U-ARM Positioner
X PLUS LP PLUS
Service Manual

SEDECAL

Technical Publication
SM-1038R17_EN_SED

Service Manual

Universal Radiographic System

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The information comprised in this manual applies to the following equipments La información contenida en este manual se aplica a los siguientes equipos L'information contenue dans ce manuel est appliquée aux équipements suivants
Radiographic System SEDECAL X: **SEDECAL X PLUS LP PLUS**

Manufactured by:
Fabricado por:
Fabriqué par:

SEDECAL
Sociedad Española de Electromedicina y Calidad S.A.
Pelaya, 9 – 13. Polígono Industrial "Río de Janeiro"
28110 Algete, Madrid – España (Spain)

Phone: +34 916 280 544 Fax: +34 902 190 385 www.sedecal.com

REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE
4	MAY 23, 2008	New Interface and Control PCBs (From Serial number 40268).
5	OCT 23, 2008	New Maintenance Arm Check.
6	MARCH 27, 2009	Inverters configuration change to (1).
7	SEP 21, 2009	Improved Tables of User Messages.
8	MARCH 2, 2010	New screens added.
9	FEB 07, 2011	New Spare Relay K3.
10	NOV 18, 2012	IEC Standards Update,
11	FEB 18, 2013	Stitching option and new Inclinometer PCB.
12	JUL 29, 2013	Digital Inclinometer PCB added.
13	FEB 25, 2014	TS10 Connection and Inverter 50.0 ammended.
14	OCT 16, 2014	New Receptor Handle, detector trays BDC/BDG and updated Bios Configuration.
15	DEC 16, 2014	Ammended Touch Sensor Calibration
16	OCT 8, 2015	New Inverters added
17	MAR 14, 2019	New Inverter‘s configuration added, New Computer and Compact flash replaced by Sata Edom HDD in Control Box due to Windows 10. Added SHFR Generator.

This Document is the English original version, edited and supplied by the manufacturer.

The Revision state of this Document is indicated in the code number shown at the bottom of this page.

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 HEEDED OR AVOIDED WILL CAUSE SERIOUS PERSONAL INJURY OR DEATH.

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

Advise of conditions or situations that if not heeded or avoided could cause personal injury or damage to equipment or data.

Note ☞

Alert readers to pertinent facts and conditions. Notes represent information that is important to know but which do not necessarily relate to possible injury or damage to equipment.

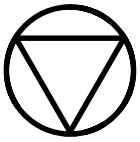
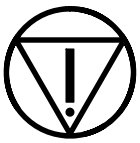
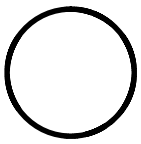
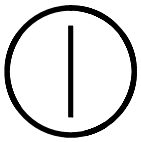
SAFETY SYMBOLS

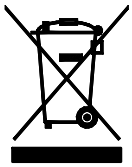
The following safety symbols may appear in the equipment.

Their meaning are described below.

	**Caution. Consult accompanying documents.**
	**Safety Symbol. Follow instructions for use, especially those instructions identified with Advisory Symbols to avoid any risk for the Patient or Operator.** *(Only applies to IEC 60601-1 Standard - Third edition)*
	**General Mandatory action.**
	**Type B applied part.**
IPX0	**Protection against harmful ingress of water or particulate matter.** **IP Classification: Ordinary.**
	**Ionizing radiation.**
	**Non-ionizing electromagnetic radiation.**
	**Radiation of Laser apparatus.** Do not stare into beam. *(Only applicable to equipment with Laser Pointer)*

	**Dangerous voltage.**
	**General warning, caution, risk of danger.**
	**Warning: Ionizing radiation.**
	**Warning: Non-ionizing radiation.**
	**Warning: Laser beam.**
	**Warning: Dangerous voltage.**
	**Warning: Do not place fingers between mobile and fixed parts of the equipment, it may cause serious injuries to patient or operator.** **As well, make sure the patient extremities are correctly positioned into limit areas during operation, movement of parts may cause serious damages to patient.**
	**Electrostatic sensitive devices.**
	**No pushing.**

	**No sitting.**
	**No stepping on surface.**
	**Stop (of action).**
	**Emergency stop.**
	“ON” power.
	**“OFF” power.**
	**“ON” / “OFF” (push-push).** *Each position, “ON” or “OFF”, is a stable position.*
	**Alternating current.**
	**Three-phase alternating current.**
	**Three-phase alternating current with neutral conductor.**

N	**Connection point for the neutral conductor on Permanently Installed equipment.**
	**Direct current.**
	**Both direct and alternating current.**
	**Protective Earth (Ground).**
	**Earth (Ground).**
	**This symbol according to the European Directive indicates that the Waste of Electrical and Electronic Equipment (WEEE) must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of your equipment.**
 **Li/Pb/Cd/Hg**	**This separate collection symbol is affixed to a battery or its packing, to advise that the battery must be recycled or disposed of in accordance with local or country laws. The letters below the symbol indicate whether certain elements (Li=Lithium, PB=Lead, CD=Cadmium, Hg=Mercury) are contained in the battery. All batteries removed from the equipment must be properly recycled or disposed. Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of your equipment.**
	**Pollution Control.** *(Only applicable to People's Republic of China (PRC)).* **This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese Standards. It must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer or an authorized waste management company for information concerning the decommissioning of your equipment.**

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SECTION 1 INTRODUCTION

1.1 OBJECTIVE AND SCOPE OF THIS MANUAL

This Service Manual is intended to describe the installation, adjustments, configuration, calibration, troubleshooting and periodic maintenance of the Radiographic Room.

OPERATOR AND SERVICE MANUALS SHOULD BE CAREFULLY READ AND UNDERSTOOD BY SERVICE PERSONNEL BEFORE USING AND SERVICING THE EQUIPMENT, ESPECIALLY THE INSTRUCTIONS CONCERNING SAFETY, REGULATORY, DOSAGE AND RADIATION PROTECTION. KEEP THE MANUALS WITH THE EQUIPMENT AT ALL TIMES AND PERIODICALLY REVIEW THE OPERATING AND SAFETY INSTRUCTIONS.

SERVICE PERSONNEL MUST HAVE SUFFICIENT KNOWLEDGE TO COMPETENTLY PERFORM THE SERVICE TASKS RELATED TO X-RAY DEVICES AND PARTICULARLY TO THE EQUIPMENT DESCRIBED IN THIS MANUAL. THIS KNOWLEDGE IS ACQUIRED THROUGH A VARIETY OF EDUCATIONAL METHODS FOR TECHNICIANS IN ACCORDANCE WITH LOCAL LAWS OR REGULATIONS, INCLUDING SPECIFIC TRAINING ON THIS EQUIPMENT.

ALWAYS MAKE SURE BEFORE ANY INSTALLATION OR SERVICE PROCEDURE THAT THE MANUALS USED ARE IN ACCORDANCE WITH THE EQUIPMENT VERSION.

1.2 TOOLS

The following hand tools are required for the Installation:

- Standard service engineers tool kit.
- Electric drill motor and assorted bits.
- Torque wrench.
- Hammer drill.

- Step Ladder.
- Digital Level.
- Silicone Insulating Grease (proofing compound) (included in the X-ray Tube package).
- HV Oil (included in the HV Cables package).
- Alcohol cleaning agent.

The following test equipment is required for Configuration and Calibration:

- Calculator.
- Digital Multimeter.
- Non-invasive kVp Meter.
- Digital mAs Meter.

The following special tools or equivalent are required for Adjustment of the X-ray System (X-ray Tube / Collimator adjustments):

- Collimator Test Tool (Model RMI 161B9).
- Beam Alignment Test Tool (Model RMI 162A).
- SID Test Stand Tool (Inside Case: RMI Model 175).
- Light Meter (Standard).

1.3 PRE-INSTALLATION CHECKS

Prior to beginning installation it is recommended to inspect the site and verify that the X-ray room complies with requirements such as:

- Space Requirements to allow installation and system movements must consider the maximum dimensions and travels of the equipment.

ACCORDING TO THE MDD/93/42/EEC, THIS UNIT IS EQUIPPED WITH EMC FILTERS. THE LACK OF THE PROPER GROUNDING MAY PRODUCE ELECTRICAL SHOCK TO THE USER.

BEFORE ANCHORING THE UNIT, CHECK THAT THE WALL AND THE ANCHORING SYSTEM ARE STRONG ENOUGH (2000 NEWTON TRACTION FORCE) TO ENSURE A SAFE INSTALLATION. SOME NON BRICK WALLS MAY REQUIRE ADDITIONAL ANCHORAGE INSTALLATION.

IN CASE THE OPTIONAL CEILING ANCHORAGE IS INSTALLED, THE REQUIREMENT FOR CEILING TRACTION FORCE IS 3000 NEWTON.

- Power Line Requirements

Power Line	Single phase, 50/60 Hz 230 / 240 V~ ±10%
Minimum Input Power Required	2.5 kVA
Power consumption in stand-by	80 W

- Storage / Transport Environmental Conditions

Temperature range	-40°C to 70°C (-40°F to 158°F)
Relative humidity range	10% to 100%
Atmospheric Pressure range	500 hPa to 1060 hPa

- Operating Environmental Conditions

Temperature range	10°C to 40°C (50°F to 104°F)
Relative humidity (no condensing) range	30% to 75%
Atmospheric Pressure range	700 hPa to 1060 hPa

- Heat Output
(for a working cycle of one patient every two minutes during one hour)

SHF X-Ray Generator + Control Box	810 BTU/h (237.4 W)
SHFR X-Ray Generator + Control Box . . .	1025 BTU/h (300 W)
Column with Arm	425 BTU/h (124.6 W)
X-ray Tube (example: Toshiba E7254FX) .	450.7 BTU/h (132 W)

- Dimensions and weight of the Control Box

Height x Width x Length	600 x 592 x 422 mm 23.6 x 23.3 x 16.6 ”
Weight	63 kg (139 lb)

- Dimensions and weight of the Radiographic Table

Height x Length x Width	700 x 2000 x 650 mm 27.5 x 80 x 25.5 ”
Weight	46 kg (101 lb)
Maximum Patient weight	200 kg (440.92 lb)

- Dimensions and weight of the Column

Maximum Height (Undertable position)	2650 mm (104.3”)
Maximum Height (of positioner) . . . . . (*****) U-arm without software/hardware limits	2775 mm (109.25”) *****
Minimum recommended Room height	2700 mm (106.3”)
Maximum Length	2135 mm (84”)
Maximum Length	2135 mm (84”)
Weight	324 kg (714.3 lb)
Optional Ceiling-Floor installation:	
Minimum recommended Room height	2700 mm (106.3”)
Maximum Room height	2925 mm (115.18”)

- Column Data

Vertical Travel of Central Carriage . . .	1265 mm (49.8”)
Minimum Source-Image Distance (SID)	1000 mm (40”)
Maximum Source-Image Distance (SID)	1800 mm (70.8”)
SID adjustment speed	87 mm/s (3.4”/s)
Rotation of Swivel Arm	$+120^{o}/-30^{o}$
(rotation may be limited by cables)	
Rotation of Tube-Collimator Assembly	$\pm 180^{o}$
(rotation may be limited by cables)	
Rotation of Receptor	$\pm 45^{o}$
(*) Grids: Interchangeable Grids . .	12:1 -1 m - 80 lines/cm 12:1-1.80m - 80 lines/cm
Oscillating Grid	12:1 -1.50m - 40 lines/cm

(*) Grids depends on type of receptor

Illustration 1-1
Positioner dimensions

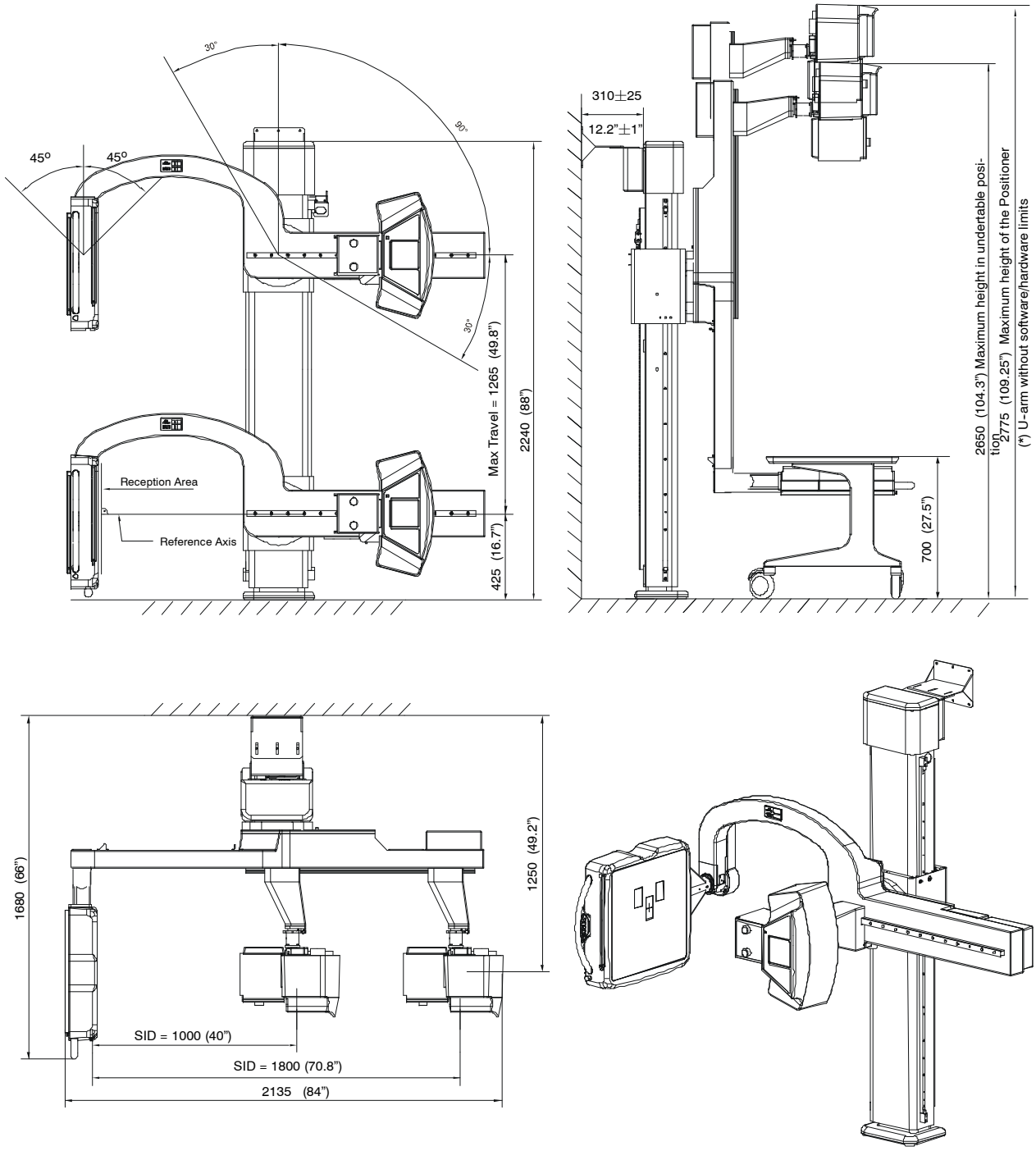


Illustration 1-2
Room Layout – Installation at Wall and Floor

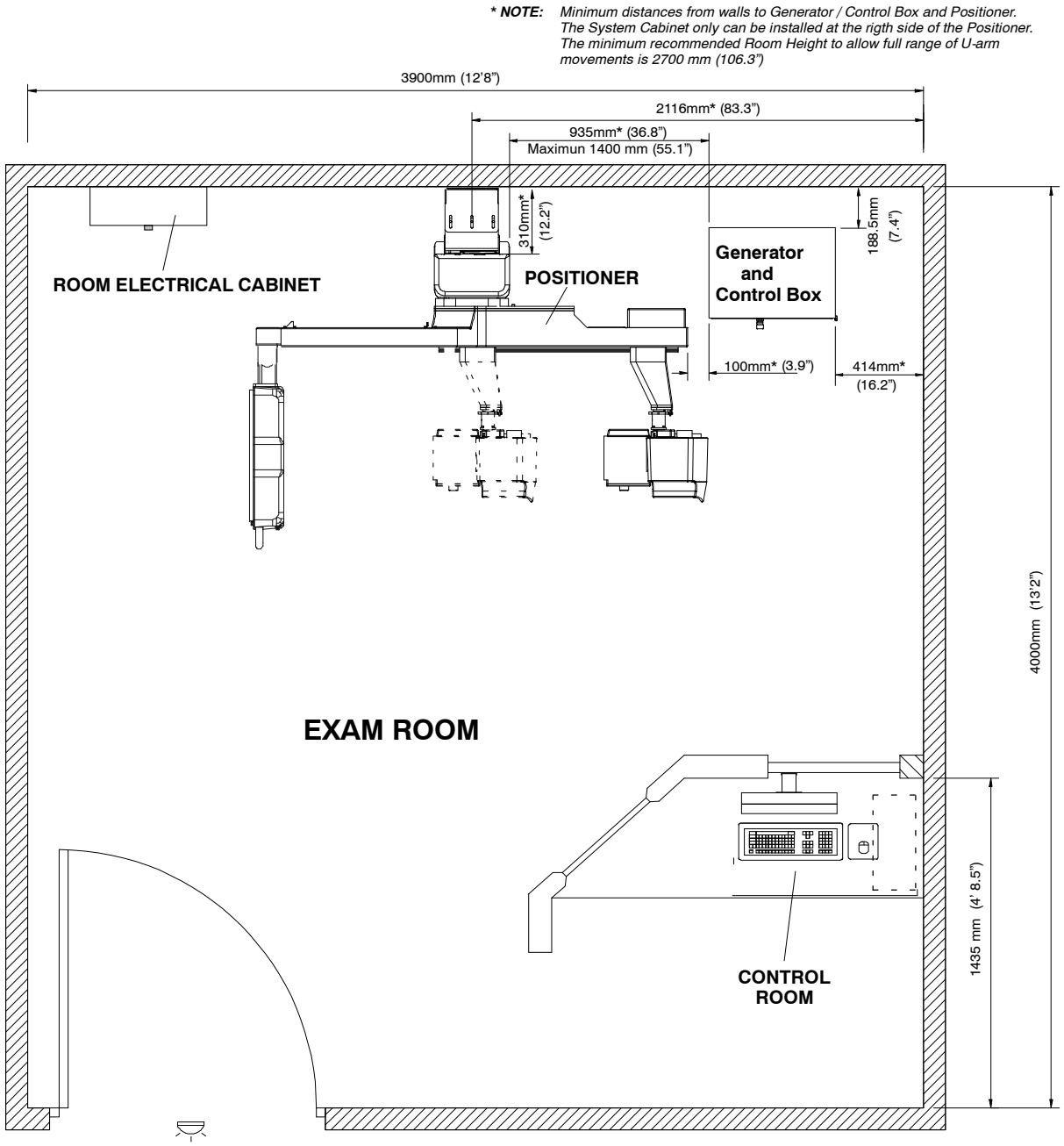


Illustration 1-3
Ceiling Installation Option

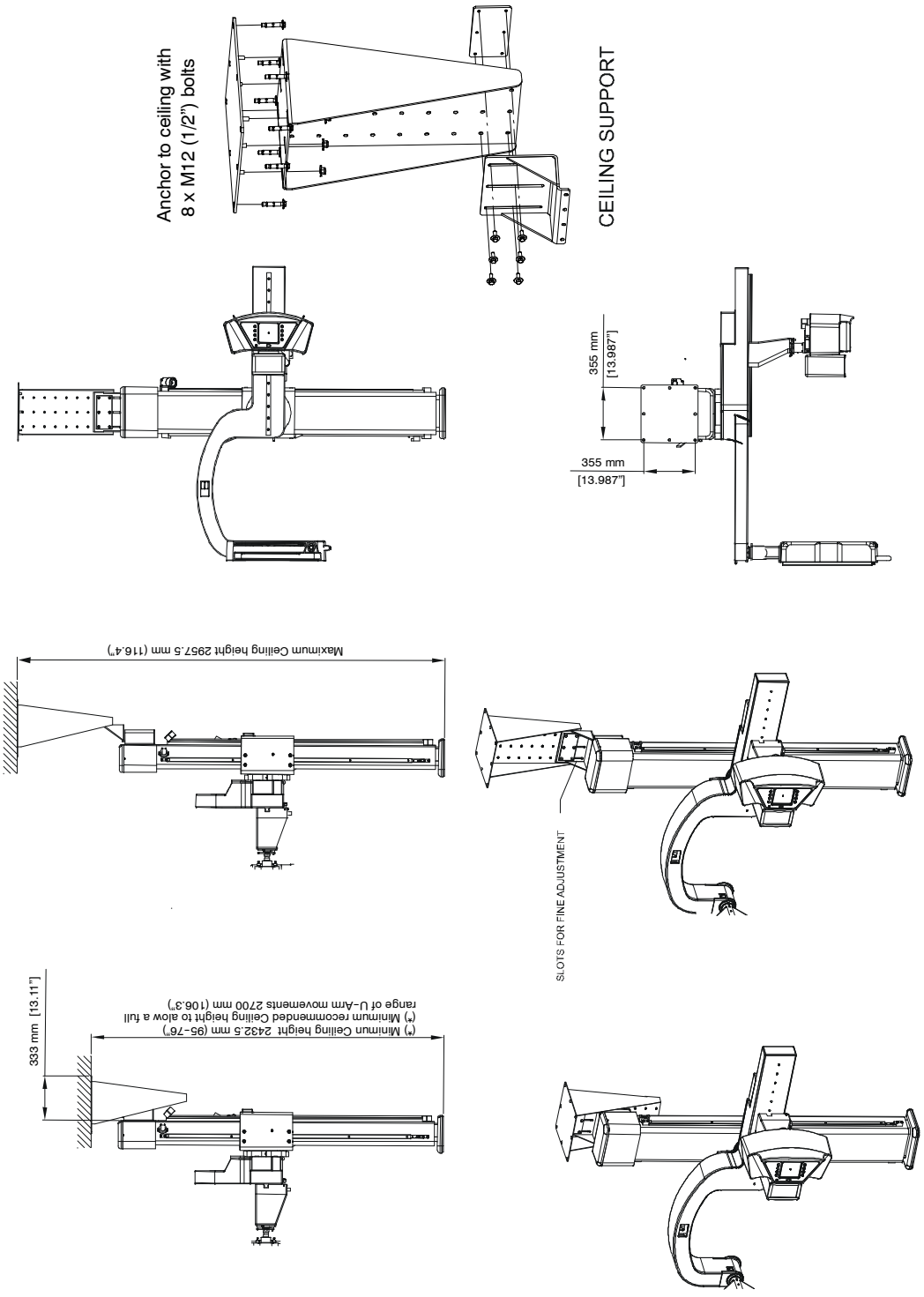


Illustration 1-4
Room Layout – Installation at Ceiling and Floor

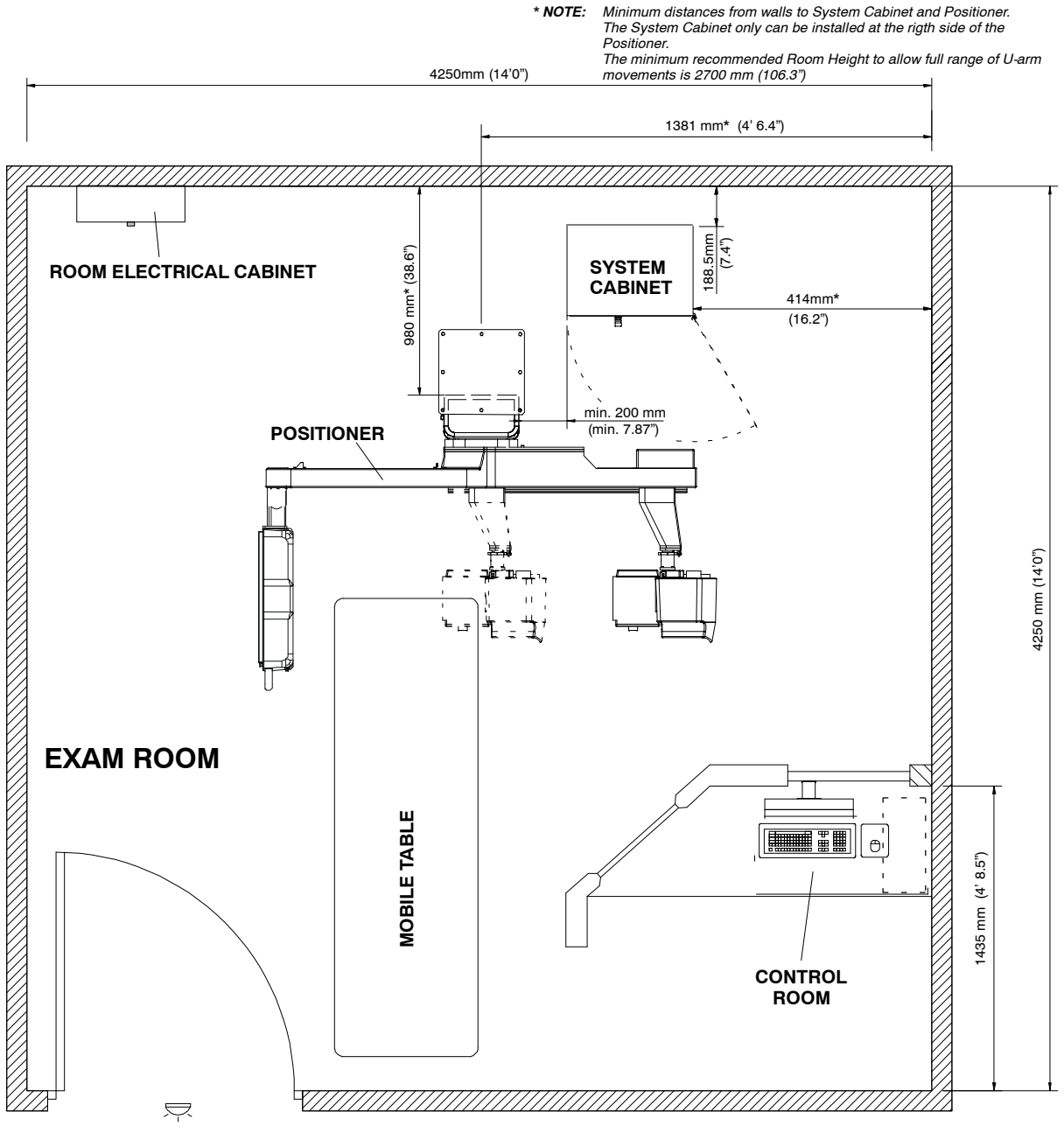


Illustration 1-5
Drill Template

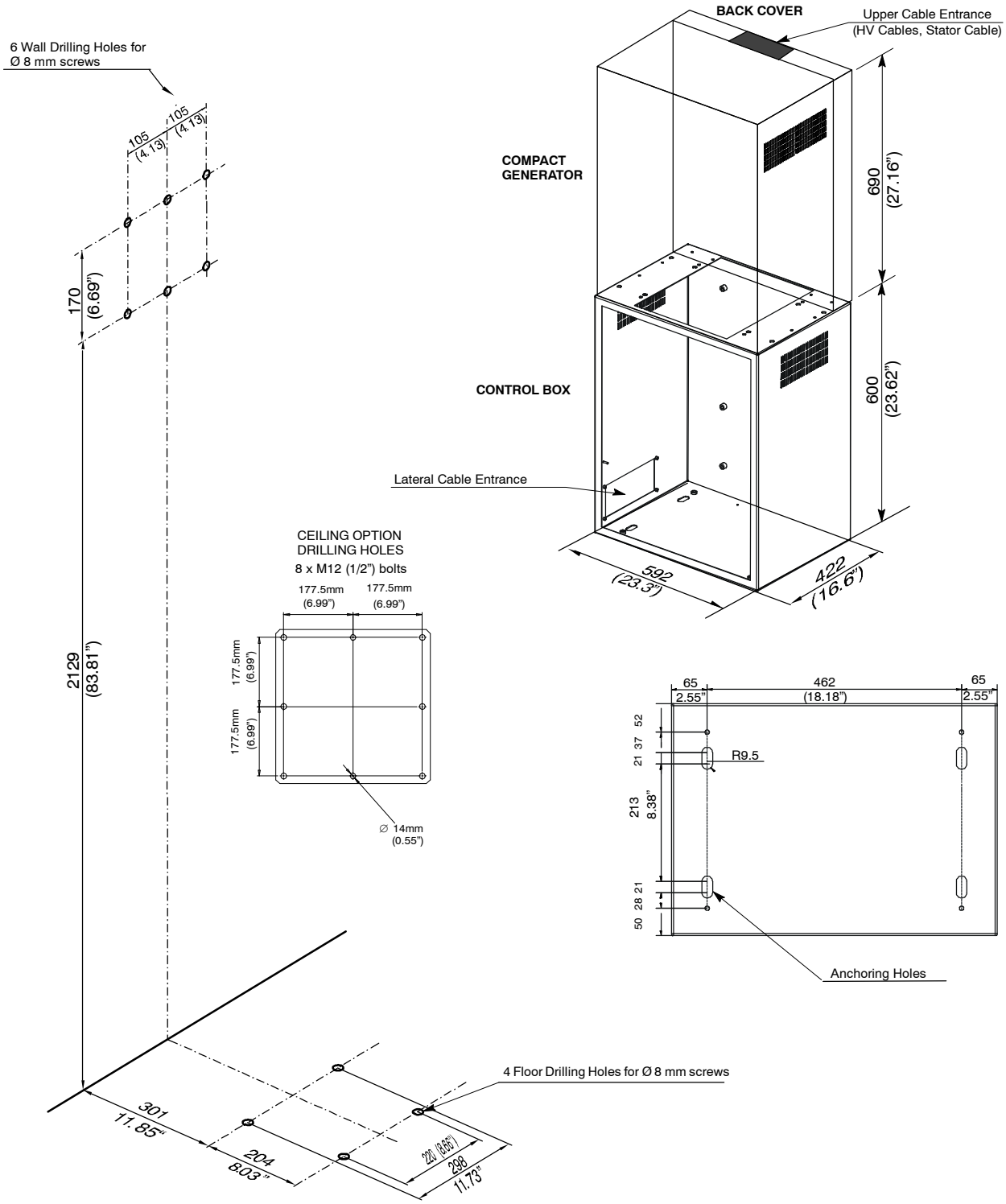
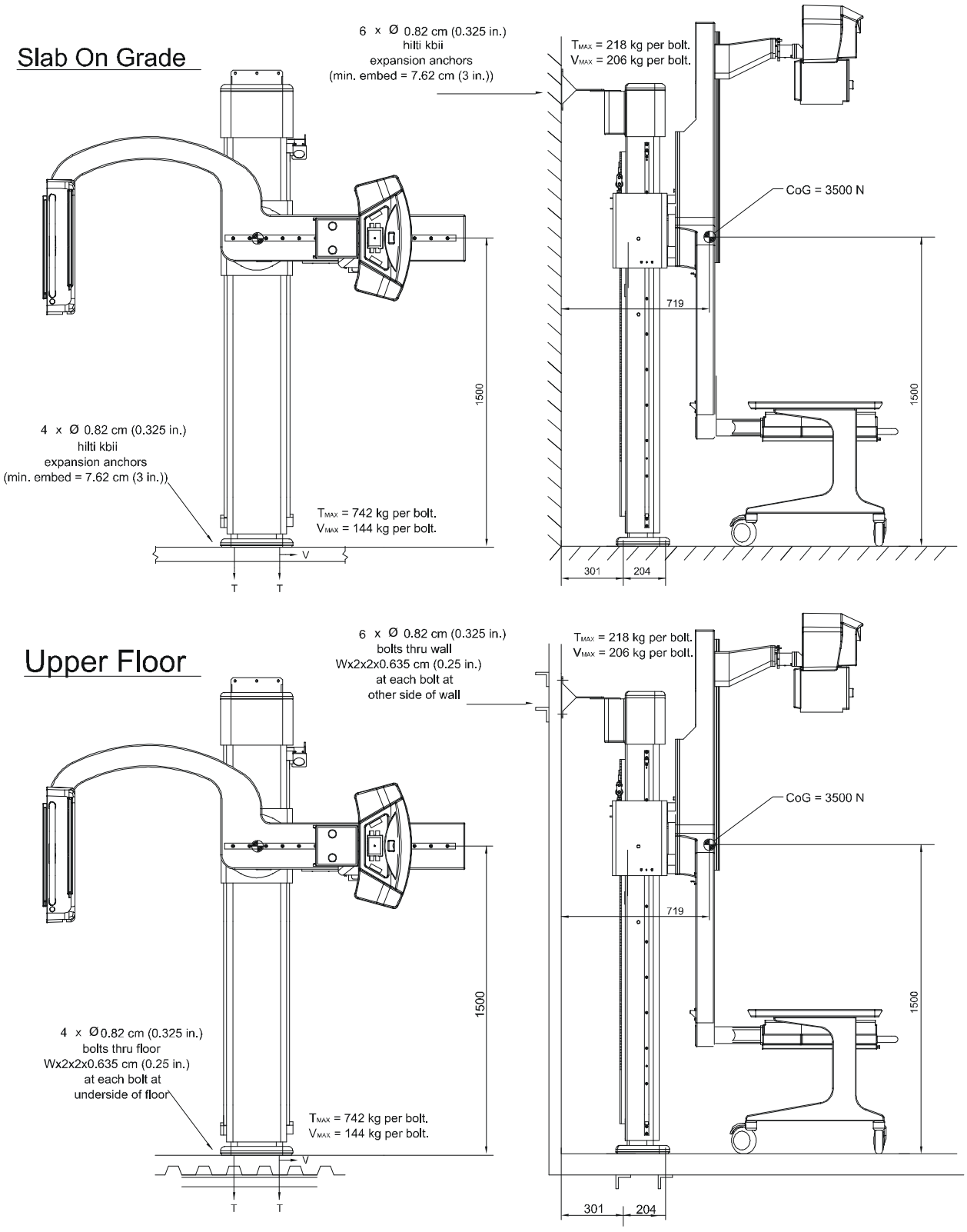


Illustration 1-6
Anchoring bolts



SECTION 2 UNPACKING

The whole system is shipped in several boxes to facilitate transport and installation. Upon receipt of the X-ray unit and associated equipment, inspect all shipping containers for signs of damage. If damage is found, notify the carrier or his agent immediately.

2.1 COLUMN, CONTROL BOX AND MOBILE TABLE

1. Place the shipping pallet near its final site in the room and remove all its laterals. Do not discard any packing material such as envelopes, boxes, bags until all parts are accounted for as listed on the packing list.

AT LEAST FOUR PEOPLE ARE REQUIRED TO REMOVE ALL HEAVY COMPONENTS FROM THE SHIPPING PALLET.

2. When the equipment is unpacked, verify that all items on the customer order are present, and the hardware and internal wiring is firmly connected.

3. Check the part numbers / serial numbers of each component with its identification labels, and inspect all pieces for visible damage. If any damaged parts are found, repair or order replacements to prevent unnecessary delay in installation.

4. Leave a working area around equipment until its final installation is complete.

2.2 GENERATOR (ANY)

1. Open the Generator shipping box, then move away the Interconnection Cables, Cabinet Cover and other furnished parts. Do not discard any packing material such as envelopes, boxes, bags until all parts are accounted for as listed on the packing list.

2. Remove the packing material from the pallet.

3. Remove the Generator Cabinet from the shipping pallet and place it near to its site in the room.

AT LEAST FOUR PEOPLE ARE REQUIRED TO REMOVE ALL HEAVY COMPONENTS FROM THE SHIPPING PALLET.

4. When the equipment is unpacked, verify that all items on the customer order are present, and the hardware and internal wiring is firmly connected.

5. Check the part numbers / serial numbers of each component with its identification labels, and inspect all pieces for visible damage. If any damaged parts are found, repair or order replacements to prevent unnecessary delay in installation.

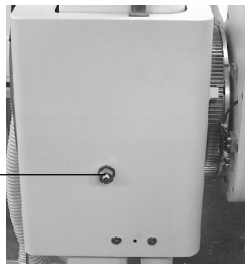
6. Leave a working area around equipment until its final installation is complete.

SECTION 3 INSTALLATION

WARNING

DO NOT REMOVE SAFETY LOCKING ROD FROM THE CENTRAL CARRIAGE UNTIL SPECIFICALLY INSTRUCTED IN THIS DOCUMENT.

Safety Locking Rod (Central Carriage)



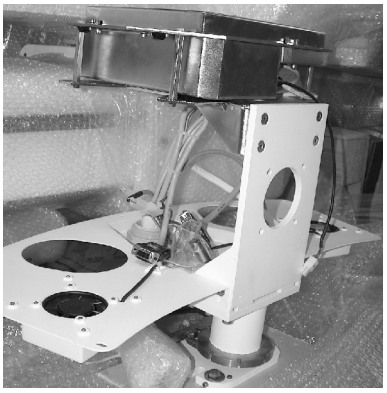
WARNING

DO NOT SUPPLY THE MAIN POWER AND TURN ON THE COLUMN / CONTROL BOX UNTIL SPECIFICALLY INSTRUCTED IN THIS DOCUMENT.

Note ☞ *For Floor-Ceiling Installation refer to Section 3.1 and go on with Step 10.*

1. With the Positioner on the Pallet, carefully remove the wrapping from the Tube-Collimator Support. This part includes the Positioner Control.

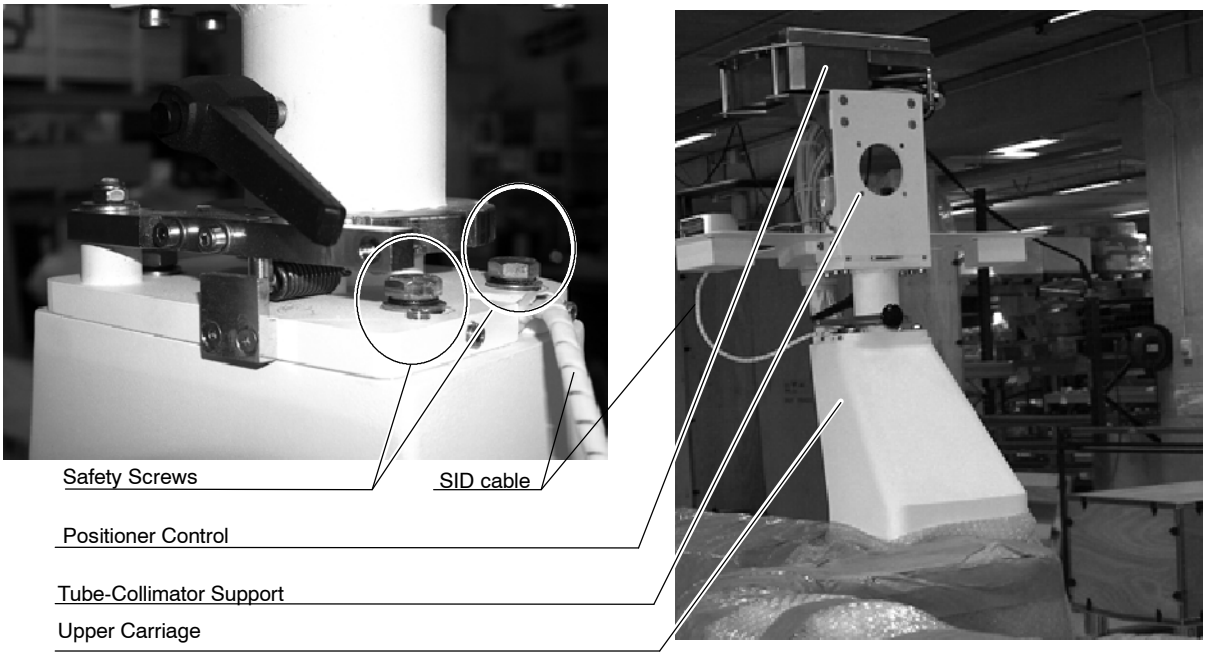
Unpacking of Tube-Collimator Support



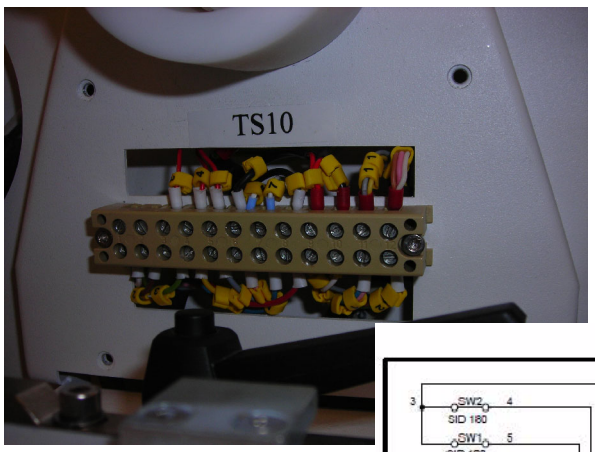
CAUTION

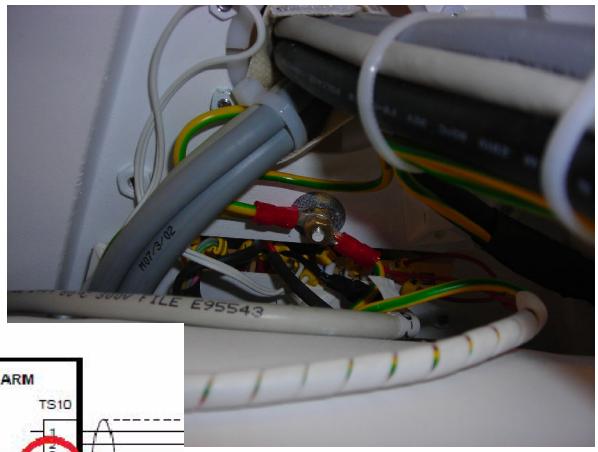
Do not remove the Protective Foam on the Touch Screen until the mechanical installation of the Positioner is completed.

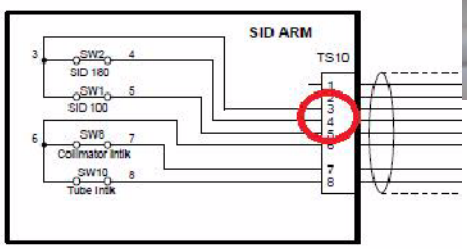
2. Install the Tube-Collimator Support to the Upper Carriage of the Swivel Arm using the four Safety Screws pre-attached to the Upper Carriage (torque 20 Nm / 177 Lbf.in). Note that the Positioner is still on the shipping pallet.



3. Connect the numbered wires of the SID Cable to the corresponding numbered slot in TS10 in the collimator support. And connect the ground wires to the ground stud in the collimator support.

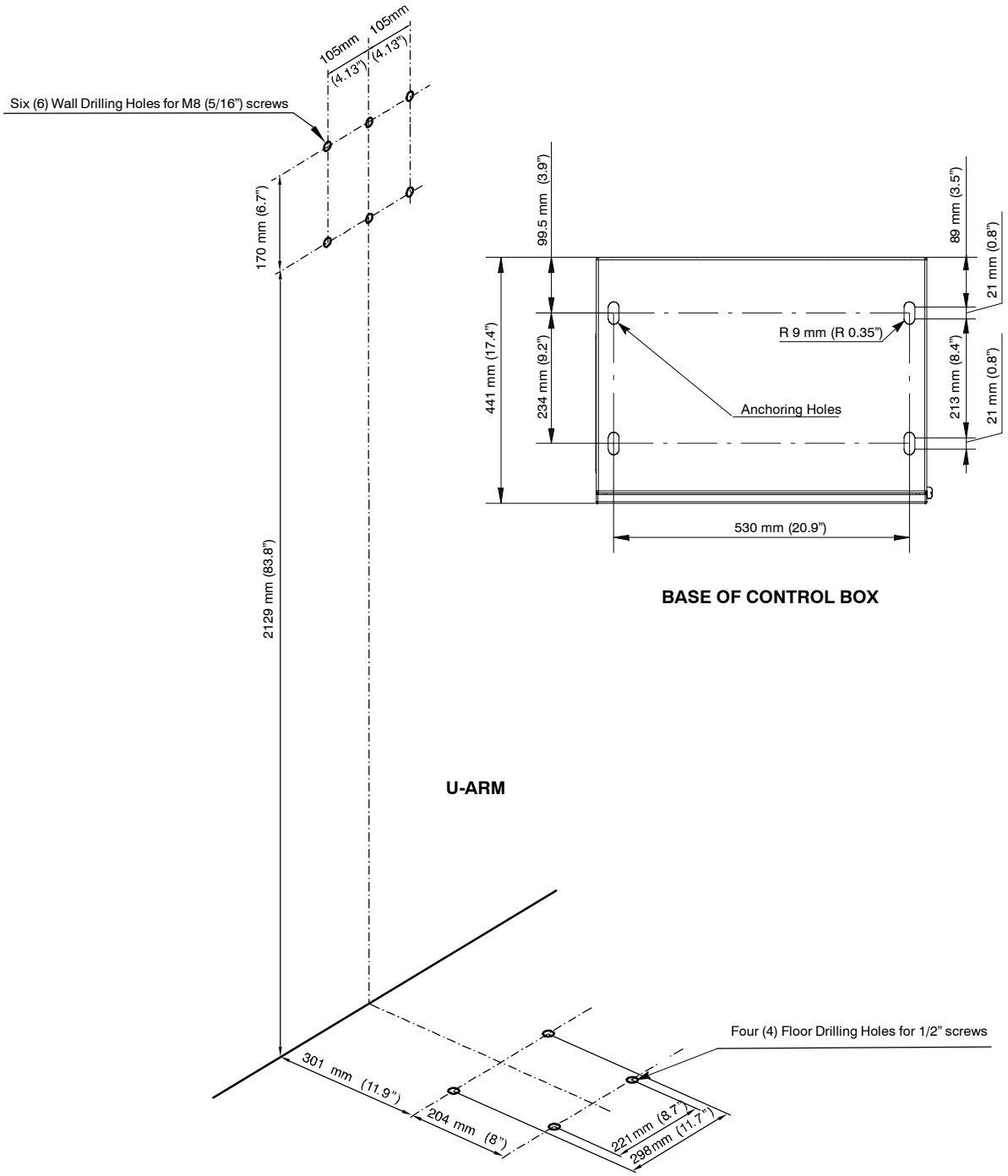






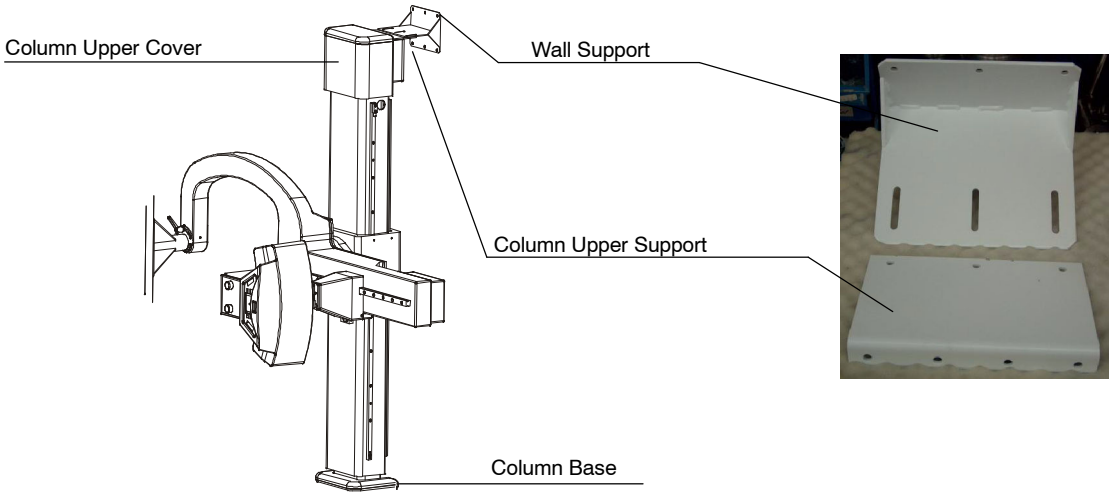
4. Mark and drill the Column anchoring holes at floor and wall. *(Refer to Illustration 3-1).* The Shipping Bracket can be used for floor anchorages marking.

Illustration 3-1
Drill Template of the Anchoring Holes



5. Install the Wall Support in the wall with the screws, washers and nuts provided.

6. With the Column still laid on the Pallet, install the Column Upper Support in the top of the Column with the screws, washers and nuts provided.



7. Place the Column standing-up and position it at its final site in the room. It is important to place the Wall Support **above** the Column Upper Support. While one person is holding up the Column, the other one should level it vertically on both lateral sides and on the front.

AT LEAST FOUR PEOPLE ARE REQUIRED PERFORM THIS ACTION.

8. Anchor the Column Upper Support to the Wall Support with the bolts and washers and nuts supplied.

9. Anchor the Column Base to the floor. Perform the leveling adjustments on Column Base and on the Column Upper Support. Make sure that the Column is correctly leveled and then firmly tighten the Column.

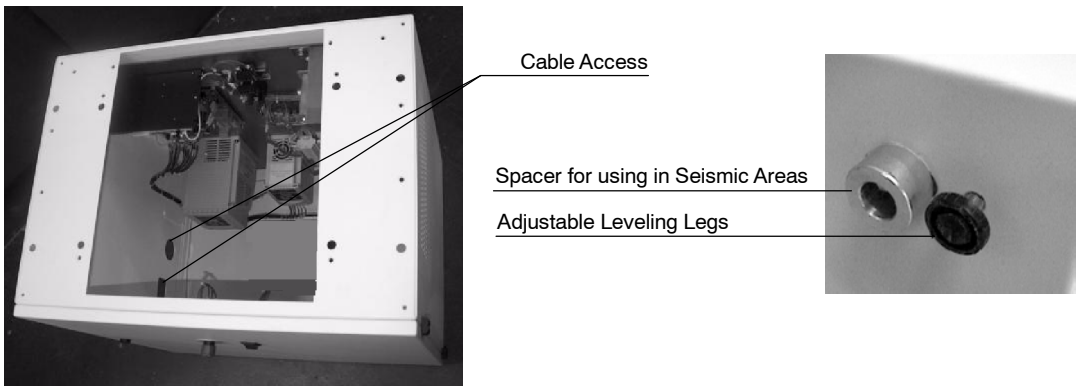
10. Place the Control Box on its final position of the room, keep in mind:

    - the length of the Column Harness (approx. 1.5 m – 59”) that goes from the Column to the Control Box,
    - the length of the High Voltage Cables (X-Ray Tube – HV Transformer in the Generator Cabinet),
    - the Swivel Arm movements.

    (*Refer to Room Layout illustrations - Section 3*).

11. Level the Control Box using the Adjustable Leveling Legs. Keep the Base at the maximum distance from the floor.

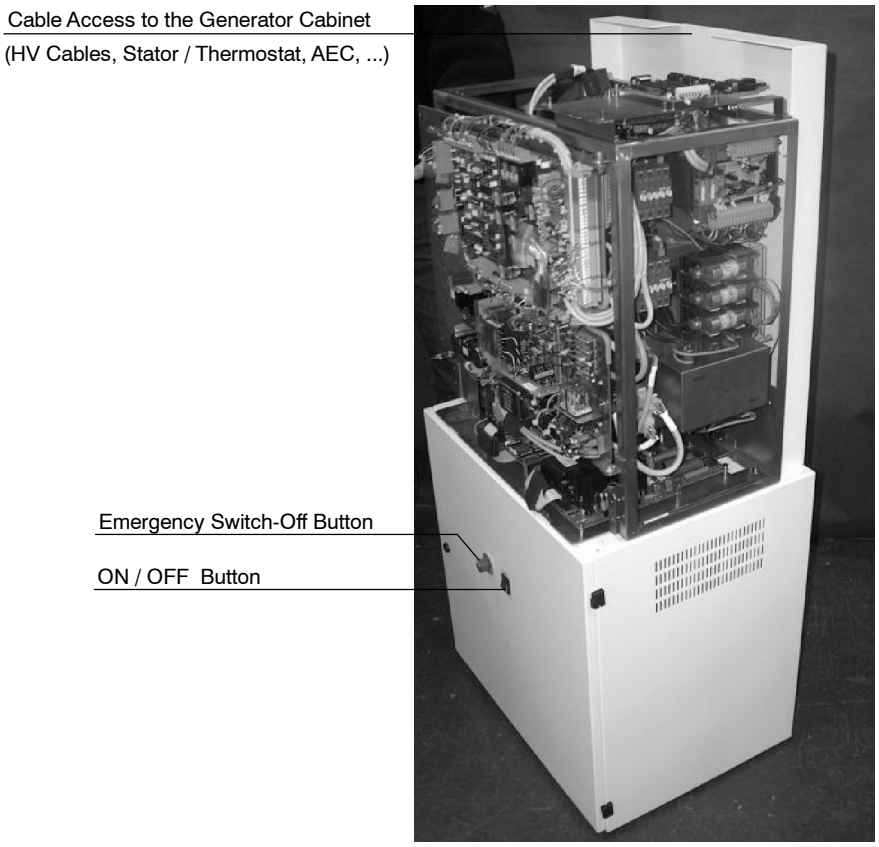
    Seismic areas and other conditions require to secure firmly the Control Box to the floor through the mounting holes at its base. In this case, place the four spacers (provided) under the base and secure them to the floor. Keep the four Leveling Legs at the same height than the spacers.



12. Usually the Generator Cabinet is installed on the Control Box.

Note ☞ *Install now the Generator Cabinet as described in the Installation Chapter of the Generator Service Manual.*

13. Leave a working area around the Generator Cabinet until its final installation.



14. Perform the corresponding connections from the Column (Main Harness) in the Control Box as per next table / illustrations and schematics 54302082 and others (*refer to these schematics at the end of this manual*). When finished, install the lateral access cover of the Control Box.

Table 3-1
Cable Connection

ILLUST.	CABLE NUMBER	FROM	TO	FUNCTION
A	A9608-XX (PC Supply Cable)	Column Harness (Touch Screen)	**POWER at PC** - (Control Box)	Supply Cable
B	55001084/ 5 (VGA Cable)	Column Harness (Touch Screen)	**VGA at PC** - (Control Box)	VGA for Touch Screen
C	A9610-01 (TS RS-232 Cable)	Column Harness	**COM2 at PC** - (Control Box)	Communication Cable
D	A8188-02 (IF CAN Cable)	Column Harness (XPC Control Board J11)	**J8 - XPC INTERFACE BOARD (A8186-XX)** (Control Box)	CAN communication
E	A8190-XX (Supply Cable)	Column Harness (XPC Control Board J4)	**J6 - XPC INTERFACE BOARD (A8186-XX)** (Control Box)	Supply Cable
F	A8199-XX (Detec. Motor Cable)	Column Harness	**J3** - **XPC INTERFACE BOARD (A8186-XX)** (Control Box)	Detec. Motor Supply cable
G	A8168-XX (Tube Fans Cable)	Column Harness	**J11 - XPC INTERFACE BOARD (A8186-XX)** (Control Box)	Fans power supply.
H	A8129-XX (SID Motor Cable)	Column Harness	**J2** (Interface Panel at Control Box)	Sid Motor Cable
I	A8160-XX (Brake-H Motor Cable)	Column Harness	**J3** (Interface Panel at Control Box)	Brake-Height Motor Cable
J	A8131-XX (Rot Motor Cable)	Column Harness	**J1** (Interface Panel at Control Box)	Rot Motor Cable
K	Collimator Cable (Communication and Supply)	Collimator	**- TS3** - (Control Box) - Can2 (flat cable marked CAN2 - PC at Control Box)	- Supply - Data Cable
L	6680-XX & A7014-XX (Anode / Cathode & Stator Cables)	X-Ray Tube	**TS2 - GENERATOR CABINET**	HV Cables
M	A3153-XX (Power Cable)	VAC Line	**TB1 (L1** / **L2/N and GND** (Control Box)	MAINS SUPPLY
N	GND	GND Stud in the Control Box	**GND Stud in the System and GND Stud in the Column**	GND
O (*)	A9609-XX (IR Receiver Cable)	X-Ray Tube - Collimator Assembly	**To it self**	Receiver Cable
P (*)	A9765-01 (Keyboard Cable)	XPC Control Board	**J3 XPC Control Board**	J1 Head
Q (*)	A8121-02 (Overlay Cable)	Detector Assy. (J1)	**J12** at Detector Assy.	Overlay Cable
R	A7067-03 (Interf. Box Cable)	Generator - Interface Panel (J5)	**GENERATOR** at System Interface Panel (Control Box)	Signal Cable
S	A9611-01 (X-Plus Remote On Cable)	TPC 12" (ON)	**REMOTE ON** at System Interface Panel (Control Box)	Signal Cable
T	A3352-01 (Interf. Box Cable)	TPC 12" (GENERATOR)	**REMOTE CONSOLE** at System Inter face Panel (Control Box)	Signal Cable
U	A8529-01 (Collimator Ext.)	TPC 12" (GENERATOR)	**COLLIMATOR CABLE (only Ralco Coll.) Tube-collimator assembly**	Supply and Signal Cable
	(*) Not illustrated Refer to Schematics 54302082. OTHER: Emergency Stop wires located at the Back of the Detector are interconnected (3/6 and 4/5 to allow motion during installation), **remove jumper** and connect wires in Terminal Strip TS4 (at the Back of the Detector). If Applicable AEC and/or Bucky Cables connected to Generator.Special Detector Signals: For Detector Signals to be connected to Image System or to Control Box refer to Schematics Section.			

Illustration 3-2
Cable connections inside the Control Box

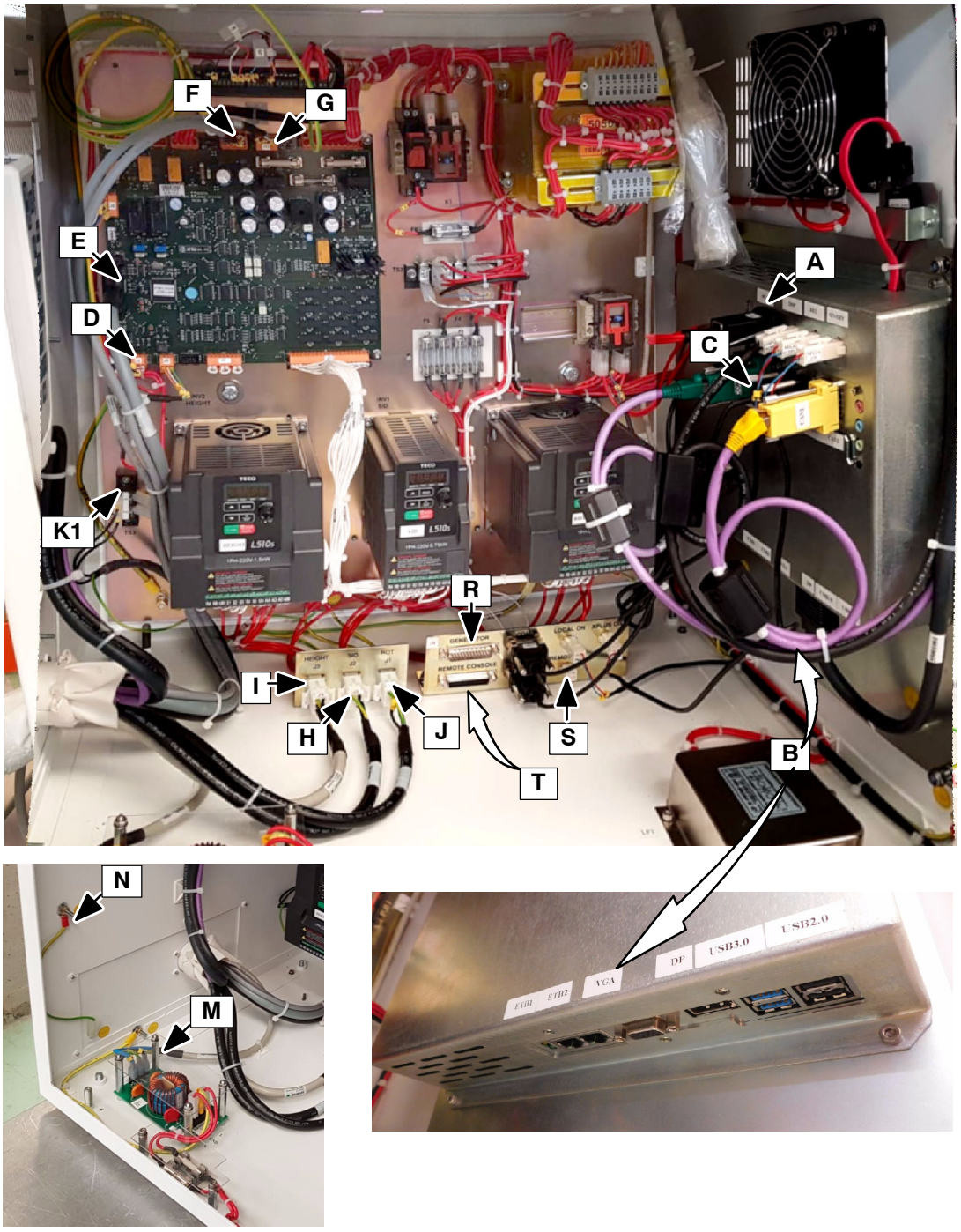
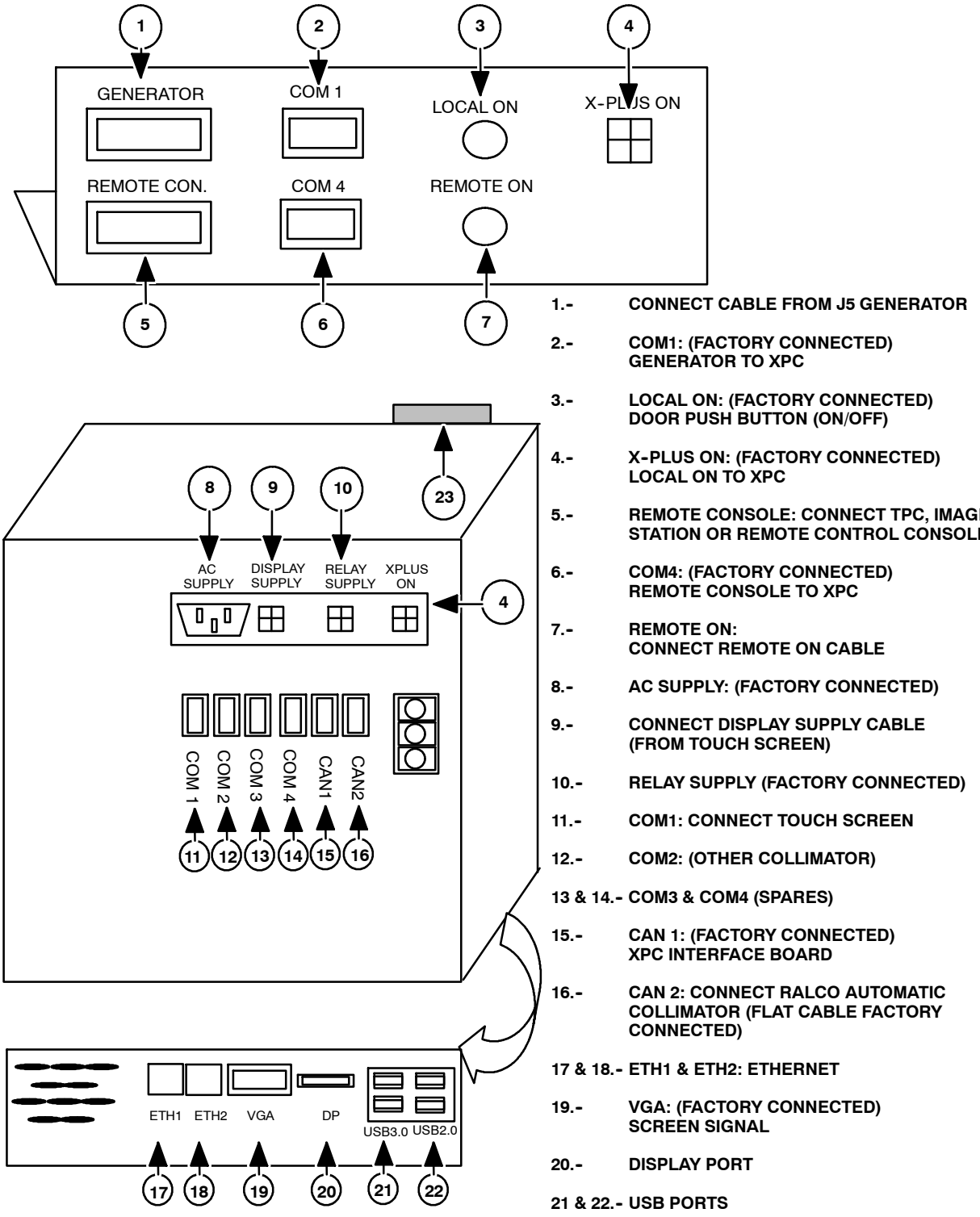


Illustration 3-3
Cable connections in Connector Panel and XPC



1.- **CONNECT CABLE FROM J5 GENERATOR**

2.- **COM1: (FACTORY CONNECTED) GENERATOR TO XPC**

3.- **LOCAL ON: (FACTORY CONNECTED) DOOR PUSH BUTTON (ON/OFF)**

4.- **X-PLUS ON: (FACTORY CONNECTED) LOCAL ON TO XPC**

5.- **REMOTE CONSOLE: CONNECT TPC, IMAGE STATION OR REMOTE CONTROL CONSOLE**

6.- **COM4: (FACTORY CONNECTED) REMOTE CONSOLE TO XPC**

7.- **REMOTE ON: CONNECT REMOTE ON CABLE**

8.- **AC SUPPLY: (FACTORY CONNECTED)**

9.- **CONNECT DISPLAY SUPPLY CABLE (FROM TOUCH SCREEN)**

10.- **RELAY SUPPLY (FACTORY CONNECTED)**

11.- **COM1: CONNECT TOUCH SCREEN**

12.- **COM2: (OTHER COLLIMATOR)**

13 & 14.- **COM3 & COM4 (SPARES)**

15.- **CAN 1: (FACTORY CONNECTED) XPC INTERFACE BOARD**

16.- **CAN 2: CONNECT RALCO AUTOMATIC COLLIMATOR (FLAT CABLE FACTORY CONNECTED)**

17 & 18.- **ETH1 & ETH2: ETHERNET**

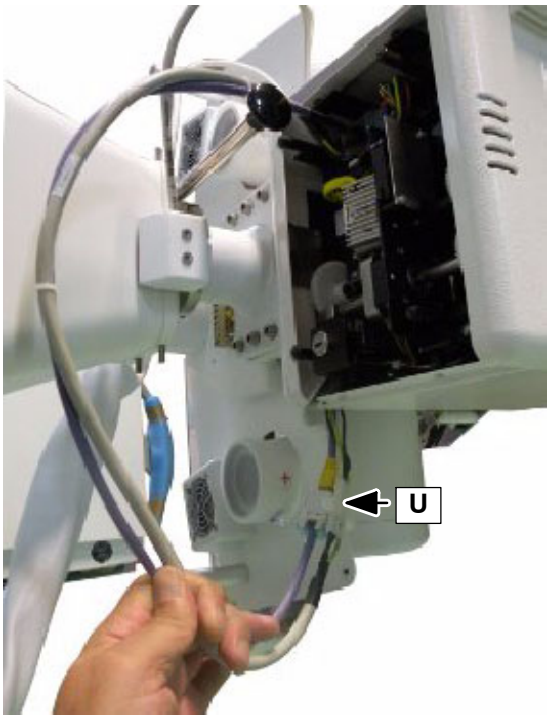
19.- **VGA: (FACTORY CONNECTED) SCREEN SIGNAL**

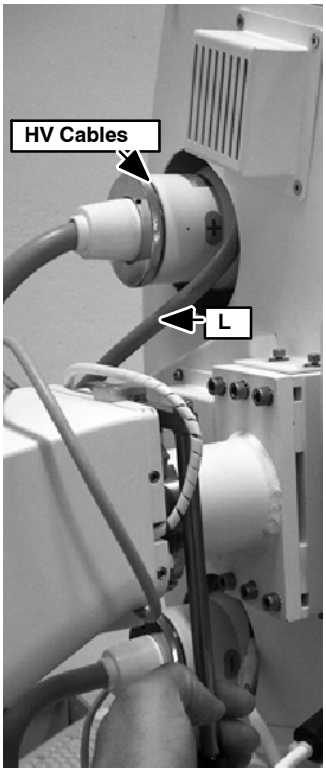
20.- **DISPLAY PORT**

21 & 22.- **USB PORTS**

23.- **SATA HDD 32 Gb**

Illustration 3-4
Cable connections outside the Control Box





15. Connect the Ground cables (GND) from the Column to the Main Ground Stud (GND) of the Control Box.

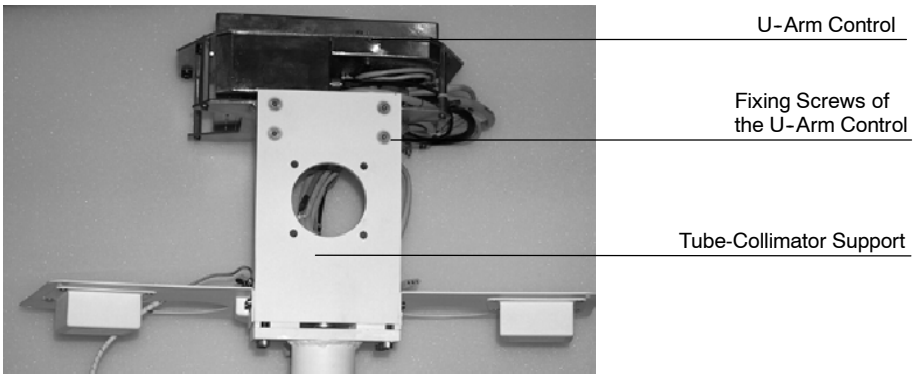
Note ☞ *The Transformer is factory set to 230 V, if the Local Power Line is 220V, connect wire "⚹" to the 208 V input in transformer.*

16. Verify that the wire "⚹" of Transformer TR1 and the Fuses of the Control Box are in accordance to the Power Line.

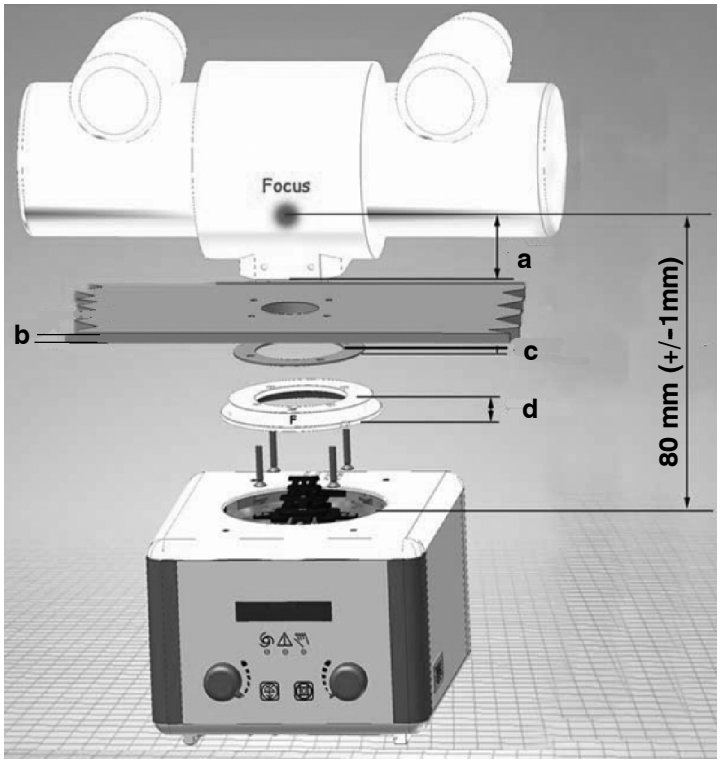
17. Connect the Power cables of the Control Box to the TB1, considering Line, Neutral and GND marked in the cable to mains.

Note ☞ *Power supply connections must be in compliance with Local Codes.*

18. Remove the U-Arm Control from the Support of the Tube-Collimator Support, for that, unscrew the four fixing screws and carefully leave it resting on the Carriage Arm.



19. Install the X-ray Tube in the Support of the Tube-Collimator Assembly using the Collimator Adaptation Ring (Mounting Flange), the corresponding spacers and its four Safety Screws (Allen).



a = **Tube Focal Distance**, depends on the Tube specifications.
For example:
a = 53 mm in X-Ray Tubes E7884X or E7252X.
a = 56mm in X-Ray Tubes E7254X or E7869XX.

b = **Tube Support (arm)**, always 8 mm.

c = **Spacer 1.5 mm,** the number of spacers installed depends on the tube model.

d = **Collimator Adaptation Ring (Mounting Flange),** always 15 mm.

a + b + c + d = 80 ± 1 mm. for Ralco 225 Collimator

Number of spacers to be installed:

X-Ray Tubes with a = 53 mm, for example the E7884X or the E7252X, require 3 spacers of 1.5 mm to get a total distance of 80.5 mm.

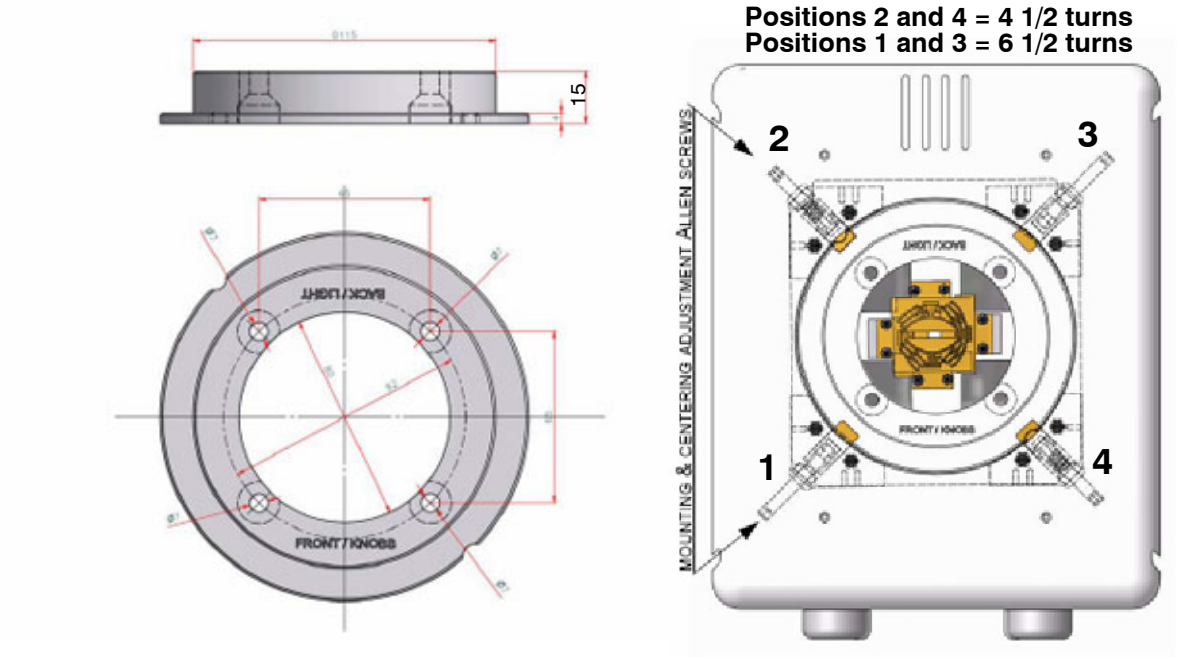
X-Ray Tubes with a = 56 mm, for example the E7254X or the E7869XX, require 1 spacer of 1.5 mm to get a total distance of 80.5 mm.

For other tubes calculate the distance as explained above.

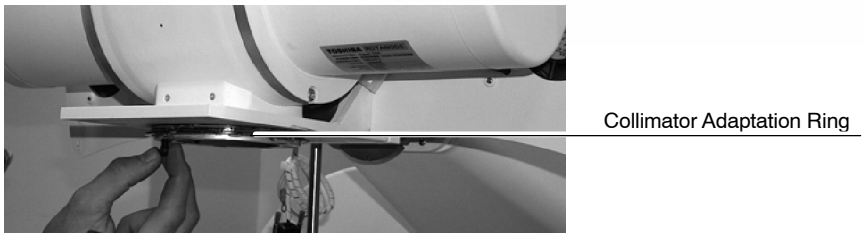
20. The Collimator Adaptation Ring shows a label “front/knob”. Place the Collimator Adaptation Ring with the label turned towards the X-ray tube front. Mount the Collimator Adaptation Ring and spacers to the tube port with 4 Flathead screws M6 that must be long enough to be driven into the tube port face for at least 5 threads. *Refer to Illustration 3-5.*

21. Unscrew the four mounting and centering adjustment Allen screws until the four tabs are withdrawn from the Collimator top opening.

Illustration 3-5
Collimator Adaptation Ring position



Note the position of the Collimator Adaptation Ring



22. Unbox the Collimator.

23. Remove the rear cover of the Collimator.

24. Remove both red label screws that retain the Collimator windows.

Note ☞ *The Collimator windows should be locked whenever the Collimator is transported to other facilities.*

25. Before installing the Collimator, manually adjust the collimator shutters to their widest setting. Carefully couple the Collimator with the tube to determine that the primary shutters have enough clearance to move in the port opening and in the Collimator Adaptation Ring.

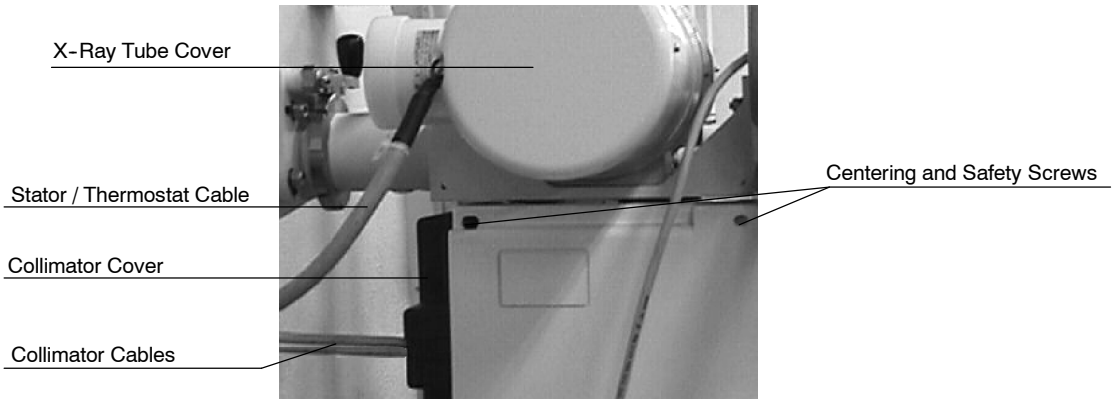
26. Make sure that the label on the Collimator Adaptation Ring is on the same side as the knobs.

