	Varistor ENC 471D-10A.	1
DT1	617 220 9784	Display Tube.	1
RL1	617 137 9358	Relay, OJE-SH-112LM.	1
RL2	617 141 0549	Relay, DEC DU12D1-1PR.	1
RS1	617 128 3372	Ceramic Oscillator	1
S1	617 169 4109	Connector.	1
S101	617 126 8959	Connector,11P	1
S201	617 002 4396	Connector,3P, Male.	1
S102	617 111 1392	Connector, 2/3P, Male.	1
PT1	617 171 2155	Step-Down Transformer, PD5TK-S150.	1
2	617 079 4107	Spacer	1
J1-6	617 079 4299	Jumper.	6
J101-108	617 079 4237	Jumper.	8

6. OVERALL CIRCUIT DIAGRAM

