TECHNICAL MANUAL

INVERTER UNIT FOR MODEL R-10R50

SHARP CORPORATION

Basic Operation of Inverter Circuit

Basic circuit diagram is shown in Figure A-1.
AC line voltage is rectified and coverted to direct-current voltage (DC. Voltage). By switching the power transistor Q1 ON and OFF, high frequecy current (about 33 – 60 KHz) is generated. The switching of the transistor Q1 is controlled by the LSI of the inverter unit. Off-time of the transistor Q1 is nealy constant. That is, on-time is varied. It is a kind of Pulse Width Modulation (PWM). Because off-time is constant, switching frequency is varied in response to the length of on-time and output power of magnetron is proportional to the length of on-time. Therefore, the frequency of inverter becomes low for high output and high for low output.

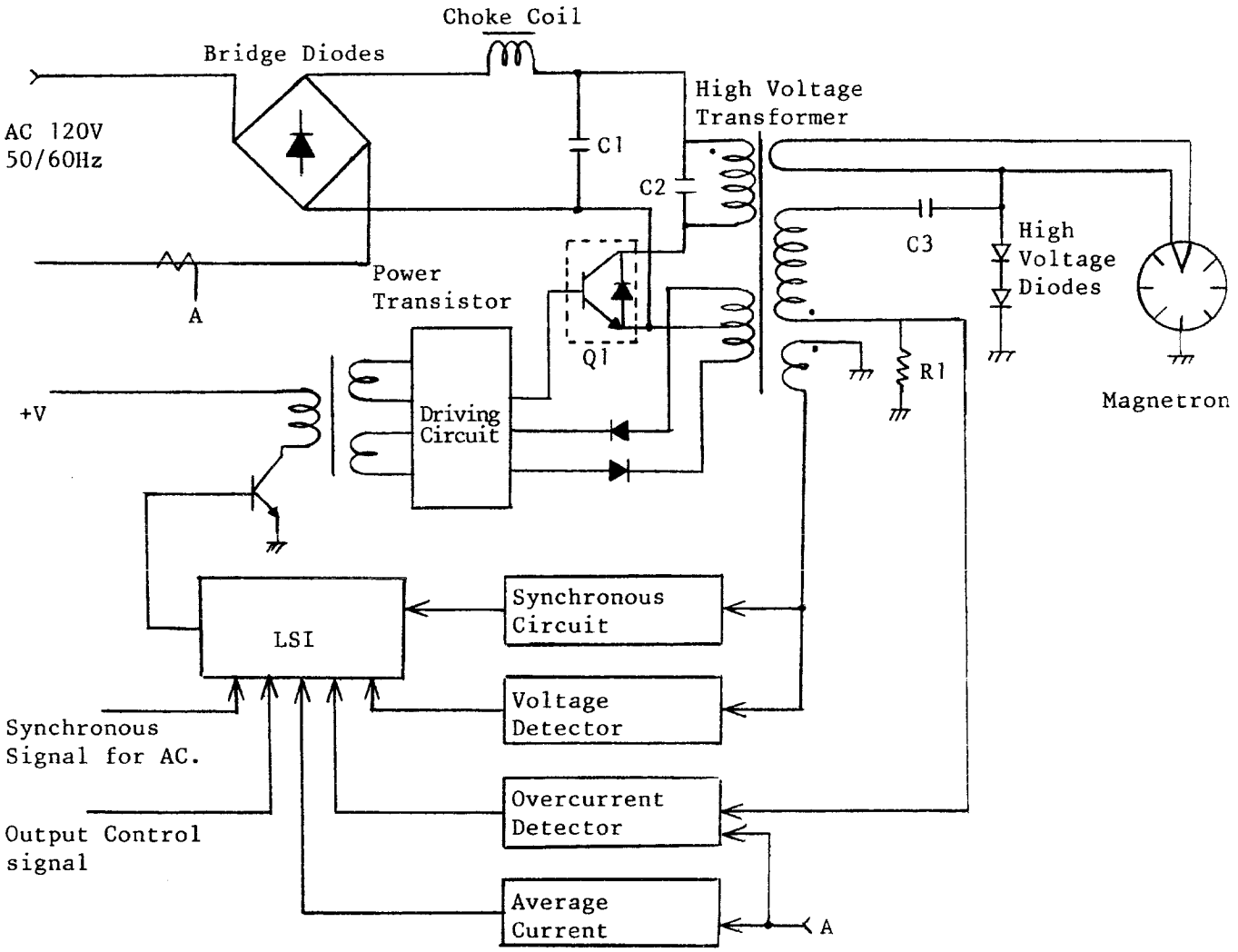


Figure A-1. Basic circuit

Waveform of main parts are shown in Figure A-2.

