

ADJUSTING MANUAL FOR PORTA 100HF

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Adjusting manual for Porta 100HF

1. Most important caution

All units must be assembled together with same Serial Number.

If new assembly of DRVINV unit and XCONT unit with different serial number is required (by an exchange with a new unit such as a service work), readjust the Ip reference value of the XCONT unit by VR5 and VR1 as shown in the pictures 20 to 23 and figures 2 to 6 of 4.3. Adjustment of XCONT unit.

2. Measuring Instruments

2.1. Storage Oscilloscope

Model : Tektronix TDS3012B

2.2. Digital Voltmeter

Model : Agilent Technologies 34401A

2.3. kV meter

Model : RMI RMI1245

2.4. Dose meter

Model : RADCAL 9015

3. Consisting units

3.1. Rectifying unit (RECT2/A5, RECT1/A6), refer to picture 2

3.2. Drive unit (DRV/A1), refer to picture 1


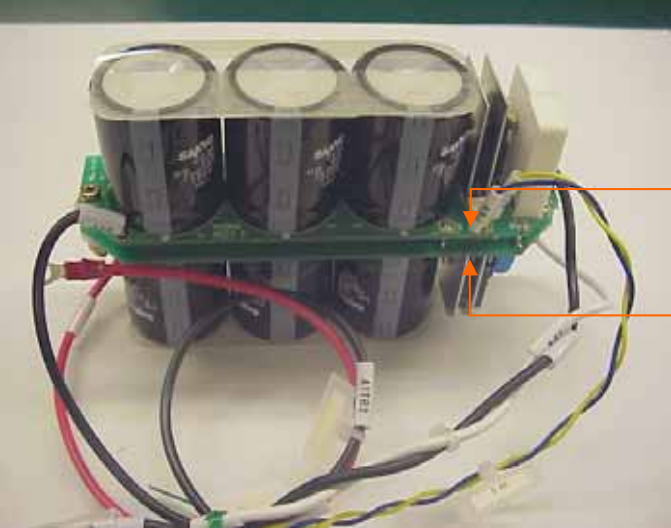
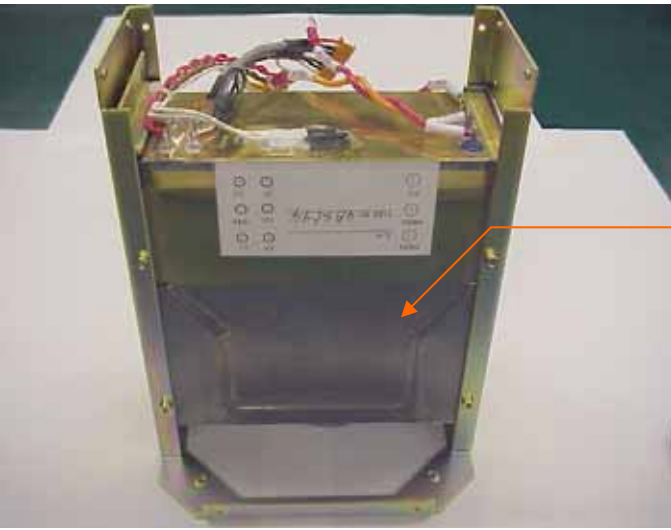
3.3. Main control unit (XCONT/A2), refer to picture 4

3.4. Display unit (DISPLAY/A3), refer to picture 5

3.5. Collimator unit (COLLIMATOR/A7), refer to picture 6

3.6. H.T.Tank unit (HT/A4), refer to picture 3

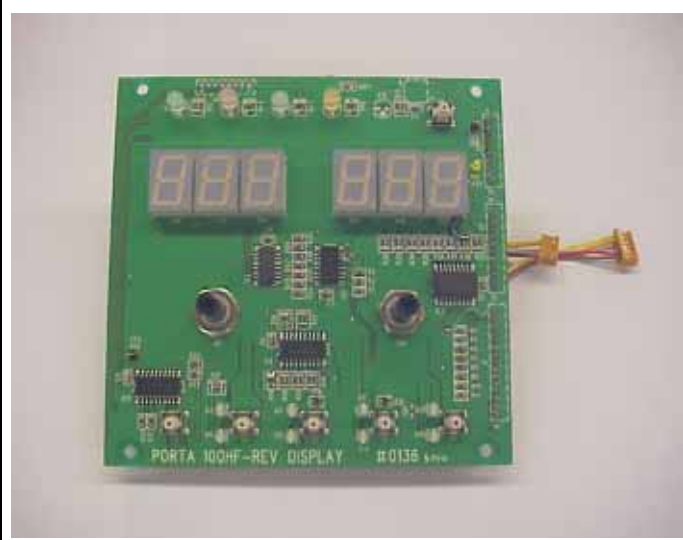
3. Consisting Unit

	<p>Picture 1</p> <p>DRV unit (DRV/A1)</p> <p>DRV CNT unit (sub unit)</p>
	<p>Picture 2</p> <p>REC unit (RECT1/A5), (RECT2/A6)</p> <p>RECT 2 unit</p> <p>RECT 1 unit</p>
	<p>Picture 3</p> <p>H.V. TANK unit (HT/A4)</p> <p>H.V. TANK unit</p>



Picture 4

MAIN CONTROL unit (XCONT/A2)



Picture 5

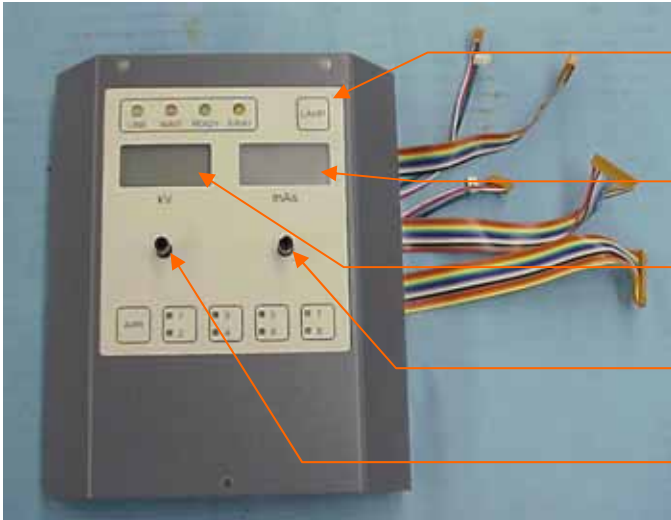
DISPLAY unit (DISPLAY/A3)



Picture 6

COLLIMATOR unit
(COLLIMATOR/A7)

