

*Technical Publication*

*Ver.2*

# **Troubleshooting**

*EVA-HF325/525 generator*

## ADVISORY SYMBOLS

The following advisory symbols will be used throughout this manual. Their application and meaning are described below.



DANGERS ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEED OR AVOIDED WILL CAUSE SERIOUS PERSONAL INJURY OR DEATH.



ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEED OR AVOIDED COULD CAUSE SERIOUS PERSONAL INJURY, OR CATASTROPHIC DAMAGE OF EQUIPMENT OR DATA.



ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEED OR AVOIDED COULD CAUSE PERSONAL INJURY OR DAMAGE TO EQUIPMENT OR DATA.

## TABLE OF CONTENTS

1. INTRODUCTION	4
2. ERROR CODES	5
3. FLOW CHART	7
4. ERROR CHECK	9
5. EEPROM TABLE	10
6. WAVEFORM DATA	11
7. JOB CODE	16
8. X-RAY CHECK	35
9. MAIN CARD BOARD(MOTHER BOARD)DRAWING	39

# 1. INTRODUCTION

The generator contains many self-diagnostic routines which greatly facilitates troubleshooting. The self-diagnostic functions require that all microprocessors function properly. Each microprocessor contains LEDs, LCD that indicates their proper operation.



THE MAIN STORAGE CAPACITORS RETAIN A LARGE PORTION OF THEIR FOR APPROXIMATELY 5MIN. AFTER THE UNIT IS TURNED OFF.



ALWAYS HAVE "IPM DRIVER PCB" CONNECTED WHEN MAIN POWER IS ACTIVATED IN THE GENERATOR. WHITOUT "IPM DRIVER PCB" CONNECTED, PERMANENT DAMAGE WILL OCCUR TO IPM'S.



DO NOT USE THE GENERATOR POWER SUPPLIES TO POWER EQUIPMENT EXTERNAL TO THE GENERATOR. ALL GENERATOR INPUTS AND OUTPUTS MUST BE TTL LOGIC LEVELS (TYPICALLY ACTIVE LOW) AND ISOLATED FROM OTHER SUBSYSTEMS OPTICALLY OR WITH DRY CONTACT RELAYS.



IF CHANGE EEPROM ON CONSOLE DISPLAY BOARD, WILL LOSE CALIBRATION DATA, APR DATA, AND SOME DATA. SO MUST CHECK EEPROM DATA.

AND IF CHANGE UV-PROM ON HT CONTROL CPU BOARD AND CONSOLE DISPLAY BOARD, WILL CHECK THE VIRSION OF PROGRAM.

## 2. ERROR CODES

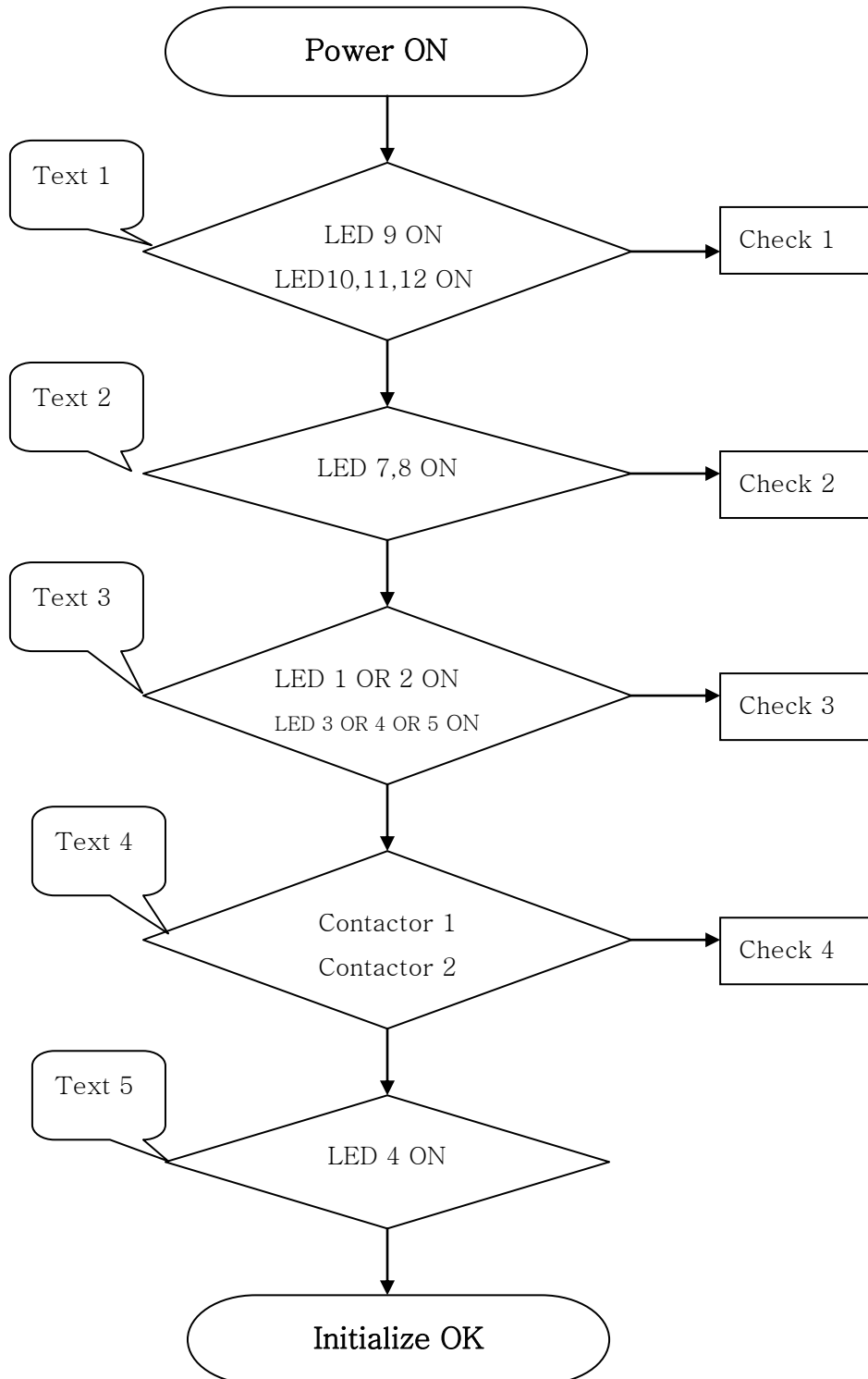
System error codes are displayed on the kVp display LCD(condition display LCD)

Each code is preceded by the letter " E"(i.e. E16). Error codes are described in below tables.

ERROR CODE	DESCRIPTION
Display E xx	A system failure has been detected. The system must be turned OFF and then ON to clear the error. Besides display "E xx", another error code could be shown on the Console display LCD.
E16	KV DATA is more than "FD"(see JOB CODE 020) Check KV DATA located Calibration data in EEPROM
E17	KV DATA is less than "20"(see JOB CODE 020) Check KV DATA located Calibration data in EEPROM
E18	mA DATA is more than "FD"(see JOB CODE 020) Check mA DATA located Calibration data in EEPROM
E19	mA DATA is less than "20"(see JOB CODE 020) Check mA DATA located Calibration data in EEPROM
E20	TIME DATA is abnormal(see JOB CODE 021) Check TIME DATA located in EEPROM address
E21/E22	COMP DATA is abnormal(see JOB CODE 020) Check COMP DATA located Calibration data in EEPROM
E26/E27	ROTOR is abnormal(see JOB CODE 022) Check ROTOR sensing circuit section or ROTOR DATA located in EEPROM address
E28	CHARGE is abnormal(see JOB CODE 008 ~010) Charge capacitor(4700uF) is not charge Check charge sensing circuit section
E29	Filament sensing "LOW" (see JOB CODE 023) Low current input to filament Check filament sensing circuit section

E30	Filament sensing "HIGH"(see JOB CODE 023) High current input to filament Check filament sensing circuit section
E32	TEMP is abnormal(see JOB CODE 024) Tube temperature is overheated Check Tube temperature section.
E00	IPM fault(see JOB CODE 025) Check IPM fault section

### 3. FLOW CHART



**TEXT 1**

Led 9 ON is meaning of system power input OK.

Led 10,11,12 ON is meaning of power supply +5V,+12V,-12V OK.

That Leds located on Relay power board.

**TEXT 2**

Led 7 ON is meaning of discharge of capacitor ON.

Led 8 ON is meaning of

Filament power input(AC60) ON.

Bucky power input(AC110) ON.

Lock power input(DC30) ON.

Collimeter power input(AC20) ON.

That Leds located on Relay power board.

**TEXT 3**

Led 1 ON is meaning of selected large focus filament.

Led 2 ON is meaning of selected small focus filament.

Leds ON will select Led 1 or Led 2.

Led 3 ON is meaning of selected bucky 1.

Led 4 ON is meaning of selected bucky 2.

Led 5 ON is meaning of selected bucky 3.

Led 3,4,5 all OFF is meaning of selected NO bucky and That leds ON will selected Led 3 or Led 4 or Led 5.

That Leds located on Relay Power Board.

**TEXT 4**

Contact 1, 2 is meaning of Main contactor and charge contactor ON.

**TEXT 5**

That meaning is System initializing OK.

Led 4 located on HT control cpu board.



## 4. ERROR CHECK

### CHECK 1

- Line input power check(see JOB CODE 001)
- Communication cable check(see JOB CODE 002)
- Membrane key check(see JOB CODE 003)
- Bridge diode in Relay power board(see JOB CODE 004)
- AC12V input check(see JOB CODE 005)

### CHECK 2

- Power(+5V,+12V,-12V) in Relay power board(see JOB CODE 006)
- Power ON signal check(see JOB CODE 007)

### CHECK 3

- Check ERROR CODE TABLE

### CHECK 4

- Check charge/discharge monitor board(see JOB CODE 008)
- Check charge contactor(see JOB CODE 009)
- Check charge signal in HT control cpu board(see JOB CODE 010)

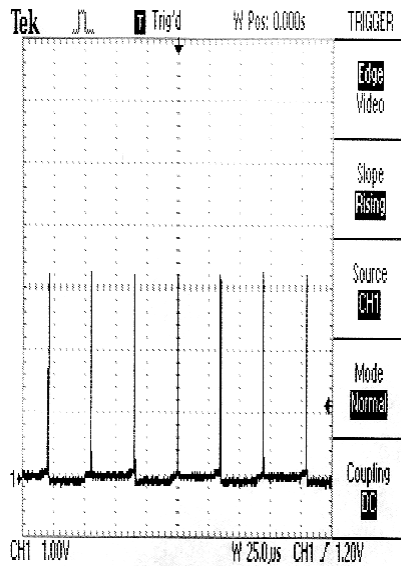
## 5. EEPROM TABLE

The APR and Calibration data and some technique data stored in the U23-EEPROM of the Operating\_Panel\_Control(Console display) Board.