27. To allow the Collimator rotate and find the position “Ø”, two of four Allen screws re-enter to rotate the Collimator. Screw the four Allen screws as follows:

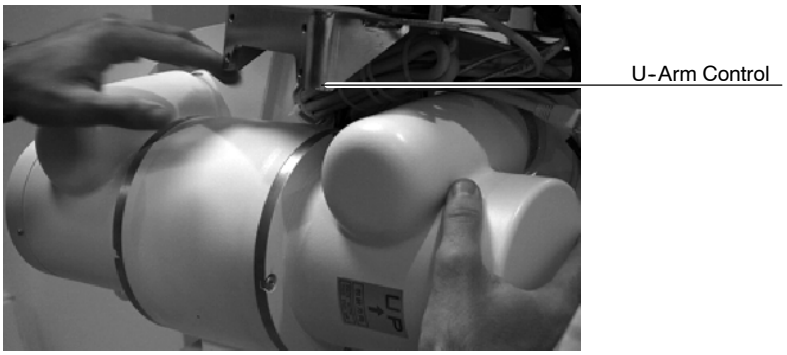
- Position 2 and 4 = 4 $^{1/2}$ turns
- Position 1 and 3 = 6 $^{1/2}$ turns

Note ☞ *If Allen screws ”2” and ”4” are screwed more than 4 $^{1/2}$ turns, the collimator will not rotate.*

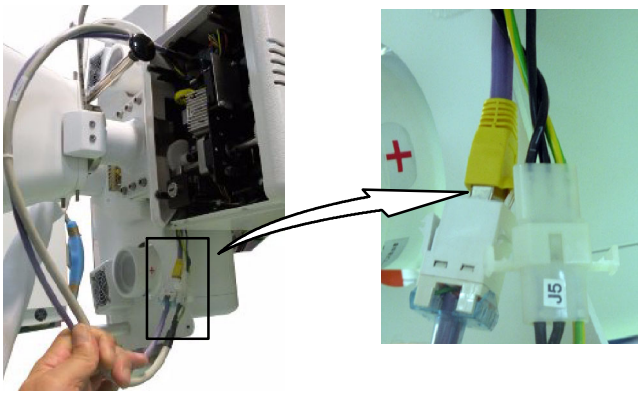
28. Check to see that the distance between the collimator housing and the Collimator Adaptation Ring is equal in all directions and, that the Collimator face is parallel to the axis of the Receptor. Loosen the screws and adjust if required. (*Also, refer to Collimator Manual*).



29. Re-install the U-Arm Control.



30. Connect collimator supply cable (J5) and data cable. **The Collimator Harness included in the Ralco Collimator Package is not used** as the collimator cable is factory pre-installed.



31. Connect HV Cables in the X-ray Tube.

CAUTION

Make sure that the Collimator is well positioned by turning it to both sides and pulling it down to ensure that it is safely and properly mounted.

32. Connect HV Cables in the X-ray Tube.

CAUTION

The Terminal Pins of the High Voltage cables are extremely delicate and easily damaged. They therefore must be handled carefully. Make sure that they are straight and that the splits in the pins are open (parallel to sides).

Anode and Cathode cables are furnished according to the room layout (length of the cables).

a. Assemble the mounting accessories of each Termination Plug following the Cable manufacturer's instructions.

CAUTION

Do not install the Silicone washer supplied with the HV Cables.

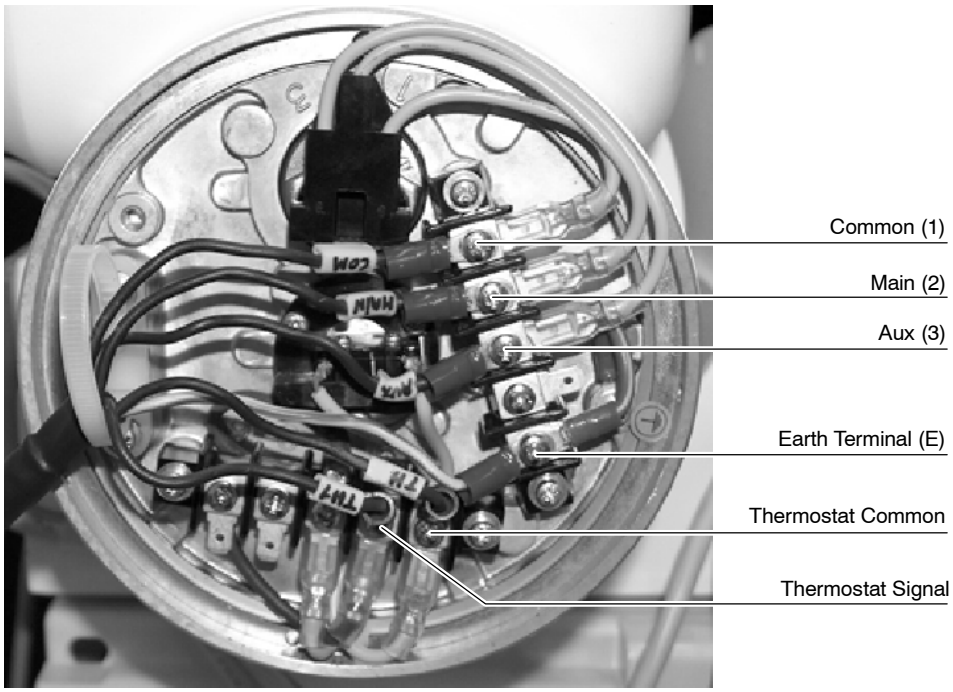
b. Prepare the High Voltage terminals that will be installed in the X-ray Tube receptacles. Apply Silicone Paste over the entire surface of the Plug including the Pins (provided in the X-ray Tube package).

c. Carefully connect the Anode and Cathode cables to the respective X-ray Tube(s) receptacles. Ensure that all connections are made correctly, maintaining correct Anode and Cathode orientation. Tighten the cable nuts securely.

33. Connect Stator/Thermostat Cables in the X-ray Tube.

a. Remove the Side cover of the X-ray Tube.

b. Connect the Stator Cable into the X-ray Tube as shown in the illustration below. Refer to the X-ray Tube Manual for extended information.



c. Re-install the side Cover of the X-ray Tube.

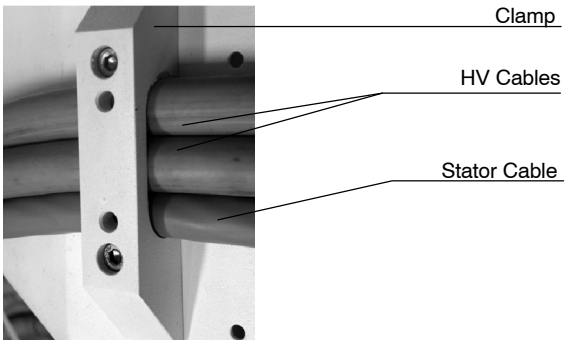
34. Route the cables connected to the X-ray Tube to the Generator. Fasten the Stator and HV cables to Upper Carriage of the Swivel Arm with the Clamp at its lateral side in the following way:

a. Unscrew the Clamp.

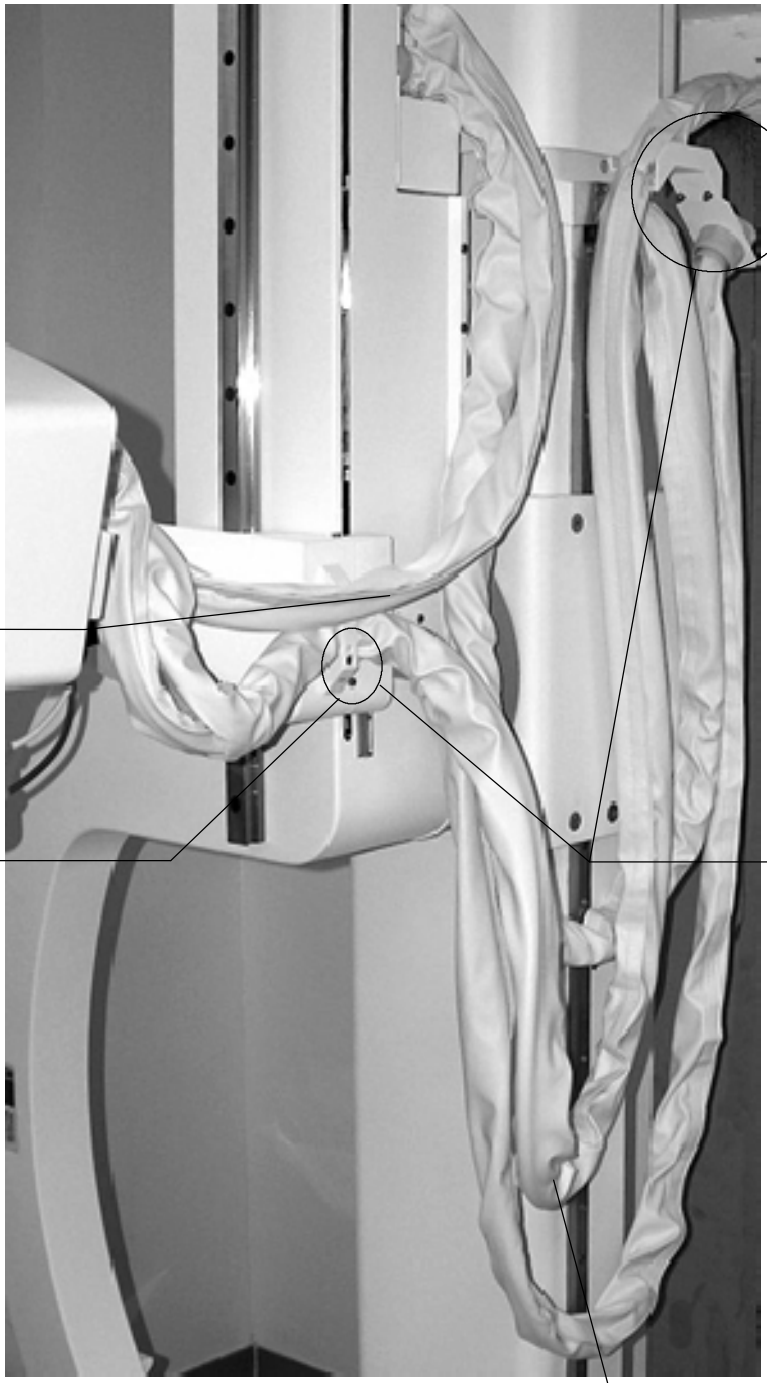
b. Insert a tie wrap through the Clamp hole but do not fasten it yet.

c. Place the the Stator and HV cables through the Clamp and reinstall it.

.



d. Leave enough slack to allow rotation of Tube-collimator assembly. Give the cable length enough to enable movements of the Swivel Arm (at least 220 cm (86.5”) and fasten them again to the Cable Support at the upper lateral side of the Column.



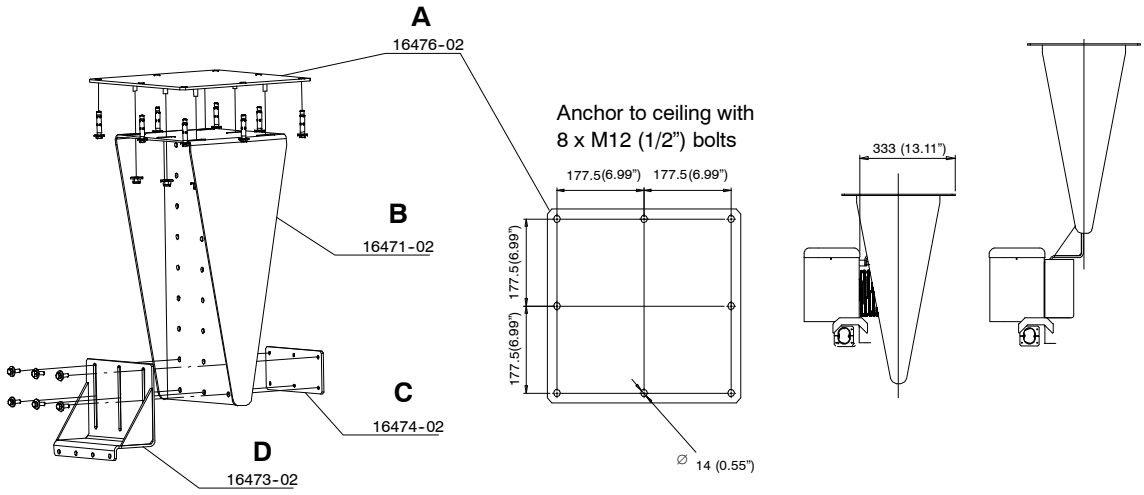
The cable white sleeves should be installed at the end of the installation process

3.1 FLOOR-CEILING INSTALLATION OPTION

Note ☞ *The ceiling height parameters are 2750 mm (108.27") minimum ceiling height and* 2950 mm (116.14") *maximum ceiling height.*

Note ☞ *The Floor-Ceiling installation requires two (2) people and two (2) ladders to complete.*

1. Mark and drill the Column anchoring holes at ceiling. These anchoring holes can be marked using the Part "A" of the Ceiling Support or with the following illustration.

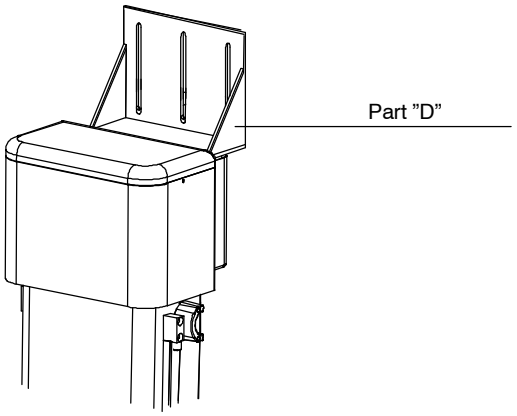


2. Anchor Part "A" of the Ceiling Support to the ceiling. Ensure that Part "A" is level, using the twenty (20) shims provided if necessary; then tighten the piece firmly to the ceiling applying a torque of 25 Nm / 221 Lbf.in.

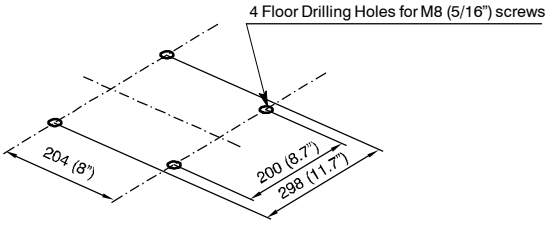
3. Assemble the Parts "B" and "A" using provided nuts and washers (torque 30 Nm / 265.5 Lbf.in).

4. Push the unit close to the final position in the room and remove the **UPPER PLATE**.

5. Assemble the Part “D” of the Ceiling Support to the Column Top (back side) (torque 20 Nm / 177 Lbf.in).



6. Push the unit to the final position in the room, the Ceiling Support part assembled to the Column Top must be in contact with Part ”B”. Mark the floor anchoring holes according to the position of the Column Base and the illustration below.

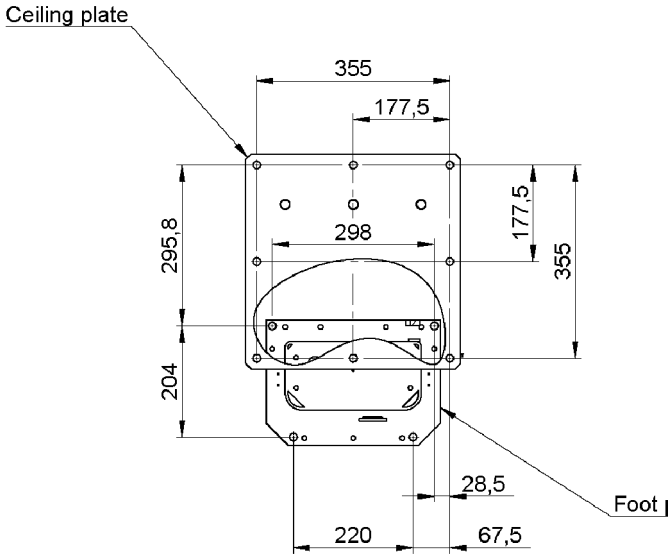


7. Move the unit and drill the floor anchoring holes.

8. Place the unit to the final position in the room, the Ceiling Support part assembled to the Column Top must contact the Part “B”.

   Anchor the Column to the Ceiling Support, that is, fix both parts and the Part “C” provided with the Ceiling Support. **This hardware will be firmly tightened in step 10.**

Drilling Template (Ceiling Plate and Foot)



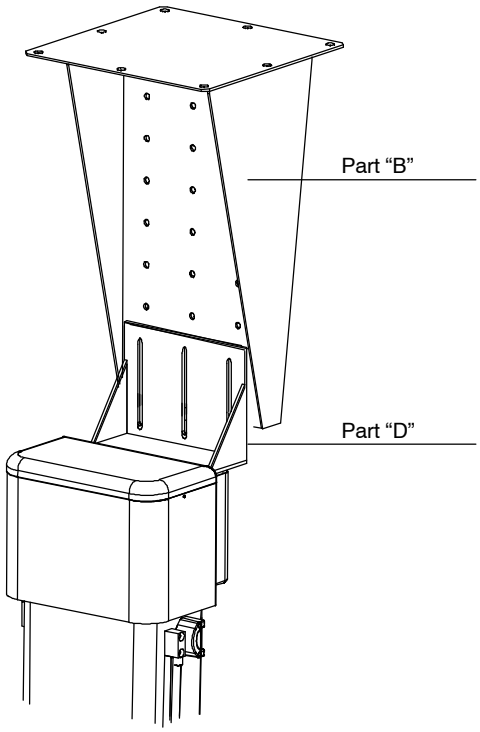
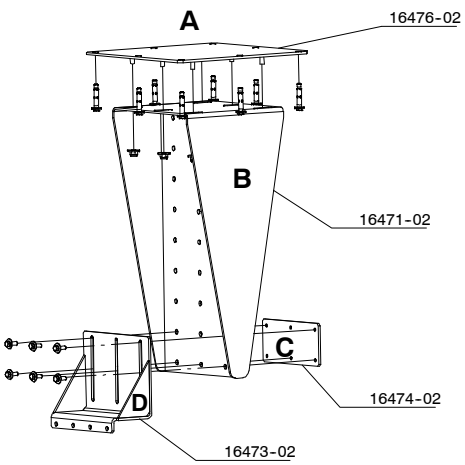
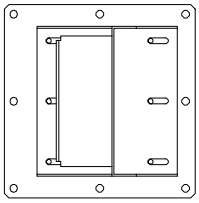
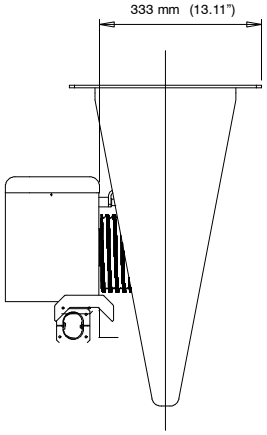


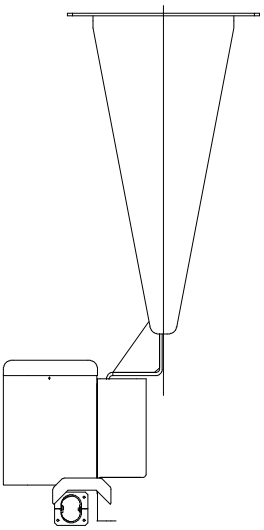
Illustration 3-6
Ceiling Support

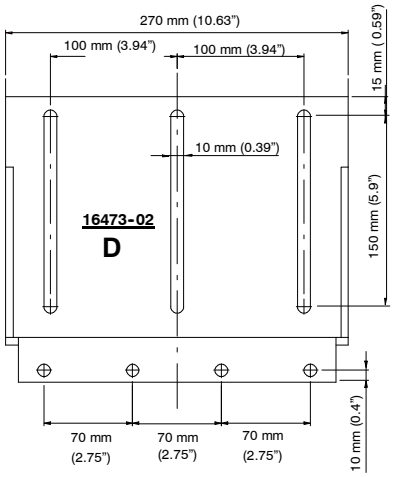


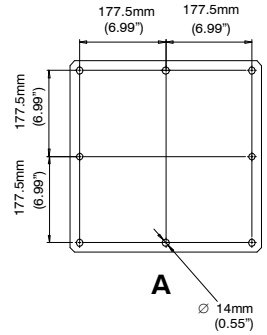


Anchor to ceiling with 8 x M12 (1/2") bolts



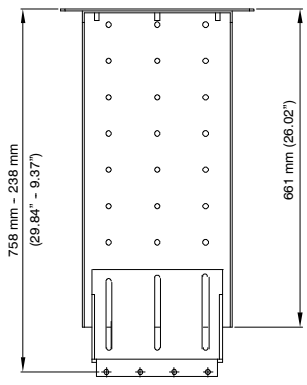






A9648-02 CEILING SUPPORT

A	16471-02	1
B	16473-02	1
C	16474-02	1
D	16476-02	1



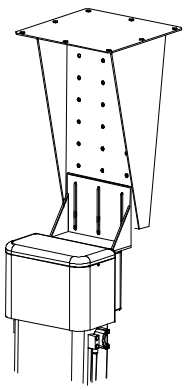
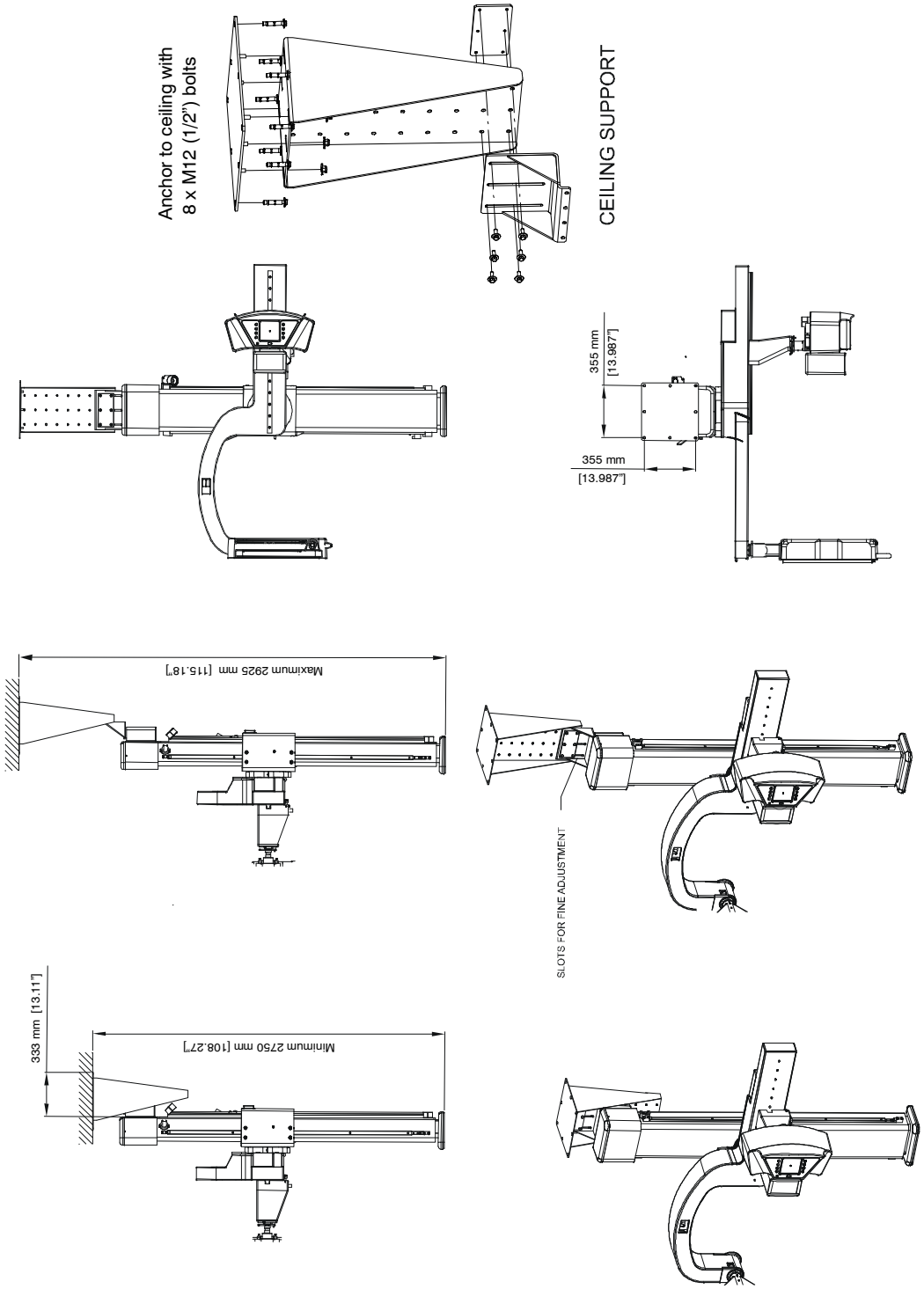
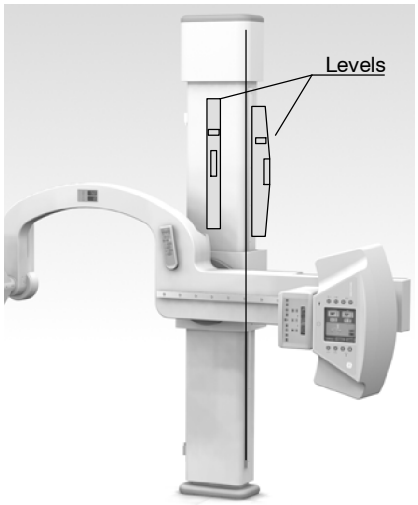


Illustration 3-7
Ceiling Installation Option



9. Determine, using a standard level, the vertical / horizontal position of the Column. Perform the levelling adjustments on the Column Base with the two Levelling screws and, if necessary, modify the position of the Column with the screws that fix the Ceiling Support parts. Make sure that the Column is correctly levelled.



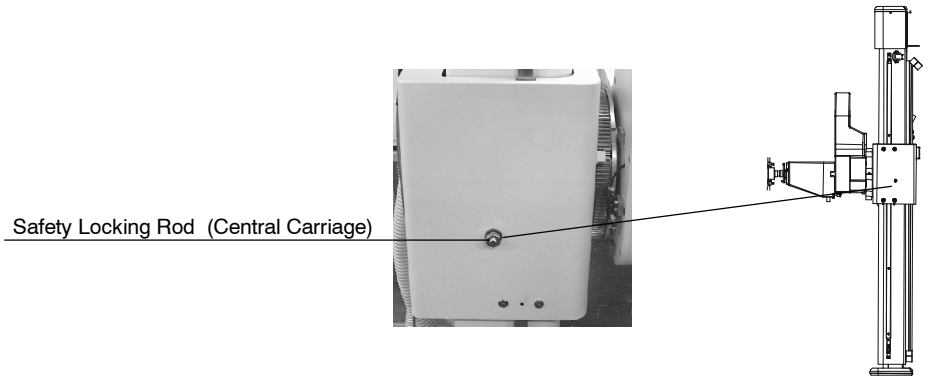
Anchor the Column Base to the Floor using the floor anchoring hardware supplied. This hardware will be firmly tightened in step 10.

10. Check with a standard level the vertical / horizontal position of the Column. Make sure that the Column is correctly levelled and then firmly tighten the Column to the floor and Ceiling Support using the following hardware.

3.2 DETECTOR ASSEMBLY INSTALLATION

Note ☞ *This Section shows the main steps of a Standard Detector Assembly Installation. Refer to the corresponding Detector manual for specific information on the Detector.*

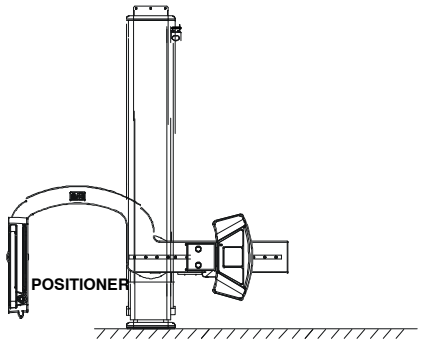
1. Turn the Unit ON with the Switch located at the Control Box door.
2. Remove now the Safety Locking Rod from the Central Carriage.



WARNING

AFTER INSTALLATION, DO NOT DISCARD THE SAFETY LOCKING ROD. KEEP IT IN A SAFE PLACE, IT COULD BE USED FOR SERVICE PURPOSES (DISASSEMBLY / REASSEMBLY).

3. Position the Swivel Arm at a comfortable position for installing the Detector Assembly. It is recommended to place the Swivel Arm in horizontal position close to the floor.



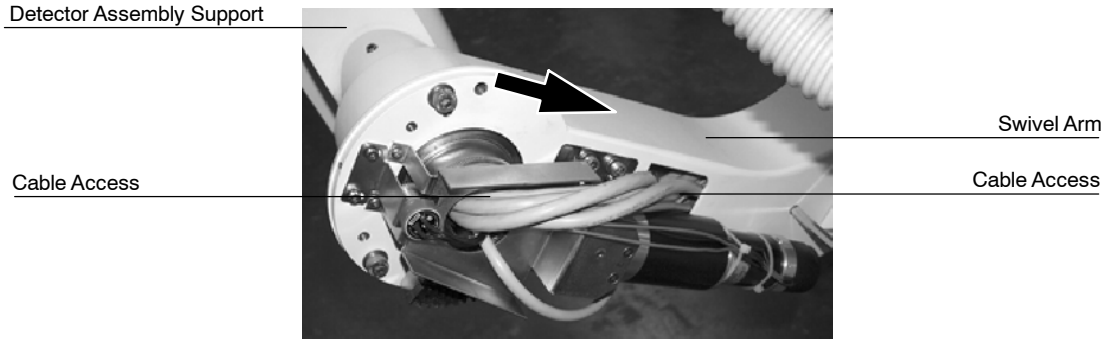
4. Turn the Unit OFF with the Switch located at the Control Box door.

5. Before installing the Detector Assembly in the Delta Support, if applicable, route the Detector Cables through the Swivel Arm as indicated below:

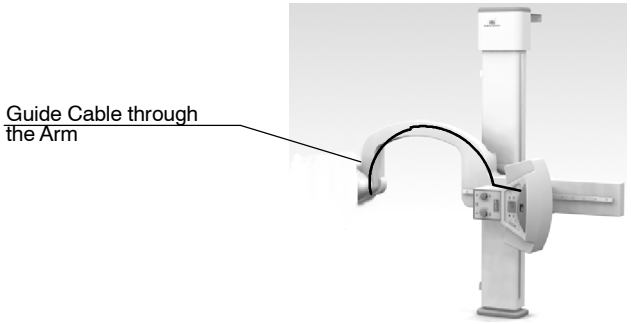
   a. Take all the Detector Cables and identify the cable end to be connected to the Detector Assembly and the cable end to be connected to the Control Box. Tie the cables to get a single harness to ease the routing through the Swivel Arm.

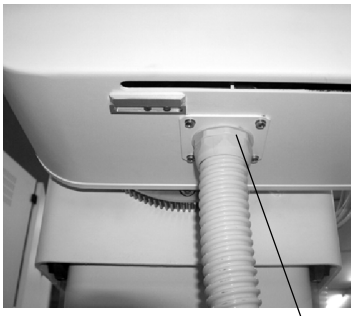
   b. Check that all connectors in both cable ends pass through the cable access or cable hoses, if not, remove connectors.

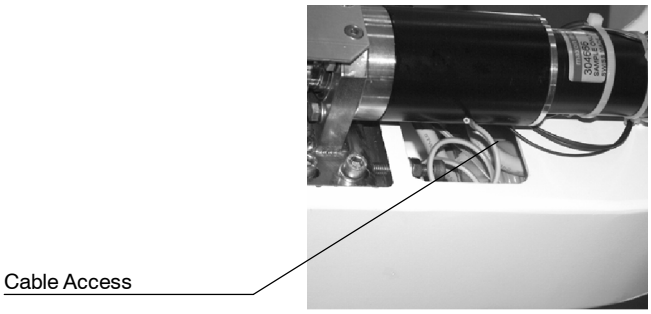
   c. Route the Detector Cables through the cable access of the Detector Assembly Support (lower side of the Swivel Arm) towards the Detector Assembly.



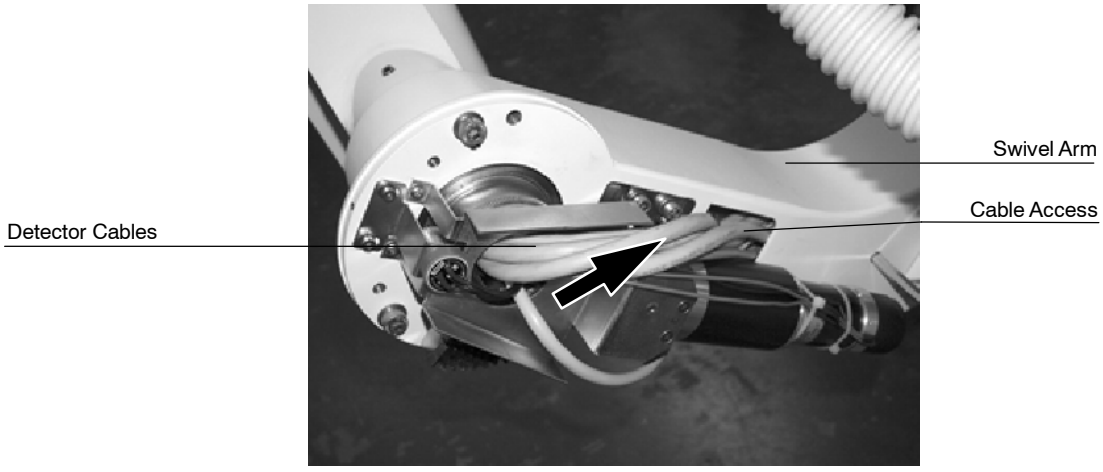
d. Remove the cover of the cable hose located close the Central Carriage in the Swivel Arm.







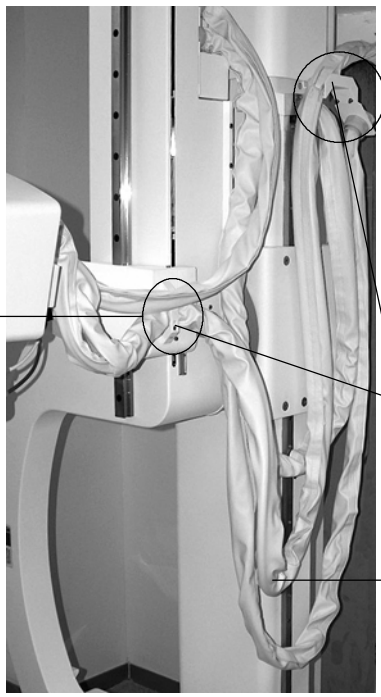
e. Route the Detector Cables through the cable access at the lower side of the Swivel Arm towards the central cable access at the Swivel Arm.



f. Route the Detector Cables through the cable hose towards the Control Box.

g. If applicable, the Detector Cable has to be guided along the rest of the cables coming from the Detector Assembly. It is needed to open the EMC Shield (black), add the Detector Cable and close the EMC Shield again.

h. This cable hose must be routed and attached to the Cable Support at the upper lateral side of the Column. The cable hose length must be enough to enable movements of the of Swivel Arm.

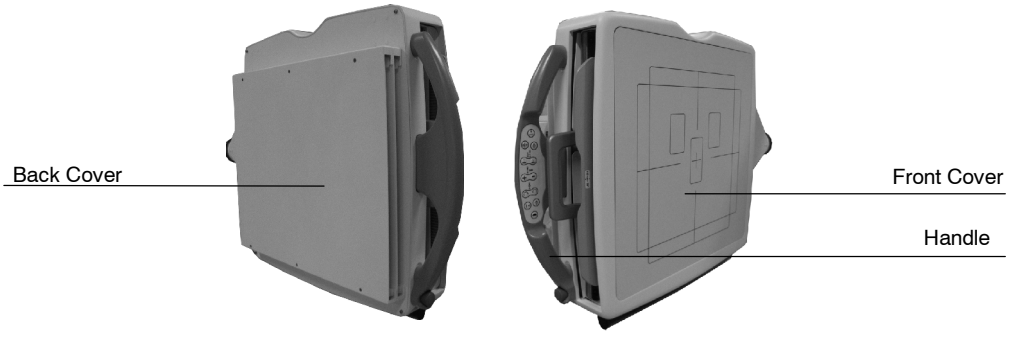


i. Reinstall the cover of the cable hose removed before and install the other end of the cable hose to the Control Box (lateral access).

6. Remove the Back Cover of the Detector Assembly.

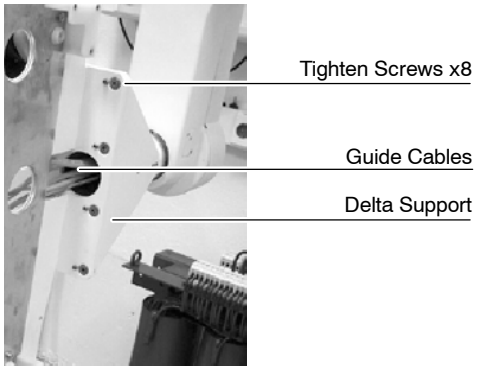
7. Remove the Handle of the Detector Assembly. For that, disconnect the flat cable of the overlay and the ground cable, then unscrew the Handle screws and take it off.

8. Remove the Front cover of the Detector Assembly and leave it aside.



9. Remove the 8 screws attached to the Delta Support.

10. Pick up the Detector Assembly, guide all the cables through its hole.



11. Install now the Detector Assembly in the Delta Support of the Swivel Arm with its fixing screws.

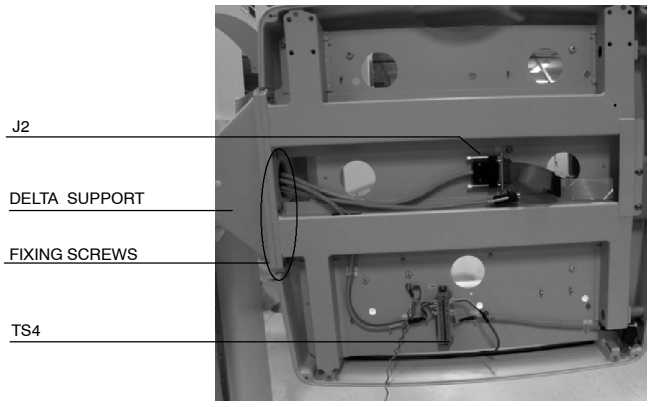
12. Perform the following connections at the Detector Assembly:

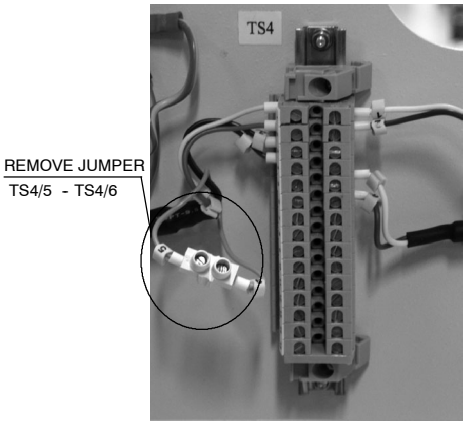
    a. Handle Panel cable with connector marked J2 to J2 socket.

    b. Emergency Stop wires: they are bridged (5/6) to allow motion during installation. **Remove the Jumper** and connect the Emergency Stop wires in the Terminal Strip TS4.

    c. If applicable AEC and/or Bucky cables.

13. Connect the Detector Cables to the respective connections of the Detector and in the Control Box.



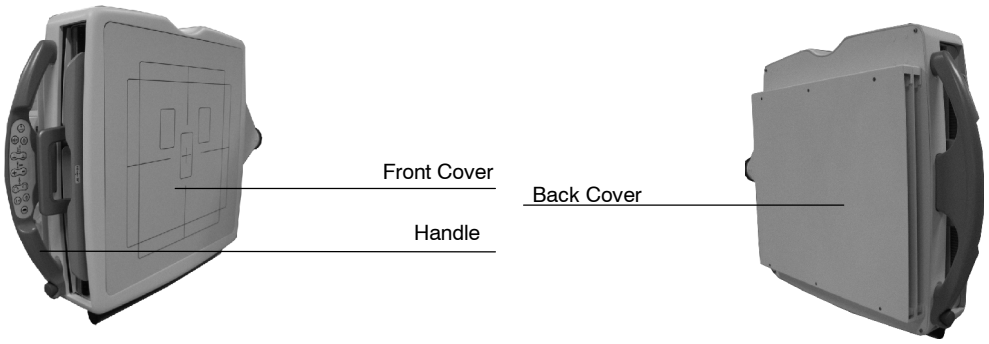


14. Turn the Unit ON with the Switch located at the Control Box door.

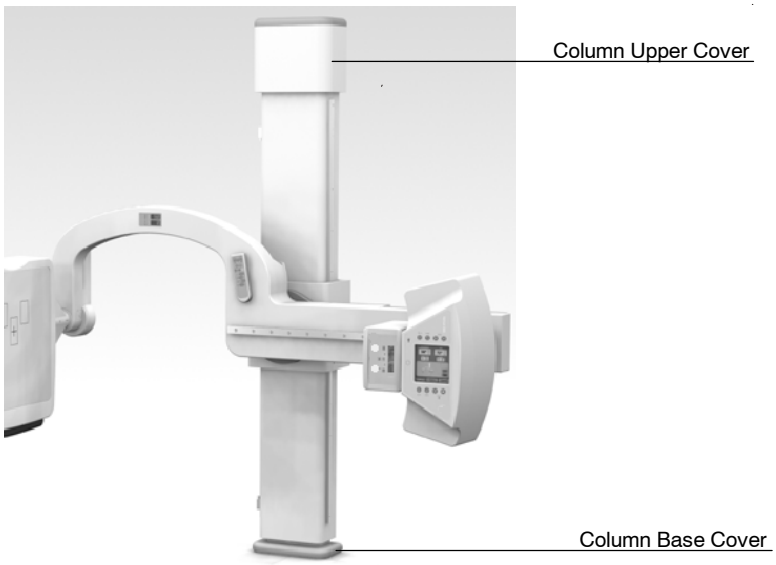
15. Check that all controls and movements operate correctly.

16. Turn the Unit OFF with the Switch located at the Control Box door.

17. Re-install the Front Cover, the Handle and the Back Cover of the Detector Assembly.



18. Install the Base and Top Covers of the Columm with the supplied screws.



19. Route, to the upper cable access of the Generator Cabinet, the cables from the Column to be connected in the Generator (HV Cables, Stator / Thermostat, if applicable AEC and Bucky signal cables).

20. Cables to be connected to the Generator Cabinet such as Power Line, Door Interlock, etc ... must be routed through the lateral cable access (or floor cable access when using a floor raceway) of the Control Box, across the Control Box and along the back side of the Generator Cabinet to the be clamped at the Fastening Bar at the top of the Generator Cabinet.

21. Perform the Generator Cabinet connections (Power Line Cable, HV Cables in the HV Transformer, Stator / Thermostat, Door Interlock Switches, Warning Room Lamps, etc) as indicated in the Installation document of the Generator Service Manual.

22. Complete the Generator Cabinet installation (configuration, calibration, covers, etc) as indicated in the Generator Service Manual.

3.3 INTERNAL RADIATION MEASURING SYSTEM - DAP (OPTIONAL)

The Radiation Measuring System consists of an Ionization Chamber installed beneath the Collimator, a Counter Unit and a Radiation Meter Board installed into the Generator Cabinet.

CAUTION

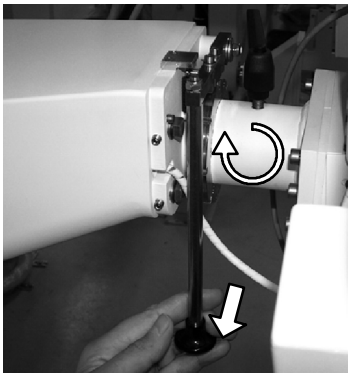
Installation of the Radiation Measuring System must be made with all power supplies turned off. The System is factory calibrated and tested.

Note ☞

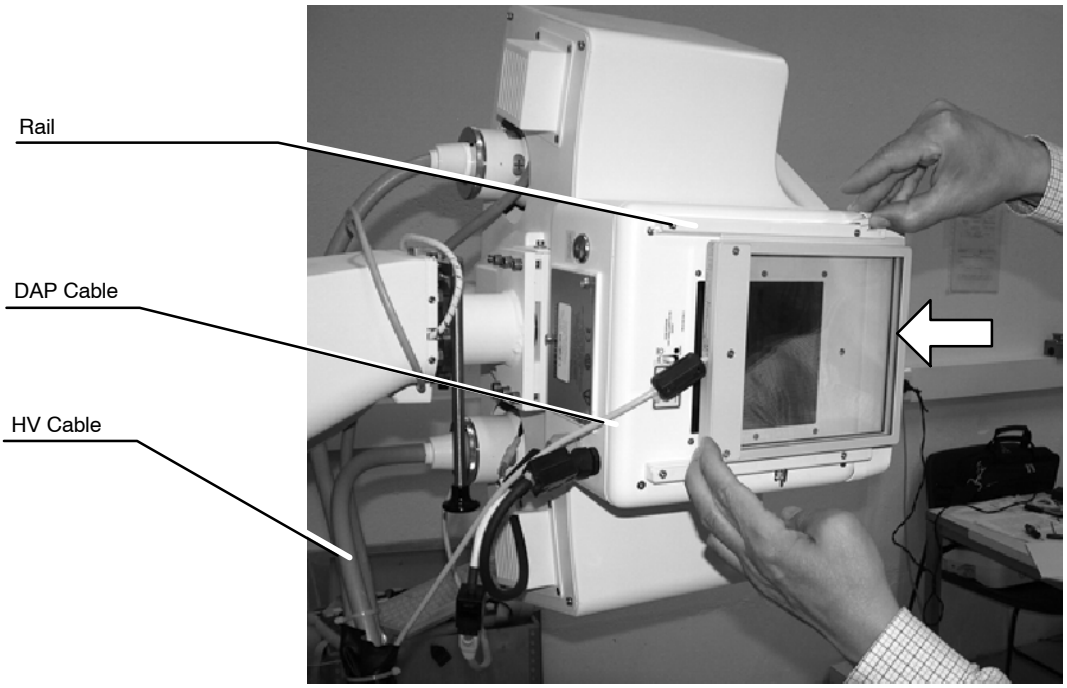
Verify that the size and characteristics of the supplied Ionization Chamber is suitable into the rails-guide located beneath the Collimator base (147 x 168 or 177 x 178 mm).

1. Unpack the system and check that all components are present and that they do not present any damage.

2. Pull the Lever of the Tube-Collimator Assembly and carefully turn the Tube-Collimator Assembly 90 degrees clockwise, this will facilitate the DAP installation.



3. Insert the DAP inside the rails of the Collimator (factory installed). Connect and route the DAP cable along the HV Cables to the Generator.



4. Connect the following cables as indicated in schematic A6534–05 (*Refer to Schematics Section in this manual*):

   a. Connect each Ion Chamber cable to its related Counter Unit 70954 (4 pins Binder round connector).

   b. Verify that the Radiation Meter cable (A3354-03) is properly connected between the Counter Unit and the Radiation Meter Board as indicated in the next table.

GENERATOR CONFIGURATION	ION CHAMBER IN TUBE-1	WIRE-1 IN CONNECTOR J1 OF THE RADIATION METER BOARD (A3170-01)
One Tube for RAD only	Cable A3354-xx connect to P2	J1-1 Inserted

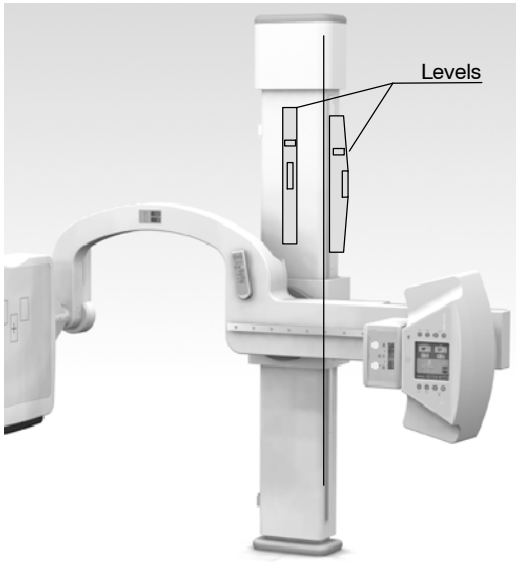
   c. Connect the Radiation Meter Control cable (A7657–01) between P3 of the Radiation Meter Board and COM4 of the TPC.

   d. Connect the TPC–Printer cable (A7038–01) between COM3 of the TPC and the Printer.

3.4 LEVELING CHECKS

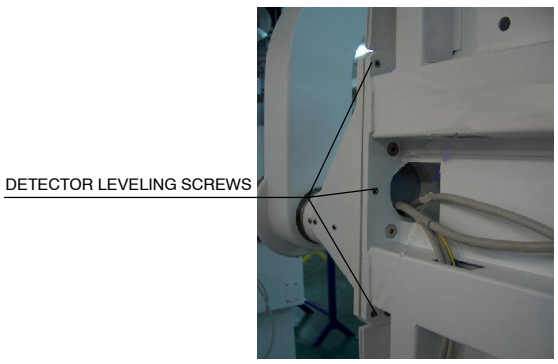
Once the System is connected, it is advisable to perform the following levelling checks in Column/Arm, Tube-Collimator Assembly and Detector Assembly.

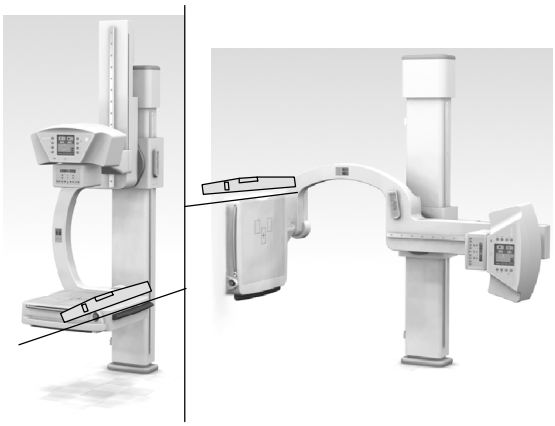
1. Check with a level the vertical/horizontal position of the Column. If necessary, modify the position of the Column with the screws attached to the Column Upper Support, a correct installation starts with a good leveling of the column.



2. Check the level of the Tube-Collimator Assembly. The mechanical installation provides a levelled Assembly, anyway check parallelism. If necessary reinstall the Tube-Collimator Assembly. (*Refer to installation section).*

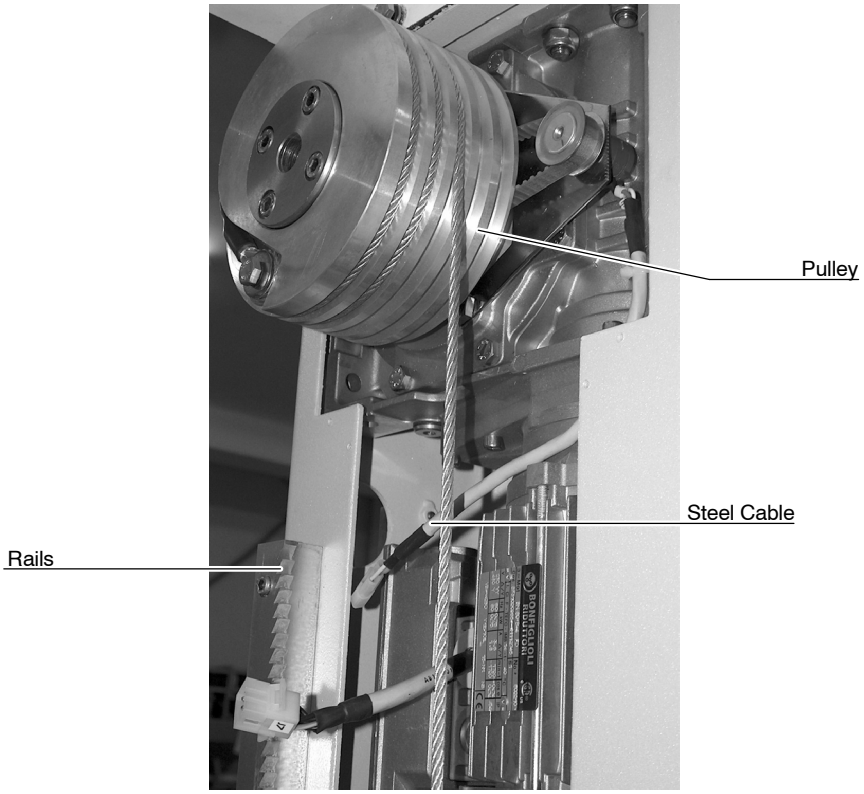
3. Check the Detector, first in horizontal position (thorax), then in vertical position (Undertable). If necessary, move up or down the Detector assembly with the Detector Assembly leveling screws.





3.5 CHECKING THE GREASING OF THE STEEL CABLE, PULLEY AND RAILS

This Unit is factory greased but in special cases it may have passed a long time in stock causing the loss of the greasing properties. Check and grease the Steel Cable, Rails and Pulley as explained in the Maintenance section of this Manual.

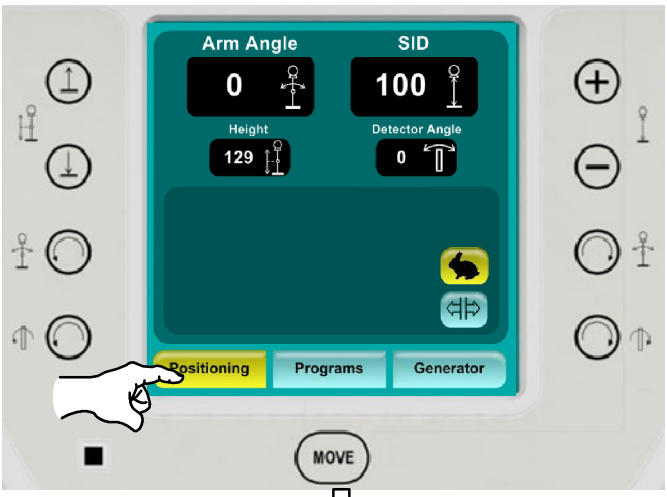


SECTION 4 SERVICE MODE

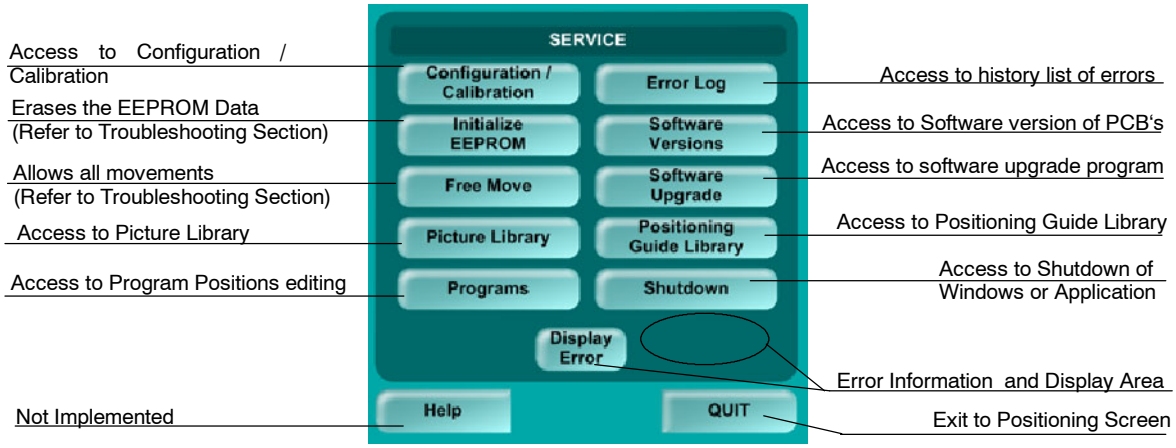
To turn the Unit ON/OFF, press the ON / OFF Switch located at the Control Unit Door.

Illustration 4-1
Enter Service Mode

ENTER SERVICE MODE:
Turn On the Unit and press and hold "Positioning" for 3 seconds.



Insert Password "2434"



4.1 CONFIGURATION / CALIBRATION

When the system is in Calibration/Configuration mode, the Unit's movement is unrestricted. While positioning the arm, carefully monitor its motion to ensure that it will not collide with people, the ceiling, the floor or any other obstacle.

This Unit is factory configured and calibrated based on the Detector dimensions and a standard room. Calibration of any other dimension or axis of motion is required only upon replacement of a potentiometer, potentiometer drive belt, or drive motor or to troubleshoot and resolve a motion–related error.

First, measure the room height (from ceiling to floor) and set the measure in the U-Arm Configuration Screen – Room height box. *Refer to section 4.1.1 for data entry instructions.*

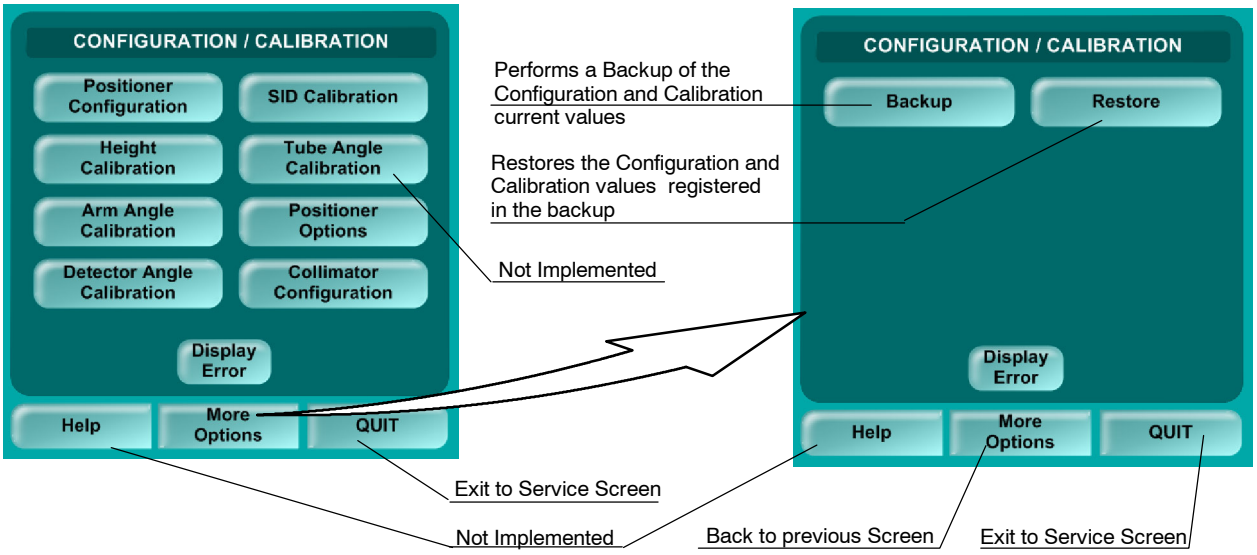
- **if the measurement is 270 cm (106.3") or greater** set the new value in the U–Arm Configuration Screen – Room Height box. Press "QUIT" to exit from Service Mode and check the correct functioning of all movements and readouts of the Unit. *Once verified, proceed to Section 5 "Adjustments".*

- **if the measurement is lower than 270 cm (106.3")** please re-configure the Undertable Height and the Thorax Height. For that, discount the same number of centimeters or inches as from 270 cm (106.3") e.g. if the room height is 252 cm (99.2") discount 18 cm (7") from the Standard Undertable Height 63 cm (24.8") and set the new value in the U–Arm Configuration Screen – Undertable Height box.

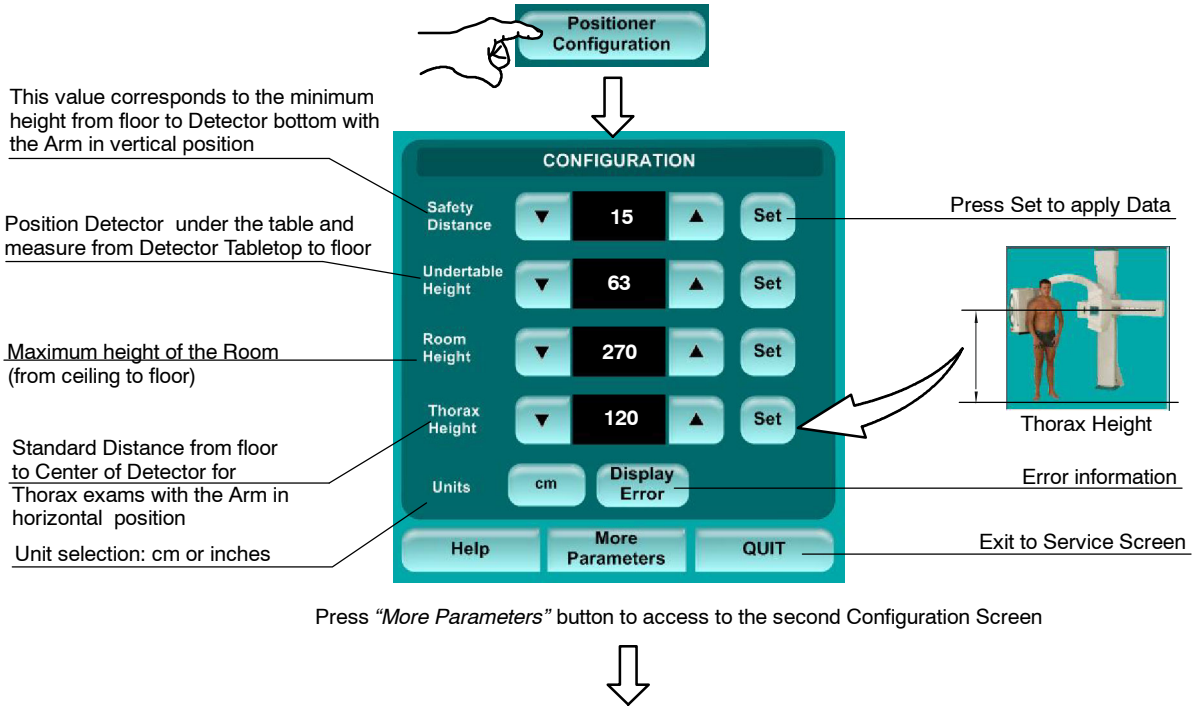
  As well discount 18 cm (7") from the Standard Thorax Height 120 cm (47.2") and set the new value in the U–Arm Configuration Screen – Thorax Height box. Then press "QUIT" to exit from Service Mode and check the correct functioning of all movements and readouts of the Unit. *Once verified, proceed to Section 5 "Adjustments".*

Note ☞ *When a configuration/calibration value is modified, the color of the number turns Green. When it is SET, it turns Yellow.*

Illustration 4-2
Configuration / Calibration Screen



4.1.1 FIRST SCREEN: U-ARM CONFIGURATION - STANDARD VALUES



4.1.2 SECOND SCREEN: U-ARM CONFIGURATION - STANDARD VALUES

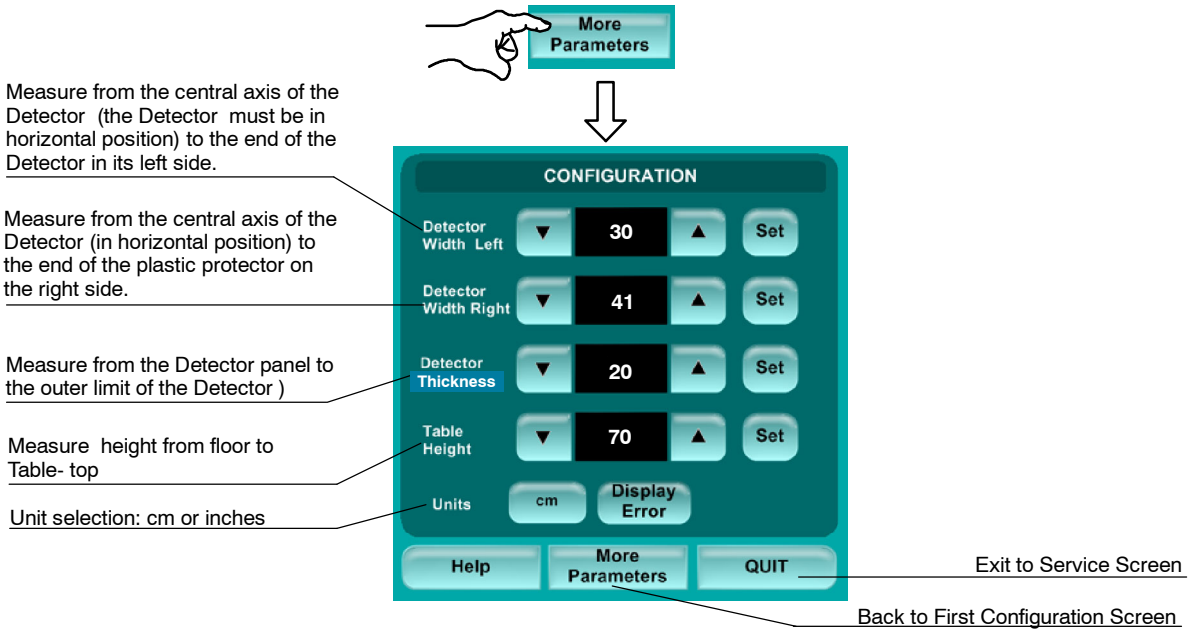
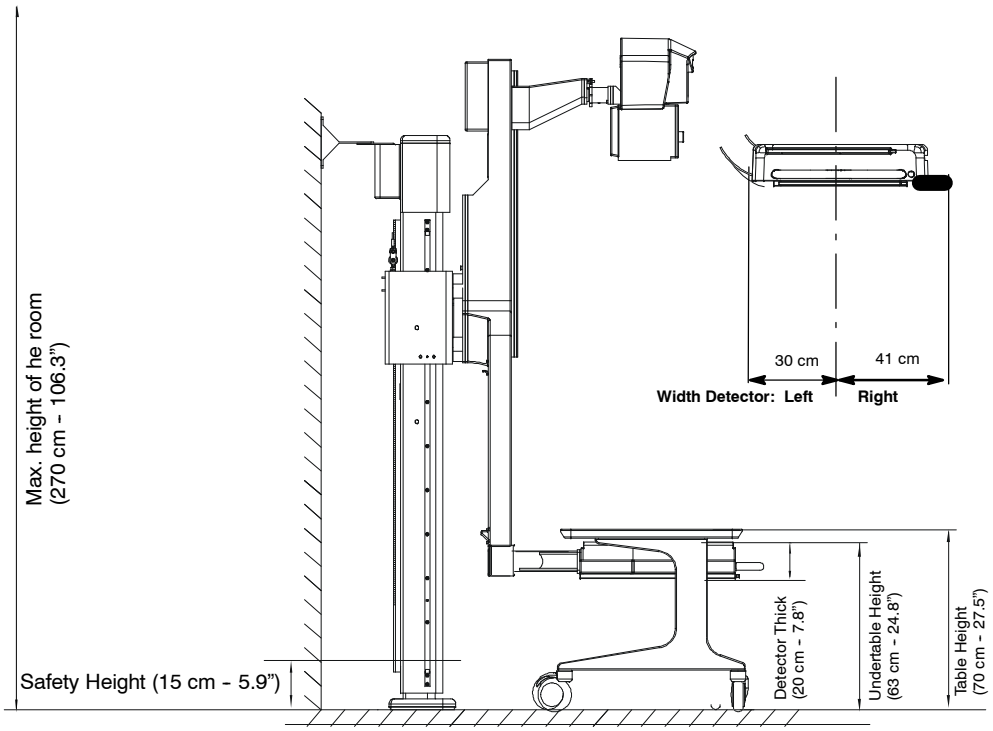


Illustration 4-3
Configuration points - Standard Values



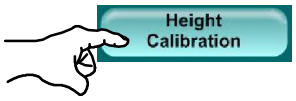
WARNING

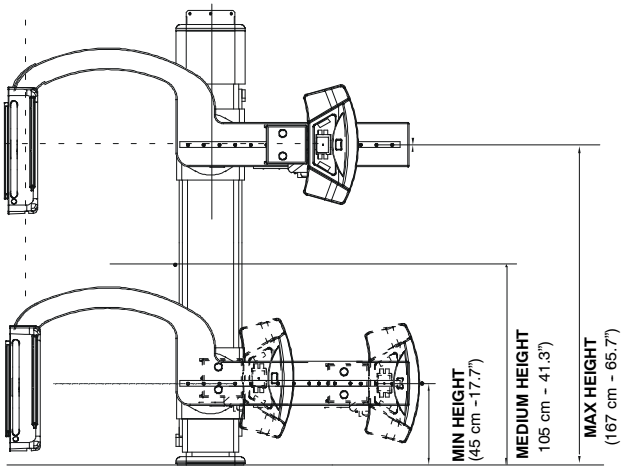
IN CASE THAT THE UNIT MOVEMENT IS DISCONTINUOUS (APPROX. EVERY 2.5 S), CHECK THE PROXIMITY SENSOR2, SOMETHING MAY BE ACTIVATING IT.

4.1.3 HEIGHT CALIBRATION - STANDARD VALUES

These values are needed to supply reference points to the Height Potentiometer. Position the Arm in horizontal and measure from the Detector Center to the floor.

When calibrating the extreme high and low positions, be certain that the mechanical limit switches are not actuated prior to pressing "Set."

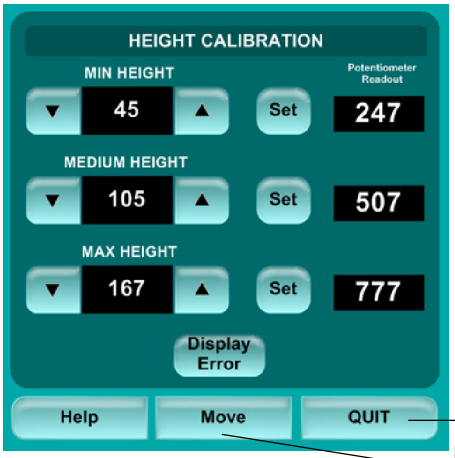




1 Press Move and rotate the arm to the horizontal position. Verify that the arm angle is 0 degrees with a digital level placed on the SID portion of the column.

2 Press *"Height Calibration"* button on Calibration Screen.

3 Press *"Move"* on Height Calibration Screen



4 Position the Arm at corresponding calibration Spot. (**Measure with Metric Tape from the Arm Central guide to the floor at each distance: 45 cm (17.7"), 105 cm (41.3") and 167 cm (65.7").**)

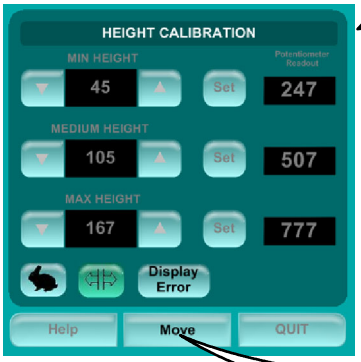
5 Press *"Move"* to enable the Screen.

6 Press *"Up" or "Down" arrow buttons to change the value (if necessary) and press "Set"* to save the data.

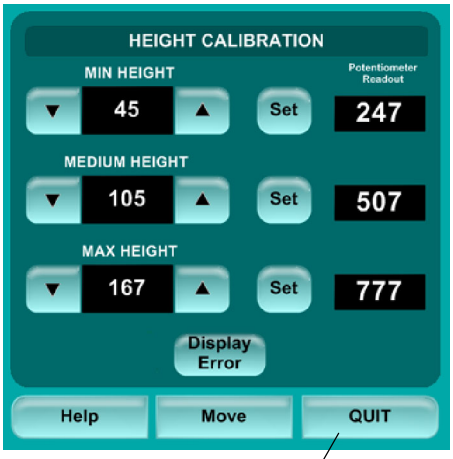
Exit to Calibration Screen

Press *"Move"* and then Position the Arm

Press *"Move"* (the screen is grayed out), then position the Arm at the corresponding calibration spot.



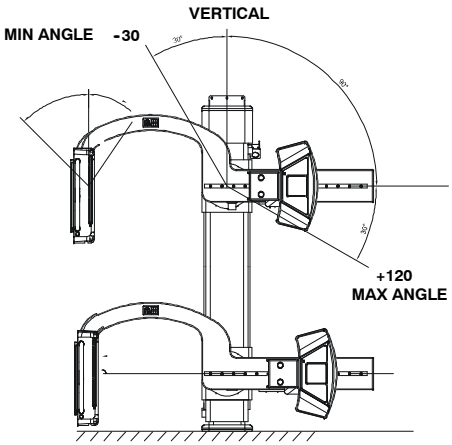
Press *"Move"* again to enable the screen



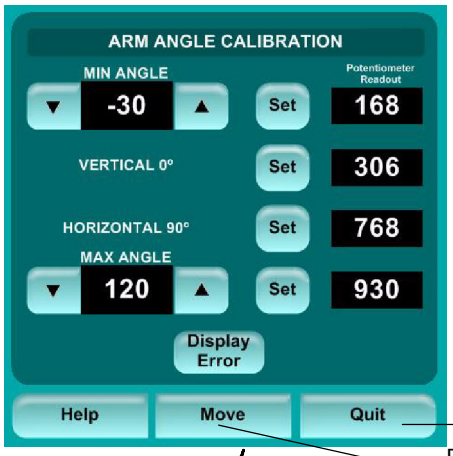
Press *"Set"* to save the corresponding data

Exit to Calibration Screen

4.1.4 ARM ANGLE CALIBRATION - STANDARD VALUES



When calibrating the extreme positions, be certain that the mechanical limit switches are not actuated prior to pressing "Set."

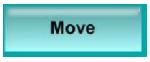


1. Press *"Arm Angle Calibration"* button on Calibration Screen.
2. Press *"Move"* on Arm Angle Calibration Screen (the screen is grayed out and the movement buttons enabled)
3. Position the Unit at corresponding calibration Spot. **(Measure with a digital level at each angle -30°, 0°, 90°, 120°)**
4. Press *"Move"* to enable the Screen
5. Press *"Up"* or *"Down"* arrow buttons to change the value (if necessary) and press "Set" to save the data.

Exit to Calibration Screen

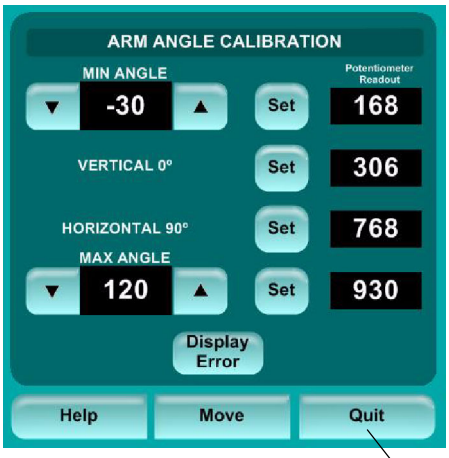
Press *"Move"* and then Position the Arm

Press *"Move"* (the screen is grayed out), Turn the Arm to the corresponding calibration spot



Press *"Move"* again to enable the screen

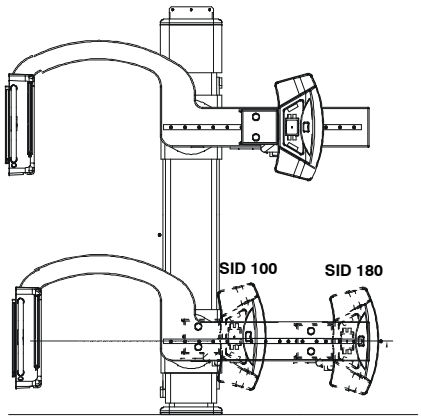
Press *"Set"* to save the corresponding data



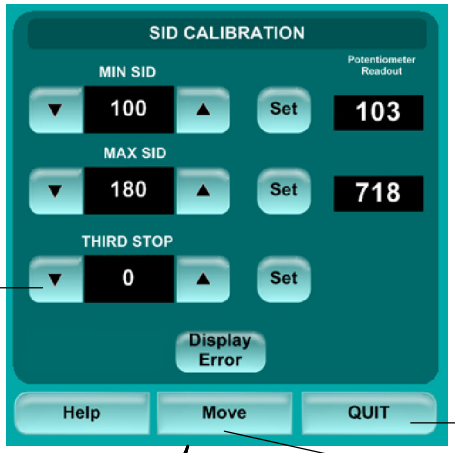
Exit to Calibration Screen

4.1.5 SID CALIBRATION - STANDARD VALUES

Measurements for SID are to be performed with the collimator's metric tape measure. It is necessary to deduct 3 cm (1.2") from the readings provided by that tape measure in order to arrive at the proper SID value for calibration purposes.



When calibrating the extreme high and low positions, be certain that the mechanical limit switches are not actuated prior to pressing "Set.".



1 Press *"SID Calibration"* button on Calibration Screen.

2 Press *"Move"* on SID Calibration Screen

3 Position the Unit at corresponding calibration Spot.
(Measure with the Collimator Metric tape and deduct 3 cm (1.2") at each SID 100 cm (40") and 180 cm (72")

4 Press *"Move"* to enable the Screen

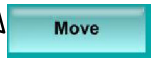
5 Press *"Up" or "Down" arrow buttons to change the value (if necessary) and press "Set"* to save the data.

Optional Third Stop for an extra SID stop.

Exit to Calibration Screen

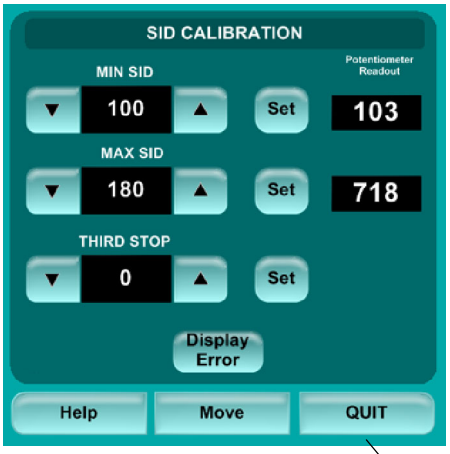
Press *"Move"* and then Position the Arm

Press *"Move"* (the screen is grayed out), Position the Tube-Collimator at the corresponding calibration spot



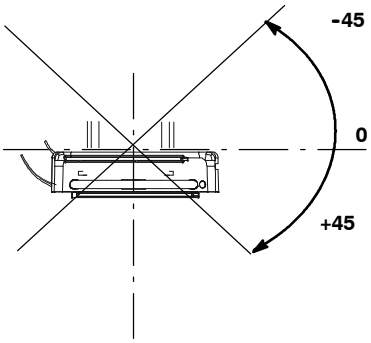
Press *"Move"* again to enable the screen

Press *"Set"* to save the corresponding data



Exit to Calibration Screen

4.1.6 DETECTOR ANGLE CALIBRATION - STANDARD VALUES



When calibrating the extreme positions, be certain that the mechanical limit switches are not actuated prior to pressing "Set."

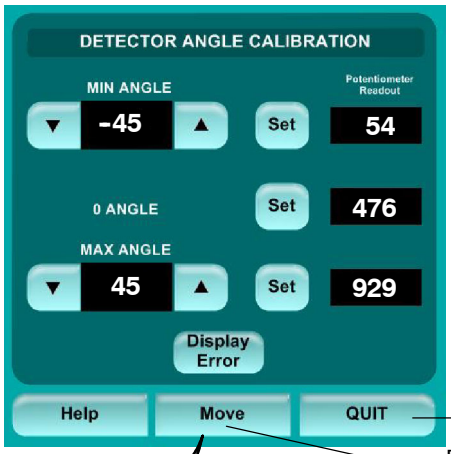
1 Press *"Detector Angle"* button on Calibration Screen.

2 Press *"Move"* on Detector Angle Calibration Screen

3 Position the Unit at corresponding calibration Spot. (Arm in vertical position).
(Measure with a digital level each angle -45º, 0º , 45º

4 Press *"Move"* to enable the Screen

5 Press *"Up" or "Down" arrow buttons to change the value (if necessary) and press "Set"* to save the data.

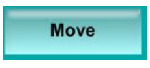


Exit to Calibration Screen

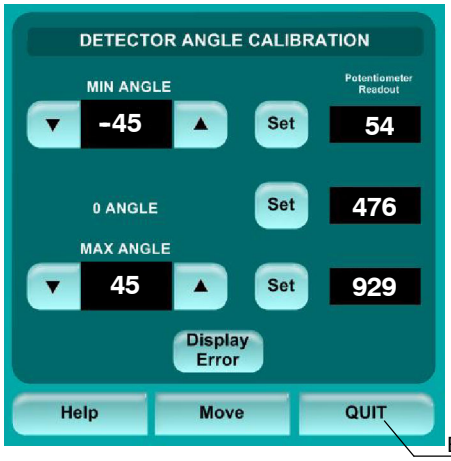
Press *"Move"* and then Position the Arm

Press *"Move"* (the screen is grayed out) and position the Detector at the corresponding calibration angle.