During off-time, flyback voltage appears on the primary winding of the high voltage transformer. The off-time depends on the inductance of the transformer and capacitance of the resonant capacitor C2. Syncronous circuit generates the timing signal by detecting the flyback voltage. The power transistor Q1 is periodically switched on when the collector voltage return to zero (0) volt. High voltage (about 2 KV) appears on the secondary winding of transformer. The half wave voltage doubler circuit increases to about 4 KV and applys to the magnetron. The efficiency of the inverter unit itself is approx. 88% and equal to that of current one. Ferrite core is used for the high voltage transformer. It is superior to silicon steel core at high frequency, low magnetic loss. The power level is determined by the touch control board, and the coded data corresponding to the level is set to the LSI of the Inverter through the data and control lines. The LSI controlls on-time of the transistor Q1 by comparing the average value of the primary current with the magnitude of the power lavel data. The LSI has the protection circuit which detects over-current of the main circuit and the high voltage circuit, over-voltage of the power transistor Q1 and AC power interruption. When abnormal phenomemon is detected, the LSI pauses on the monent in order to protect the power transistor Q1 from being destroyed. After approx. 1 millisecond, it starts generating the driving signal from the minimum pulse width and expands the length of on-time slowly until the current of the main circuit reaches the target level.

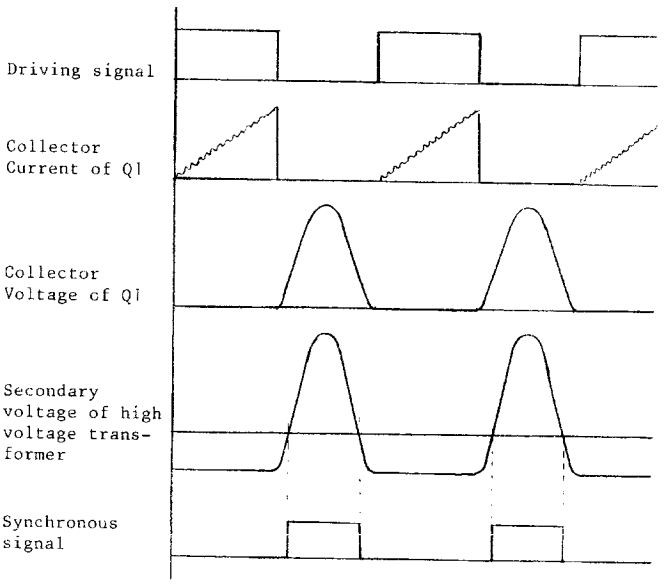


Figure A-2. Switching Waveform

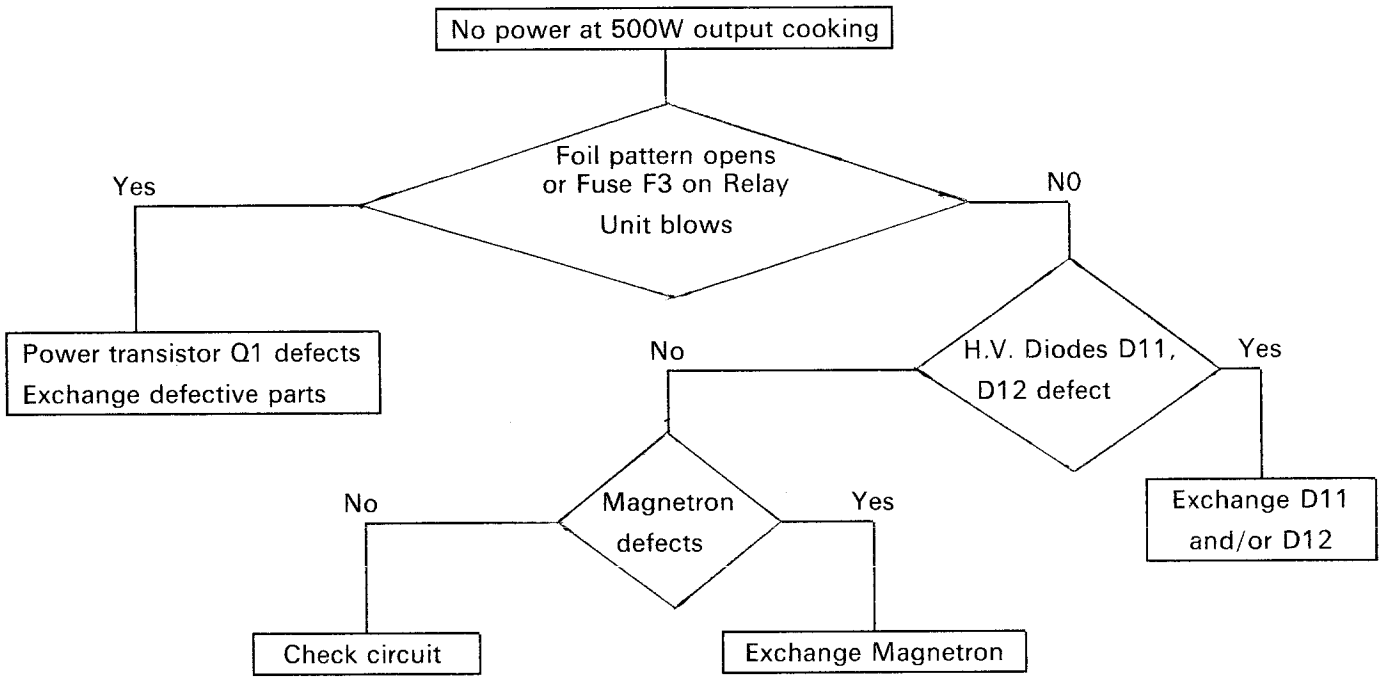
Servicing for Inverter Unit

WARNING

This inverter unit contain circuitry capable of producing very high voltage and current, contact with any part of the high voltage will result in electrocution.