Picture 7



DISPLAY unit is located under this panel

mAs display

kV display

mAs selector knob

kV selector knob

Picture 8

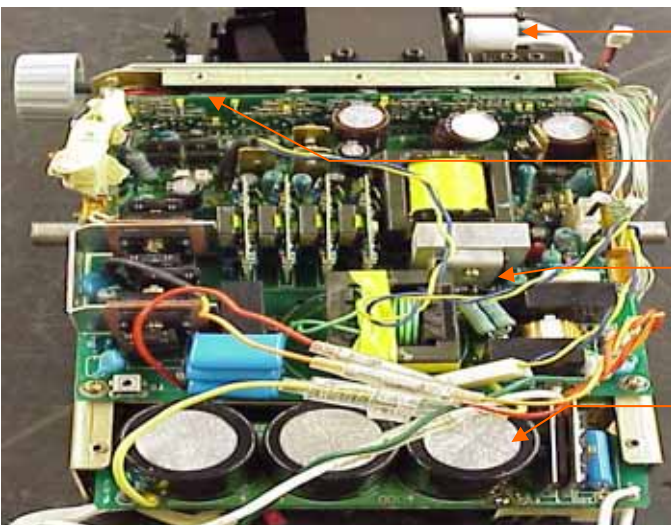


XCONT unit

HT unit

RECT 2 unit

Picture 9



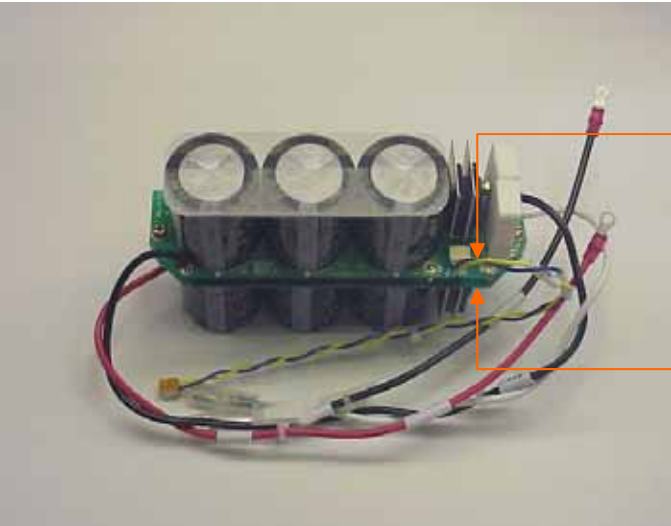
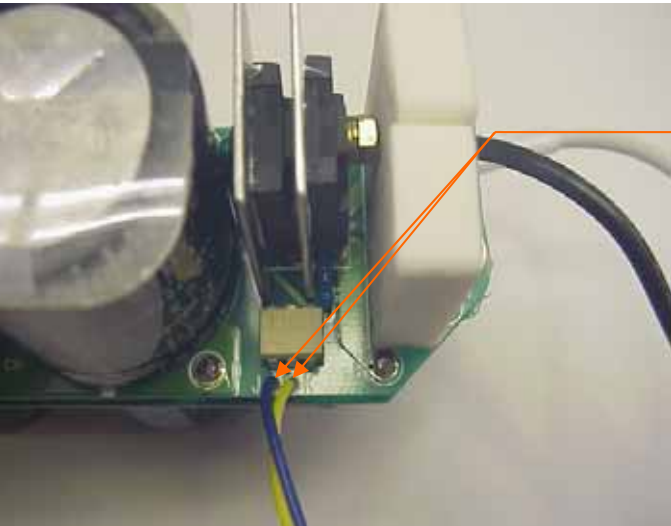
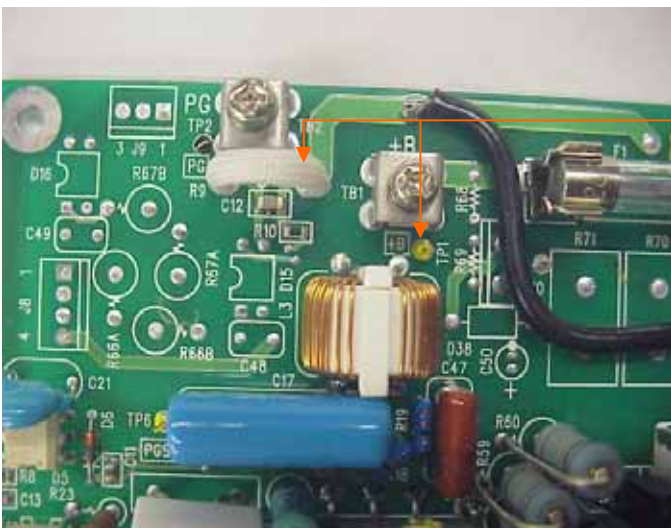
Collimator unit