Press *"Move"* again to enable the screen



Press *"Set"* to save the corresponding data



Exit to Calibration Screen

Table 4-1
Calibration Messages

DESCRIPTION	WHAT TO DO
Non-superuser has tried to enter into calibration mode.	Non authorized person has entered in Calibration mode, enter using a correct password.
Selected Room Height does not permit a complete movement.	Check Room Height or Security Distance in Configuration or Max Height in Calibration and modify any inconsistency with other measurements.
Thorax Height out of range	Check Thorax Height in Configuration and modify any inconsistency. If the error remains, confirm all Height Configuration and Calibration measurements.
Undertable Height out of range	Check Undertable Height in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements.
Invalid Table Height measurement	Check Table Height in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements.
Detector Height out of range, blocking complete Rotation	Check Detector Height in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements, including Security Distance.
Detector Width from center to left is out of range	Check Detector Width in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements, including Security Distance
Detector Width from center to right is out of range	Check Detector Width in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements, including Security Distance
Third SID stop value invalid (this value can be configured)	In Calibration, check for a correct SID value compared with maximum and minimum SID.
Floor Safety Distance out of range, blocking movements	Check Safety Distance in Configuration and modify any inconsistency. If the error persists, confirm all Height measurements.

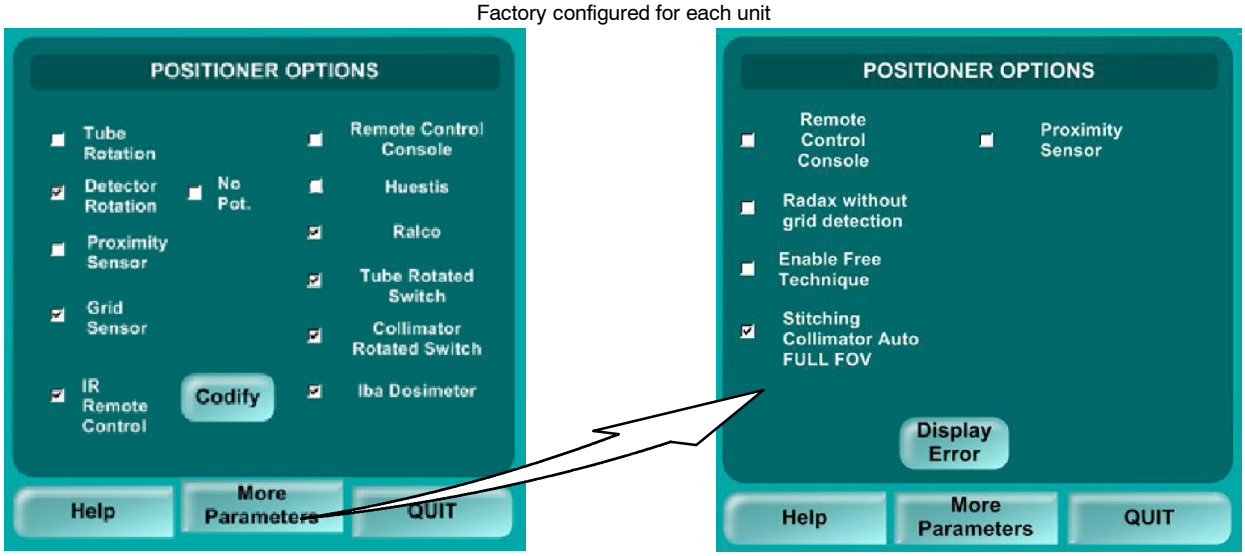
Continues on next page

Table 4-1 (Continued)

DESCRIPTION	WHAT TO DO
Incoherent Potentiometer values for Height Calibration	The Pot readout is out of range, calibrate again, if message remains, check Height Pot.
Minimum Height out of range or incoherent	Re-calibrate again Minimum Height
Medium Height out of range or incoherent	Re-calibrate again Medium Height
Maximum Height out of range or incoherent	Re-calibrate again Maximum Height
Incoherent Potentiometer values for Rotation Angle	The Inclinometer readout is out of range, calibrate again, if message remains, check Inclinometer.
Minimum Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Vertical Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Horizontal Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Maximum Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent Potentiometer values for SID	The Pot readout is not arranged in logical order, calibrate again, if message remains, check SID Pot.
Minimum SID out of range or incoherent	Re-calibrate again specific SID
Maximum SID out of range or incoherent	Re-calibrate again specific SID
Incoherent Potentiometer values for the Detector Angle	The Pot readout is not arranged in logical order, calibrate again, if message remains, check Detector Pot.
Minimum Detector Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent 0 Detector Angle	Re-calibrate again specific Angle
Maximum Detector Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent Potentiometer values for the Tube Angle	The Pot readout is not arranged in logical order, check Tube Pot.
Maximum Tube Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent 0 Tube Angle	Re-calibrate again specific Angle
Minimum Tube Angle out of range or incoherent	Re-calibrate again specific Angle
Revise Room Height	The value entered for Room height is inhibiting some movements, review data and modify if applicable.
Revise Detector Thickness and Safety Distance	The value entered for Detector Height and Safety Distance is inhibiting some movements, review data and modify if applicable.
Revise Maximum Height	The value entered for Max height is inhibiting some movements, review data and modify if applicable.

4.1.7 U-ARM OPTIONS

Factory configured for each unit

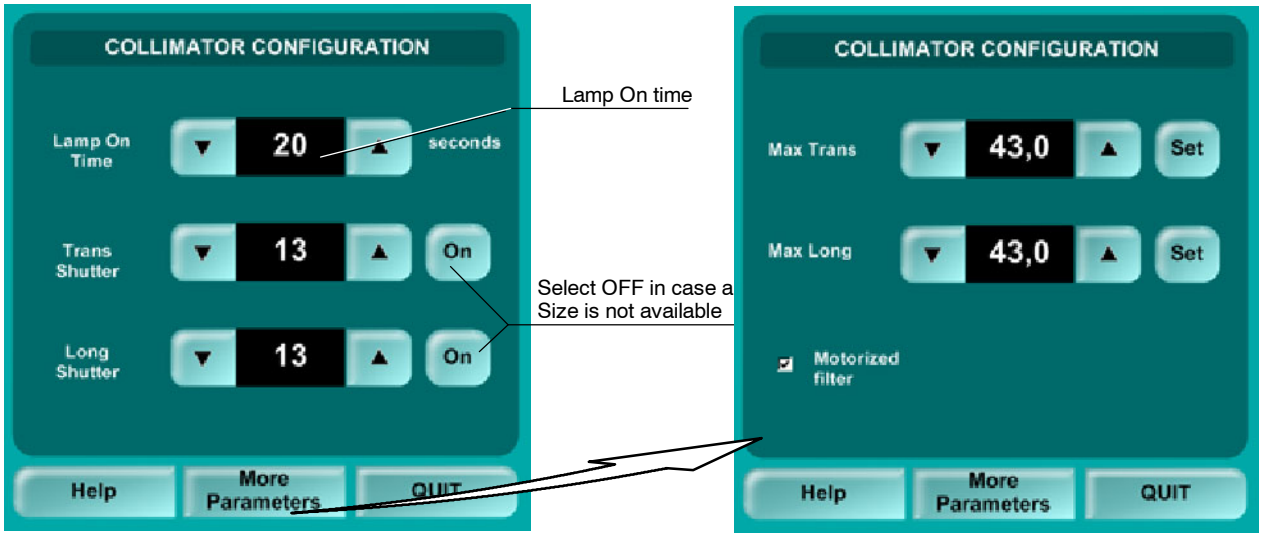


UNITS WITH PORTABLE DIGITAL DETECTOR:
POSITIONER OPTIONS
GRID SENSOR = UNCHECKED
RADAX WITHOUT GRID DETECTION = CHECKED

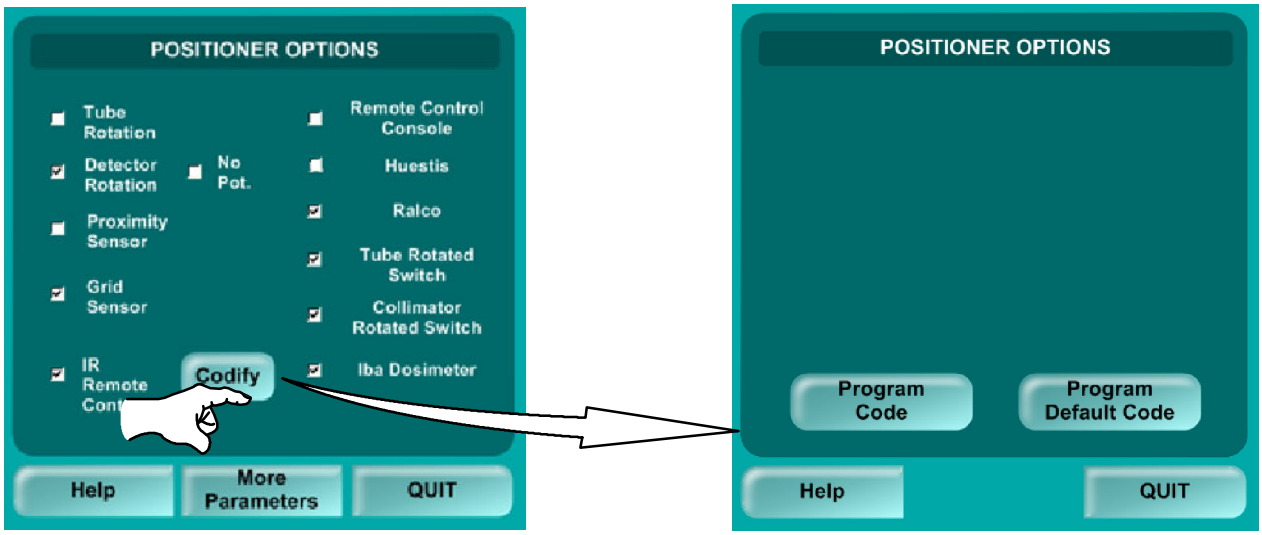
COLLIMATOR OPTIONS (SEE BELOW)
MAX TRANS = 43
MAX LONG = 35

RESTART THE UNIT TO SET A MODIFIED OPTION

4.1.8 COLLIMATOR CONFIGURATION



4.1.9 IR REMOTE CONTROL



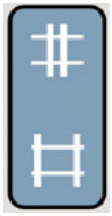
PROGRAM DEFAULT CODE (FACTORY SET) CONFIGURES THE REMOTE CONTROL WITH THE STANDARD FACTORY CODE

PROGRAM CODE GENERATES AND SENDS A CODE TO THE UNIT THAT MAKES THE REMOTE CONTROL UNIQUE FOR THAT U-ARM

IN CASE THAT A NEW REMOTE CONTROL IS BROUGHT TO THE INSTALLATION OR A NEW COMPACT FLASH IS INSTALLED, IN BOTH CASES IT IS NECESSARY TO CONFIGURE REMOTE CONTROL.

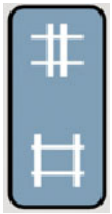
GENERATING CODE

1 



2 **PRESS AND HOLD**

3 **SIMULTANEOUSLY PRESS AND RELEASE**

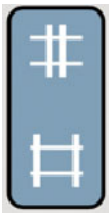


4 **RELEASE**

THE CODE HAS BEEN GENERATED

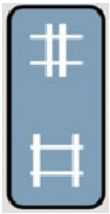
SENDING THE CODE TO THE RECEPTOR

5 **PRESS AND HOLD**



6 **SIMULTANEOUSLY PRESS AND RELEASE**

7 **RELEASE**

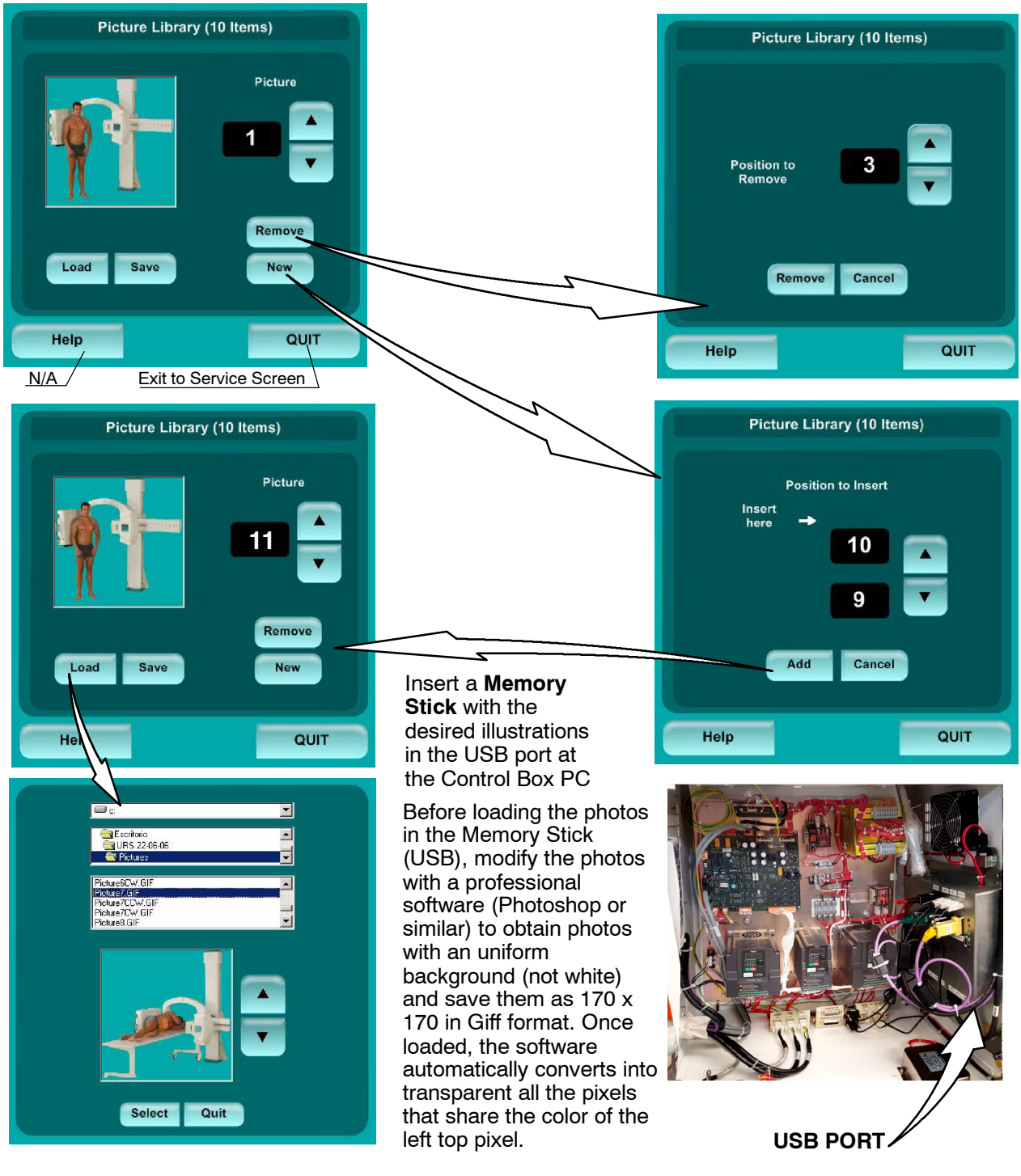


THE CODE HAS BEEN SENT TO THE RECEPTOR. ***RESET THE SYSTEM***

4.2 PICTURE LIBRARY SCREEN

Illustration 4-4
Picture Library Selection

The Picture Library screen is used for Loading or Removing Illustrations for position reference



Insert a **Memory Stick** with the desired illustrations in the USB port at the Control Box PC

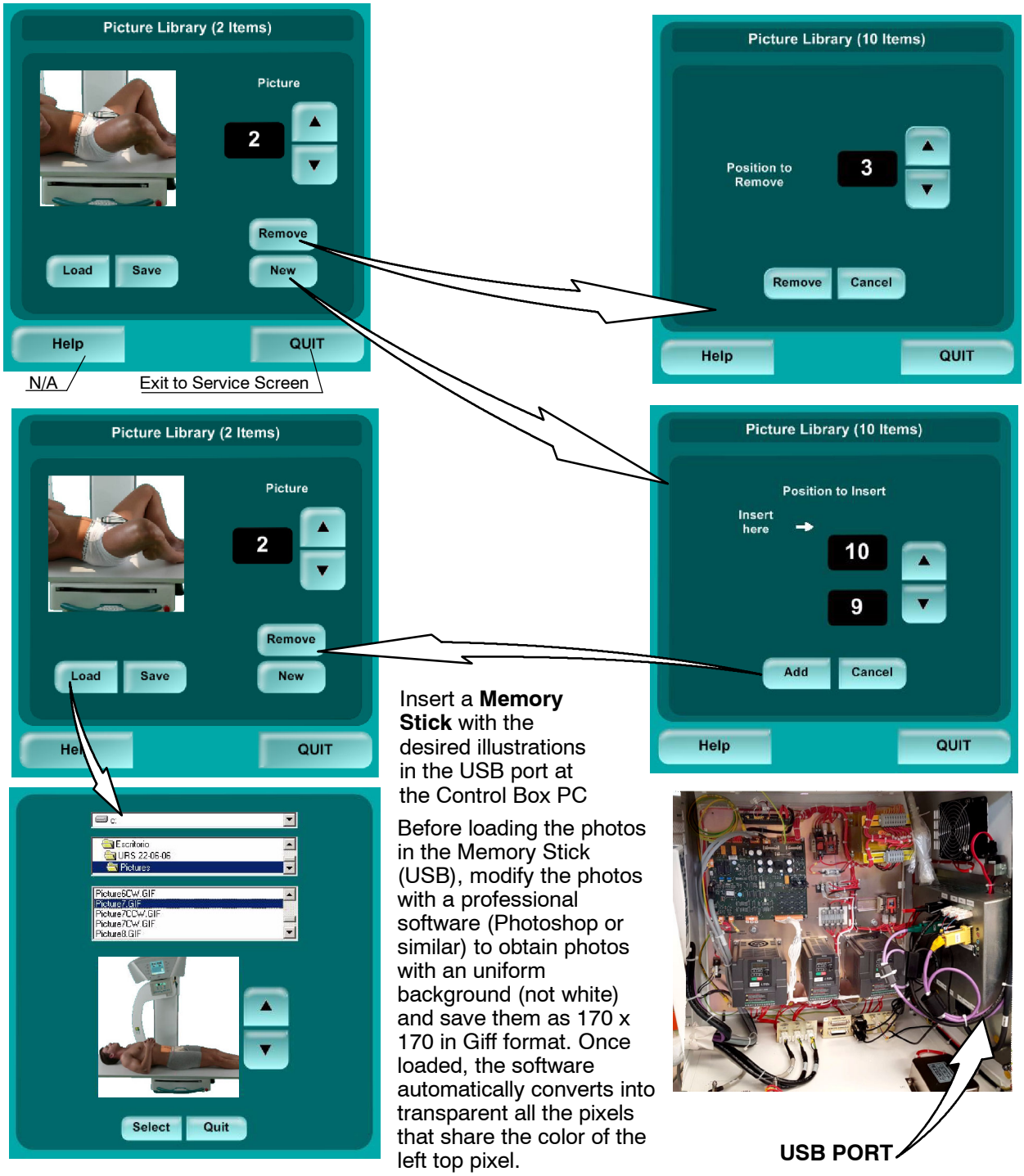
Before loading the photos in the Memory Stick (USB), modify the photos with a professional software (Photoshop or similar) to obtain photos with an uniform background (not white) and save them as 170 x 170 in Giff format. Once loaded, the software automatically converts into transparent all the pixels that share the color of the left top pixel.

USB PORT

4.3 POSITIONING GUIDE LIBRARY SCREEN

Illustration 4-5
Picture Library Selection

The Positioning guide Library screen is used for Loading or Removing Illustrations for patient position reference



Insert a **Memory Stick** with the desired illustrations in the USB port at the Control Box PC

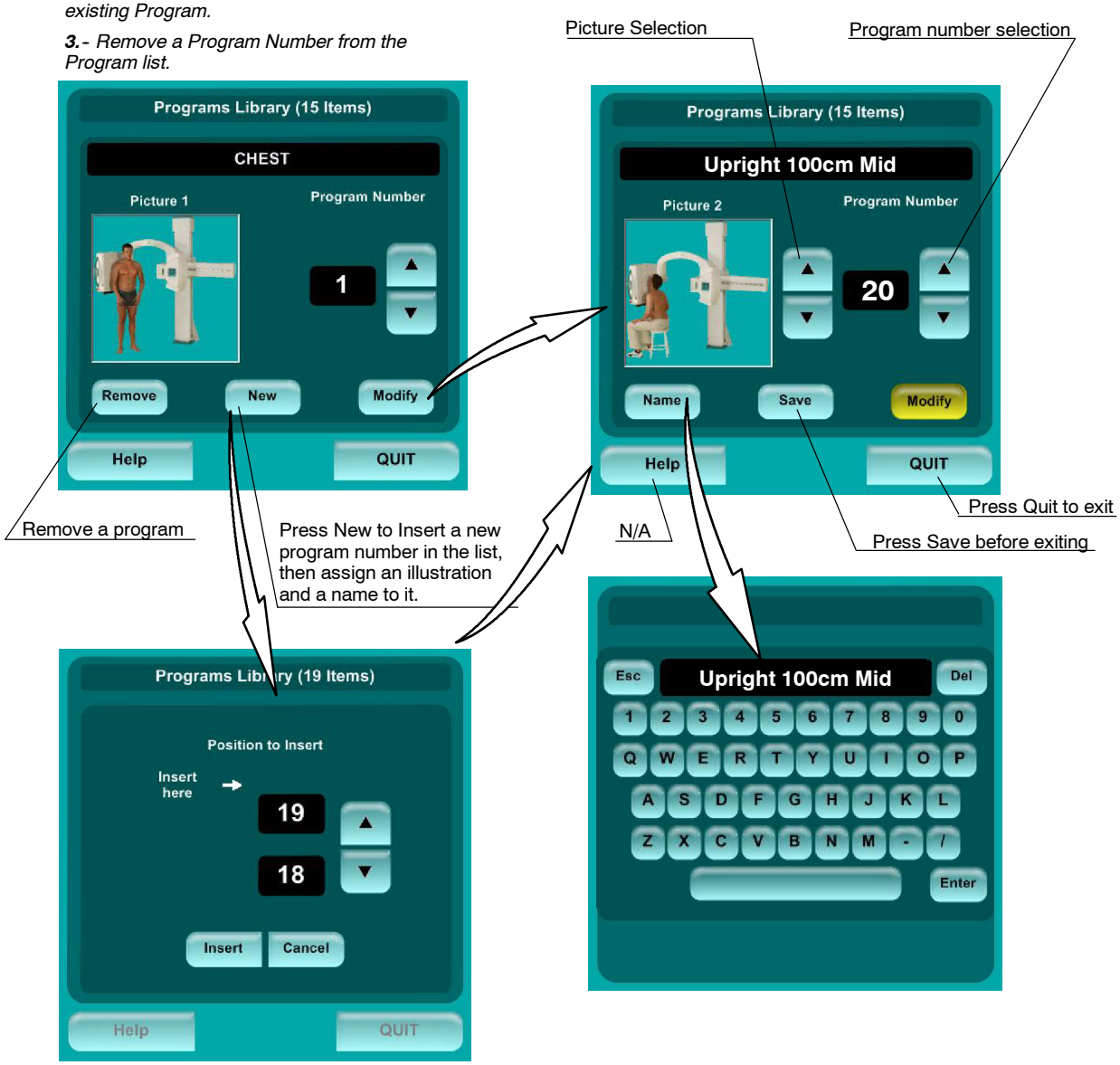
Before loading the photos in the Memory Stick (USB), modify the photos with a professional software (Photoshop or similar) to obtain photos with an uniform background (not white) and save them as 170 x 170 in Giff format. Once loaded, the software automatically converts into transparent all the pixels that share the color of the left top pixel.

USB PORT

4.4 PROGRAMS SCREEN

Illustration 4-6
Programs Library Screen

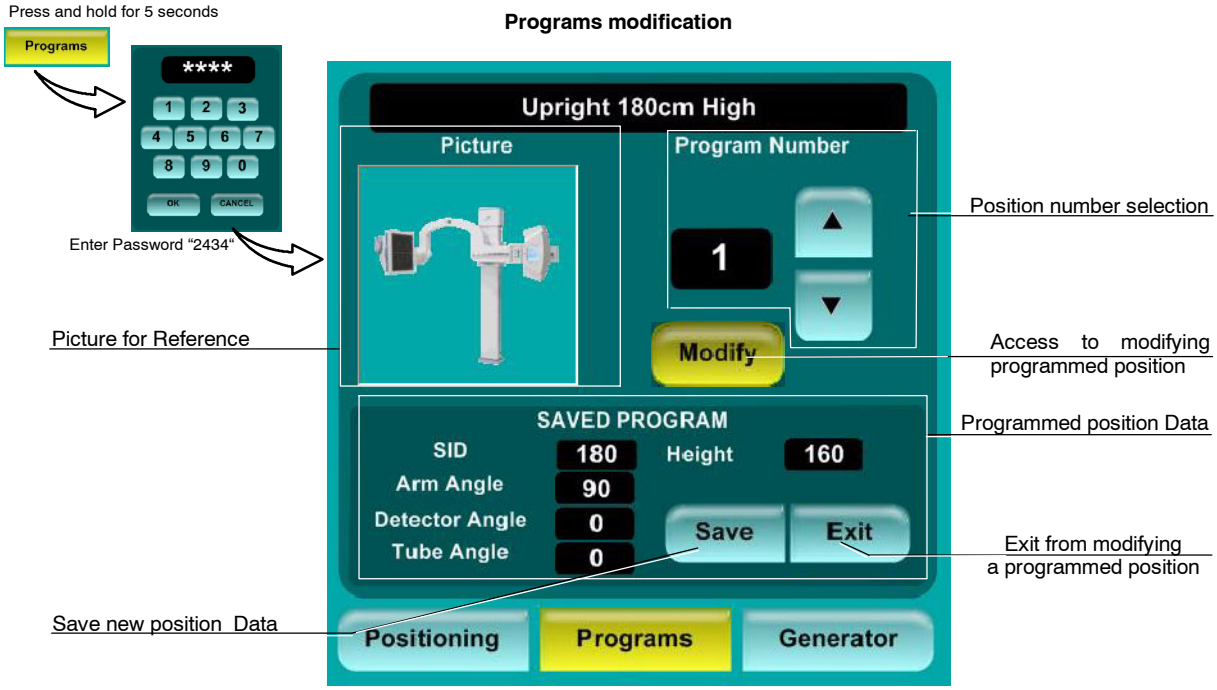
The Programs Library Screen is used to:
1.- *Create a new Program and assign / match an illustration to it. To load images refer to Picture Library Screen.*
2.- *Modify the illustration or the name of an existing Program.*
3.- *Remove a Program Number from the Program list.*



4.5 PROGRAMS MODIFICATION

Once a Program Number with its images has been created, assign the Position Parameters by exiting Service Mode and entering the *"Programs Screen"* as per Illustration 4-7. In addition, a saved Program Number can be modified for operator convenience. The SID, Arm Angle, Arm Height and Detector Angle of a Program Number can be customized and saved for future use.

Illustration 4-7
Programs modification



1.- Press and hold "Programs" for 5 seconds.

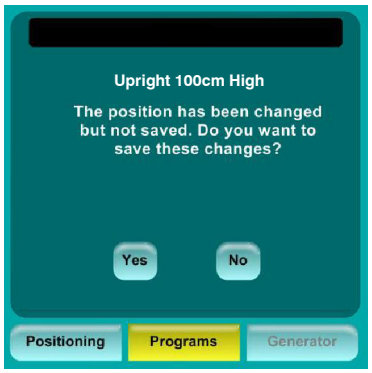
2.- enter the password (2434) and press "OK".

3.- Select the Program position number to be modified and Press "Modify".

4.- Then, press the "Positioning" button and press on the different motion buttons in order to place the Arm at the desired position.

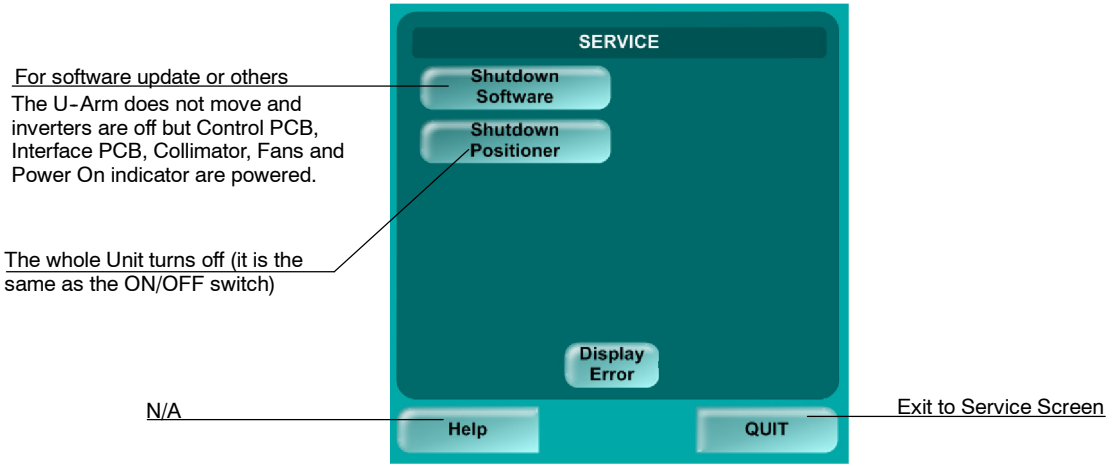
5.- Then, go back to Programs Screen (the screen shows actual position data) and press "Save".

6.- Press "Exit", to go back to previous screen.

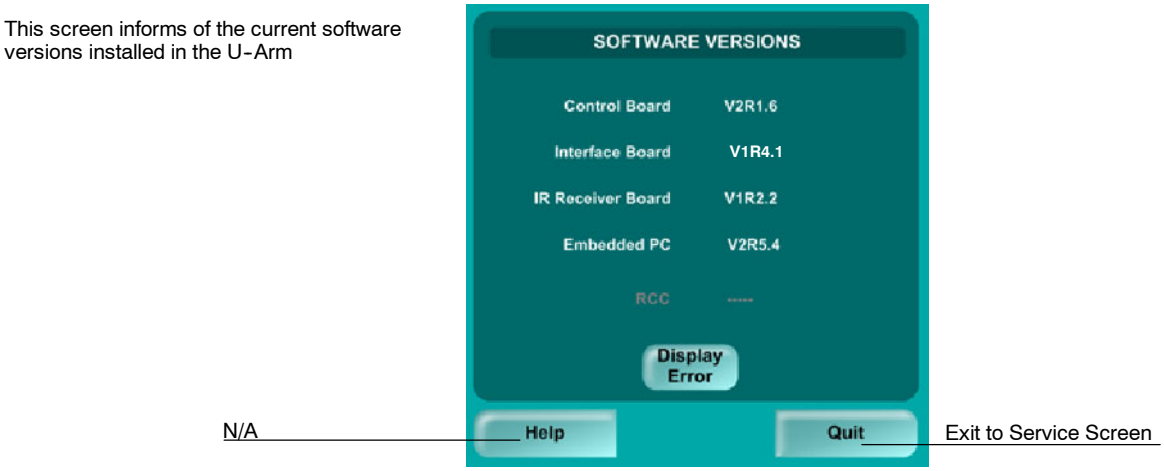


If a position has been modified and exit selected, the above prompt appears. Press "Yes" or "No" to save and exit or simply exit as desired.

4.6 SHUTDOWN SCREEN



4.7 SOFTWARE VERSION SCREEN



4.8 SOFTWARE UPGRADE SCREEN

This feature allows the Unit to upgrade the software versions of each Micro controller of the Unit (3).

Illustration 4-8
Software Upgrade Screen

1 Insert a memory Stick with the corresponding software in the USB slot located at the Control Box PC.

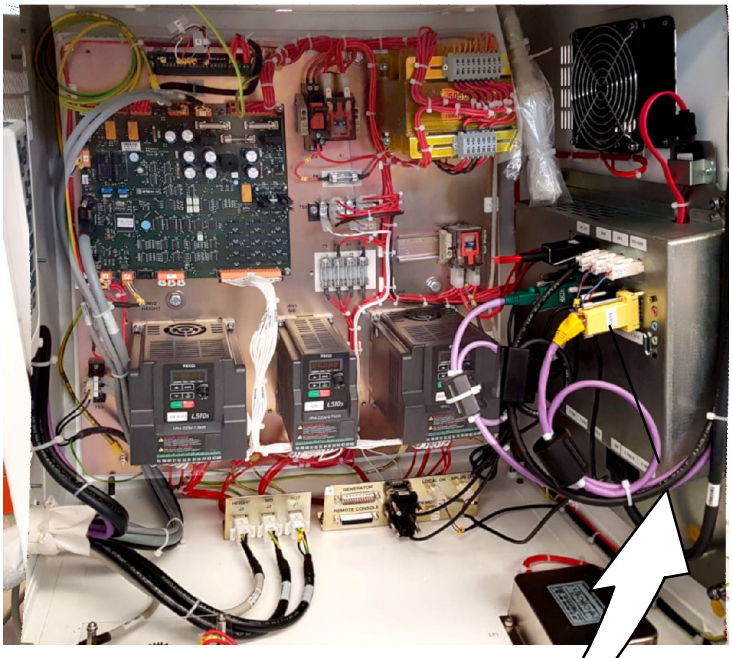
2 Select the destination Board on the Touch Screen (that is, select the PCB where the Software to be upgraded is located.)

3 Select the corresponding file from the memory Stick and press “Open”.

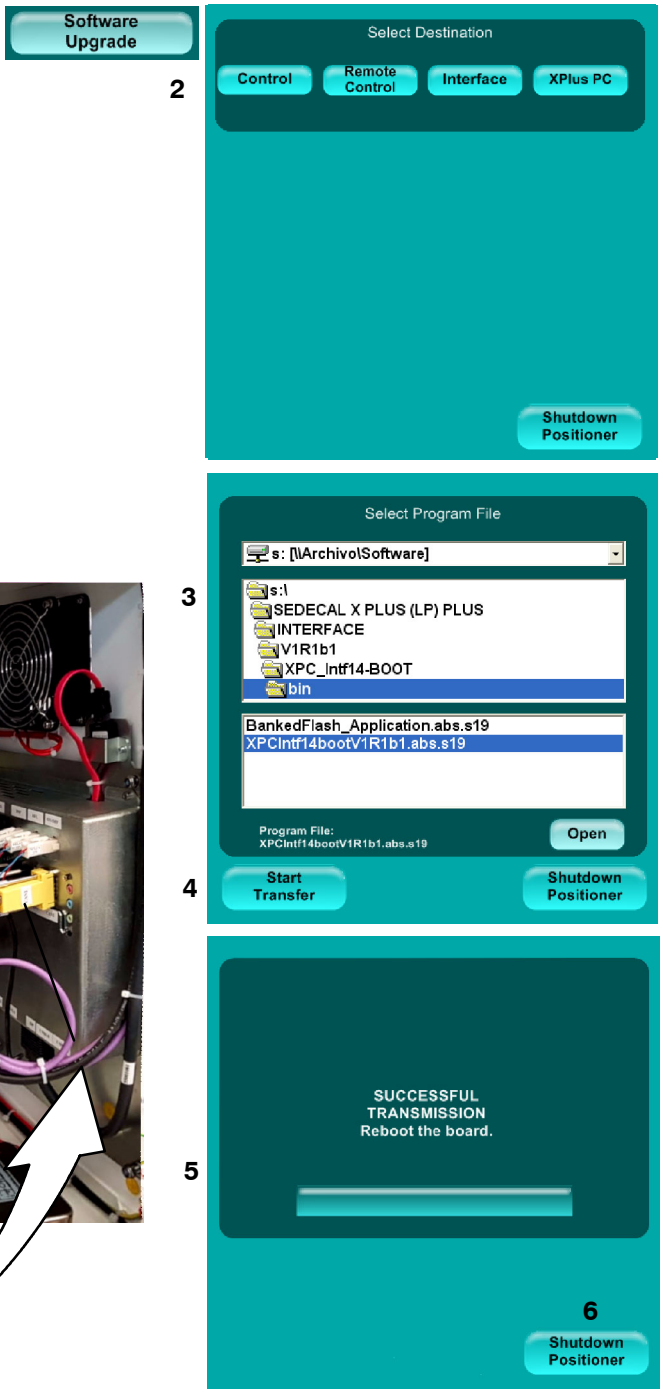
4 Press on “Start Transfer”.

5 The software is automatically downloaded.

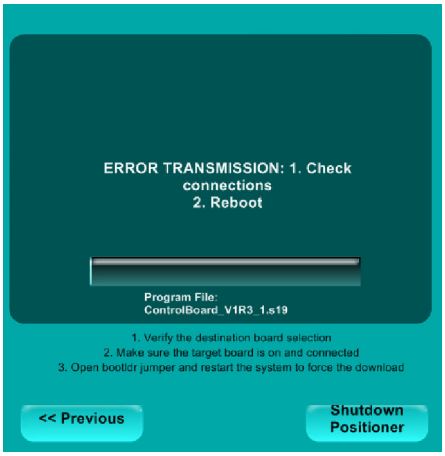
6 Shutdown U-Arm in order to apply changes. **(Shutdown U-Arm every time a PCB is updated).**



USB PORT



In case this program cannot download the new software or a wrong software has been loaded and the system does not work, proceed as follows:

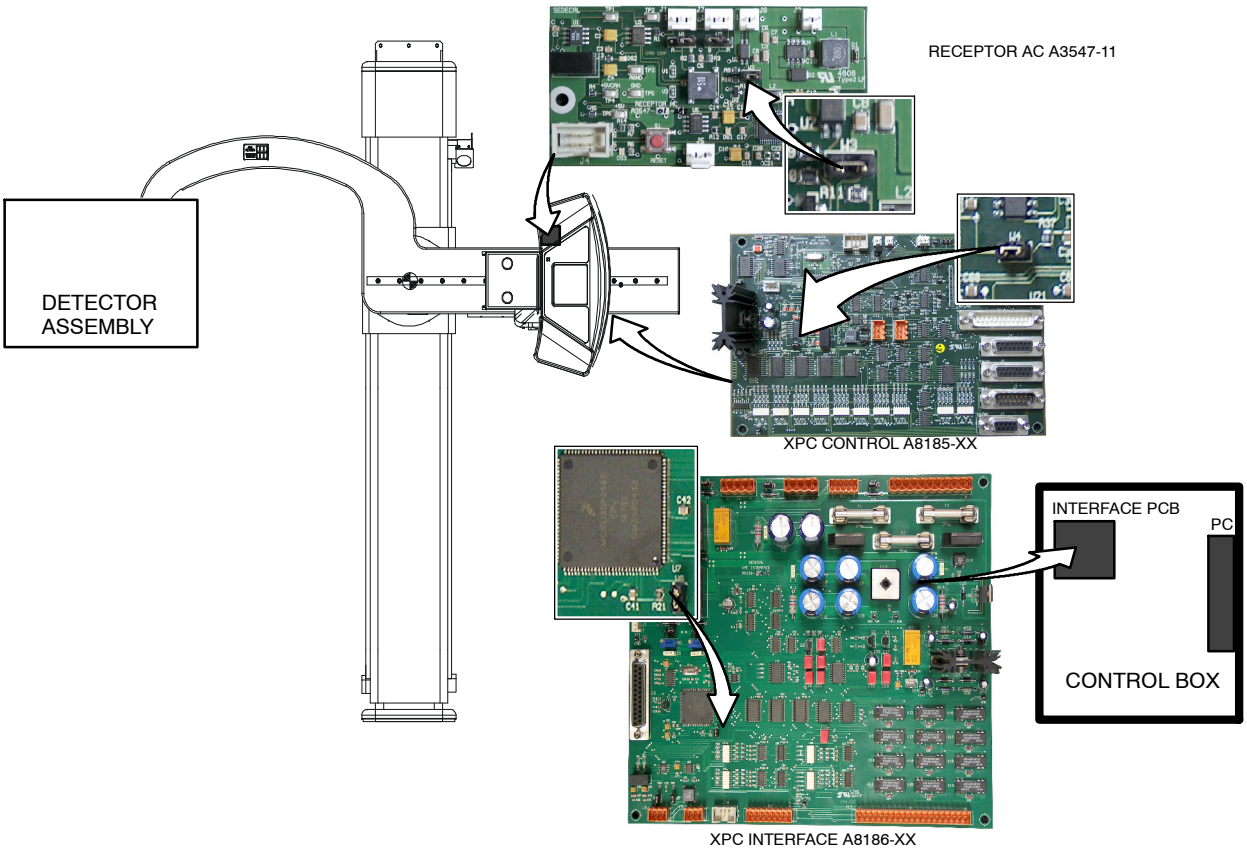


1 Turn the System OFF

2 Remove the Jumper for the specific PCB, that is:
W4 in the XPC Control PCB (A8185-XX)
W5 in the XPC Interface Control PCB (A8186-XX)
W3 in the RECEPTOR AC PCB (A3547-XX)

3 Turn on the System, **ignore the system messages** (the corresponding PCB is not acting as such, it is just waiting to be updated) and load the software as explained on the previous page.

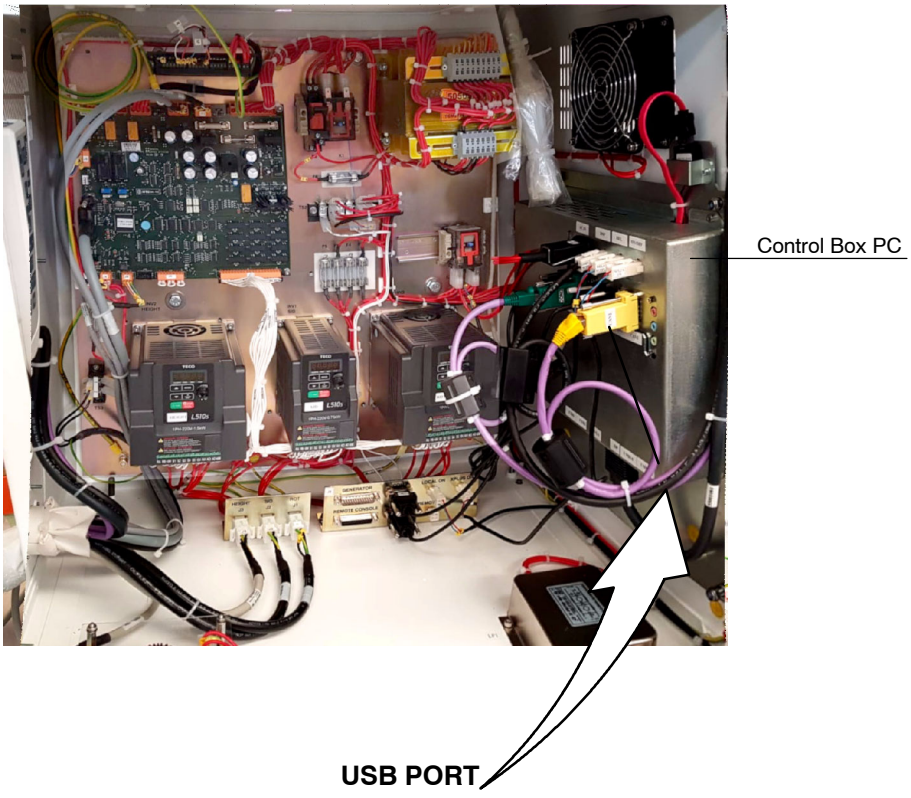
4 Reinstall the Jumper before turning OFF/ON the Unit.



4.9 SOFTWARE UPGRADE OF THE CONTROL BOX PC

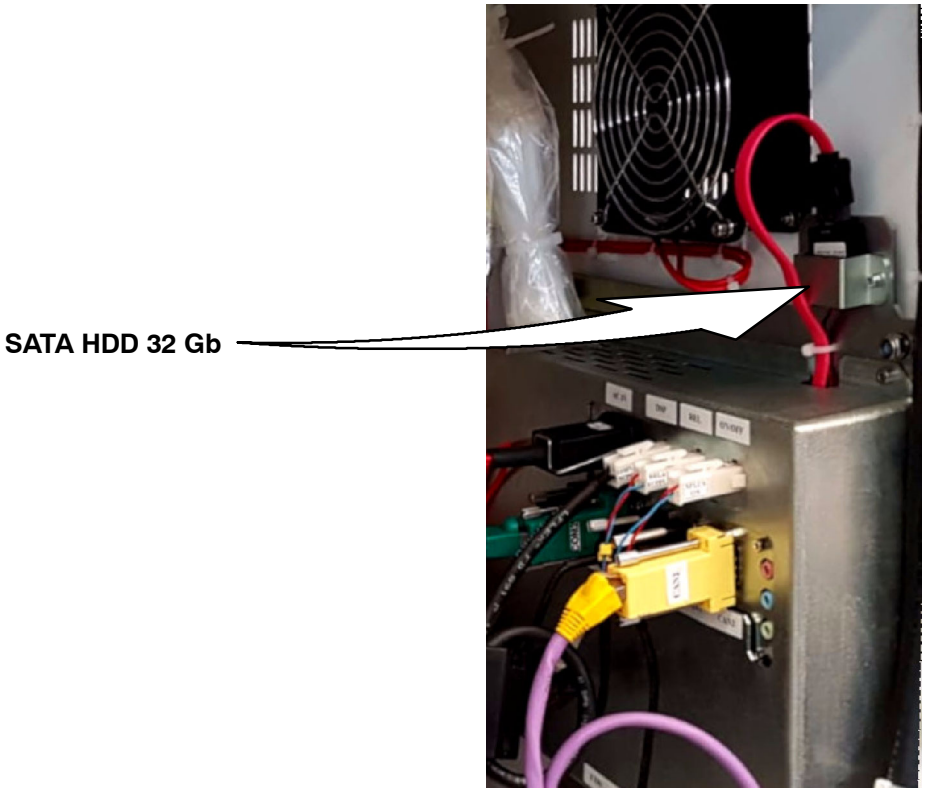
1. Connect a Keyboard in the Control Box PC: Use either a PS2 Keyboard connected to the Keyboard cable or a USB Keyboard connected to a USB Port.
2. Copy the file URS.exe **provided by the Service Department** inside the ”Software” folder to an USB storage device and connect it to an USB port of the URS PC.
3. Press and hold for 3 seconds the “Positioning” button on the URS screen until a password request appears.
4. Enter the password: 2434.
5. Press the Shutdown button.
6. Then press “Shutdown application”.
7. In the keyboard, press ”Windows + E” to open the explorer and place the new URS.exe in c:\Program Files\URS Plus (before, you can rename the old URS.exe as URS_old.exe for historic purposes).
8. Turn the System OFF / ON.

CONTROL BOX



4.10 REPLACEMENT OF THE SATA EDOM HDD 32 GB

1. Turn the System Off.
2. Open the SATA HDD 32 Gb brakect.
3. Disconnect the Cable.
4. Remove the old SATA HDD 32 Gb.
5. Insert the new SATA HDD 32 Gb.
6. Reinstall the cable and the Bracket.

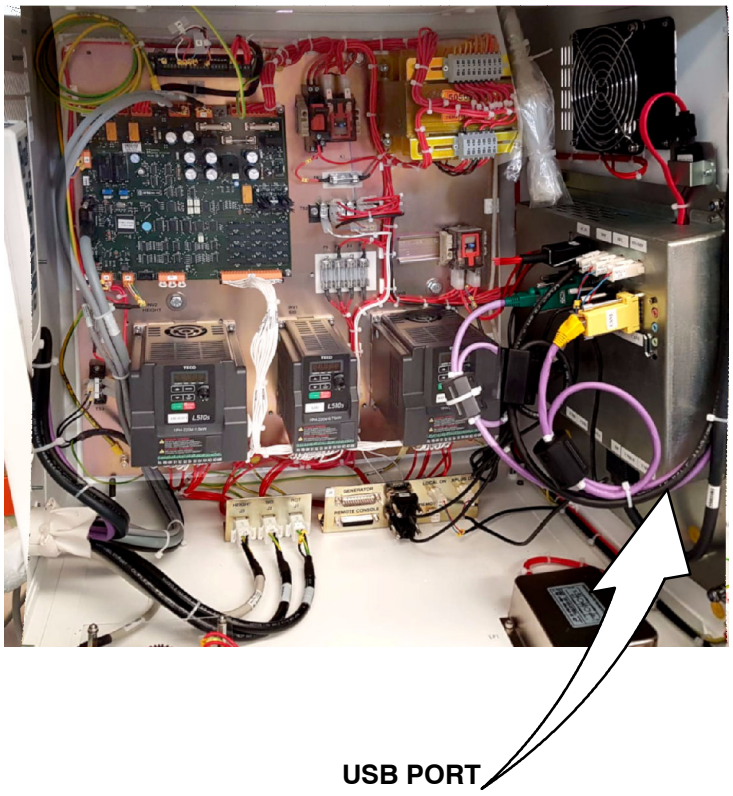


7. Turn the Unit on.
8. Calibrate the Touch Screen Sensor, for that, refer to Section 4.11.

4.11 CALIBRATION OF THE “ELO” TOUCH SENSOR

The Sensor of the Touch Screen requires calibration when the buttons can not be properly selected or when the SATA HDD 32 Gb has been replaced. The steps below should be followed whenever a calibration is required:

1. Turn the U-Arm ON and connect a USB Keyboard in the USB port of the Control Box PC.



2. Press the “*Start-Windows*” button on the keyboard, then select (double-click):
“*Settings / Control Panel / EloTouchscreen*”.

3. Execute the “*Align*” program and follow the process touching on the indicated spots.

4. When finished, the Screen is ready for operation.

SECTION 5 ADJUSTMENTS

5.1 ADJUSTMENT TOOLS

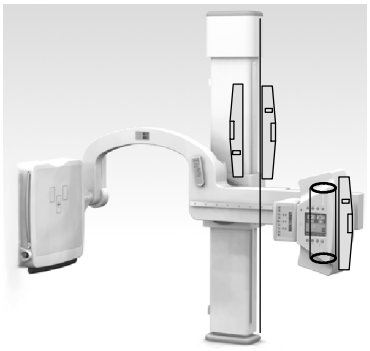
The following special Tools have been used for adjustment of the X-ray System (these tools are not included with the System):

The following special Tools have been used for adjustment of the X-ray System (these tools are not included with the System):

- Collimator Test Tool (Model RMI 161B9).
- Beam Alignment Test Tool (Model RMI 162A).
- SID Test Stand Tool (Inside Case: RMI Model 175).
- Light Meter (Standard).

Illustration 5-1
Checkings overview

1 Check /Correct levels of Column and tube



2 Check /Correct levels of Detector

3 Check / Correct alignment of the light field with the X-ray field

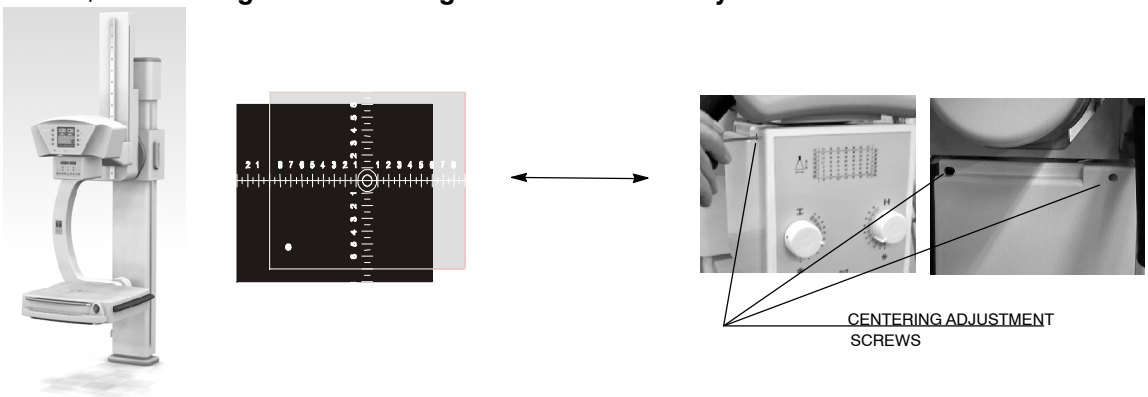
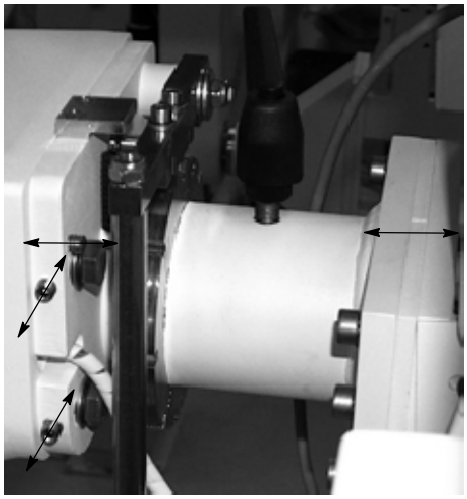
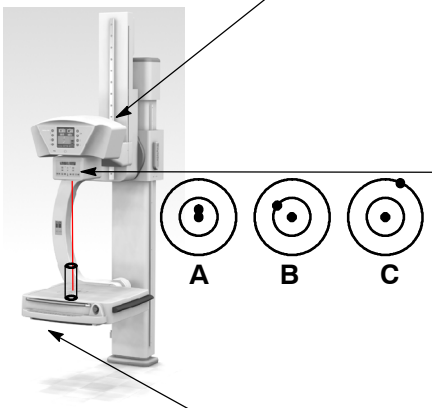
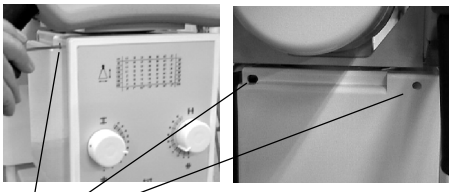


Illustration 5-1 (cont.)
Checkings Overview

4 Check / Correct the perpendicular adjustment of the X-Ray Beam with the Image Detector

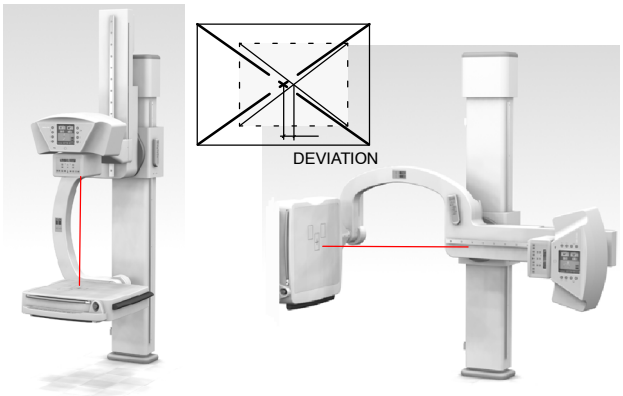






CENTERING ADJUSTMENT SCREWS

5 Check / Correct centering of X-Ray field and Image Detector (same adjustments as step 4)



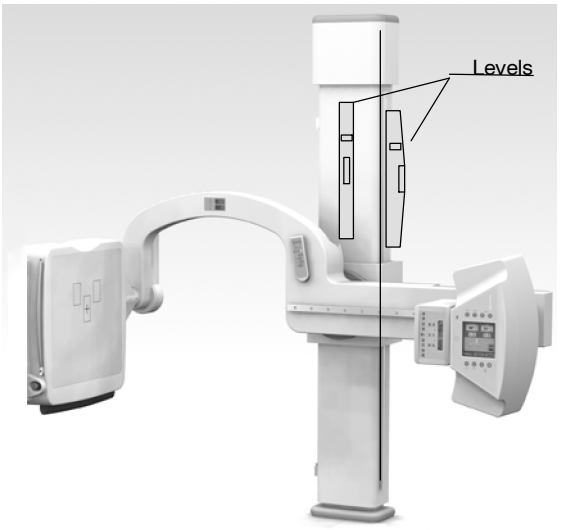
6 SID Indicator Test

7 Field Size Indicator Test

8 Collimator Lamp Brightness Test

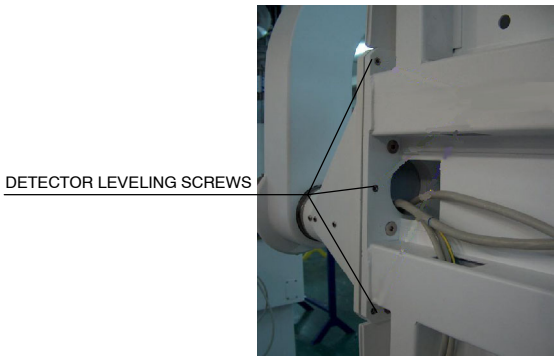
5.2 ALIGNMENT OF X-RAY BEAM

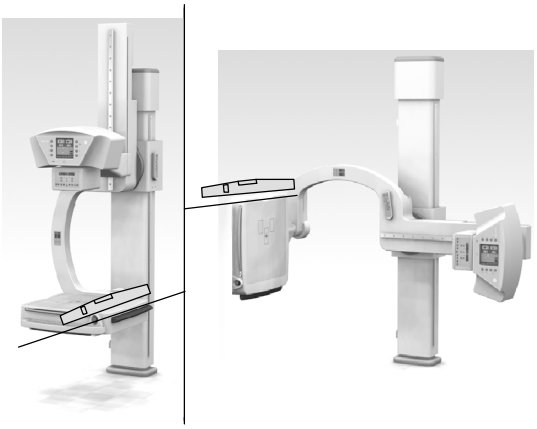
1. Check with a level the vertical/horizontal position of the Column. If necessary, modify the position of the Column with the screws attached to the Column Upper Support, a correct installation starts with a good leveling of the column.



2. Check the level of the Tube-Collimator Assembly. The mechanical installation provides a levelled Assembly, anyway check parallelism. If necessary reinstall the Tube-Collimator Assembly. (*Refer to installation section).*

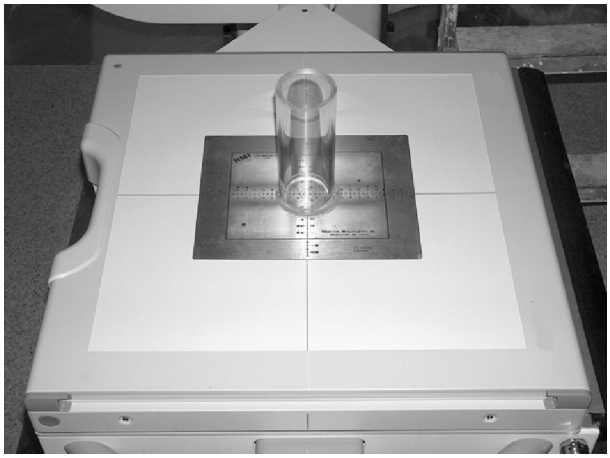
3. Check the Detector, first in horizontal position (Thorax), then in vertical position (Undertable). If necessary, move up or down the Detector assembly with the Detector Assembly leveling screws.





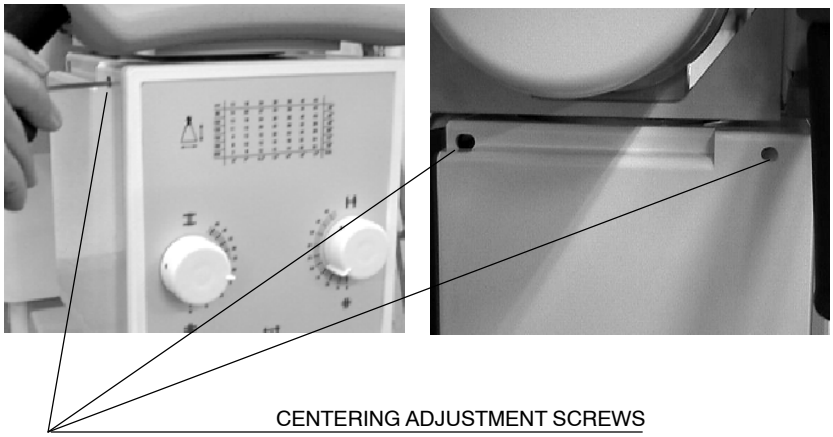
4. Place the Swivel Arm in vertical position and Place SID at 1 meter.

Illustration 5-2
Vertical Position of Swivel Arm with Alignment Tools



5. Turn on the Collimator light and center the Collimator in relation to the Detector Table-Top. Horizontal and transversal position of the light axes projected by the Collimator Lamp must be in line with the axes or Field Sizes marked on the Detector Table-Top.
   If needed, modify Collimator position by carefully unscrewing and screwing the Centering Adjustment Screws of the Collimator.

Illustration 5-3
Collimator Screws



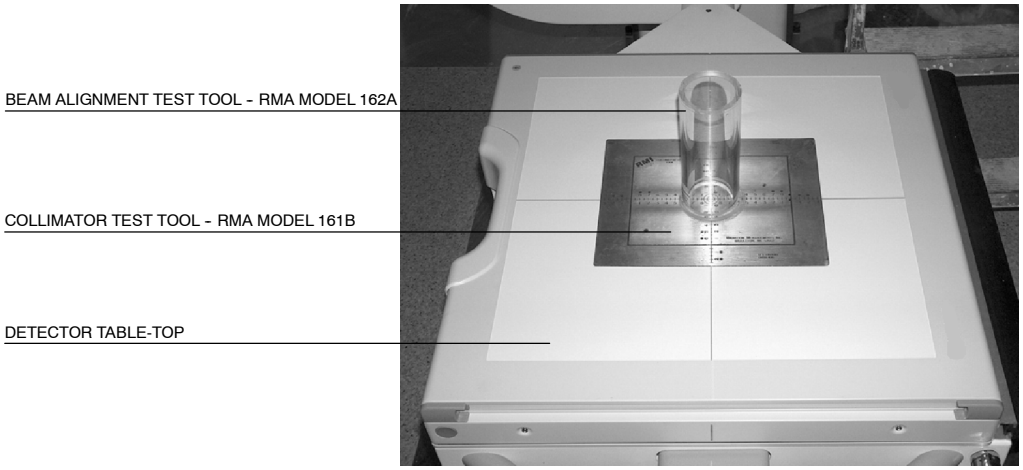
6. Position the Collimator Test Tool (RMI model 161B) on the Detector Table-Top.

7. Turn on Collimator light and by means of the Collimator Control Knobs, center the Collimator Test Tool with the light axes projected by the Collimator Lamp.

8. Adjust the Light Field of the Collimator Lamp to the rectangle drawn inside the Collimator Test Tool.

9. Place centered the Beam Alignment Test Tool (RMI model 162A) on the Collimator Test Tool.

Illustration 5-4
Alignment Test Tools



10. Make an exposure at 60 kVp / 5 mAs.

11. Acquire the Digital Image in the Control Station and:

    a. Check that the X-ray Field falls just within the image of the inner rectangle of the Collimator Test Tool.

       If an edge of the X-ray Field falls out of the inner rectangle means a misalignment of the Light Field respect to the X-ray Field. The maximum misalignment allowed is 2 % of SID (for SID 1m = 2 cm tolerance).

       Refer to Section 5.2.1 for alignment of Light Field with X-ray Field.

b. Check that the X-ray Beam is perpendicular to the plane of the Image Detector. If the Image Detector is parallel to the Detector Table-Top, the perpendicularity of the X-ray Beam can be checked using the Beam Alignment Test Tool with the Collimator Test Tool.

Based on next illustration, the criteria for SID at 1 meter is:

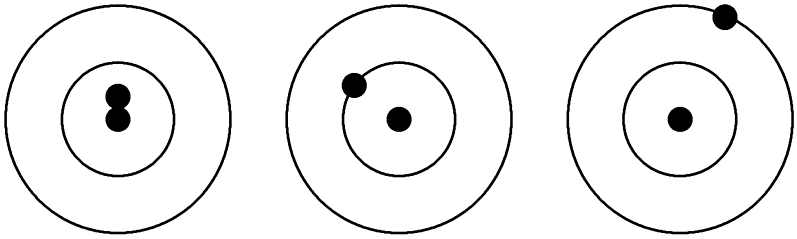
- If the image of the two balls overlap (A) the X-ray Beam is perpendicular to within 0.5°.

- If the image of the top ball (larger shadow) intercepts the first circle (B), the X-ray Beam is about 1.5° away from the perpendicular.

- If the image of the top ball (larger shadow) intercepts the second circle (C), the X-ray Beam is about 3° away from the perpendicular.

In cases (A) and (B) perpendicularity is within tolerance for SID at 1 meter (top ball is within or intercepting the first circle). The third case (C) needs readjustment.

Refer to Section 5.2.2 for perpendicularity adjustment.



c. Check that the X-ray Beam is properly centered with the Image Detector. The maximum misalignment allowed is 2 % of SID (for SID 1m = 2 cm tolerance).

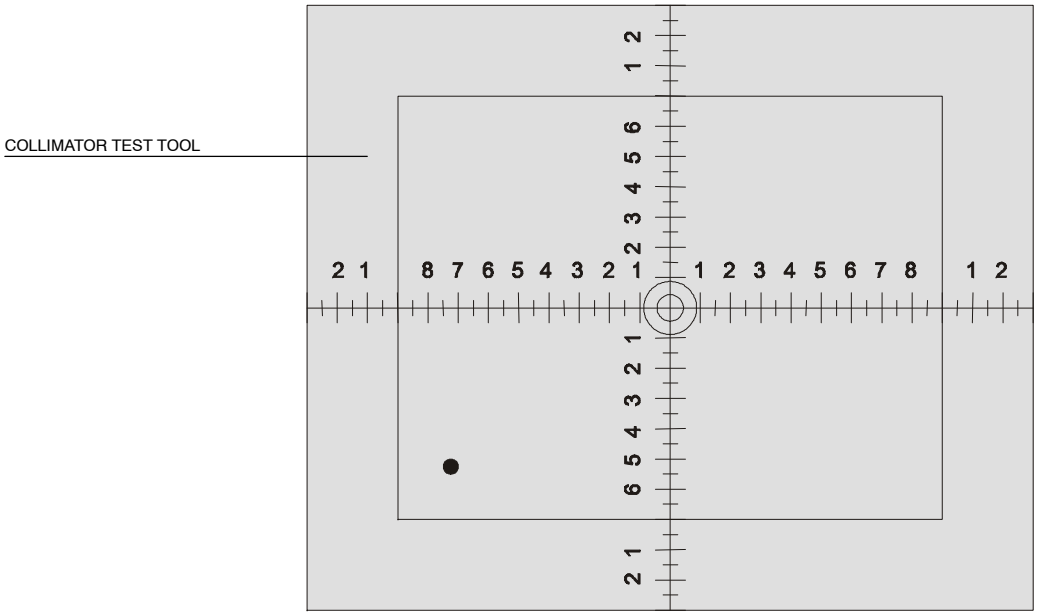
Refer to Section 5.2.3 for centering of X-ray Field and Image Detector.

5.2.1 ALIGNMENT OF LIGHT FIELD WITH X-RAY FIELD

1. Place the Swivel Arm in vertical position. The Tube-Collimator Assembly has to be perfectly aligned with the Detector Assembly. Check with a level correct horizontal position of both assemblies.

2. Place SID at 1 meter.

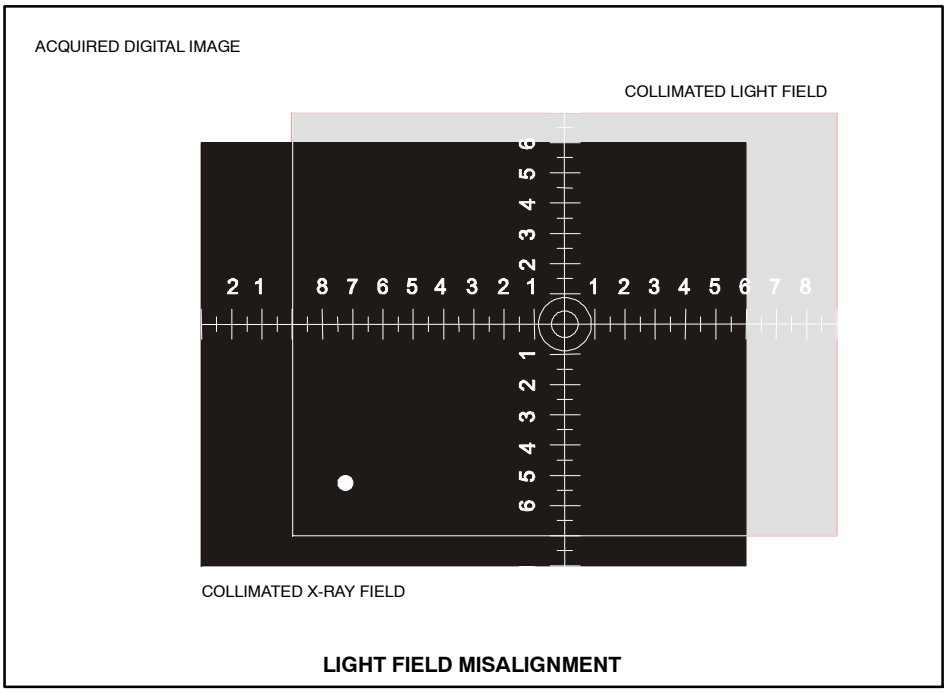
3. Position the Collimator Test Tool (RMI model 161B) on the Detector Table-Top.



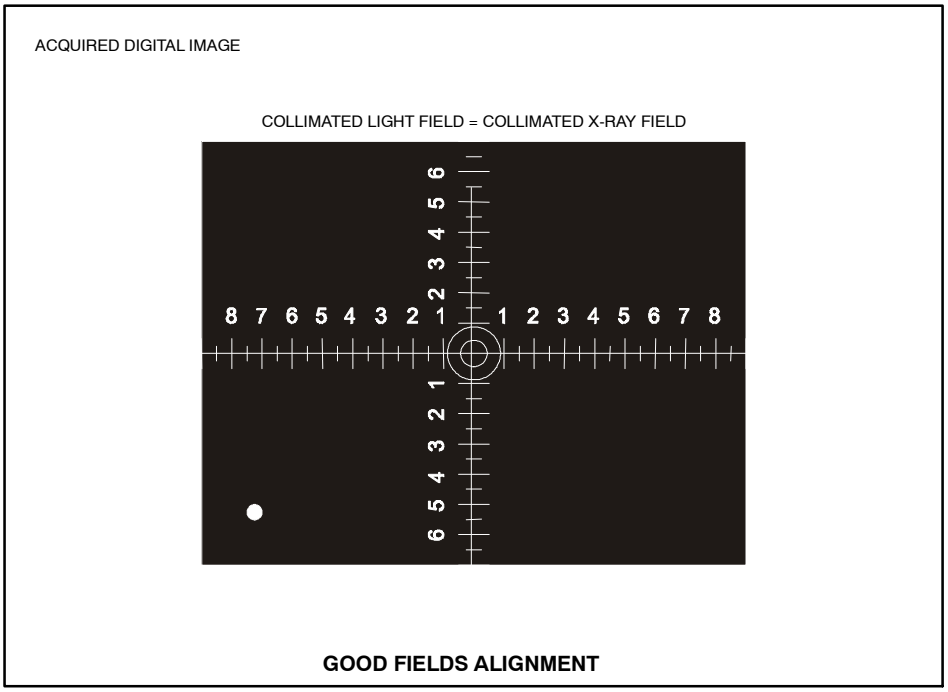
4. Turn on Collimator light and center the Collimator Test Tool with the light axes projected by the Collimator Lamp.

5. Adjust the Light Field of the Collimator Lamp to the rectangle drawn inside the Collimator Test Tool.

6. Make an exposure at 60 kVp / 5 mAs and check on the acquired Digital Image the adjustment required to completely overlap the Light Field with the X-ray Field. Identify the deviation on the axes imaged on the image. The maximum misalignment allowed is 2 % of SID (for SID 1m = 2 cm of tolerance).



LIGHT FIELD MISALIGNMENT



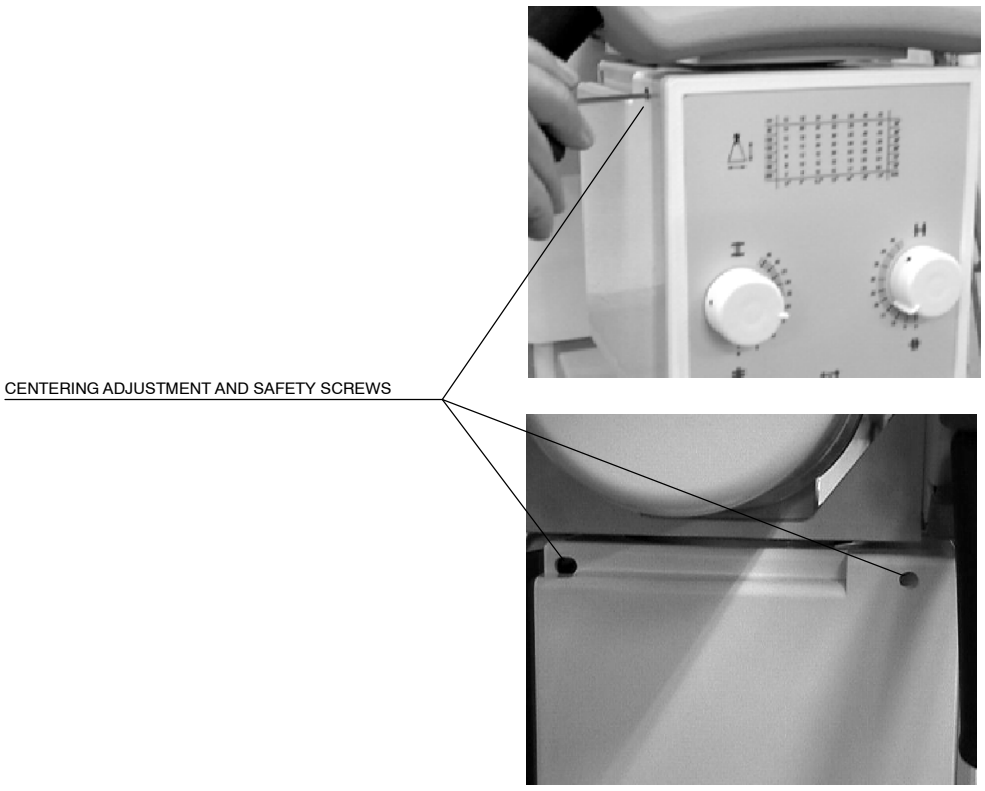
GOOD FIELDS ALIGNMENT

7. Do not remove the Collimator Test Tool from its original position and adjust the Light Field by moving the Collimator Unit and/or the Collimator Lamp.

   a. Collimator Lamp must be ON during Light Field adjustment.

   b. Modify Collimator position by carefully unscrewing and screwing the Centering Adjustment Screws until the Light Field coincides with the axes reference imaged (numbers and dots) on the acquired image.

Illustration 5-5
Collimator Screws



   c. If adjustment is still necessary, modify position of Collimator Lamp (*refer to Collimator Manual*).

8. Repeat exposure at 60 kVp / 5 mAs and procedure until the result is satisfactory. The maximum misalignment allowed is 2 % of SID (for SID 1m = 2 cm of tolerance).

5.2.2 PERPENDICULARITY ADJUSTMENT OF X-RAY BEAM WITH IMAGE DETECTOR

In case that perpendicularity is out of tolerance (top ball is out of first circle), adjust perpendicularity as follows:

1. Place the Swivel Arm in vertical position. The Tube-Collimator Assembly has to be perfectly aligned with the Detector Assembly. Check with a level correct horizontal position of both assemblies.

   The Detector Assembly is factory adjusted (slightly up) and it is not recommended **to perform any additional correction**. During procedure, it must be horizontally placed at 0^{o} (check position with a level and with its indicator plate).

2. Place SID at 1 meter.

3. Position the Collimator Test Tool (RMI model 161B) on the Detector Table-Top.

4. Turn on Collimator light and center the Collimator Test Tool with the light axes projected by the Collimator Lamp.

5. Place centered the Beam Alignment Test Tool (RMI model 162A) on the Collimator Test Tool and observe if a shadow of the Beam Alignment Test Tool is projected in equal proportion around it.

6. Check on the acquired Digital Image the adjustment required to center the top ball mark. Shadow around the Beam Alignment Test Tool can also help to make a first correction.

7. Loosen slightly the four Safety Screws (Allen–6) of the Tube-Collimator Assembly. If required, perform the following adjustments:

   - For horizontal correction, move horizontally the Tube-Collimator Assembly before tightening the four Fixing Screws.

   - For vertical correction, loosen or tighten carefully the four Leveling Screws (Allen–3) of the Tube-Collimator Assembly before tightening the four Safety Screws.

   - Angle correction is factory adjusted and it is recommended not to perform any additional correction. If needed, loosen slightly the two Tube Fixing Screws of the Pivoting Locking Ratchet and adjust very carefully the two Setscrews of the Ratchet to position left/right the Lock Tooth. After adjustment, tighten the two Safety Screws again.

8. Repeat exposure and procedure until the result is satisfactory (top ball must be inside of the first circle).

Illustration 5-6
Adjustments in the Tube-Collimator Assembly

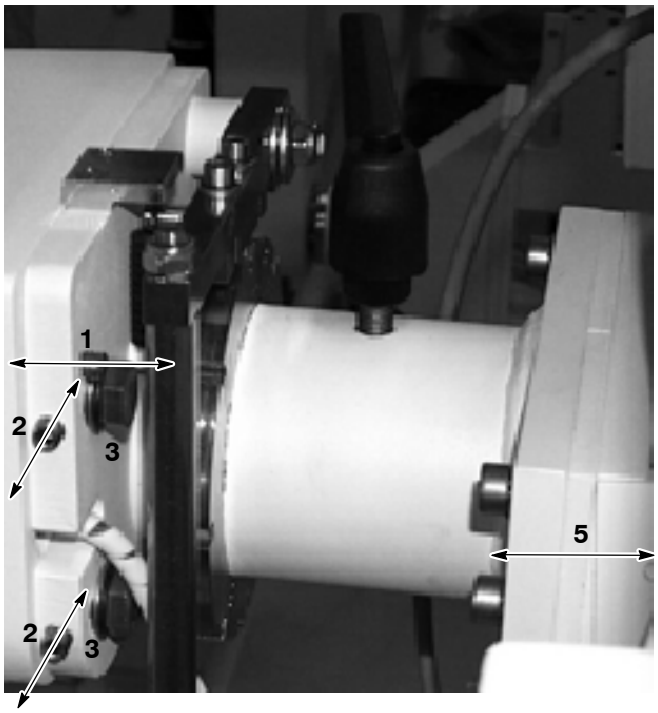
1.- Leveling Screws (4): The Tube-Collimator Assembly moves slightly up or down from one side.

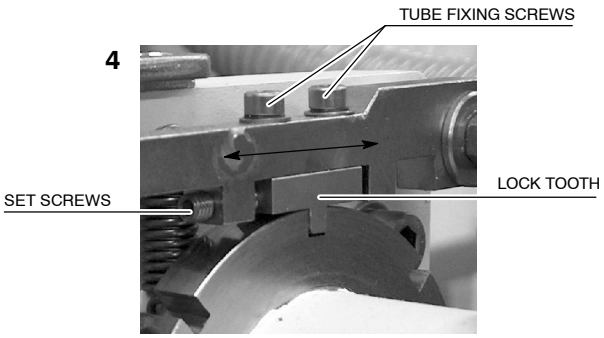
2.- Lateral Adjustment Screws (4) The Tube-Collimator Assembly moves slightly right or left from one side.

3.- Fixing Screws (4): Fix the assembly with these screws after leveling and lateral adjustment is done.

4.- Tube Angle Leveling Set Screw and Tube Fixing Screws: They are factory adjusted and can also be adjusted to obtain the required level of the Tube. In horizontal position, loose the Tube Fixing Screws and adjust to the left or right with the Set Screws, then tighten again the Tube fixing screws.