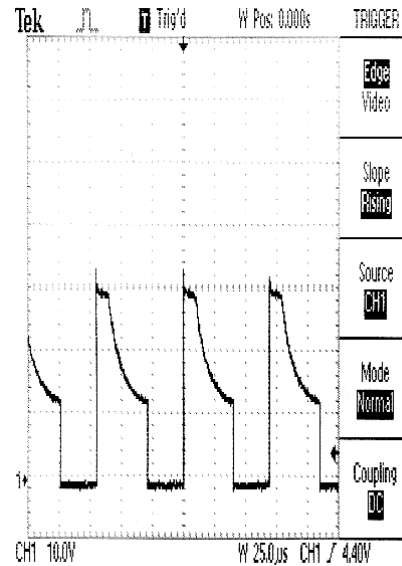
Address	+0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +A +B +C +D +E +F	003000	23 05 1C 83 23 05 1B 83 28 05 1D 83 1E 05 1C 83
000000	FF F6 F6 F5 F5 F4 F4 F3 F2 F1 F0 EF EE ED EC EB	003010	1E 05 1B 83 05 03 15 85 FF FF FF FF FF FF FF FF
000010	EA E9 E8 FF FF FF FF FF FF FF FF FF FF FF FF	003020	2D 05 1D 83 23 03 1F 85 26 03 1E 85 2D 03 1F 85
000080	FF 08 08 08 08 08 08 08 08 08 08 08 08 08 08	003030	21 05 1B 83 26 05 1D 83 FF FF FF FF FF FF FF FF
000090	08 08 07 FF FF FF FF FF FF FF FF FF FF FF FF	003040	37 05 11 93 37 05 1C 93 28 05 1C 93 21 05 1C 93
000100	FF F8 F8 F7 F7 F6 F6 F5 F5 F4 F4 F3 F3 F2 F2 F1	003050	28 05 1D 93 28 05 1C 93 FF FF FF FF FF FF FF FF
000110	F0 EF EE FF FF FF FF FF FF FF FF FF FF FF FF	003060	23 05 1C 8B 23 05 1D 8B 28 05 1E 8B 2D 05 1C 8B
000180	FF 09 09 09 09 09 09 09 09 09 09 09 09 09 09	003070	37 05 1E 8B 32 05 20 8B FF FF FF FF FF FF FF FF
000190	09 09 08 FF FF FF FF FF FF FF FF FF FF FF FF	003080	28 05 1E 8B 28 05 1E 8B 2D 05 1E 8B 1E 05 1F 8B
000200	FF FA FA FA FA F9 F9 F8 F8 F7 F7 F6 F6 F5 F5 F4	003090	32 05 1F 8B 37 05 1E 8B FF FF FF FF FF FF FF FF
000210	F3 F2 F1 FF FF FF FF FF FF FF FF FF FF FF FF	0030A0	05 03 0D 85 08 03 13 85 0A 03 15 85 0A 03 19 85
000280	FF 09 09 09 09 09 09 09 09 09 09 09 09 09 09	0030B0	0A 03 1B 85 0F 03 1D 85 FF FF FF FF FF FF FF FF
000290	09 09 08 FF FF FF FF FF FF FF FF FF FF FF FF	0030C0	08 03 1B 85 0F 03 1B 85 0F 03 1B 85 14 03 1D 85
000300	FF FC FC FB FB FA FA F9 F9 F8 F8 F7 F7 F6 F6 F5	0030D0	19 03 1D 85 14 03 1B 85 FF FF FF FF FF FF FF FF
000310	F4 F3 F2 FF FF FF FF FF FF FF FF FF FF FF FF	0030E0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
000380	FF 0A 0A 0A 0A 0A 0A 0A 0A 0A 0A 0A 0A 0A 0A	0030F0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
000390	0A 0A 09 FF FF FF FF FF FF FF FF FF FF FF FF	003200	21 05 16 83 1E 05 16 83 21 05 1B 83 21 05 16 83
000400	FF FF FF FF FF FF FE FE FD FD FC FC FB FB FA	003210	1E 05 16 83 03 03 11 85 FF FF FF FF FF FF FF FF
000410	F9 F8 F7 FF FF FF FF FF FF FF FF FF FF FF FF	003220	21 03 1E 85 1E 03 1E 85 1E 03 1D 85 23 03 1E 85
000480	FF 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B	003230	20 03 1B 85 20 03 1E 85 FF FF FF FF FF FF FF FF
000490	0B 0B 0A FF FF FF FF FF FF FF FF FF FF FF FF	003240	28 05 0E 93 2D 05 16 93 28 05 16 93 1E 05 16 93
000500	FF 02 02 02 02 02 01 01 00 FF FF FF FF FE FE FD	003250	1E 05 1C 93 28 05 16 93 FF FF FF FF FF FF FF FF
000510	FD FC FB FF FF FF FF FF FF FF FF FF FF FF FF	003260	1E 05 1B 8B 20 05 1B 8B 20 05 1C 8B 28 05 1B 8B
000580	FF 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B	003270	2D 05 1D 8B 2D 05 1E 8B FF FF FF FF FF FF FF FF
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000610	FF FE FD FF FF FF FF FF FF FF FF FF FF FF FF	0032A0	00 03 0B 85 05 03 11 85 0A 03 10 85 0A 03 13 85
000680	FF 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B	0032B0	0A 03 15 85 0F 03 17 85 FF FF FF FF FF FF FF FF
000690	0B 0B 0A FF FF FF FF FF FF FF FF FF FF FF FF	0032C0	05 03 15 85 0F 03 15 85 0D 03 15 85 0F 03 1B 85
000700	FF 01 01 01 01 01 01 01 01 00 00 FF FF FE FE FD	0032D0	14 03 1B 85 14 03 15 85 FF FF FF FF FF FF FF FF
000710	FC FB FA FF FF FF FF FF FF FF FF FF FF FF FF	0032E0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
000780	FF 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B 0B	0032F0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
000790	0B 0B 0A FF FF FF FF FF FF FF FF FF FF FF FF	003300	1E 05 11 83 1C 05 11 83 1E 05 16 83 0A 03 1B 85
000800	FF FF FF FF FF 03 FF FF FF FF FF FF FF FF FF FF	003310	0A 03 15 85 03 03 0D 85 FF FF FF FF FF FF FF FF
000810	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	003320	1E 05 11 83 1E 03 16 85 1E 03 16 85 1E 03 11 85
000880	FF FF FF FF FF 01 FF FF FF FF FF FF FF FF FF FF	003330	19 03 11 85 1E 03 16 85 FF FF FF FF FF FF FF FF
000890	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	003340	1E 03 0F 95 1E 03 13 95 0A 03 16 95 0A 03 13 95
		003350	0F 03 13 95 0A 03 16 95 FF FF FF FF FF FF FF FF
		003360	0F 03 16 8D 0F 03 16 8D 0F 03 16 8D 0F 03 16 8D
		003370	14 03 1B 8D 19 03 1B 8D FF FF FF FF FF FF FF FF
		003380	0F 03 16 8D 0F 03 16 8D 0F 03 16 8D 0F 03 16 8D
		003390	14 03 1B 8D 19 03 1B 8D FF FF FF FF FF FF FF FF
		0033A0	00 03 0A 85 05 03 0B 85 0A 03 0B 85 0A 03 0D 85
		0033B0	0A 03 0D 85 0A 03 0D 85 FF FF FF FF FF FF FF FF
		0033C0	05 03 0D 85 0A 03 0D 85 0A 03 0D 85 0A 03 11 85
		0033D0	0F 03 0F 85 0D 03 11 85 FF FF FF FF FF FF FF FF
		0033E0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
		0033F0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
		003400	FF AA 0A 05 1B 93 FF FF FF FF FF FF FF FF FF FF
		003500	FF 28 07 1E 60 1E FF FF FF FF FF FF FF FF FF FF
		003700	02 02 02 03 03 03 04 05 05 05 FF FF FF FF FF FF

## 6. WAVEFORM DATA

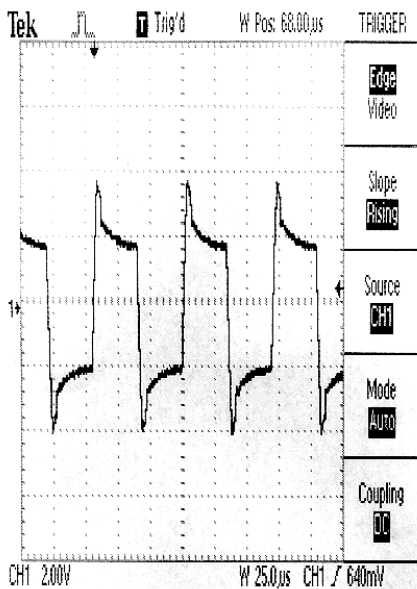
### 1. control waveform



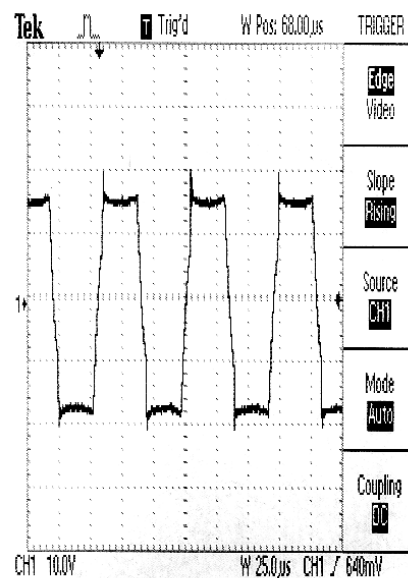
### 2. output in gate of Q3,Q4



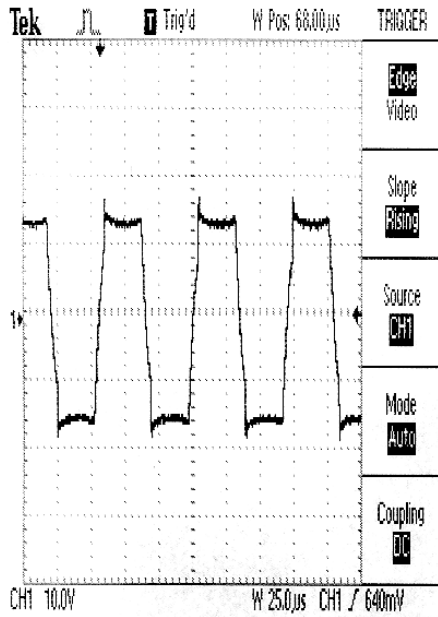
### 3. preheating



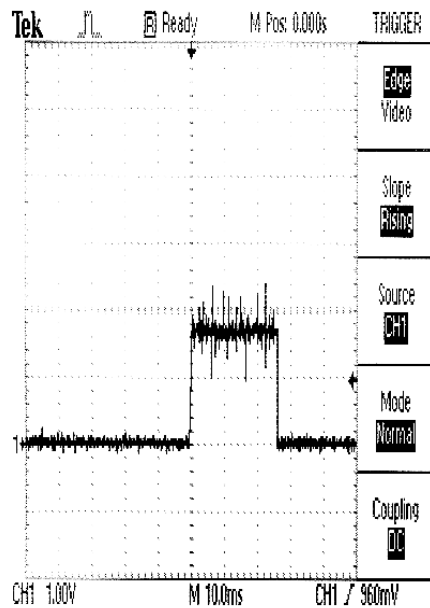
### 4. ready preheating(at low mA data)



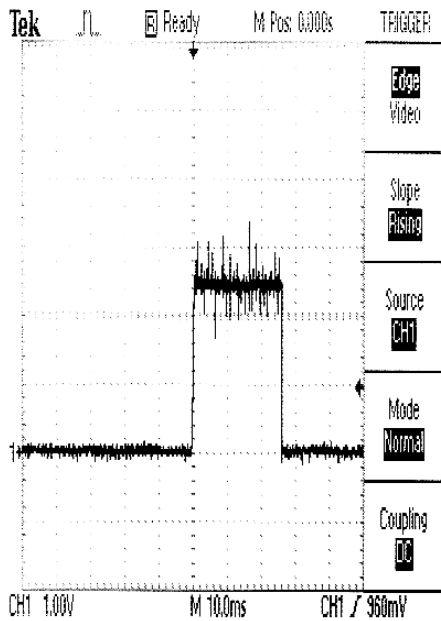
5. ready preheating(at high mA data)



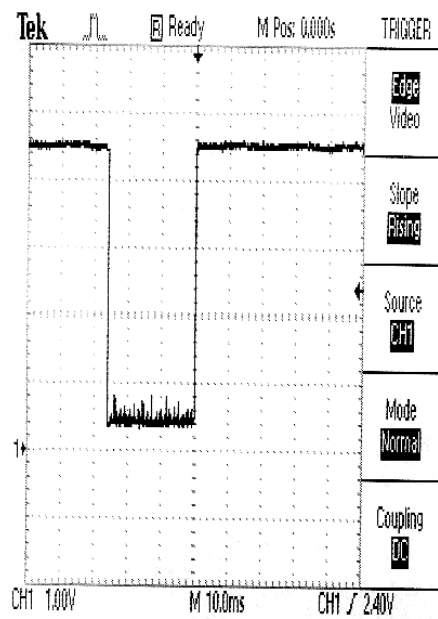
6. kV data output(at low kV data)



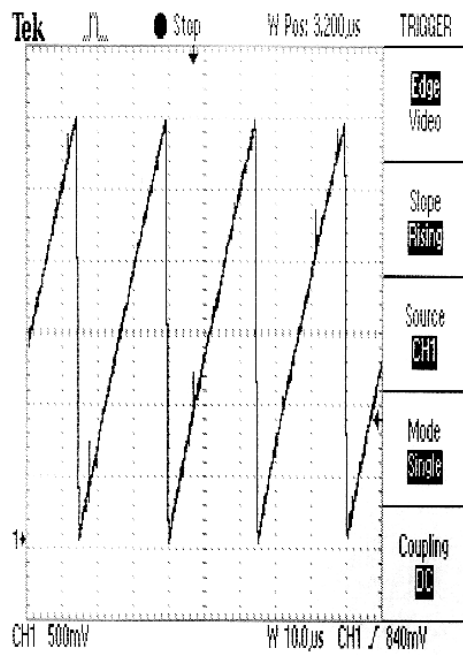
7. kV data output(at high kV data)



