

Document Name: Alignment cubes mounting		
Project: JEM-X	Document Code: JEMX-FM01-WO-016	Revision: 02
Customer Number:	Serial Number: JEM-X-FM01	MX Part Code:
Authorizing Engineer:		Date:
Author: H. Seppänen, T. Koivula		Date: 31-Jul-07

Special instructions / Comments etc.

Alignment cubes PO 20009489
 Alignment cubes support See JEMX-FM01-PA-022
 SCOTCH-WELD 2610 B/A JEMX-M133
 Nut M5
 Stainless steel rod
 Mainframe No: 77

Step	Work step description	Date/Initials	Notes
	ALIGNMENT MARKS MACHINING INSIDE DETECTOR (before EB-welding components)		
1	Center mainframe using three points: middle of the mainframe(jig), gas filling tube hole (centering tool) and HV-feedthrough hole (90° to gas filling tube hole)	21 Jul - 00 HVS	See figure 1
2	Machine alignment marks on gas filling and D-connector sides (three on both sides). Radius 180.5 distance between marks 50 mm	"	See figure 2
	ALIGNMENT MARKS MACHINING INSIDE DETECTOR (before EB-welding components)	"	
3	Center mainframe using three points: middle of the mainframe(jig), gas filling tube hole (centering tool) and HV-feedthrough hole (90° to gas filling tube hole)	"	
4	Machine alignment marks on gas filling and D-connector sides (three on both sides). Radius 180.5 distance between marks 50 mm	"	
	ALIGNMENT MARKS MEASURING		
5	Center the mainframe in milling machine. Mount Al-plate used in measuring alignment marks (on the inner side of the detector). Al-plate's corners shall be in the same line with alignment marks in the center. Lock Al-plate with M4 nuts.	"	See figure 3

Final Acceptance:

Date:

8-AUG-01

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Step	Work step description	Date/Initials	Notes
6	Measure distances from the Al-plates corner to alignment marks on the gas filling tube side (alignment marks In04, In05 and In06. Dimension B5). Measure also B1, B2, B6, B4, and B3. Write down results on the DRAWING-WO-016.2	21 Jul -00 HVS	See figure 4
7	Measure mainframe's thickness In04 and In 01 locations. Write down results on tables 01 and 02	14 Aug -00 HVS	
8	Turn the mainframe and measure dimensions A1, A2, A3, A4 and A5. Write down results on the DRAWING-WO-016.1	21 Jul -00 HVS	
	MOUNTING ALIGNMENT CUBES SUPPORT ON THE MAINFRAME	"	
9	Center the mainframe using alignment marks (milling machine).	"	
10	Mount alignment cubes support on the mainframe. Fasten with M5 nuts.	"	
11	Adjust the alignment support so that the distance from the Out01 to Cube01 is the same as from Out04 to Cube01	"	See DRAWING WO-016.1
12	When found the right location drill the holes for locking pins Ø1.5 mm	"	
13	Mount locking pins AISI 316L Ø 1.5 mm	"	
14	Alignment cube assembly can be taken off and re-mounted after EB-welding the cover	21 Jul -00 HVS	
	MOUNT SPIDER ASSEMBLY JEMX-FM01-W0-006 JEMX-FM01-W0-015 JEMX-FM01-W0-023		
	MICROSTRIP PLATE – MAINFRAME		
15	Center the mainframe under microscope by using In01, In02 and In03 alignment marks.	5 Jul -01 HVS	
16	Measure distance (Y and Z) from MS01 to In01, In02 and In03 alignment marks. Write down results on DRAWING-WO-016.2	"	
17	Center the mainframe under microscope using In04, In05 and In06 alignment marks.	"	
18	Measure distance (Y and Z) from MS02 to In04,	"	