DRV CNT unit

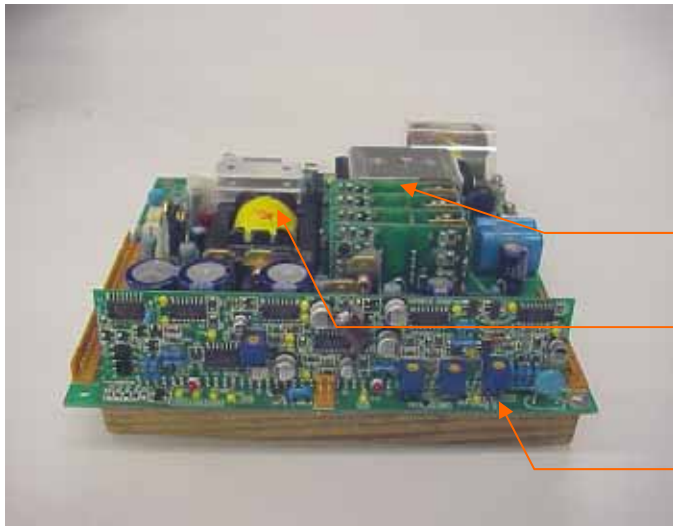
DRV unit

RECT 1 unit

4.1. Adjustment of REC Unit

 <p>A photograph showing the overall appearance of a REC unit. It consists of a green printed circuit board (PCB) with three cylindrical capacitors mounted on top. Various colored wires (red, black, yellow, blue) are connected to the board. Two orange arrows point to specific components: one points to a component labeled 'REC 2 unit' and the other to a component labeled 'REC 1 unit'.</p>	<p>Picture 10</p> <p>Outlook of a REC unit</p> <p>REC 2 unit</p> <p>REC 1 unit</p>
 <p>A close-up photograph of the control circuit area of the REC unit. It shows a white connector with several pins. Two orange arrows point to the pins where a blue wire (labeled 'J') and a yellow wire (labeled 'K') are connected. The PCB is green and has various components visible.</p>	<p>Picture 11</p> <p>Confirmation of control circuit</p> <p>Confirm whether the control input J and K are connected correctly.</p> <p>J = Blue color K = Yellow color</p>
 <p>A close-up photograph of the output voltage section of the REC unit. It shows a green PCB with various components, including a transformer, capacitors, and resistors. Two orange arrows point to terminals labeled 'TB1 (+B)' and 'TB2 (PG)'. The PCB has various component labels such as R67B, R5, C12, R10, R57A, R68B, C48, C17, C21, TP6, PG5, R80, R59, C47, C50, R71, R70, R65A, C49, D16, J, J9, T, TP2, PG, R9, R67A, R67B, R67C, R67D, R67E, R67F, R67G, R67H, R67I, R67J, R67K, R67L, R67M, R67N, R67O, R67P, R67Q, R67R, R67S, R67T, R67U, R67V, R67W, R67X, R67Y, R67Z, R67AA, R67AB, R67AC, R67AD, R67AE, R67AF, R67AG, R67AH, R67AI, R67AJ, R67AK, R67AL, R67AM, R67AN, R67AO, R67AP, R67AQ, R67AR, R67AS, R67AT, R67AU, R67AV, R67AW, R67AX, R67AY, R67AZ, R67BA, R67BB, R67BC, R67BD, R67BE, R67BF, R67BG, R67BH, R67BI, R67BJ, R67BK, R67BL, R67BM, R67BN, R67BO, R67BP, R67BQ, R67BR, R67BS, R67BT, R67BU, R67BV, R67BW, R67BX, R67BY, R67BZ, R67CA, R67CB, R67CC, R67CD, R67CE, R67CF, R67CG, R67CH, R67CI, R67CJ, R67CK, R67CL, R67CM, R67CN, R67CO, R67CP, R67CQ, R67CR, R67CS, R67CT, R67CU, R67CV, R67CW, R67CX, R67CY, R67CZ, R67DA, R67DB, R67DC, R67DD, R67DE, R67DF, R67DG, R67DH, R67DI, R67DJ, R67DK, R67DL, R67DM, R67DN, R67DO, R67DP, R67DQ, R67DR, R67DS, R67DT, R67DU, R67DV, R67DW, R67DX, R67DY, R67DZ, R67EA, R67EB, R67EC, R67ED, R67EE, R67EF, R67EG, R67EH, R67EI, R67EJ, R67EK, R67EL, R67EM, R67EN, R67EO, R67EP, R67EQ, R67ER, R67ES, R67ET, R67EU, R67EV, R67EW, R67EX, R67EY, R67EZ, R67FA, R67FB, R67FC, R67FD, R67FE, R67FF, R67FG, R67FH, R67FI, R67FJ, R67FK, R67FL, R67FM, R67FN, R67FO, R67FP, R67FQ, R67FR, R67FS, R67FT, R67FU, R67FV, R67FW, R67FX, R67FY, R67FZ, R67GA, R67GB, R67GC, R67GD, R67GE, R67GF, R67GG, R67GH, R67GI, R67GJ, R67GK, R67GL, R67GM, R67GN, R67GO, R67GP, R67GQ, R67GR, R67GS, R67GT, R67GU, R67GV, R67GW, R67GX, R67GY, R67GZ, R67HA, R67HB, R67HC, R67HD, R67HE, R67HF, R67HG, R67HH, R67HI, R67HJ, R67HK, R67HL, R67HM, R67HN, R67HO, R67HP, R67HQ, R67HR, R67HS, R67HT, R67HU, R67HV, R67HW, R67HX, R67HY, R67HZ, R67IA, R67IB, R67IC, R67ID, R67IE, R67IF, R67IG, R67IH, R67II, R67IJ, R67IK, R67IL, R67IM, R67IN, R67IO, R67IP, R67IQ, R67IR, R67IS, R67IT, R67IU, R67IV, R67IW, R67IX, R67IY, R67IZ, R67JA, R67JB, R67JC, R67JD, R67JE, 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R67UF, R67UG, R67UH, R67UI, R67UJ, R67UK, R67UL, R67UM, R67UN, R67UO, R67UP, R67UQ, R67UR, R67US, R67UT, R67UU, R67UV, R67UW, R67UX, R67UY, R67UZ, R67VA, R67VB, R67VC, R67VD, R67VE, R67VF, R67VG, R67VH, R67VI, R67VJ, R67VK, R67VL, R67VM, R67VN, R67VO, R67VP, R67VQ, R67VR, R67VS, R67VT, R67VU, R67VV, R67VW, R67VX, R67VY, R67VZ, R67WA, R67WB, R67WC, R67WD, R67WE, R67WF, R67WG, R67WH, R67WI, R67WJ, R67WK, R67WL, R67WM, R67WN, R67WO, R67WP, R67WQ, R67WR, R67WS, R67WT, R67WU, R67WV, R67WW, R67WX, R67WY, R67WZ, R67XA, R67XB, R67XC, R67XD, R67XE, R67XF, R67XG, R67XH, R67XI, R67XJ, R67XK, R67XL, R67XM, R67XN, R67XO, R67XP, R67XQ, R67XR, R67XS, R67XT, R67XU, R67XV, R67XW, R67XX, R67XY, R67XZ, R67YA, R67YB, R67YC, R67YD, R67YE, R67YF, R67YG, R67YH, R67YI, R67YJ, R67YK, R67YL, R67YM, R67YN, R67YO, R67YP, R67YQ, R67YR, R67YS, R67YT, R67YU, R67YV, R67YW, R67YX, R67YY, R67YZ, R67ZA, R67ZB, R67ZC, R67ZD, R67ZE, R67ZF, R67ZG, R67ZH, R67ZI, R67ZJ, R67ZK, R67ZL, R67ZM, R67ZN, R67ZO, R67ZP, R67ZQ, R67ZR, R67ZS, R67ZT, R67ZU, R67ZV, R67ZW, R67ZX, R67ZY, R67ZZ.</p>	<p>Picture 12</p> <p>Confirmation of output voltage</p> <p>Output voltage of REC unit comes to TB1(+B) and TB2 (PG). Confirm whether the input voltage is DC270~280V by connecting a Digital Voltmeter to TB1 and TB2.</p>

4.2.1. Adjustment of DRV Unit



Picture 13

Outlook of a DRV unit

* For easy observation of inside,
upper radiator was removed.