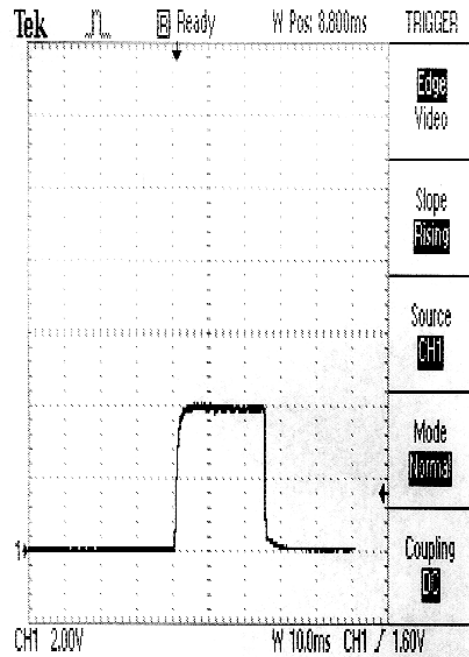
8. exposure enable



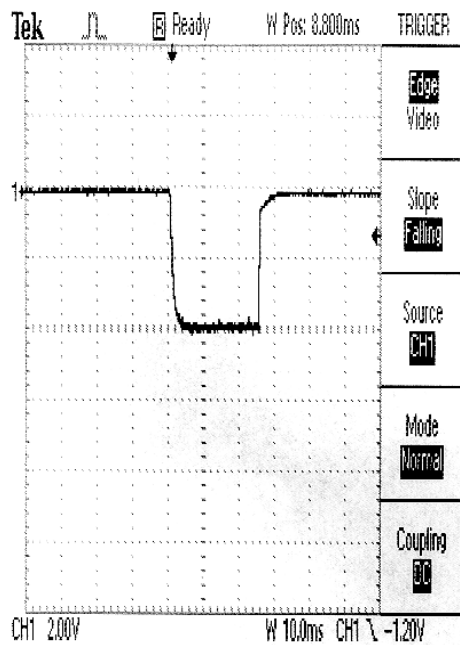
## 9. control waveform



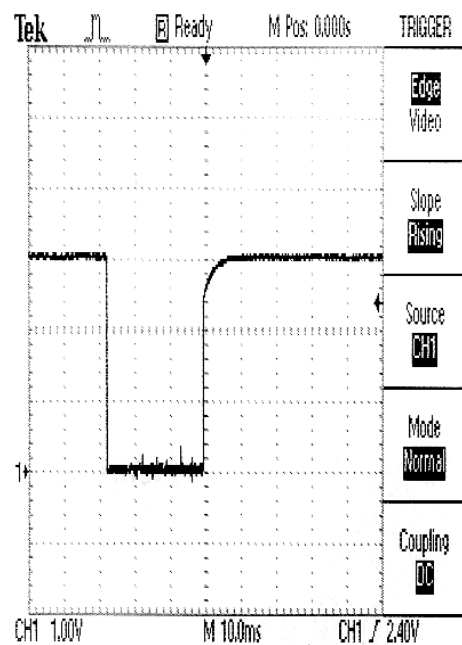
## 10. +kV feedback



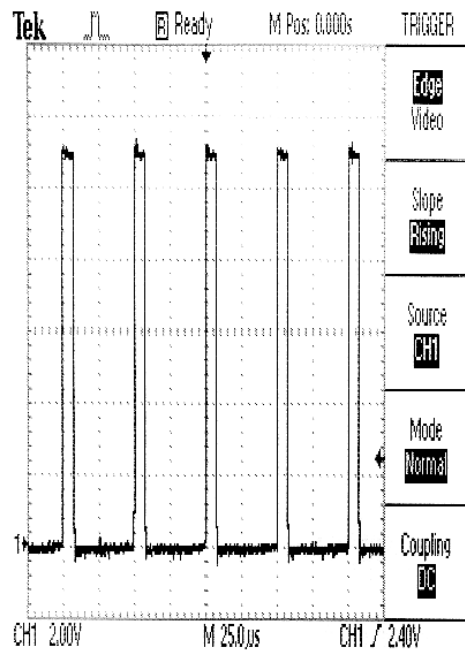
## 11. -kV feedback



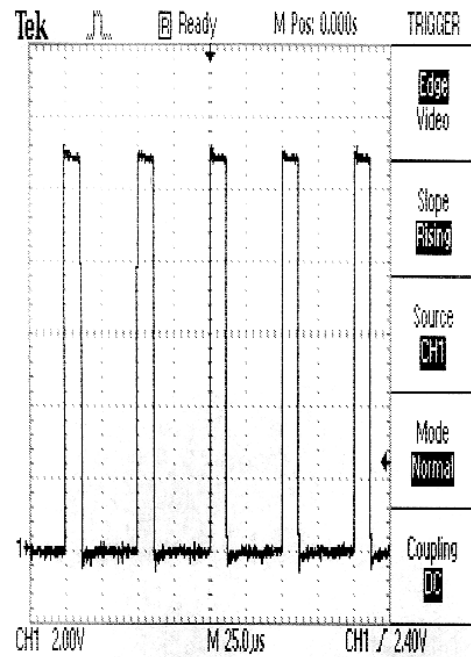
## 12. deadtime control



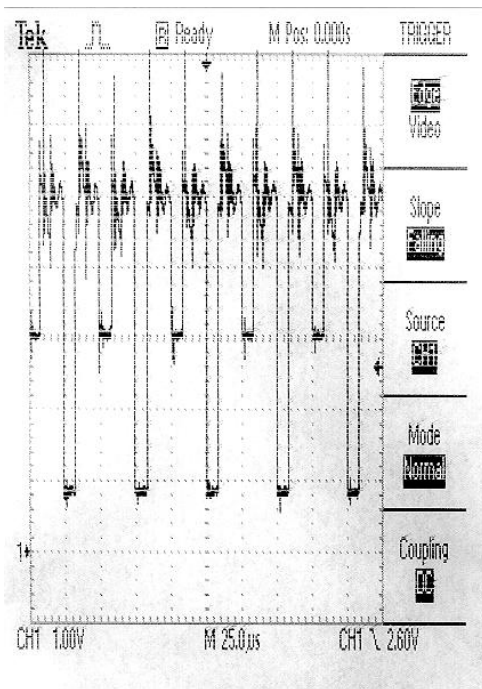
## 13. TL594 output(at low kV data)



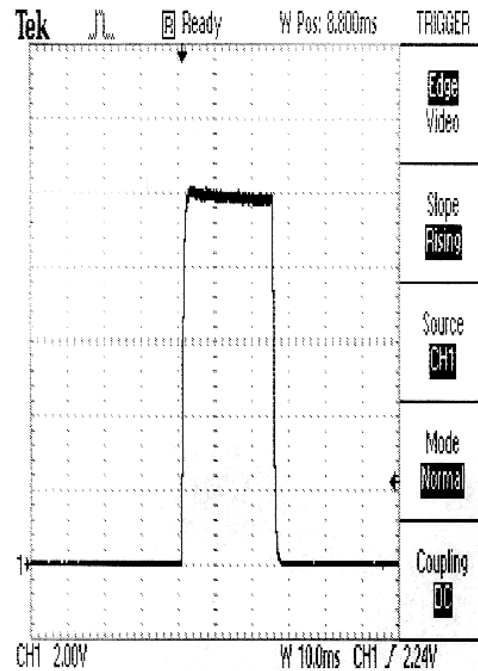
## 14. TL594 output(at high kV data)



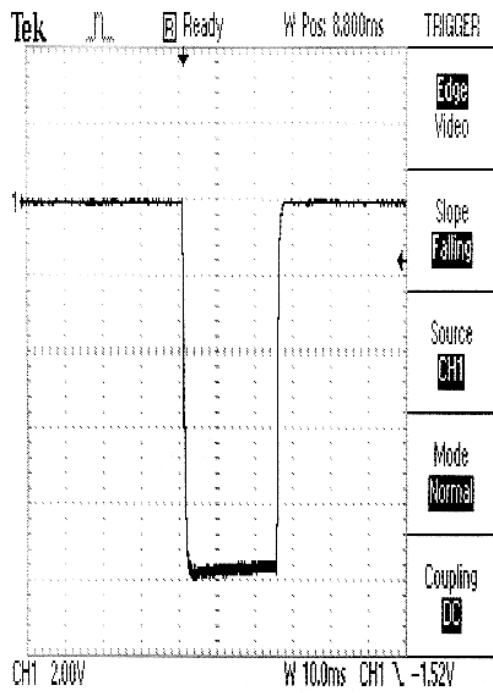
## 15. KDR1~KDR4 output



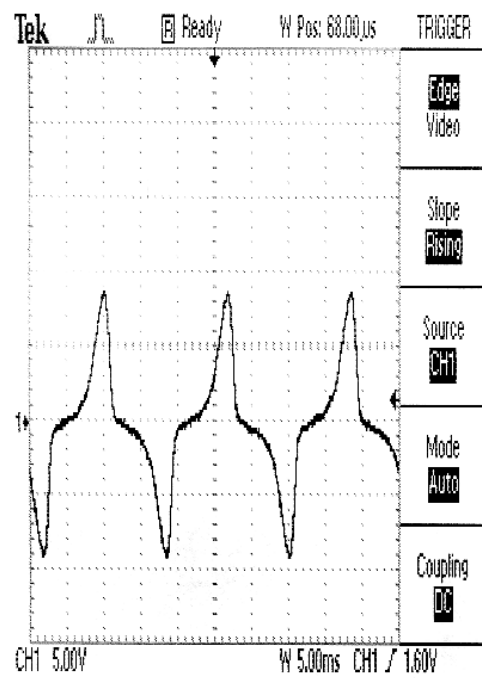
## 16. +mA feedback



## 17. -mA feedback



## 18. rotor signal



## 7. JOB CODE

### 7.1 JOB CODE 001

**Tools & Equipment required : DVM**

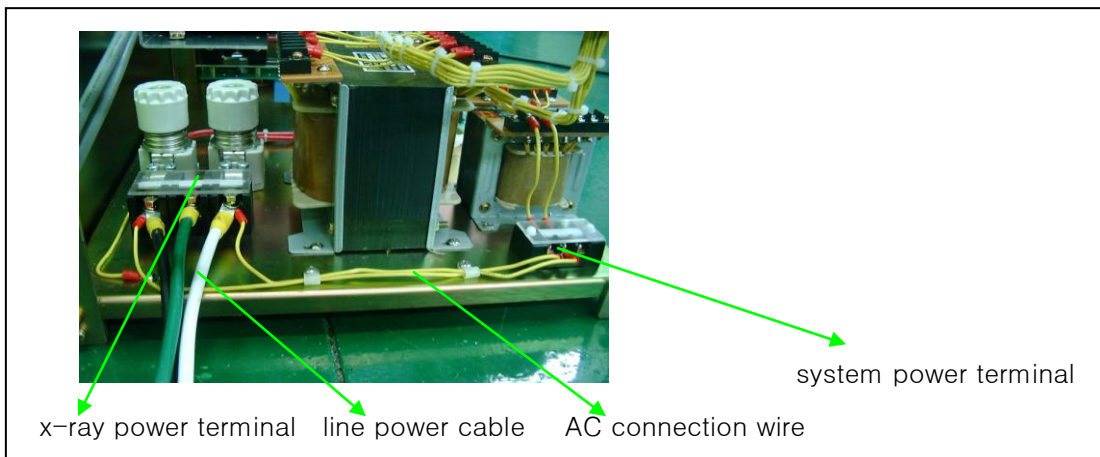
*THIS GENERATOR IS PERMANENTLY CONNECTED TO THE POWER LINE.*



*INTERNAL PARTS OF THE GENERATOR(LINE FUSE, ETC.) ARE PERMANENTLY POWERED ON THROUGH POWER LINE ALTHOUGH THE CONSOLE IS OFF. BE SURE THAT THE SAFETY SWITCH IS OFF BEFORE HANDLING ANY INTERNAL PART OF THE EQUIPMENT.*



*THIS 325/525 GENERATOR LINE POWER IS SINGLE PHASE 220VAC. FOR SINGLE PHASE GENERATOR, CONNECT THE POWER CABLE L1 AND L2(N : NEUTRAL) AND GND TO THE TERMINAL BLOCK.*



Check 1. input power of line power cable L1 and L2 voltage is 215 ~230VAC

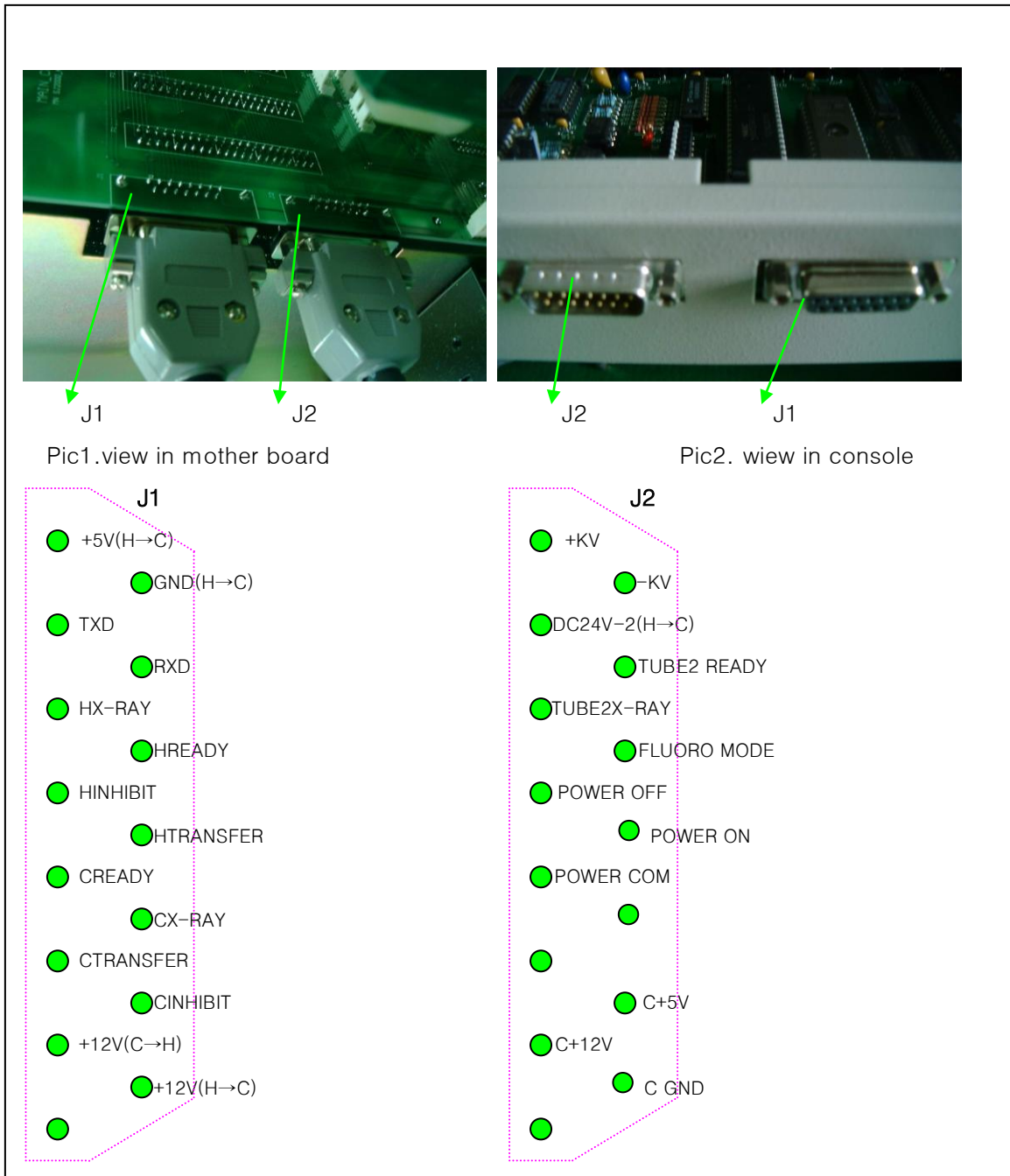
Check 2. connection of AC connection wire are tight to each terminals



## 7.2 JOB CODE 002

Tools & Equipment required : DVM

CHECK POWER ON/OFF/COM OF J2 IN COMMUNICATION CABLE SIGNAL



J1 AND J2 IS CONNECTED CONTROLLER AND CONSOLE WITH RS-232 COMMUNICATION CABLE SO, FIX TIGHTLY WITH SCREW WHEN CONNECT J1,J2. AND THEN CHECK IT.