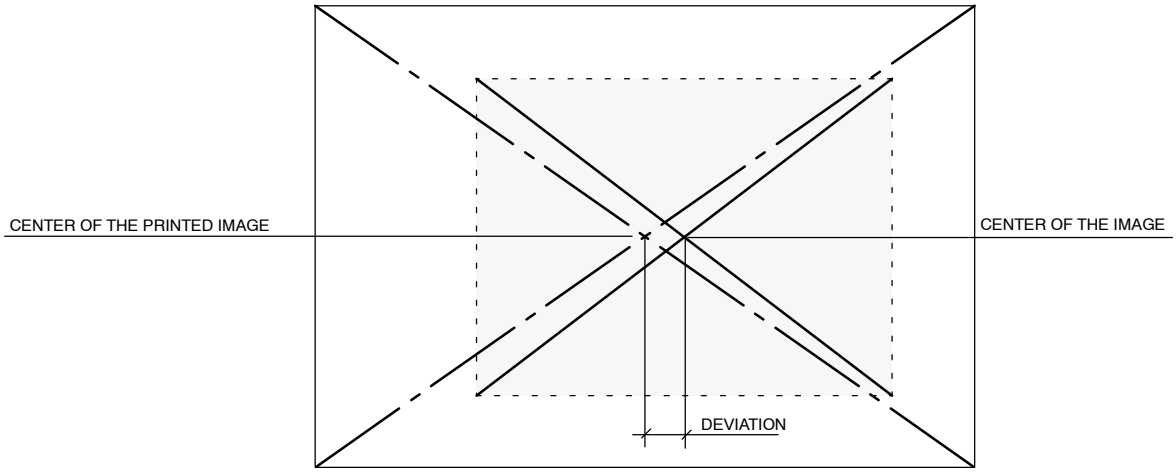
5.-Shims (factory installed / adjusted, and extra units (1mm thick and 2 mm thick included in package). These plates can be added or removed in order to extend/reduce the length of the Tube-Collimator Assembly, for that unscrew the 6 fixing screws and add or remove the shims).





5.2.3 CENTERING OF X-RAY FIELD AND IMAGE DETECTOR ASSEMBLY

The error between centers of the X-ray Field and the Image Detector should not be greater than 2% of the SID (for SID 1m = 2 cm tolerance).



If the deviation is greater than 2% of SID, perform the following procedure:

1. Print the acquired Digital Image. Check on the acquired Image the correction required for centering the X-ray Field with the Image Detector. Adjustments on the Tube-Collimator Assembly will be performed as the same way described for Perpendicularity correction, so only re-adjust it if really is necessary.

Centering adjustments may affect to perpendicularity corrections.

2. Repeat exposure and check centering until the result is satisfactory (centers position are within tolerance).

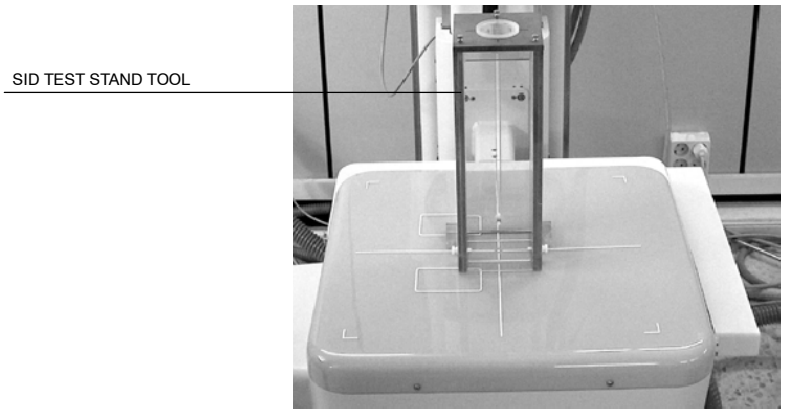
3. Now place the Arm in Thorax position, acquire an image and repeat the procedure from step 1. Due to the weight of the Detector, the weight of the Tube and also due to the Arm torsion, sometimes the Centering of the X-Ray field with the Detector Assembly in Undertable and Thorax position will have to be left at a middle position between the center in Undertable position and the center in Thorax position. If this is the case, the Collimator Laser lamp position can be slightly modified with its regulating Screw.

5.3 SID INDICATOR TEST

Note ☞ *Before starting with the SID Indicator Test, the Alignment of X-Ray Beam Test and the Alignment of Light Field with X-Ray Field Test should be performed.*

1. Place the Swivel Arm in vertical position. The Tube-Collimator Assembly has to be perfectly aligned with the Detector Assembly. Check with a level correct horizontal position of both assemblies (*refer to Illustration 5-7).*

Illustration 5-7
SID Test Stand Tool

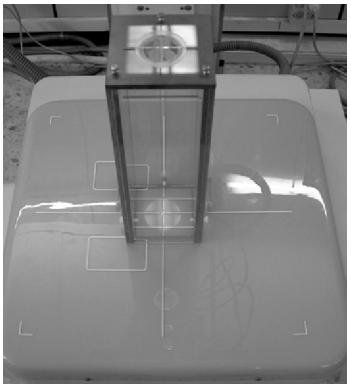


2. Position SID at 1 meter (use the SID scale of the Column).
3. Place the SID Test Stand Tool on the Detector Table-Top. (*Refer to Illustration 5-7).*
4. Turn on the Collimator Light and by means of Collimator Control Knobs, center the SID Test Stand Tool with the light axes projected by the Collimator Lamp.

5. Adjust the Light Field to cover the window (circle) on the top SID Stand Test Tool. *(Refer to Illustration 5-8).*

6. Place the Small Tool included in the SID Stand Test Tool with two straight narrow wires crossed on the center of circle at top SID Stand Test Tool. Place a small signal on the circle in order to mark the position.

Illustration 5-8
Light Field over SID Test Stand Tool



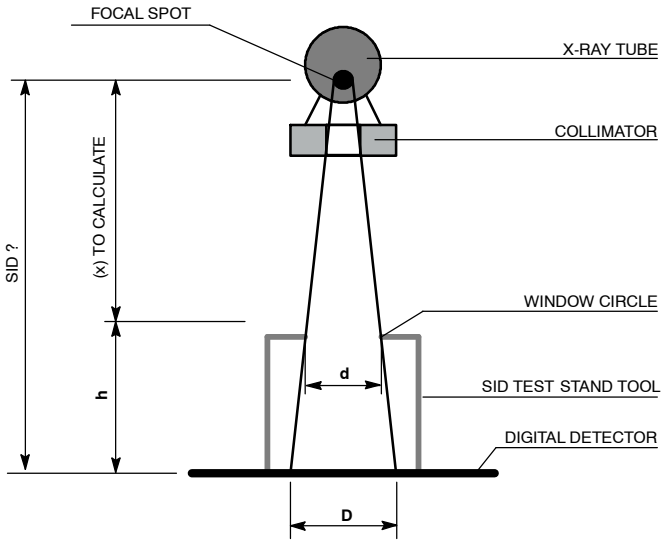
7. Make an exposure at 60 kVp, 1 mAs.

8. Acquire the Digital Image on the Control Station and check the following measurements known *(Refer to Illustration 5-9):*

   a. Measure the height **h**, it is the height of the SID Test Stand Tool plus the distance from the Digital Detector to the Detector Table-Top.

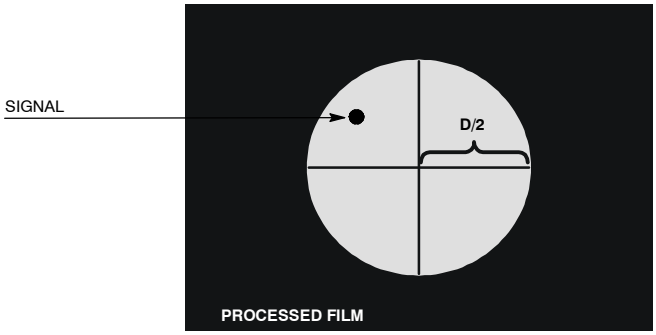
   b. Measure the radius of window (**d**/2) on the SID Test Stand Tool.

Illustration 5-9
SID Calculation

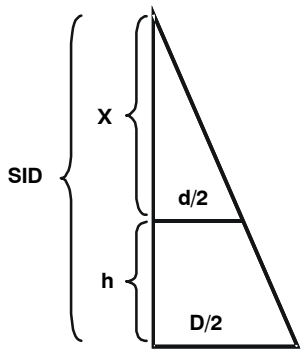


c. Measure the radius of the circle (**D**/**2**) obtained on the acquired Image *(refer to Illustration 5-10).*

Illustration 5-10
Radius in Acquired Image



9. With the measurements obtained on the step-8., calculate the "*X*" value, where:



$$X = \frac{(d/2) \times h}{(D/2) - (d/2)}$$

10. The SID value to calculate will be: $SID = X + h$.

11. The difference between the indicated SID and the calculated SID may not exceed 1.8 % (rejection limit) of indicated SID. Therefore the deviation of SID calculated should be not higher than 18 mm for SID at 1 meter.

12. If the SID value calculated is out acceptance limits, it will be necessary to perform the configuration and calibration of the Unit for the Minimum and maximum SID.

5.4 FIELD SIZE INDICATOR TEST

Note ☞ *Before starting with the Field Size Indicator Test, the Alignment of X-Ray Beam Test, the Alignment of Light Field with X-Ray Field Test and the SID Indicator Test should be performed.*

1. Place the Swivel Arm in vertical position. The Tube-Collimator Assembly has to be perfectly aligned with the Detector Assembly. Check with a level correct horizontal position of both assemblies.

2. Position SID at 1 meter (use the SID scale on the Column).

3. Set the Collimator in manual mode, for that turn 90^{o} the key at the back of the Collimator, and open the Collimator blades to set a Field Size of 24 x 30 cm for SID 1 m.

4. Turn on the Collimator Light and center the Collimator in relation to the Detector Table-Top. Horizontal and transversal position of the light axes projected by the Collimator Lamp must be in line with the axes or Field Size marked on the Detector Table-Top.

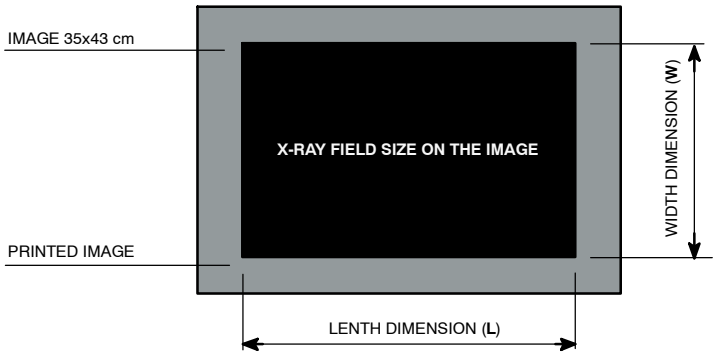
5. Make an exposure at 60 kVp, 1 mAs.

6. Acquire the image on the Control station and check the following measurements known (*refer to Illustration 5-11*):

   a. Measure the length of the X-ray Field on the Printed Image (identified as **L**)

   b. Measure the width of the X-ray Field on the Printed Image (Identified as **W)**

Illustration 5-11
X-ray Field Size



7. With the measurements obtained and according to the field size indication selected, the results should be:

   - Length dimension (**L**) = 300 mm
   - Width dimension (**W**) = 240 mm

8. The difference between the indicated Field Size and the obtained Field Size may not exceed 1.5 % (rejection limit) of the SID in either direction. Therefore the deviation in any direction should not be higher than 15 mm (rejection limit) for SID at 1 meter.

9. If the deviation of Field Size Indication is out acceptance limits, it is necessary to readjust the index of Collimator Blades Control Knobs. For that, loosen each Collimator Control Knob and position it according to deviation. Repeat the complete tests until the X-Ray Field Size selected (24 x 30 cm) is obtained.

5.5 COLLIMATOR LAMP BRIGHTNESS TEST

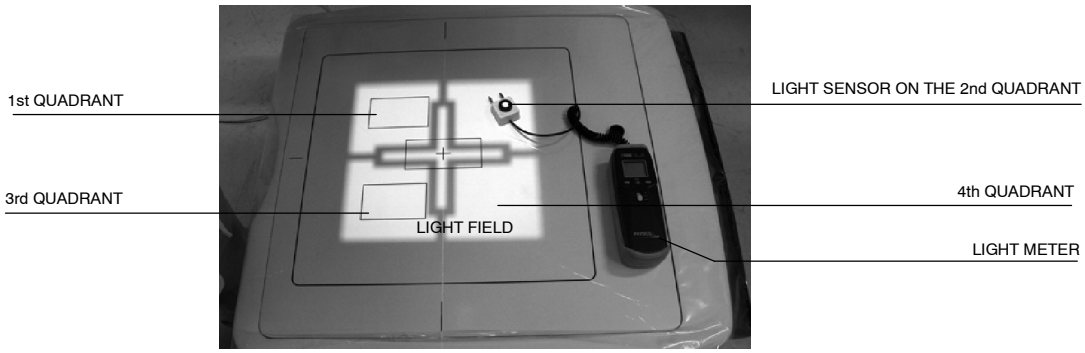
Note ☞ *Perform this procedure only if a lack of Collimator Light intensity or lack of Light contrast is noticed in the room*

Note ☞ *Before starting with the Collimator Lamp Brightness Test, the SID Indicator Test should be performed.*

5.5.1 COLLIMATOR LIGHT FIELD INTENSITY

1. Place the Swivel Arm in vertical position. The Tube-Collimator Assembly has to be perfectly aligned with the Detector Assembly. Check with a level correct horizontal position of both assemblies.
2. Position SID at 1 meter (use the SID scale of the Column).
3. Set the Collimator in manual mode, for that turn 90^{o} the key at the back of the Collimator, and open the Collimator shutter by means of Collimator Control Knobs and set a Field Size of 25 x 25 cm for SID 1m.
4. Turn on the Collimator Light and center the Collimator in relation to the Detector Table-Top. Horizontal and transversal position of the light axes projected by the Collimator Lamp must be in line with the axes or Field Size marked on the Detector Table-Top.
5. Place the Light Meter on the Detector Table-Top with sensor directed toward the Light Source.
6. Place the Light Meter in the center of one quadrant of the light field (*refer to Illustration 5-12*).

Illustration 5-12
Light Meter on Detector Table-Top



7. With Collimator Lamp OFF, measure and keep record of the ambient light level.

8. Do not move the Light Meter. With the Collimator Lamp ON, measure and keep record of light level of that quadrant.

9. Determine the light intensity of that quadrant by subtracting the ambient light level from the corresponding light level.

10. Repeat measurements at the approximate center of remaining three quadrants of light field.

11. With the measurements obtained on the step-10., the results of Light Field Intensity in all quadrants should be higher of 170 lux (16 foot-candles) and among all the quadrants the intensity light field shall be not differ more than 10%.

12. The average illumination at a distance of 1 meter from the focal spot shall not be less than 160 lux (15 foot-candles). Rejection limit is 170 lux (16 foot-candles).

13. If the deviation of Light Field Intensity is out acceptance limits, it is necessary to take into account the following:

    a. If the difference of Light Field Intensity among all quadrants is higher than 10%, we need to readjust the Collimator Lamp socket. Refer to Collimator Manual.

    b. If the light level in all quadrants is less than 170 lux, it is necessary to check the following:

        - The lamp voltage level when it is ON shall not be lower of 24 VAC. (Measure on the Bulb socket contact).
        - Check that the Collimator Lamp, the Mirror and the Mylar window are not dirty or discolored.
        - Check the correct position of the Mirror (*Refer to Collimator Manual*).

    c. If the light level is still low:

        - Replace the Collimator Bulb.
        - Replace the Collimator Bulb socket.

5.5.2 COLLIMATOR LIGHT FIELD CONTRAST RATIO

1. Place the Swivel Arm in vertical position. The Tube-Collimator Assembly has to be perfectly aligned with the Detector Assembly. Check with a level correct horizontal position of both assemblies.

2. Position SID at 1 meter (use the SID scale of the Column).

3. Open the Collimator blades to set a Field Size of 25 x 25 cm for SID 1m.

4. Turn ON the Collimator Light and center the Collimator in relation to the Detector Table-Top. Horizontal and transversal position of the light axes projected by the Collimator Lamp must be in line with the axes or Field Size marked on the Detector Table-Top.

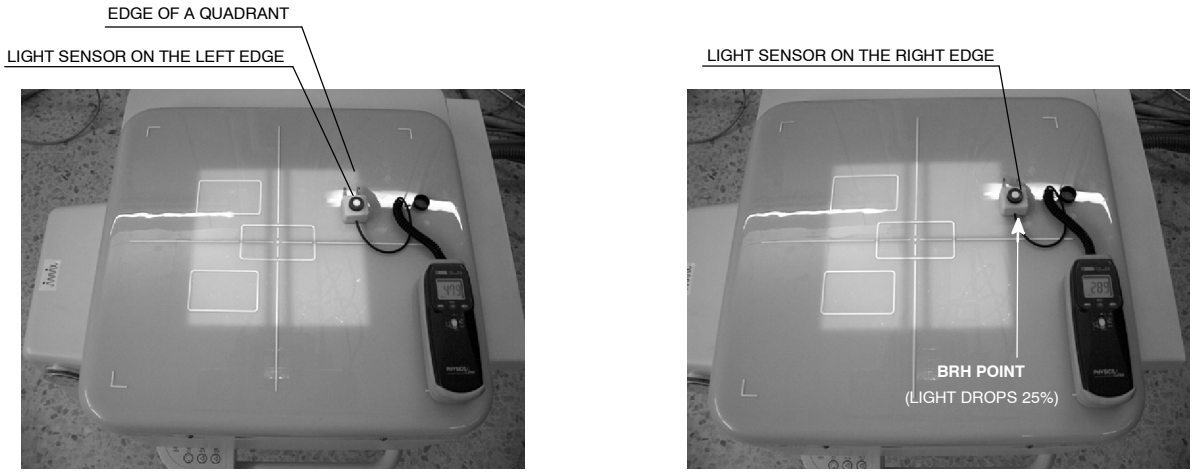
5. Place the Light Meter on the Detector Table-Top with sensor directed toward Light Source.

6. Place the Light Meter in the center of one quadrant of the light field. (*Refer to Illustration 5-13)*.

7. Minimize the room lighting. With the Collimator Lamp OFF, measure and record the ambient light level.

8. Turn ON the Collimator Light. Measure the maximum illumination; this should occur near the field center. Slide the light sensor along the Table-Top, and locate the point where the illumination drops to a 75% of the maximum. This point is defined by BRH as lying on the edge of the Light Field (*refer to Illustration 5-13*). All subsequent measurements will be referenced to this point and to this definition of “edge”.

Illustration 5-13
Light Contrast Calculation



9. Measure the illumination at a point 3 mm from the edge of the field toward the center of the field (Light sensor on the left of edge). *(Refer to Illustration 5-13*). Record this as $\mathbf{I_1}$.

10. Measure the illumination at a point 3 mm from the edge of the field away from the center of the field (Light sensor on the right of edge). (*Refer to Illustration 5-13*). Record this as $\mathbf{I_2}$.

11. Correct the values of $\mathbf{I_1}$ and $\mathbf{I_2}$ by subtracting from each value the ambient light level measured in step-7. Now divide the corrected value of $\mathbf{I_1}$ by $\mathbf{I_2}$. This ratio should be 4 or more.

12. Repeat the process from step-8. for all quadrants of Light Field.

13. If the deviation of Light Field Contrast Ratio is out acceptance limits, it is necessary check the following:

    - Check that the Collimator Lamp, the Mirror and the Mylar window are not dirty or discolored.
    - The Light Field Intensity level shall be higher of 170 lux.
    - Ensure that the ambient light level is as low as possible. Turn off as many lights as possible and close blinds and doors. Ambient light levels adversely affect the accuracy of these measurements.

SECTION 6 TROUBLESHOOTING

6.1 GENERAL PROCEDURES

Note ☞ *For parts replacement and adjustments refer to Section 7 Disassembly / Reassembly.*

6.1.1 FREE MOVE (PACKING MODE) - CHANGE OF ROOM OR FACILITIES

In case this Unit is to be moved or transported, it is necessary to position the Column in Transport position, that is, with the Safety Locking Rod inserted. Some Receptors, due to its height, do not allow to position the carriage in straight position to insert the Safety Locking Rod, if that is the case, proceed as follows.

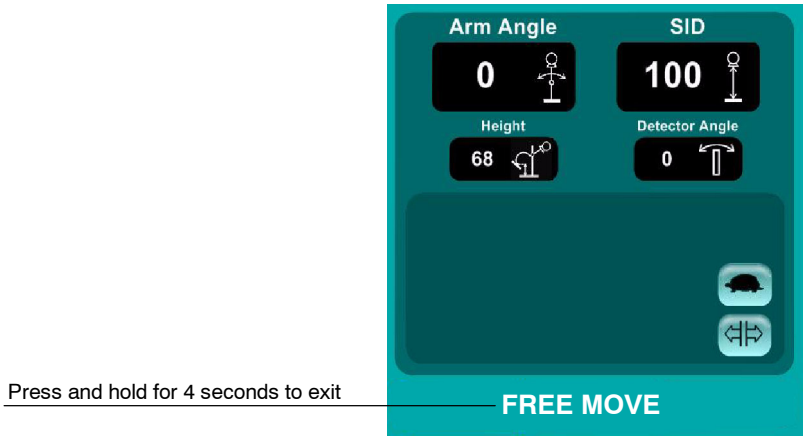
1. Enter Service Mode. Press and hold *"Positioning"* Button for 3 seconds and enter password *"2434"*.

2. Press *"Free Move"* button. This mode disables all limitations on range of motion.

CAUTION

Once in Free Move, the Positioner movement is completely unrestricted. Verify that the Positioner will not collide with personnel, ceiling, floor or other equipment. The Positioner's movements may be continuously (approx. every 2.5 s) interrupted. This is a normal behavior when some safeties are activated.

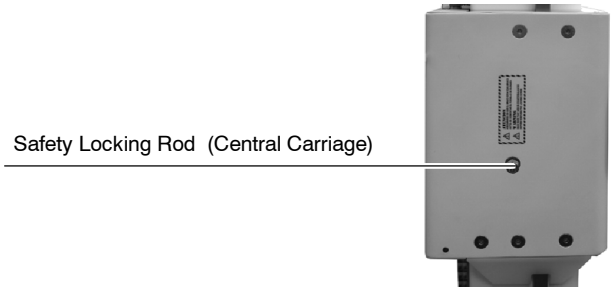
Illustration 6-1
Free Move Screen



3. If required, position the Unit at desired height for a comfortable dismantling of the Receptor and Tube collimator assembly.

4. Position the Swivel Arm in horizontal position and at the correct height in order to install the Safety Locking Rod.

5. Install the Safety Locking Rod.



6. Once inside the “Free Move” mode, the only way to exit is turning off the System. Press for 4 seconds on the *“Free Move Mode*” words to go to “Shut Down” screen and Shut down the system.

6.1.2 INITIALIZE THE EEPROM

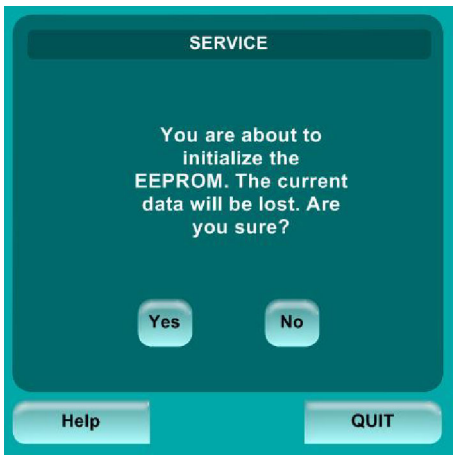
In the event the Calibration data of the Unit becomes corrupted, the EEPROM can be reset. All Previous data is erased and replaced with default values. After reset, a complete Configuration / Calibration process is required.

1. Enter Service Mode. Press and hold *“Positioning”* Button for 3 seconds and enter password *“2434”*.

2. Press “Init EEPROM” button.

3. Select ”Yes” to initialize the EEPROM and reset all calibration and configuration data to default settings.

Illustration 6-2
Initialize EEPROM Screen



6.1.3 ERROR MESSAGES

Table 6-1
Error Messages

Error No	DESCRIPTION	WHAT TO DO
1	*Initialize EEPROM in Service Mode*	Enter in Service Mode and Initialize the EEPROM.
2	*EEPROM could not be initialized*	Replace the Control Board PCB.
3	*Fatal Error - Height, SID, Arm Rotation, Detector Rotation Movement without Order* *Detected by Interf Board*	If this message appears on screen and the Unit did not really move itself, check the corresponding Relay signal. If the Unit moved, call the manufacturer.
4	*Fatal RAM: Call Service*	Replace the Control Board PCB.
5	*Movement Order active during Start-up*	Press*"Reset"* button, if error persists, check the different button pads, a push-button is being pressed. If error persists, check the unit overlays.
6	*Security: Call Service*	Refer to Section 6.1.6. in this manual.
7	*Initial Gauge Check : Restart*	Check Fuse F1 at the Interface Board (Control Box), if ok, check that the Jumper in the Anticrushing PCB is installed (refer to Section 6.1.9). If error remains after placing the Jumper and turning the unit OFF/ON, if error remains, replace the Anticrushing PCB.
8	*Communication Lost*	Press *"Reset"* button, if error persists, refer to section 6.1.7.
9	*Inconsistent Relay Input*	Press*"Reset"* button, if error persists, it is probably caused by a defective connection, check the following connectors and signals (the feedback signals from the motors): J12 and J6 at the Interface Board and J4 at the Control Board. *Refer to Schematics 54302082.*
10	*Error - Height / SID / Arm Rotation / Detector Rotation Order without movement*	Press*"Reset"* button, if error persists, check for the red Emergency Stop Switch located at the Receptor, if pressed, pull it and push it (wait until the Inverters are completely OFF). If the error remains or if the Emergency Stop Switch located at the Receptor was not pressed, turn the System OFF / ON. If the error remains, manually modify the cam position (upper or lower) at column, If error remains, perform the corresponding movement. If error remains, check the Microswitches SW3-SW4 functioning and connections.
11	*Fatal Error Potentiometer Height / SID / Arm Rotation / Detector Rotation*	Check the corresponding Potentiometer and replace if necessary. Refer to Disassembly/Reassembly Section.
12	*Calibration*	Calibrate again the affected parameter. Refer to Calibration Section.
13	*External*	Turn the Unit OFF/ON, if error remains, call manufacturer.
14	*Fatal Error - Potentiometer out of Range Height / SID / Arm Rotation / Detector Rotation*	Turn the Unit OFF/ON, if error remains, calibrate the movement affected by the corresponding potentiometer, if error persists, replace the corresponding Potentiometer.
15	*Movements locked*	Release the Safety Lock Button. If error remains check Safety Lock Button at different Overlays.

Table 6-1 (cont.)
Error Messages

Error No	DESCRIPTION	WHAT TO DO
16	*Move Button Released*	Operator stopped pressing the Auto positioning button. Press and hold until auto positioning has finished.
17	*Incompatible Movements*	A movement button has been pressed while auto positioning was in progress. Release the movement button.
18	*Opposite Move*	An opposite movement button has been pressed while other movement was in progress. Release the opposite movement button.
19	*Calibration Warning*	Perform the calibration required. *Refer to Calibration Section in this Manual.*
20	*Program not Selected*	Move button has been pressed without having selected a auto-position.
21	*Movement not enabled*	The operator is trying to move a disabled option, enter in Configuration/Calibration -> “Positioner Options” and enable the required option.
22	*Movement stop*	Information message. The Unit has reached a Standard stop. Physical Limit: Detector Right. Recalibrate.
23	*Inverters Powering up*	Wait until the Unit has finished the starting sequence.
FUSE	*Potentiometer Detector Rotation and Emergency Stop Inverters OFF Cnt Board*	Check F2 at the Interface Board (Control Box), if ok, check signal power Supply +24VUNR as per schematics A8186-XX.
FUSE	*Communication Lost with Control Board*	Check F3 at the Interface Board (Control Box), if ok, check signal power Supply +5V as per schematics A8186-XX .
FUSE	*Initial Gauge Check: Restart*	Check F1 at the Interface Board (Control Box), if ok, check signal power Supply +24V as per schematics A8186-XX.

6.1.4 INFORMATION MESSAGES

The Positioner messages are self explanatory and provide additional information to the user.

Table 6-2
Positioner Information Messages

MESSAGE ON SCREEN	WHAT TO DO
SID movement without order	Refer to Section Table 6-1
SID order without movement	
Arm Rotation movement without order	
Arm Rotation order without movement	
Height movement without order	
Height order without movement	
Detector movement without order	
Arm rotation potentiometer error	
Broken Cable: Call Service	
Gauge Active	
Communication lost with Control Board	
Collimator not communicating	
Control Board not communicating	
Interface Board not communicating	
Interface Board not communicating	
RCC not communicating	
CAN BUS COMMUNICATION LOST	
Detected by: Control Board	Informative Message
Detected by: Interface Board	
FREE MOVE MODE	
Limit: Arm Rotation Left	
Limit: Arm Rotation Right	
Limit: Detector Rotation Left	
Limit: Detector Rotation Right	
Limit: Detector Left	
Limit: Detector Right	
Limit: Column Rotation Left	
Limit: Column Rotation Right	
Limit: Tube Rotation Left	
Limit: Tube Rotation Right	

Table 6-2 (Cont.)
Information Messages

MESSAGE ON SCREEN	WHAT TO DO
Collimator Rot	Informative Message
Tube Rot	
Proximity Sensor activated	
Photocell 1 activated	
Photocell 2 activated	
Limit: SID minimum	
Limit: SID maximum	
Limit: Height minimum	
Limit: Height maximum	
Inverters Powering Up	
Emergency Move: Press and Hold MOVE button + any Movement button	
Position Adjusted by User	
Position Reached	
Press and Hold MOVE button	
MOVE button released. Press and Hold MOVE button to continue	
Undertable position reached	
Chest button released: Press and Hold CHEST button to continue	
Undertable button released: Press and Hold UNDERTABLE button to continue	
Limit: Detector Left	
Grid Range	
Cannot Open Collimator Port	
Door Open	
Tray Out	
Grid partially inserted	
Dosimeter not Communicating	
Free technique	
Detector angle out of -3/+3º range	
Tube not perpendicular	
Collimator rotated	
Collimator Manual Mode Variable SID	
Collimator Auto Mode	
Follow the instructions to generate and send a new code	
Stitching: target positions not reachable. Press Height Up	

Table 6-2 (Cont.)
Information Messages

MESSAGE ON SCREEN	WHAT TO DO
Stitching: target positions not reachable. Press Height Down	Informative Message
Stitching Setup Height and SID modified	
Stitching Setup SID modified	
Moving to Stitching Setup position	
Press Move button to Stitching position	
Stitching Setup position reached	
Stitching Setup Height modified	
Stitching Aborted: Incorrect button pressed	
Stitching Setup error: invalid parameters	
Stitching Setup error: number of images exceeded	
Stitching Setup error: initial height limit	
Stitching Finished	
Stitching Canceled	
Ready to acquire extra image	
Ready to acquire image	
Collimator Manual Mode Fixed SID	
Filter feature not available	
Detector out of Radax docking stations	
Program Aborted: Incorrect button pressed	
Bumper activated	Press the Safety Lock Button
Program Aborted: Invalid Parameters	Press the Safety Lock Button and try again
Program Aborted: Incorrect button pressed	Press “Move” button
Stitching	
Press Move button for Stitching Initial setup	
Press Move button to extra image position	
Detector Orientation	Stitching is not possible with Detector in landscape position. Turn the Detector to Portrait position.
Tray Out	Insert the Detector Tray.
Tube Rotated and Detector inside	X-Rays inhibited until the Tube is pointing the Detector. Turn the Tube towards the Detector.
Emergency Stop	Message associated to a Fatal Error. Turn the Unit OFF/ON, if error remains, call field service.

6.1.5 CALIBRATION MESSAGES

Table 6-3
Calibration Messages

DESCRIPTION	**WHAT TO DO**
Non-superuser has tried to enter into calibration mode.	Non authorized person has entered in Calibration mode, enter using a correct password.
Selected Room Height does not permit a complete movement.	Check Room Height or Safety Distance in Configuration or Max Height in Calibration and modify any inconsistency with other measurements.
Thorax Height out of range	Check Thorax Height in Configuration and modify any inconsistency. If the error remains, confirm all Height Configuration and Calibration measurements.
Undertable Height out of range	Check Undertable Height in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements.
Invalid Table Height measurement	Check Table Height in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements.
Detector Height out of range, blocking complete Rotation	Check Detector Height in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements, including Security Distance.
Detector Width from center to left is out of range	Check Detector Width in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements, including Security Distance.
Detector Width from center to right is out of range	Check Detector Width in Configuration and modify any inconsistency. If the error persists, confirm all Height Configuration and Calibration measurements, including Security Distance.
Third SID stop value invalid (this value can be configured)	In Calibration, check for a correct SID value compared with maximum and minimum SID.
Floor Safety Distance out of range, blocking movements	Check Safety Distance in Configuration and modify any inconsistency. If the error persists, confirm all Height measurements.
Physical Limit: Detector Left.	Recalibrate
Physical Limit: Detector Right.	Recalibrate
Physical Limit: Arm Rotation Left.	Recalibrate
Physical Limit: Arm Rotation Right.	Recalibrate
Physical Limit: SID minimum.	Recalibrate
Physical Limit: SID maximum.	Recalibrate
Physical Limit: Height minimum.	Recalibrate
Physical Limit: Height maximum.	Recalibrate
Physical Limit: Column Rotation Left.	Recalibrate
Physical Limit: Column Rotation Right.	Recalibrate

Continues on next page

Table 6-3 (Continued)
Calibration Messages

DESCRIPTION	**WHAT TO DO**
Incoherent Potentiometer values for Height Calibration	The Pot readout is out of range, calibrate again, if message remains, check Height Pot.
Minimum Height out of range or incoherent	Re-calibrate again Minimum Height
Medium Height out of range or incoherent	Re-calibrate again Medium Height
Maximum Height out of range or incoherent	Re-calibrate again Maximum Height
Incoherent Potentiometer values for Rotation Angle	The Inclinometer readout is out of range, calibrate again, if message remains, check Inclinometer.
Minimum Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Vertical Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Horizontal Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Maximum Rotation Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent Potentiometer values for SID	The Pot readout is not arranged in logical order, calibrate again, if message remains, check SID Pot.
Minimum SID out of range or incoherent	Re-calibrate again specific SID
Maximum SID out of range or incoherent	Re-calibrate again specific SID
Incoherent Potentiometer values for the Detector Angle	The Pot readout is not arranged in logical order, calibrate again, if message remains, check Detector Pot.
Minimum Detector Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent 0 Detector Angle	Re-calibrate again specific Angle
Maximum Detector Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent Potentiometer values for the Tube Angle	The Pot readout is not arranged in logical order, check Tube Pot.
Maximum Tube Angle out of range or incoherent	Re-calibrate again specific Angle
Incoherent 0 Tube Angle	Re-calibrate again specific Angle
Minimum Tube Angle out of range or incoherent	Re-calibrate again specific Angle
Revise Room Height	The value entered for Room height is inhibiting some movements, review data and modify if applicable.
Revise Detector Thickness and Safety Distance	The value entered for Detector Height and Safety Distance is inhibiting some movements, review data and modify if applicable.
Revise Maximum Height	The value entered for Max height is inhibiting some movements, review data and modify if applicable.

6.1.6 ERROR 06: SAFETY ERROR

Description: Steel Cable that moves the Carriage Assembly of the system is either broken or loose or the Safety Device (”Parachute”) has been activated. This device prevents the carriage from falling to the ground in case the steel cable breaks or is loose.

Actions:

PERFORM THE FOLLOWING CHECKS BEFORE TOUCHING THE SYSTEM, AND DO NOT TRY TO MAKE ANY SYSTEM MOVEMENT UNLESS INSTRUCTED TO DO SO.

Remove the upper back cover of the Column and check that the Steel Cable holding the Carriage Assembly on the back of the column is not **broken, or loose or winded in opposite direction**.

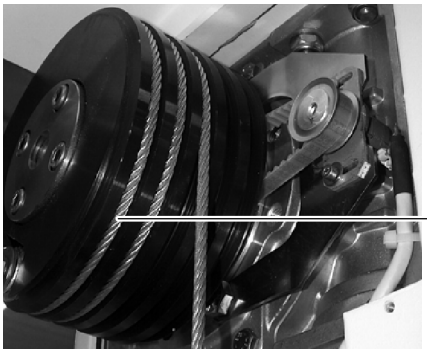
If the steel cable is broken. Perform the Steel Cable replacement procedure as explained in this Manual.

If the steel cable is loose. Turn off/on the Unit.

If Error 6 does not reappear after power on.

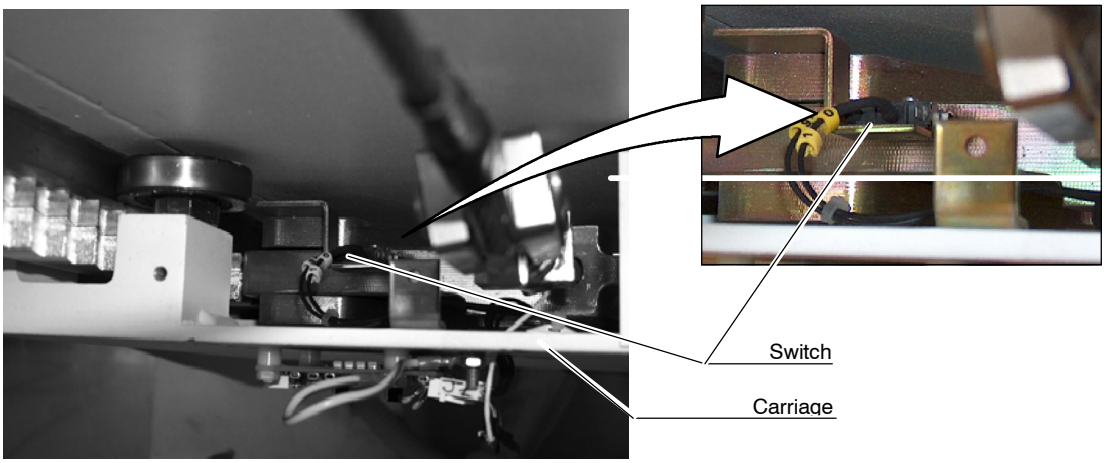
Secure the carriage with a slinge or rope to the Wall Support or Ceiling Support in order to prevent a strong collision in the extremely rare case of falling of the Arm *(refer to first illustration in JOB CARD 1.1).*

Verify that the carriage assembly is in its proper position, that no bearing is out of place or broken as the carriage may have shifted it from its proper position, if so, tighten or fix the bearing *(refer to Section 6.3 "Bearing Gap Check Procedure").* Verify also the proper rolling of the cable arround the pulley.



Then, at the same time, press the "Safety Lock button" and the "up movement" button to **rewind the cable** in the motors pulley.

Turn the Unit OFF, wait two minutes, remove the slinge or rope in the meantime, and then turn it ON again, the system should be fully operational. If Error 06 still appears on screen, check the electrical signal of the Carriage Switch SW7 that should be normally closed.

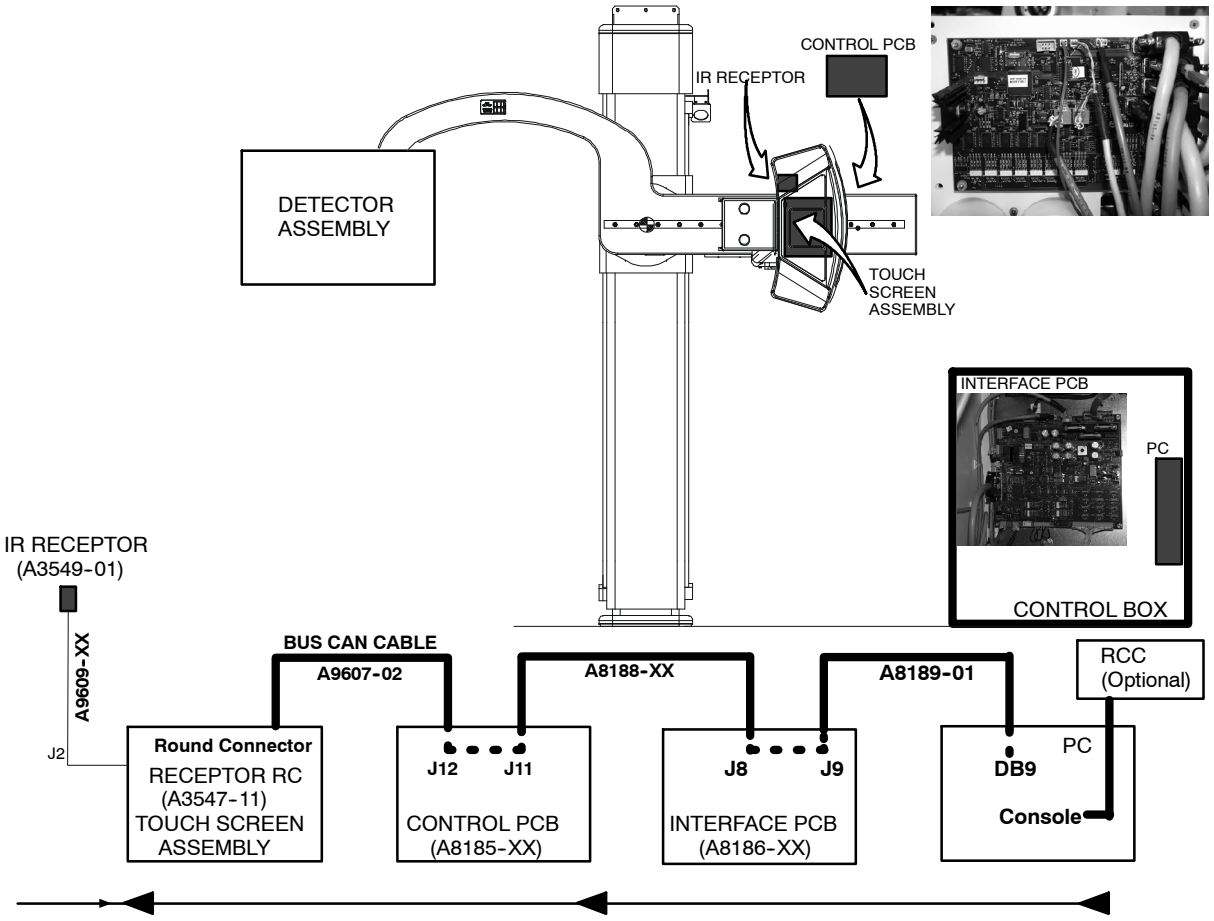


6.1.7 ERROR 8: COMMUNICATION LOST

Note ☞ *In case that the Software of the PCB's has been recently Updated or any PCB has been replaced, check first that the Jumpers at each PCB have been re-inserted. Refer to Software Update Section.*

Note ☞ *This error mainly appears on screen when the Bus CAN connection between the different modules of the Unit fails. It is important to check the LEDs at each PCB. They inform of the situation (communicating = Blinking) of the connectivity in the BUS CAN network.*

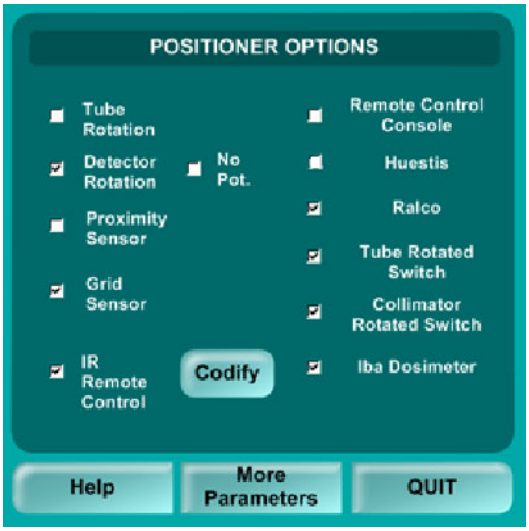
Illustration 6-3
Bus Can network



If the screen message is:

"REMOTE CONTROL NOT COMMUNICATING",

1. Enter *"Configuration – Calibration> Positioner Options"* (Refer to Configuration – Calibration Section and disable the *"Remote Control"* option.



2. Check if the Unit works well, if it works well, check the connectivity of the BUS CAN Cable from J12 in the Control PCB to the 5 Pin Male Round Connector in the connector panel of the Touch Screen. Replace the cable if defective.

3. If the cable is OK, replace Remote Control Receptor PCB (A3547–11).

Note ☞ *(Once finished, do not forget to enable the Remote Control option).*

If the screen message is:
"INTERFACE BOARD NOT COMMUNICATING",

1. Press "Reset Button" on the Touch Screen.

2. If the error persists, replace the Interface Board PCB. *Refer to JOB CARD 1.14.*

If the screen message is:
"RCC NOT COMMUNICATING", (RCC stands for Remote Control Console – Optional. In case the unit does not have RCC, enter in Service Mode, disable the option RCC and reset the System).

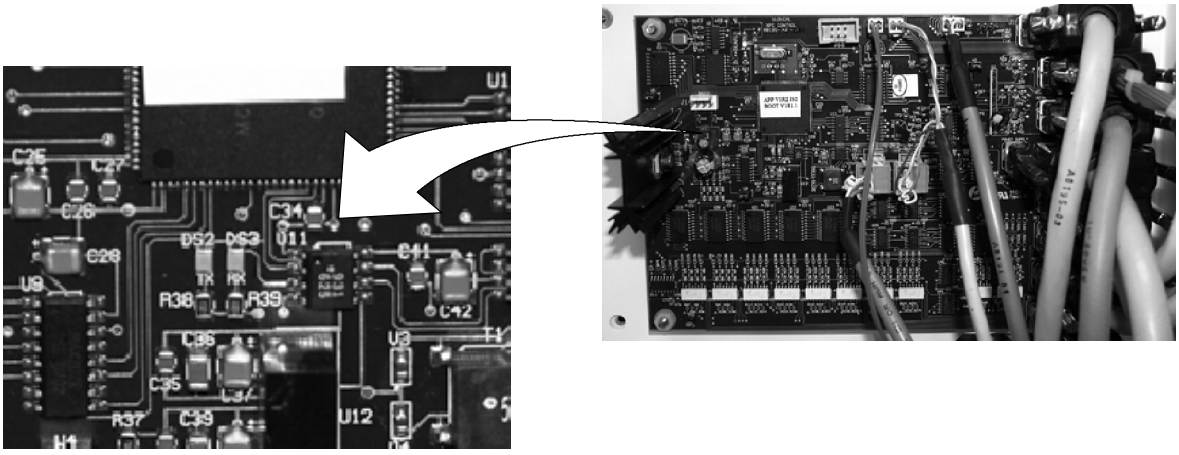
1. Check the Ribbon Cable connected to DB9 at the base of the PC. It may be misconnected (red line to the right) or broken. Replace if necessary.
2. If Ribbon cable is ok, check the RCC cable from the Control Box connector "Console" to the RCC.
3. If the cable and connector are ok, Replace the RCC.

If the screen message is
"COMMUNICATION LOST WITH CONTROL BOARD",

Note ☞ *Wait 3 minutes to see if "CAN ERR" message appears in the Arm Display.*

1. Press "Reset Button" on the Touch Screen.
2. If error persists, check the Ribbon Cable connected to DB9 at the base of the PC. It may be misconnected (red line to the right) or broken. Replace if necessary.
3. If error persists, **check the Arm Display message**:
4. If *"INI SYS"* appears in the Arm Display, check the LEDs at the Control PCB.

Illustration 6-4
LEDs at the Control PCB



a. If not blinking, check the Bus Can cable and connections from the PC to the J11 of the Control PCB. Replace cable or Control PCB if necessary.

b. If the LEDs in the Control PCB are blinking, reset the system.

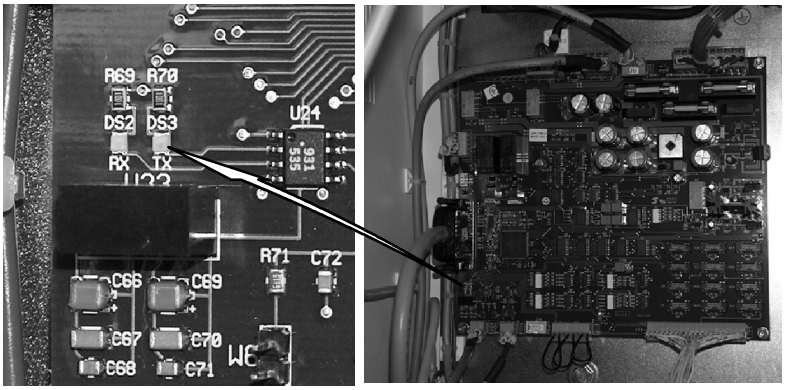
c. If error persists, replace Control PCB.

5. If *"COM ERR" appears in the Arm Display,* check the Bus Can cable and connections from the J9 connector at the Interface PCB to the Control Box PC in the Control Box. *(Refer to Illustration 6-3)*

   a. If the cable and connectors are ok, replace the Control Box PC.

6. If *"CAN ERR" appears in the Arm Display,* check the LEDs (DS2 and DS3) in the Interface PCB. If they do not blink, remove connector J9 in the Interface PCB.

Illustration 6-5
LEDs in the Interface PCB



7. If LEDs blink, reconnect J9 and disconnect the Console Connector at Control Box connector‘s Panel.

   a. If LEDs Blink, replace the RCC.

   b. If LEDs do not blink, check and replace the Control Box PC.

8. If LEDs do not blink after removing connector J9 in the Interface PCB, disconnect J12 in the Control PCB.

   a. If LEDs blink, check the Remote Control.
   (Refer to ***"RCC NOT COMMUNICATING"***).

   b. If LEDs do not blink –check BUS CAN cable A8188-XX.

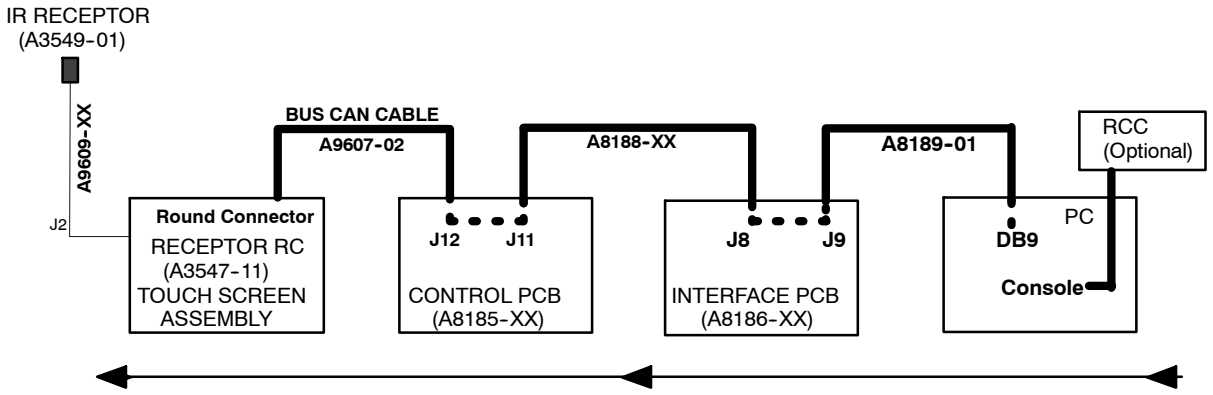
   c. If cable A8188-XX is OK, replace Control PCB.

If the screen message is
"CAN COMMUNICATION LOST" and the Arm Display is "INI SYS" or "CAN ERR"

As a general rule, first press the reset button on the Touch Screen. It is important to check the blinking LEDs at each PCB (Interface and Control Board). If they blink, probably the problem comes from any PCB, the Control Box PC or the Compact Flash. If they do not blink the problem use to be the Bus Can Cable.

1. Check Can Bus communication system from right to left.

Illustration 6-6
Bus Can checking direction



If the screen message is
"CAN COMMUNICATION LOST" and the Arm Display is "COM ERR"

1. Check PC at Control Box and the RCC if installed, replace if defective.

2. If ok, check from the Interface PCB to the right. *Refer to Illustration above.*

If the screen message is
"CAN COMMUNICATION LOST" and the Arm Display is "INI SYS"

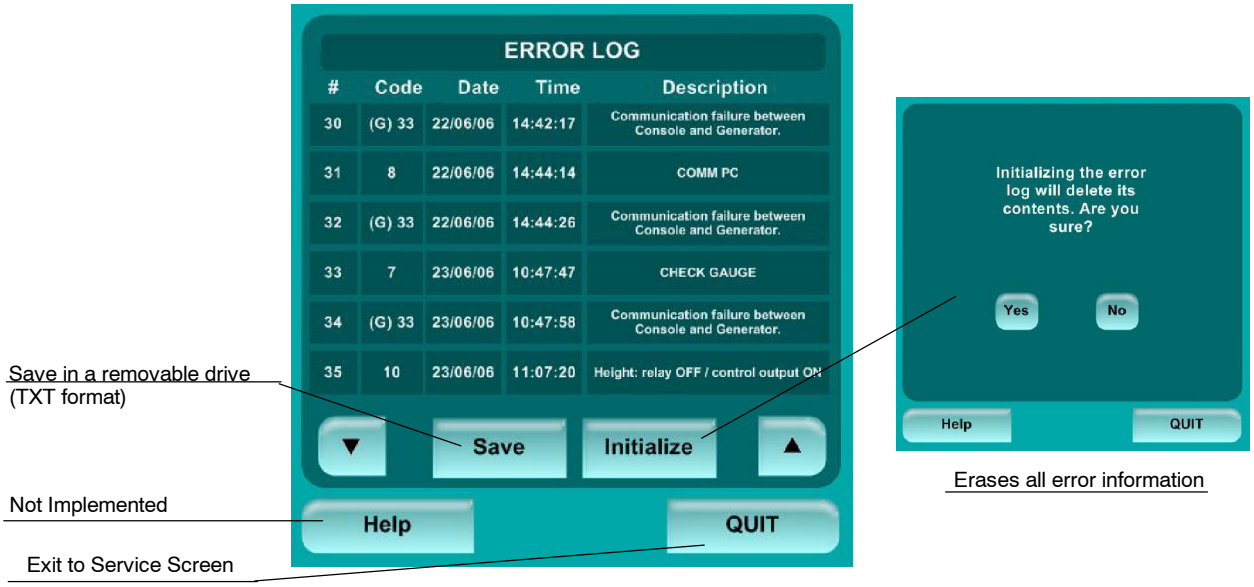
1. If LEDs blink, remove the RCC and check Control Box PC. Replace if necessary.

2. If LEDs do not blink, check Can Bus communication system from right to left. *Refer to Illustration above.*

6.1.8 ERROR LOG SCREEN

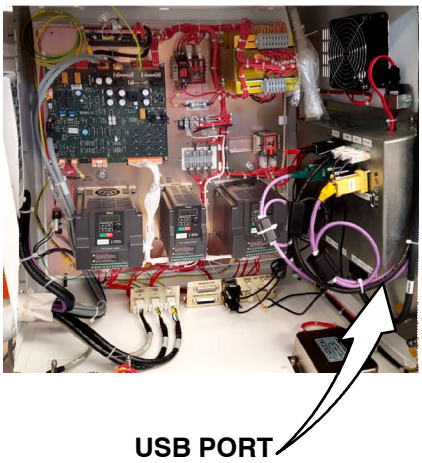
This screen informs of the Error data. They can be saved in TXT format to a removable drive for reference. The error code with a (G) corresponds to Generator Error.

Enter in Service Mode. For that, press and hold *"Positioning"* Button for 3 seconds and insert password *"2434"* and press "Error Log" button.



Note ☞

In case the date and time of the Error Log Screen is not correct, turn the system OFF, connect a standard keyboard (not included) to the keyboard cable attached to the bottom of the PC inside the Control Box (cable included), turn the system ON, press the "Windows Key" and the task bar pops up in the Positioner Touch Screen > enter in "Control Panel">"Settings">"Date and Time" and set the correct date and time. Remove the Keyboard.



6.1.9 UNIT MOVEMENTS BLOCKED

Note ☞ *In case of bump or collision of any type, please position the Arm in Horizontal position and medium height, then turn OFF the Unit, wait two minutes and turn ON to allow the system performing a self test that will apply correct values.*

In case that the Unit movements are suddenly stopped, there are two ways to disable the protection Gauge:

+
Any movement Button

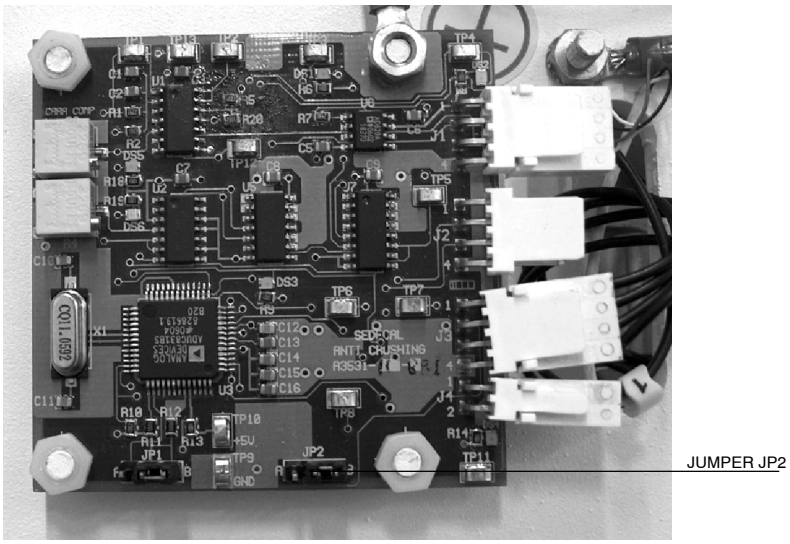
MOVE PLUS ANY MOVEMENT BUTTON: In case the Unit remains continuously blocked (button lights up), it can be moved by pressing and holding the *"Move"* button and then pressing the movement button required.

The second involves the **JUMPER JP2 IN THE ANTICRUSHING BOARD** located at the back of the Column. All gauges are controlled through the Anticrushing Board. Proceed as follows to disable the Gauges action and to be able to move the Swivel Arm:

1. Remove the four screws of the Board cover located at the back of the column.
2. Pick up the JP2 Jumper factory connected in position **B.**
3. Insert the Black Jumper in position **A**. Now the Gauges are disabled.
4. Press any movement key to relocate the Arm in a unlocked position.
5. Turn the unit OFF / ON.
6. Do not forget to re-install the jumper after relocating the arm position or "Error 07" will appear on display after powering On the Unit.

Note ☞ *Refer to Disassembly / Reassembly Section for ADJUSTMENT OF SENSITIVITY IN THE ANTICRUSHING BOARD.*

Illustration 6-7
Gauge Disabling Jumper



6.1.10 INVERTERS FACTORY CONFIGURATION

The Control Box includes three Motor Inverters factory configured. All units are factory tested and configured according to customer electrical requirements (50/60 Hz).

The Table 6-4 includes the factory configuration data. Due to the weight of the Receptor, sometimes a fine adjustment can be performed to improve the accuracy of the stop position.

The following steps show how to modify a parameter in an Inverter, the process of configuration is the same for the three of them. *(Refer to the Inverter Manual for extended information).*

1. Turn On the Unit with the On/Off Switch-button of the Control Box Door. Wait 30 seconds until the Inverters are ready. “50.0” appears on display.

2. **Press MODE,** the last configured parameter appears on the Display.
3. **Press ENT** (long press), the value a the right starts to blink.
4. **Press UP/DOWN** arrows to go to the desired parameter or **Press ENT** (short press) to jump to the following position to the left.
5. Once the parameter appears on the Display, **Press ENT** (long press) to check the value related to the parameter, a.e. for the parameter 02-01 the value configured in the Height Inverter is “1.00”.
6. If required, modify the value with the UP/DOWN arrows.
7. **Press ENT** (long press) to save the modified value. the words *“END”*appear for one second in the display.
8. **Press MODE** to go back to running mode.

Table 6-4
Inverters Factory Configuration Table

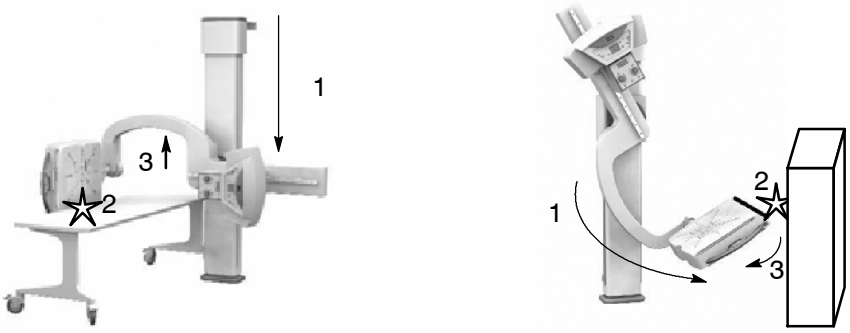
Parameter	Description	HEIG.	SID	ROT	Comments
00-02	Main Run Source Selection	1	1	1	Ext Run/Stop Control
00-03	Alternative Run Source	1	1	1	Ext Run/Stop Control
00-04	Ext. term. operation mode	0	0	0	Fw/Stop-Rev/Stop
00-12	Freq. Upper limit	50	50	50	
00-13	Freq. Lower Limit	15	0	0	
01-00	V/Hz Pattern	2	2	2	50Hz high start,torque
01-10	Torque Boost	1.4	10	10	10% enhancement
02-01	Motor Rated Current (OL1)	1.00	0.5	1.00	
02-01	Motor Rated Current	4.5	1.0	1.6	Amperes
02-03	Motor Rated Speed (Rpm)	1720	1650	1370	
03-00	Multifunct Input Term.S1	1	1	1	Reverse/Stop Command
03-01	Multifunct Input Term.S2	0	0	0	Forward/Stop Command
03-02	Multifunct Input Term.S3	4	4	4	Preset Speed 1 (05-02)
03-03	Multifunct Input Term.S4	3	3	3	Preset Speed 2 (05-03)
03-11	Output Relay (RY1)	4	4	4	Relay closed freq > 03-13 Hz
03-13	Output freq. detection level	0	0	0	Relay closed until 0Hz
03-19	Relay Output function type	0	0	0	A (Normally open)
05-00	Preset Speed Control mode Selection	1	1	1	Individual Accel/Decel
05-01	Preset Speed0 (Hz)	50	50	50	Fast Speed
05-03	Preset Speed2 (Hz)	10	15	10	Slow Speed
05-05	Preset Speed4 (Hz)	20	20	30	Positioning Speed
05-07	Preset Speed6 (Hz)	10	10	8	Detents Speed
05-17	Acc. Time Speed0	1	0.3	1	
05-18	Decc. Time Speed0	0.3	0.3	0.3	
05-21	Acc. Time Speed2	1	0.3	1	
05-22	Decc. Time Speed2	0.3	0.3	0.3	
05-25	Acc. Time Speed4	1	0.3	1	
05-26	Decc. Time Speed4	0.3	0.3	0.3	
05-29	Acc. Time Speed6	1	0.3	1	
05-30	Decc. Time Speed6	0.3	0.3	0.3	
07-00	Momentary Power Loss Restart	0	0	0	Disable
07-02	Number of Auto Restart Attempts	0	0	0	No attempts
07-04	Direct Running After Power On	0	0	0	Enable
07-06	DC Injection Brake Start Freq.	1.5	1.5	1.5	Hertzs
07-07	DC Injection Brake Level (%)	10	10	10	
07-08	DC Injection Brake Time	1	0.1	0.1	Seconds
07-09	Stop method	0	0	0	Decc to stop
11-01	Carrier Frequency (KHz)	15	16	15	

6.2 DETECTOR BUMPER AND ANTICRUSHING SYSTEM

Besides the Light beams installed in the Arm that slow down the speed and stops motion in case the light beam is cut, this unit includes two Safety Devices that will react to any inadvertent bump into the Arm Assembly (Anticrushing System) or into the Detector (Detector Bumper).

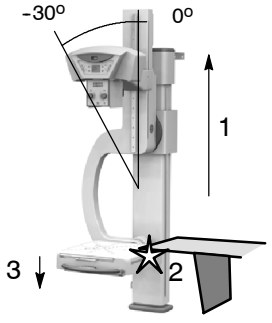
These safety Devices are designed to prevent high risk situations with patients, that is, in the extremely rare case of collision into the Arm or the Detector, it will automatically stop or reverse (in low speed and during 1.5 seconds in rotational movement and during 3 seconds in up or down movement), the following is an explanation of when the unit stops or reverses.

Detector Bumper: When the Arm of the URS-LP is **moving down** or **when it rotates**, it will always reverse the movement if the Detector Bumper is activated to avoid something kept between the detector and the floor.



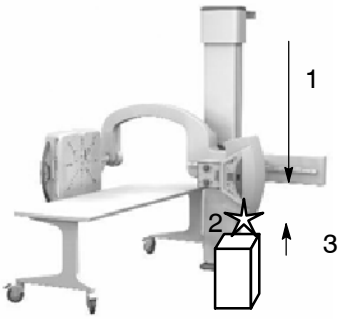
When the Arm of the URS-LP is **moving up** and the Detector Bumper is activated, it will make the reverse movement or stop depending on the following situations:

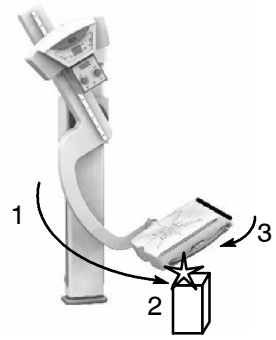
- The system only reverses down automatically when the Detector Bumper is activated and the angle is between 0º and -30º (the angle interval where the detector could be under the table to avoid something kept between the table and the detector).



- In the rest of the angle ranges (from 1º to 120º) and in horizontal position, the system never reverses automatically, it stops.

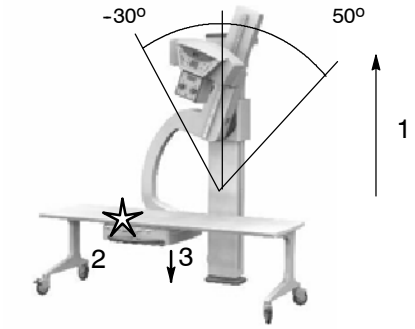
Anticrushing System: When the Arm of the URS-LP is **moving down** or **when it rotates**, it will always reverse the movement if the Anticrushing System is activated to avoid something kept between the detector and the floor.



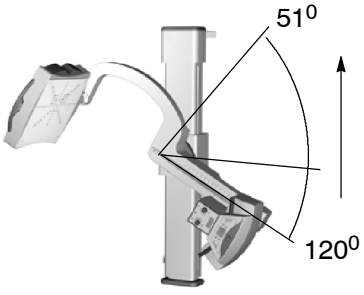


When the Arm of the URS-LP is **moving up** and the Anticrushing System is activated, it will make the reverse movement or stop depending on the following situations:

- The system only reverses down automatically when the Anticrushing System is activated and the angle is between -30º and 50º (the angle interval where the detector could be under the table). In any other case it stops.



- In the rest of the angle ranges (from 51º to 120º) and in horizontal position, the system just stops.

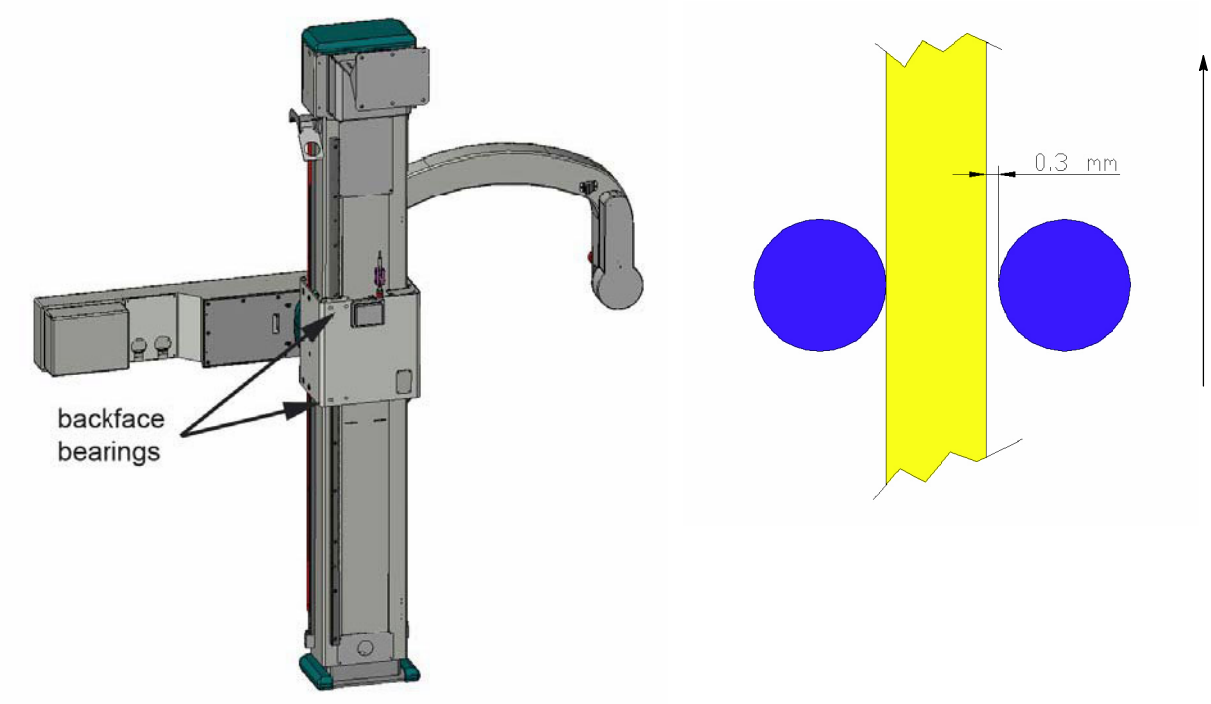


Note ☞ *In case the Unit remains continuously blocked, it can be moved by pressing and holding the Safety Lock button and then pressing the movement button required.*

6.3 BEARINGS GAP CHECK PROCEDURE

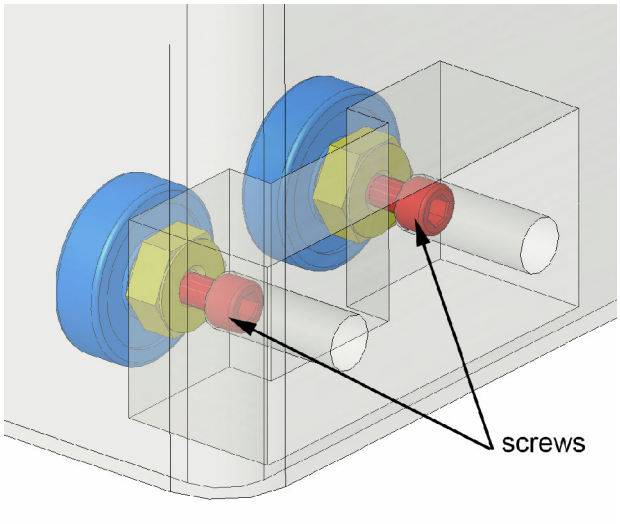
In the back face of the main carriage there are 4 bearings that must be properly tightened against the linear guide.

a. First we must check if the gap between the bearings and the guide is correct; the gap between any of the 4 bearings and the guide must be less than 0.3 mm.



b. This gap must be measured using a caliper shim:

c. The next step is to check if the screws are properly tightened. Each screw must be tightened to 15 Nm (11 lbf-ft) torque. While checking the torque with a torque wrench using an XX mm Allen bit, an open-end wrench is needed to hold the eccentric nut, such that it does not move.



6.4 MESSAGES WHEN INTERFACE BOARD FUSES F1 - F2 - F3 ARE BLOWN

When F1 is blown the following message appears in the Touch screen: “FATAL ERROR- INITIAL GAUGE CHECK. RESTART”. No movement is allowed.

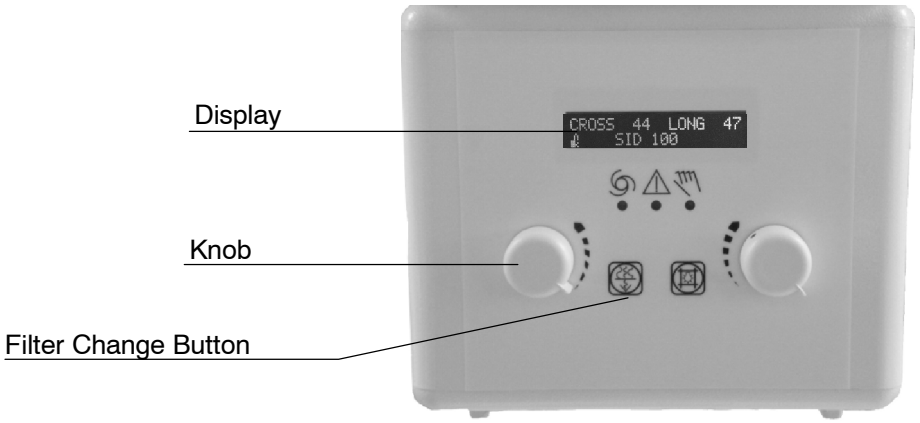
When F2 is blown the following message appears in the Touch screen: “DETECTOR ROTATION, POTENCIOMETER ERROR”. All movements work except for the Detector Angle.

When F3 is blown the following message appears in the Touch screen: COMMUNICATION LOST WITH CONTROL BOARD. No movement is allowed.

6.5 CONFIGURATION OF THE RALCO 225 COLLIMATOR

In case the Collimator is replaced and it has not been previously configured, please check the following.

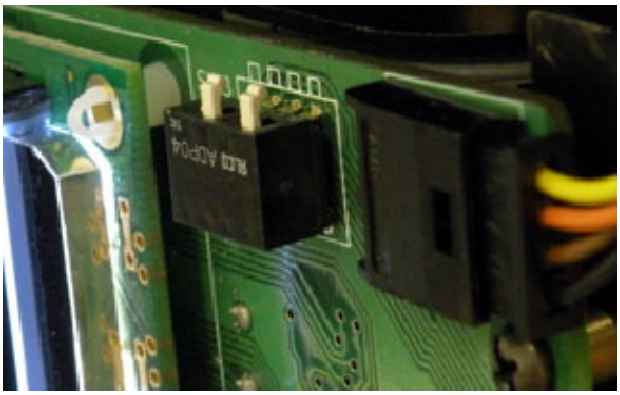
1. Turn the unit on and write down the Serial Number that appears for a few seconds in the Collimator Display, a.e: 00011.
2. Then turn the Unit off.
3. Disassemble both control knobs and remove the Collimator front cover.

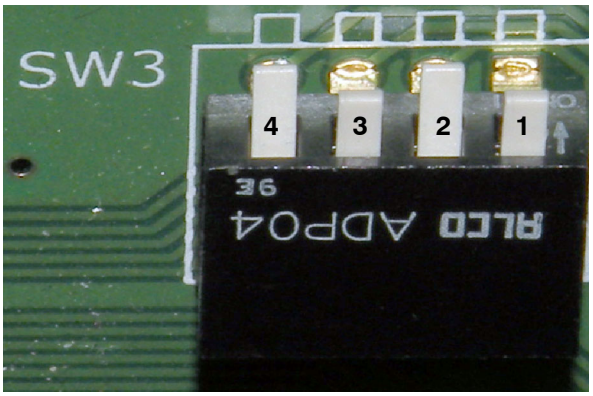


4. Check that the SW3 in configured as follows:

Units without DAP: **SW3-1: OFF** / **SW3-2: OFF** / **SW3-3: OFF** / **SW3-4: OFF**.

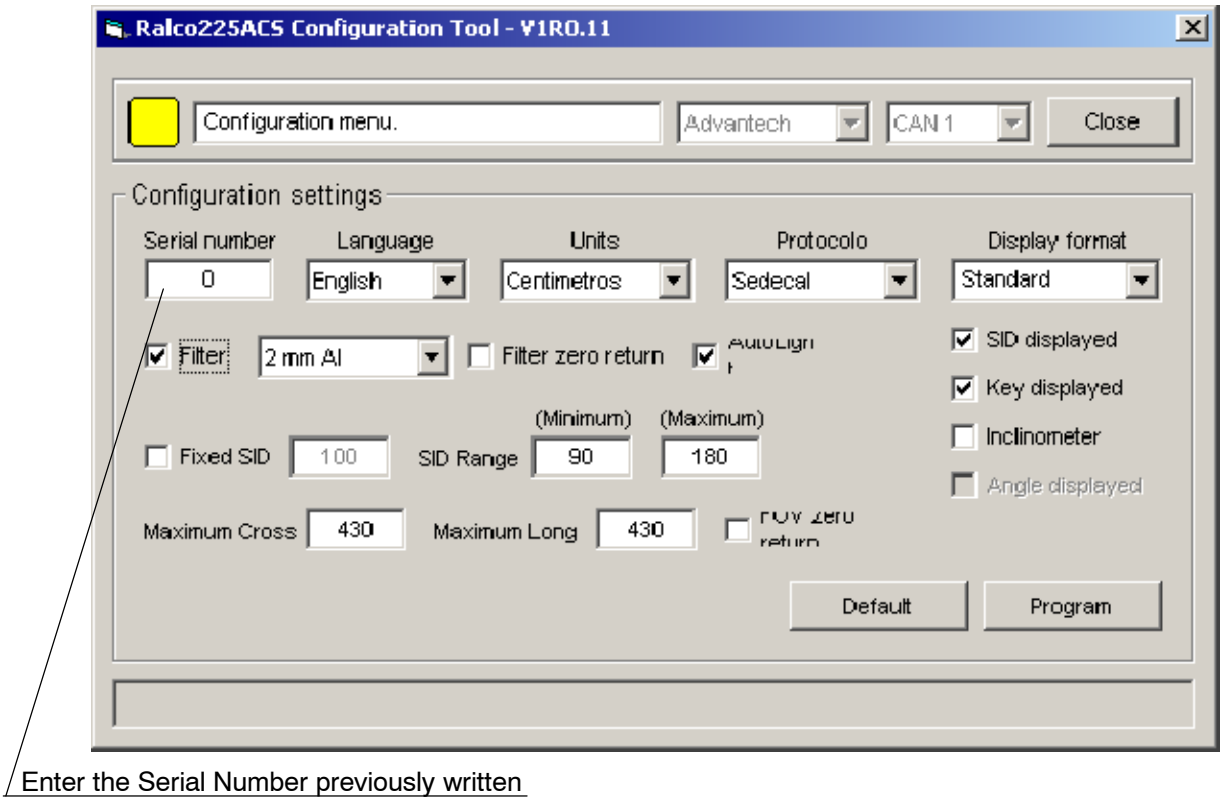
Units with DAP: **SW3-1: OFF** / **SW3-2: ON** / **SW3-3: OFF** / **SW3-4: ON**.





5. Connect a Keyboard in the connector located at the Control Box.
6. Turn the Unit on while pressing the collimator Filter Change Button.
7. Turn off all applications currently running in the Touch Screen PC.

8. Run the Ralco application in the Touch screen : “Start” – “Programs”– “Ralco” and set the parameters as indicated in the illustration below:



9. Exit the Ralco application and Turn OFF/ON the Unit.

6.6 INSTRUCTIONS TO ENABLE ARM MOVEMENTS IN CASE OF NOT OPERATIVE COMPUTER

The purpose of this procedure is to enable the movements (Height, SID, Rotation in case of failure in the computer (PC BOX).

Due to safety reasons, the inverters that drive the different motors are switched off in case of the Computer does not start up properly.

This procedure should be carried out only in special cases –for example when packing a system– when for any reason the Computer remains inoperative.