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	In05 and In06 alignment marks. Write down results on the DRAWING-WO-016.2	5 Jul-07 HVS	
19	Measure (X) height from C3 (from MS01 to In04) and C3 (from MS02 to In01). Write down results on tables 01 and 02	u	See DRAWING-WO-016.2 and WO-016.3
	ALIGNMENT CUBES GLUING JEMX-FM01-WO-026	30 Jul-07 HVS	
	DETECTOR TESTING AND CLOSING (EB-WELDING THE COVER)		
	ALIGNMENT CUBES ASSEMBLY MOUNTING		
20	Center mainframe by using alignment marks	31 Jul-07 HVS	
26	Fasten alignment support assembly with M5 nuts. (Torque 5.9 Nm)	31 Jul-07 HVS	
27	Measure distance (A7, A8, A9 and A10) from alignment cubes to alignment marks. Write down results on DRAWING-WO-016.2	u	
28	Lock M5 nuts with SCOTCH-WELD 2610 B/A	u	
	CALCULATED DISTANCE FROM MS-PLATE TO ALIGNMENT CUBE		
	See RESULTS attached drawing		

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X- DIRECTION MEASURED DIMENSIONS (HEIGHT)

	D-CONNECTOR SIDE
C1 (MS02 → In03)	52.115
C2 mainframe thickness (In03 → Out03)	5.38
C3 (Out03 → Cube 02)	20.480

Table 01.

	GAS FILLING TUBE SIDE
C1 (MS01 → In06)	52.370
C2 mainframe thickness (In06 → Out06)	6.03
C3 (Out06 → Cube 01)	20.525

Table 02.

ALIGNMENT CUBES DISTANCE FROM MS-PLATE CALCULATED BY USING ALIGNMENT MARKS Out01, In01, Out 04 AND In04

GAS FILLIG TUBE SIDE

Inside of the detector:

Y-direction: (MS-plate cross MS01 → alignment mark In04) = 22.855 Measured distance

Z-direction: (MS-plate cross MS01 → alignment mark In04) = 42.760 Measured distance

Outside of the detector:

Correct the error if alignment marks are not in the same location in Y and Z direction:

Y-direction: (MS-plate MS01 → alignment mark In04) + (B1 - A1) =
 $22.855 + (50.000 - 49.995) = 22.860$

Real distance from MS-plate
to outer side alignment mark
Out04

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Z-direction: (MS-plate MS01 → alignment mark In04) + (B5 - A5) =
 $48,160 + (26,065 - 25,860) = 48,365$

Real distance from MS-plate
to outer side alignment mark
Out04

D-CONNECTOR SIDE

Inside of the detector:

Y-direction: (MS-plate cross MS02 → alignment mark In01) = 84,150 Measured distance

Z-direction: (MS-plate cross MS02 → alignment mark In01) = 47,860 Measured distance

Outside of the detector:

Y-direction: (MS-plate MS02 → alignment mark In01) + (B3 - A3) =
 $84,150 + (49,995 - 50,005) = 84,140$

Real distance from MS-plate
to outer side alignment mark
Out01

Z-direction:

(MS-plate MS02 → alignment mark In01) + [(B6 + B5) - (A6 + A5)] =

$47,860 + [(359,940 + 26,065) - (360,000 + 25,860)]$
 $= 48,005$

Real distance from MS-plate
to outer side alignment mark
Out01

REAL DISTANCE FROM ALIGNMENT CUBE TO MS-PLATE CROSS

GAS FILLIG TUBE SIDE

Alignment cube 01 corner 01

Y-direction: (MS-plate MS01 → alignment mark Out04 real distance) + A8 =

$82,890 + 159,190 = 242,08$

Real distance from MS01
cross to the alignment cube 01
Corner C1

Z-direction: A9 - (MS-plate MS01 → alignment mark Out04 real distance) =

$101,470 - 48,365 = 53,105$

Real distance from MS01
cross to the alignment cube 01
Corner C1

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Alignment cube 01 corner 02

Y-direction: (MS-plate MS01 → alignment mark Out04 real distance) + A11 =
 $82,890 + 159,170 = 242,060$

Real distance from MS01
cross to the alignment cube 01
corner 02

Z-direction: A10 - (MS-plate MS01 → alignment mark Out04 real distance) =
 $116,560 - 48,365 = 68,195$