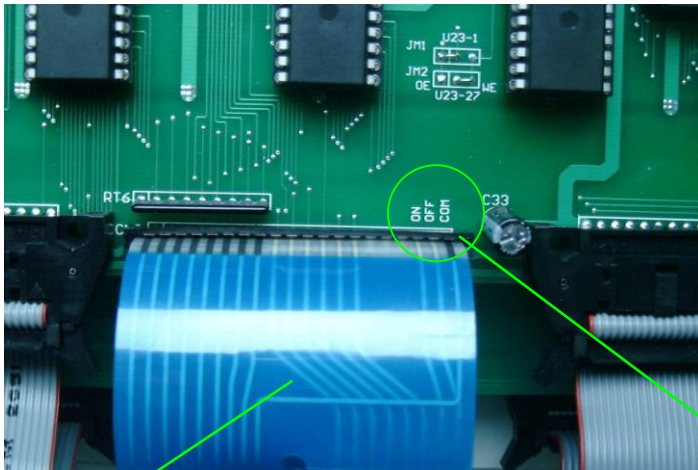
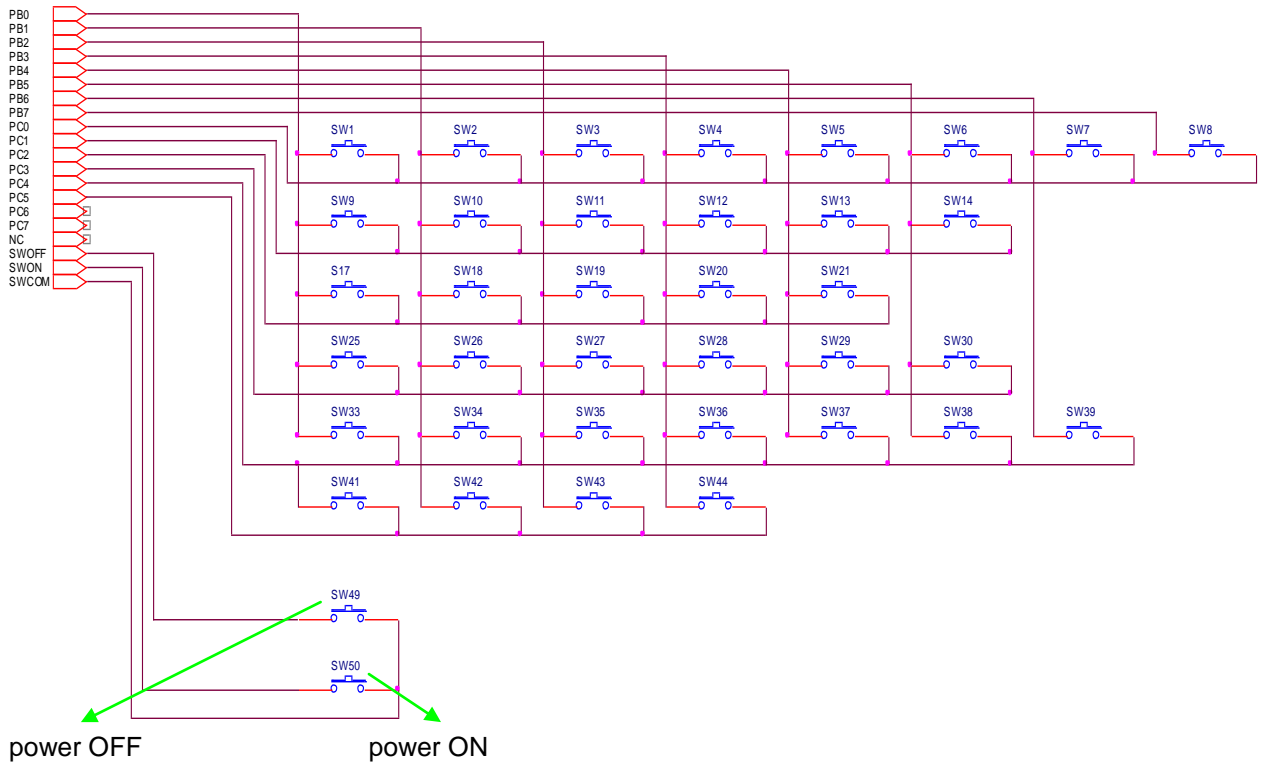
ONESIDE COMMUNICATION CABLE LOCATED MOTHER BOARD INSIDE CONTROLLER INTERCONNECTION ARE FACTORY MADE. ONLY OPPOSITE CONNECTION SHOULD BE CONNECT TO CONSOLE.

AND COMMUNICATION CABLE LENGTH IS 10M. FOR CABLE LENGTH REFER TO STANDARD RS-232 COMMUNICATION WIRE LENGTH. IF ROOM REQUIRE MORE THAN LENGTH MUST NOT OVER THAN 15M. IF WIRE LENGTH MORE THAN 15M WILL BE OCCUR COMMUNICATION FAILURE.

### 7.3 JOB CODE 003

Tools & Equipment required : DVM

Check SW49(power off), SW50(power on) connection.



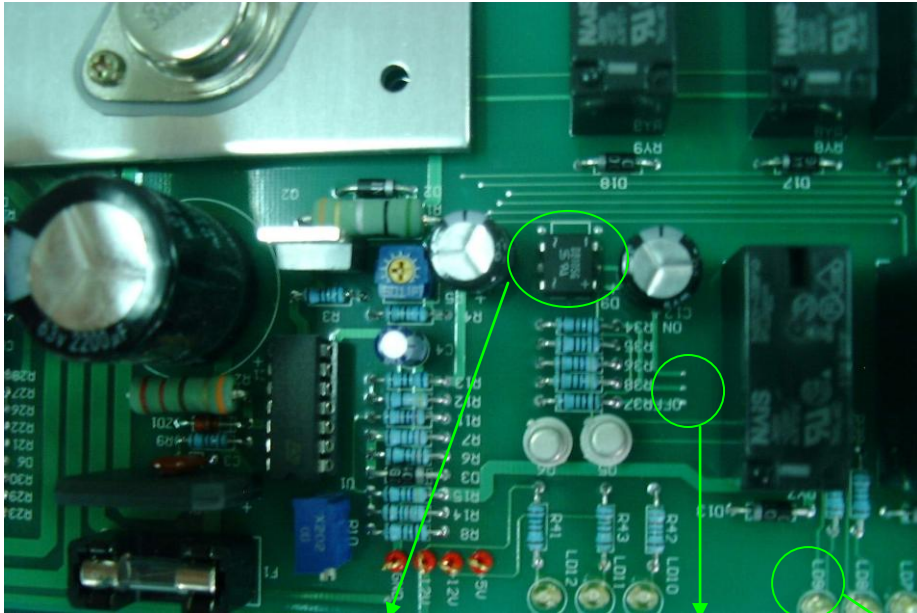
membrane key

misprint silkscreen

### 7.4 JOB CODE 004

Tools & Equipment required : DVM

Check D9(bridge diode) of Relay power board

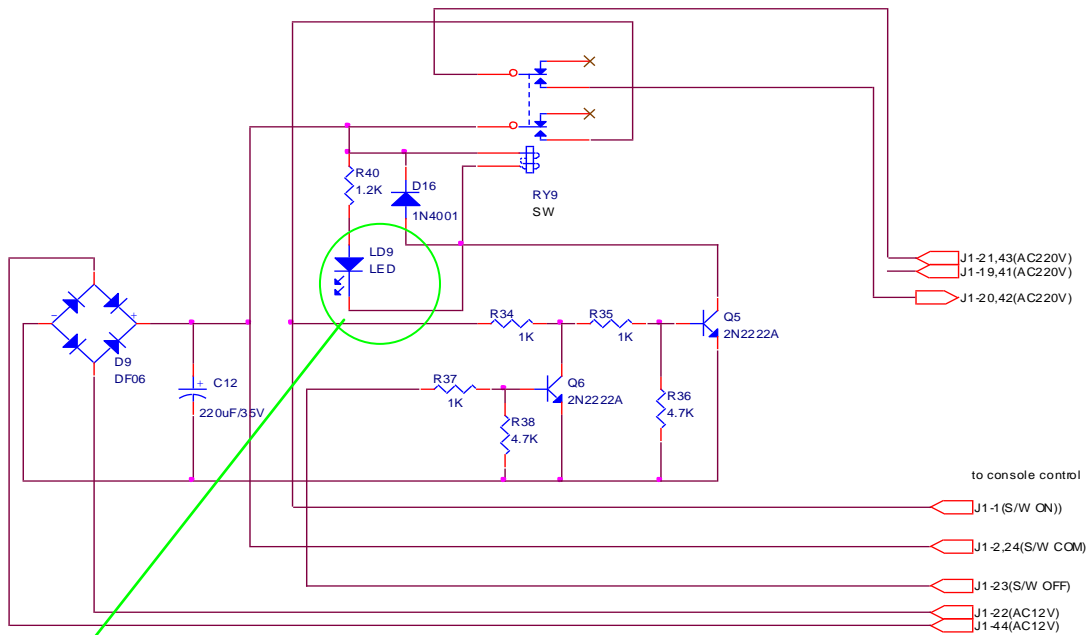


bridge diode

COM/ON/OFF

LED9

Check diode input AC12V and output DC20V



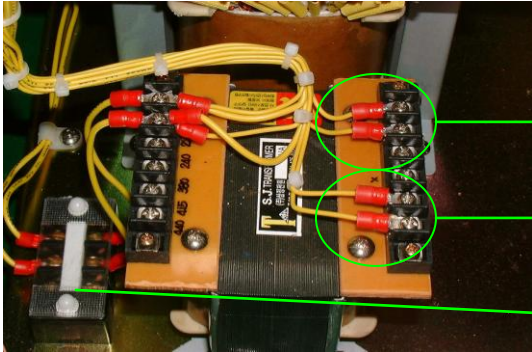
LED9 ON

SWITCH ON/COM/OFF LINE IS CONNECTED WITH COMMUNICATION AND CONSOLE.

## 7.5 JOB CODE 005

Tools & Equipment required : DVM

Check AC12V in Pictures



Pic 1. SUB TRANSFORMER



Pic 2. MAIN POWER BOARD

- J9(6P)
- AC220V
  - AC220V
  - AC12V (From sub-transformer)
  - AC12V
  - AC20V
  - AC20V

- J5
- DC24V-2
  - GND
  - DC24V-1
  - AC220V(N)
  - AC220V(N)
  - IPM AC220V
  - IPM AC220V
  - AC12V
  - AC12V (To mother board)
  - AC220V
  - AC220V

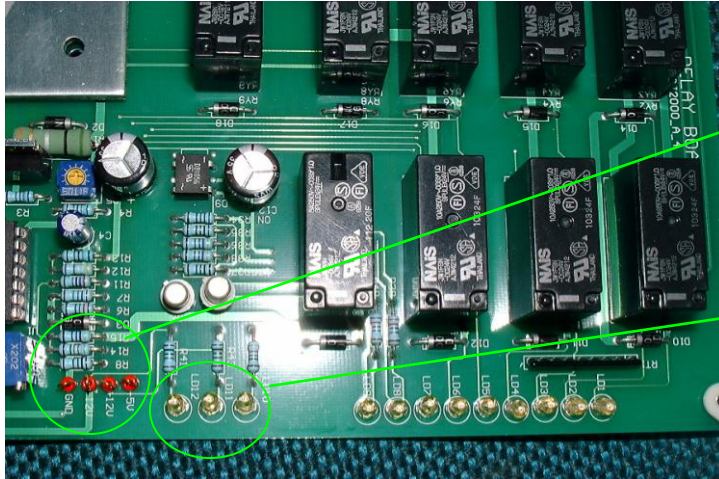
mother board drawing refer



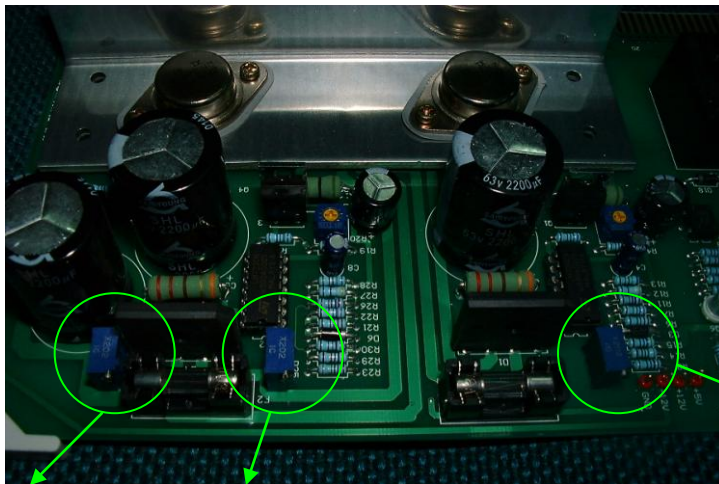
## 7.6 JOB CODE 006

Tools & Equipment required : DVM

Check TEST POINT +5V,+12V,-12V in Relay Power Board



- Check +5V(4.95V ~5.10V)
- Check +12V(11.95V ~12.10V)
- Check -12V(11.95 ~12.10V)
- LED10 ON : +5V
- LED11 ON : +12V
- LED12 ON : -12V



- R10 : +5V ADJUST
- R25 : +12V ADJUST
- R33 : -12V ADJUST

R33

R25

R10

## 7.7 JOB CODE 007

Tools & Equipment required : DVM

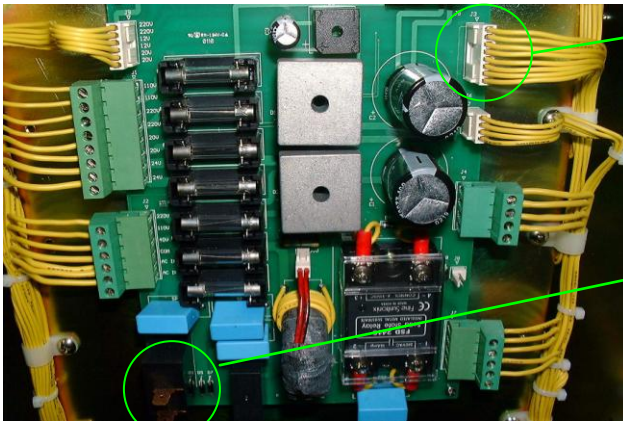
Check POWER ON signal.