DANGER: THE APPLICATION OF THIS PROCEDURE IMPLIES THE FREE MOVEMENT OF THE SYSTEM WITH NO SOFTWARE OR HARDWARE RESTRICTIONS. THE MANUFACTURER DOES NOT ACCEPT ANY RESPONSIBILITY FOR PERSONAL INJURIES OR MATERIAL DAMAGES CAUSED AS A CONSEQUENCE OF THIS OPERATION. THIS PROCEDURE MUST BE CARRIED OUT ONLY BY TRAINED PERSONNEL. TWO PERSONS ARE REQUIRED FOR THIS OPERATION: ONE FOR ACTIVATING THE MOVEMENTS FROM THE CONTROL BOX AND ANOTHER TO VISUALLY MONITOR THE MOVEMENTS TO AVOID CRUSHING AND THE REACHING THE MECHANICAL LIMITS.

6.6.1 PRELIMINARY CHECKS

Release the Emergency Pushbutton on the Control Box.

Open the Control Box and visually locate the relay K3.

Press the ON button to switch ON the system and visually check if the relay K3 has been energized. An alternative way to check the activation of the relay K3 is verifying the operation of the fan located on the right side of the Control Box.

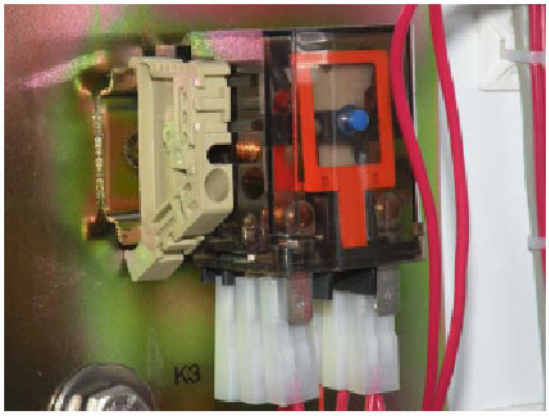
If the relay K3 is energized continue in step 2.3, if not continue in step 2.2.

6.6.2 BYPASS OF RELAY K3 (ONLY IF REQUIRED)

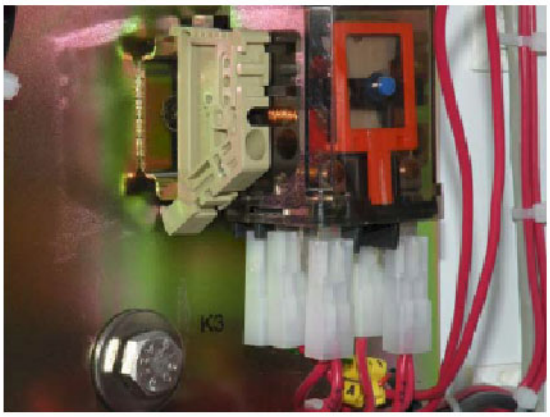
Perform this step only if K3 is not energized in step 1.

Switch OFF the system by pressing the Emergency Pushbutton on the Control Box.

Disconnect the wires previously connected to the Normally Open contact (FASTON connectors) on the socket of the relay K3 and connect them to the connections of the same relay that were not used before (NC contacts). By this action we have bypassed the relay K3.



Connection before bypass



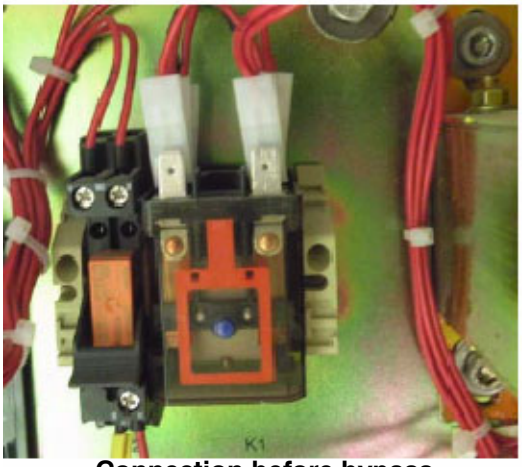
Connection after bypass

6.6.3 BYPASS OF RELAY K1

Switch OFF the system by pressing the Emergency Pushbutton on the Control Box.

Disconnect the wires originally connected to the “Normally Open” contact (FASTON connectors) on the socket of the relay K1

connect them to the connections of the same relay that were not used before (NC contacts). By this action we have bypassed the relay K1 and the motor inverters will receive power supply.



Connection before bypass

Connection after bypass

6.6.4 RELEASE OF BRAKE OF THE HEIGHT MOTOR

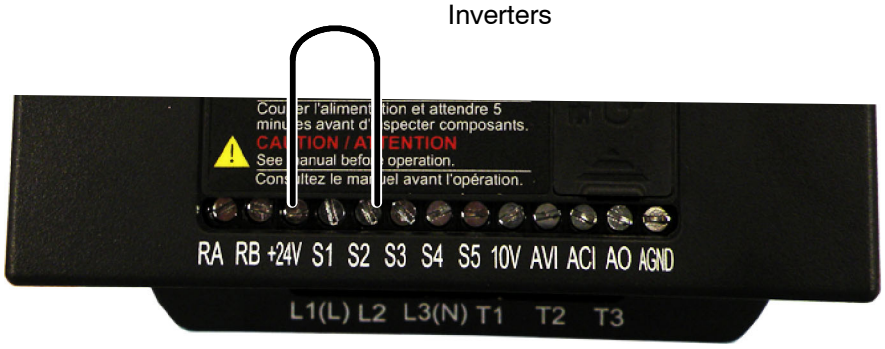
Change the position of the jumper “W2” on the XPC INTERFACE BOARD (A8186-XX) from A to B. By this operation we are releasing the brake of the height motor to enable this movement.

6.6.5 MANUAL ACTIVATION OF MOVEMENTS

To manually activate the different movements: Height, SID, Rotation, is necessary to place momentarily a jumper between two points of the corresponding inverter. For this purpose you can use a piece of wire that must be applied carefully by hand in short periods of time. This operation is critical and must be visually monitorized at any moment to avoid crushings.

Perform the corresponding actions to reach the desired final position as follows:

Inverters



Apply jumper manually

6.6.5.1 HEIGHT MOVEMENT (INVERTER 2)

- To move up the carriage: apply jumper between S1 (FWD) & +24V.
- To move down the carriage: apply jumper between S2 (REV) & +24V.

6.6.5.2 ROTATION MOVEMENT (INVERTER 3)

- To rotate clockwise: apply jumper between S1 (FWD) & +24V.
- To rotate counter clockwise: apply jumper between S2 (REV) & +24V.

6.6.5.3 SID MOVEMENT (INVERTER 1)

- To increase the SID: apply jumper between S1 (FWD) & +24V.
- To decrease the SID: apply jumper between S2 (REV) & +24V.

6.6.5.4 UNDO CHANGES

Once reached the desired position, switch OFF the unit from the Emergency Swtich and reconfigure the unit as originally by undoing the changes in steps 2.2 (if applicable), 2.3 and 2.4.

SECTION 7 DISASSEMBLE / REASSEMBLE

JOB CARD LIST	
JOB CARD	**DESCRIPTION**
1.1	REPLACEMENT OF HEIGHT MOTOR ASSEMBLY
1.2	REPLACEMENT OF ROTATION MOTOR ASSEMBLY
1.3	REPLACEMENT OF HEIGHT POTENTIOMETER
1.4	REPLACEMENT OF SID POTENTIOMETER
1.5	REPLACEMENT OF DETECTOR MOTOR
1.6	REPLACEMENT OF DETECTOR POTENTIOMETER
1.7	REPLACEMENT OF ANTICRUSHING PCB
1.8	REPLACEMENT OF FRAYED STEEL CABLE
1.9	REPLACEMENT OF PULLEY / TOOTH BELT
1.10	REPLACEMENT OF COLLIMATOR LAMP
1.11	REPLACEMENT OF LIMIT SWITCHES: ROTATION
1.12	REPLACEMENT OF LIMIT SWITCHES: HEIGHT
1.13	REPLACEMENT OF CONTROL PCB
1.14	REPLACEMENT OF INTERFACE PCB
1.15	REPLACEMENT OF X-RAY TUBE AND COLLIMATOR
1.16	REPLACEMENT OF ION CHAMBER (OPTIONAL)
1.17	REPLACEMENT OF HV CABLES
1.18	REPLACEMENT OF PC (CONTROL BOX)
1.19	REPLACEMENT OF TOUCH SCREEN
1.20	REPLACEMENT OF COMPACT FLASH MEMORY
1.21	REPLACEMENT OF SERVOAMPLIFIER
1.22	REPLACEMENT OF CARRIAGE BEARINGS
1.23	REPLACEMENT OF THE SID MOTOR ASSEMBLY
1.24	REPLACEMENT OF STRAIN GAUGE
1.25	REPLACEMENT OF STRAIN GAUGE MICROSWITCH
1.26	REPLACEMENT OF GRID SWITCHES
1.27	REPLACEMENT OF THE INCLINOMETER PCB
1.28	REPLACEMENT OF THE EMC CABLE SHIELD
ADJUSTMENTS / SOFTWARE UPDATE	
2.1	ADJUSTMENT OF THE HEIGHT POTENTIOMETER
2.2	ADJUSTMENT OF THE SID POTENTIOMETER
2.3	ADJUSTMENT OF THE SWIVEL ARM BALANCE IN HORIZONTAL POSITION
2.4	ADJUSTMENT OF SENSITIVITY IN THE ANTICRUSHING PCB - “Collision” message
2.5	SOFTWARE UPDATE IN ANTICRUSHING PCB
2.6	ADJUSTMENT OF CAM - HEIGHT / SID
2.7	CONTROL BOX PC CONFIGURATION AND TOUCH SCREEN SENSOR CALIBRATION

JOB CARD 1.1 : REPLACEMENT OF HEIGHT MOTOR ASSEMBLY

SUBASSEMBLY : HEIGHT MOTOR ASSEMBLY AT UPPER COLUMN.

TOOLS : Standard Service Tool Kit.
3 m (118") rope or similar (sling) to avoid the Unit to tilt if the replacement is performed with the Unit in vertical position **or**
a piece of wood, 30 cm height (12") or similar if the replacement is performed with the Unit resting on a piece of wood and floor (due to the low ceiling height in some facilities).

PARTS : Kit Height Motor Assembly

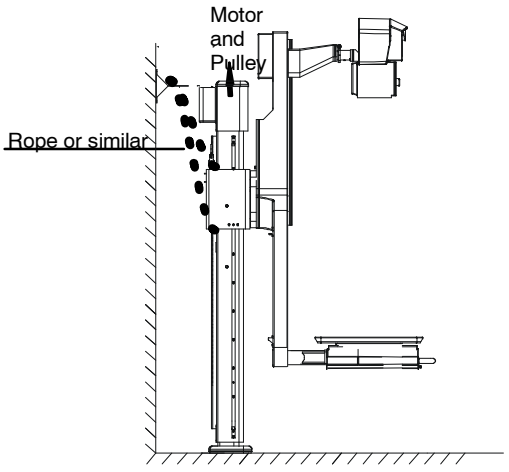
PROCEDURE

WARNING

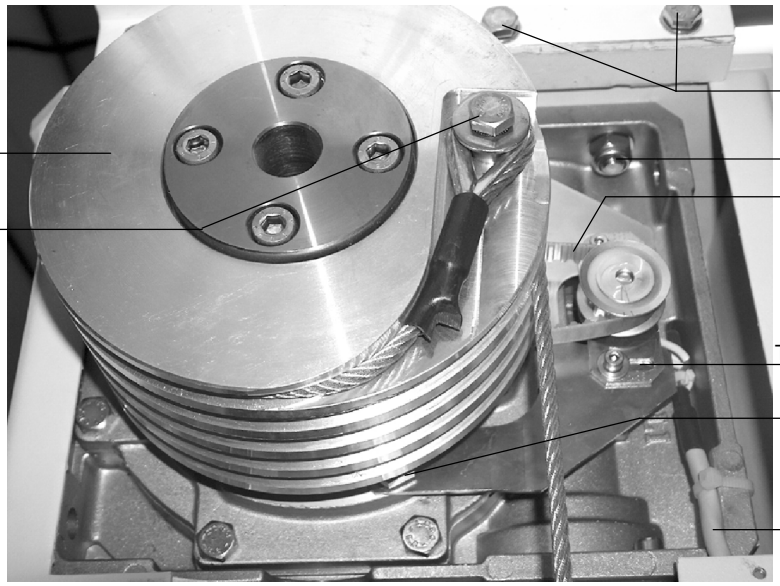
IF THE HEIGHT OF CEILING IN THE ROOM IS BELOW 280 CM (110") PERFORM THE PROCEDURE WITH THE UNIT LAY DOWN ON A PIECE OF WOOD OR SIMILAR.

Note ☞ *If possible, insert the Safety Locking rod in the Carriage to block the carriage, in case it is not possible two persons will be needed to support the carriage when releasing the Steel Cable.*

1. Insert the Safety Locking Rod (If possible).
2. Remove the upper back cover of the Column.
3. Unscrew and remove the Upper Column Support (not the Wall Support) from the Unit.
4. Install a 3m (118") rope or similar (sling) between the Wall Support and the Carriage (insert the rope in the carriage) to avoid the Unit to tilt or fall.
5. Manually push up the carriage to release the steel cable tension and then unscrew the fixing screw for the steel cable at the back of the column. Unroll the cable and leave it. If the Safety Locking Rod is not inserted, the Arm (Carriage) will go down, carefully let it rest on the floor or on a support.
6. Unscrew 6 bolts that fix motor to the Column body.
7. Disconnect 2 cable connections for potentiometer and motor power.
8. Manually lift the defective motor (the Pulley and the Potentiometer Assembly included) out from the top.



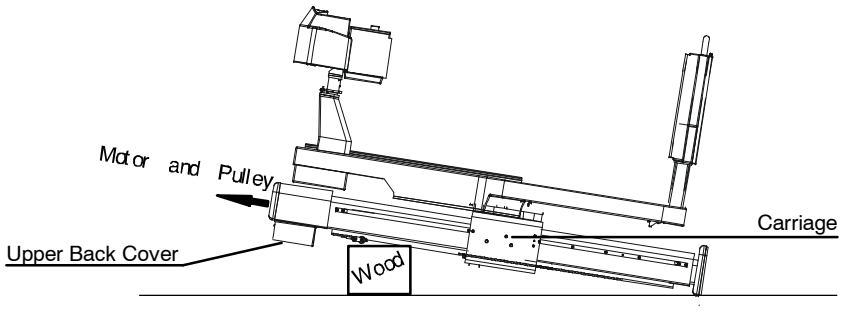
9. (with the Motor Assembly on a working surface). Disassembly the Top Cover of the Defective Motor.



10. Release the Potentiometer Support Screws and release the Tooth Belt from the Pot Gear.
11. Disassembly (1) one allen Screw at the back of the Pulley and remove it (with its shaft) from the defective motor. (Use a Plastic Head hammer to bump out the shaft).
12. Unscrew the Potentiometer Assembly Screws from the defective Motor and take the Potentiometer Assembly out (cable and connector included).
13. Reinstall the Potentiometer Assembly in the new motor (leave it loose).
14. Insert the Shaft/Pulley in the new motor (do not forget the Potentiometer Tooth Belt).
15. Reinstall the Top Cover of the Defective Motor in the new motor.
16. Install the new Motor in the Column and connect the Motor and potentiometer Assembly connectors.
17. Wire the Steel cable around the spiral pulley in clockwise direction and install the Steel Cable Screw. (it may be needed to power on the Unit and move up the carriage to release tension in the Steel Cable).
18. Carefully remove the rope and reinstall the Upper Column Support with the Wall Support.
19. Power on the Unit and place the Carriage at middle travel. Then set the Potentiometer shaft in its middle way, that is, five turns. Another way is to connect a multimeter (volts) in the potentiometer contacts and move the potentiometer shaft to 2.5 Volts.
20. Place the tooth belt over the Gear and place the Mounting Plate to its final position. The belt should be straightened by hand without any pressure at all. The idea is to have the belt straightened enough so the teeth will stay in place but a little bit loose so the pot will not be pulled and consequently damaged. It would be better to leave it a little bit loose than tighten. Normally if you place some normal manual (finger) pressure in the middle of the belt ,it should bend around 2 to 3 mm. For fine positioning use the Tensioner Plate Screws, do not forget to tighten them when in place.
21. Calibrate maximum, half and minimum height, for that, follow procedures in this manual.
When calibrating, the potentiometer readout (it appears during the calibration process after pressing store button, the displays shows “OK” and then the potentiometer readout) for minimum height should not be lower than 20 (typ. 23) and for maximum height should not be higher than 80 (typ 78). If everything is well adjusted the value for half height should be very close to 50. If the values are not within the limits, repeat step 3 and turn the potentiometer shaft to increase or decrease all these values.
22. Reinstall the upper back cover.

Note ☞ *In case the Height Motor has to be replaced on the floor, perform the following steps. At least three persons are needed to lay the Unit on the floor.*

23. Turn the Arm in Vertical position and lower the carriage as much as possible to keep the gravity center close to the floor.
24. Power off the Unit.
25. Remove the upper back cover of the Column.
26. Unscrew the Floor anchoring screws and then the Upper Column Support.
27. Carefully, lay down the Unit. Rest the upper part on a piece of wood and the base on the floor.



28. Follow from Step 5 of previous procedure. When the new motor is assembled and the Unit is in vertical position, do not forget to to install the base anchoring screws.

JOB CARD 1.2 : REPLACEMENT OF ROTATION MOTOR ASSEMBLY

SUBASSEMBLY : ROTATION MOTOR ASSEMBLY

TOOLS : Standard Service Tool Kit
Scissors Lift Table or equivalent

PERSONNEL : 2 Service Engineers

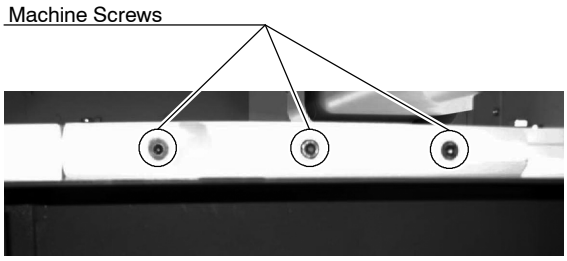
PARTS : Kit Rotation Motor

PROCEDURE

1. Power up the System.
2. Rotate the U-arm to the 90° and If possible, set the SID to 180 cm.

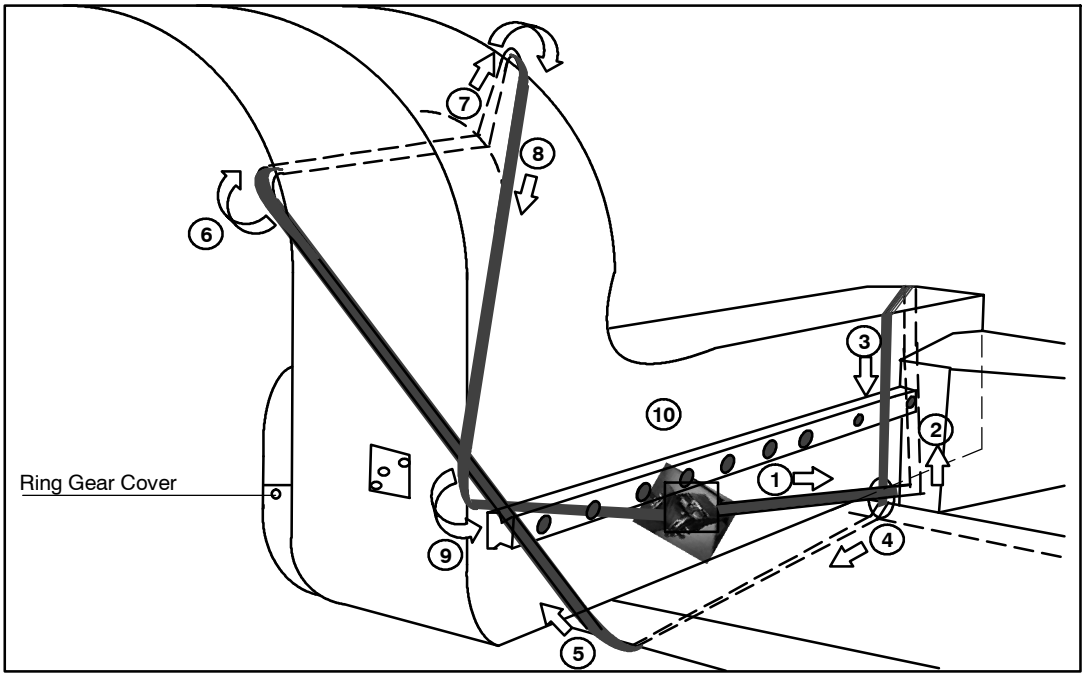
Note ☞ *Free Move Mode will override the software movement limits to rotate the U-arm.*

3. Raise or lower the U-arm to a comfortable working height to remove the Detector Housing.
4. Power down the System.
5. Rotate the Tube and Collimator so that the Collimator faces the floor.
6. Remove the Tube-Collimator Assembly. For that, disconnect cables at the back of the Assembly, remove the Stator and HV Cable Clamp to ensure adequate slack once the Tube Assembly is removed and leave the Assembly on a safe surface.
7. Carefully turn and roll the Scissors Lift Table into position under the U-arm between the Tube Support and the Column.
8. Check to ensure that cables and any other obstructions are clear. The table must be placed such that the U-arm Front Cover is all that is supported. The last approximately 3.5 cm (1") is part of the U-arm's supporting superstructure and cannot be obstructed as 3 machine screws will have to be removed .



9. Raise the Lift Table until it supports the U-arm weight that is normally held by the Steel Cable. Tension is released when the Pawl engages on the parachute – raise the Lift Table and Arm until a sharp "bang" is heard (Pawl engaging).
10. Lower the Lift Table and verify that the Pawl is engaged and holding the U-arm in place.
11. If the U-arm lowers with the Table, repeat from step 9.

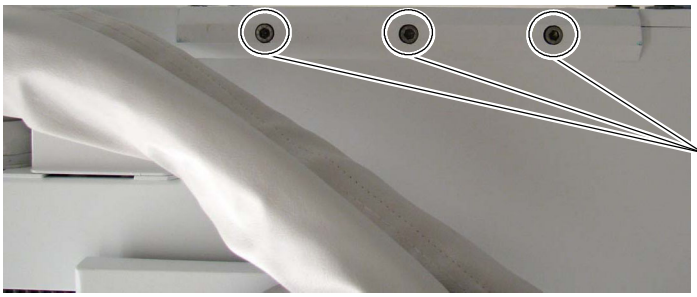
12. ***It is recommended*** to strap the U-arm to the Scissors Lift Table. This will help keep the U-arm level and prevent it from tipping off of the Table.. Only a portion of the Structure's "front cover" should be strapped to the Table. If the Strap spans the U-arm's main support at the back of the U-arm, it will not be possible to remove the front side . Refer to the following Illustration.



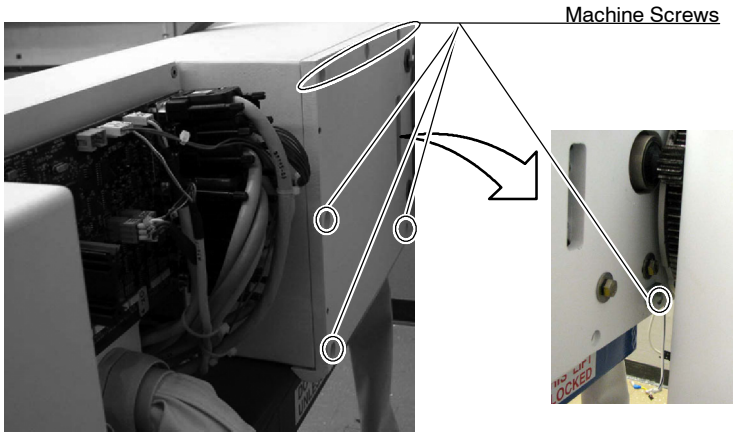
13. Dismount the Ring Gear Cover .

14. Remove the Cover of the XPC Control Board from the back of the U-arm.

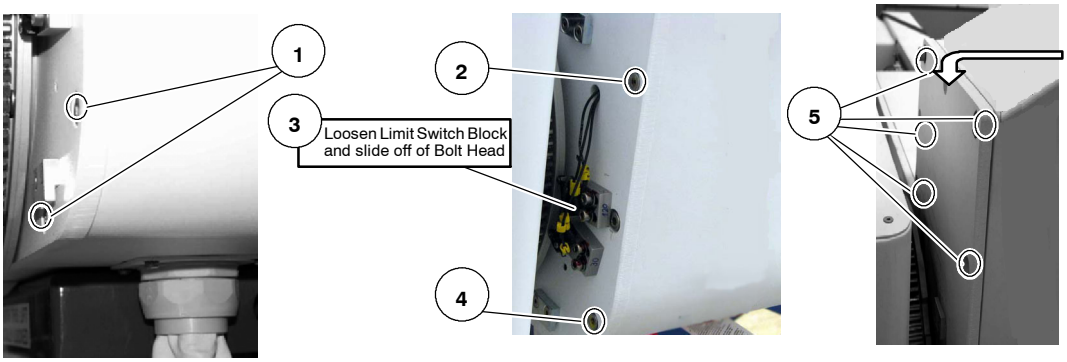
15. Remove the three Machine Screws fastening the arm support ledge to the front of the U-arm.



16. Remove the seven (7) Machine Screws from the back of the tube end of the U-arm. One of these is near the Limit Switch Actuator close to the Ring Gear.

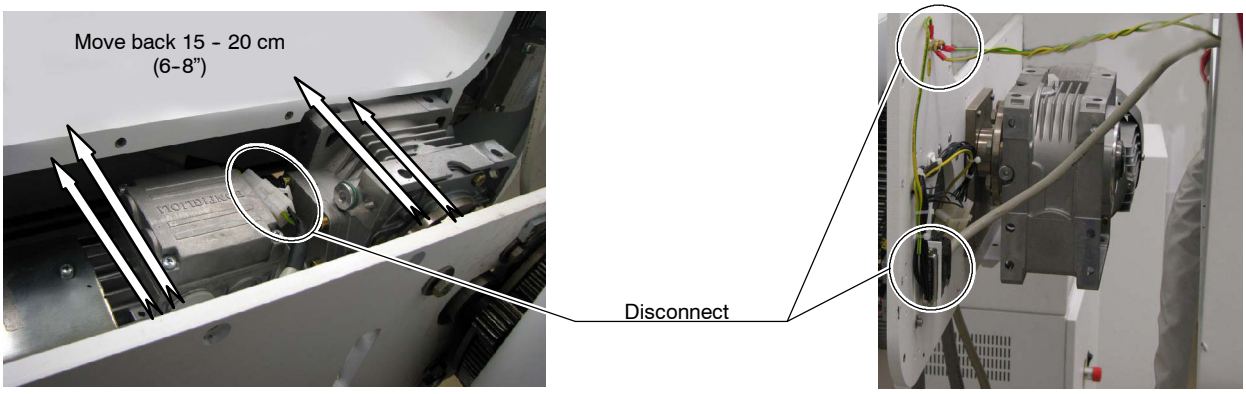


17. Remove nine (9) of the ten (10) remaining Machine Screws in the order indicated around the Ring Gear.

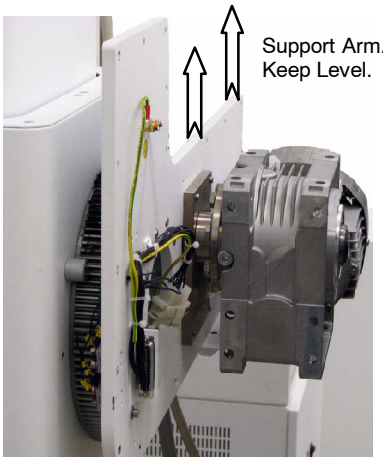


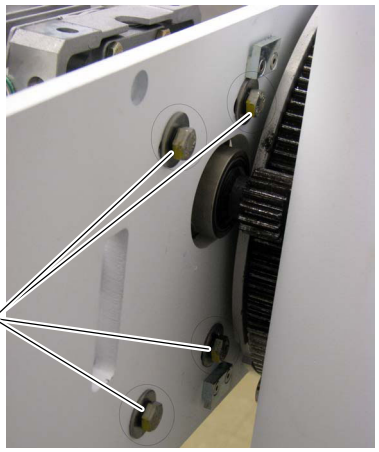
18. Remove the last Machine Screw slowly. Monitor the U-arm and the amount of force required to remove the Machine Screw.

19. Slowly and carefully pull the U-arm away from the Column 15 to 20 cm (6 to 8 inches)so that the electrical connectors to the Main Support and the Rotate Motor are exposed.



20. While one Service Engineer supports the Motor and Rotate Arm Main Support, the other removes the Motor by first removing the Motor Mounting Bolts.





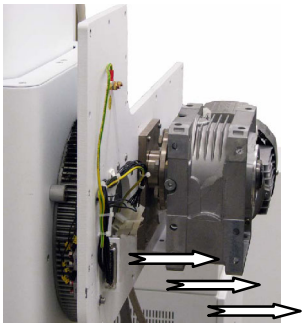
21. Remove the four (4) bolts that mount the Motor to the U-arm. Slide the Motor straight back, extracting the Pinion from the Ring Gear.

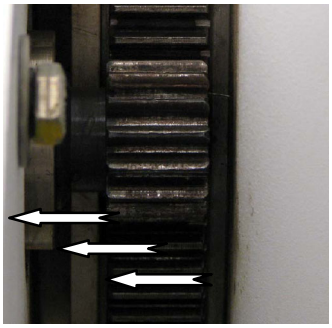
CAUTION

Once the four (4) bolts that mount the Motor to the U-arm Main Support are removed, the Motor or the Main Support can swing freely and may provoke damage or injury.

The Main Support will swing freely once the Pinion Gear clears the ring. Hold it level and steady for the installation.

Illustration 7-1
Removing Faulty Motor Assembly





22. Turn the Pinion and Gearbox Drive Shaft so that the Pinion Teeth position matches that of the faulty Motor's position at removal.

23. Place a Digital Level onto the U-arm Main Support and reposition as needed to achieve 0° (±2°).

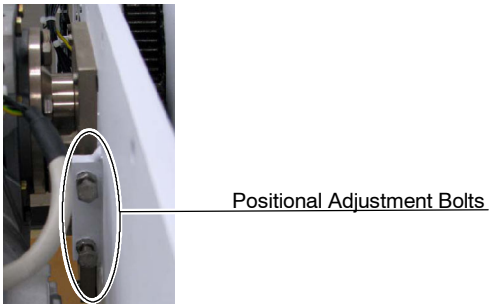
24. Fine-tune the Pinion to mesh into the Ring Gear and then slide the new Motor Assembly in place. If the Pinion does not fit into the Ring because it is overly engaged, loosen the Pinion Engagement Adjustment Bolts.

25. Install the four (4) Motor Mounting Bolts and snug up, but do not tighten yet.

26. Verify that the U-arm Main Support level has been maintained. If not, repeat from step 21.

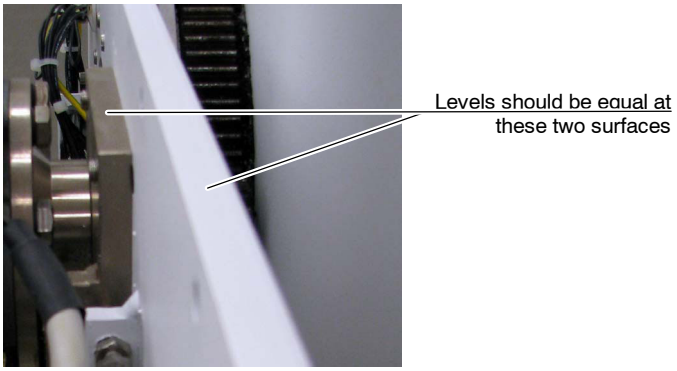
27. Check for the proper engagement of the Pinion and Ring Gear. At least 50% and no more than 60% of the Pinion Gear's Teeth should rest inside the Ring Gear's Teeth. A little more than 50% is preferable to a "little less".

28. If required, adjust the lateral position of the Motor by loosening the Lock Nuts on the Positional Adjustment Bolts. Tighten or loosen the Bolts equally to shift the Motor Assembly's position.



Note ☞ *It is important to maintain the level relative to the Main Support. The Bolts should be changed equally and only a few flats at a time to move the Motor. Clockwise increases engagement, counterclockwise decreases engagement.*

29. If the Ring and Pinion Gear Engagement was adjusted, verify that the Motor Mount and Main Support are equally level using a Digital level or equivalent). Adjust the Pinion Engagement Adjustment Bolts as needed to achieve an equal level while maintaining proper engagement.

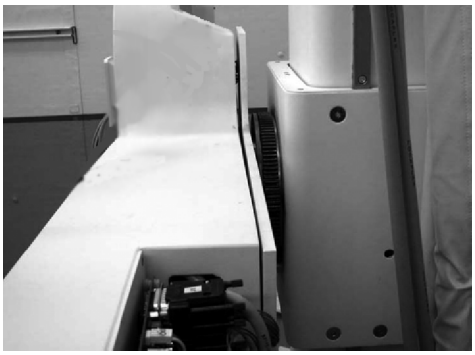


30. Tighten the Motor Mount Bolts to 35 N-m (26 lbf-ft).

31. Unlock the Scissors Lift Table's Wheels and carefully slide the front half of the U-arm back towards the Main Support until a gap of 15 - 20 cm (6 - 8") remains. Pay close attention to clearances and cables.

32. Reconnect the Motor Power, D-connector for the Switch Signals and Grounds.

33. Close the U-arm until the two halves meet and lock the Table's Wheels. It is likely that the front portion of the U-arm has shifted position a bit causing the threaded holes to no longer perfectly align with the countersunk holes on the Main Support.



34. Inspect each of the holes to determine if any of the Machine Screws can be inserted and started using only your fingers. If any binding occurs, do not install that Machine Screw at this time.

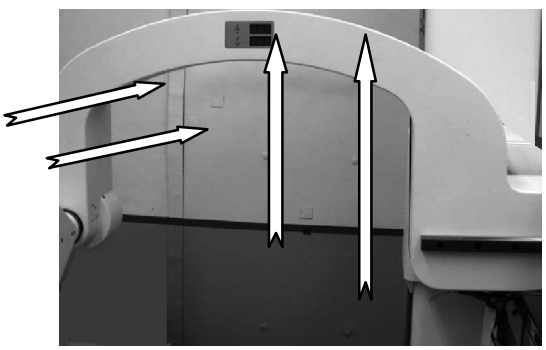
Note ☞ *It is not a problem if none can be started at this time.*

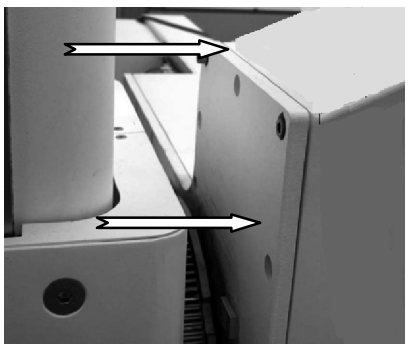
35. Fine-tune the alignment of the front part of the U-arm with the Main Support in order to get the Machine Screws started in every hole. A second Service Engineer may be helpful; however, one should be sufficient to complete this task.

- The Scissors Lift Table can be used to help jockey the Unit into position in all directions.

Note ☞ *When raising and lowering the Table, it is important to not let the front of the U-arm move too far up or down as this could damage the Motor.*

- The Wheels can be unlocked to enable adjustment towards or away from the Column.
- Movement can be achieved laterally by unlocking the Wheels, shifting back and then moving diagonally. It is necessary to restore proper perpendicularity before reengaging with the U-arm. This adjustment should not be required if the U-arm was disengaged straight back at the start of the removal.
- Lifting the U-arm will aid in fine-tuning the position to allow Machine Screws to be started.





36. Once all seventeen (17) Machine Screws have been successfully started and threaded in halfway, tighten them to 15 N-m (11 lbf-ft) to complete the reinstallation of the front of the U-arm to the Main Support.

37. Restore the Rotational Limit Switch to its original position.

38. If applicable, remove the strap from the U-arm and Scissors Lift Table.

39. Put the Receptor and Detector back on.

40. Lower the Scissors Lift Table by squeezing the Release Lever once quickly. The parachute should now be supporting the U-arm. Unlock the Wheels and move the Table around to aid with supporting the Tube / Collimator Assembly and reinstall the Tube / Collimator.

Note ☞ *It may be necessary to raise / lower the Table to align the holes of the Support with the Tube / Collimator Assembly's threaded holes.*

41. Lower the Scissors Lift Table and then remove it from the room. Reconnect the Red Wires, Zero degree Detent Switch and Grounds.

42. Reinstall the HV and Stator Cable Clamp ensuring that adequate slack is left to allow the Tube and Collimator to rotate.

43. Power up the System, the System will post an error.

44. Enter Service Mode and Free Move.

45. Drive the U-arm upwards to remove the slack from the Steel Cable and release the Parachute.

46. Place the Arm in Undertable position.

47. Loose the four position bolts and the Lock Nuts on the Positional Adjustment Bolts. This allows the gear to settle in place.

48. Tighten first the four position bolts and then the Lock Nuts on the Positional Adjustment Bolts.

49. Check the Cable to make sure it is under tension, properly wrapped on the Pulley and bearing the weight of the U-arm.

50. Shut the System down and restart.

51. Calibrate the Arm Angle.

52. Check / Adjust Tube and Collimator alignments.

53. Perform functional checks.

JOB CARD 1.3 : REPLACEMENT OF HEIGHT POTENTIOMETER

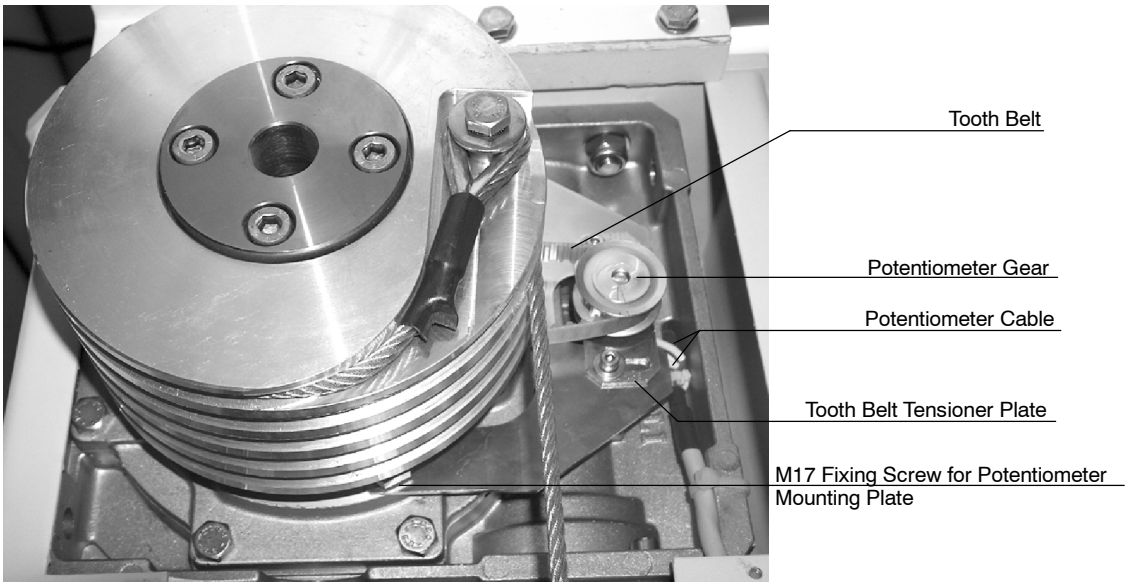
SUBASSEMBLY : HEIGHT MOTOR ASSEMBLY AT UPPER COLUMN.

TOOLS : Standard Service Tool Kit.

PARTS : Kit Height Potentiometer

PROCEDURE

1. Power on the Unit and position the Arm so that the carriage is at the middle height of the total travel (typically 105 cm from the center of the carriage to the floor).
2. Power Unit down.



3. Remove the upper back cover of the Column.
4. Release the Tensioner Plate Disengage the Tooth Belt from from the Potentiometer Gear and remove both screws of the “U” shaped Potentiometer Mounting Plate. A 17mm open wrench is required.
5. Disconnect the other end of pot cable from its connector, cut the tie wrap and pick up the Potentiometer Assembly.
6. Screw out the two Grub screws (do not totally remove them) inserted in the Gear that fixes the Gear to the potentiometer and remove the Gear.
7. Remove the potentiometer from t he Tensioner plate. Be careful not to lose the round and locking washers.
8. Mount the new potentiometer in the Tensioner Plate. Insert first the round washer, then the locking washer. Position the potentiometer more or less where the other one was mounted before and tighten the screws.
9. Mount the Mounting Plate on the Column, insert the gear in the potentiometer shaft and tighten the two Grub screws.

10. Tighten the two Potentiometer Mounting Plate screws (M17) and place a Tie wrap to route the Potentiometer cable.

11. Connect the potentiometer cable.

12. Power on the Unit and enter in Service Mode>Calibration>HeightCalibration (Refer to “Height Calibration”).

13. Place the Carriage at middle travel. Then set the Potentiometer shaft in its middle way, that is, five turns. Another way is to connect a multimeter (volts) in the potentiometer contacts and move the potentiometer shaft to 2.5 Volts.

14. Place the tooth belt over the Gear and place the Mounting Plate to its final position. The belt should be straightened by hand without any pressure at all. The idea is to have the belt straightened enough so the teeth will stay in place but a little bit loose so the pot will not be pulled and consequently damaged. It would be better to leave it a little bit loose than tighten. Normally if you place some normal manual (finger) pressure in the middle of the belt ,it should bend around 2 to 3 mm. For fine positioning use the Tensioner Plate Screws, do not forget to tighten them when in place.

15. Calibrate maximum, half and minimum height, for that, (Refer to Section 2.1.3 “Height Calibration”). When calibrating, the potentiometer readout for minimum height should not be lower than “200” and for maximum height should not be higher than “800”.If everything is well adjusted, the value for half height should be around”500”. If the values are not within the limits, repeat step 3 and turn the potentiometer shaft to increase or decrease all these values.

16. Reinstall the upper back cover.

JOB CARD 1.4 : REPLACEMENT OF SID POTENTIOMETER

SUBASSEMBLY : SID POT AT ARM END.

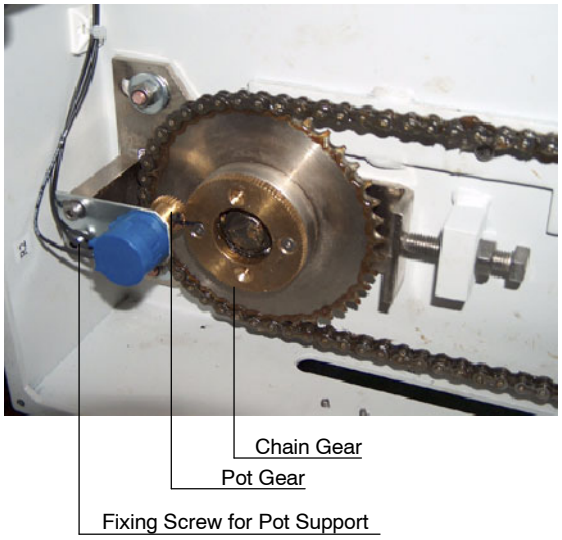
TOOLS : Standard Service Tool Kit

PARTS : Kit SID Potentiometer

PROCEDURE

1. Power on the Unit and enter in Service Mode > Calibration> SID Calibration
2. Place the system so that the tube carriage is at the middle of the total travel of the SID.
3. Power system down.
4. Remove the Arm Back Cover.

SID Potentiometer Standard Version



5. Remove the old Potentiometer.
6. Connect the new Potentiometer wires.
7. Set the Pot in the middle position, that is, five turns **or** power up the machine, connect the multimeter and set 2.5 Volts with the pot's shaft.
8. Place the pot support so that the pot's gear is in touch with the chain gear, do not apply force, they should be just touching, enough for the movement to be transmitted to the Pot (make sure that you keep the pot at its middle position).
9. Tighten the screws fixing the support.
10. Reinstall the Arm Back cover.
11. Start up the system and recalibrate the SID.

JOB CARD 1.5 : REPLACEMENT OF DETECTOR MOTOR

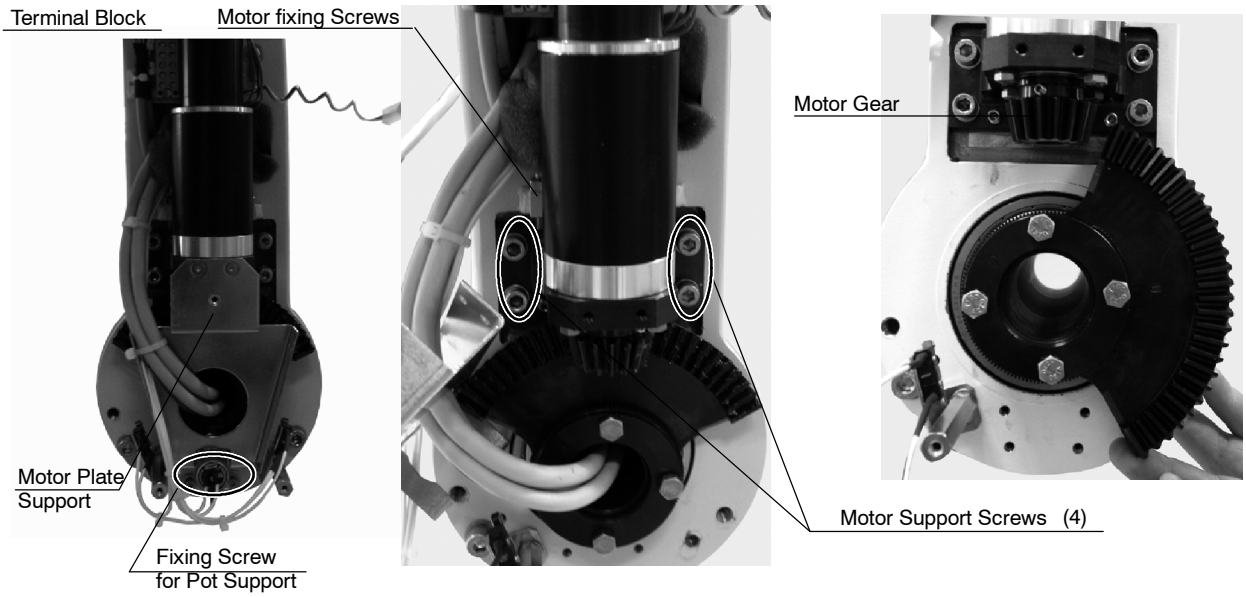
SUBASSEMBLY : DETECTOR MOTOR AT ARM END

TOOLS : Standard Service Tool Kit

PARTS : Kit Detector Motor

PROCEDURE

1. Place the system in Thorax position, move the table below the Detector and position two bookends or similar to keep the Detector perpendicular to the ground when the gear is disengaged.
2. Power system down and remove the Detector Motor Back Cover.



3. Release the Pot Support screws to separate the Pot Gear from the Motor Gear.
4. Remove the SW support Screws.
5. Remove the screws of the Cables support Plate (4 screws).
6. Turn the Unit On and move the Detector in order to free the pinion from the motor Gear. (Grab the Detector to avoid it turns suddenly).
7. Turn the Unit off and remove the Electrical connections from the Terminal block.
8. Unscrew the Motor Plate support screws (2).
9. Unscrew the Motor Support screws (4). and carefully take out the motor.
10. Install the new motor, and adjust it with the Motor Fixing screws located at both sides of the motor body. Be careful with the Motor Gear and the Pot Gear do not apply force, they should be just touching, enough for the movement to be transmitted to the Pot.
11. Turn On the System and set the pot at 2.5 V (0 degrees). Use a Digital Multimeter and a digital level to check for perpendicularity.
12. Tighten the Pot Support screws.
13. Connect the Motor cables to the Terminal Block and Ground.
14. Turn the System Off and Install Detector Motor Back cover.

JOB CARD 1.6 : REPLACEMENT OF DETECTOR POTENTIOMETER

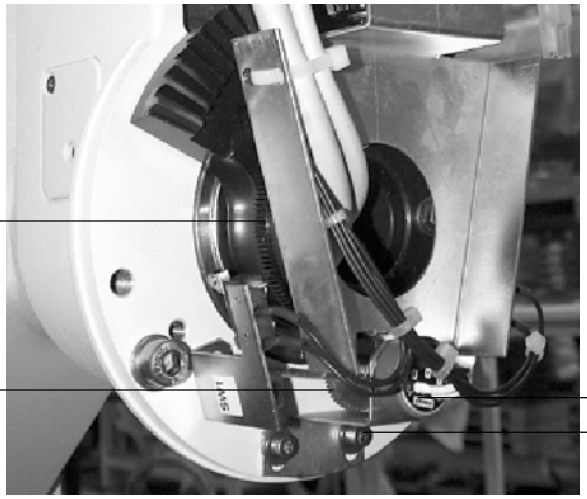
SUBASSEMBLY : DETECTOR MOTOR AT ARM END

TOOLS : Standard Service Tool Kit

PARTS : Kit Detector Potentiometer

PROCEDURE

1. Place the system in Thorax position.
2. Power system down.
3. Remove the Detector Back Cover.



4. Release the Pot Support screws to separate the Pot Gear from the Motor Gear.
5. Replace the broken Pot by the new one and sold the wires. Be careful with the Motor Gear and the Pot Gear do not apply force, they should be just touching, enough for the movement to be transmitted to the Pot. Tighten the Pot Support screws.
6. Turn On the System and set the pot at 2.5V (0 degrees). Use a Digital Multimeter and a digital level to check for perpendicularity.
7. Turn the System Off and install the Detector Motor Back cover.
8. Start up the system and recalibrate the Detector Angle.

JOB CARD 1.7 : REPLACEMENT OF ANTICRUSHING PCB

SUBASSEMBLY : COLUMN BACK

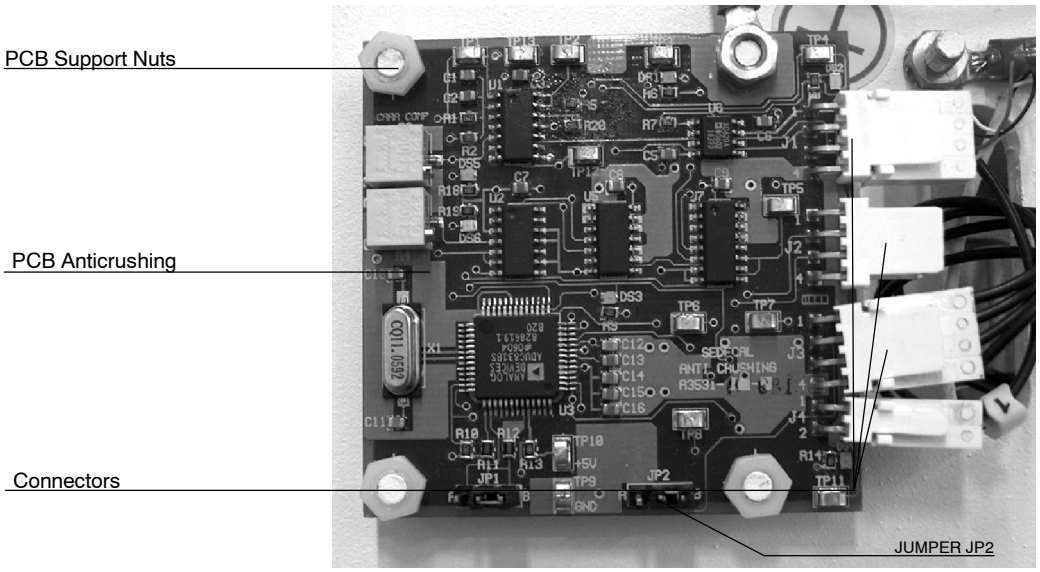
TOOLS : Standard Service Tool Kit

PARTS : Anticrushing PCB

PROCEDURE

Note ☞ *The Anticrushing Board is factory set and no adjustments are necessary after replacement.*

1. Place the system in Thorax position.
2. Power system down.
3. Remove the PCB Cover at the back of the column (a small square cover with four screws).



4. Disconnect all the connectors at the PCB and remove the PCB Support Nuts.
5. Replace the Anticrushing PCB and connect all connectors.
6. Reinstall the cover and power on the Unit.

JOB CARD 1.8 : REPLACEMENT OF FRAYED STEEL CABLE

SUBASSEMBLY : HEIGHT MOTOR ASSEMBLY AT UPPER COLUMN AND CARRIAGE.

TOOLS : Standard Service Tool Kit.

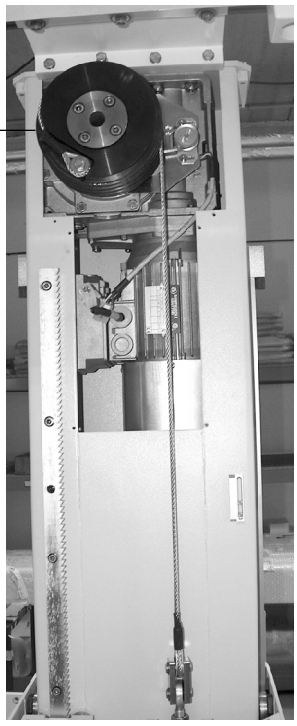
PARTS : Steel Cable Kit

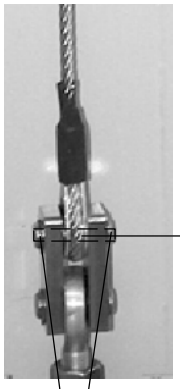
PROCEDURE

WARNING

BEFORE RELEASING THE STEEL CABLE, INSERT THE SAFETY LOCKING ROD IN THE CARRIAGE TO BLOCK THE CARRIAGE, IN CASE IT IS NOT POSSIBLE, LET IT REST ON A STRONG AND RELIABLE SUPPORT.

1. Power On the Unit.
2. Move the Carriage up or down and insert the Safety Locking Rod.
3. Remove the upper back cover of the Column.
4. Press up or down button to release tension in the Steel cable and then unscrew the fixing screw for the steel cable at the back of the column. Unroll the cable and leave it. If the Safety Locking Rod is not inserted, the Carriage will go down, carefully let it rest in a strong and reliable support.
5. Then remove the Safety Washers and the Pin attached to the end of the Steel Cable at the carriage.
6. Install the new Steel Cable: wire the Steel cable around the spiral pulley in clockwise direction and tighten the Steel Cable Screw at the carriage with the Safety Washers.
7. Apply Multi-purpose lithium grease as explained in Maintenance Section 8.3.1 of this Manual.
8. Reinstall the upper back cover.





JOB CARD 1.9 : REPLACEMENT OF THE PULLEY / TOOTH BELT

SUBASSEMBLY : HEIGHT MOTOR ASSEMBLY AT UPPER COLUMN AND CARRIAGE.

TOOLS : Standard Service Tool Kit.

PARTS : Pulley / Tooth Belt

PROCEDURE

1. Please follow Job Card 1.1 (Replacement of the Height Motor). It includes the disassembly of both the Pulley and the Tooth Belt.

JOB CARD 1.10 : REPLACEMENT OF COLLIMATOR LAMP

SUBASSEMBLY : COLLIMATOR

TOOLS : Standard Service Tool Kit.

PARTS : Collimator Lamp

PROCEDURE

Do not touch the lamp directly. Use a cloth or tissue. This will prevent any oil or contamination from getting on the lamp, potential burns, or premature lamp failure.

1. Turn the System Off and remove the Collimator Back cover.
2. Remove the lamp protection heatsink.
3. Carefully remove the faulty lamp.
4. Replace the lamp with an identical lamp.
5. Make sure that the lamp pins are completely inserted in the lamp-holder.
6. Check on Light Field / X-Ray field correspondence.
7. If necessary remove the lamp, rotate it 180º axially and re-insert.

Note ☞ *Lamp replacement requires checks for proper light intensity and contrast. Refer to Section "Collimator Lamp Brightness Test."*

JOB CARD 1.11 : REPLACEMENT OF LIMIT SWITCHES: ROTATION

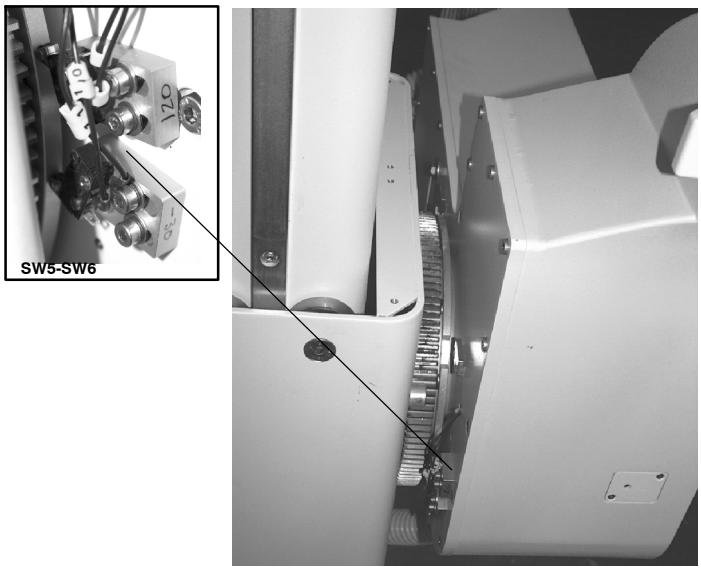
SUBASSEMBLY : ARM

TOOLS : Standard Service Tool Kit.

PARTS : Kit Rotation Switch

PROCEDURE

1. Turn on the system and move the Unit to Thorax position.
2. Turn the System Off and remove the Rotation Gear cover.
3. The Rotation Switches appear accessible. Remove the defective switch (take note of the connections).
4. Install the new switch in the same position.
5. Power the system ON and check that switch works properly when the arm is rotated.



JOB CARD 1.12 : REPLACEMENT OF LIMIT SWITCHES: HEIGHT

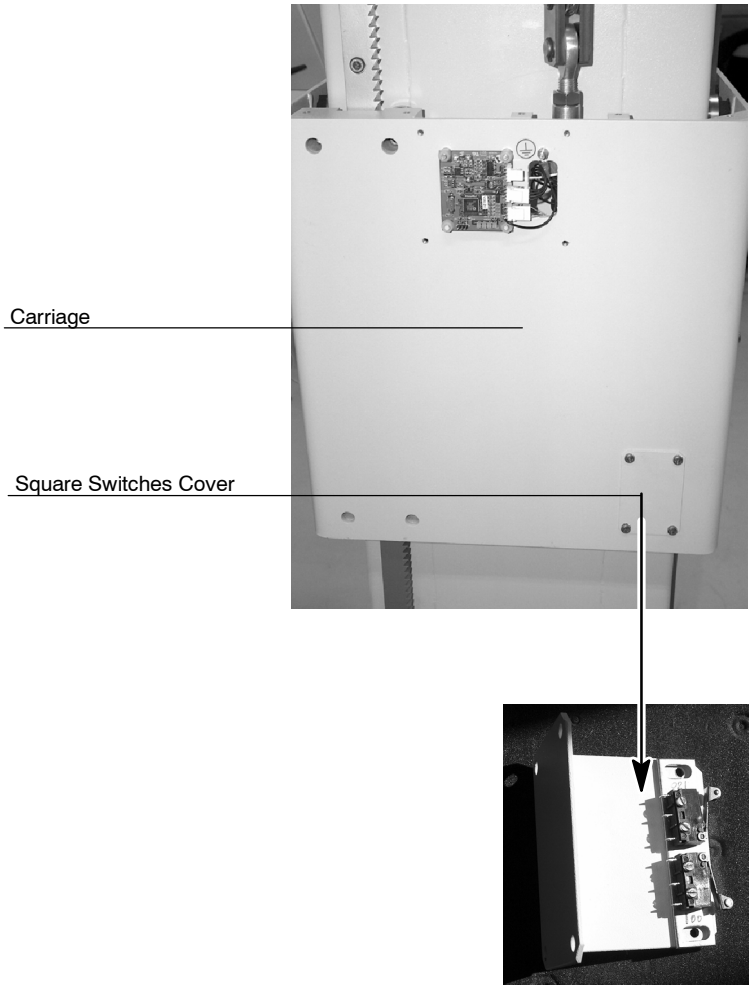
SUBASSEMBLY : CARRIAGE

TOOLS : Standard Service Tool Kit.

PARTS : Kit Height Switch

PROCEDURE

1. Turn the system OFF and remove the small square cover located at the back of the carriage. This cover provides the access to the height limit switches.
2. Mark exact position of the slotted bracket in the small square cover.
3. Remove the defective switch (take note of the connections).
4. Install the new switch in the same position.
5. Power the system ON and check that the switch works properly and the carriage moves.



JOB CARD 1.13 : REPLACEMENT OF CONTROL PCB

SUBASSEMBLY : ARM ASSEMBLY.

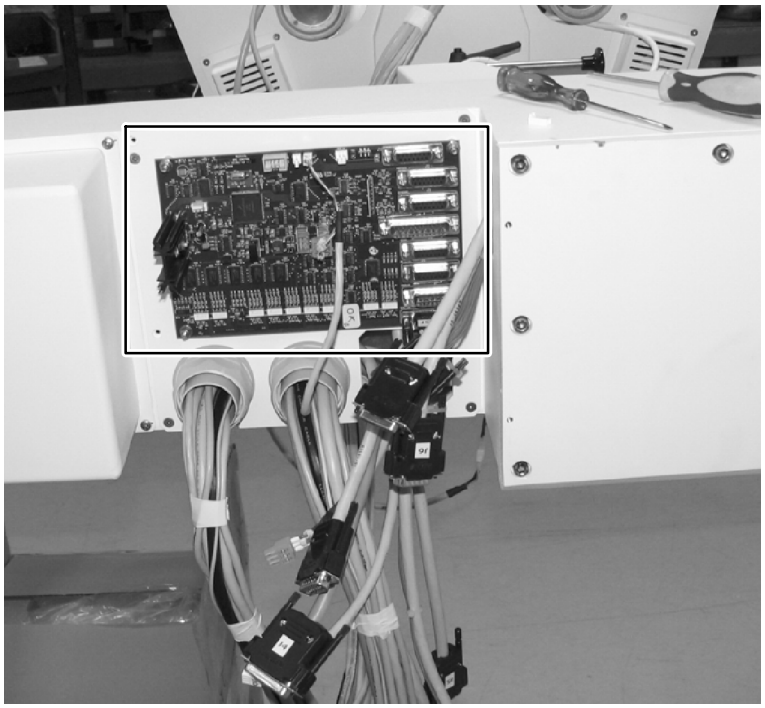
TOOLS : Standard Service Tool Kit.

PARTS : Control PCB

PROCEDURE

1. Turn the system ON, enter in *Service* > *Software Versions* and write down the Software version of the PCB.
2. Turn the System Off and remove the Back Arm middle cover.
3. Disconnect all the connectors at the Control PCB and remove the PCB Support Nuts.
4. Replace the Control PCB and re-connect all connectors.

Note ☞ *Check the Software version of the new PCB (as explained in step 1). The replacement part software might be older than the defective PCB. If that is the case, perform a software upgrade as explained in Section 4.8, "Software Upgrade Screen."*



JOB CARD 1.14 : REPLACEMENT OF INTERFACE PCB

SUBASSEMBLY : CONTROL BOX.

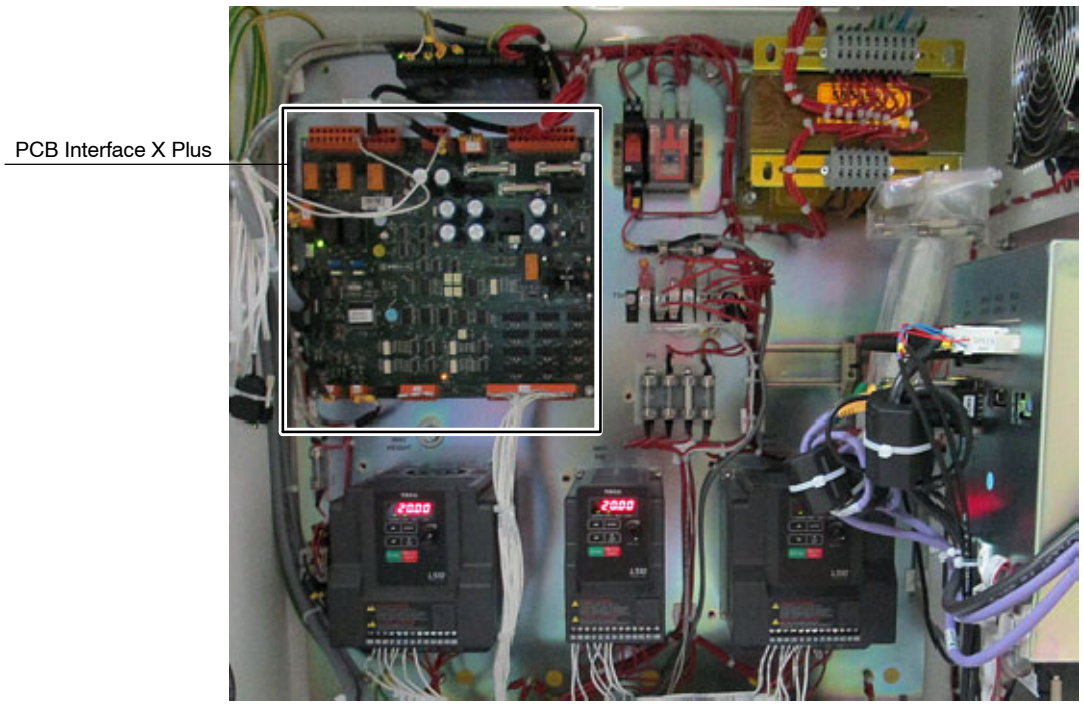
TOOLS : Standard Service Tool Kit.

PARTS : Interface PCB

PROCEDURE

1. Turn the system ON, enter in *Service* > *Software Versions* and write down the software version of the PCB.
2. Power system down.
3. Open the Control Box.
4. Disconnect all the connectors at the PCB Interface X Plus and remove the PCB Support Nuts.
5. Replace the PCB Interface X Plus and connect all connectors.
6. Adjust 4 volts in the potentiometers of the XPC INTERFACE board as follows: R7 for CW speed (measure with a voltmeter between W4 (positive) and TP1 (negative) 4 volts). R6 for CCW speed (measure with a voltmeter between W3 (positive) and TP1 (negative) 4volts.

Note ☞ *Check the Software version of the new PCB (as explained in step 1). The replacement part software might be older than the defective PCB. If that is the case, perform a software upgrade as explained in Section 4.8, "Software Upgrade Screen."*



JOB CARD 1.15 : REPLACEMENT OF THE X-RAY TUBE AND COLLIMATOR

SUBASSEMBLY : TUBE-COLLIMATOR ASSEMBLY.

TOOLS : Standard Service Tool Kit.

PARTS : X-Ray Tube - Collimator

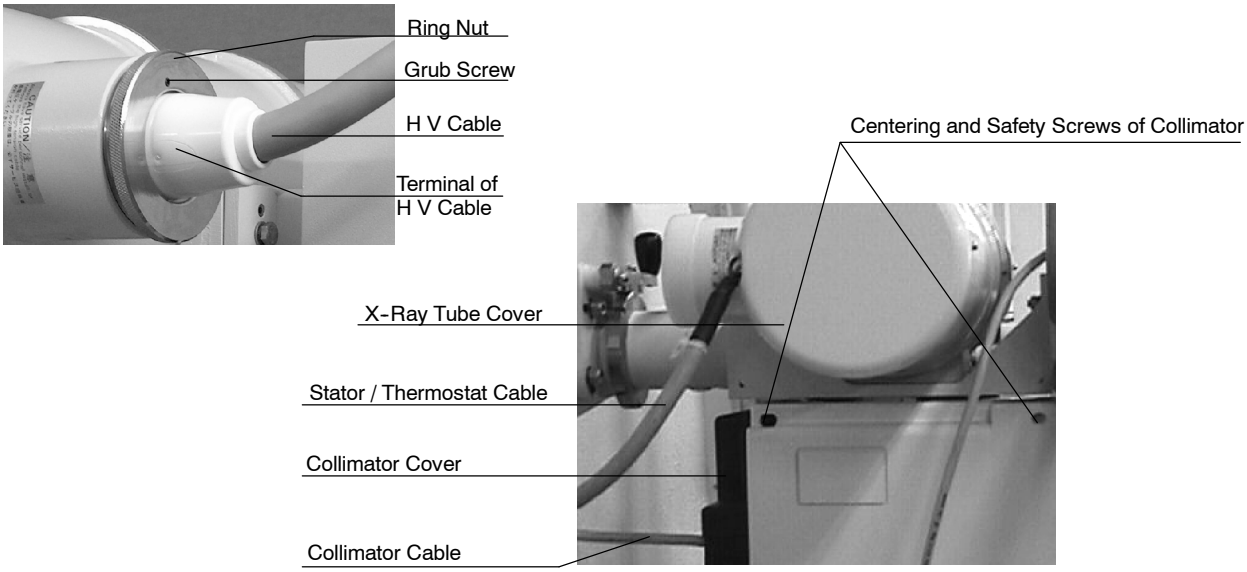
PROCEDURE

1. Turn the System Off and remove the Tube-Collimator cover.
2. Carefully disconnect the High Voltage cables from the Tube, for that, screw out first the Grub Screw located at the Ring Nut, then unscrew Ring Nut and pull out the Termination Plug of the High Voltage cable.

CAUTION

Terminal Pins of HV Cables are extremely delicate and they are easily damaged. Take particular care to handle them carefully. Make sure that they are all straight and that the splits in the pins are open (parallel to sides).

3. Remove the X-Ray Tube side cover and disconnect the Stator / Thermostat cables.
4. Disconnect all the Collimator Cables.
5. Unscrew the four mounting and centering adjustment Allen screws until the four tabs are withdrawn from the Collimator top opening and remove the Collimator (the Tube-Collimator Assembly can be turned up-side-down).
6. Unscrew the four allen screws of the Collimator Adaptation Ring and remove the X-Ray Tube.
7. Replace the X-Ray Tube and reinstall the assembly in reverse order as explained in the Section 6 of this manual.



8. Check the alignment of the Tube-collimator as indicated in Section “Adjustments.”

Note ☞ *Do not forget to replace the old external Tube label in the Tube Cover.*

JOB CARD 1.16 : REPLACEMENT OF ION CHAMBER (OPTIONAL)

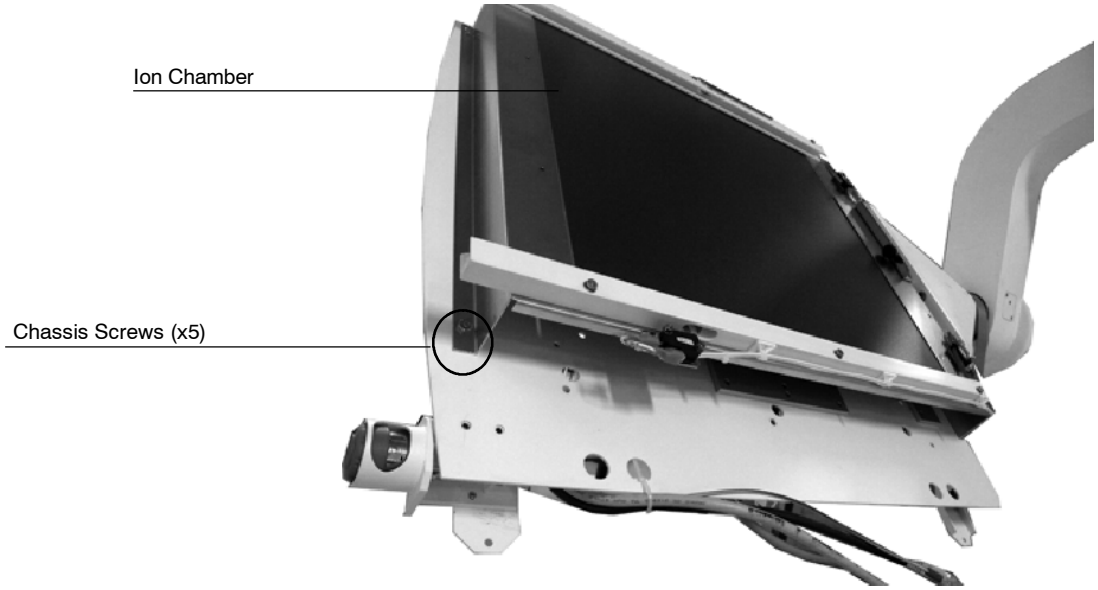
SUBASSEMBLY : RECEPTOR ASSEMBLY.

TOOLS : Standard Service Tool Kit.

PARTS : Ion Chamber (optional)

PROCEDURE

1. Turn the Unit OFF.
2. Remove the front and back covers of the Receptor Assembly.
3. Disconnect the Ion Chamber Cable.
4. Unscrew the four Plate Support s (two screws each) and lift carefully the defective Ion Chamber.
5. Place the new Ion Chamber at the same position on the Receptor Assembly.
6. Route and connect the Ion Chamber cables.
7. Fix it with the Four Plate Supports.
8. Reinstall the cover front and back covers of the Receptor Assembly.



JOB CARD 1.17 : REPLACEMENT OF HV CABLES

SUBASSEMBLY : TUBE-COLLIMATOR ASSEMBLY.

TOOLS : Standard Service Tool Kit.

PARTS : HV Cables

PROCEDURE

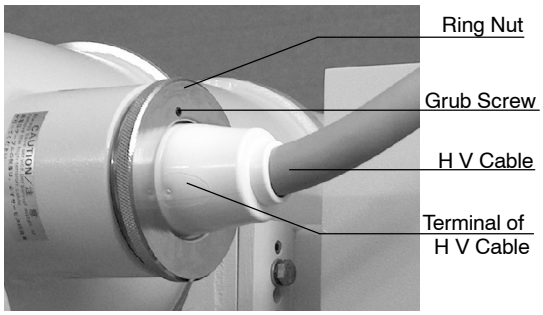
1. Turn the System Off and remove the Tube-Collimator cover.
2. Carefully disconnect the High Voltage cables from the Tube, for that, screw out first the Grub Screw located at the Ring Nut, then unscrew by hand the Ring Nut and pull out the Termination Plug of the High Voltage cable.

Terminal Pins of HV Cables are extremely delicate and they are easily damaged. Take particular care to handle them carefully. Make sure that they are all straight and that the splits in the pins are open (parallel to sides).

3. Now disconnect in the same way the High Voltage Cables from the Generator.
4. Assemble the mounting accessories of each Termination Plug following the Cable manufacturer instructions.

Do not install the Silicone washer supplied with the HV Cables.

5. Before installing the cables in the Generator Tank and in the X-Ray Tube, prepare the High Voltage terminals that will be installed in the X-ray Tube(s) receptacles; Apply Silicone Paste over the entire surface of the Plug including the Pins and the Tube receptacle, then remove old oil and place 1cm of new oil in the HV Cable receptacle in the Generator.
6. Carefully connect the Anode and Cathode cables into the respective X-rayTube receptacles. Make sure that all connections are made correctly, that is, keep correct Anode and Cathode orientation. Thoroughly tighten the Ring Nut by hand, once finished, tighten the Grub Screw located at the Ring Nut.
7. Put approximately 1cm (0.5") of HV Oil in the HV Transformer receptacles. (oil included in package).
8. Carefully connect the Anode and Cathode cables from the X-ray Tube(s) into the respective HV Transformer receptacles. Make sure that all connections are made correctly, that is, keep correct Anode and Cathode orientation. Thoroughly tighten the Ring Nut by hand, once finished, tighten the Grub Screw located at the Ring Nut.



9. Re-install the Tube-Collimator cover.

JOB CARD 1.18 : REPLACEMENT OF PC (Control Box)

SUBASSEMBLY : Control Box

TOOLS : Standard Service Tool Kit.

PARTS : PC Control Box

PROCEDURE

1. Turn the System Off and carefully disconnect all cables connected to the PC, keep in mind that they will be reconnected.
2. Remove the nuts that support the old PC at each corner.
3. Carefully take out the old PC from the Control Box.
4. Now, remove the Compact Flash memory from the base of the old PC (push the black button).
5. Insert old Compact Flash in new PC (if new PC includes a new Compact Flash, remove it).
6. Assemble the new PC and connect all cables.
7. In case that the Old compact Flash does not work with the new PC, perform the Configuration and calibration procedures as explained in this manual.

JOB CARD 1.19 : REPLACEMENT OF TOUCH SCREEN

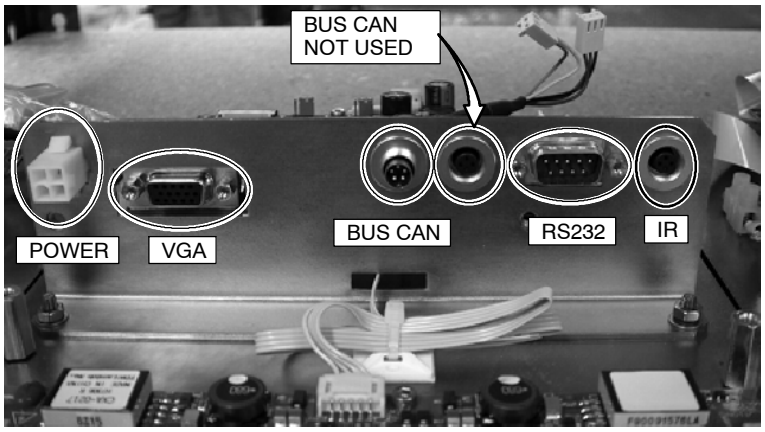
SUBASSEMBLY : Tube Collimator Assembly

TOOLS : Standard PC Keyboard, Mouse and Standard Service Tool Kit.

PARTS : Kit Touch Screen

PROCEDURE

1. Turn the System Off.
2. Remove the cover of the Tube Collimator Assembly.
3. Carefully disconnect all cables connected to the Touch Screen, keep in mind that they will be reconnected.
4. Remove the nuts that support the old Touch Screen.
5. Carefully take out the old Touch Screen.
6. Assemble the new Touch Screen and connect all cables.



7. Remove the metal Screen frame to gain access to the whole screen.

8. Turn on the System and calibrate the new Touch Screen, for that, follow JOB CARD 2.7

JOB CARD 1.20 : REPLACEMENT OF SATA HDD 32 Gb

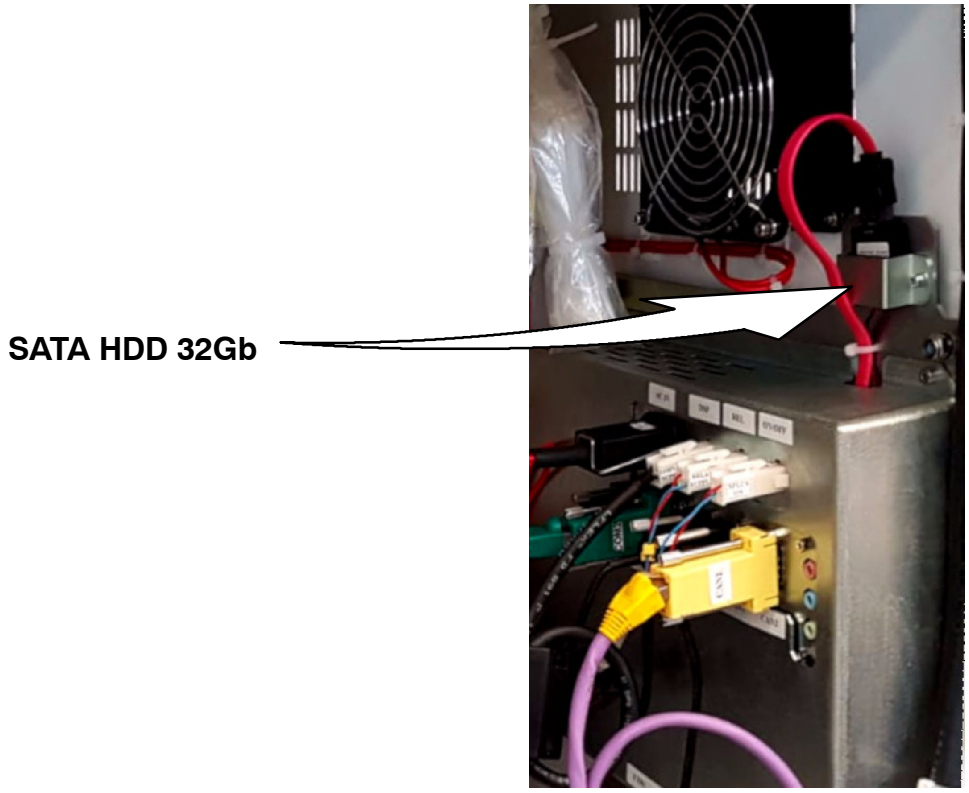
SUBASSEMBLY : Control Box XPC

TOOLS : Standard PC Keyboard, Mouse and Standard Service Tool Kit.