Real distance from MS01
cross to the alignment cube 01
corner 02

X-direction (Height): C1 + C2 + C3 =
 $52,370 + 6,03 + 20,525 = 78,925$

Distance from alignment cube
to MS-plate (Cube 01 →
MS01)

D-CONNECTOR SIDE

Alignment cube 02 corner 03

Y-direction: A7 + (MS-plate MS02 → alignment mark Out01 real distance) =
 $159,130 + 84,140 = 243,270$

Real distance from MS02
cross to the alignment cube 02
corner 03

Z-direction: A15 - (MS-plate MS02 → alignment mark Out01 real distance) =
 $116,080 - 48,005 = 68,075$

Real distance from MS02
cross to the alignment cube 02
corner 03

Alignment cube 02 corner 04

Y-direction: A14 + (MS-plate MS02 → alignment mark Out01 real distance) =
 $159,120 + 84,140 = 243,260$

Real distance from MS02
cross to the alignment cube 02
corner 04

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Z-direction: A12 - (MS-plate MS02 → alignment mark Out01 real distance) =

$$101,005 - 48,005 = 53,000$$

Real distance from MS02
cross to the alignment cube 02
corner 04

X-direction (height): C1 + C2 + C3 =

$$52,115 + 5,938 + 20,480 = 78,533$$

Distance from alignment cube
to MS-plate (Cube 02 →
MS02)

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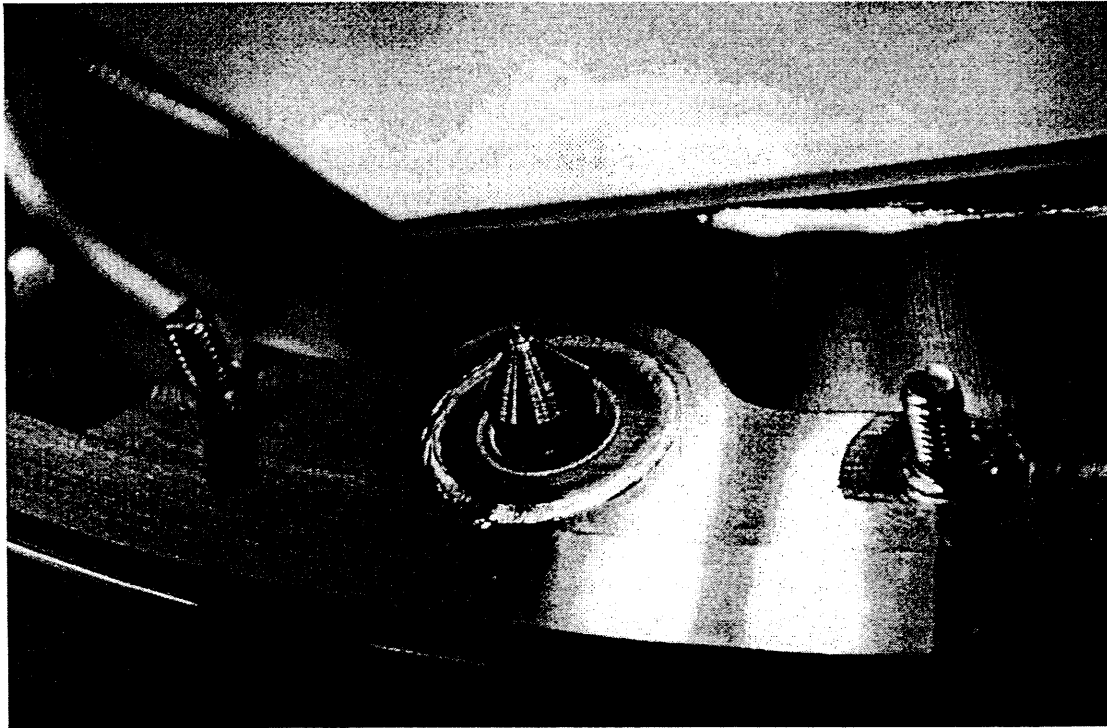