1. Check output signal 17pin of U19 in HT Control Cpu Board



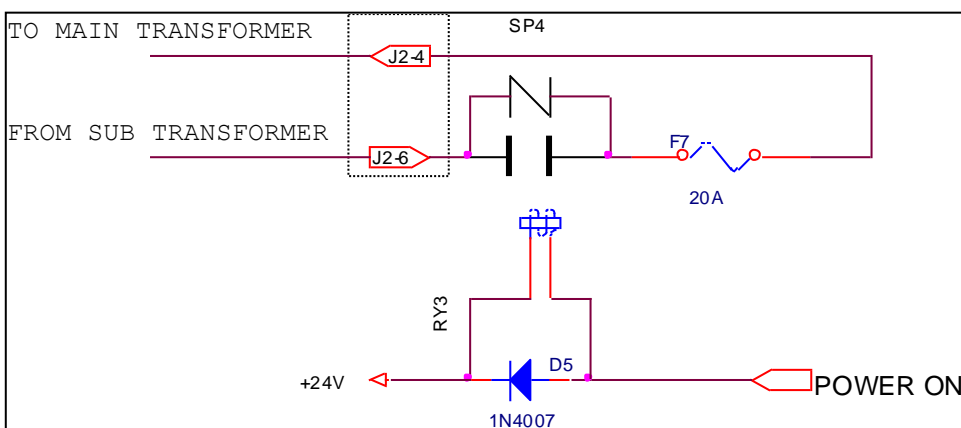
17pin of U19(power on signal) is High→Low

2. Check input signal 2pin of J3 in Main Power Board



- J3
- ROTOR ON
- POWER ON
- 220/40 CHANGE
- TUBE SELECT
- ROTOR SENSE
- ROTOR SENSE
- BUCKY AC110V
- BUCKY AC110V

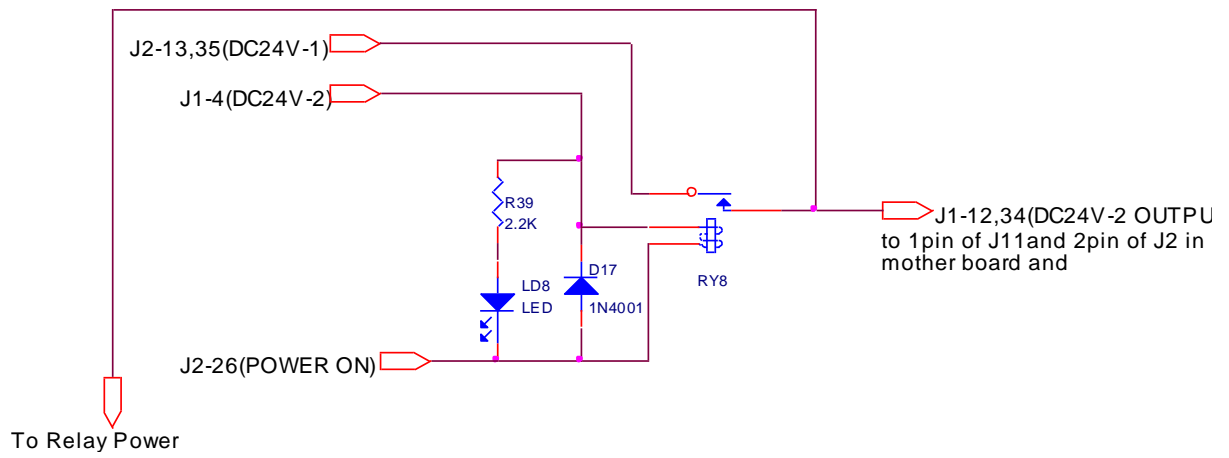
Relay 3 and D5



Pic. Main power board drawing

One wire of sub transformer (Input power 220VAC) and main transformer (220VAC) is interconnected by Relay 3. So, operating by Relay 3 will give Input power to system.

## 3. Check input signal to Relay8 in Relay Power Board

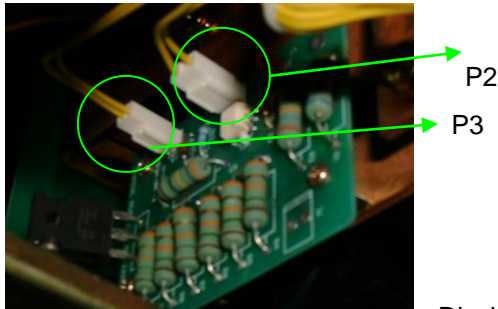




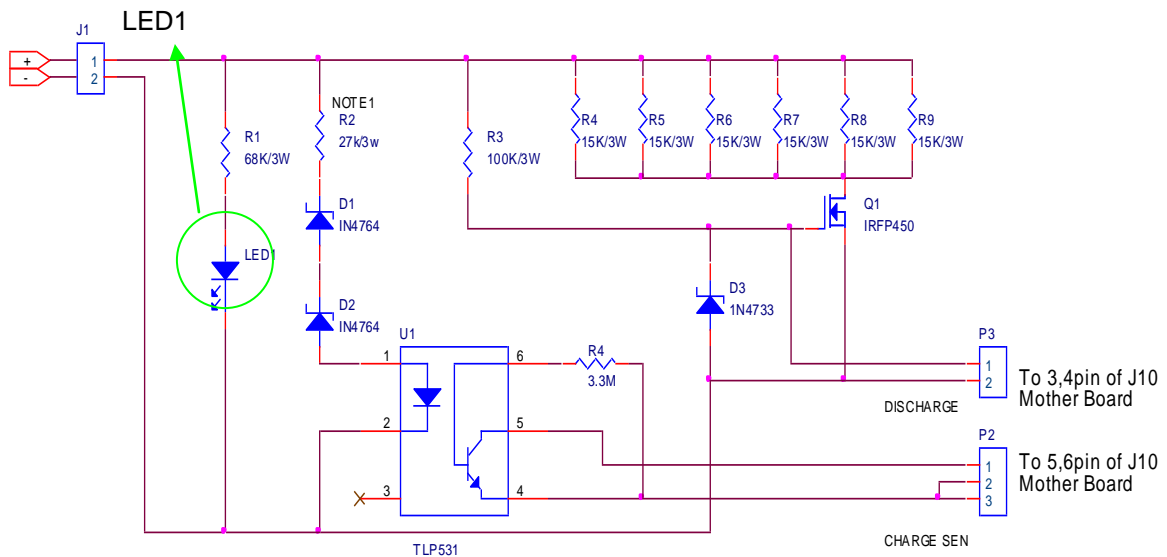
## 7.8 JOB CODE 008

Tools & Equipment required : DVM

Check Led1 light ON and Charge Capacitor storage voltage(about 310VDC)



Discharge signal refer to Relay Power Board drawing



NOTE 1 : AC220/1PHASE → 27K/3W  
AC380/3PHASE → 18K/3W

Pic. Charge/discharge Monitor Board



***THIS GENERATOR IS PERMANENTLY CONNECTED TO THE POWER LINE.***

***INTERNAL PARTS OF THE GENERATOR(LINE FUSE, ETC.) ARE PERMANENTLY POWERED ON THROUGH POWER LINE ALTHOUGH THE CONSOLE IS OFF. BE SURE THAT THE SAFETY SWITCH IS***

***OFF BEFORE HANDLING ANY INTERNAL PART OF THE EQUIPMENT.***

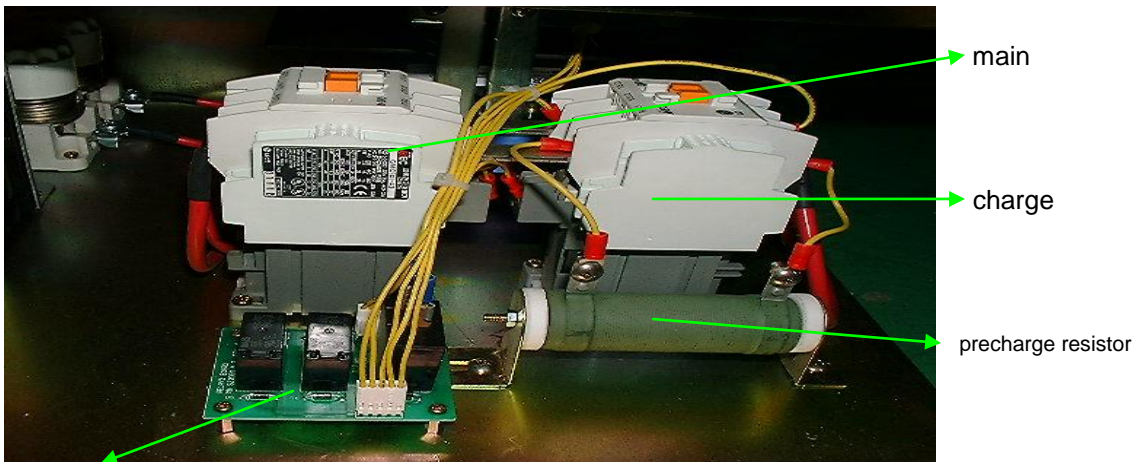
***THE MAIN STORAGE CAPACITORS RETAIN A LARGE PORTION OF THEIR CHARGE FOR APPROXIMATELY 3 MIN. AFTER THE UNIT IS***

TURNED OFF.

### 7.9 JOB CODE 009

Tools & Equipment required : DVM

Check main and charge contactor action.



Sub Relay Board

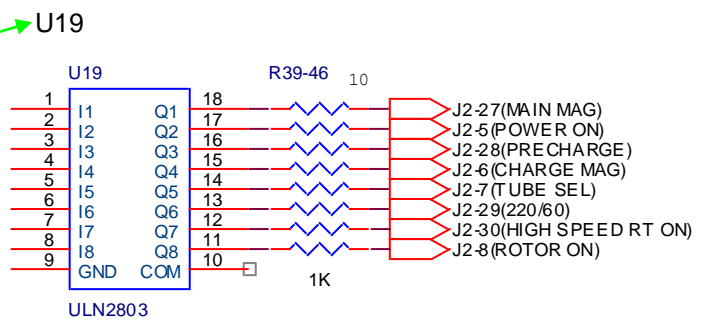
- J2 DC24V-2
- GND
- MAIN RELAY
- CHARGE RELAY
- PRECHARGE

- J3 MAIN MAG
- MAIN MAG
- CHARGE
- CHARGE

### 7.10 JOB CODE 010

Tools & Equipment required : DVM

Check each signal actions in HT control cpu board.



	POWER OFF	POWER ON	MAIN MAG	CHARGE MAG
18PIN	low	high	low	low
17PIN	high	low	low	low
16PIN	low	high	low	high
15PIN	low	high	high	low

If power not charge in storage capacitor will displayed "E28" in console display.

## 7.20 JOB CODE 020

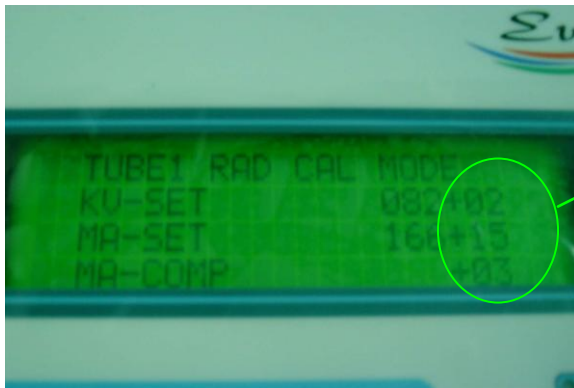
**Tools & Equipment required : ROM-WRITER, CALCULATOR**

Check kV,mA,comp data in Calibration Mode or read EEPROM with ROM-WRITER.