PARTS : Compact Flash Memory.

PROCEDURE

1. Turn the System Off.
2. Open the SATA HDD 32Gb brakect.
3. Disconnect the Cable.
4. Remove the old SATA HDD 32Gb.
5. Insert the new SATA HDD 32Gb..
6. Reinstall the cable and the Bracket.



7. Turn the Unit on.
8. Calibrate the Touch Screen Sensor, for that, refer to Section 4.11.

JOB CARD 1.21 : REPLACEMENT OF SERVOAMPLIFIER

SUBASSEMBLY : Control Box Assembly

TOOLS : Standard Service Tool Kit.

PARTS : Servoamplifier

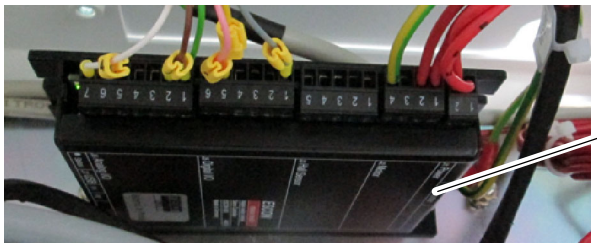
PROCEDURE

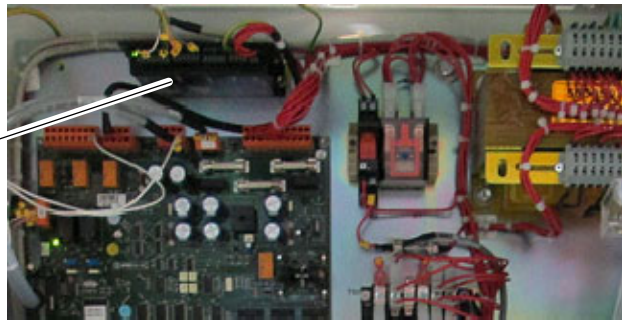
1. Turn the System Off and open the Control Box Door.

2. Remove the cables connected to the Servoamplifier (keep in mind that they will be reconnected in the new Servoamplifier).

3. Remove the screws that attach the Servoamplifier to the back cover of the Control Box and remove it.

4. Install the new Servoamplifier and connect all the cables.





5. Turn the system On and check the Detector Assembly Movements.

JOB CARD 1.22 : REPLACEMENT OF CARRIAGE BEARINGS

SUBASSEMBLY : U-ARM CARRIAGE

TOOLS : Standard Service Tool Kit
Carriage Bearing Wrench (included with system)

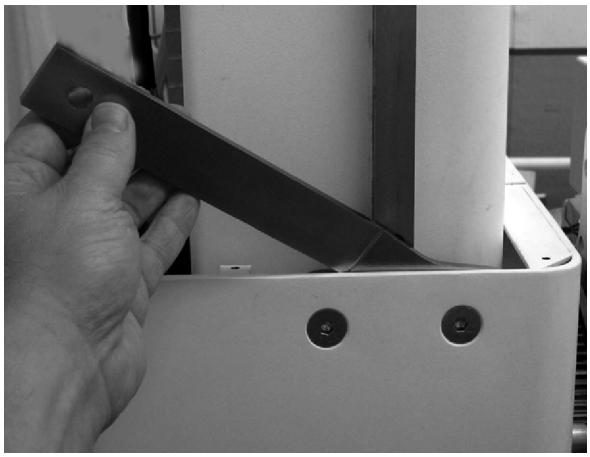
PERSONNEL : 1 Service Engineer

PARTS : Kit Carriage Bearings

PROCEDURE

1. Rotate the U-arm to the 90^{o} position (parallel to the floor).
2. Raise or lower the U-arm until the Safety Locking Rod can be inserted.
3. Insert the Safety Locking Rod.
4. Shut OFF the System .
5. Remove the Carriage Top and Bottom Covers.
6. Using the provided Wrench and a 7 mm Allen Wrench, remove the faulty bearing.

Illustration 7-2
Removing Faulty Bearing



7. Install the new bearing.
8. Repeat until all bearings have been replaced.
9. Adjust the eccentric as per Section 6.3.
10. Remove the Safety Locking rod from the Carriage.
11. Power-up the System .
12. Perform System Functional Checks.

JOB CARD 1.23 : REPLACEMENT OF SID MOTOR ASSEMBLY

SUBASSEMBLY : SID MOTOR ASSEMBLY

TOOLS : Standard Service Tool Kit
Scissors Lift Table
Recommended 20 ft (6m) Ratcheting Strap with hooks at both ends (obtained locally)

PERSONNEL : 2 Service Engineers

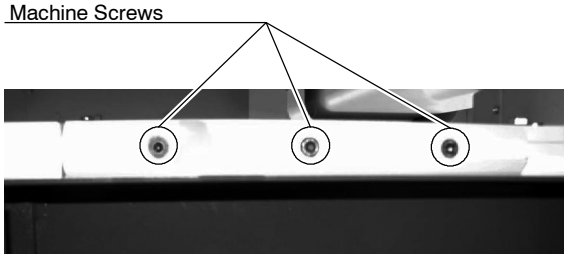
PARTS : Kit SID Motor

PROCEDURE

1. Power up the System.
2. Rotate the U-arm to the 90° and If possible, set the SID to 180 cm.

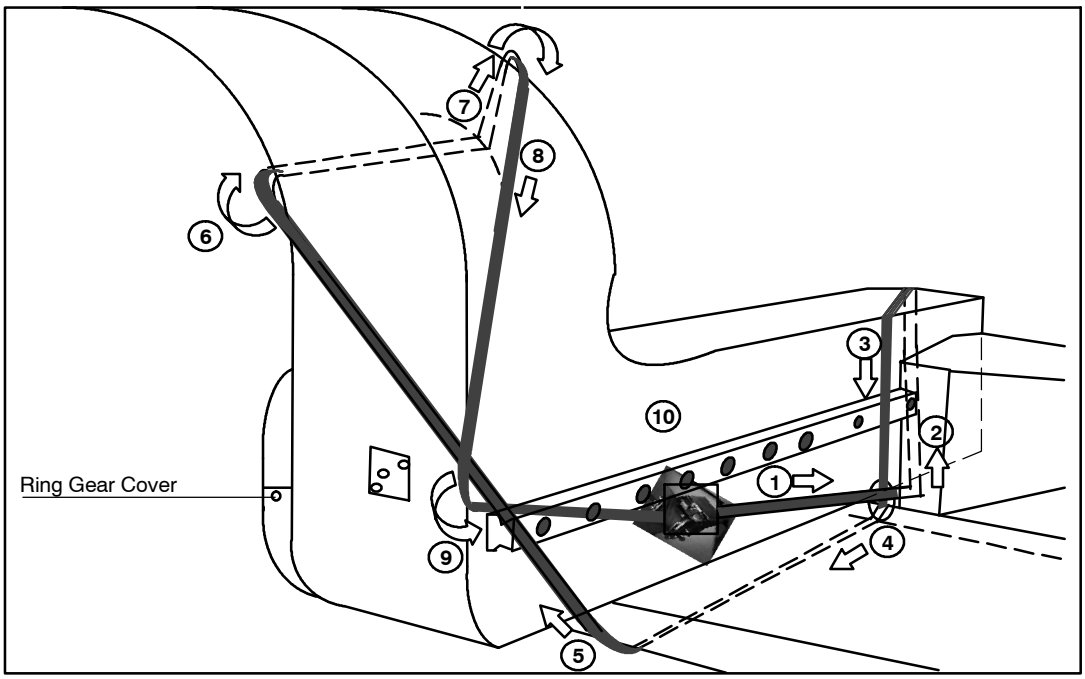
Note ☞ *Free Move Mode will override the software movement limits to rotate the U-arm.*

3. Raise or lower the U-arm to a comfortable working height to remove the Detector Housing.
4. Power down the System.
5. Rotate the Tube and Collimator so that the Collimator faces the floor.
6. Remove the Tube-Collimator Assembly. For that, disconnect cables at the back of the Assembly, remove the Stator and HV Cable Clamp to ensure adequate slack once the Tube Assembly is removed and leave the Assembly on a safe surface.
7. Carefully turn and roll the Scissors Lift Table into position under the U-arm between the Tube Support and the Column.
8. Check to ensure that cables and any other obstructions are clear. The table must be placed such that the U-arm Front Cover is all that is supported. The last approximately 3.5 cm (1") is part of the U-arm's supporting superstructure and cannot be obstructed as 3 machine screws will have to be removed .



9. Raise the Lift Table until it supports the U-arm weight that is normally held by the Steel Cable. Tension is released when the Pawl engages on the parachute - raise the Lift Table and Arm until a sharp "bang" is heard (Pawl engaging).
10. Lower the Lift Table and verify that the Pawl is engaged and holding the U-arm in place.
11. If the U-arm lowers with the Table, repeat from step 9.

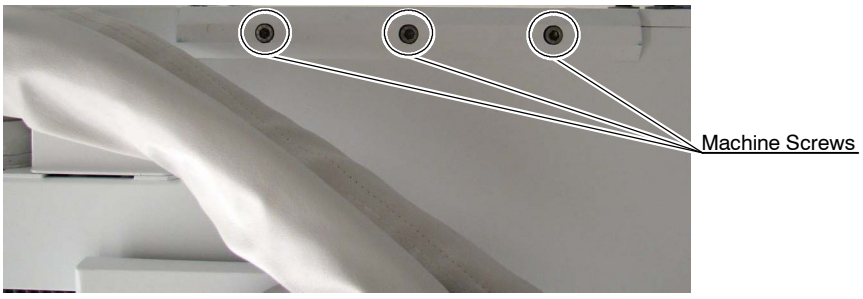
12. ***It is recommended*** to strap the U-arm to the Scissors Lift Table. This will help keep the U-arm level and prevent it from tipping off of the Table.. Only a portion of the Structure's "front cover" should be strapped to the Table. If the Strap spans the U-arm's main support at the back of the U-arm, it will not be possible to remove the front side . Refer to the following Illustration.



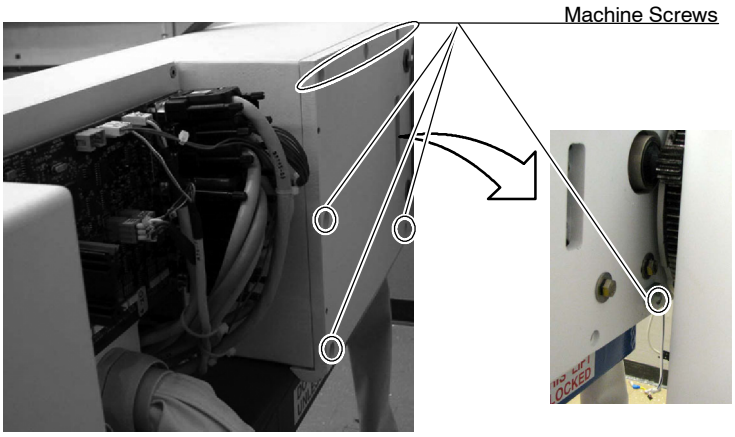
13. Dismount the Ring Gear Cover .

14. Remove the Cover of the XPC Control Board from the back of the U-arm.

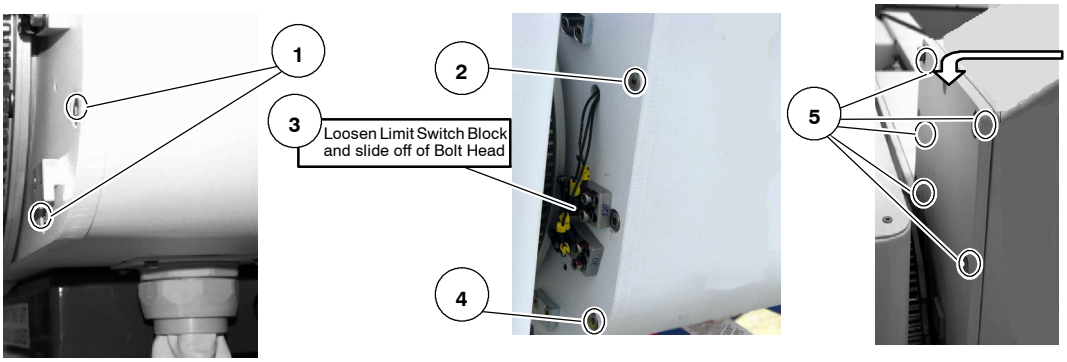
15. Remove the three Machine Screws fastening the arm support ledge to the front of the U-arm.



16. Remove the seven (7) Machine Screws from the back of the tube end of the U-arm. One of these is near the Limit Switch Actuator close to the Ring Gear.

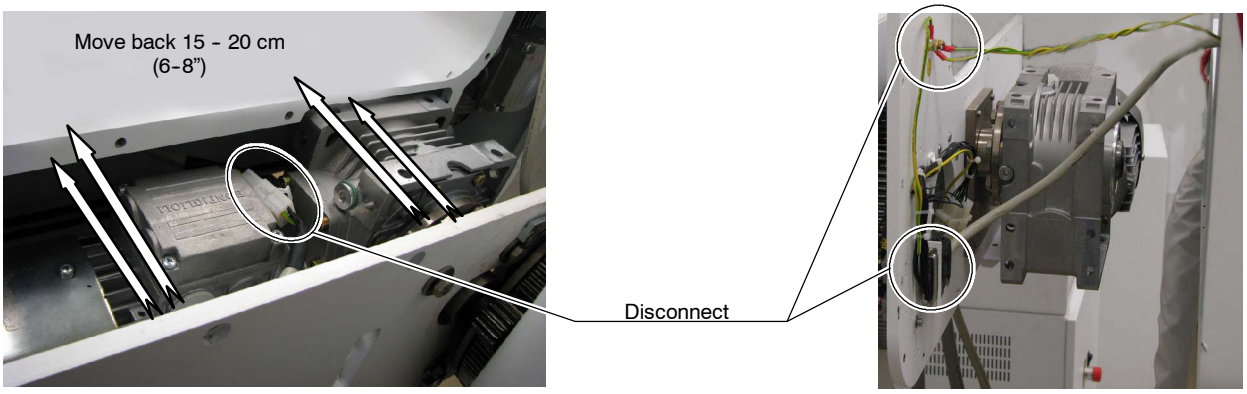


17. Remove nine (9) of the ten (10) remaining Machine Screws in the order indicated around the Ring Gear.



18. Remove the last Machine Screw slowly. Monitor the U-arm and the amount of force required to remove the Machine Screw.

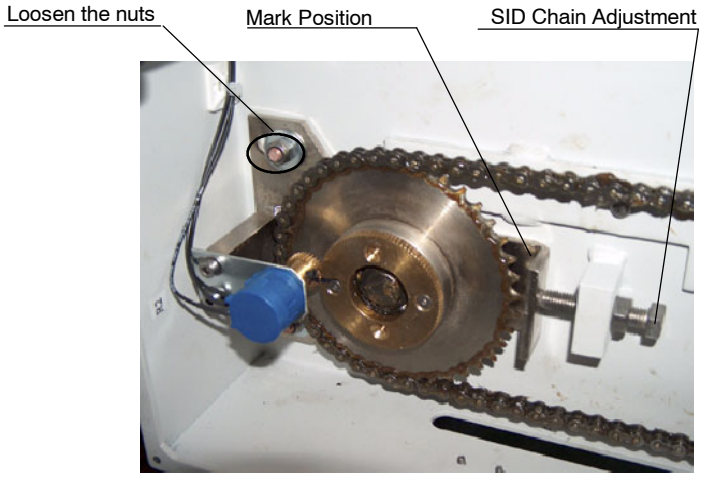
19. Slowly and carefully pull the U-arm away from the Column 15 to 20 cm (6 to 8 inches)so that the electrical connectors to the Main Support and the Rotate Motor are exposed.



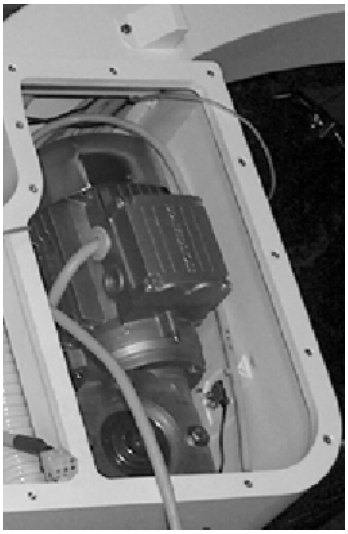
20. Move the U-arm further back to provide adequate working access to the Rotate Motor and then lock the Table's Wheels.

21. Remove the Counterweight Cover, remove the three (3) nuts securing the Counterweights with a 19 mm Wrench and remove the weights.

22. Mark the location of the Chain Tension Adjustment Bolt.
23. Loosen the SID Chain Gear Mounting Nuts.
24. Loosen the SID Chain Tension Adjustment to create slack on the Chain.

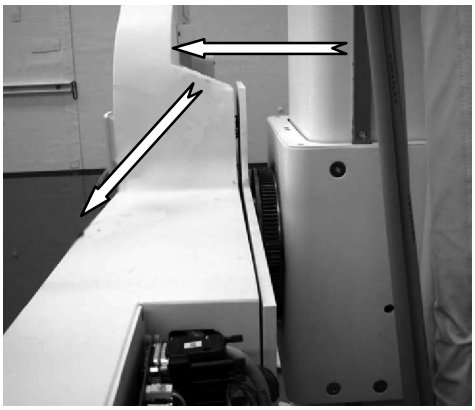


25. Disconnect the Power Connections to the Motor by removing the Cover Plate and disconnecting the wires and remove SID Motor Mounting Bolts.



26. Check the Strap and make certain it is still tight and holding the U-arm firmly in position.
27. Remove the SID Chain from the Drive Gear by holding the Chain and sliding the Motor Assembly towards the Counterweighted end of the U-arm.
28. Extract the faulty Motor from the U-arm.
29. Install the replacement SID Motor by reversing steps 25. - 28. Ensure that the Chain is hung back on the Drive Gear while positioning the SID Motor Assembly.
30. Tighten the SID Motor Mounting Bolts to 35 N-m (26 lbf-ft).
31. Restore the SID Chain Tensioning and Gear to the position matched marked in step 22. and tighten its Mounting Nuts.

32. One at a time, place the Counterweights back onto the Threaded Rod.
33. Install the three (3) Counterweight Retaining Nuts and tighten them to 70 N-m (52 lbf-ft).
34. Unlock the Scissor Lift Table's Wheels and carefully slide the front half of the U-arm towards the Main Support until a gap of 15 - 20 cm (6 – 8 in) remains. Pay close attention to clearances and Cables.
35. Reconnect the Motor Power, D-connector for the Switch Signals and Grounds.
36. Close the U-arm until the two halves meet and lock the Table's Wheels. It is likely that the front portion of the U-arm has shifted position a bit causing the threaded holes to no longer perfectly align with the countersunk holes on the Main Support.



37. Inspect each of the holes to determine if any of the Machine Screws can be inserted and started using only your fingers. If any binding occurs, do not install that Machine Screw at this time.

Note ☞ *It is not a problem if none can be started at this time.*

38. Fine-tune the alignment of the front part of the U-arm with the Main Support in order to get the Machine Screws started in every hole.

Note ☞ *When raising and lowering the Scissors Lift Table, it is important to not let the front of the U-arm move too far up or down as this could damage the Motor. Lifting the U-arm will aid in fine-tuning the position to allow Machine Screws to be started.*

39. Once all seventeen (17) Machine Screws have been successfully started and threaded in halfway, tighten them to 15 N-m (11 lbf-ft) to complete the reinstallation of the front of the U-arm to the Main Support.

40. Restore the Rotational Limit Switch to its original position.

41. If installed, remove the strap from the U-arm and Scissors Lift Table.

42. Put the Detector Assembly back on.

43. Lower the Scissors Lift Table by squeezing the Release Lever once quickly. The parachute should now be supporting the U-arm.

44. Reinstall the Tube / Collimator Assembly, for that reconnect the Red Wires, Grounds. and if applicable the Zero degree Detent Switch and reinstall the HV and Stator Cable Clamp ensuring that adequate slack is left to allow the Tube and Collimator to rotate.

45. Power up the System. After power up, the System will post an error.

46. Enter Service Mode and Free Move.

47. Drive the U-arm upwards to remove the slack from the Steel Cable and release the Parachute.

48. Check the Cable to make sure it is under tension, properly wrapped on the Pulley and bearing the weight of the U-arm.

49. Shut the System down and restart.

50. Calibrate the Arm Angle.

51. Check / Adjust Tube and Collimator alignments.

52. Perform functional checks.

JOB CARD 1.24 : REPLACEMENT OF STRAIN GAUGE

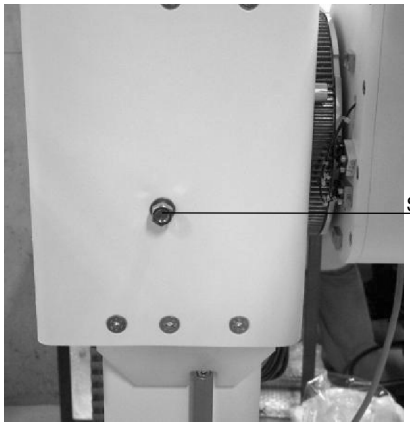
SUBASSEMBLY : CARRIAGE ASSEMBLY

TOOLS : Standard Service Tool Kit, especially a fixed 19 mm wrench and a fixed 20 mm wrench.

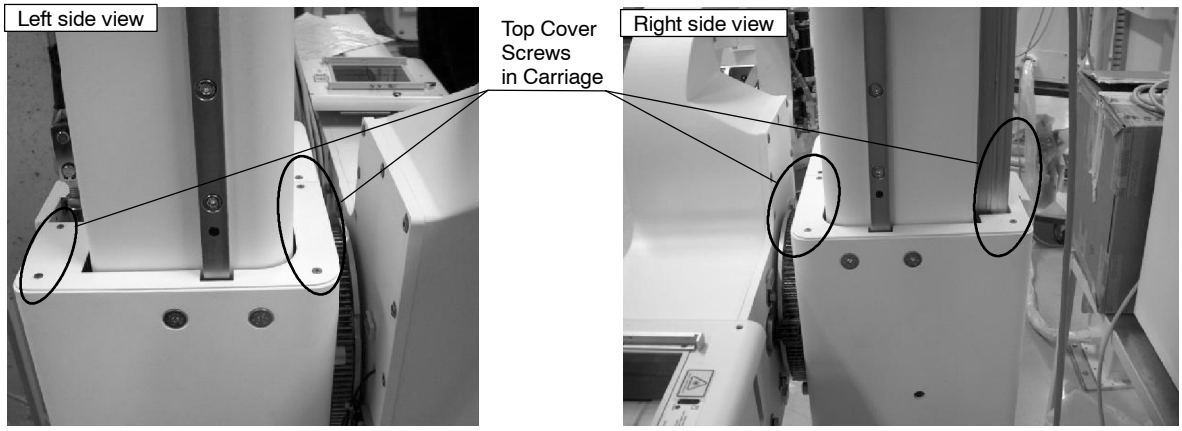
PARTS : Kit Strain Gauge

PROCEDURE

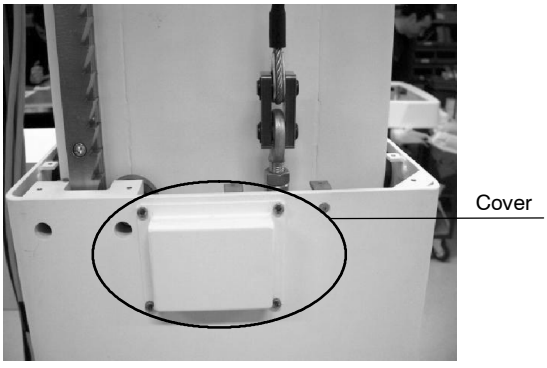
1. Place the Arm in undertable position in order to be able to insert the Safety Locking Rod, it may be necessary to enter in Free move to perform this action, for that , enter Service Mode. Press and hold *"Positioning"* Button for 3 seconds and enter password *"2434"*. Press *"Free Move"* button. This mode disables all limitations on range of motion..

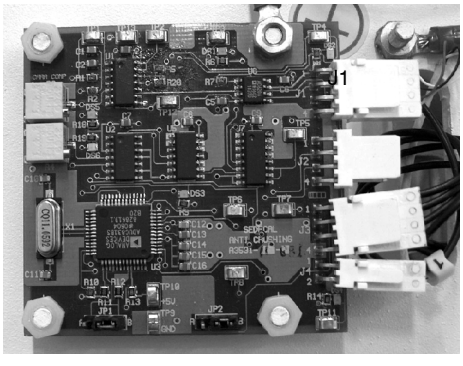


2. Dismount the top covers of the Carriage by removing the countersunk screws.

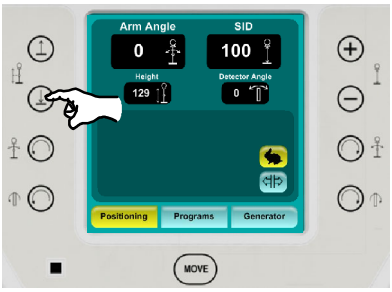


3. Dismount the cover of the Anticrushing PCB by removing the screws on the outside cover. Disconnect the Ground cable and the connector J1 of the Anticrushing PCB.

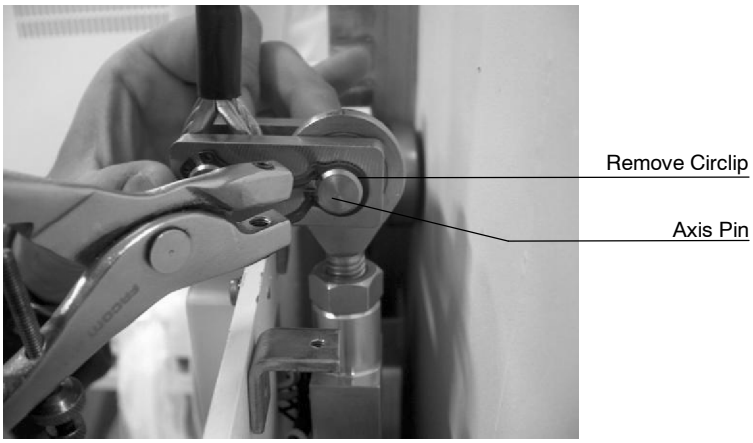




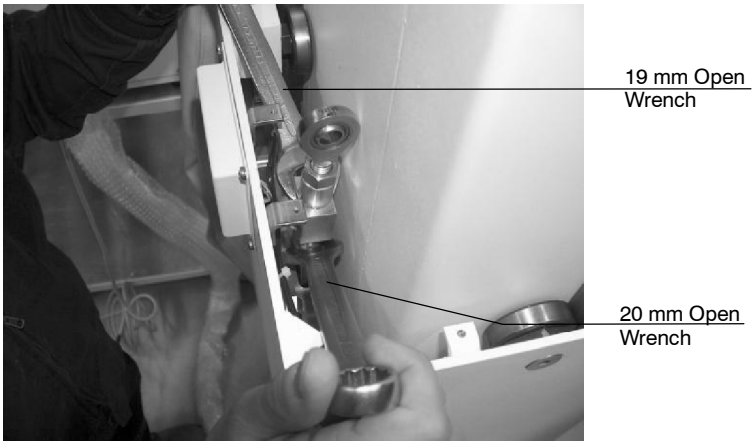
4. With the equipment already in Free Move mode, press the carriage down bottom in order to release tension on the steel cable without any error shown on the display.



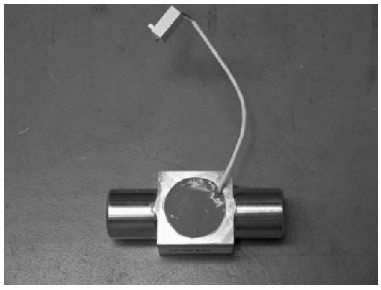
5. On the top of the Strain Gauge Assembly, dismount the security washer (circlip), remove the axis pin and remove the steel cable support from the Strain Gauge Assembly.



6. Remove the lower nut with a fixed wrench of 19mm into the nut and with another one of 20 mm to the body of the strain gauge.



7. Replace the Strain Gauge and mount everything back in reverse order



JOB CARD 1.25 : REPLACEMENT OF STRAIN GAUGE MICROSWITCH

SUBASSEMBLY : CARRIAGE ASSEMBLY

TOOLS : Standard Service Tool Kit

PERSONNEL : 1 Service Engineers

PARTS : Kit Strain Gauge

PROCEDURE

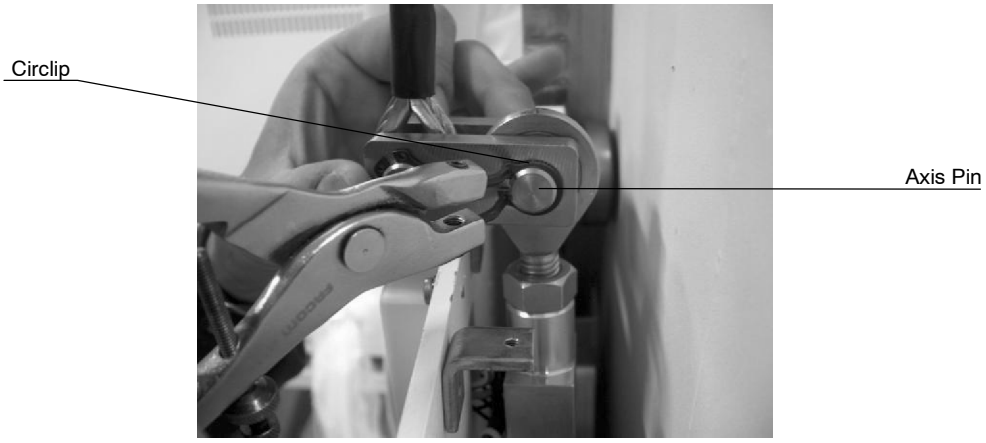
1. Power up the System.
2. Enter in Service > Free Move mode

Note ☞ *Free Move Mode will override the software movement limits to rotate the U-arm.*

3. Place the arm in undertable position with the carriage in the middle position.
4. Insert the Safety Locking Rod.;
5. Dismount the top and Bottom covers of the Carriage by removing the countersunk screws.

6. Dismount the cover of the Anticrushing PCB by removing the screws on the outside cover.
7. Disconnect the ground cable and the connector J1 of the Anticrushing PCB.
8. With the Unit already in Free Move press the carriage down bottom in order to release tension on the steel cable without any error shown on the display.

9. On the top of the Strain Gauge Assembly, dismount the security washer (circlip).

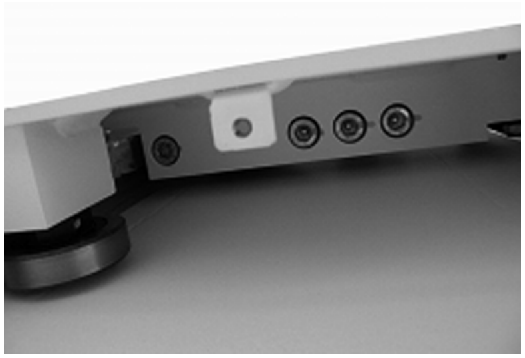


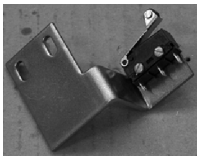
10. Remove the axis pin.

11. Remove the steel cable support from the Strain Gauge Assembly.

12. Remove the lower nut with a fixed wrench of 19mm for the nut and use a 20 mm fixed wrench for the body of the strain gauge.

13. Remove the four fixing screws of the Vertical movement Safety System and pick the assembly from the upper side.





14. Replace the Microswitch and mount everything back follow the steps in reverse order .

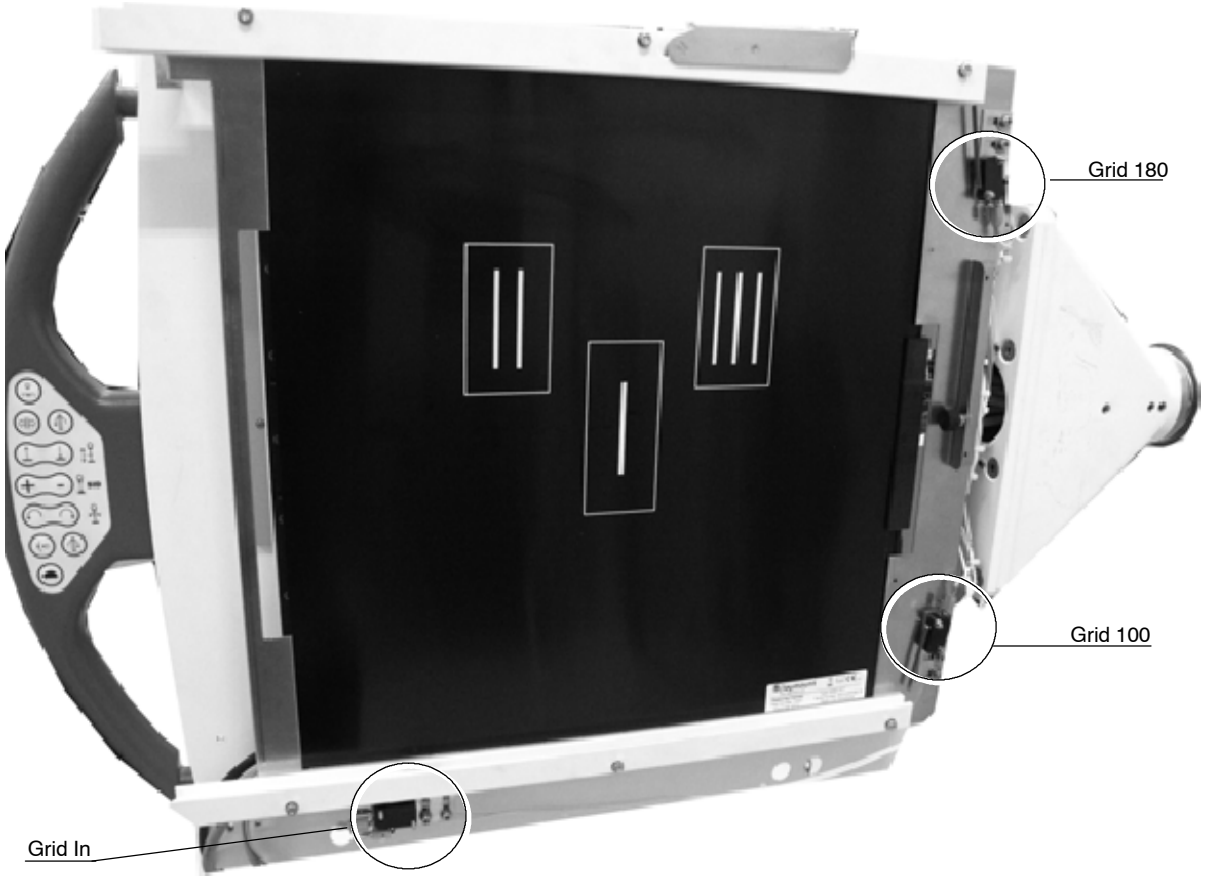
JOB CARD 1.26 : REPLACEMENT OF SWITCHES: GRID SWITCHES

SUBASSEMBLY : RECEPTOR ASSEMBLY.

TOOLS : Standard Service Tool Kit.

PROCEDURE

1. Turn the unit OFF.
2. Remove the front and back covers of the Receptor Assembly.
3. Remove the defective switch (Grid In / Grid 180 or Grid 100). Take note of the connections.
4. Install the new switch.
5. Reinstall the cover front and back covers of the Receptor Assembly.



JOB CARD 1.27 : REPLACEMENT OF INCLINOMETER PCB

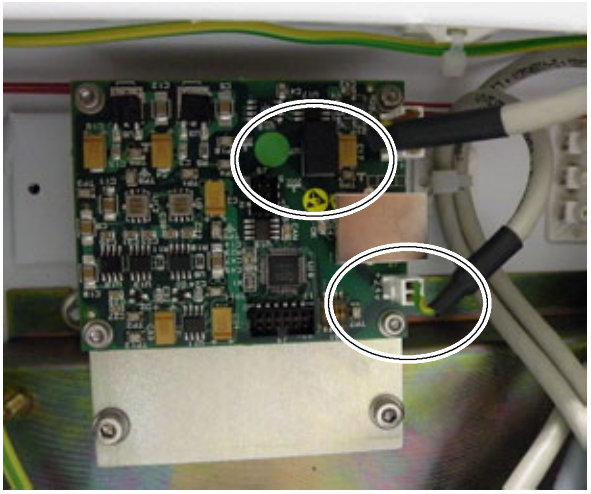
SUBASSEMBLY : ARM ASSEMBLY

TOOLS : Standard Service Tool Kit

PROCEDURE

1. Place the Arm in Thorax Position and turn the System off.
2. Remove the Control Board Cover (4 Allen Screws).
3. Remove the back plate cover behind the Control PCB in order to gain access to the Inclinometer PCB.

4. Disconnect both connectors (J1 & J3) attached to the Inclinometer PCB.



5. Replace the Inclinometer PCB.
6. Reconnect the connectors previously disconnected in the Inclinometer PCB.
7. Reinstall the unit arm in reverse order.
8. Turn the System On and check the arm positioned in different angles. If necessary perform the Arm Angle Calibration process as described in this Service Manual.

JOB CARD 1.28 : REPLACEMENT OF THE EMC CABLE SHIELD

SUBASSEMBLY : CABLE NETWORK

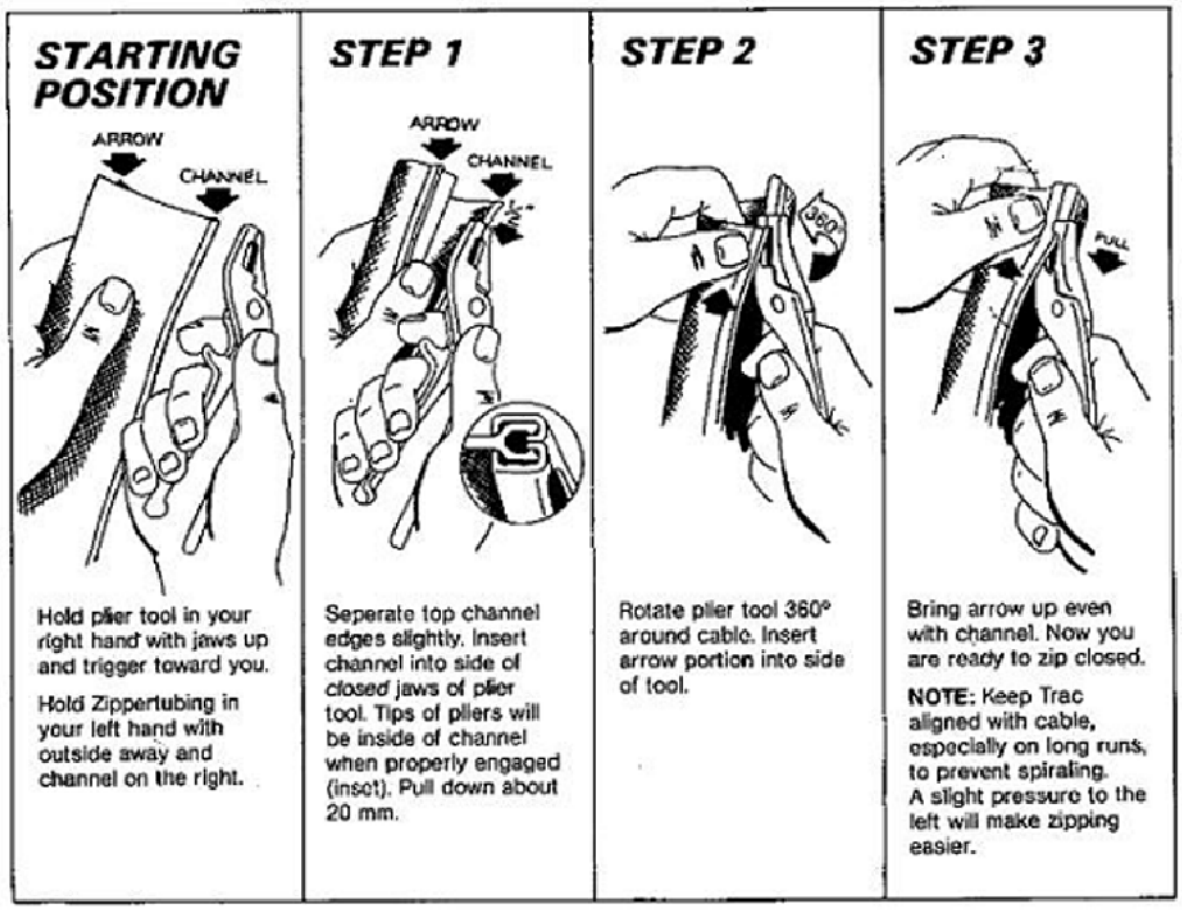
TOOLS : Standard Service Tool Kit, EMI Shield Mounting Tool (A520168-01), tie wraps (different sizes, Standard ladder).

PERSONNEL : 1 Service Engineer

PROCEDURE

1. Remove the external cable cover of the target shield.
2. Remove the tie wraps - factory installed in the Shield. Remember the position.
3. Remove the old Shield - (just open by hand one channel end and remove it).
4. Follow instructions in illustration for installation.

Illustration 7-3
Cable Shield installation



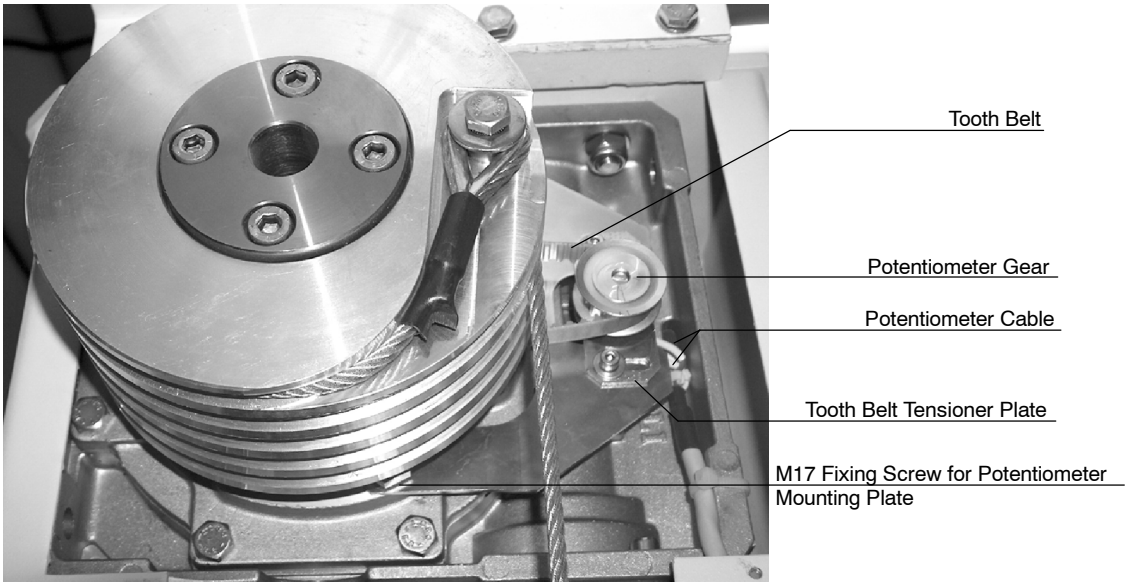
JOB CARD 2.1 : ADJUSTMENT OF THE HEIGHT POTENTIOMETER

SUBASSEMBLY : HEIGHT MOTOR ASSEMBLY (COLUMN UPPER PART)

TOOLS : Standard Service Tool Kit

PROCEDURE

1. Power on the Unit and position the Arm so that the carriage is at the middle height of the total travel (typically 105 cm from the center of the carriage to the floor).
2. Power Unit down.



3. Remove the upper back cover of the Column.
4. Release the Tensioner Plate and disengage the Tooth Belt from from the Potentiometer Gear.
5. Power on the Unit and place the Carriage at middle travel. Then set the Potentiometer shaft in its middle way, that is, five turns. Another way is to connect a multimeter (volts) in the potentiometer contacts and move the potentiometer shaft to 2.5 Volts.
6. Place the tooth belt over the Gear and place the Mounting Plate to its final position. The belt should be straightened by hand without any pressure at all. The idea is to have the belt straightened enough so the teeth will stay in place but a little bit loose so the pot will not be pulled and consequently damaged. It would be better to leave it a little bit loose than tighten. Normally if you place some normal manual (finger) pressure in the middle of the belt ,it should bend around 2 to 3 mm. For fine positioning use the Tensioner Plate Screws, do not forget to tighten them when in place.
7. Calibrate maximum, half and minimum height, for that, follow procedures in this manual. When calibrating, the potentiometer readout (it appears during the calibration process after pressing store button, the displays shows “OK” and then the potentiometer readout) for minimum height should not be lower than 200 and for maximum height should not be higher than 800. If everything is well adjusted the value for half height should be around to 500. If the values are not within the limits, repeat step 3 and turn the potentiometer shaft to increase or decrease all these values.
8. Reinstall the upper back cover.

JOB CARD 2.2 : ADJUSTMENT OF THE SID POTENTIOMETER

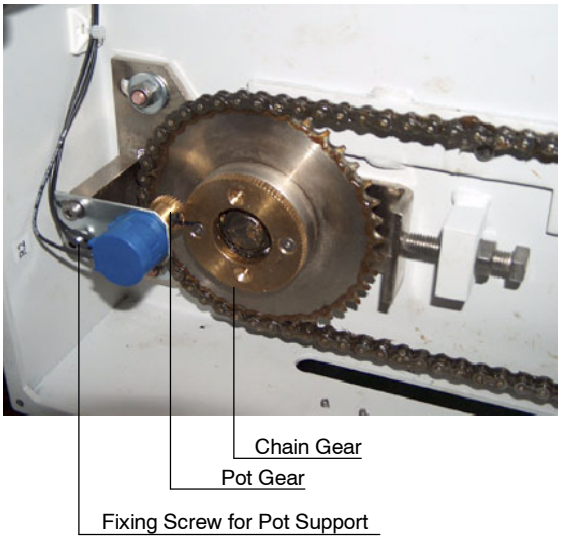
SUBASSEMBLY : SID MOTOR ASSEMBLY (ARM)

TOOLS : Standard Service Tool Kit.

PROCEDURE

1. Place the system so that the tube carriage is at the middle of the total travel of the SID.
2. Power system down.
3. Remove the Arm Back Cover.

SID Potentiometer Standard Version



4. Set the Pot (both pots if system with auto-collimation) in the middle position, that is five turns. One can also power up the machine and adjust the voltage at the pot's shaft 2.5 Volts.
5. Place the pot support so that the pot's gear are in touch with the chain gear, do not apply force, they should be just touching, enough for the movement to be transmitted to the Pot (make sure that you keep the pot at its middle position).
6. Tighten the screws fixing the support.
7. Reinstall the Arm Back cover.
8. Start up the system and recalibrate the SID.

JOB CARD 2.3 : ADJUSTMENT OF THE SWIVEL ARM BALANCE IN HORIZONTAL POSITION

SUBASSEMBLY : ARM ASSEMBLY

TOOLS : Standard Service Tool Kit

PROCEDURE

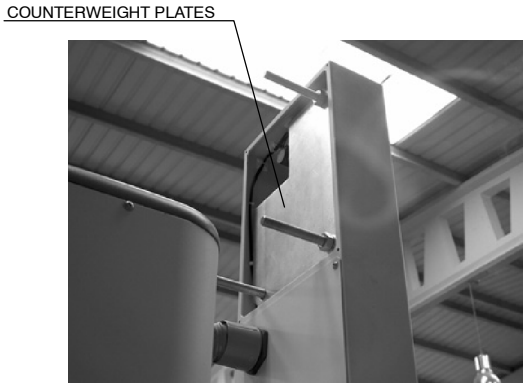
Note ☞ *This section only applies to systems where the X-ray Tube or the Collimator has to be replaced by a new different X-ray Tube or Collimator with different weight.*

1. Turn the unit ON. Place the Swivel Arm in horizontal position and open SID at maximum meters.
2. Press the "*Rotation*" button and check that the Swivel Arm is balanced, that is, the Swivel Arm should not tilt in any direction without force applied at any point.

   If the Swivel Arm is correctly balanced, check the next section. If not, perform the following steps:

   a. Remove the end cover of the Arm.

   b. Install or remove the Counterweight Plates required to balance the Swivel Arm, so that the Tube-Collimator Assembly end weights the same than the Detector Assembly end. Re-install the Top Cover.



JOB CARD 2.4 : ADJUSTMENT OF SENSITIVITY IN THE ANTUCRUSHING PCB - “Collision” message

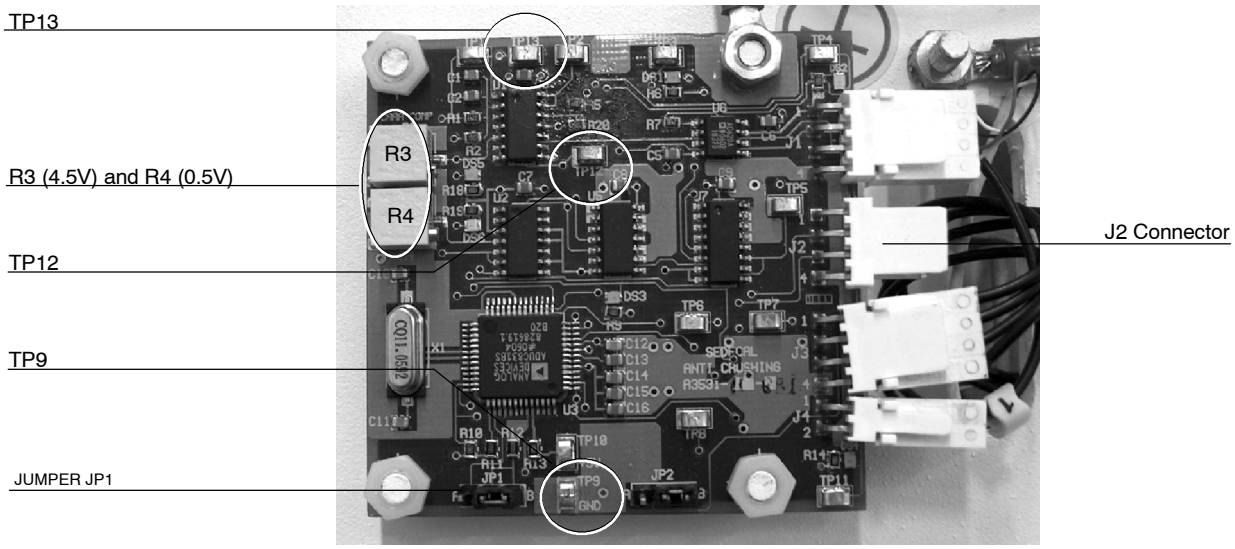
SUBASSEMBLY : CARRIAGE ASSEMBLY

TOOLS : Standard Service Tool Kit

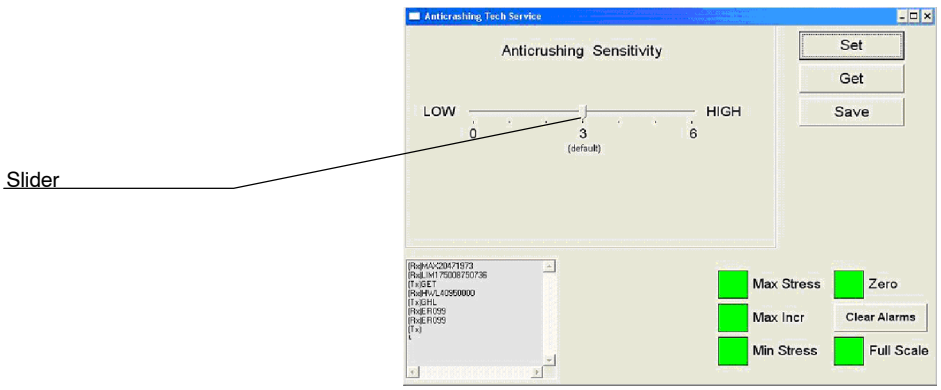
PROCEDURE

Note ☞ *This section only applies to systems where the “COLLISION“ message appears frequently on screen or when the Unit does not lock motion when pushing the Arm.*

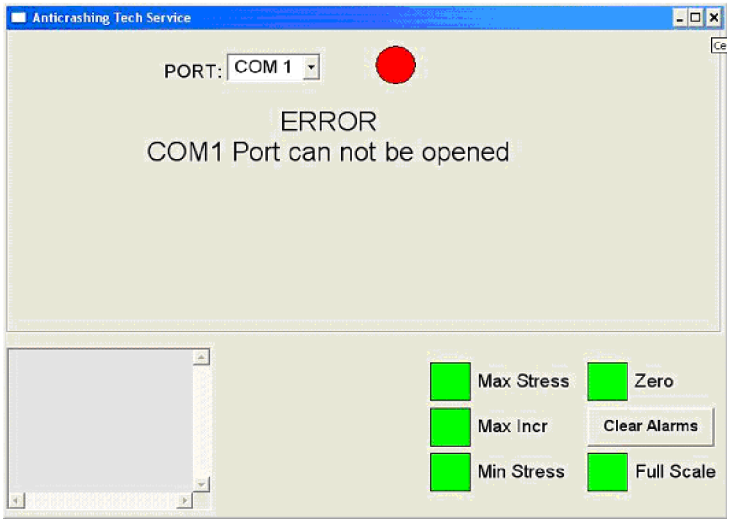
1. Remove the cover of the Anticrushing PCB located at the Arm Carriage (back of the column).
2. Measure with a multimeter between TP12 and TP9 (GND) and adjust **4.5V** with a flat screwdriver in **R3.**
3. Then measure with a multimeter between TP13 and TP9 (GND) and adjust **0.5V** with a flat screwdriver in **R4**.



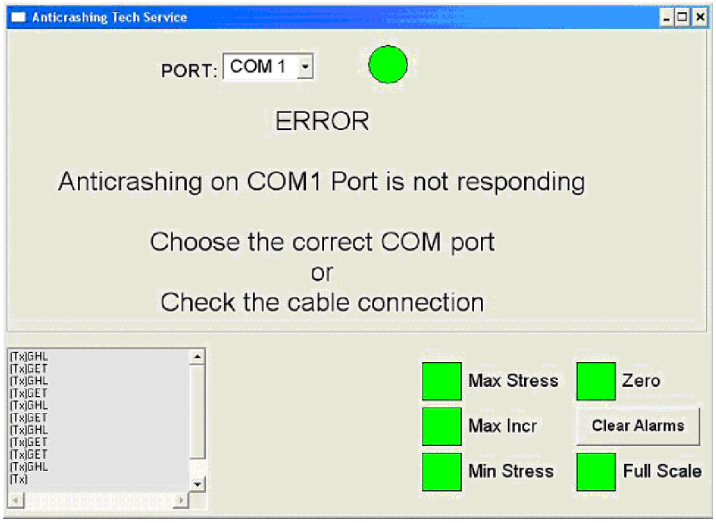
4. Then connect a Laptop (COM1) in the J2 connector of the Anticrushing PCB with the cable supplied (A8441-01) for software update and start the program “anticrushingtechservice.exe”.



5. Move the slider down one step (to position “2”) to decrease the sensitivity level.
6. Press “Save” and try with different positions of the arm, if the “Collision” message appears again (or the square in the screen turns red), move down the slider one step, press save and try again in different positions.
7. In case the message *“COM port cannot be opened”* appears on screen, close ”AnticrushingTechServXPLUS.exe” application, then close any application that could be using COM1 port and start “AnticrushingTechServXPLUS.exe” again.



8. In case the message *“Anticrashing is not responding”* ,this message appears when any other port than COM1 is in use or the crossed serial cable is not connected or the Anticrushing PCB power supply is off, then select the appropriate COM port and the application will re-connect automatically.



9. Check that the Jumper JP1 is in “B” position (Standard Mode).

JOB CARD 2.5 : SOFTWARE UPDATE IN ANTICRUSHING PCB

SUBASSEMBLY : CARRIAGE ASSEMBLY

TOOLS : Special Serial Cable RS232 (included in the Unit) . PC (Laptop) with RS232 serial port. Program "*Anticrusing_Dwnld_installer.exe* ", new Software version (.hex file to load software in the board supplied by the manufacturer).

PROCEDURE

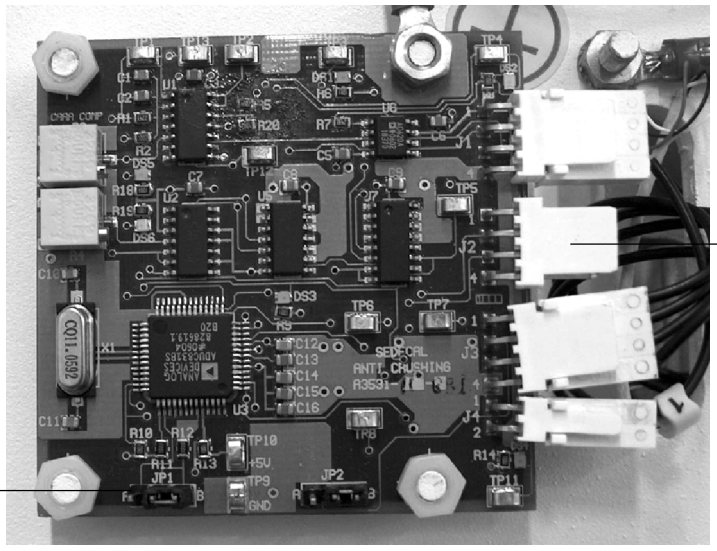
1. Install the *Anticrusing_Dwnld_installer.exe* software using the default path. At the end, it is important to restart the Lap top computer.

2. Remove the cover of the Anticrushing PCB located at the Arm Carriage (back of the column).

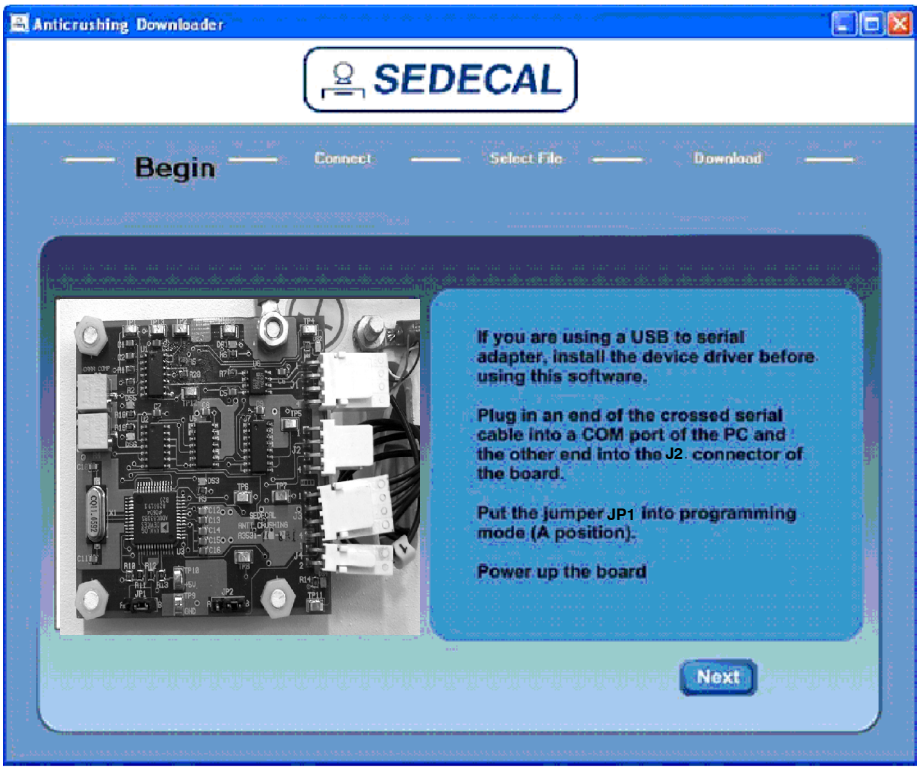
3. Place the Jumper JP1 in "A" position (Software update mode).

4. Turn ON the Positioner.

5. Then connect a Laptop (COM1) in the J2 connector of the Anticrushing PCB with the cable supplied (A8441-01) for software update.

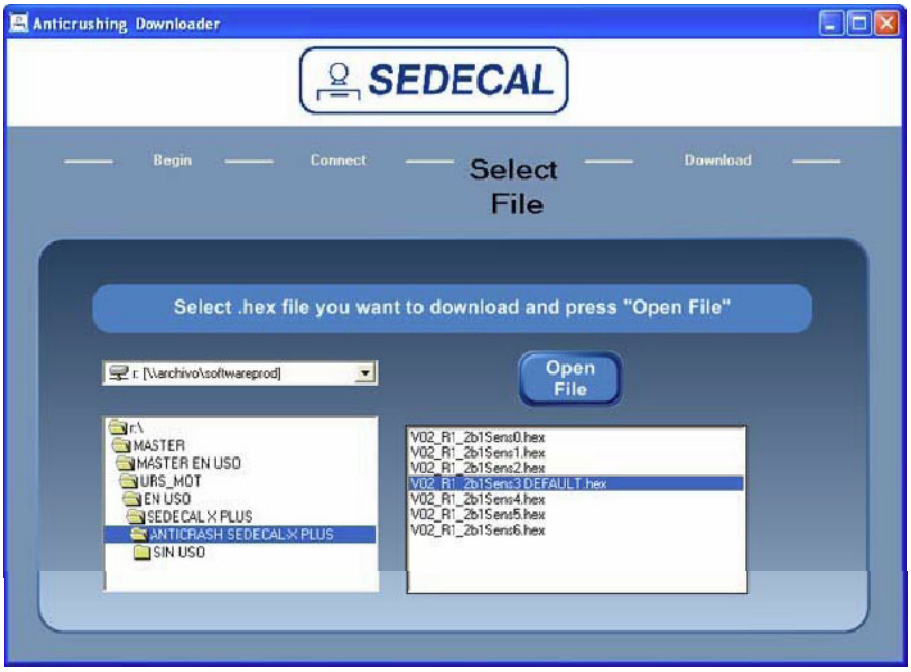


6. Run the program, the software program is self guided.



7. Once connected, and Jumper in A position press “Next”.

8. Select the Port and press “Connect”. In case that the program is not able to perform the connection refer to end of this Job Card.
9. Select the supplied .hex file and press “Open File”.



10. Make sure that the selected file is the correct one and press on “Download”. While the downloading is in progress do not abort the process as the PCB can be damaged. If the selected file is not correct, press “Prev” to go back to the previous screen.

11. Once the download is finished, disconnect the PCB from the Laptop.

12. When pressing “Connect”, the following message may appear:

13. Please check the following:

- Check the Com port where the cable was connected in the PC. It must coincide with the Com port selected in the program.
- Check that Jumper JP1 is A position.
- Check the 5 Volts supply in the Anticrushing PCB.
- Check the cable.

JOB CARD 2.6 : CAM ADJUSTMENT - HEIGHT / SID

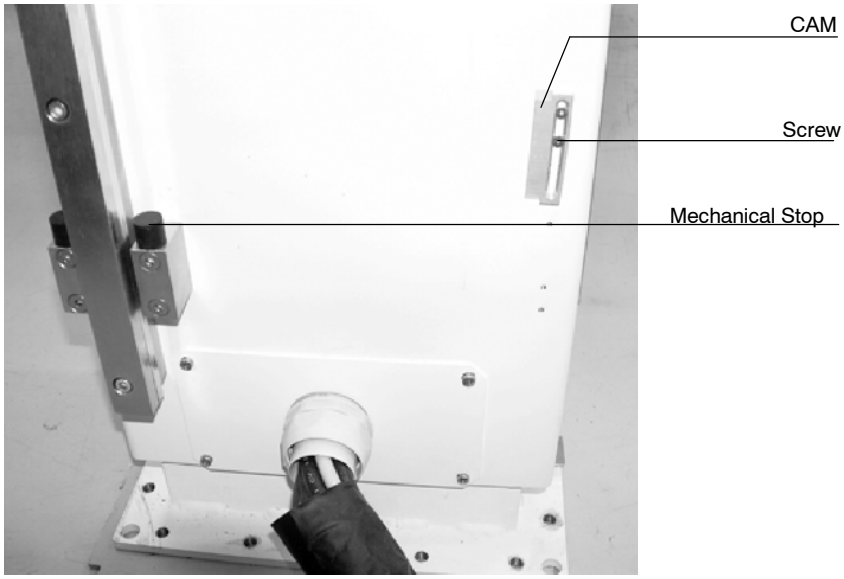
SUBASSEMBLY : COLUMN / ARM ASSEMBLIES

TOOLS : Standard Service Tool Kit

PROCEDURE

Note ☞ *This section only applies to systems where the range of the Limit Switch has to be incremented or reduced. For that, modify the position of the corresponding Cam.*

1. Position the Arm at a position where the corresponding Cam can be seen.
2. Loosen the allen (2) screws.
3. Move the Cam and tighten the allen screws.



4. Once modified the position of the Cam, enter in Free Move mode and carefully check that the switch is activated before the mechanical stop, if not so, move again the position of the Cam in order to avoid the mechanical stop to act.

JOB CARD 2.7 : EMBEDDED PC BIOS CONFIGURATION AND TOUCH SENSOR CALIBRATION

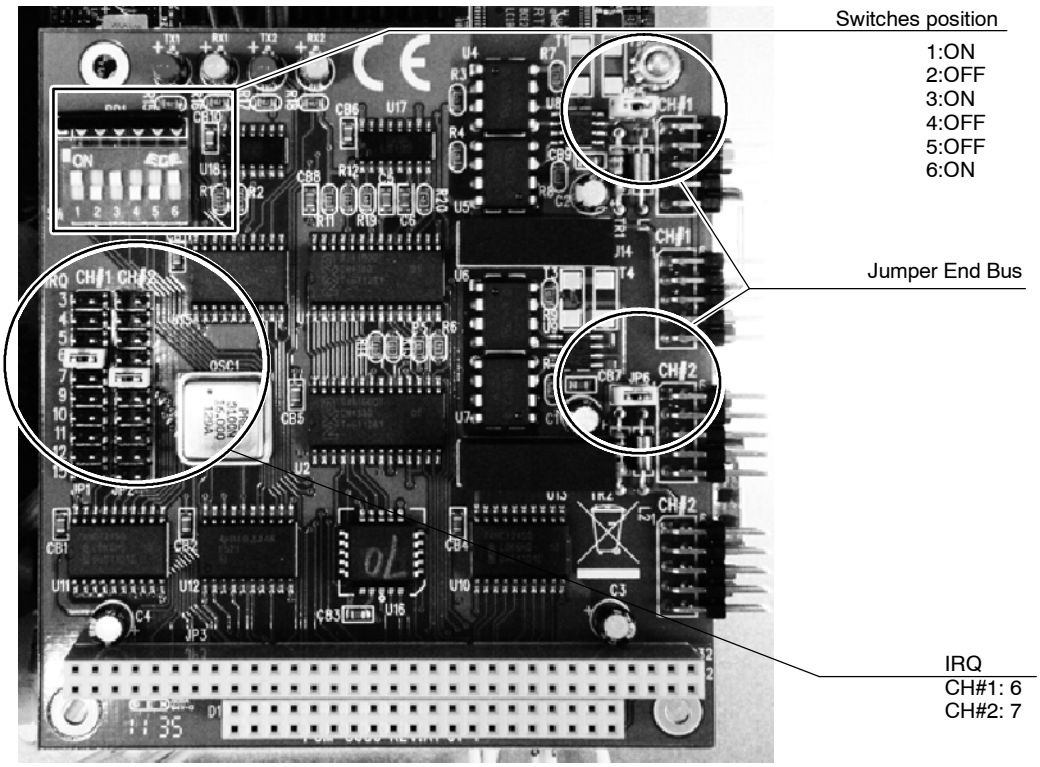
SUBASSEMBLY : Tube Collimator Assembly.

TOOLS : Standard Service Tool Kit.

PROCEDURE

Note ☞ *This section only applies to systems where the Embedded PC has **does not have or have lost** the Bios configuration.*

1. Check the Switches and Jumpers position in the PCB.

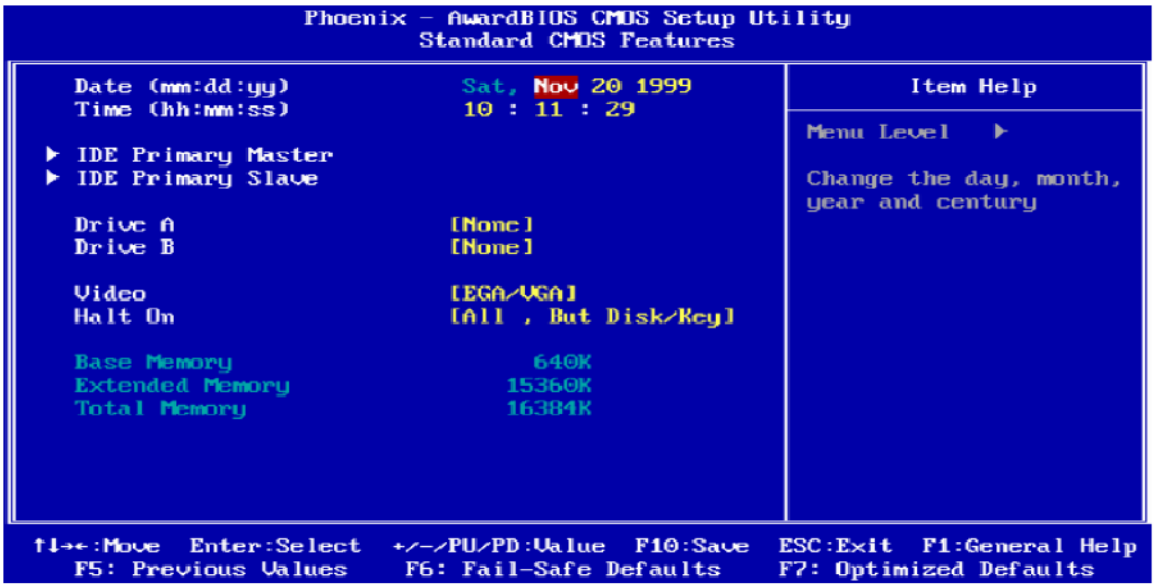


2. Connect the System, insert the Compact Flash and connect a Keyboard and mouse in the PC splitter.
3. Turn the System ON and Press “Del” in the keyboard to enter in the BIOS configuration.

4. Use the **data displayed in the tables** of the illustration to configure the BIOS. The Screens are displayed only as an aid. Do not forget to save before exit.

USE THE TABLES BELOW TO CONFIGURE THE BIOS

STANDARD CMOS FEATURES:

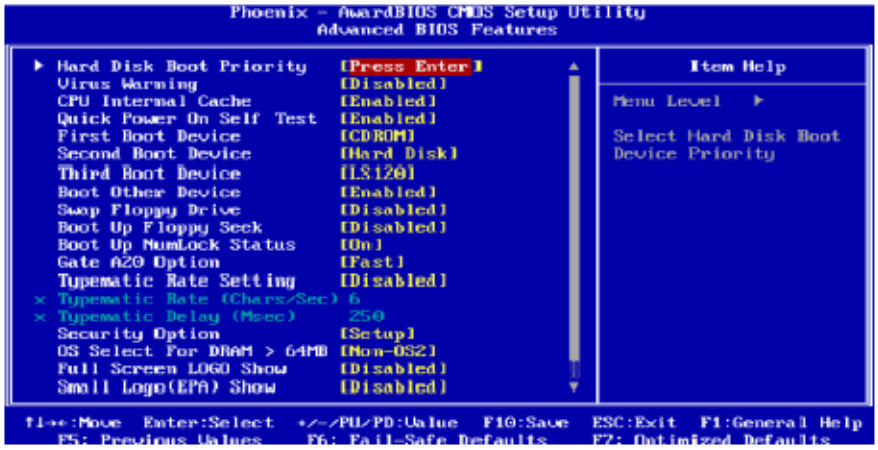


ITEM	ESTATUS	OK
Date	Set Date	√
Time	Set Time	√
IDE Primary Master & Slave	None	√
Drive A & B	None	√
Video	EGA/VGA	√
Halt On	No Errors	√

Continued

USE THE TABLES BELOW TO CONFIGURE THE BIOS

ADVANCED BIOS FEATURES:

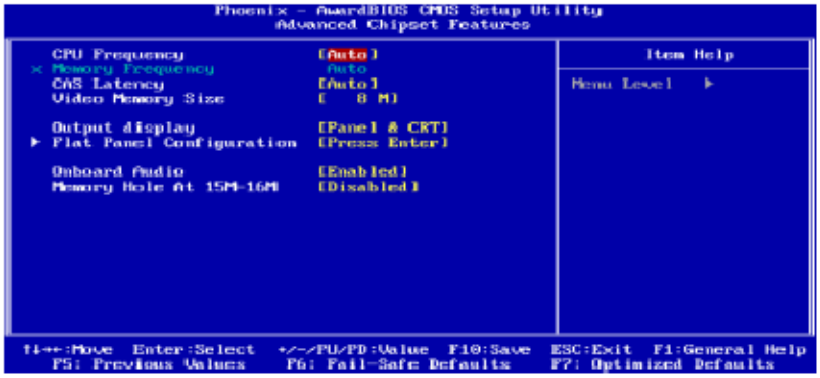


ITEM	STATUS	OK
Hard Disk Boot Priority	Press Intro and Select **Compact Flash**	√
Virus Warning	Disabled	√
CPU Internal Cache	Enabled	√
Quick Power ON Self Test	Enabled	√
First Boot Device	Hard Disk	√
Second Boot Device	Hard Disk	√
Third Boot Device	USB-FDD	√
Boot Other Device	Enabled	√
Swap Floppy Drive	Disabled	√
Boot Up Floppy Seek	Disabled	√
Boot Up NumLock STATUS	On	√
Gate A20 Option	Fast	√
Typematic Rate Setting	Disabled	√
Security Option	Set Up	√
OS Select for DRAM>64MB	NON-OS2	√
FULL Screen LOGO Show	Disabled	√
Small Logo(EPA) Show	Disabled	√
Onboard Lan Boot ROM	Disabled	√

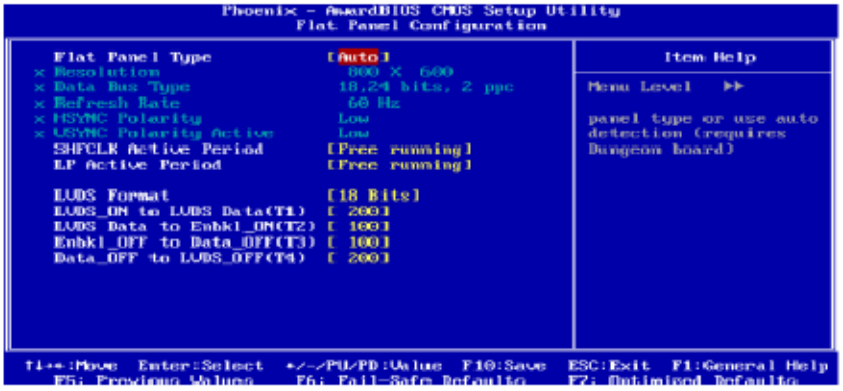
Continued

USE THE TABLES BELOW TO CONFIGURE THE BIOS

ADVANCED CHIPSET FEATURES:



ITEM	STATUS	OK
Clock Determined by	H/W Strapping	√
CAS Latency	Auto	√
Refresh Rate	Auto	√
Memory Latencies	Auto	
Video Memory Size	**128 MB**	√
Output Display	Panel & CRT	√
Flat Panel Configuration	See next page	√
Onboard Audio	Disabled	√
Onboard USB 1.1	Enabled	√
Onboard USB 2.0	Enabled	√
Onboard IDE	Enabled	√
Memory Hole	Disabled	√



ITEM	STATUS	OK
Flat Panel Type	640x480	√
LVDS Format	24 bits	√

Continued

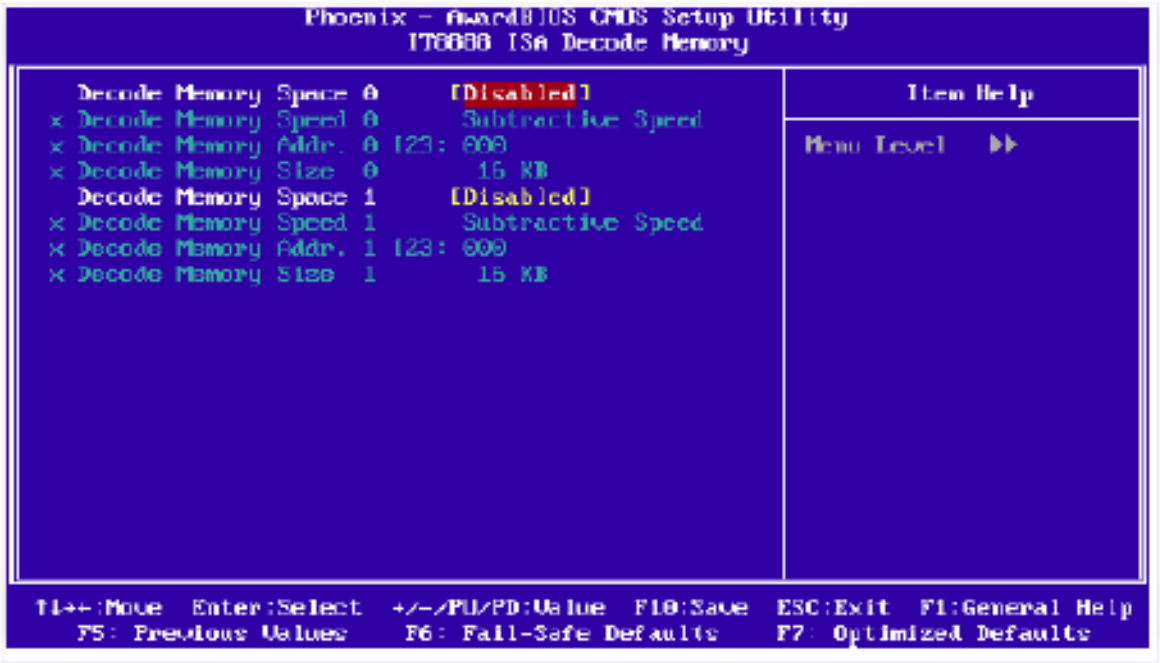
USE THE TABLES BELOW TO CONFIGURE THE BIOS

INTEGRATED PERIPHERALS:

ITEM	STATUS	OK
Master Drive PIO Mode	Auto	√
Slave Drive PIO Mode	Auto	√
IDE Primary Master UDMA	Auto	√
IDE DMA transfer access	Enabled	√
IT8888 ISA Decode IO	Keep	√
IT8888 ISA Decode Memory	See next page	√
IDE HDD Block mode	Enabled	√
Onboard FDC Controller	Disabled	√
Onboard Serial Port 1	3F8/IRQ4	√
Onboard Serial Port 2	2F8/IRQ3	√
UART Mode Select	Normal	√
Onboard Parallel Port	Disabled	√
Watch dog Timer Select	Disabled	√
Onboard Serial Port 3	3E8	√
Serial Port 3 Use IRQ	IRQ 5	√
Onboard Serial Port 4	2E8	√
Serial Port 4 Use IRQ	IRQ10	√

Continued

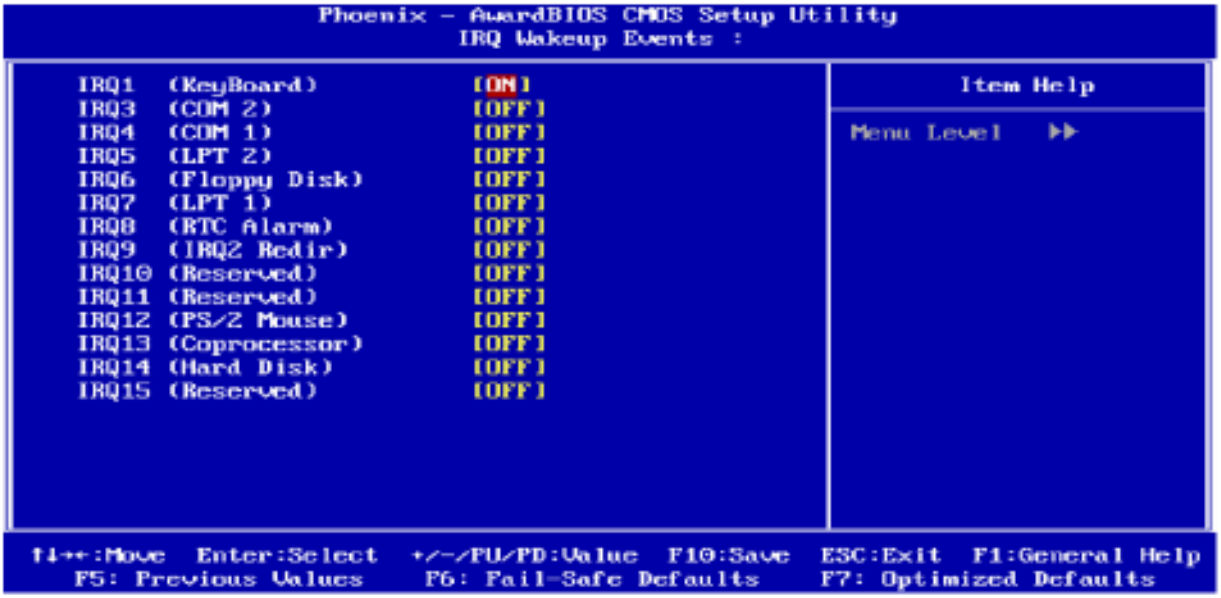
USE THE TABLES BELOW TO CONFIGURE THE BIOS



ITEM	STATUS	OK
Memory Space 0	Enabled	√
Memory Speed 0	Fast Speed	√
Memory Addr. 0 [23:12]	0DA	√
Memory Size 0	16 kB	√
Memory Space 1	Disabled	√
Memory Space 2	Disabled	√
Memory Space 3	Disabled	√

Continued

USE THE TABLES BELOW TO CONFIGURE THE BIOS

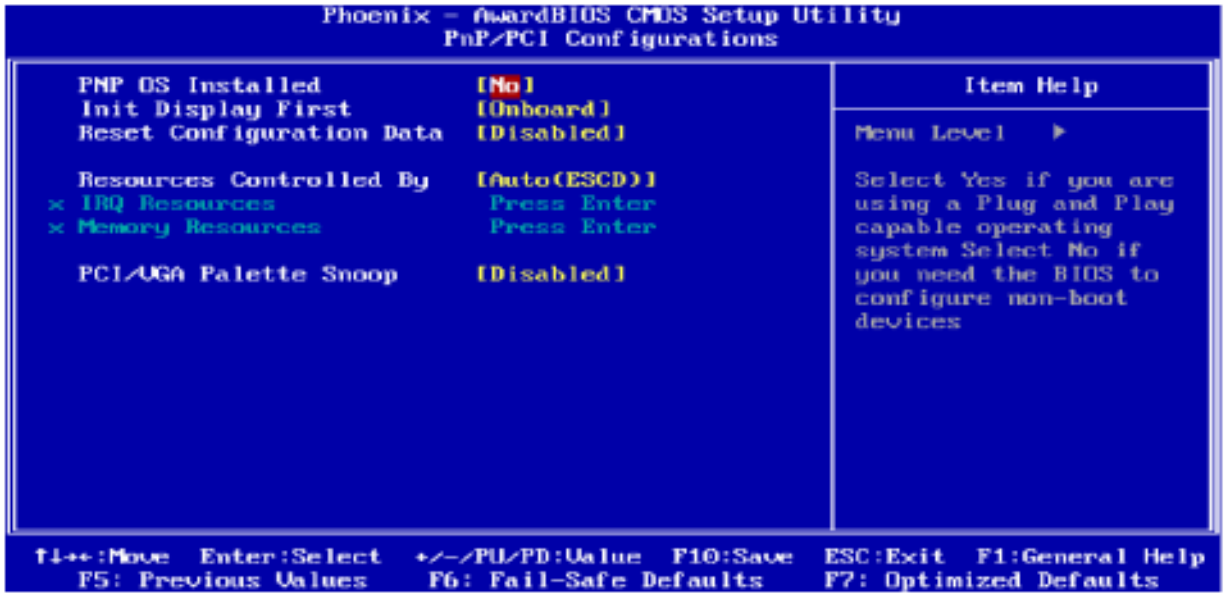


ITEM	STATUS	OK
IRQ1	ON	√
IRQ3	ON	√
IRQ4	ON	√
IRQ5	ON	√
IRQ6	ON	√
IRQ7	ON	√
IRQ8	ON	√
IRQ9	ON	√
IRQ10	ON	√
IRQ11	ON	√
IRQ12	ON	√
IRQ13	ON	√
IRQ14	ON	√
IRQ15	ON	√

Continued

USE THE TABLES BELOW TO CONFIGURE THE BIOS

PNP/PCI CONFIGURATIONS:



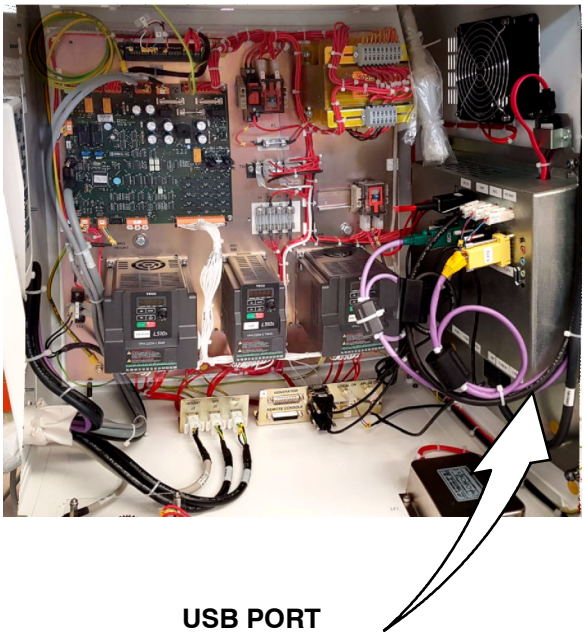
ITEM	STATUS	OK
PNP OS Installed	No	√
INIT Display First	Onboard	√
Resources Controlled by	Manual	√
IRQ Resources	Edit IRQ 7 and marck as "Reserved". Keep the rest.	√
Memory Resources	Keep	√
PCI/VGA Palette Snoop	Disabled	√

Note ☞ *Do not forget to select Save and Exit and press Enter Twice. Then, calibrate the Touch Screen Sensor.*

CALIBRATION OF THE "ELO" TOUCH SCREEN SENSOR

The Sensor of the Touch Screen requires calibration when the buttons cannot be properly selected or when the Compact Flash has been replaced. The steps below should be followed whenever a calibration is required:

1. Turn the U-Arm OFF and connect a Keyboard in the Control Box PC: Use a USB Keyboard connected to a USB Port.



2. Turn the U-Arm ON and press the "*Start-Windows*" button on the keyboard, then select (double-click):
"*Settings / Control Panel / EloTouchscreen*".