Figure 1. Tool used in centering the mainframe

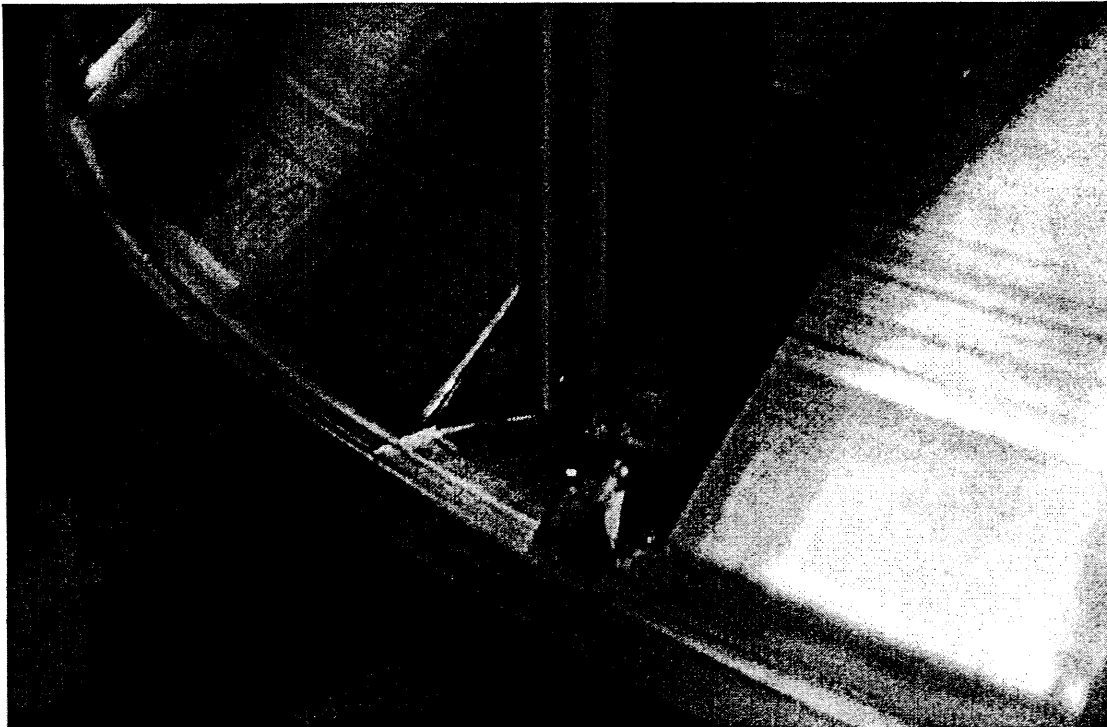


Figure 2. Machining the alignment mark Out05

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