- DO NOT CHECK ANY PARTS OF INVERTER UNIT WITH CONTACTED POWER SUPPLY
- DO NOT OPERATE INVERTER UNIT BY ITSELF.
  It is danger because this unit has high voltage components.

Chart for checking of defective inverter unit



Description of main parts

SYNBOL	PART NAME	FUNCTION
L1	Filter Coil	To suppress line noise
L2	Choke Coil	To smoth line signal
C101,102	Film Capacitor	To suppress line noise
CT1	Current Transformer	To detact power current
D1	Diode Bridge	To rectify full-wave of pwoer supply
C2	Film Capacitor	To smooth line signal
C3	Film Capacitor	Capacitor for resonant
Q1	Transistor	Power transistor for switching
Q2	Transistor	To drive Transistor Q1 ON
Q3	Transistor (MOS FET)	To drive Transistor Q1 OFF
Q5	Transistor	It will turn on and off according drive signal from IC1.
Q6	Transistor	To suppress high voltage of no load
IC1	Intergrated Circuit (LSI)	To control inverter circuit.
T1	H.V. Transformer assembly	High voltage transformer for high frequency.
T2	Isolate Transformer	Isolate transformer for drive circuit
D11,12	High Voltage Diode	High voltage diode for high frequency.
C11	High Voltage Capacitor	High Voltage Capacitor for doubler circuit.