Radiator of DRV unit

Radiator of Sub power supply IC

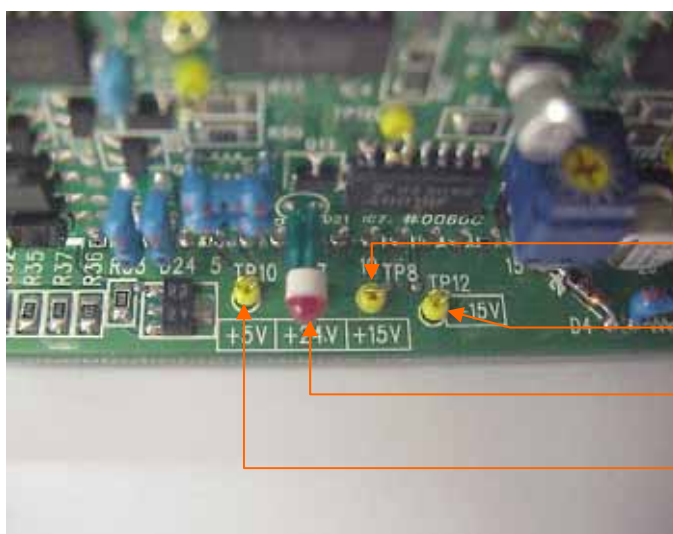
DRV CNT unit



Picture 14

Adjustment of AC-V SET

Turn VR1 fully counterclockwise
since this is not used.



Picture 15

Confirmation of bias voltage

* 1. Voltage is all DC voltage.
2. TP17 (S.GND) is used as GND.

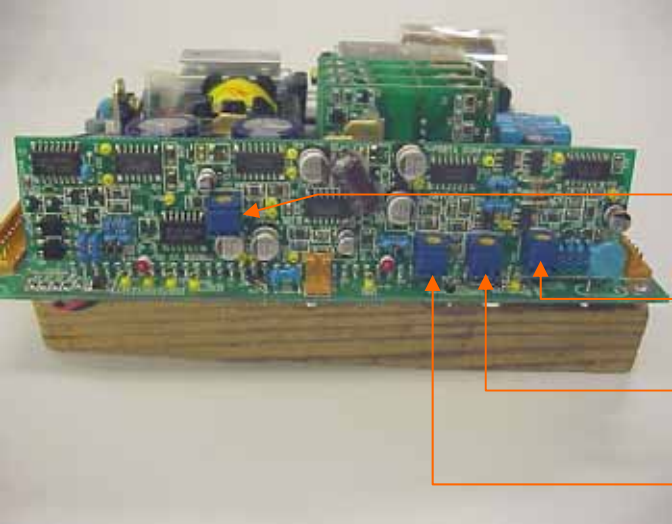

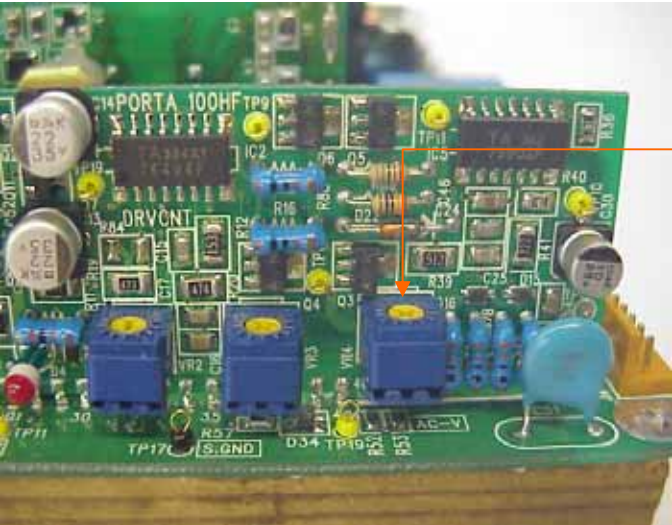
Confirm TP8 (+15V)

Confirm TP12 (-15V)

Confirm TP7 (+24V)

Confirm TP10 (+5V)

4.2.2. Adjustment of DRVCNT Unit

	<p>Picture 16</p> <p>Outlook of a DRVCNT unit</p> <p>* Procedure which should be performed before the adjustment.</p> <p>Place VR1 (Ep-SET) at 12 o'clock position.</p> <p>Place VR4 (Pre-H) at 10 o'clock position.</p> <p>Turn VR3 (Pre-H Gain) to fully counterclockwise.</p> <p>Place VR2 (Ip-SET) at 12 o'clock position.</p>
	<p>Picture 17</p> <p>DRVCNT unit</p> <p>* Procedure which should be performed before the adjustment.</p> <p>detection terminal TP10 (Ep-MON) and mA detection terminal TP8 (Ip-MON) on the X-CONT unit. GND is TP11.</p> <p>Settings are</p> <p>TP10 2V/div. = 40kV/div.</p> <p>TP 8 2V/div. = 8mA/div.</p> <p>Time axis = 10msec./div.</p>
	<p>Picture 18</p> <p>Pre-heat adjustment</p> <p>At the exposure under 40kV, 0.3mAs setting, adjust the peak waveform of TP8 (Ip MON) on the X-CONT unit by VR4 to becomes stable at 7.5V within the 10msec. (Refer the attached charts)</p>


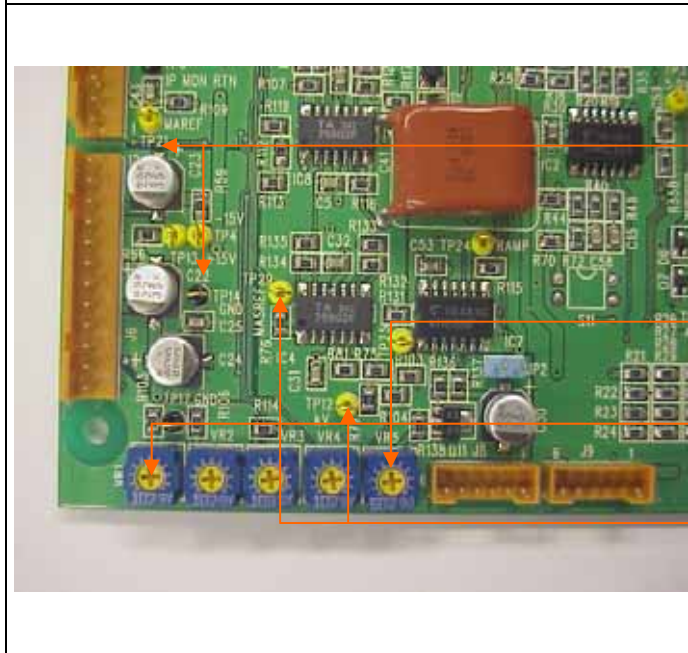
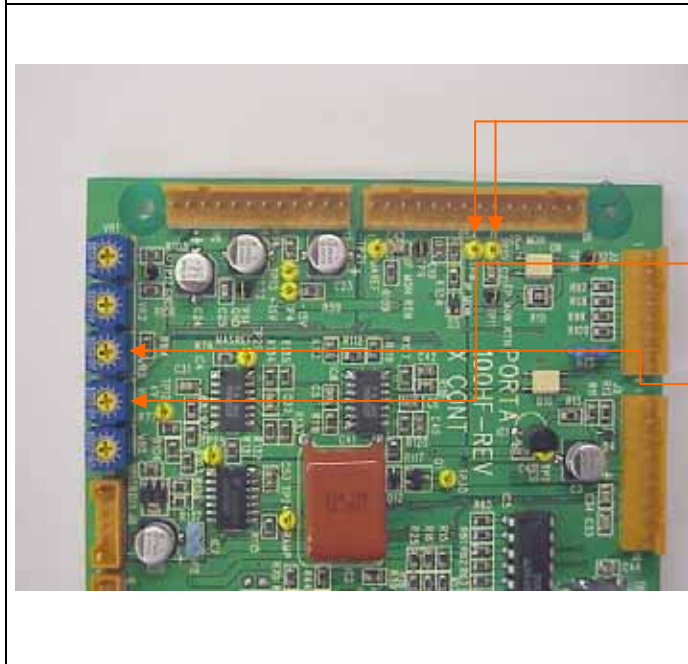