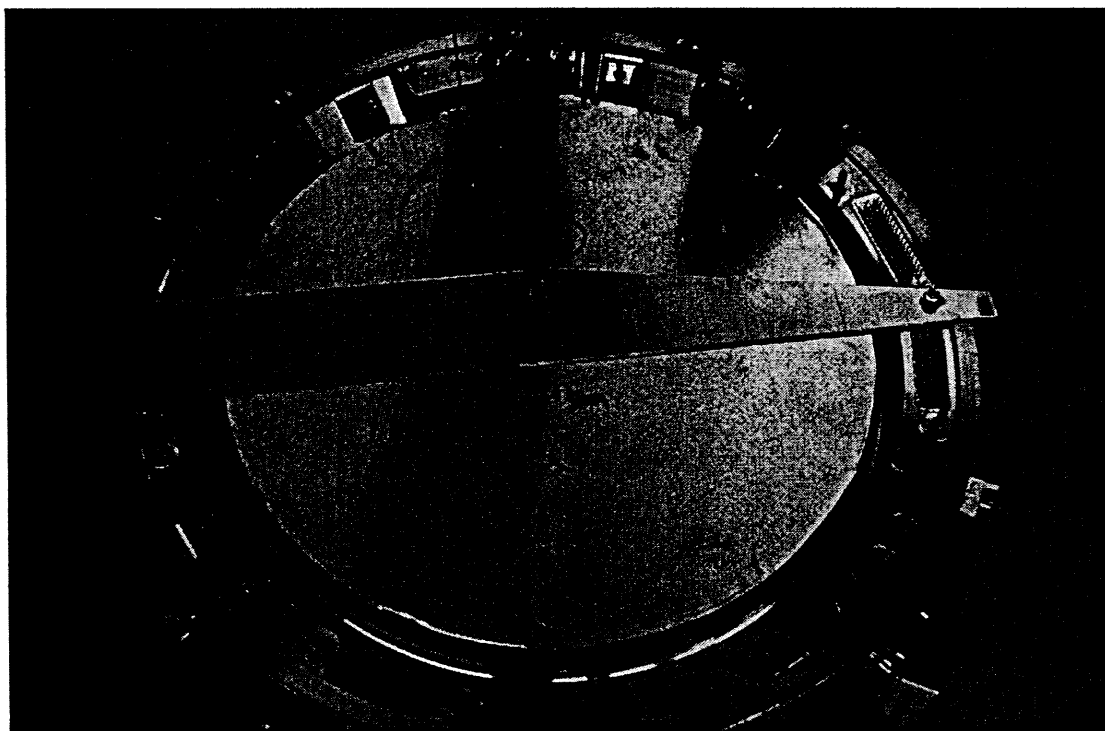


Figure 3. Al-plate used in measuring alignment marks

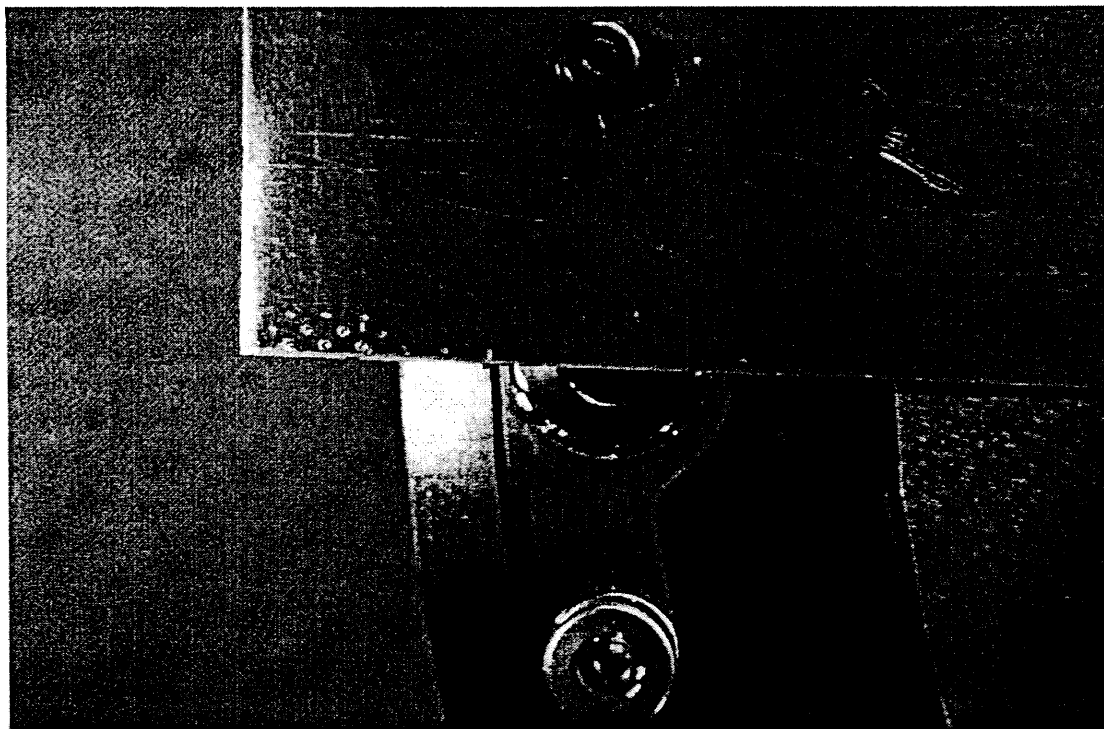
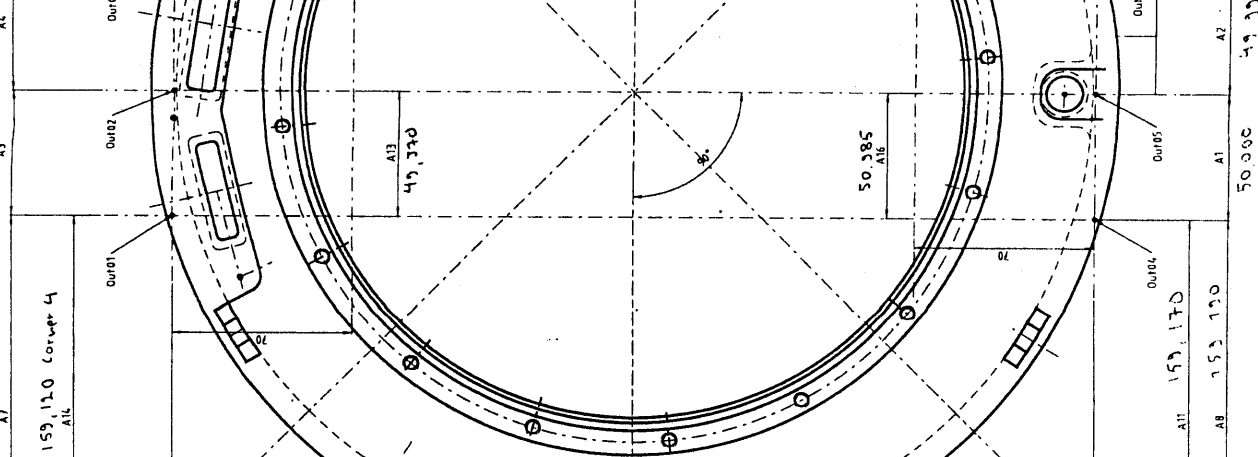