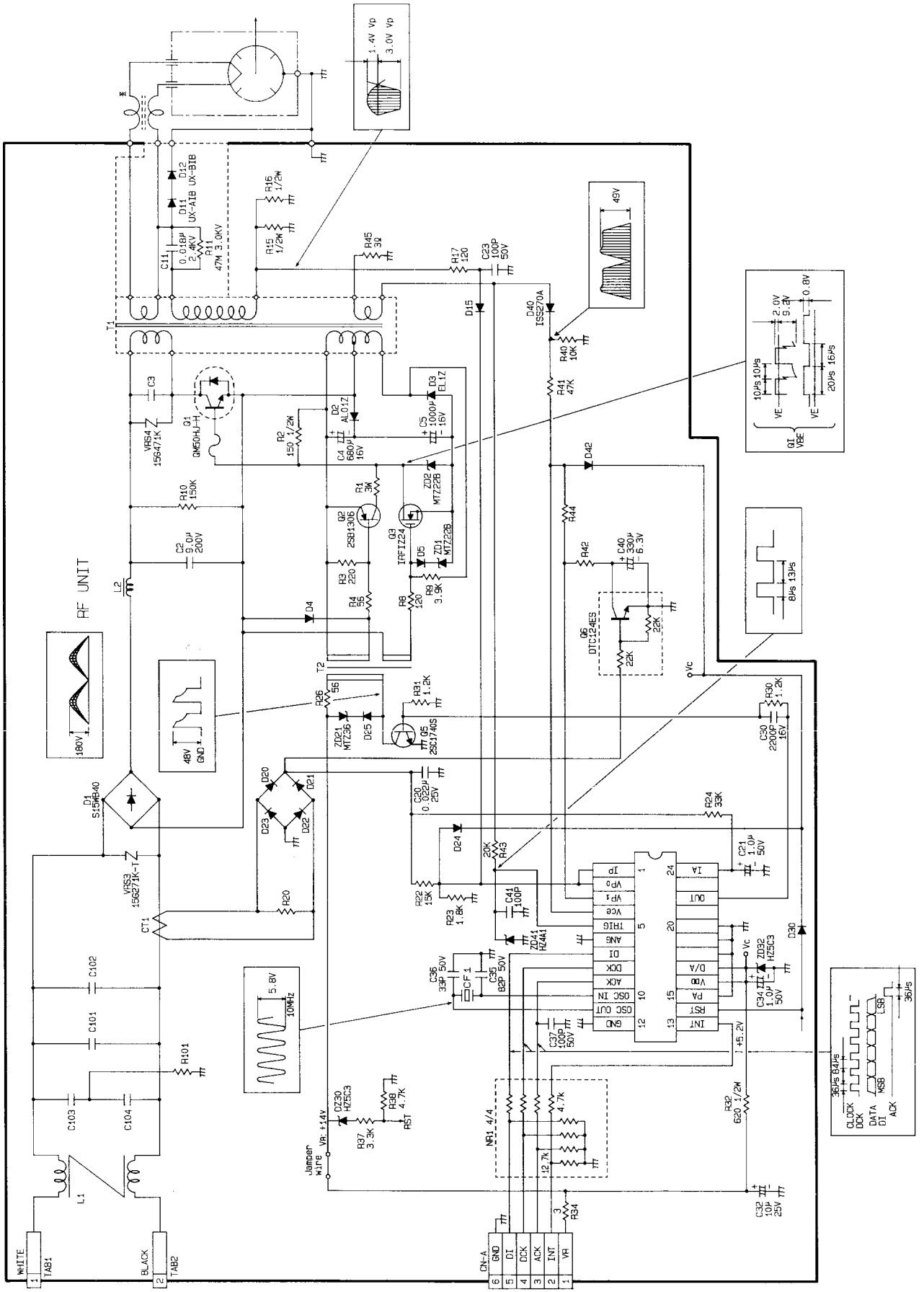


Figure S-1. Inverter Unit Circuit

Test procedure

1. H.V. Diode D11, D12
   Check these diode by using ohmmeter as shown Fig. B-1.
   If the diode shorted, exchange both diodes D11 and D12

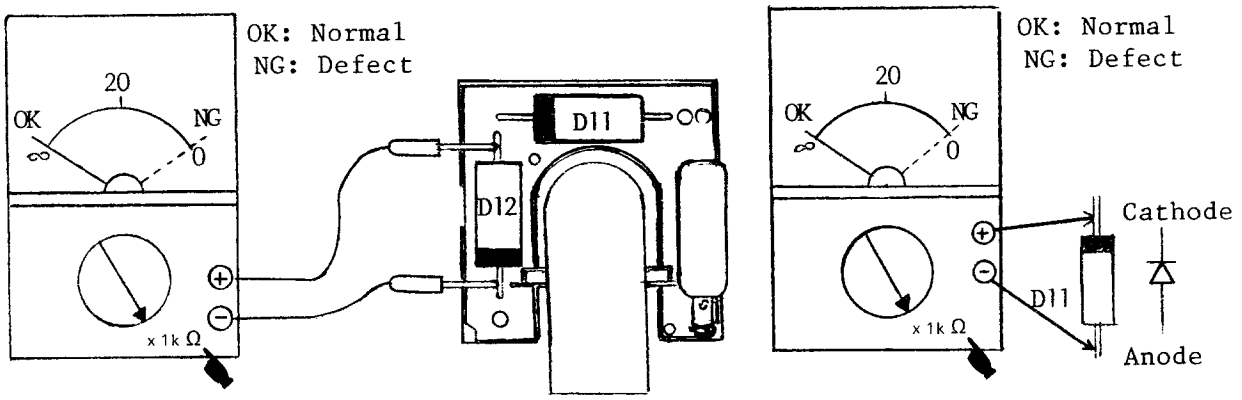


Figure B-1. Check for High Voltage Diode D11 and D12

2. Bridge Diode D1
   Check the diode D1 by using ohmmeter as shown Fig. B-2.
   If the diode D1 defects, exchange the D1 and Power Transistor Q1 at same time (Q1 is defect)