3. Execute the "*Align*" program and follow the process touching on the indicated spots.

4. When finished, the Screen is ready for operation.

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SECTION 8 MAINTENANCE

The purpose of this Periodic Maintenance is to guarantee a continue safe performance of the Unit, to increase serviceability, to reduce costs (down time, repairs, etc.) and to assure the safety (personal risk).

The following checks and maintenance procedures, at the suggested intervals, are the manufacturer's recommendation for the most effective Periodic Maintenance schedule for this Unit.

Service tasks here described must be performed exclusively by service personnel specifically trained on medical X-ray Units. The first periodic maintenance service should be performed six (6) months after installation, and the subsequent services at twelve (12) month intervals.

Heavy duty installations (more than125 patients per day) require a regular six (6) month maintenance.

Note ☞ *For parts replacement and adjustments refer to Section 7 Disassembly / Reassembly.*

8.1 GENERAL CLEANING

NEVER ATTEMPT TO CLEAN OR HANDLE ANY PART OF THE UNIT WHEN IT IS ON. SWITCH IT OFF AND DISCONNECT IT FROM THE MAINS BEFORE CLEANING OR INSPECTING.

GENERAL CLEANING	
EXTERNAL SURFACES	Clean external Covers and surfaces frequently, particularly if corroding chemicals are present, with a cloth moistened in warm water with mild soap. Rinse wipe with a cloth moistened in clean water. Do not use cleaners or solvents of any kind.Also check painted surfaces for scratching and touch up as required.
INTERNAL CLEANING	***DANGER: NEVER ATTEMPT TO CLEAN INTERNALLY THE UNIT. THE UNIT MUST BE ALWAYS KEPT SHUT UNLESS A SPECIFIC RENEWAL PART PROCEDURE IS TO BE UNDERTAKEN BY HIGHLY QUALIFIED MAINTENANCE PERSONNEL.***

8.2 ELECTRICAL CHECKS

ELECTRICAL CHECKS	
ELECTRICAL CABLES AND CONNECTIONS	Check that all electrical connections are firm and secure and that all cable clamps and strain reliefs are in place. Also check that connectors do not have any exposed wires and check cable sheaths for wear and fraying. Check that all cables are correctly routed.

8.3 MECHANICAL CHECKS

MECHANICAL CHECKS	
STEEL CABLE	Verify that the steel cable is in good condition and has a uniform appearance. Replace the Cable if any steel wire is damaged. *(Refer to section 8.3.1 "Greasing: Rails, Steel Cable and Pulley" for greasing and Section 7 "Disassemble / Reassemble").*
RAILS	*(Refer to section 8.3.1 "Greasing: Rails, Steel Cable and Pulley" for greasing).* In case of noise during movement, clean and grease again.
FUNCTIONAL CHECKS / ADJUSTMENTS	Perform the following Functional Checks: 1.- Check the proper operation of the button controls located at CRIB, Detector Handle, Positioner Head and Remote Control (optional). 2.- Check travel of the Column Carriage from minimum height to maximum height and viceversa. 3.- Check rotation travel of Arm from minimum angle to maximum angle and viceversa. 4.- Check SID travel of Tube-Collimator from Minimum SID to Maximum SID and viceversa. 5.- Check Rotation travel of Detector from minimum angle to maximum angle and viceversa. 6.- Check Rotation travel of Tube-Collimator from minimum angle to maximum angle and viceversa. 7.- Insert and remove the Grid from its Housing. If necessary perform the respective adjustments of the equipment *(refer to Section 7 "Disassemble / Reassemble".*

8.3.1 GREASING: RAILS, STEEL CABLE AND PULLEY

Note ☞ *Use Multi-purpose Lithium Grease to lubricate the parts covered by this Sub-section.*

RAILS: There are three rails along the Column to support the Swivel Arm vertical movement: left side, right side and back side.

Clean the tracks of the rails before greasing them. Use some sandpaper on the track surface if necessary.

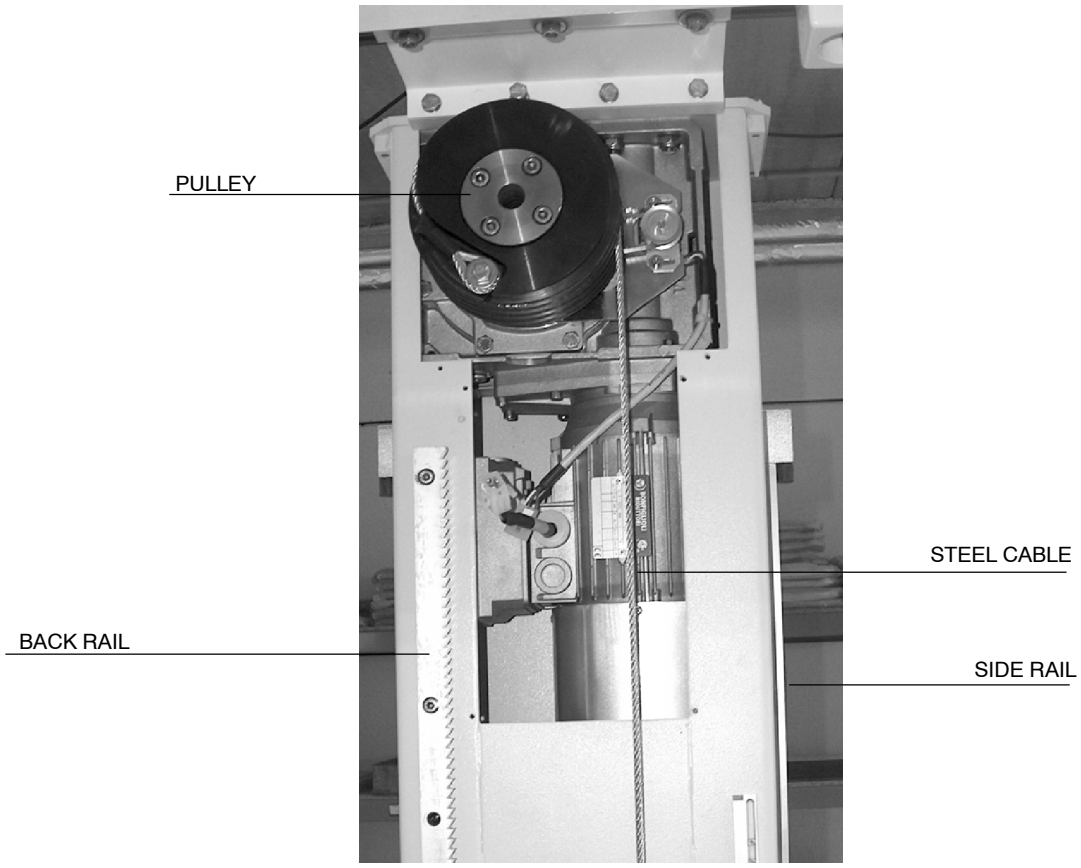
Once the track surfaces are cleaned, apply a thin film of grease using a brush or a piece of paper along the two tracks of the three different rails. The grease must be applied **only on the tracks where the bearings run**. It is recommended to stick some paper tape to the column next to the tracks to prevent dirt in the column.

Do not apply any grease on the side of the rails where the screws are placed. After greasing the tracks, clean this surface of the rail and remove the paper tape.

STEEL CABLE AND PULLEY: Remove the upper back cover of the column and place the swivel arm in the lower position to have the maximum length of the wire rope extended out of the pulley.

Use a piece of cotton or cloth to revise the extended wire. If any small wire is broken the cloth or cotton will stick. If this happens is recommended to replace the steel cable as soon as possible. *(Refer to Section 7 Disassembly / Reassembly).*

Using a piece of paper or cloth, grease the extended wire rope placed on the back of the column allowing grease to saturate the cable. Using a brush, apply the grease to the rest of the cable in the pulley.



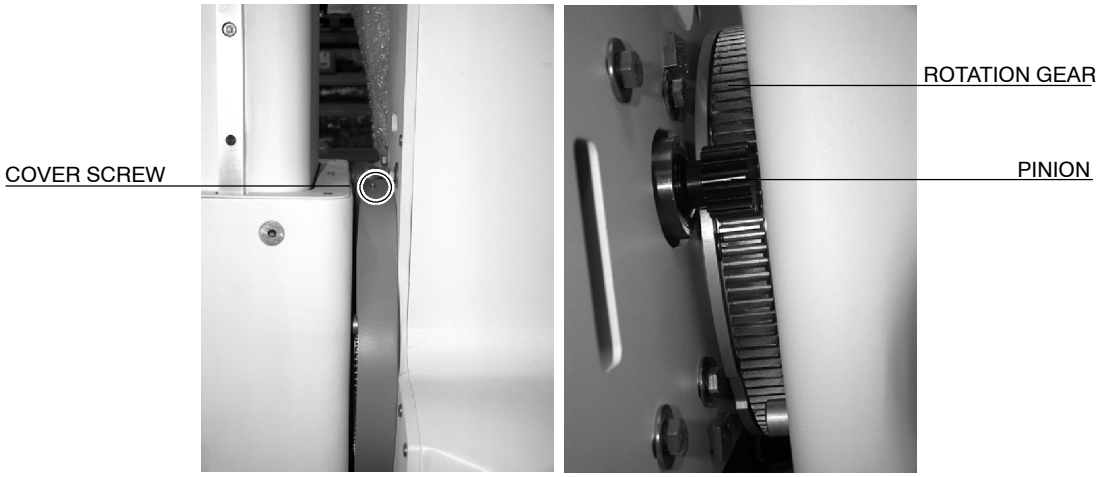
8.3.2 GREASING: ROTATION GEAR AND MOTOR PINION

Note ☞ *Use Multi-purpose Lithium Grease to lubricate the parts covered by this Sub-section.*

Remove the Rotation Gear round cover (two screws at opposite sides).

Remove / clean the old grease of the Gear and the pinion with paper before greasing them.

Apply enough grease to cover all the teeth of the Rotation Gear with a brush or similar. The pinion will be greased by the Rotation Gear.



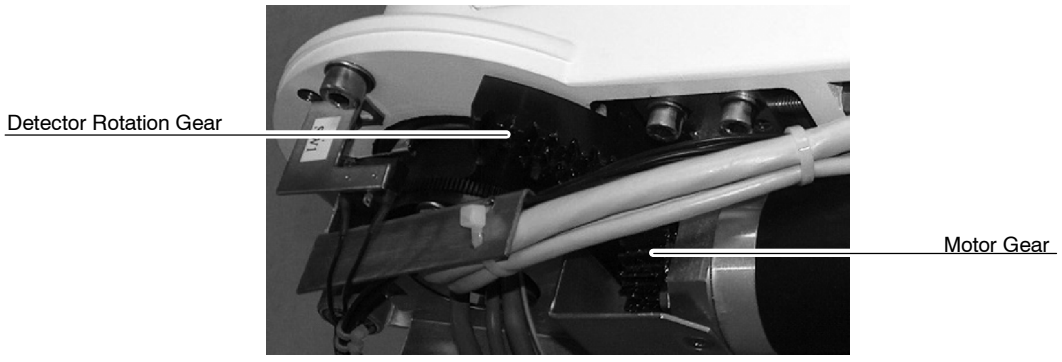
8.3.3 GREASING: DETECTOR ROTATION GEAR

Note ☞ *Use Multi-purpose Lithium Grease to lubricate the parts covered by this Sub-section.*

Remove the Detector Motor Cover.

Remove / clean the old grease of the Detector Rotation Gear and Motor Gear with paper before greasing them.

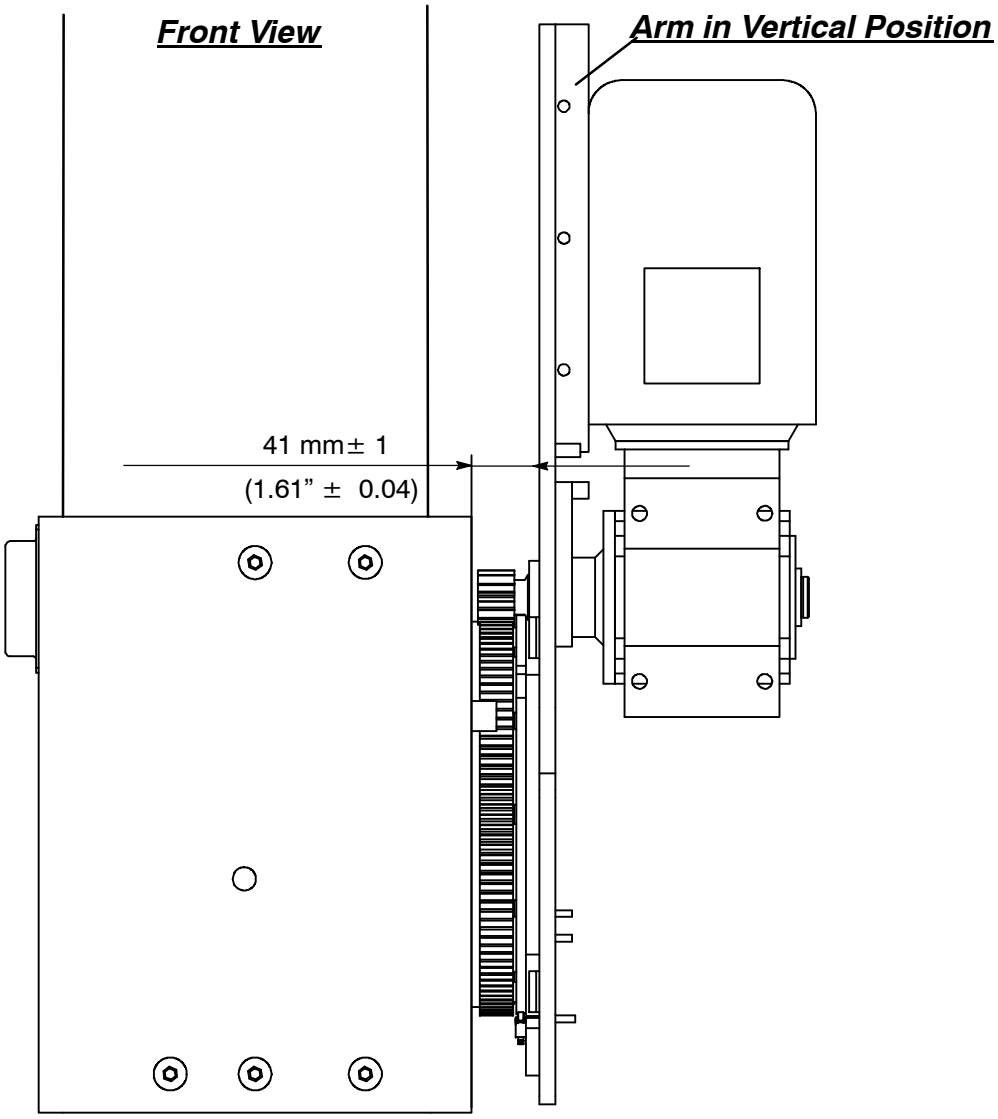
Apply enough grease to cover all the teeth of the Detector Rotation Gear with a brush or similar. The Motor Gear is greased by the Detector Rotation Gear.



8.3.4 CHECKING THE SWIVEL ARM LEANING

1. First check 41 mm ± 1mm between the carriage and the Arm plate as shown in the illustration below.

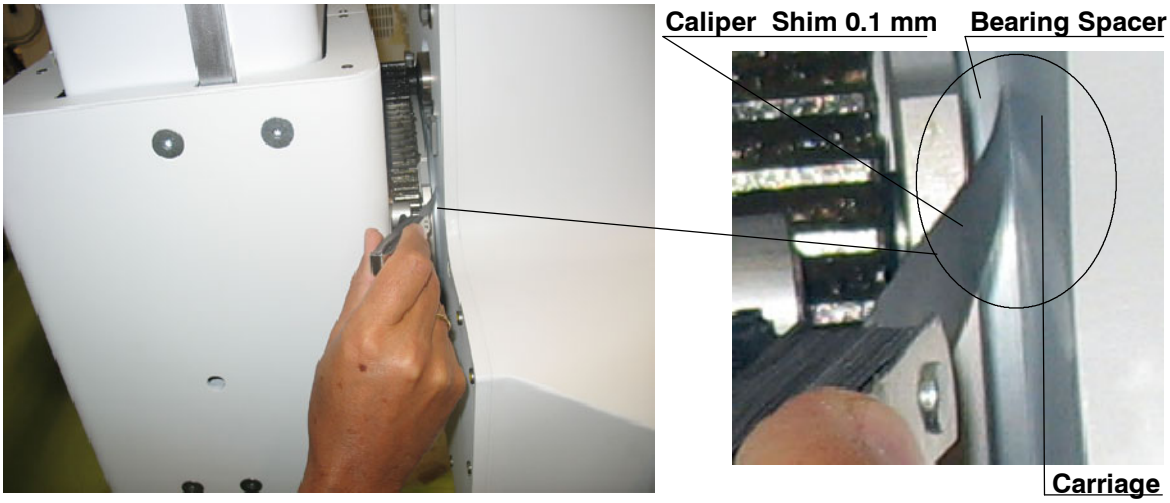
Illustration 8-1
Correct position of Arm



2. If the measurement is not within limits, remove the Round cover of the Rotating Bearing.

3. Try to insert a 0.1 mm caliper shim between the Carriage and the Bearing spacer as shown in the illustration below.

Illustration 8-2
Correct position of Arm



4. Repeat this procedure with the Arm in Vertical position.

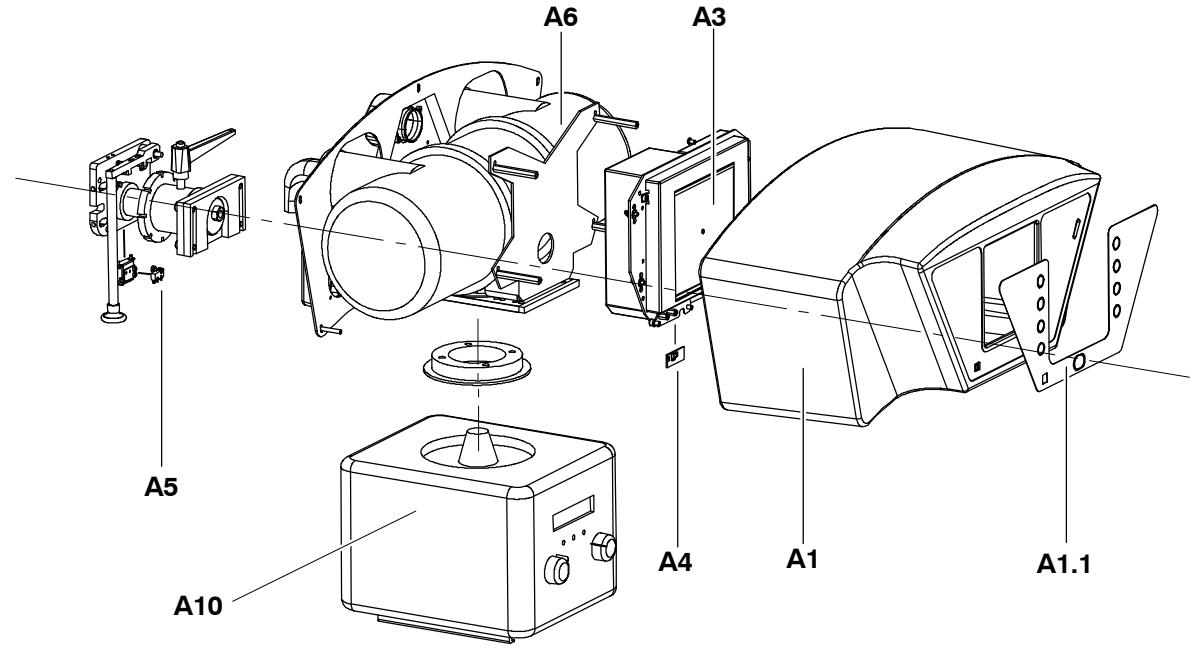
5. If the 0.1 mm caliper shim **can be inserted** between the Carriage and the Bearing spacer, it means that the Bearing screws are loosen: Contact Service Support and ask for the corresponding Service Note.

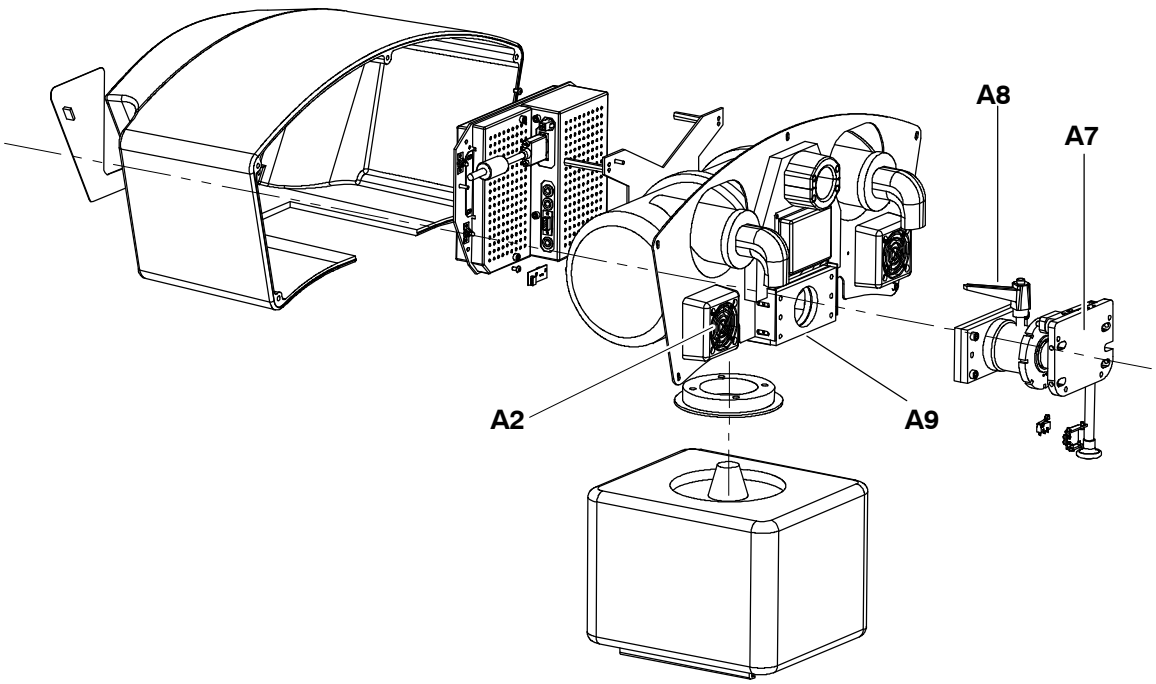
6. If the 0.1 mm caliper shim **can not be inserted** between the Carriage and the Bearing spacer, it means that the the Bearing screws are correct.

SECTION 9 RENEWAL PARTS

Please, include the Serial Number of the Unit in any Purchase Order related to the following Renewal Parts.

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
A0	**U-ARM HEAD**			
A1	TUBE COVER	1	A520187-01	Includes Item A1.1
A1.1	TUBE COVER OVERLAY	1	SAT-10374-03	
A2	KIT FAN	2	SAT-A9721-01	
A3	KIT TFT SCREEN	1	A520265-01	
A4	REMOTE CONTROL RECEPTOR	1	SAT-A3549-01	
A5	KIT MICROSWITCH TUBE HEAD	1	SAT-A520148-01	
A6	X-RAY TUBE: TOSHIBA E7884X	1	6690-33	
	X-RAY TUBE: TOSHIBA E7252X	1	6690-09	
	X-RAY TUBE: TOSHIBA E7254FX	1	6690-28	
	X-RAY TUBE: TOSHIBA E7869XX	1	6690-60	
A7	TUBE HEAD SUPPORT	1	A520169-21	
A8	DETENT LOCK	1	SAT-54402015	(Black plastic handle)
A9	COLLIMATOR CENTERED SWITCH	1	SAT-50605022	
A10	COLLIMATOR	1	SAT-6693-XX	XX= 35 with DAP XX= 41 laser and Bus Can XX= 42 with laser, Bus Can and Filter XX= 43 with DAP and motorized Filter
A10.1	LASER	1	A525147-01	
A10.2	POWER LED	1	A525343-01	
A10.3	KNOB	1	A525158-01	
A10.4	FRONT PANEL	1	A525364-01	
A10.5	RSR 008 PCB	1	A525145-01	
A10.6	RETRACTABLE TAPE	1	A525150-01	
A10.7	TIMER	1	A525344-01	
A10.8	DAP ION CHAMBER	1	6695-55	Optional


A6
A3
A5
A10
A4
A1
A1.1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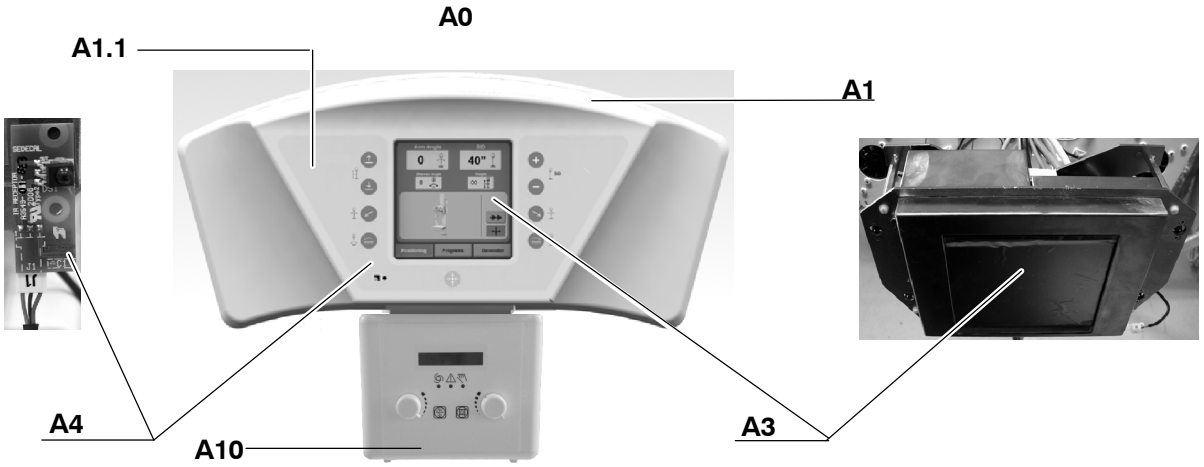
A2
A9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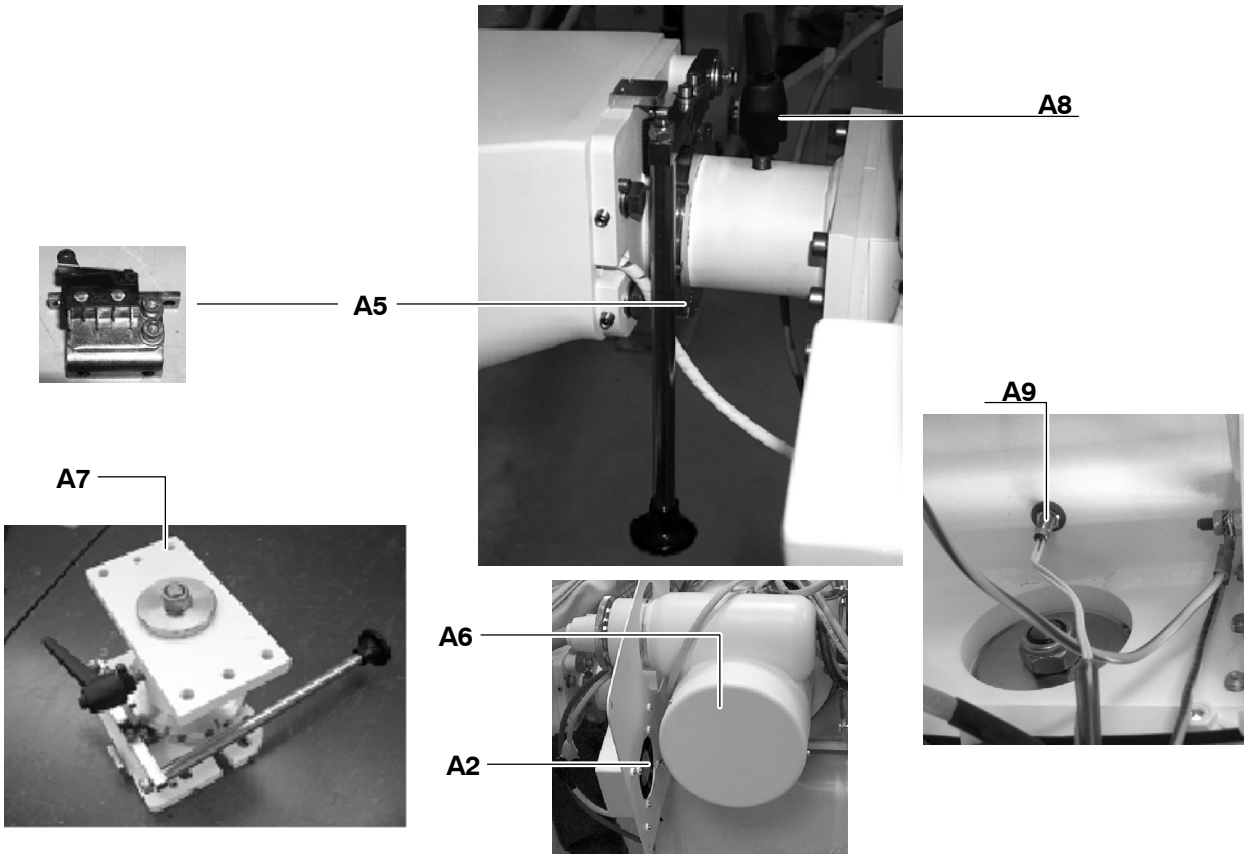
A1.1
A1
A4
A10
A3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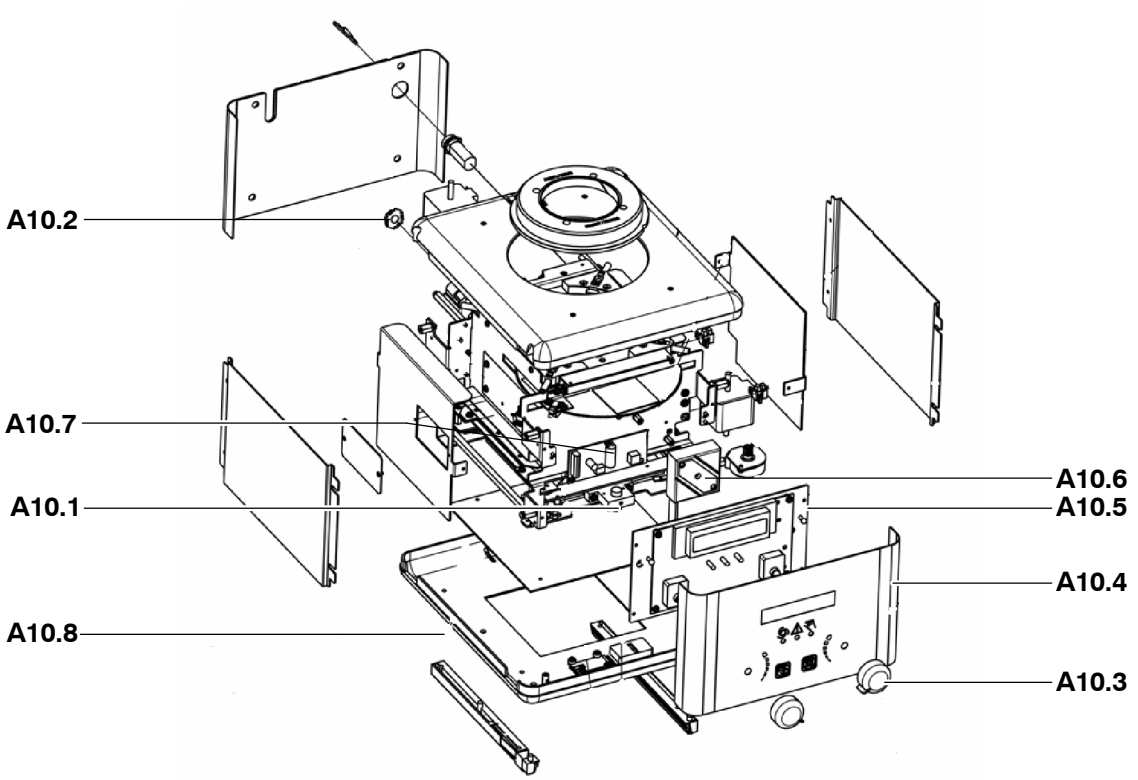
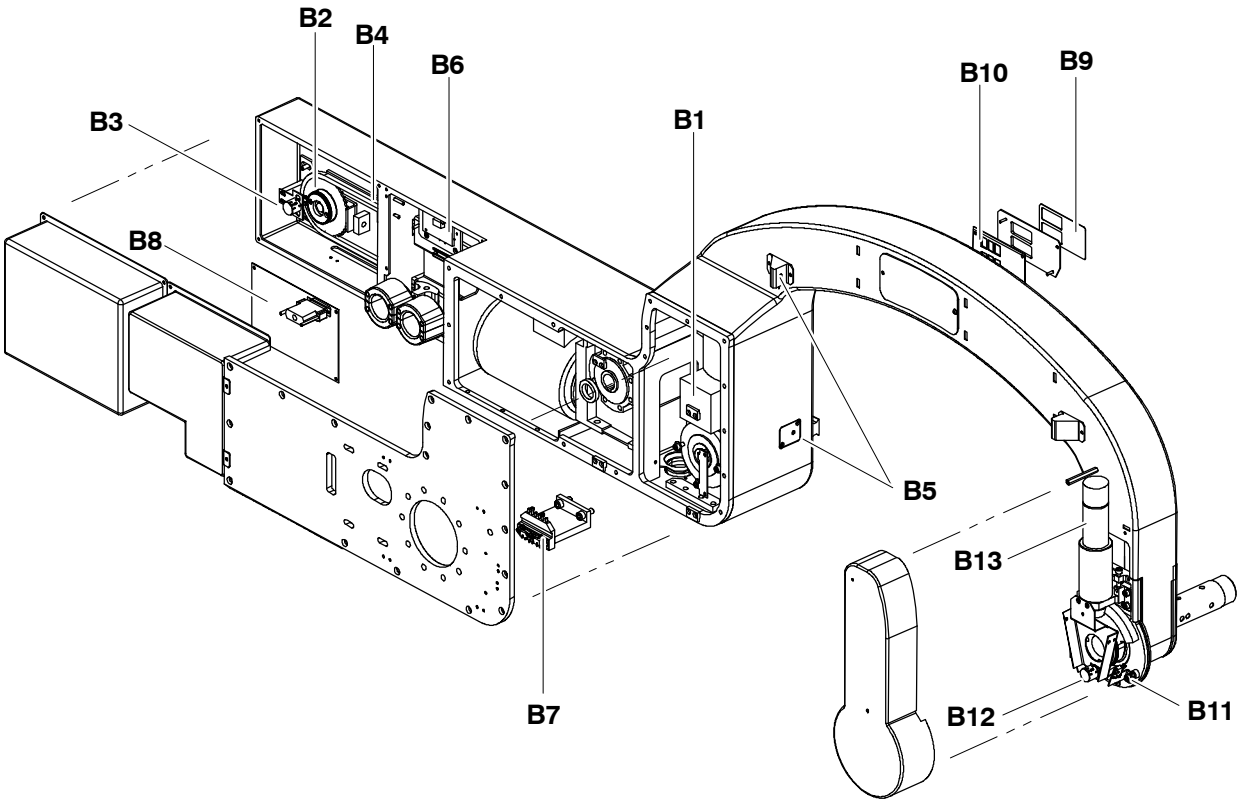
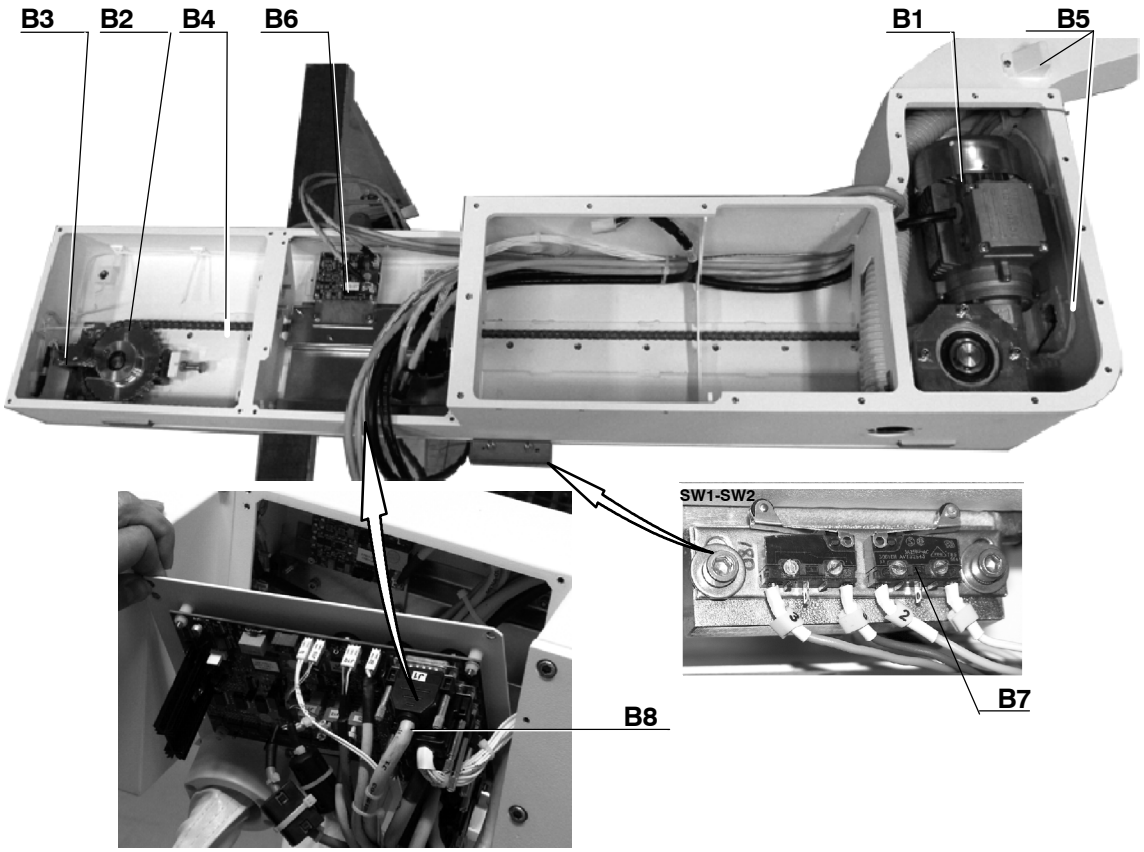
A2

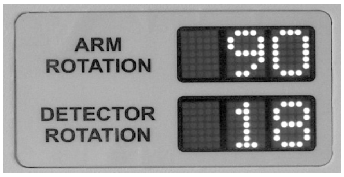
A10



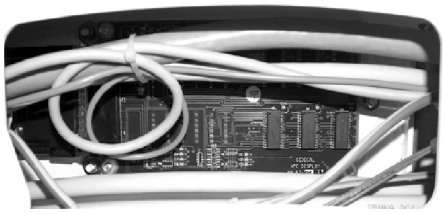
ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
B0	**SWIVEL ARM**			
B1	KIT SID MOTOR	1	A520215-01	
B2	KIT SID CHAIN GEAR	1	A520214-01	
B3	KIT SID POTENTIOMETER	1	SAT-A9711-01	
B4	KIT SID CHAIN	1	A520213-01	
B5	KIT PHOTODETECTOR	2	SAT-A9713-01	
B6	KIT INCLINOMETER	1	SAT-A7804-01	
B7	KIT CARRIAGE SWITCHES	1	SAT-A9715-01	
B8	PCB XPC CONTROL	1	SAT-A8185-14	
B9	ARM DISPLAY OVERLAY	1	SAT-55801200	
B10	ARM DISPLAY PCB	1	SAT-A8187-02	
B11	KIT DETECTOR SWITCHES	2	SAT-A9716-01	
B12	KIT DETECTOR ROTATION POT	1	SAT-A9717-01	
B13	KIT DETECTOR ROTATION MOTOR	1	SAT-A9718-01	




B3
B2
B4
B6
B1
B5
SW1-SW2
B7
B8


ARM
ROTATION
90
DETECTOR
ROTATION
18

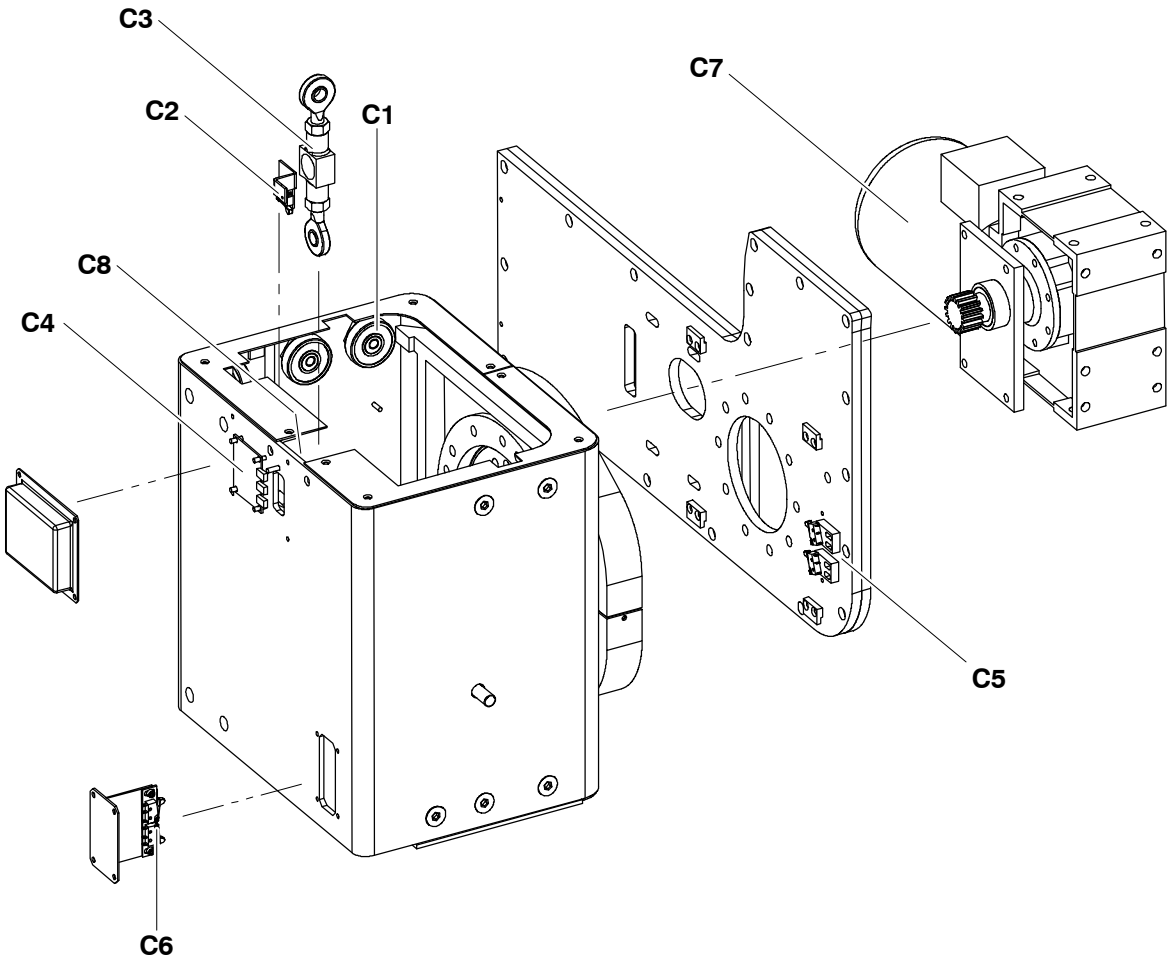
B9

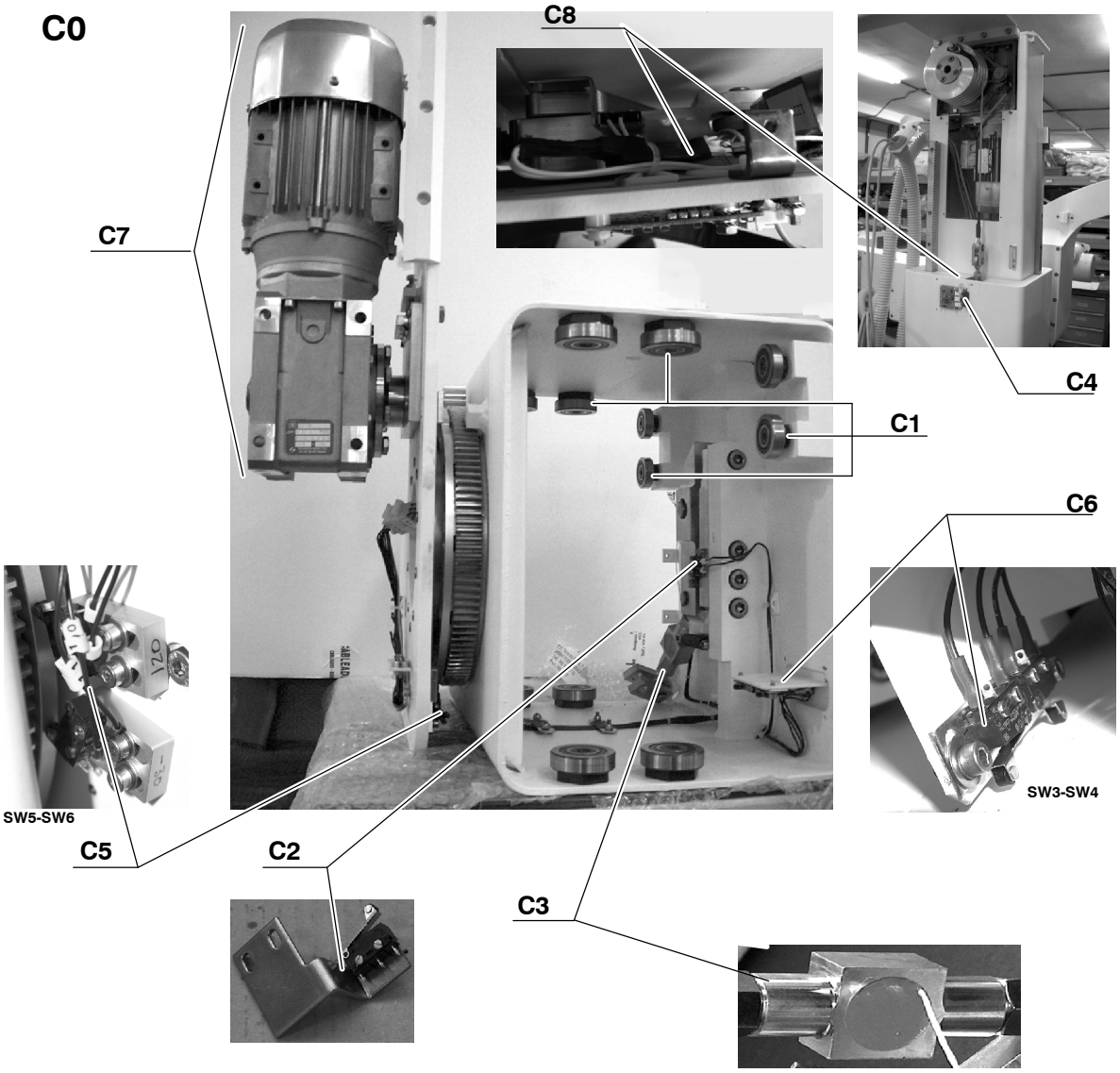


B10

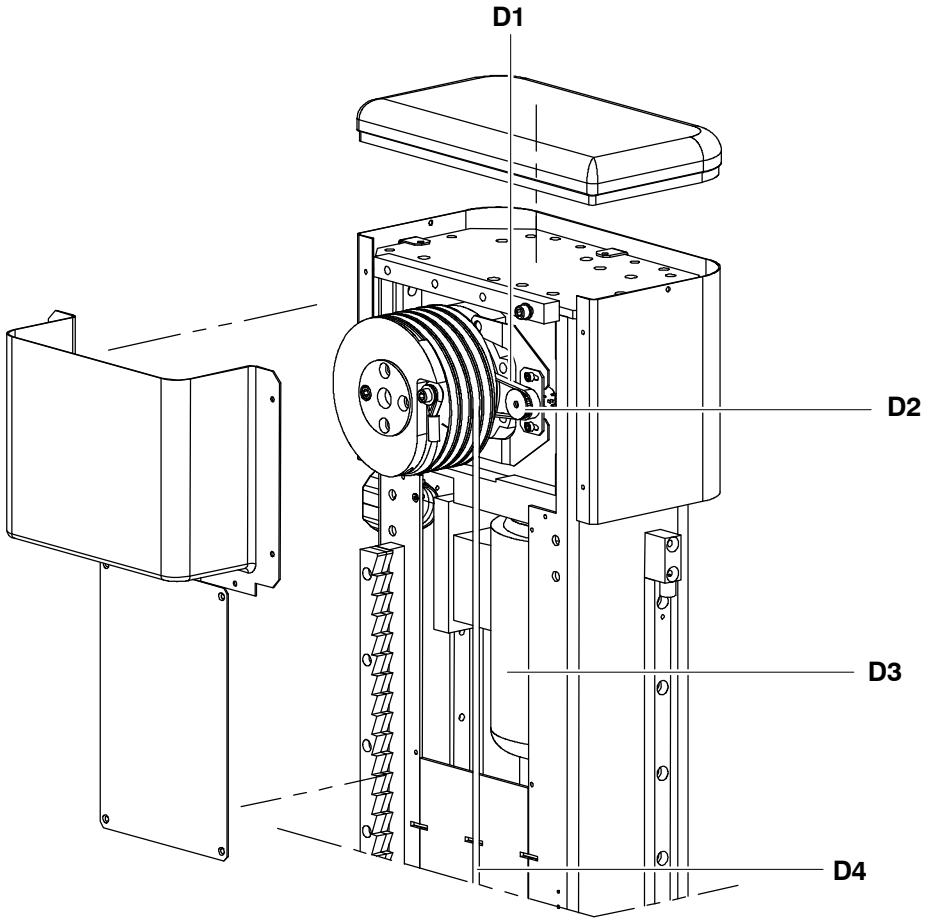

B13
B12
B11
SW2

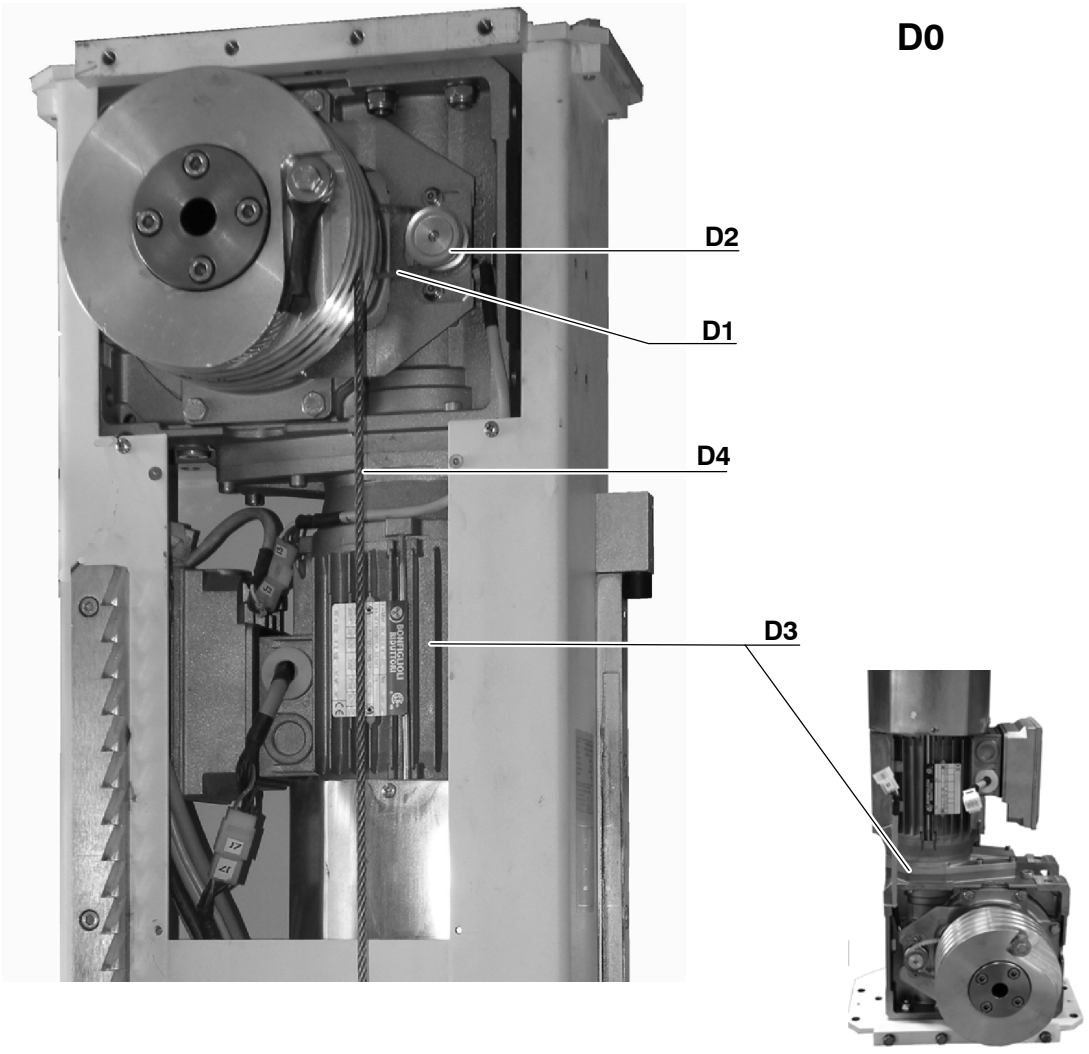
ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
C0	**CARRIAGE**			
C1	KIT CARRIAGE BEARINGS	1	SAT-A9702-01	Includes 8+2+2 bearings
C2	KIT SAFETY BRAKE SWITCH	1	SAT-A9705-01	
C3	STRAIN GAUGE	1	SAT-10328-02	
C4	ANTICRUSHING PCB	1	SAT-A3531-11	
C5	KIT ARM ROTATION SWITCHES	2	SAT-A9706-01	
C6	KIT HEIGHT SWITCHES	1	SAT-A9707-01	
C7	KIT ROTATION MOTOR	1	SAT-A9708-01	
C8	ANTICRUSHING PCB FILTER	1	SAT-A9884-01	



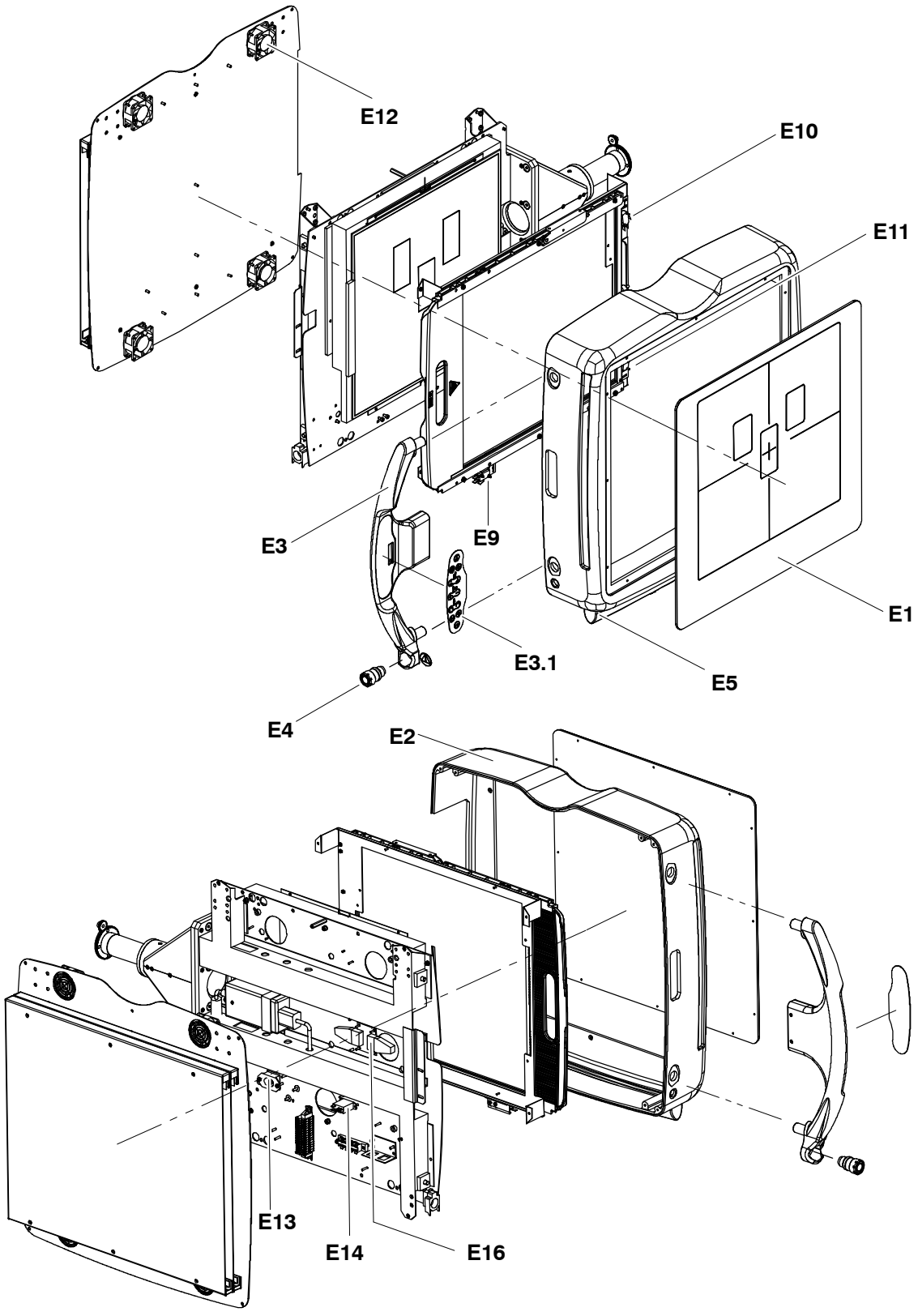

C0
C8
C7
C4
C1
C6
SW5-SW6
SW3-SW4
C5
C2
C3

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
D0	**COLUMN**			
D1	TOOTH BELT HEIGHT POT.	1	SAT-53940115	
D2	KIT HEIGHT POTENTIOMETER	1	SAT-A9727-01	
D3	KIT HEIGHT MOTOR	1	SAT-A9700-01	
D4	KIT STEEL CABLE	1	SAT-A9701-01	




D0
D2
D1
D4
D3

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
E0	**DETECTOR BOX ASSEMBLY**			
E1	TABLE - TOP KIT	1		provide Serial Number Includes Overlay
E2	COVER KIT	1	SAT-10442-01	
E3	HANDLE KIT	1	SAT-27329-01-XXX	XXX specify color
E3.1	OVERLAY (HANDLE)	1	SAT-55801698	
E4	KIT EMERGENCY SWITCH	1	SAT-A9719-01	
E5	RUBBER BUMPER	1	SAT-55102008	
E9	KIT MICROSWITCH GRID	1	A520145-01	
E10	KIT MICROSWITCH GRID - 1.8 m	1	A520147-01	
E11	KIT MICROSWITCH GRID - 1 m	1	A520146-01	
E12	KIT FAN	4	SAT-A9721-01	
E13	THERMOSTAT	1	SAT-50501019	
E14	RELAY	1	SAT-51403069	K3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E10
E11
E3
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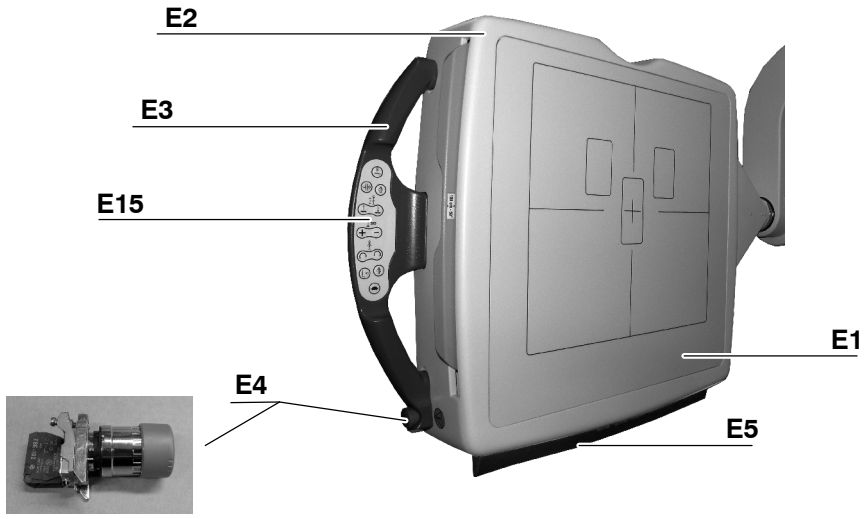
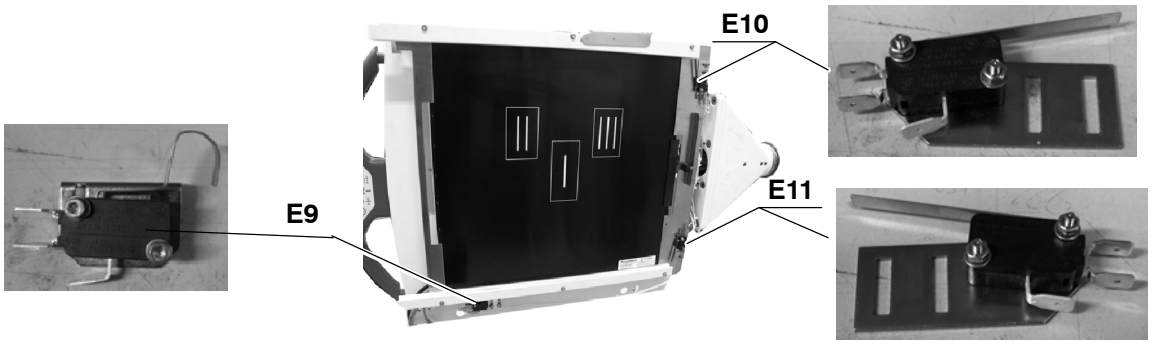
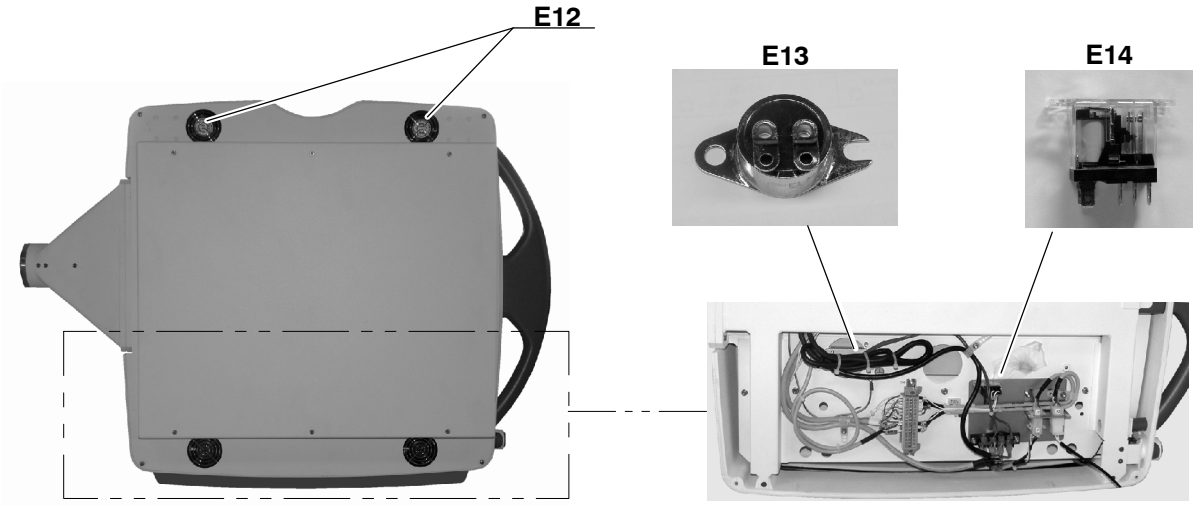
E3.1
E5
E4
E2
E13
E14
E16

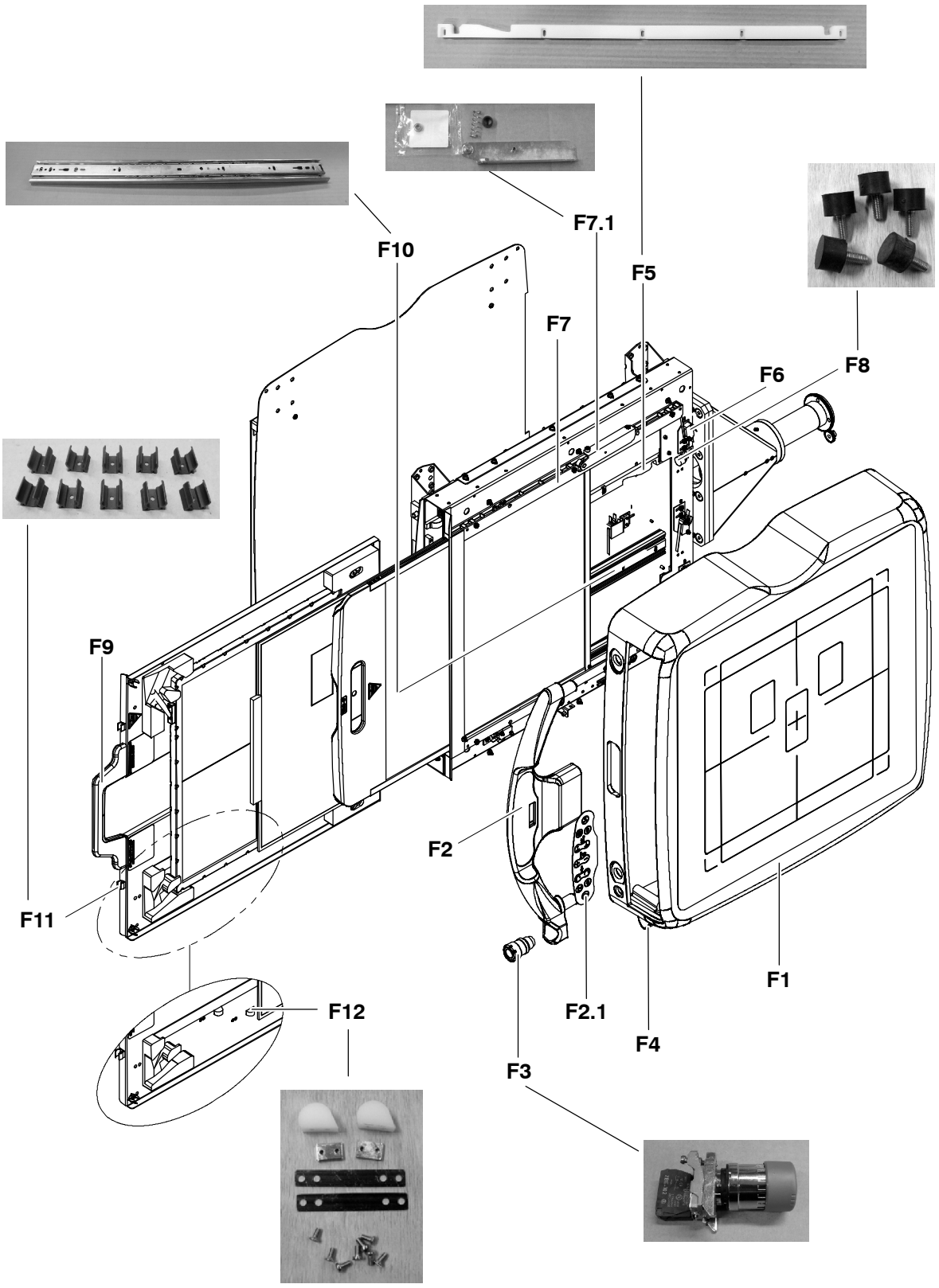
E0



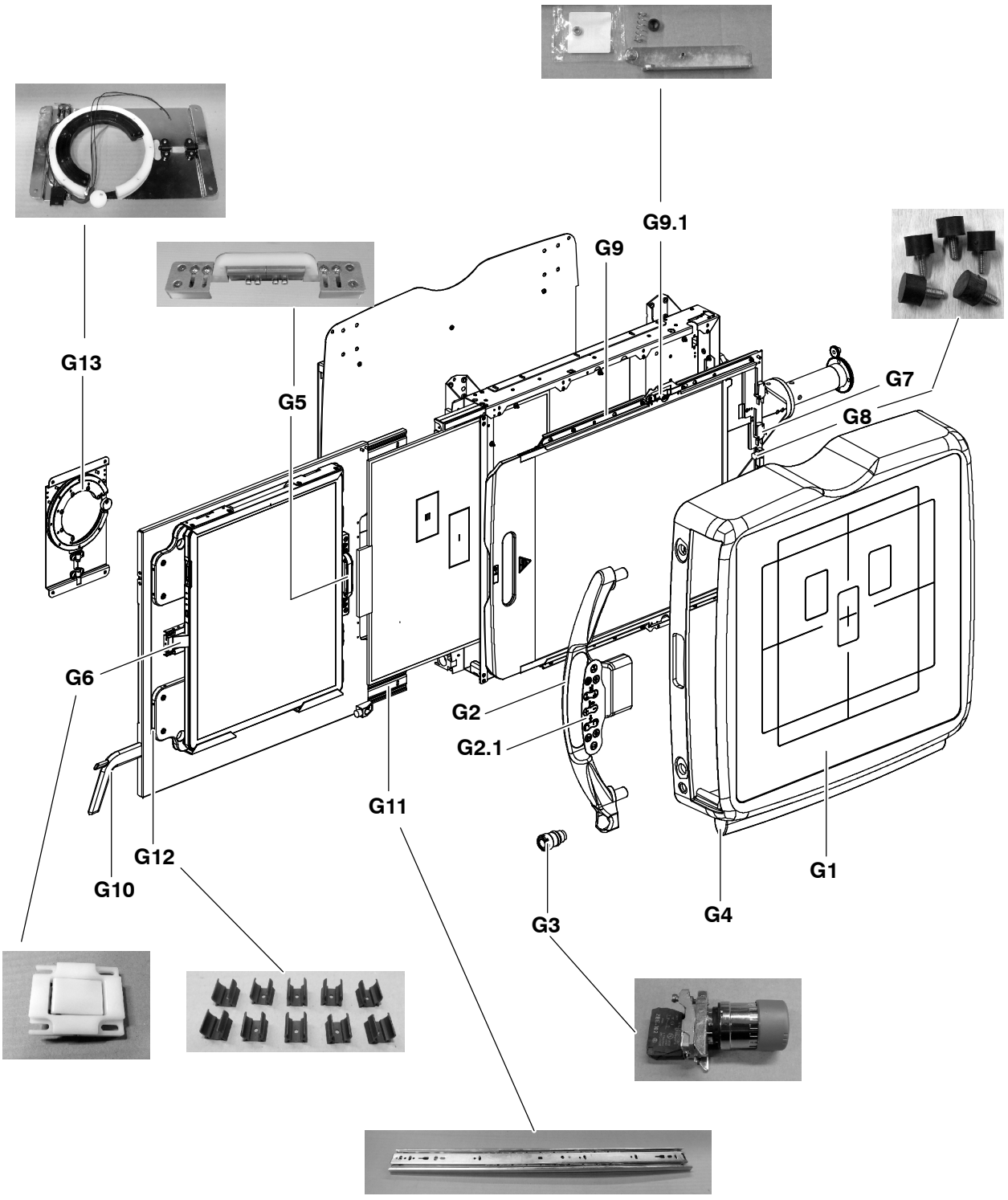




ITEM	DESCRIPTION	QTY	MFT. REFERENCE	REMARKS
F	**DETECTOR BOX WITH BDC**			
F1	COVER OF DETECTOR ASSY	1	A521522-01	
F2	HANDLE KIT	1	SAT-27329-01-XXX	XXX specify color
F2.1	OVERLAY (HANDLE)	1	SAT-55801698	
F3	KIT EMERGENCY SWITCH	1	SAT-A9719-01	
F4	RUBBER BUMPER	1	SAT-55102008	
F5	TRAY BLOCKAGE	1	SAT-28213-01	
F6	SWITCH KIT BDC	1	A520491-01	
F7	GRID GUIDES BDC KIT	1	A520492-01	Includes ITEM F7.1
F7.1	GRID BLOCKAGE	1	A525510-01	
F8	RUBBER BUMPER KIT	1	SAT-53830100	*This reference comprises 5 units*
F9	HANDLE KIT	1	SAT-A10634-01	
F10	BALL BEARING SLIDE	3	SAT-54505012	
F11	CABLE SUPPORT	1	SAT-53530150	Includes 10 Units
F12	DETECTION OF DETECTOR POSITION	1	A520496-01	Includes 2 Units