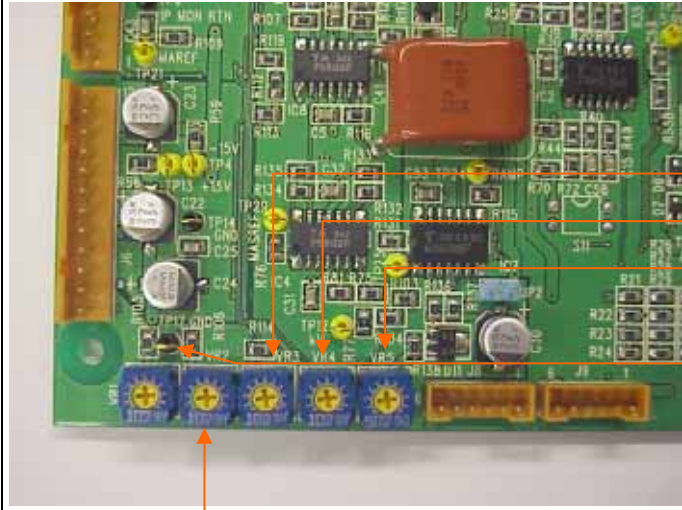
Picture 19

Adjustment of IP wave form

At the time of the exposure under 70kV, 3.2mAs setting, adjust a peak waveform of TP8 (Ip MON) on the X-CONT unit by VR2 to become 5.0V
(Refer to attached charts, Fig. 3, Fig. 4, Fig. 5)

4.3. Adjustment of XCONT Unit

	<p>Picture 20</p> <p>Out look of X-CONT unit</p> <ul style="list-style-type: none"> TP21 (Ma Ref.) TP29 (mAs Ref.) TP12 (kV Ref.) <p>* For the GND, use the black terminal nearest to the terminal to measure.</p> <ul style="list-style-type: none"> VR3 } They are VR for VR4 } mAs measurement VR5 (for 7.5V setting) VR1 (for 5.0V setting) VR2 (no adjustment)
	<p>Picture 21</p> <p>Adjustment for IP reference value</p> <p>Caution 1. Connect a digital voltmeter to TP21 and TP14</p> <p>2. Do not expose the x-ray during adjustment</p> <p>Set kV to 40kV and obtain 7.5V by VR5.</p> <p>Set kV to 70kV and obtain 5.0V by VR1.</p> <p>Confirm the voltage at TP12 (kV) and TP29 (mAs Ref.) by attached reference chart.</p>
	<p>Picture 22</p> <p>mAs adjustment</p> <p>Connect the oscilloscope to</p> <ul style="list-style-type: none"> * 1 TP10 and TP8 2 Make an exposure during the adjustment. <p>(1) When setting 70kV, 5mAs, adjust X-ON time of EP to 250msec. +/-7.0%by VR4</p> <p>(2) When setting 70kV, 20mAs, adjust X-ON time of EP to 1sec. +/-7.0%by VR3</p> <p>(3) When setting 70kV, 0.5mAs, confirm the X-ON time on EP is 25msec. +/-7.0%</p> <p>(Refer to the waveform chart of Tp10 and TP8)</p>



Picture 23

Additional explanation on VR

VR for mAs adjustment

- VR3 (0.3~5.0, mAs).
- VR4 (6.4~20, mAs).
- VR5 (7.5V setting, 40~66kV, IP=30mA, automatic setting).
- VR1 (5.0V setting, 68~100kV, IP=30mA, automatic setting).
- VR2 (No adjustment)

4.3.1. Confirmation of kV reference value (TP12) corresponding to each kV value.

Confirm V value at TP12 by changing kV by a kV selector switch.

Fig. 1

kV	TP12(V)
40	2.00
42	2.10
44	2.20
46	2.30
48	2.40
50	2.50
52	2.60
54	2.70
56	2.80
58	2.90
60	3.00
62	3.10
64	3.20
66	3.30
68	3.40
70	3.50

kV	TP12(V)
72	3.60
74	3.70
76	3.80
78	3.90
80	4.00
82	4.10
84	4.20
86	4.30
88	4.40
90	4.50
92	4.60
94	4.70
96	4.80
98	4.90
100	5.00

4.3.2. Confirmation of kV reference value (TP29) corresponding to mAs value.

Confirm V value at TP29 by changing mAs by a mAs selector switch.

Fig. 2

mAs	TP29(V)
0.3	0.31
0.4	0.39
0.5	0.50
0.6	0.58
0.7	0.70
0.8	0.78
0.9	0.89
1.0	1.01
1.1	1.09
1.2	1.20
1.3	1.28
1.4	1.40
1.5	1.48
1.6	1.59
1.7	1.71
1.8	1.79
1.9	1.91
2.0	1.98

mAs	TP29(V)
2.2	2.19
2.5	2.51
2.8	2.80
3.2	3.19
4.0	3.99
5.0	4.99
6.4	0.65
7.0	0.70
8.0	0.80
9.0	0.90
10	1.00
12	1.29
16	1.60
20	2.00

4.3.3. Wave form of TP10(EP), TP8(IP) on XCONT board

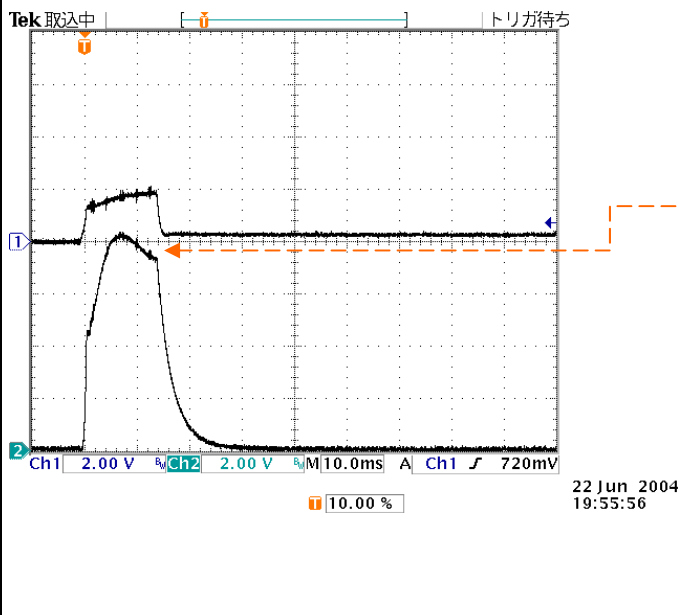


Fig. 3

Setting of 40kV, 0.3mAs ($I_p=30\text{mA}$)

* Acceptable waveform at the time of a pre-heat adjustment.