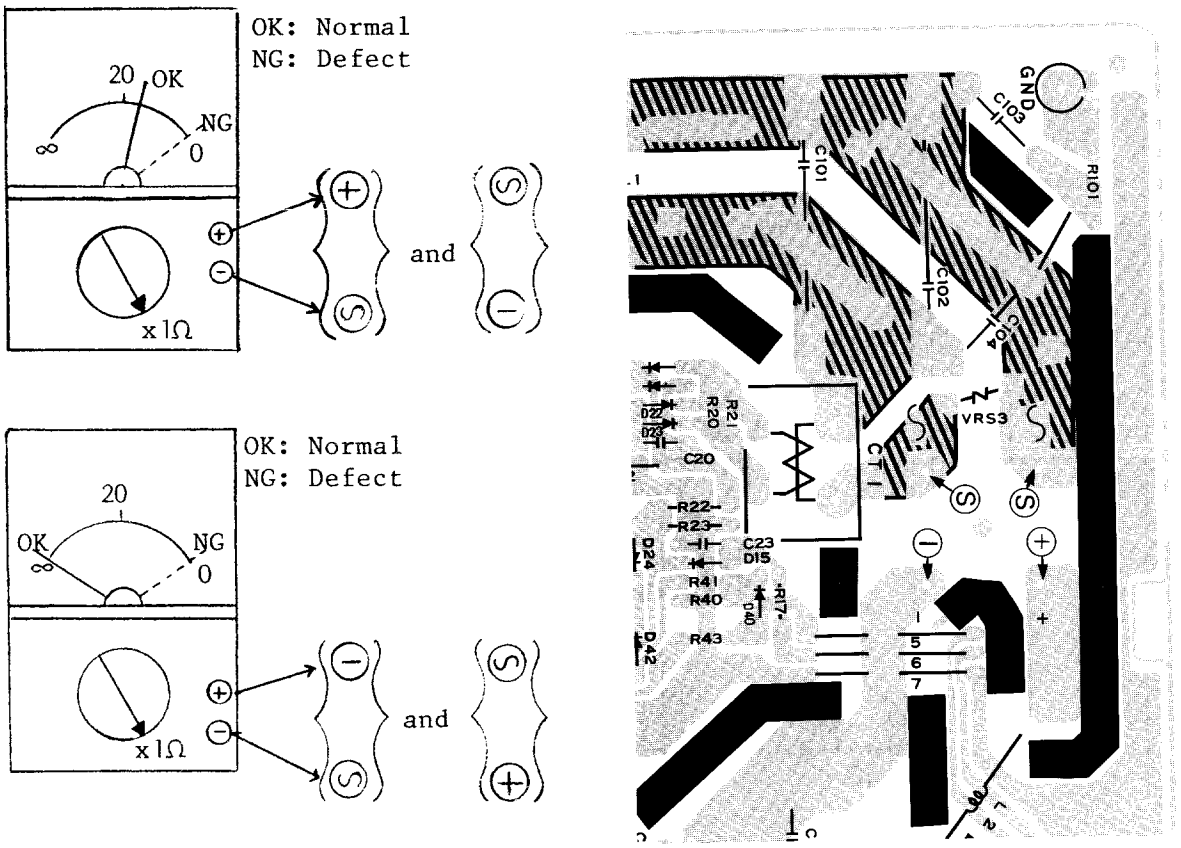


Figure B-2. Check for Bridge Diode D1

3. Power Transistor Q1
   Check the transistor Q1 by using ohmmeter as shown Fig. B-3. (If the foil pattern opend or Fuse F3 on relay unit blew, the Q1 is defect.)
   If the Q1 is defect, exchange Transistor Q3, Zener Diode ZD2 and Diode D3 with Q1 at same time.
   Check Bridge Diode D1, Diode D5 and Transistor Q2 by using ohmmeter and exchange defective one.

REPLACEMENT PARTS LIST FOR DEFECTED POWER TRANSISTOR Q1

Exchane follwing parts at same time with Q1			Check following parts and exchange defect one		
SYMBOL	PART NAME	PART CODE	SYMBOL	PART NAME	PART CODE
Q1	Power Transistor	RH-TZA110DRE0	D1	Bridge Diode	RSRCDA010DRE0
Q3	Transistor	RH-TZA112DRE0	D5	Diode	VHD1SS133//-1
ZD2	Zener Diode	VHEMTZ22B//-1	Q2	Transistor	VS2SB1306//-1
D3	Diode	RH-DZA048DRE0	C3	Capacitor 0.14 μF 580V	RC-FZA025DRE0

Replacement procedure

a. Take off the solder on legs of Q1 and metal plate, and take out the Q1 with heatsink from inverter unit boad.
b. Separate the Q1 and heatsink by remove two (2) screws.
c. Exchange Q1 and reinstall the heatsink after coated heatsink-grease on Q1.
d. Exchange Transistor Q3, Zener Diode ZD2 and Diode D3 (Q3 can not check by ohmmeter.)
e. Check Zener Diode ZD1 by using ohmmeter. If ZD1 is shorted, exchange Diode D5 with ZD1 at same time.
f. Check Transistor Q2 by using ohmmeter. Correct resistance between B. and E. of Q2 is approx. 20 Ω and between C. and E. of Q2 is Over Range. If Q2 is defect, exchange Q2.
g. If the foil pattern is open, insert jumper wire at position "A" and solder as shown Fig. B-4
h. Check appearance of individual parts on invterter unit and finish of soldering condition are normal.