See EEPROM TABLE(chapter.6)

address	description	address	description
000000 ~ 000010	KVp data at 25mA	000500 ~ 000510	KVp data at 200mA
000080 ~ 000090	mA data at 25mA	000580 ~ 000590	mA data at 200mA
000100 ~ 000110	KVp data at 50mA	000600 ~ 000610	KVp data at 250mA
000180 ~ 000190	mA data at 50mA	000680 ~ 000690	mA data at 250mA
000200 ~ 000210	KVp data at 75mA	000700 ~ 000710	KVp data at 200mA
000280 ~ 000290	mA data at 75mA	000780 ~ 000790	MA data at 200mA
000300 ~ 000310	KVp data at 100mA	250mA,300mA,400mA,500mA refer EEPROM TABLE	
000380 ~ 000390	mA data at 100mA	003000 ~ 0033F0	APR DATA
000400 ~ 000410	KVp data at 150mA		(As the size of human body)
000480 ~ 000490	mA data at 150mA	003700	Comp DATA

Pic. Calibration Mode LCD display

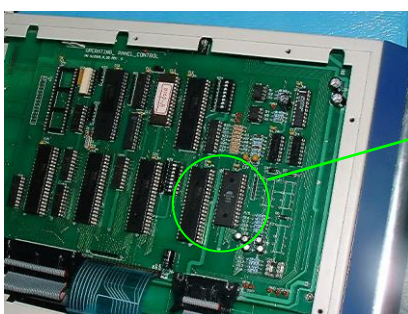


KVp data, mA data, comp data

If the EEPROM DATA is broken by some causes(i.e. noise, component broken)will accuse EEPROM message. And if you save abnormal data, it will be displayed ERROR message in Console Display LCD.

So, repair each data with Calibration mode or APR mode or ROM-WRITER.

Pic. EEPROM location



Console display board(operating\_panel\_console board)  
U23(AT28C256B)

## 7.21 JOB CODE 021

**Tools & Equipment required : ROM-WRITER, CALCULATOR**

Check EEPROM data with ROM-WRITER.

When the Power is OFF and ON again, the condition is displayed at CONDITION DISPLAY LCD, which is the exposed condition before the Power OFF.

ADDRESS	DATA
003400 ~ 0034F0	FF AA 0A 05 1B 93 FF FF FF FF FF FF FF FF FF

ADDRESS	DATA	DESCRIPTION
003400	FF	NOT USED
003401	AA	LAST EXPOSURE DATA READ ENABLE
003402	00	KV DATA
003403	05	MA DATA
003404	09	TIME TATA
003405	8B	BUCKY SELECT DATA

*If program didn't read last exposure data or 3401's data broken, it will be displayed 3402 ~ 3405's data.*

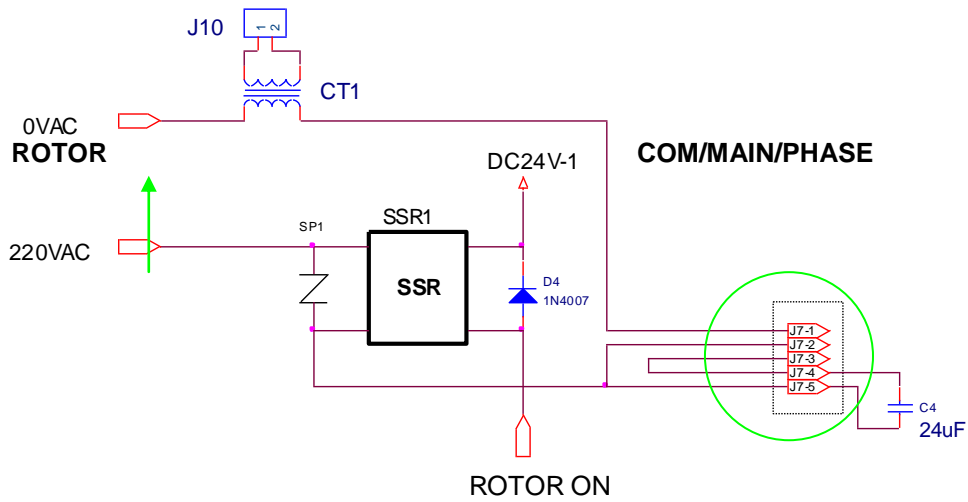
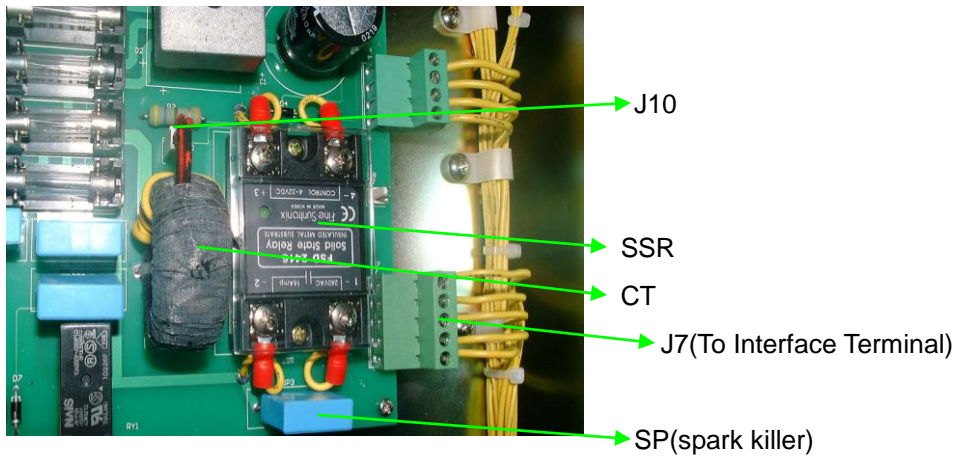
*And, If 3402 ~ 3404's data broken, will be displayed ERROR E16/17(kVp), E18/19(mA), E20(time) That time, must repair 3401 ~3405's data in EEPROM.*

## 7.22 JOB CODE 022

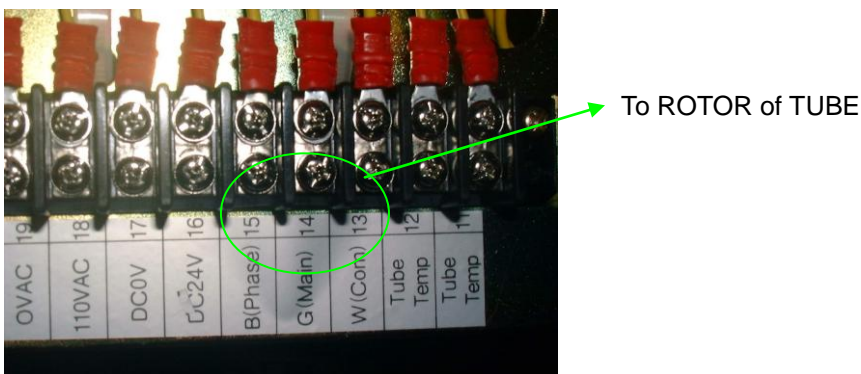
Tools & Equipment required : DVM,OSC

1. Check ROTOR connecton

Pic. Main power board and drawing

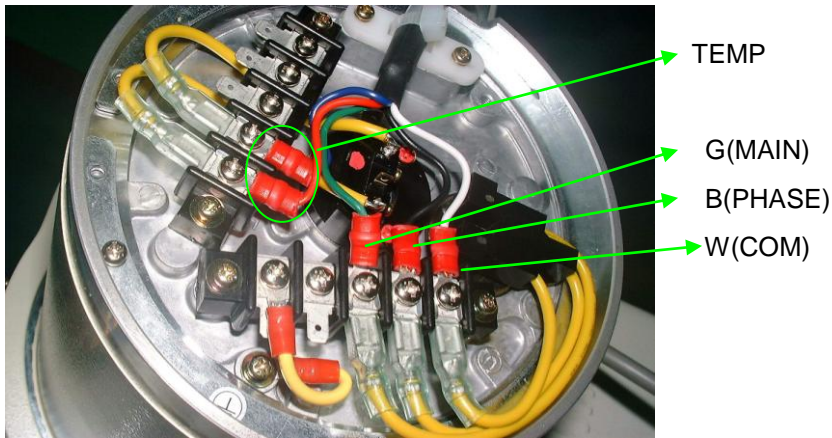


Pic. Interface Terminal





Pic. Rotor(anode of tube)



Check connection of ROTOR wire.(Checking point is interface terminal)



*Must power OFF when check the ROTOR connection.  
Will accuse electrical shock.*

Checking Point	Value	Accuracy limit
COM - PHASE	$\Omega$	29 ~ 32 $\Omega$
COM - MAIN	$\Omega$	58 ~ 62 $\Omega$
MAIN - PHASE	$\Omega$	85 ~ 95 $\Omega$

Check ROTOR input signal when pushed ready switch.

Checking Point	Value	Accuracy limit
COM - PHASE	VAC	280 ~ 310VAC
COM - MAIN	VAC	210 ~ 230VAC
MAIN - PHASE	VAC	280 ~ 310VAC

Check ROTOR feedback signal and waveform.

Checking Point	Value	Accuracy limit
TP9	VDC	0.8 ~ 0.95VDC

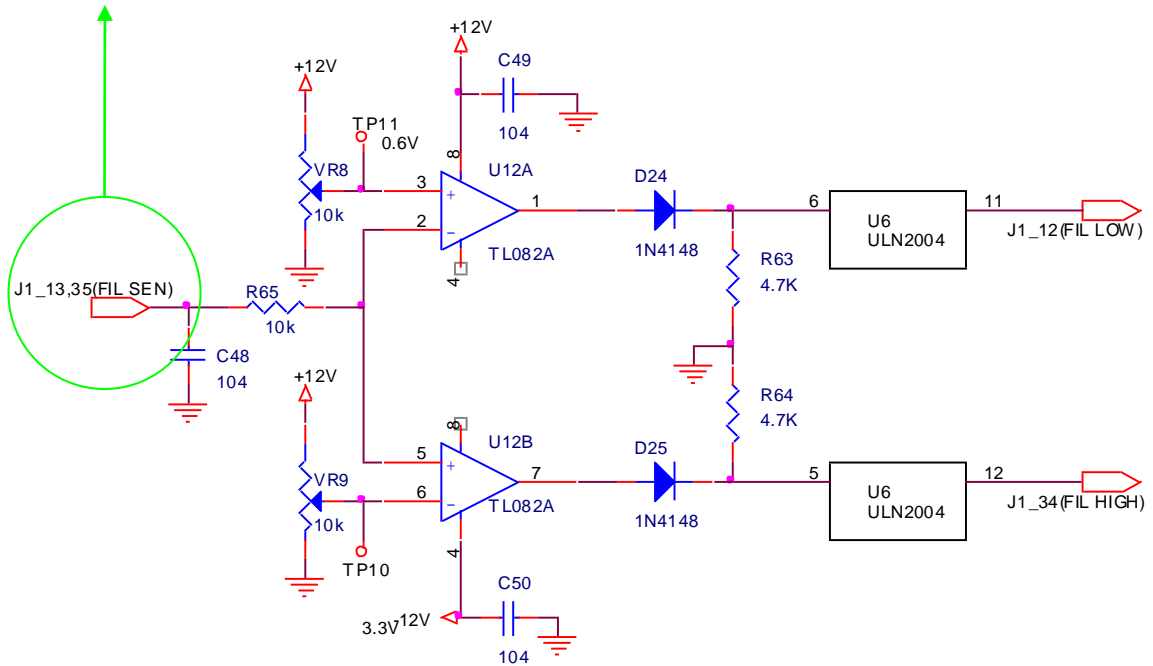
Waveform of ROTOR feedback signal refer **chapter 6 18. ROTOR signal**

**If did not output sensing signal of ROTOR sense, it will display "E26/27" in Console display LCD.**

## 7.23 JOB CODE 023

Tools & Equipment required : DVM

1. Check the feedback signal.(HT control control board)  
**filament feedback signal**(from filament drive board)



Check time is not ready switch pushed.

Check point	Value	Accuracy limit
Filament feedback sensing	VDC	0.6 ~ 0.9VDC
Sensing LOW limit(TP11)	VDC	0.1 ~ 0.5VDC
Sensing HIGH limit(TP10)	VDC	3.0 ~ 3.5VDC

If you want LOW limit change, use with VR8. and HIGH limit is VR9.

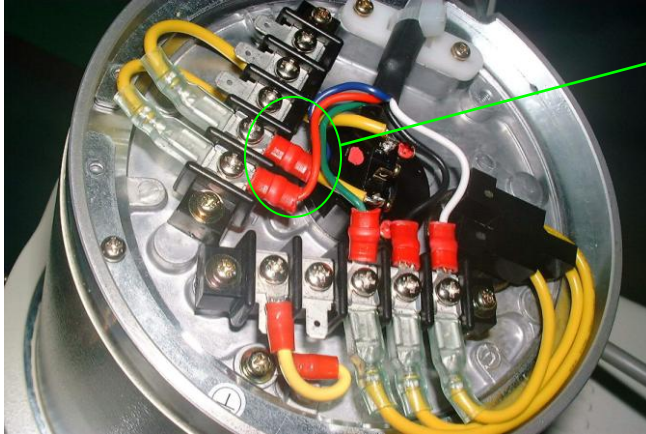
**If filament sensing value is lower than TP11, will display "E29" in Console Display LCD.**

**And higher than TP10, will display "E30" in Console Display LCD.**

## 7.24 JOB CODE 024

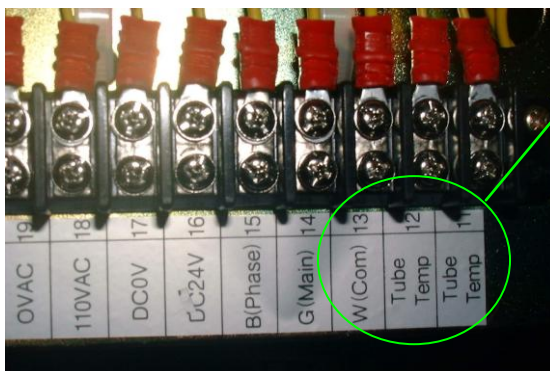
Tools & Equipment required : DVM

Pic. TUBE(anode)



TUBE temperature signal is normal close but temperature about over than 70° will open.