(Since it is confirmed that the peak waveform of Ch2 was 7.5V)

Ch 1 : TP10 (E_p) = 40kV/div.

Ch 2 : TP 8 (I_p) = 8mA/div.

(Ch 1, Ch 2 = 2V/div.)

Time axis : 10msec/div.

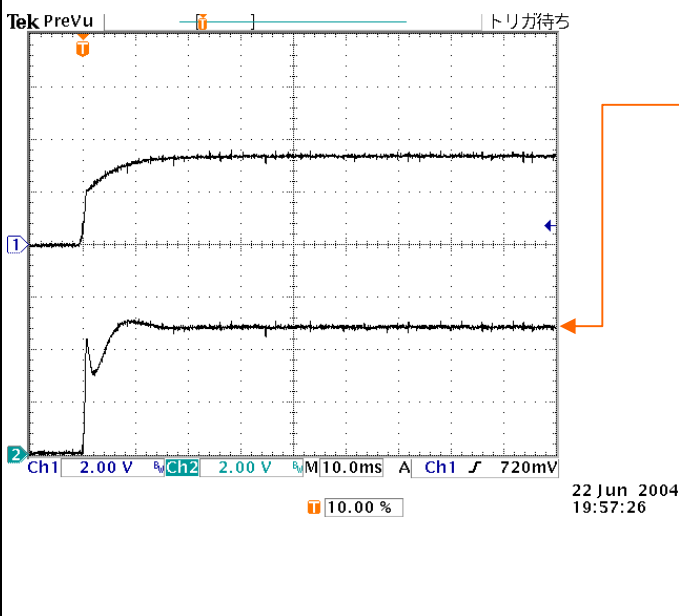


Fig. 4

Setting of 70kV, 3.2mAs ($I_p=20\text{mA}$)

* Acceptable waveform at the time of a pre-heat adjustment.

(Since it is confirmed that the peak waveform of Ch2 was 5.00V)

Ch 1 : TP10 (E_p) = 40kV/div.

Ch 2 : TP 8 (I_p) = 8mA/div.

(Ch 1, Ch 2 = 2V/div.)

Time axis : 10msec/div.

Ripple ; $E_p = \pm 3\%$

$I_p = \pm 5\%$

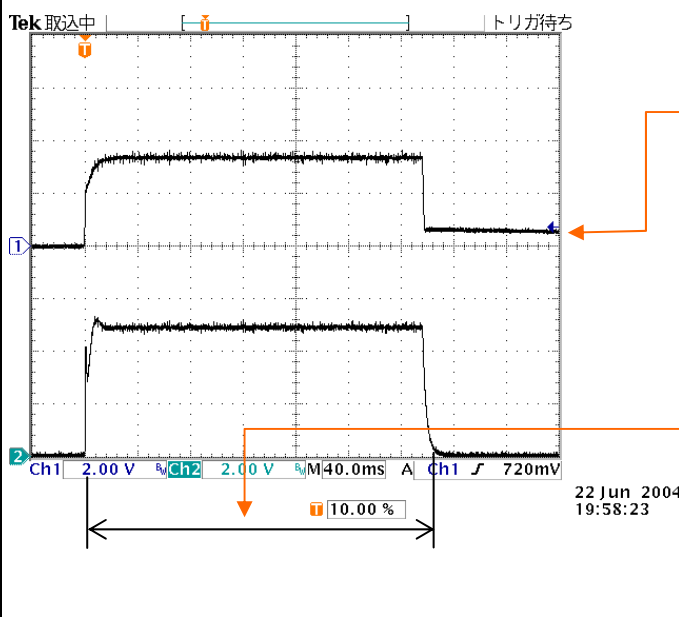


Fig. 5

Setting of 70kV, 5mAs ($I_p=20\text{mA}$)

* Acceptable waveform at the time of mAs waveform adjustment.

(Since it is confirmed that the pulse width of Ch2 was within 250msec. $\pm 7.0\%$)

Ch 1 : TP10 (E_p) = 40kV/div.

Ch 2 : TP 8 (I_p) = 8mA/div.

(Ch 1, Ch 2 = 2V/div.)

Time axis : 40msec/div.

250msec.

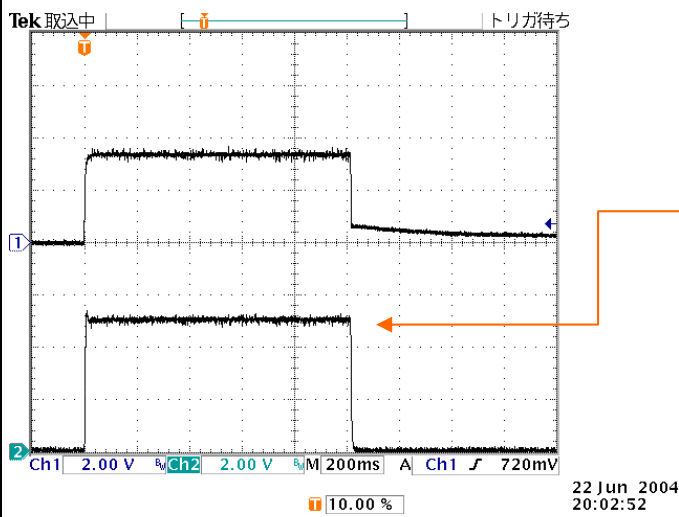


Fig. 6

Setting of 70kV, 20mAs ($I_p=20\text{mA}$)

* Acceptable waveform at the time of a pre-heat adjustment.
 (Since it is confirmed that the pulse width of Ch2 was within 1sec. $\pm 7.0\%$)