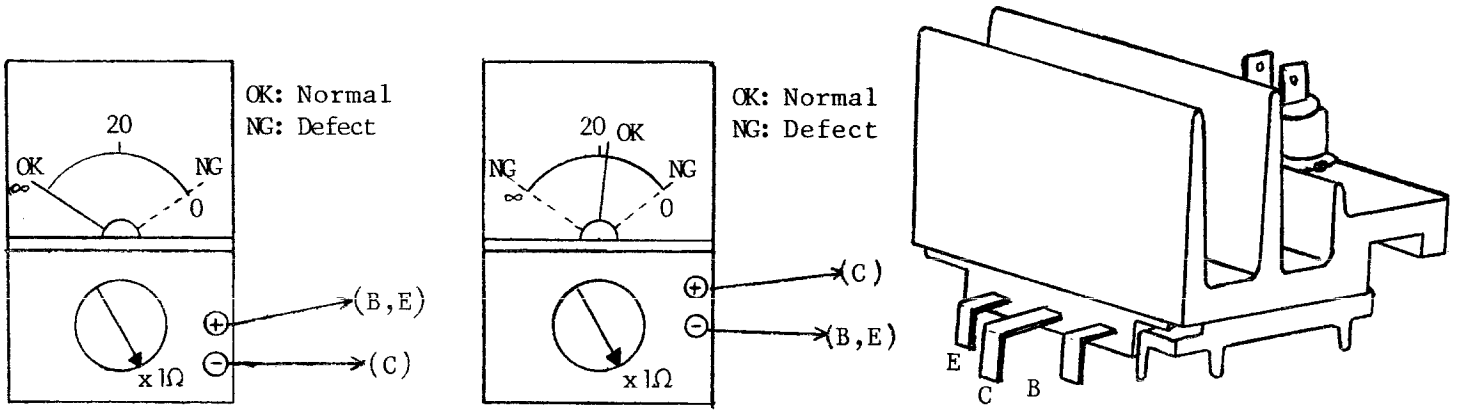


Figure B-3. Check for Power Transistor Q1

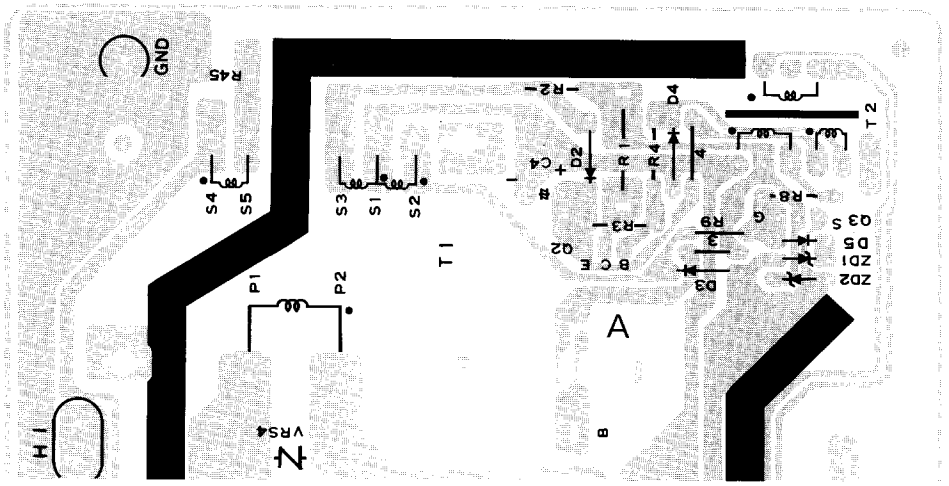


Figure B-4. Repair of Foil pattern

Operation check

CAUTION: DO NOT OPERATE INVERTER UNIT BY ITSELF.

1. Make sure oven is disconnected from power supply.
2. Install inverter unit to inverter unit angle correctly with two (2) screws.
3. Connect 6-pin connector on inverter unit.
4. Connect H.V. wire of flyback transformer to Magnetron 2
5. Connect wire leads (Black and White) from main harness to TAB1 and TAB2 of inverter unit.
6. Install inverter unit with angle to oven chassis.
7. Fix earth wire of inverter unit to magnetron duct.
8. Make sure wiring connections and inverter unit are installing correctly and securely.
9. Install outer cabinet and operate the oven

CAUTION: DO NOT OPERATE THE OVEN WITHOUT THE OUTER CASE CABINET.

10. Measure the microwave output power at 500W cooking condition or mesure input current at 200W and 1000W cooking condition.
11. Microwave output power should be less than 500W ± 15%.
    Input current are approx. 2 – 3A at 200W output power and 5 – 6A at 1000W output power