Pic. Interface terminal



Temp(from tube)

***If TUBE temperature signal is open, will display "E30" in Console display LCD.***

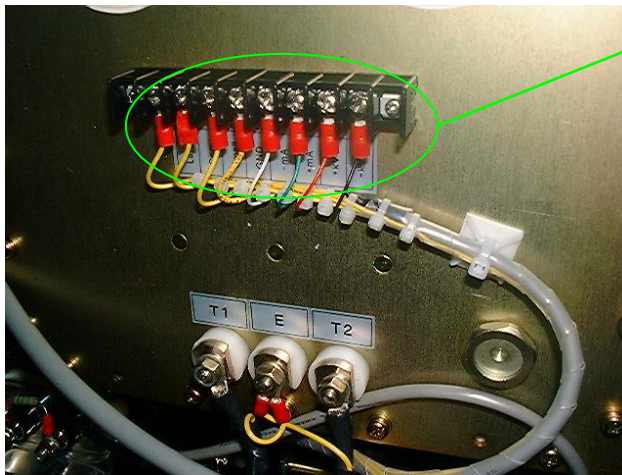


## 7.25 JOB CODE 025

### Tools & Equipment required : DVM

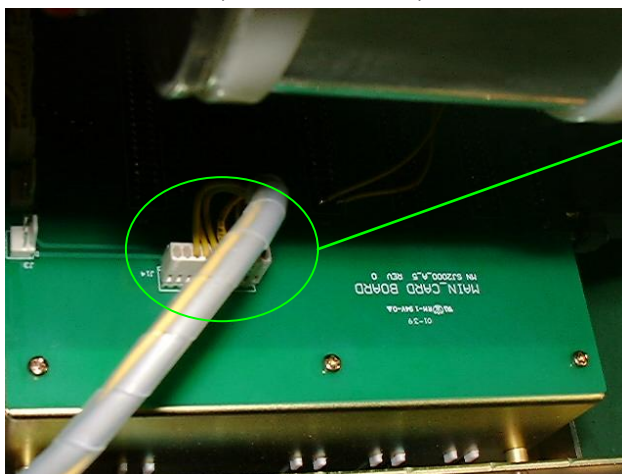
1. Check that the wires made "+kV, -kV, +mA, -mA" in the HV Tank are well placed and tighten.

Pic. HV tank(High tension transformer)



- 1.-kV(black)
- 2.+kV(red)
- 3.+mA(green)
- 4.-mA(white)
- 5.GND(yellow/shield)
- 6.small
- 7.com
- 8.large

Pic. Mother board(Main card board)



From HV tank

Connection check point

Check Point	Value	Accuracy limit
-kV – GND	kΩ	113 ~ 114kΩ
+kV – GND	kΩ	112 ~ 113kΩ
+mA – GND	kΩ	2 ~ 2.5kΩ
-mA - GND	kΩ	2 ~ 2.5kΩ



Must power OFF When check the connection

2. Check the IPM driver

Pic. IPM Drive Board drawing.

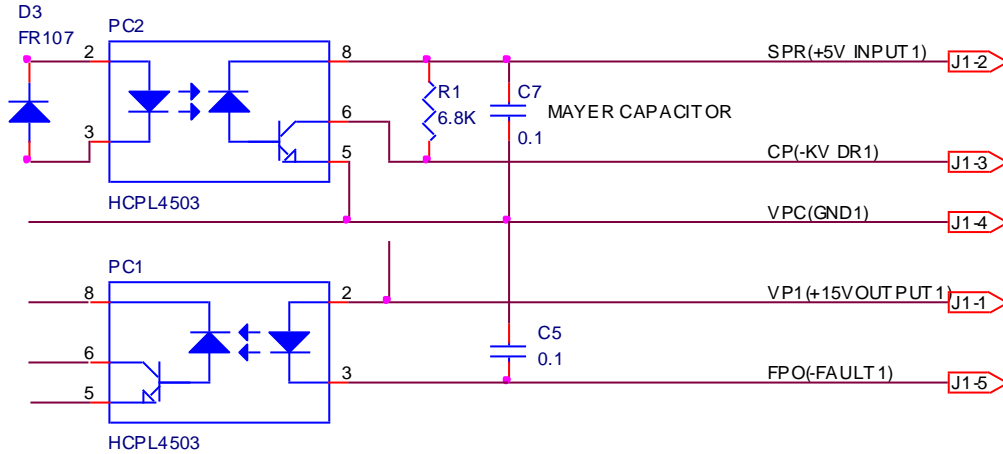
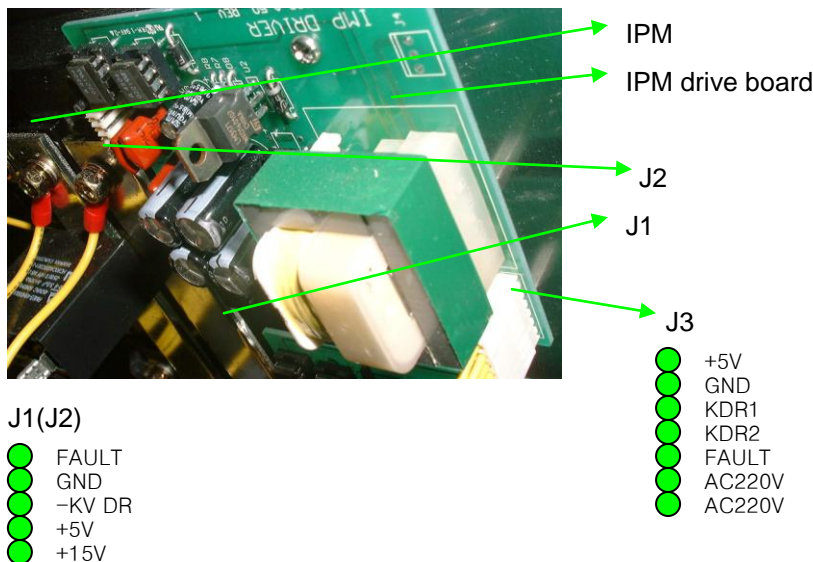


Table. Check Point

Checking point	Value	Accuracy limit
J1 – 1,4	VDC	14.9 ~ 15.1VDC
J1 – 2,4	VDC	4.95 ~ 5.05VDC
J2 – 1,4	VDC	14.9 ~ 15.1VDC
J2 – 2,4	VDC	4.95 ~ 5.05VDC

Pic. IPM and IPM drive board



ALWAYS HAVE "IPM DRIVER PCB" CONNECTED WHEN MAIN POWER IS ACTIVATED IN THE GENERATOR. WITHOUT "IPM DRIVER PCB" CONNECTED, PERMANENT DAMAGE WILL OCCUR TO IPM'S.

# 8. X-RAY CHECK

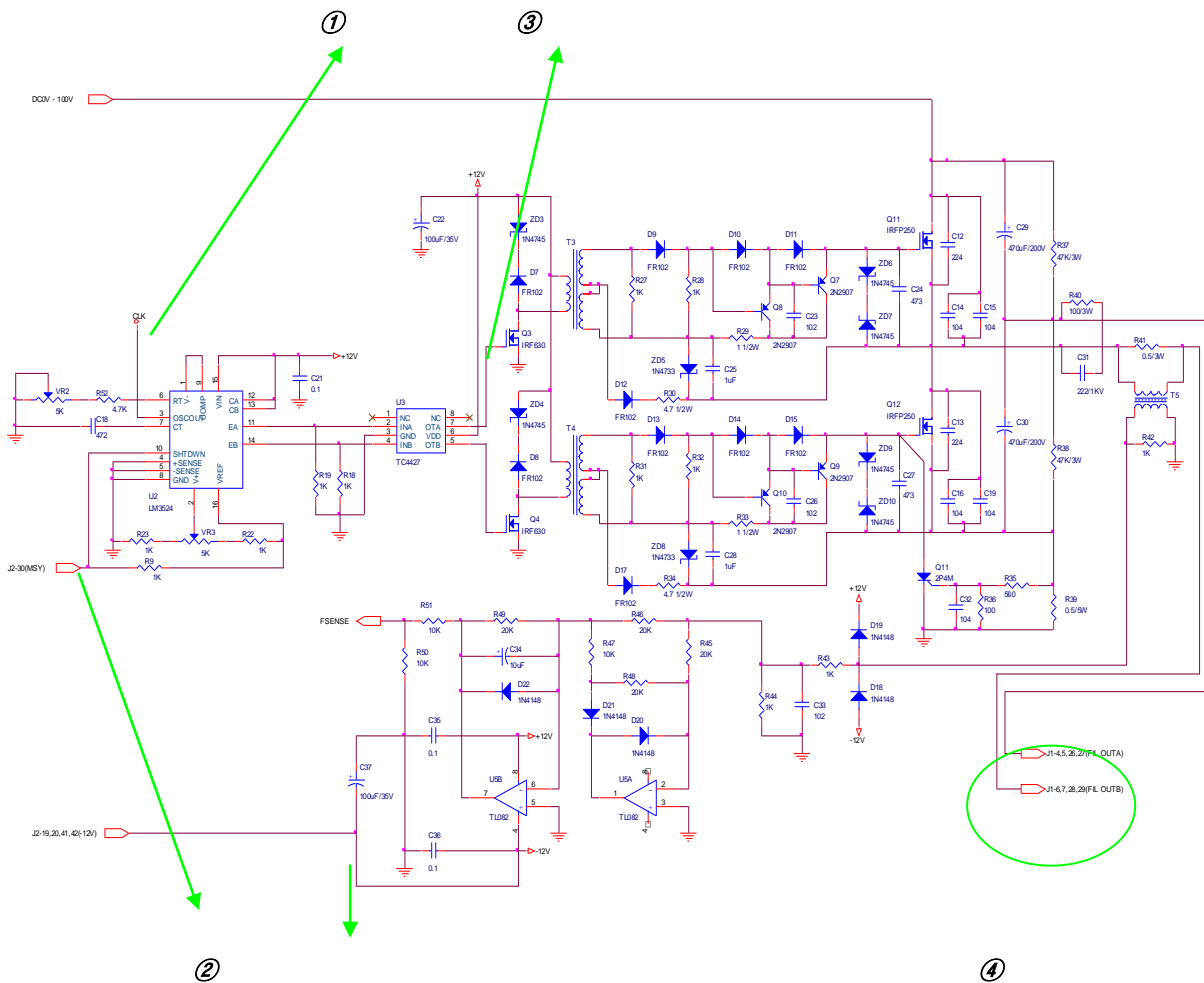
## 1. FILAMENT DRIVE BOARD CHECK

Tools & Equipment required : DVM,OSC

Pic. Filament drive board



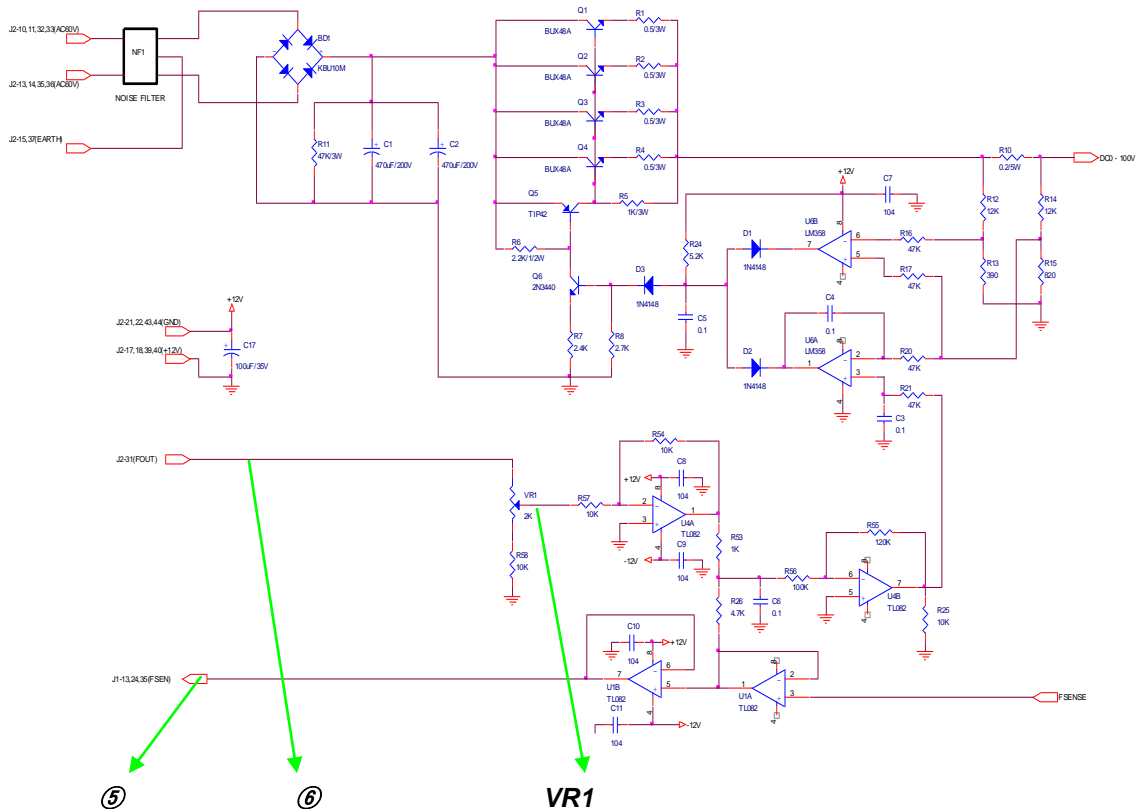
- ① filament enable signal (high → low)
- ② control waveform (see waveform 1)
- ③ output in gate of Q3,Q4(see waveform 2)
- ④ preheating wave(see waveform 3)
- ready wave with low mA data(see waveform 4)
- ready wave with high mA data(see waveform 5)



## Filament control frequency check

Checking point	Value	Accuracy limit
CLK in U2(SG3524)	$\mu\text{sec}$	65 ~ 75 $\mu\text{sec}$

Adjust point : VR2



⑤ Filament feedback signal (to HT control control board)

⑥ FOUT signal (from HT control cpu board)

All mA step condition will change uniformly with VR1 contrasting FOUT signal.