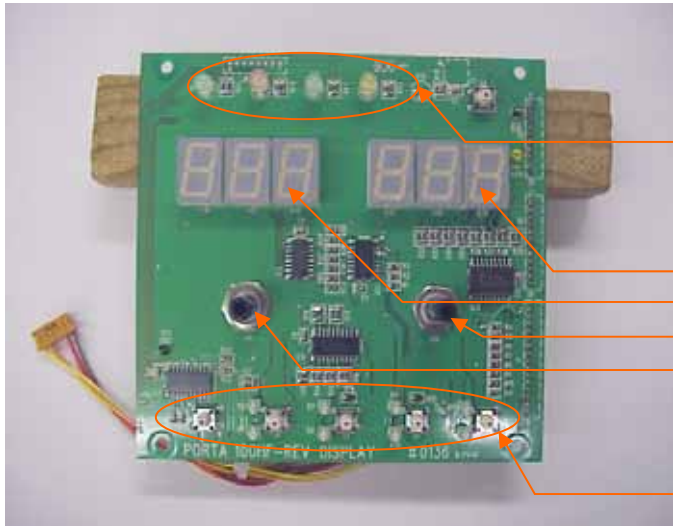
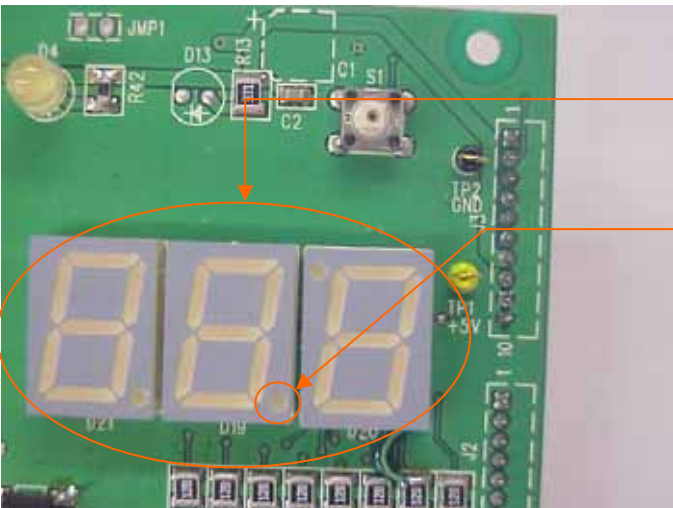
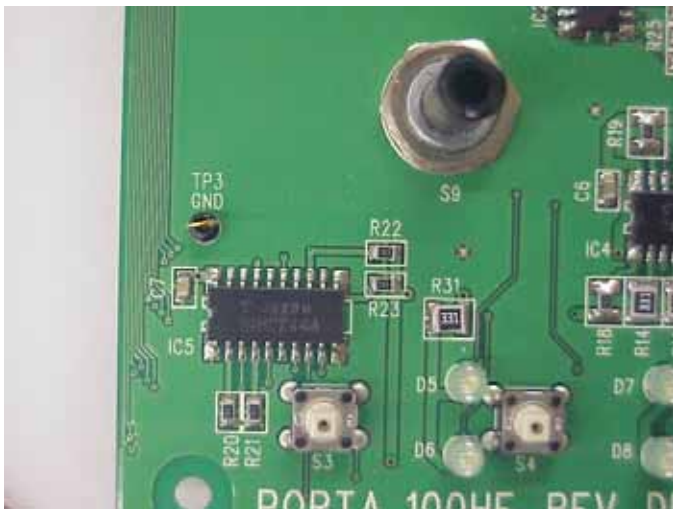
Ch 1 : TP10 (E_p) = 40kV/div.

Ch 2 : TP 8 (I_p) = 8mA/div.

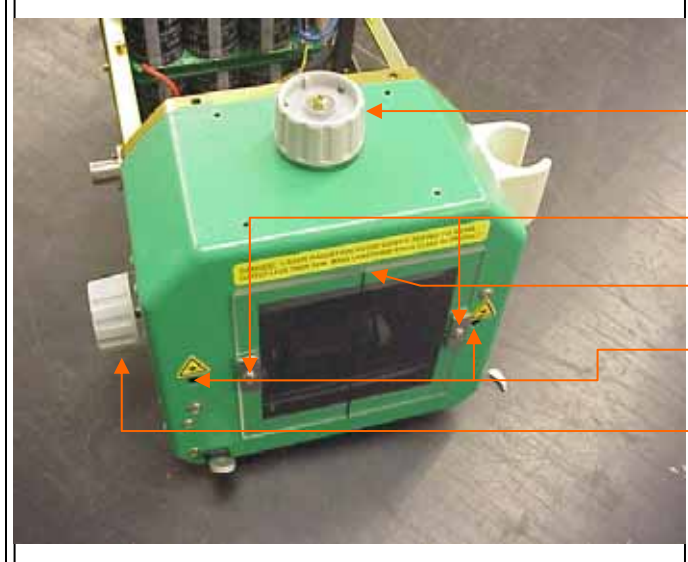
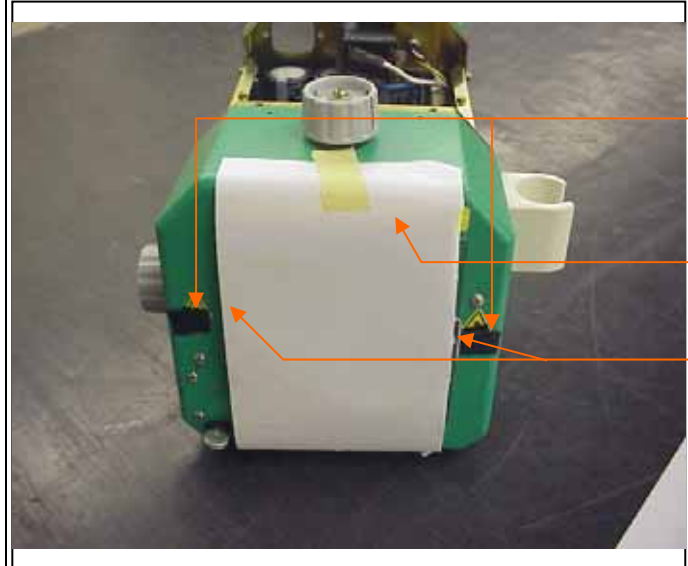

(Ch 1, Ch 2 = 2V/div.)

Time axis : 200msec/div.