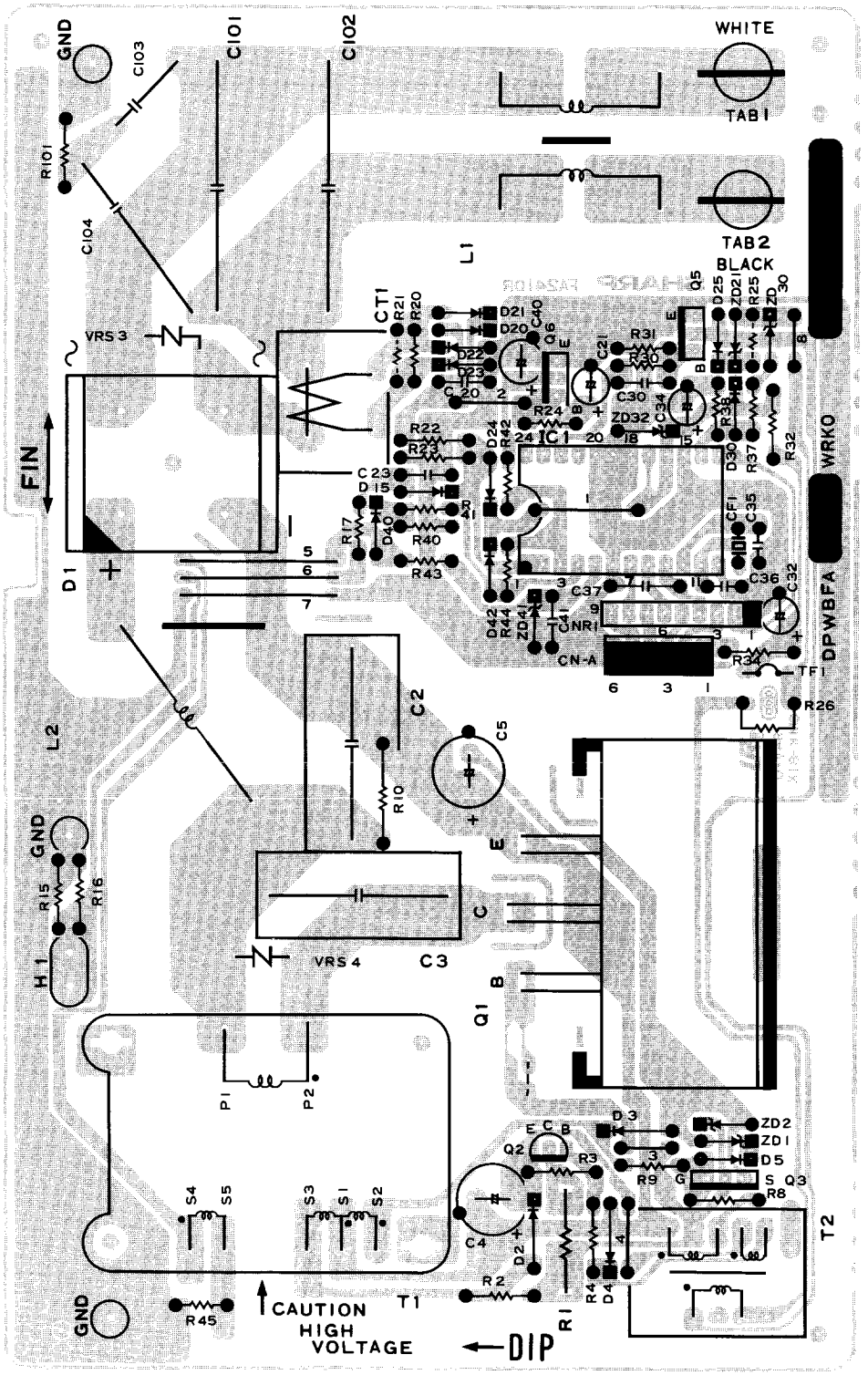


Figure C-1. Printed Wiring Boad

PARTS LIST FOR INVERTER UNIT

Note : The parts marked "*" are used in voltage more than 250V.