Figure 4. Dimensions (A5 and B5) are measured from the corner of Al-plate

559,130 Corner 3
A7




AS 09855

[illegible]

359, 940⁸⁶

5. Jul. 01 Hus

21.12.2020 Hrus

QTY	DATE	BY	REMARKS
1	10/10/10	10/10/10	10/10/10
<div style="display: flex; justify-content: space-between;"> <div>  </div> <div> <p>JEN-X</p> <p>JENX-FH0-WD-016</p> <p>Alignment class mounting</p> </div> <div> <p>10/10/10</p> </div> </div>			

4		3		2		1		
REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.				
<p style="position: absolute; left: 100px; top: 280px; transform: rotate(-90deg);">6.250</p> <p style="position: absolute; left: 150px; top: 330px;">C1</p> <p style="position: absolute; left: 100px; top: 390px;">C2</p> <p style="position: absolute; left: 230px; top: 430px;">C3</p> <p style="position: absolute; left: 230px; top: 460px; transform: rotate(-90deg);">52.225</p> <p style="position: absolute; left: 710px; top: 700px;">X</p> <p style="position: absolute; left: 640px; top: 760px;">Y</p> <p style="position: absolute; left: 560px; top: 760px;">5 Jul. 01 HUS</p>								
OSA ITEM		OSAN NIMI, MITAT, MITTASTO., AINE, AINESTO. DESCRIPTION				PIIR.N:O TAKO CODE		1 KPL QTY
YLEISTOLERANSSI TOLERANCES						SUUNN. DESIGNED		PIIRT. DRAWN
		SUHDE SCALE LIITTYY NEXT ASSY JEMX-FM01-W0-016 Alignment cubes mounting				TARK. CHECKED		HYV. APPROVED
						TUOTE PRODUCT		
						OSAL.N:O PART LIST		REV. 0
						PIIR.N:O CODE W0-016.3		