4.4. Adjustment of DISPLAY Unit

 <p>A photograph of a green printed circuit board (PCB) for a display unit. The board features two 7-segment displays at the top. Various components are labeled with callouts: a row of four LEDs at the top, a central collimator lamp switch, two LEDs for mAs and kV display, two rotary switches for mAs and kV selection, and a row of eight APR switches at the bottom. The PCB is populated with various electronic components like resistors, capacitors, and integrated circuits.</p>	<p>Picture 24</p> <p>Outlook of DISPLAY unit From left, Display LEDs for Line (D1), Wait (D2) Ready (D3), X-RAY (D4) Collimator lamp switch LED for mAs display LED for kV display mAs selector SW kV selector SW</p> <p>From left, APR switches for (APR), (APR1,2), (APR3,4), (APR5,6), (APR7,8)</p>
 <p>A close-up view of the 7-segment display and its driver circuitry on the PCB. The display is currently showing '000'. A red circle highlights the decimal point area. Callouts point to specific components: D13 (a diode), R13 (a resistor), C1 (a capacitor), and S1 (a switch). The PCB also shows labels for TP2 GND and +5V.</p>	<p>Picture 25</p> <p>Confirmation of Display</p> <p>Confirm whether any LED of 7 segments is lighting or not during the display.</p> <p>Confirm whether the decimal point is lighting or not.</p>
 <p>A close-up view of the APR switch (S3) and its associated circuitry on the PCB. The switch is a rotary switch with a black knob. Callouts point to TP3 GND, S9 (a potentiometer), R22, R23, R31, IC5, R20, R21, D5, D6, D7, D8, R18, R19, R14, and IC4. The PCB is labeled 'PORTA 1004E REV. D1'.</p>	<p>Picture 26</p> <p>Confirmation of APR switch (S3)</p> <p>Confirm whether the selected kV and mAs are memorized or not.</p> <p>Confirm whether the figures in the display window turns upside down when the APR switch is pressed for more than 3 seconds. Also whether it turns to normal direction by pressing the switch again for more than 3 seconds.</p>

4.5. Adjustment of COLLIMATOR Unit

	<p>Picture 27 Outlook of COLLIMATOR unit</p> <ul style="list-style-type: none"> Adjusting knob for up/down movement of the blades. Adjusting screws of acrylic plate Acrylic plate with crossing lines Windows for laser beam Adjusting knob for left/right movement of the blades (Most important notice ; Do not place the laser beam direct to the eyes)
	<p>Picture 28 Adjustment of the acrylic plate, No.1</p> <ul style="list-style-type: none"> * Paste a black tape doubly for the protection purpose of eyes. Place a white paper in front of the acrylic plate. Fully close either blades and open slightly the other. Adjust the acrylic plate until the crossing line on the acrylic plate is placed on the line of the light coming from the collimator bulb.
	<p>Picture 29 Adjustment of the acrylic plate, No.2</p> <ul style="list-style-type: none"> This shows that the blades for up/down movement are fully open, closing the blades for left/right movement. A fine adjustment is performed by the adjusting screws of the acrylic plate.

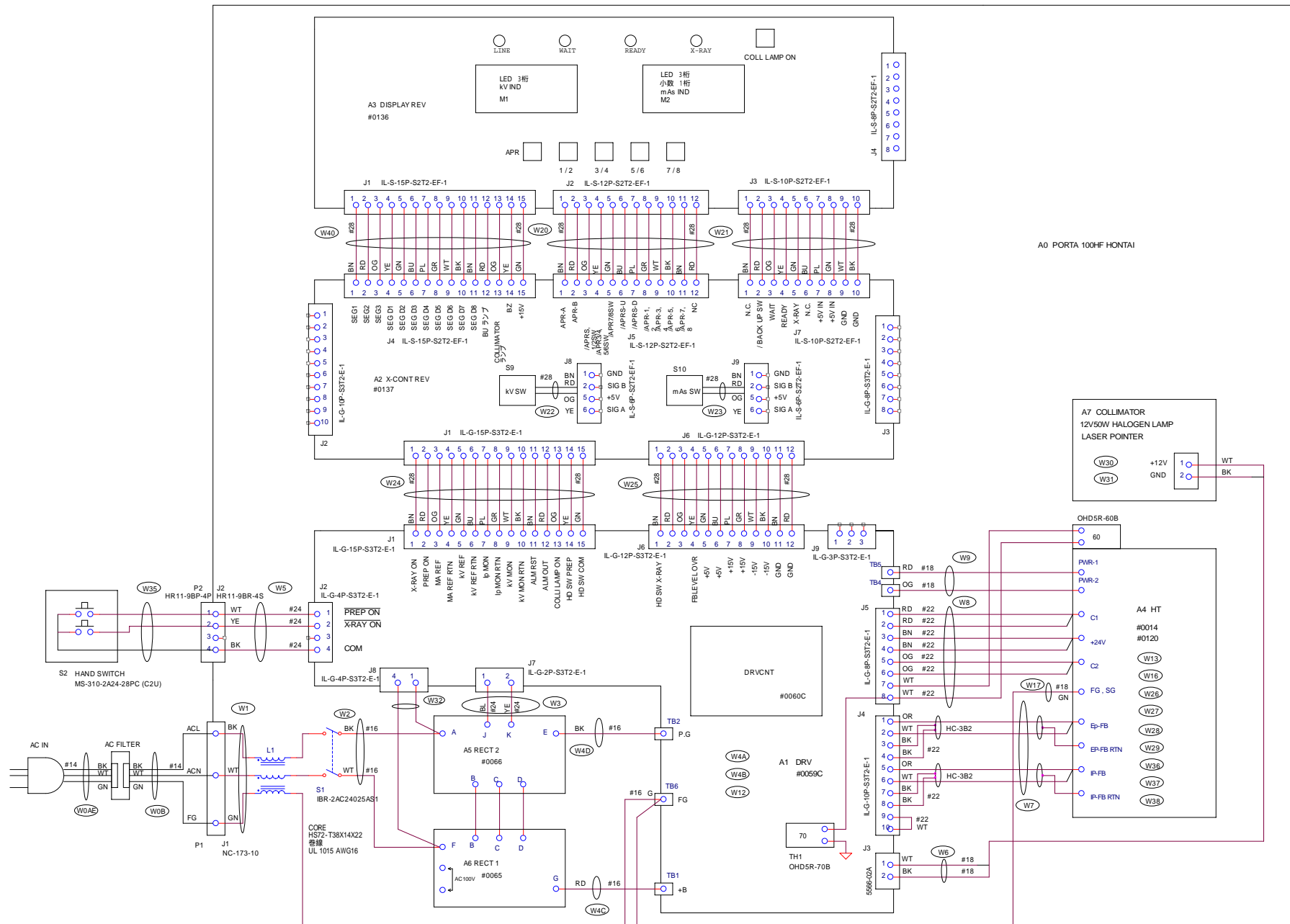


図 号	REV. MARK	材料	仕様	TREATMENT/FINISH	図 尺	縮 尺	単位
3A.3B	ゾーン	3A.3B	ゾーン				UNIT
04-10-12	発行日	承認	承認	承認	承認	承認	承認
		山本	大和田	山本	大和田	山本	大和田
		04-03-30	04-03-29	04-03-30	04-03-29	04-03-30	04-03-29
基板変更	#0050B	#0050C	#0050C	#0050C	#0050C	#0050C	#0050C
株式会社 ジョブ				PORTA 100HF_REV			
A3E0145				A3E0145			