	REF. NO.	PART NO.	DESCRIPTION	Q'TY	CODE
			ELECTRIC PARTS		
*	RF	DPWBFA681WRK0	Inverter Unit	1	BT
	IC1	RH-IZA180DRE0	LSI (LR3962)	1	AS
	Q1	RH-TZA110DRE0	Power Transistor	1	AW
	Q2	VS2SB1306//-3	Transistor 2SB1306	1	AC
	Q3	RH-TZA112DRE0	Transistor FIZ24	1	AH
	Q5	VS2SC1740S/-3	Transistor 2SC1740STP	1	AA
	Q6	VSDTC124ES/-3	Transistor DTC124ES	1	AA
	D1	RSRCDA010DRE0	Bridge Diodes	1	AL
	D2	RH-DZA045DRE0	Diode	1	AB
	D3	RH-DZA048DRE0	Diode	1	AC
	D4,20,15 D20 - 25 D30,42	VHD1SS133//-1	Diode (1SS133T)	11	AA
*	D11	RH-DZA049DRE0	High Voltage Diode	1	AG
*	D12	RH-DZA050DRE0	High Voltage Diode	1	AG
	D40	VHD1SS270A/-1	Diode (1SS270A)	1	AA
	ZD1, 2	VHEMTZ22B//-1	Zener Diode (MTZ22B)	2	AA
	ZD21	VHEMTZ36C//-1	Zener Diode (MTZ36C)	1	AA
	ZD30,32	VHEHZ5C3///-1	Zener Diode (HZ5C3)	2	AA
	ZD41	VHEHZ4A1///-1	Zener Diode (HZ4A1)	1	AA
	L1	RTRNCA007DRE0	Filter Coil	1	AN
	L1	RTRNCA008DRE0	Choke Coil	1	AM
	VRS3	RH-VZA008DRE0	Varistor 15G271K	1	AE
	VRS4	RH-VZA010DRE0	Varistor 15G471K	1	AE
	CF1	RCRS-A013DRE0	Ceramic resonator (10 MHz)	1	AD
	CT1	RTRN-A060DRE0	Current Transformer	1	AH
*	T1	FTRN-A008DRK0	High Voltage Transformer Assembly	1	BC
	T2	RTRNLA005DRE0	Transformer	1	AL
	TC1	RTHM-A017WRE0	Thermal Cut-out 115 °C	1	AF
*	C2	RC-FZA026DRE0	Capacitor 9.0 µF 200V	1	AH
*	C3	RC-FZA025DRE0	Capacitor 0.14 µF 580V	1	AF
	C4	RC-EZA241DRE0	Capacitor 680 F 16V	1	AC
	C5	RC-EZA240DRE0	Capacitor 1000 µF 16V	1	AD
*	C11	RC-FZA018DRE0	HV Cacpcitor 0.018 µF2.4kV	1	AE
	C20	VCKYD11EF223Z	Capacitor 0.022 µF 25V	1	AA
	C21,34	VCEAB31HW105M	Capacitor 1.0 µF 50V	2	AA
	C23,37 C41	VCKYD11HB101K	Capacitor 100 pF 50V	3	AA
	C30	VCKYD11CX222N	Capacitor 2200 pF 16V	1	AA
	C32	VCEAB31EW106M	Capacitor 10 µF 25V	1	AA
	C35	RC-KZA083DRE0	Capacitor 82 pF 50V	1	AA
	C36	RC-KZA084DRE0	Capacitor 33 pF 50V	1	AA
	C40	VCEAB30JW337M	Capacitor 330 µF 6.3V	1	AB
*	C101,102	RC-FZA022DRE0	Capacitor 1.0 µF 250V	2	AK
*	C103,104	RC-KZA086DRE0	Capacitor 2200 pF 250V	2	AE
	NR1	RR-DZA106DRE0	Resistor Block 2.7k Ω / 4.7k Ω	1	AC
	R1	RR-SZA018DRE0	Resistor 3.3 Ω 3W	1	AC
	R2	VRD-B12HF151J	Resistor 150 Ω 1/2W	1	AA
	R3	VRD-B12EF221J	Resistor 220 Ω 1/4W	1	AA
	R4,26	VRD-B12EF560J	Resistor 56 Ω 1/4W	2	AA
	R8,17	VRD-B12EF121J	Resistor 120 Ω 1/4W	2	AA
	R9,42	VRD-B12EF392J	Resistor 3.9k Ω 1/4W	2	AA
	R10	VRD-B12EF154J	Resistor 150k Ω 1/4W	1	AA
*	R11	RR-HZA001DRE0	H.V. Resistor 47M Ω 3kV	1	AE
	R15,16	VRD-B12HF3R0J	Resistor 3.0 Ω 1/2W	2	AA
	R20	VRD-B12EF272J	Resistor 2.7k Ω 1/4W	1	AA
	R22	VRD-B12EF153J	Resistor 15k Ω 1/4W	1	AA
	R23	VRD-B12EF182J	Resistor 1.8k Ω 1/4W	1	AA
	R24	VRD-B12EF333J	Resistor 33k Ω 1/4W	1	AA
	R30,31	VRD-B12EF122J	Resistor 1.2k Ω 1/4W	2	AA
	R32	VRD-B12HF621J	Resistor 620 Ω 1/2W	1	AA
	R34,45	VRD-B12EF3R0J	Resistor 3.0 Ω 1/4W	2	AA

Note : The parts marked "*" are used in voltage more than 250V.

REF. NO.	PART NO.	DESCRIPTION	Q'TY	CODE
R37	VRD-B12EF332J	Resistor 3.3k Ω 1/4W	1	AA
38	VRD-B12EF472J	Resistor 4.7k Ω 1/4W	1	AA
R40	VRD-B12EF103J	Resistor 10k Ω 1/4W	1	AA
R41	VRD-B12EF473J	Resistor 47k Ω 1/4W	1	AA
R43	VRD-B12EF203J	Resistor 20k Ω 1/4W	1	AA
R44	VRD-B12EF391J	Resistor 390 Ω 1/4W	1	AA
R101	VRD-B12HF102J	Resistor 1k Ω 1/2W	1	AA

CONNECTOR, SCREW etc.

CN-A	QCNCMA148DRE0	6-pin Connector	1	AC
TAB1,2	QLUGPA012DRE0	Tablet	2	AA
	QW-HZA036DRE0	High Voltage Wire	1	AD
	QW-VZA122DRE0	Earth Wire E (Long)	1	AE
	QW-VZA120DRE0	Earth Wire B (Short)	1	AC
	PRDAFA026DRF0	Heatsink of Power Transistor Q1	1	AK
	PRDAFA027DRF0	Heatsink of Bridge Diode D1	1	AG
	PRDAFA028DRF0	Transistor Bracket	1	AD
	XCBSD30P08000	Screw; Thermal Cut-out mounting	2	AA
	XCBSD30P06000	Screw; Power Transistor mounting	2	AA
	XCPSD40P14000	Screw; Bridge Diode mounting	1	AA
	XCPSD30P05000	Screw; H.V. Unit (D11,D12, etc.) mounting	1	AA

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