And, If you want each mA step condition change, use Calibration mode

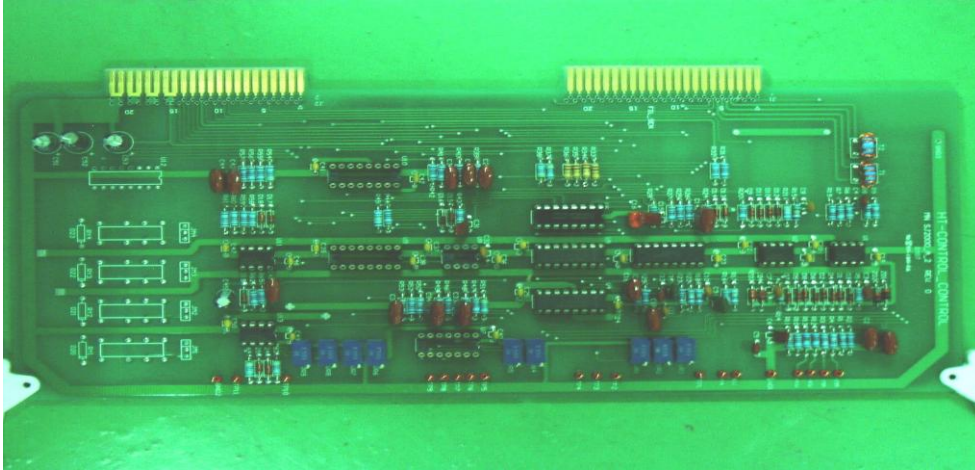


BE CAREFUL WHEN YOU CHECKING "FOUT SIGNAL". IF ELECTRICAL SHORT HAPPEN, U25(AD7224) IN HT CONTROL CPU BOARD WILL BE BROCKEN.

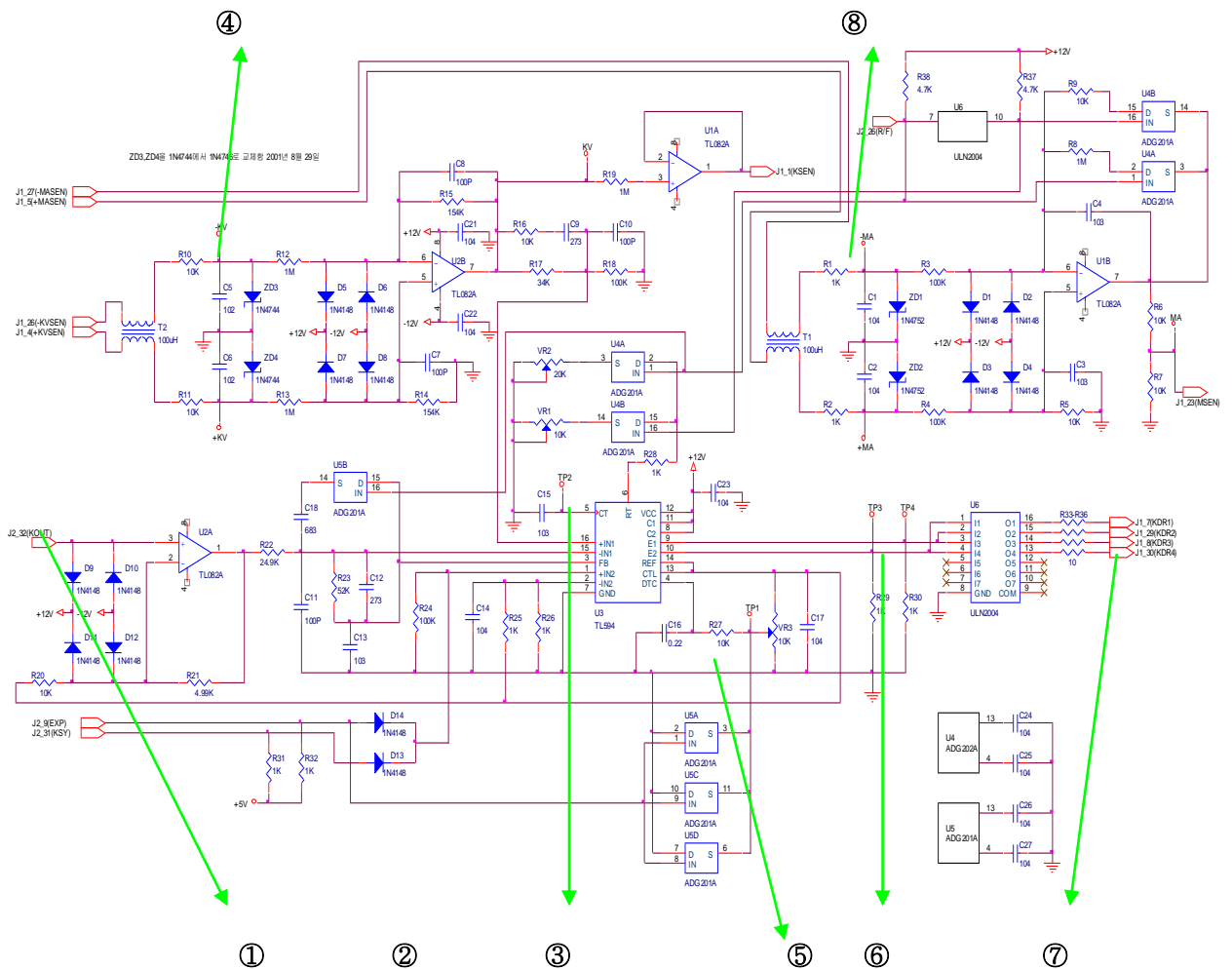
## 2. HT CONTROL CONTROL BOARD CHECK

Tools & Equipment required : DVM,OSC

Pic. HT control control board



Test exposure condition : 40kV/70kV, 200mA ,0.025sec)



- ① kV output data voltage from 2 of U27 in Ht control cpu board 1(when exposed)  
 kV low (**40kV see waveform 6**)  
 kV high(**70kV see waveform 7**)
- ② exposure/kV enable signal  
 high → low (**see waveform 8**)
- ③ TP 2 is control waveform(**see waveform 9**)

Checking point	Value	Accuracy limit
TP1	kHz	49 ~ 51kHz

Adjust point : VR2

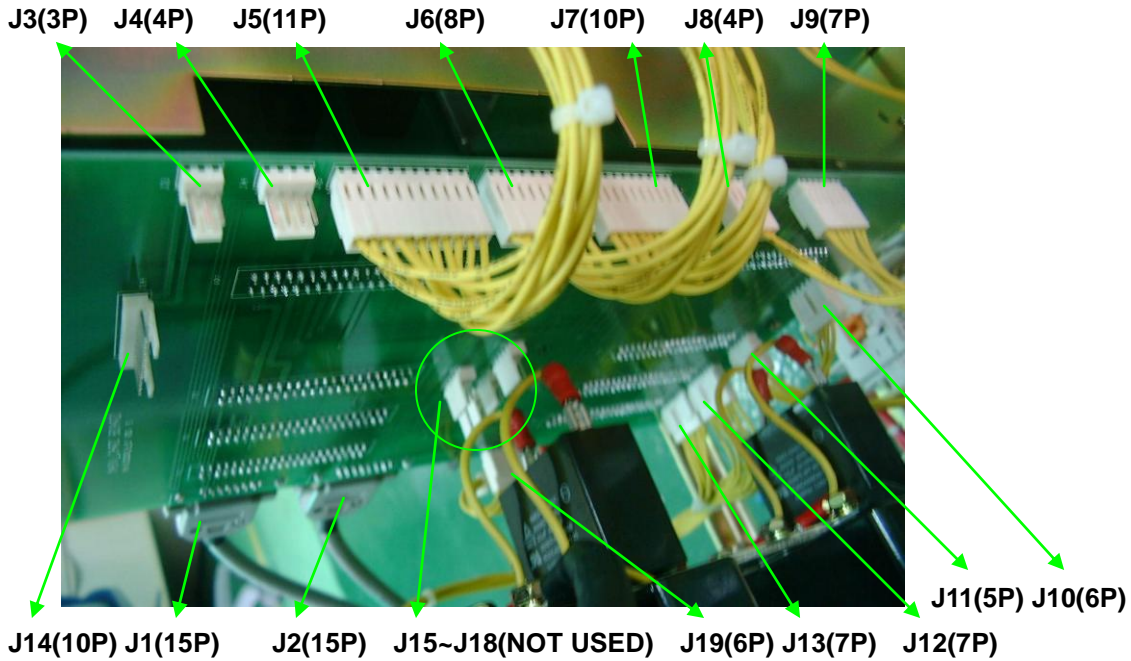
- ④ test point : -kV, +kV feedback signal waveform  
 +kV feedback (**see waveform 10**)  
 -kV feedback(**see waveform 11**)  
 1V  $\doteq$  10kV
- ⑤TP1(dead time control)  
 Adjust point : VR3 (**see waveform 12, when exposure**)
- ⑥TP3,TP4 : TL594 output point  
 kV data low(**see waveform 13**)  
 kV data high(**see waveform 14**)  
 E1 is 90 degree phase ahead of E2
- ⑦KDR1,KDR4 (**see waveform 15**)  
 KDR1,4 is 90 degree phase ahead of KDR2,3  
 KDR1 ~ KDR4 signal input to IPM DRIVE BOARD
- ⑧ test point : -mA, +mA feedback signal waveform  
 +mA feedback (**see waveform 16**)  
 -mA feedback(**see waveform 17**)  
 1V  $\doteq$  20mA



BE CAREFUL WHEN YOU CHECKING "KOUT SIGNAL". IF ELECTRICAL SHORT HAPPEN, U27(AD7224) IN HT CONTROL CPU BOARD WILL BE BROCKEN.



## 9. MAIN CARD BOARD DRAWING



- J3**  
 ● TUBE2 AC220V  
 ● TUBE2 AC220V

- J4**  
 ● TUBE2 READY  
 ● TUBE2 X-RAY  
 ● FLUORO MODE  
 ● GND

- J5**  
 ● AC220V  
 ● AC220V  
 ● AC12V  
 ● AC12V  
 ● IPM AC220V  
 ● IPM AC220V  
 ● AC220V(N)  
 ● AC220V(N)  
 ● DC24V-1  
 ● GND  
 ● DC 24V-2

- J6**  
 ● ROTOR ON  
 ● POWER ON  
 ● 220/40 CHANGE  
 ● TUBE SELECT  
 ● ROTOR SENSOR  
 ● GND  
 ● AC110V  
 ● AC110V

- J7**  
 ● BUCKY1  
 ● BUCKY1  
 ● BUCKY2  
 ● BUCKY2  
 ● BUCKY3  
 ● BUCKY3  
 ● TUBE1 TEMP  
 ● TUBE1 TEMP  
 ● TUBE2 TEMP  
 ● TUBE2 TEMP

- J8**  
 ● AC220V(N)  
 ● AC220V(N)  
 ● AC60V  
 ● AC60V

- J9**  
 ● AC220V  
 ● AC220V  
 ● AC15V  
 ● AC15V  
 ● AC20V  
 ● AC20V RTN  
 ● AC20V

- J10**  
 ● DISCHARGE4  
 ● DISCHARGE3  
 ● DISCHARGE2  
 ● DISCHARGE1  
 ● CHARGE SENSE  
 ● GND

- J11**  
 ● DC24V-2  
 ● GND  
 ● PRECHARGE  
 ● CHARGE  
 ● MAIN

- J12**  
 ● GND  
 ● +5V  
 ● KDR4  
 ● KDR3  
 ● IPM FAULT  
 ● AC220V  
 ● AC220V

- J13**  
 ● GND  
 ● +5V  
 ● KDR2  
 ● KDR1  
 ● IPM FAULT  
 ● AC220V  
 ● AC220V

- J14**  
 ● -KV  
 ● +KV  
 ● +MA  
 ● -MA  
 ● GND  
 ● SMALL  
 ● COM  
 ● LARGE  
 ● TUBE2 AC220V  
 ● TUBE2 AC220V

- J19**  
 ● AC220V  
 ● AC220V  
 ● +12V GND  
 ● +12V  
 ● +5V GND  
 ● +5V

**J1,J2**  
 : REFER JOB CODE002