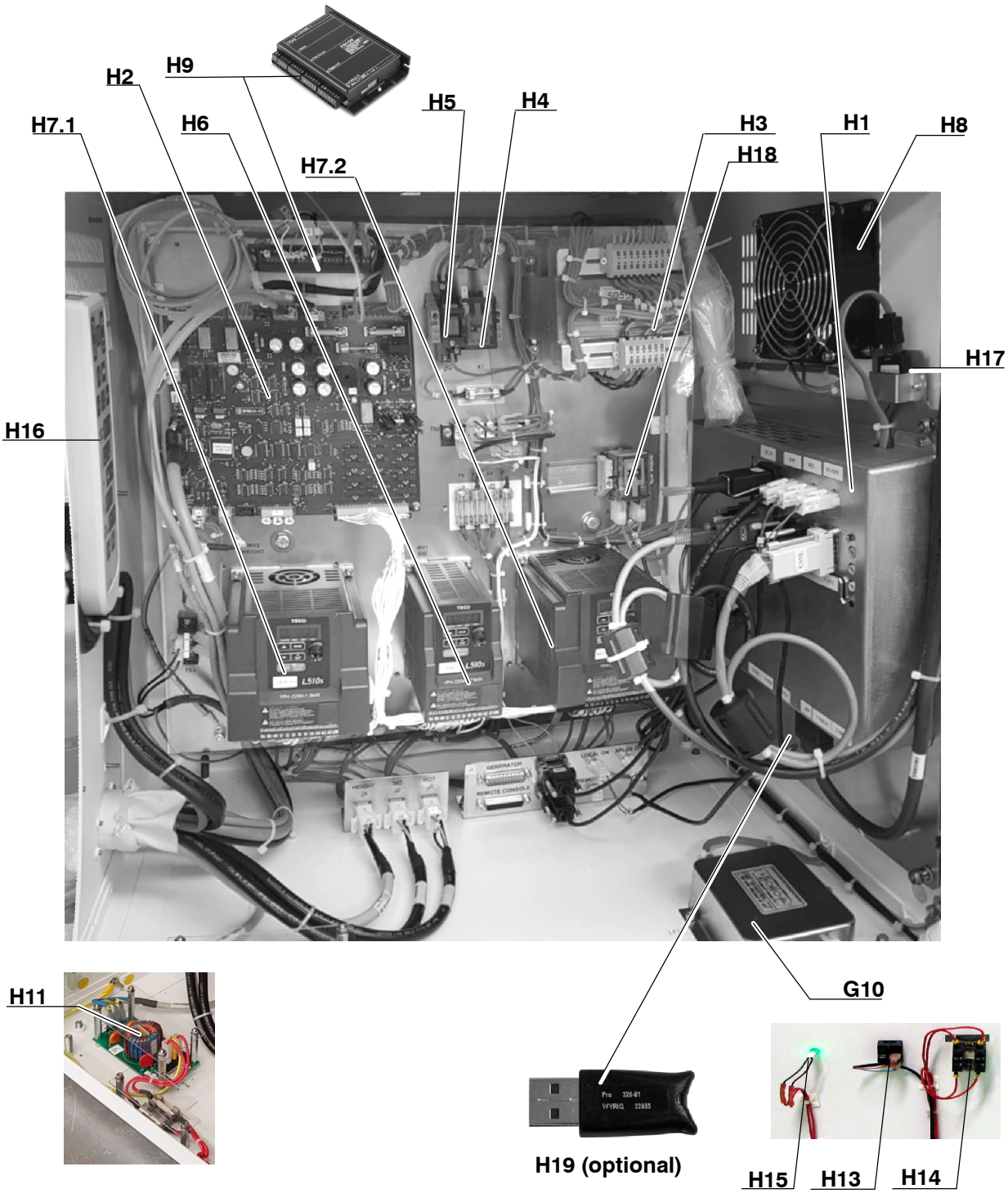

F10
F7.1
F5
F8
F7
F6
F9
F2
F11
F12
F2.1
F4
F1
F3

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
G0	**DETECTOR CABINET WITH ROTATING TRAY**			
G1	COVER OF DETECTOR ASSY	1	A521522-01	
G2	HANDLE KIT	1	SAT-27329-01-XXX	XXX specify color
G2.1	OVERLAY (HANDLE)	1	SAT-55801698	
G3	KIT EMERGENCY SWITCH	1	SAT-A9719-01	
G4	RUBBER BUMPER	1	SAT-55102008	
G5	REAR BUMPER KIT	1	SAT-A10676-02	
G6	DETECTOR DETENT KIT	1	SAT-A10677-01	
G7	SWITCH KIT BCG	1	A520490-01	
G8	RUBBER BUMPER KIT	1	SAT-6533-01	*This reference comprises 5 units*
G9	GRID GUIDES BDG KIT	1	A520493-01	Includes ITEM G9.1
G9.1	GRID BLOCKAGE	1	A520476-01	
G10	HANDLE KIT	1	SAT-A10634-11	
G11	BALL BEARING SLIDE	5	SAT-54505012	
G12	CABLE SUPPORT	1	SAT-53530150	Includes 10 Units
G13	TURNING KIT	1	SAT-A10654-01	

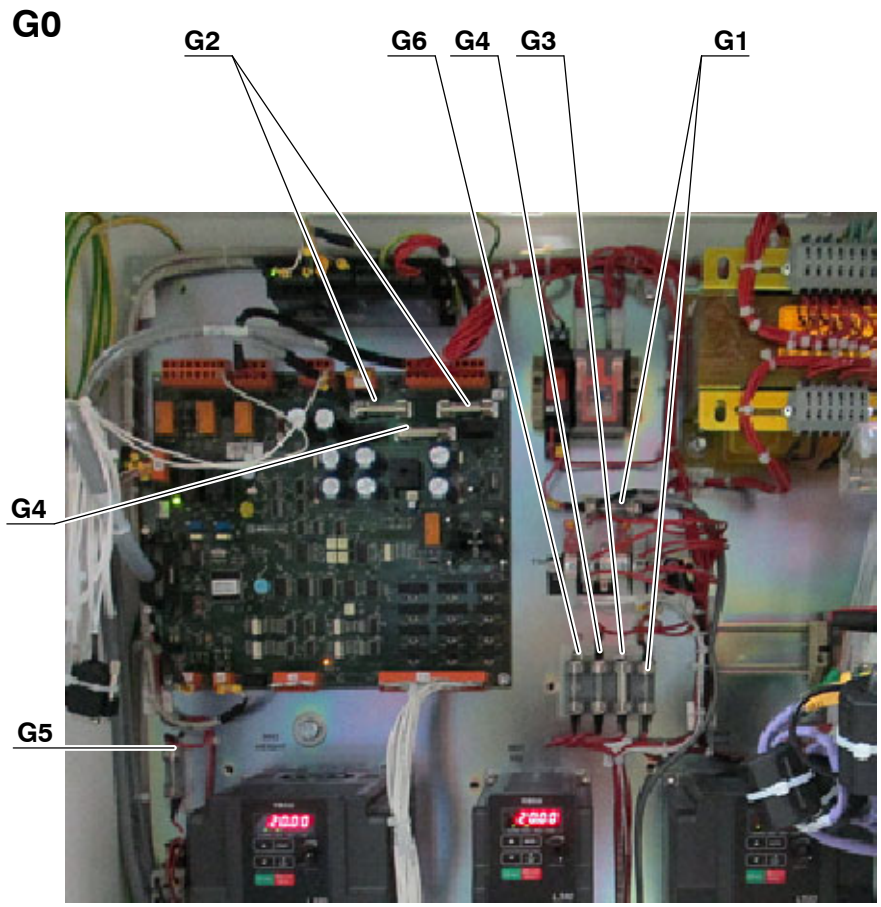

G9.1
G9
G13
G5
G7
G8
G6
G2
G2.1
G11
G12
G10
G1
G4
G3

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
H0	**CONTROL BOX**			
H1	PC CONTROL BOX W10	1	SAT-A9603-13	
H2	PCB XPC INTERFACE	1	SAT-A8186-xx	13 (standard) / 15 Stitching
H3	INPUT TRANSFORMER	1	SAT-50509037	
H4	RELAY K1	1	SAT-51403039	
H5	KIT RELAY K2	1	SAT-A9723-01	
H6	SID INVERTER 0.75KW	1	SAT-52403008-S	
H7.1	HEIGHT INVERTER 1.5KW	1	SAT-52403009-H	
H7.2	ROTATION INVERTER 1.5KW	1	SAT-52403009-R	
H8	KIT FAN POWER BOX	1	SAT-A9724-01	
H9	SERVOAMPLIFIER	1	SAT-52403018	
H10	EMC LINE FILTER P-0739-001	1	SAT-50208014	
H11	EMI FILTER PCB	1	SAT-A9502-01	
H13	PUSH BUTTON (BLACK)	1	SAT-50613046	
H14	EMERGENCY ON/OFF SWITCH CABINET	1	SAT-A9719-01	
H15	GREEN LIGHT LAMP	1	SAT-54203006	
H16	REMOTE CONTROL	1	SAT-A6288-01	
H17	SATA EDOM HDD 32 Gb	1	SAT-55001419	
H18	RELAY K3	1	SAT-51403055	
H19	DONGLE for FLFS (STITCHING)	1	SAT-A6910-02	OPTIONAL

CONTROL BOX RENEWAL PARTS

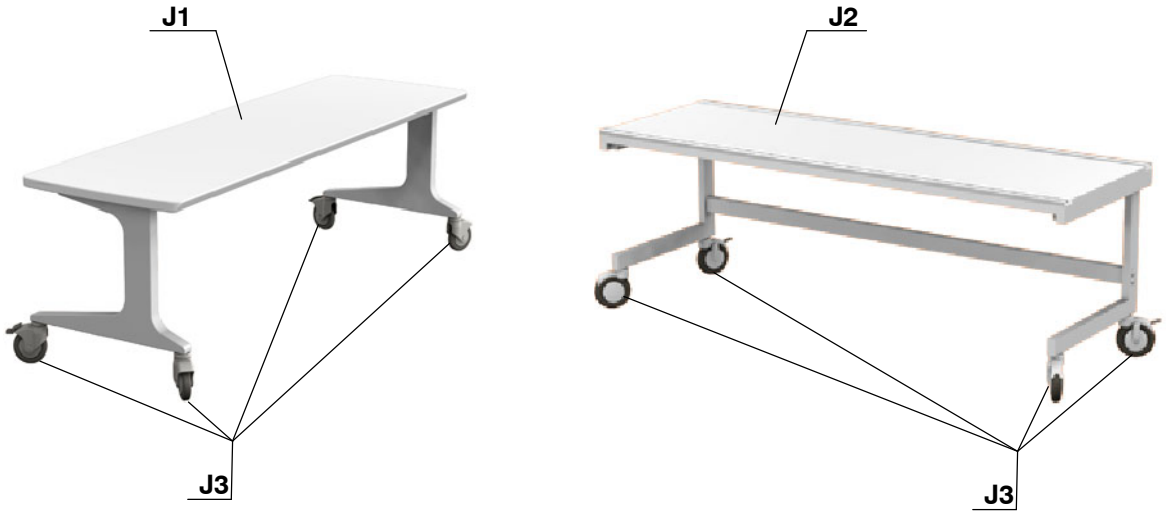


ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
I0	**FUSE KIT**	**1**	**SAT-A9729-01**	**All fuses installed in the unit are included in the Fuse Kit that comprises:** *Reference* *Qty* *53801015* *10* *53801010* *10* *53801003* *10* *53801013* *10* *53801002* *10* *53801014* *10* *53801008* *10*
I1	Fuse SB, 400 mA, 250 V		SAT-53801015	CONTROL BOX: F6, F7
I2	Fuse SB, 2 A, 250 V		SAT-53801010	CONTROL BOX (XPC Interface Board): F1, F3
I3	Fuse SB, 3 A, 250 V		SAT-53801003	CONTROL BOX: F3
I4	Fuse SB, 4 A, 250 V		SAT-53801013	CONTROL BOX: F4 CONTROL BOX (XPC Interface Board): F2
I5	Fuse SB, 8 A, 250 V		SAT-53801014	CONTROL BOX: F8
I6	Fuse SB, 8 A, 250 V		SAT-53801014	CONTROL BOX: F5
	Fuse SB, 10 A, 250 V (optional)		SAT-53801008	PDU-CONTROL BOX (Emi Filter Board): F1, F2



ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
J0	**LAMINATED AND CARBON FIBER MOBILE TABLES**			
J1	CARBON FIBER TABLE-TOP	1	SAT-8836-01	
J2	LAMINATED TABLE-TOP	1	SAT-8857-01	
J3	KIT WHEELS FOR LAMINATED OR CARBON FIBER TABLE	1	SAT-A9728-01	

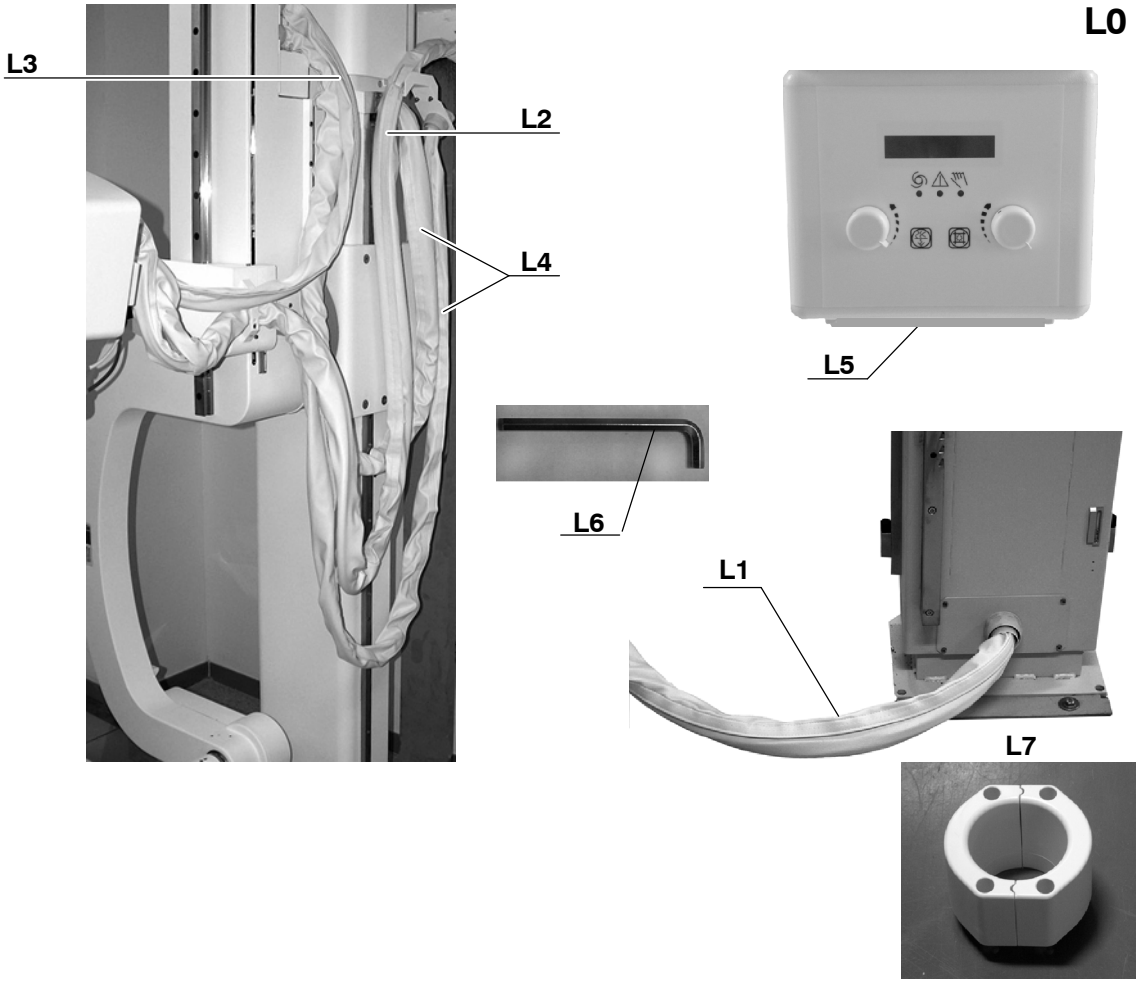
J0



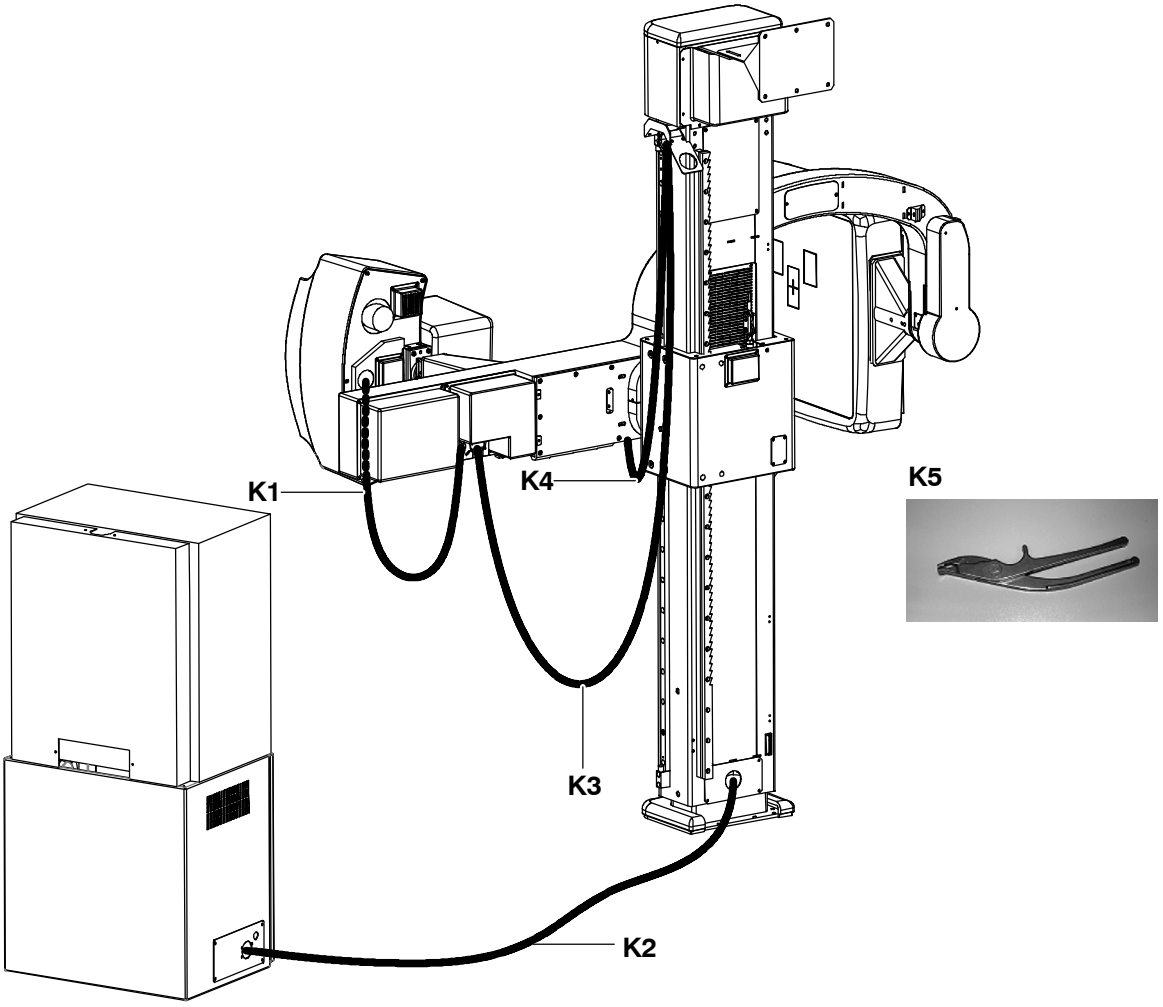
ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
K0	**REMOTE CONTROL**			
K1	REMOTE CONTROL	1	SAT-A6288-XX	SPECIFY COLOR- (if applicable, Configure at site)
K2	OVERLAY REMOTE CONTROL	1	SAT-55801421	

K0

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
L0	**MISCELLANEOUS**			
L1	EXTERNAL CABLE COVER (2 m)	1	A6855-02	
L2	EXTERNAL CABLE COVER (9 m)	1	A6855-09	
L3	EXTERNAL CABLE COVER (1.5 m)	1	A6855-26	
L4	EXTERNAL CABLE COVER (2.5 m)	1	A6855-27	
L5	DAP METER	1	A6335-01	
L6	ALLEN TOOL	1	15154-01	Used for Detector Installation
L7	CABLE OUTLET KIT	1	A520403-01	



CABLE COVERS				
ITEM	**DESCRIPTION**	**QTY**	**REFERENCE**	**REMARKS**
	MISCELLANEOUS			
M0	**CABLE COVERS**			
M1	EMI SHIELD	1	SAT-A7384-03	
M2	EMI SHIELD	1	SAT-A7384-04	
M3	EMI SHIELD	1	SAT-A7384-05	
M4	EMI SHIELD	1	SAT-A7384-06	
M5	EMI SHIELD Mounting tool	1	A520168-01	



ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
	CABLES (The Manufacturer Reference of each cable is marked on the cable jacket.)			
-	SUPPLY CABLE	1	A8169-01	
-	TPC POWER SUPPLY CABLE	1	A9608-01	
-	VGA CABLE	1	55001084	
-	CABLE REMOTE ON	1	A9611-01	
-	SERIAL CABLE	1	A7067-01	
-	TPC SUPPLY CABLE	1	A7059-01	
-	INTERFACE BOX CABLE	1	A3352-04	
-	POWER CABLE	1	A15324-01	
-	H POT I/F CABLE	1	A8144-01	
-	TS RS232 CABLE	1	A9610-01	
-	SENSOR CABLE	1	A8191-02	
-	CARRIAGE CABLE	1	A8138-02	
-	SW CABLE	1	A8192-01	
-	HEIGHT POTENTIOMETER CABLE	1	A8194-01	
-	SID CABLE	1	A8193-02	
-	EMERGENCY CABLE	1	A8197-01	
-	KEYBOARD CABLE	1	A9605-01	
-	DISPLAY CABLE	1	A8195-03	
-	PUSH-BUTTON CABLE	1	A8196-01	
-	DETECTOR OVERLAY CABLE	1	A8121-02	
-	RECEIVER CAN CABLE	1	A9607-01	
-	I/F CAN CABLE	1	A8188-01	
-	DETECTOR MOTOR CABLE	1	A8199-01	
-	FAN CABLE	1	A8168-03	
-	SID MOTOR CABLE	1	A8129-02	
-	ROTATION MOTOR CABLE	1	A8131-01	
-	H-MOTOR BRAKE CABLE	1	A8160-03	
-	RS232 CABLE (Software Update)	1	A8441-01	
-	SUPPLY CABLE	1	A8190-01	
-	OVERLAY CABLE	1	A9617-01	
-	24 V SUPPLY CABLE	1	A9693-01	
-	HARNESS CARRIAGE	1	A6343-49	
-	CABLE ROTATION SWITCH	1	A9767-01	
-	RALCO CAN CABLE	1	A9699-01	
-	COLLIMATOR EXTENSION CABLE	1	A8529-01	

SECTION 10 INTERCONNECTION MAPS

Refer to the following maps for details of the wire connections.

- X PLUS LP PLUS Basic System 54302100
- DI X PLUS LP PLUS–PC–CTSC–SHFR . . 6005024
- SEDECAL X PLUS LP PLUS 54302082
- Interface Panel 54302088
- XPC Control A8185-14
- XPC Interface A8186-15
- X-PC Display A8187-02
- Anti-Crushing A3531-11
- Remote Control (transmitter) A3546-01
- Remote Control (Receptor) A3547-11
- Remote Control IF-057
- X-Plus LP Plus with Manual Collimator . . . IM-373
- X-Plus LP Plus with Auto-Collimator IM-378
- Stitching Interface Option IM-404
- Detector Cabinet U-Arm Interconnections . IM-410
- XPLUS LP Plus Tilting Detector Interface . 54305001
- Inclinometer PCB A7804–11

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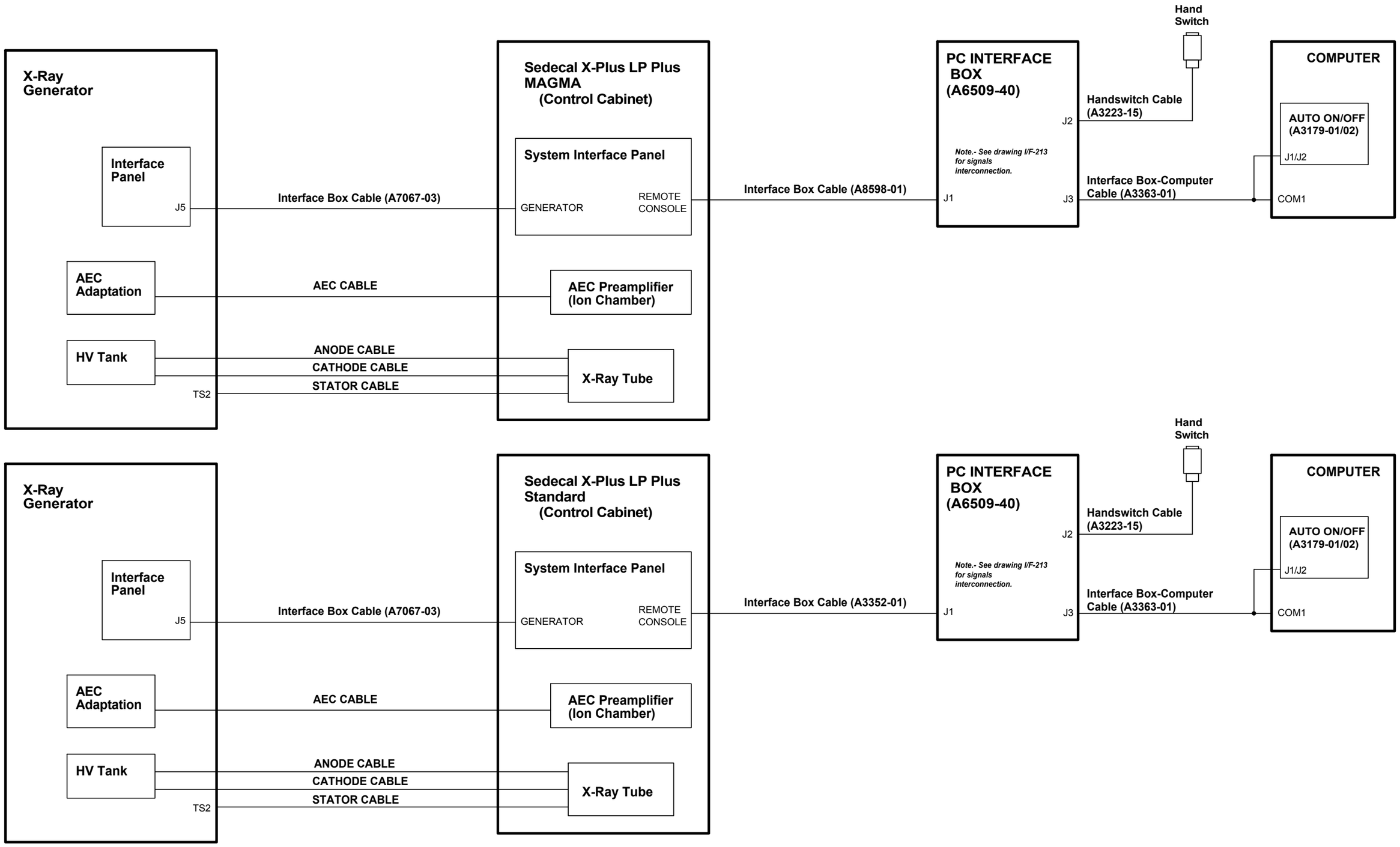


REV	DESCRIPTION	ISSUED BY	DATE
C	NC 13/132	M.A.González	11/04/13
B	sheet 2 added	F. García	10/10/06

	NAME	DATE
DRAWING	F.GARCIA	07/07/06
REVISED	A.DIAZ	07/07/06

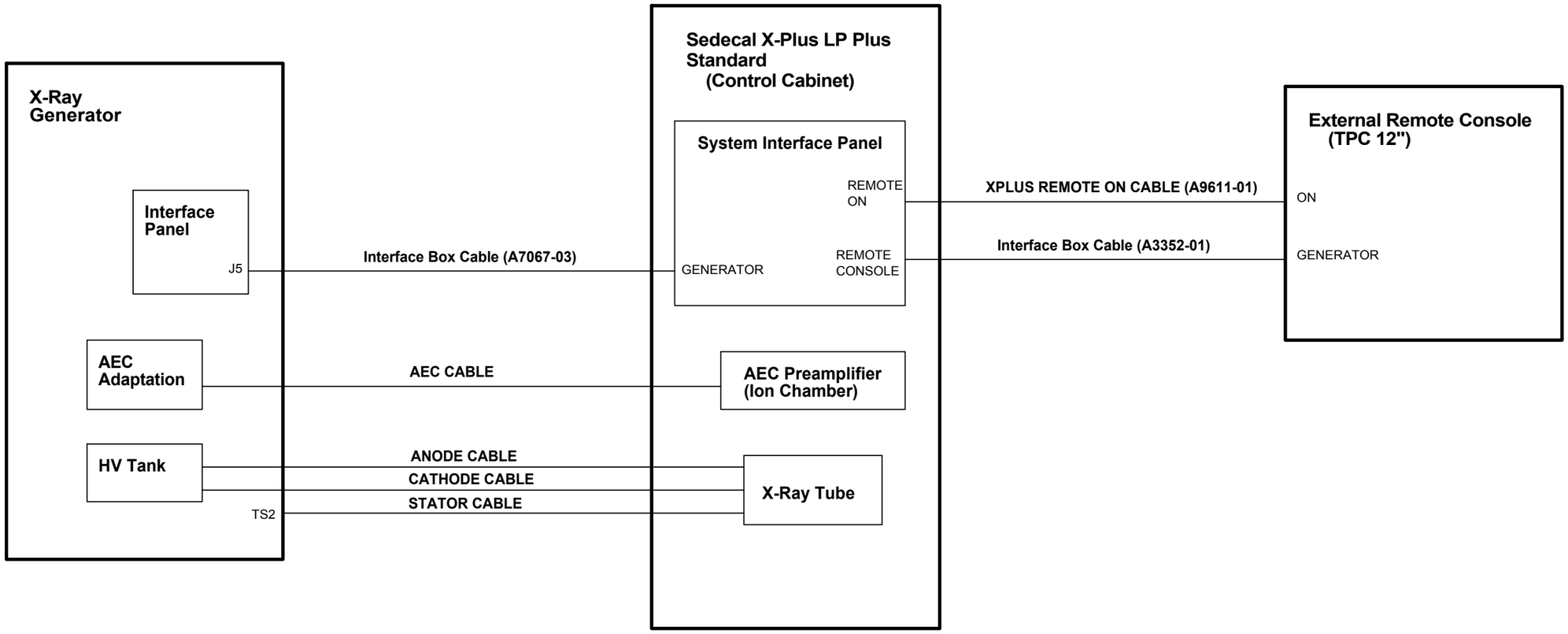
SHEET / OF: 1/2

54302100

C B A REV

SEDECAL

X-Plus LP Plus Basic System



REV	DESCRIPTION	ISSUED BY	DATE
C	NC 13/132	M.A.González	11/04/13
B	sheet 2 added	F. García	10/10/06

	NAME	DATE
DRAWING	F.GARCIA	07/07/06
REVISED	A.DIAZ	07/07/06

SHEET / OF: 2/2

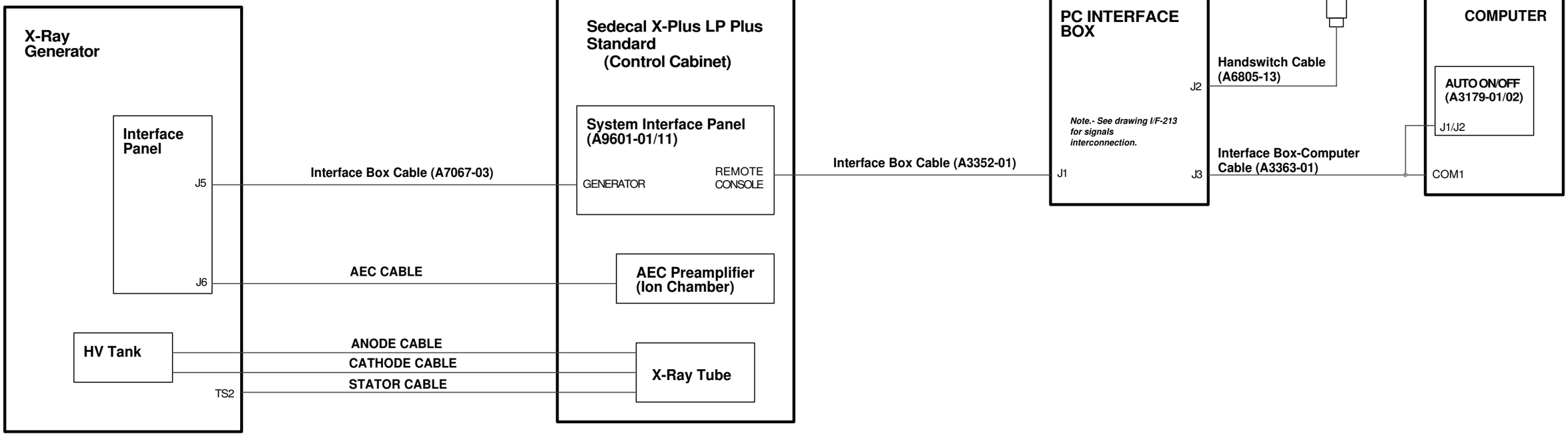
SEDECAL

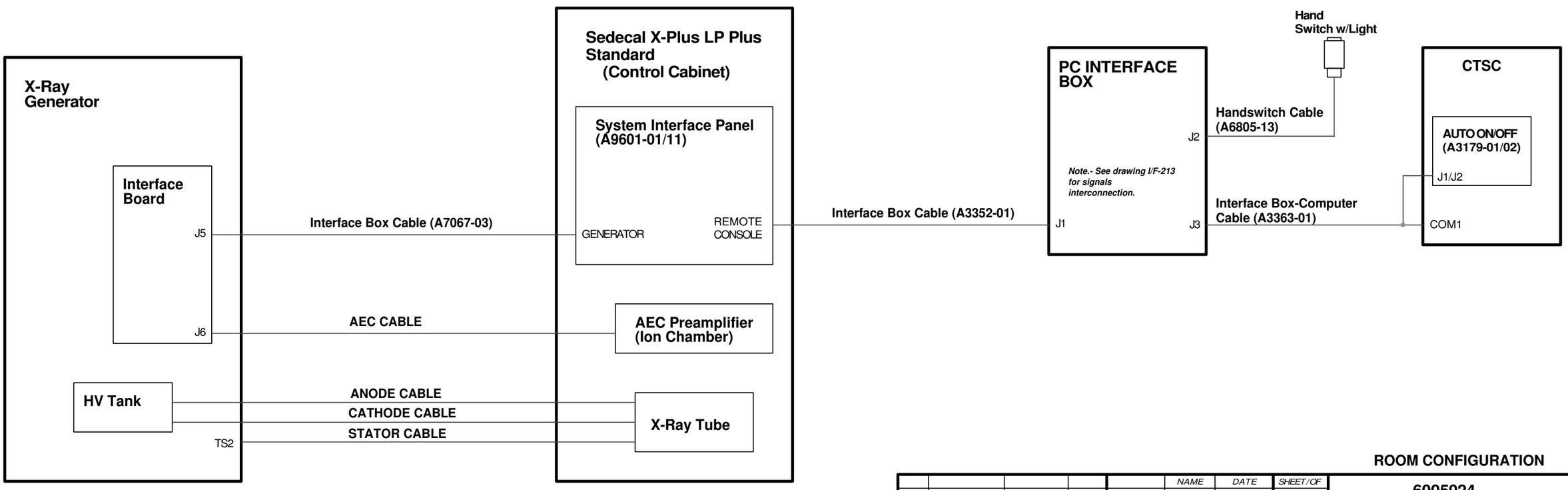
54302100

C B A ← REV

X-Plus LP Plus Basic System

CONFIDENTIAL





ROOM CONFIGURATION

REV	DESCRIPTION	ISSUED BY	DATE
A	NC 16/0119	M.González	04/04/16

	NAME	DATE
DRAWING	M.González	04/04/46
REVISED	A.DIAZ	04/04/16

SHEET / OF: 1/2

6005024

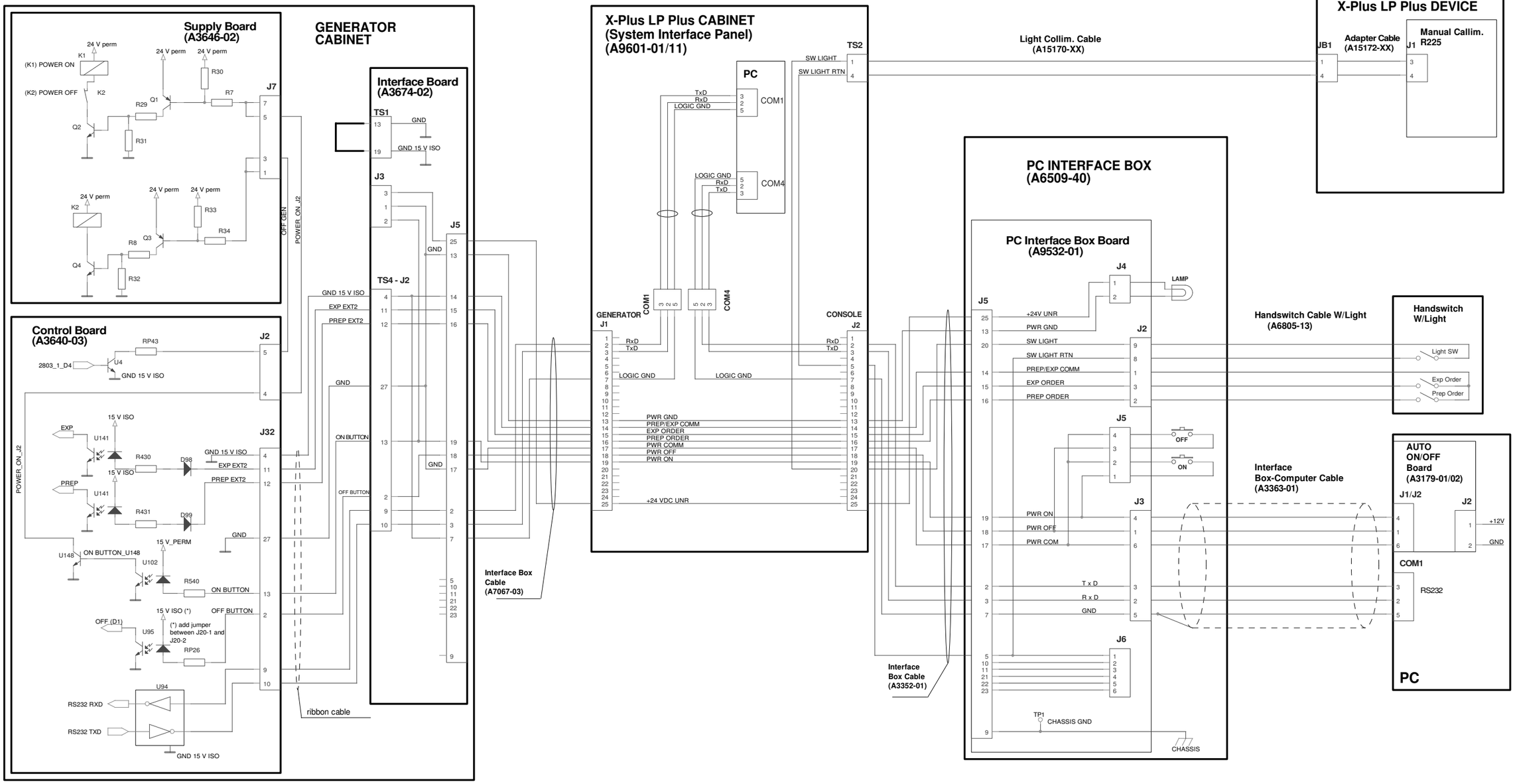
A ← REV

SEDECAL

DEVICE INTERCONECTION (DI)

XPLUS LP PLUS - PC-CTSC - SHFR

CONFIDENTIAL



DEVICE WIRING

REV	DESCRIPTION	ISSUED BY	DATE
A	NC 16/0119	M.González	04/04/16

	NAME	DATE	SHEET / OF
DRAWING	M.González	04/04/46	2/2
REVISED	A.DIAZ	04/04/16	

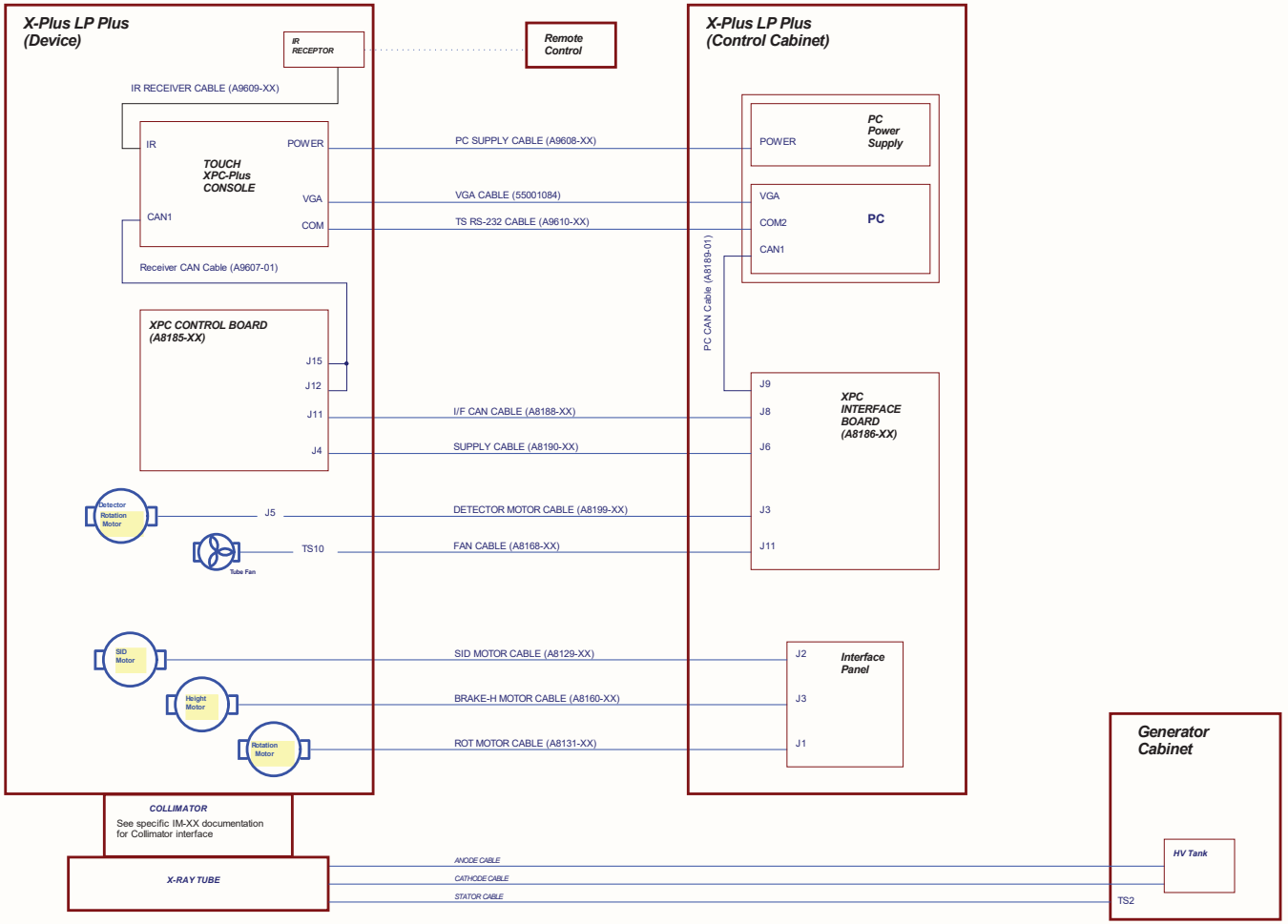
6005024

A ← REV

SEDECAL

DEVICE INTERCONECTION (DI)

XPLUS LP PLUS - PC-CTSC - SHFR



REV	DESCRIPTION	ISSUED BY	DATE
O	NC19/0024	R. Hermosilla	15/03/19
N	NC16/0070	R. Hermosilla	16/12/16
M	NC 14/0427	MC	16/12/14
L	NC 13/199	S.Pérez	05/08/13
K	CN 10/284	F.Garcia	25/06/10

	NAME	DATE
DRAWING	MC	16/12/14
REVISED	FD	16/12/14

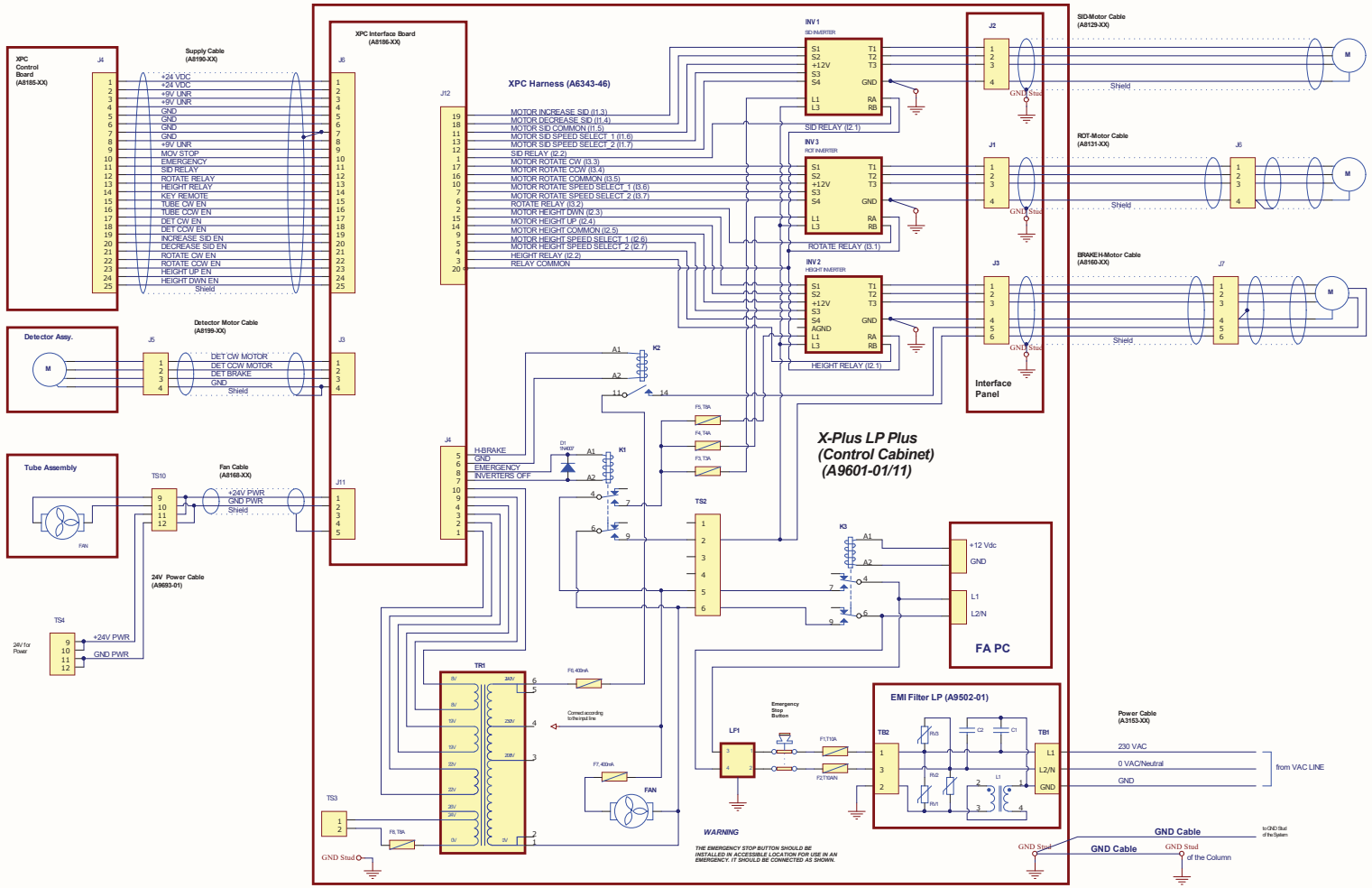
SHEET / OF
1 / 4

54302082

O N M L K REV

SEDECAL

Sedecal X-Plus LP Plus



REV	DESCRIPTION	ISSUED BY	DATE
O	NC19/0024	R. Hermosilla	15/03/19
N	NC16/0070	R. Hermosilla	16/12/16
M	NC 14/0427	MC	16/12/14
L	NC 13/199	S.Pérez	05/08/13
K	CN 10/284	F.Garcia	25/06/10

	NAME	DATE
DRAWING	MC	16/12/14
REVISED	FD	16/12/14

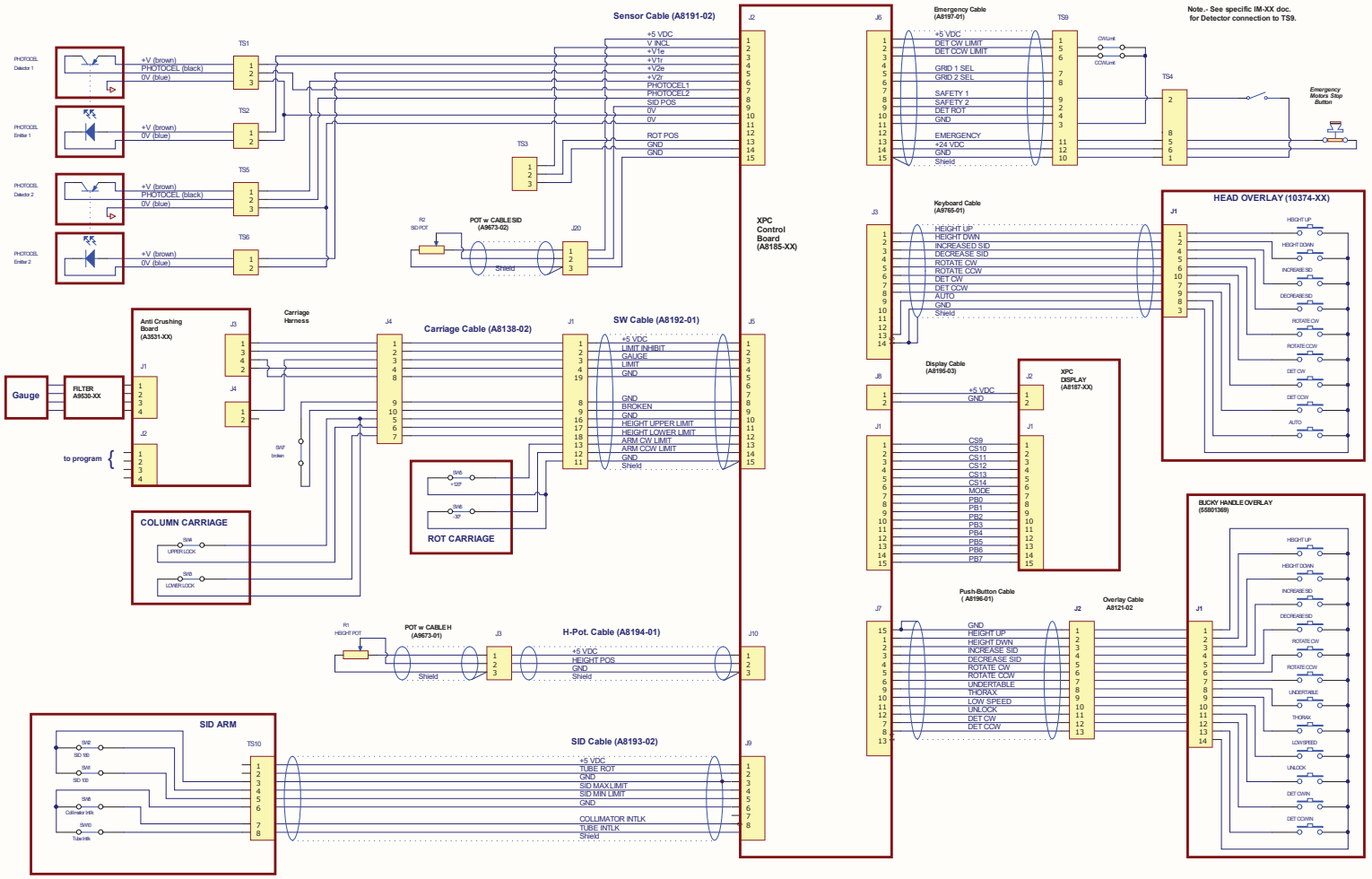
SHEET / OF: 2 / 4

SEDECAL

54302082

REV: O N M L K

Sedecal X-Plus LP Plus



REV	DESCRIPTION	ISSUED BY	DATE
O	NC19/0024	R. Hermosilla	15/03/19
N	NC16/0070	R. Hermosilla	16/12/16
M	NC 14/0427	MC	16/12/14
L	NC 13/199	S.Pérez	05/08/13
K	CN 10/284	F.Garcia	25/06/10

	NAME	DATE
DRAWING	MC	16/12/14
REVISED	FD	16/12/14

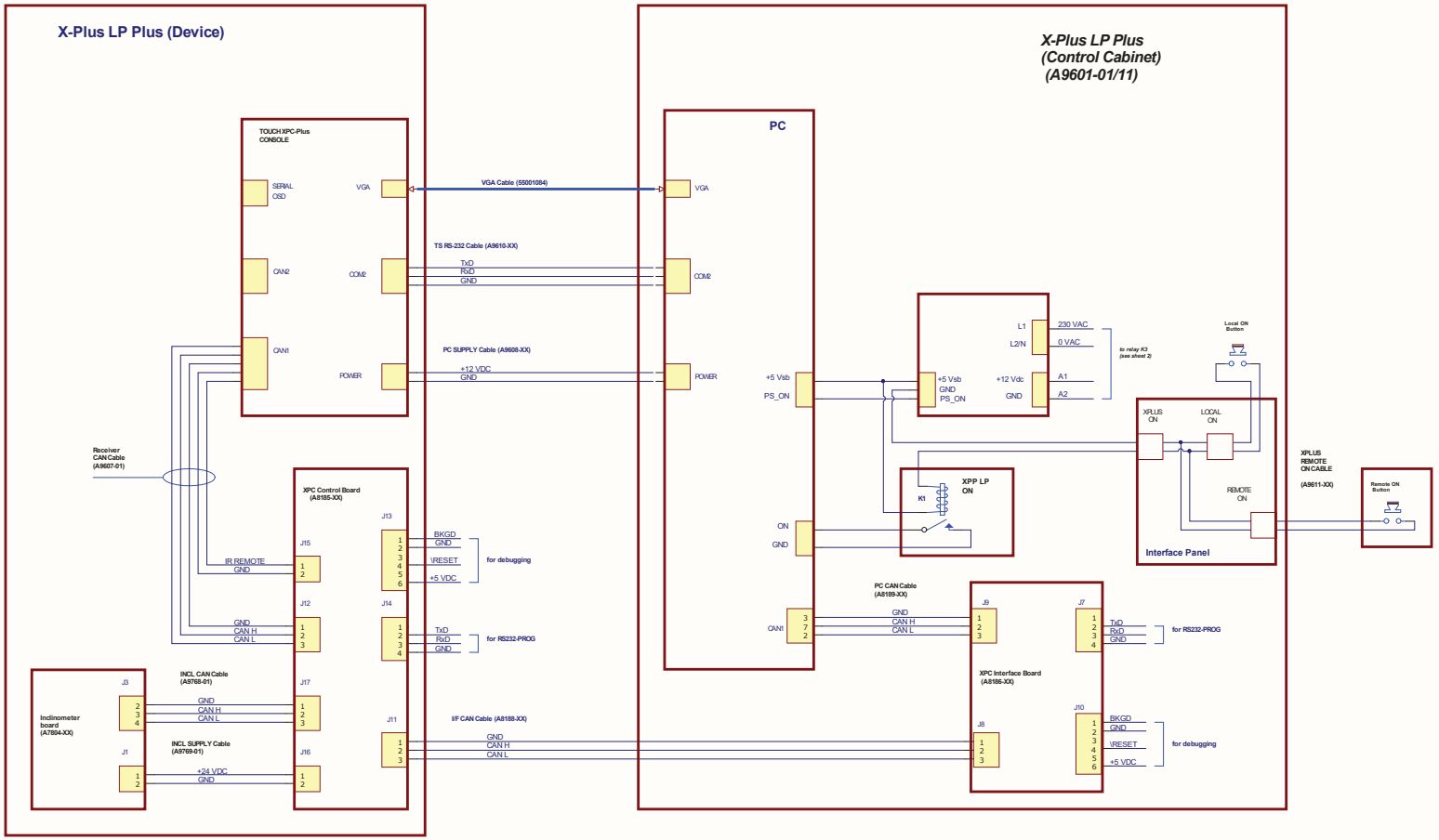
SHEET / OF: 3 / 4

SEDECAL

54302082

O N M L K REV

Sedecal X-Plus LP Plus



REV	DESCRIPTION	ISSUED BY	DATE
O	NC19/0024	R. Hermosilla	15/03/19
N	NC16/0070	R. Hermosilla	16/12/16
M	NC 14/0427	MC	16/12/14
L	NC 13/199	S.Pérez	05/08/13
K	CN 10/284	F.Garcia	25/06/10

	NAME	DATE
DRAWING	MC	16/12/14
REVISED	FD	16/12/14

SHEET / OF: 4 / 4

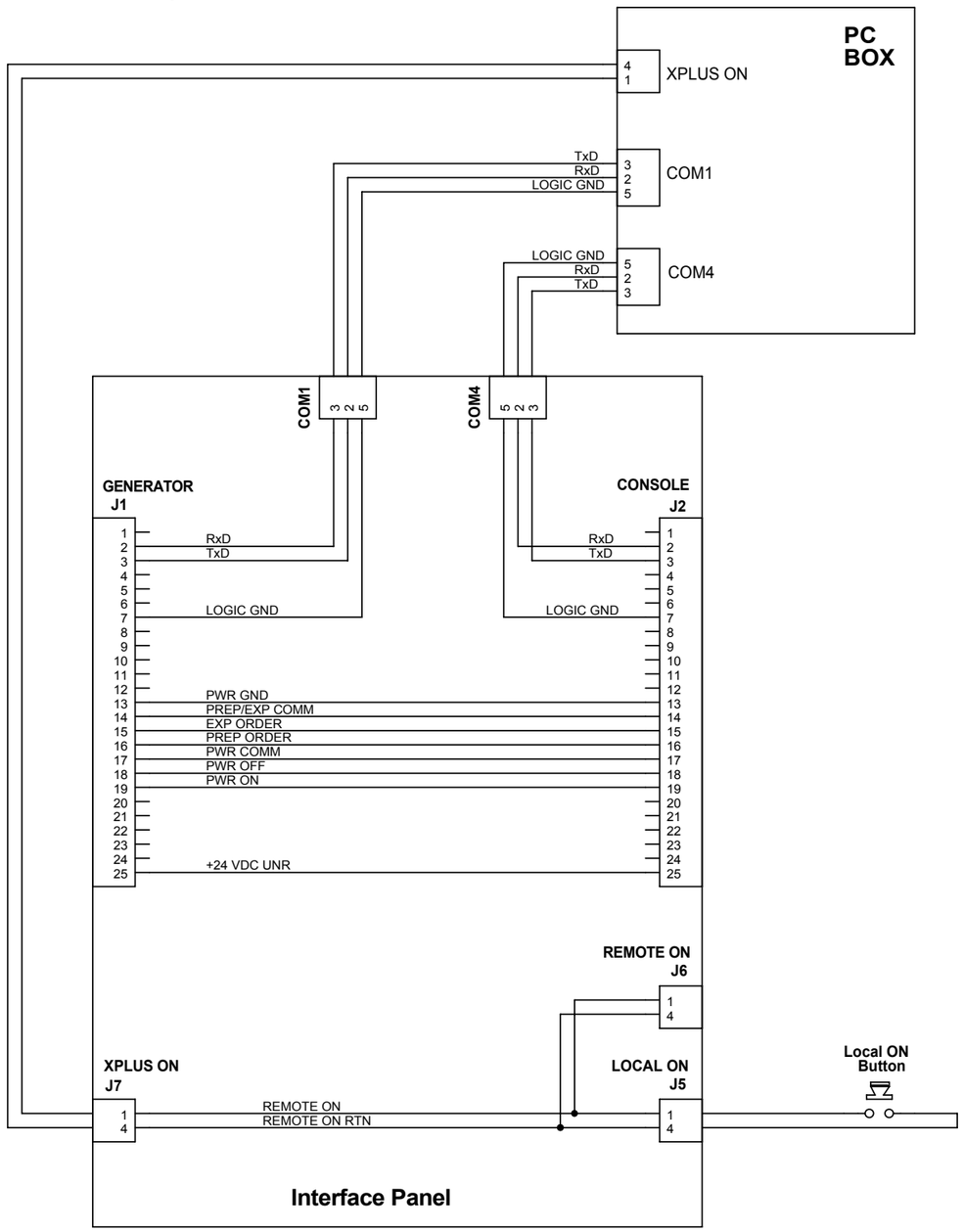
54302082

REV: O N M L K

SEDECAL

Sedecal X-Plus LP Plus

X-Plus LP Plus
(Control Cabinet)



REV	DESCRIPTION	ISSUED BY	DATE

	NAME	DATE
DRAWING	F.GARCIA	03/03/07
REVISED	A.DIAZ	06/06/07

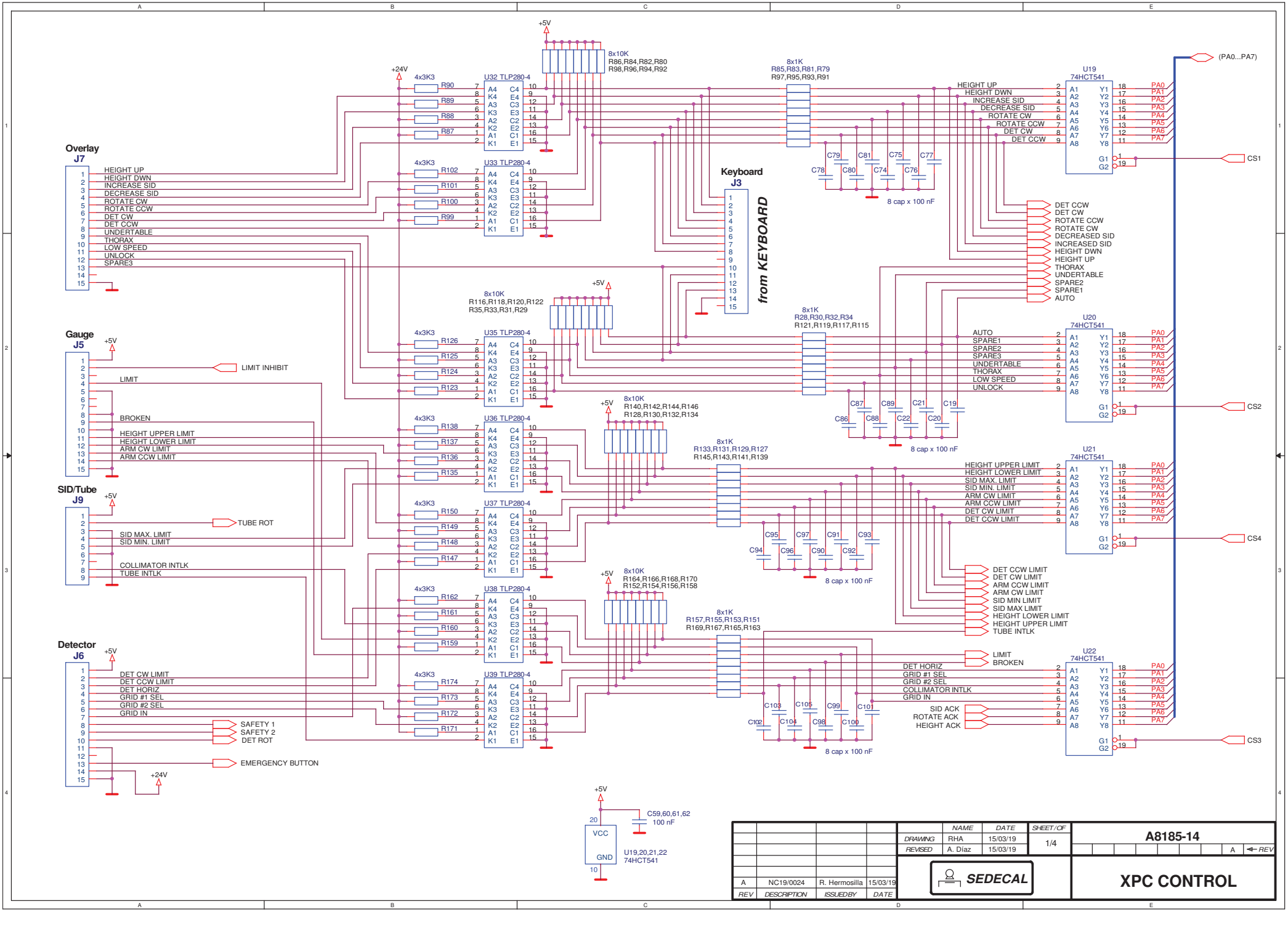
SHEET / OF: 1/1

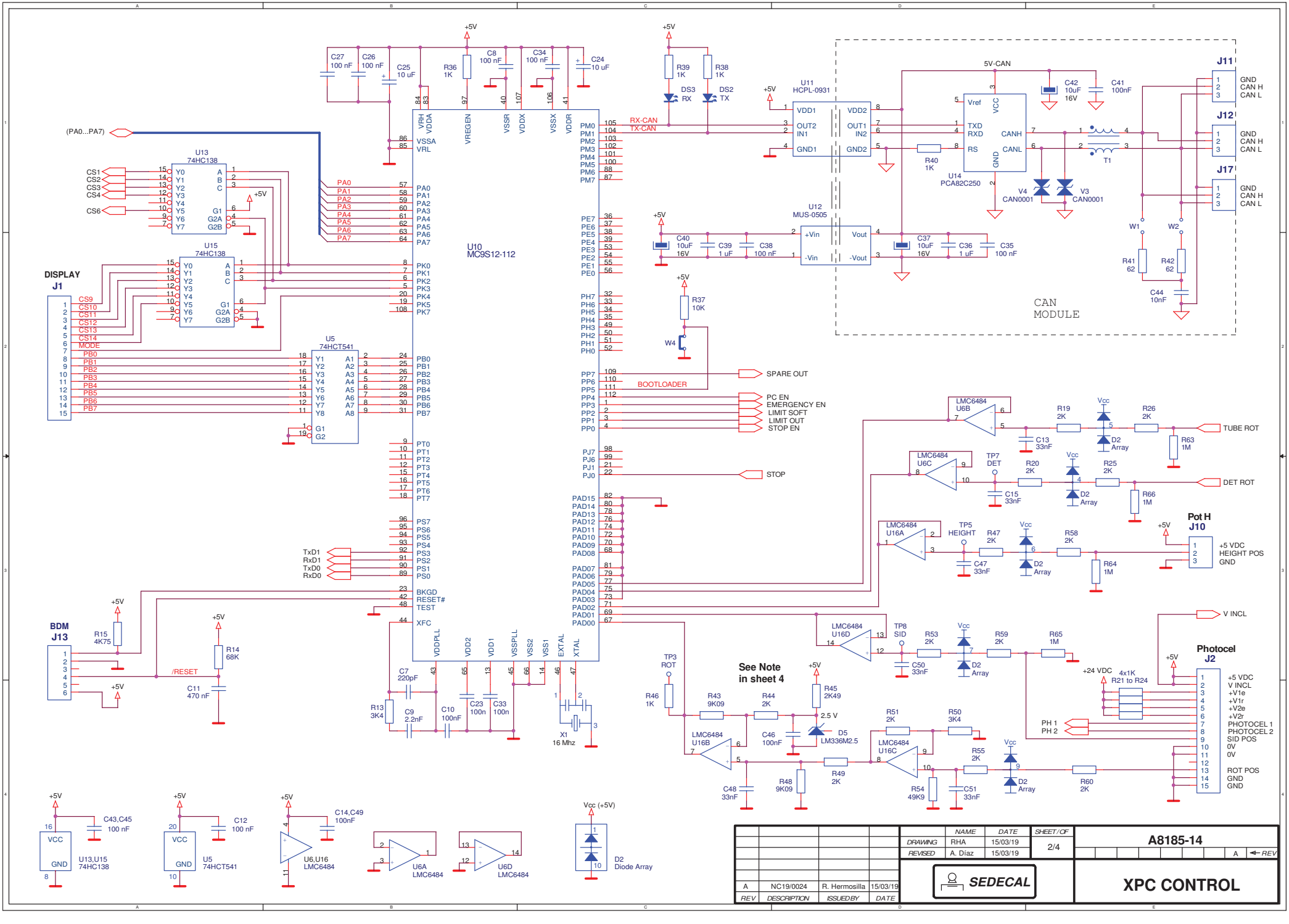
SEDECAL

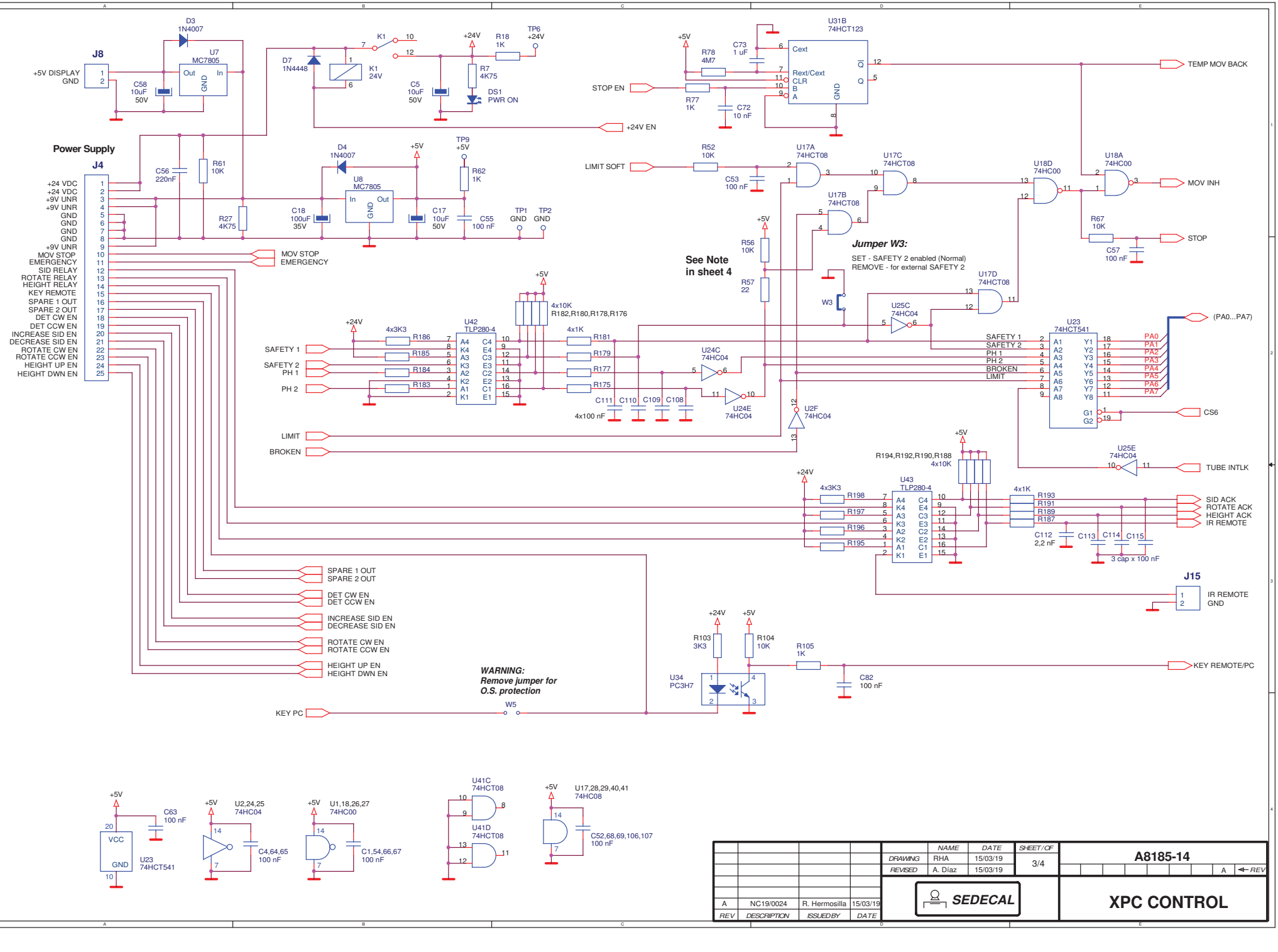
54302088

A ← REV

INTERFACE PANEL


Overlay
J7
HEIGHT UP
HEIGHT DWN
INCREASE SID
DECREASE SID
ROTATE CW
ROTATE CCW
DET CW
DET CCW
UNDERTABLE
THORAX
LOW SPEED
UNLOCK
SPARE3
Gauge
J5
LIMIT INHIBIT
LIMIT
BROKEN
HEIGHT UPPER LIMIT
HEIGHT LOWER LIMIT
ARM CW LIMIT
ARM CCW LIMIT
SID/Tube
J9
TUBE ROT
SID MAX. LIMIT
SID MIN. LIMIT
COLLIMATOR INTLK
TUBE INTLK
Detector
J6
DET CW LIMIT
DET CCW LIMIT
DET HORIZ
GRID #1 SEL
GRID #2 SEL
GRID IN
SAFETY 1
SAFETY 2
DET ROT
EMERGENCY BUTTON
+5V
+24V
4x3K3
R90
R89
R88
R87
R102
R101
R100
R99
R126
R125
R124
R123
R138
R137
R136
R135
R150
R149
R148
R147
R162
R161
R160
R159
R174
R173
R172
R171
U32 TLP280-4
U33 TLP280-4
U35 TLP280-4
U36 TLP280-4
U37 TLP280-4
U38 TLP280-4
U39 TLP280-4
8x10K
R86,R84,R82,R80
R98,R96,R94,R92
8x10K
R116,R118,R120,R122
R35,R33,R31,R29
8x10K
R140,R142,R144,R146
R128,R130,R132,R134
8x10K
R164,R166,R168,R170
R152,R154,R156,R158
Keyboard
J3
from KEYBOARD
8x1K
R85,R83,R81,R79
R97,R95,R93,R91
8x1K
R28,R30,R32,R34
R121,R119,R117,R115
8x1K
R133,R131,R129,R127
R145,R143,R141,R139
8x1K
R157,R155,R153,R151
R169,R167,R165,R163
C79
C81
C75
C77
C78
C80
C74
C76
C87
C89
C21
C19
C86
C88
C22
C20
C95
C97
C91
C93
C94
C96
C90
C92
C103
C105
C99
C101
C102
C104
C98
C100
8 cap x 100 nF
HEIGHT UP
HEIGHT DWN
INCREASE SID
DECREASE SID
ROTATE CW
ROTATE CCW
DET CW
DET CCW
DET CCW
DET CW
ROTATE CCW
ROTATE CW
DECREASED SID
INCREASED SID
HEIGHT DWN
HEIGHT UP
THORAX
UNDERTABLE
SPARE2
SPARE1
AUTO
AUTO
SPARE1
SPARE2
SPARE3
UNDERTABLE
THORAX
LOW SPEED
UNLOCK
HEIGHT UPPER LIMIT
HEIGHT LOWER LIMIT
SID MAX. LIMIT
SID MIN. LIMIT
ARM CW LIMIT
ARM CCW LIMIT
DET CW LIMIT
DET CCW LIMIT
DET CCW LIMIT
DET CW LIMIT
ARM CCW LIMIT
ARM CW LIMIT
SID MIN LIMIT
SID MAX LIMIT
HEIGHT LOWER LIMIT
HEIGHT UPPER LIMIT
TUBE INTLK
LIMIT
BROKEN
DET HORIZ
GRID #1 SEL
GRID #2 SEL
COLLIMATOR INTLK
GRID IN
SID ACK
ROTATE ACK
HEIGHT ACK
U19
74HCT541
U20
74HCT541
U21
74HCT541
U22
74HCT541
A1 A2 A3 A4 A5 A6 A7 A8
Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8
G1 G2
PA0 PA1 PA2 PA3 PA4 PA5 PA6 PA7
(PA0...PA7)
CS1
CS2
CS4
CS3
VCC
GND
20
10
C59,60,61,62
100 nF
U19,20,21,22
74HCT541
DRAWING
RHA
15/03/19
REVISED
A. Diaz
15/03/19
NAME
DATE
SHEET/OF
1/4
A8185-14
REV
A
NC19/0024
R. Hermosilla
15/03/19
REV
DESCRIPTION
ISSUED BY
DATE
SEDECAL
XPC CONTROL


U10
MC9S12-112
U13
74HC138
U15
74HC138
U5
74HC541
DISPLAY
J1
BDM
J13
U11
HCPL-0931
U12
MUS-0505
U14
PCA82C250
5V-CAN
CAN
MODULE
J11
J12
J17
T1
V4
CAN0001
V3
CAN0001
RX-CAN
TX-CAN
BOOTLOADER
SPARE OUT
PC EN
EMERGENCY EN
LIMIT SOFT
LIMIT OUT
STOP EN
STOP
TUBE ROT
DET ROT
Pot H
J10
+5 VDC
HEIGHT POS
GND
Photocel
J2
V INCL
+5 VDC
V INCL
+V1e
+V1r
+V2e
+V2r
PHOTOCEL 1
PHOTOCEL 2
SID POS
0V
0V
ROT POS
GND
GND
+24 VDC
See Note
in sheet 4
X1
16 Mhz
/RESET
U13,U15
74HC138
U5
74HC541
U6,U16
LMC6484
U6A
LMC6484
U6D
LMC6484
D2
Diode Array
A8185-14
XPC CONTROL
SEDECAL
NC19/0024
R. Hermosilla
15/03/19
RHA
A. Díaz
2/4



REV	DESCRIPTION	ISSUED BY	DATE
A	NC19/0024	R. Hermosilla	15/03/19

	NAME	DATE
DRAWING	RHA	15/03/19
REVISED	A. Díaz	15/03/19

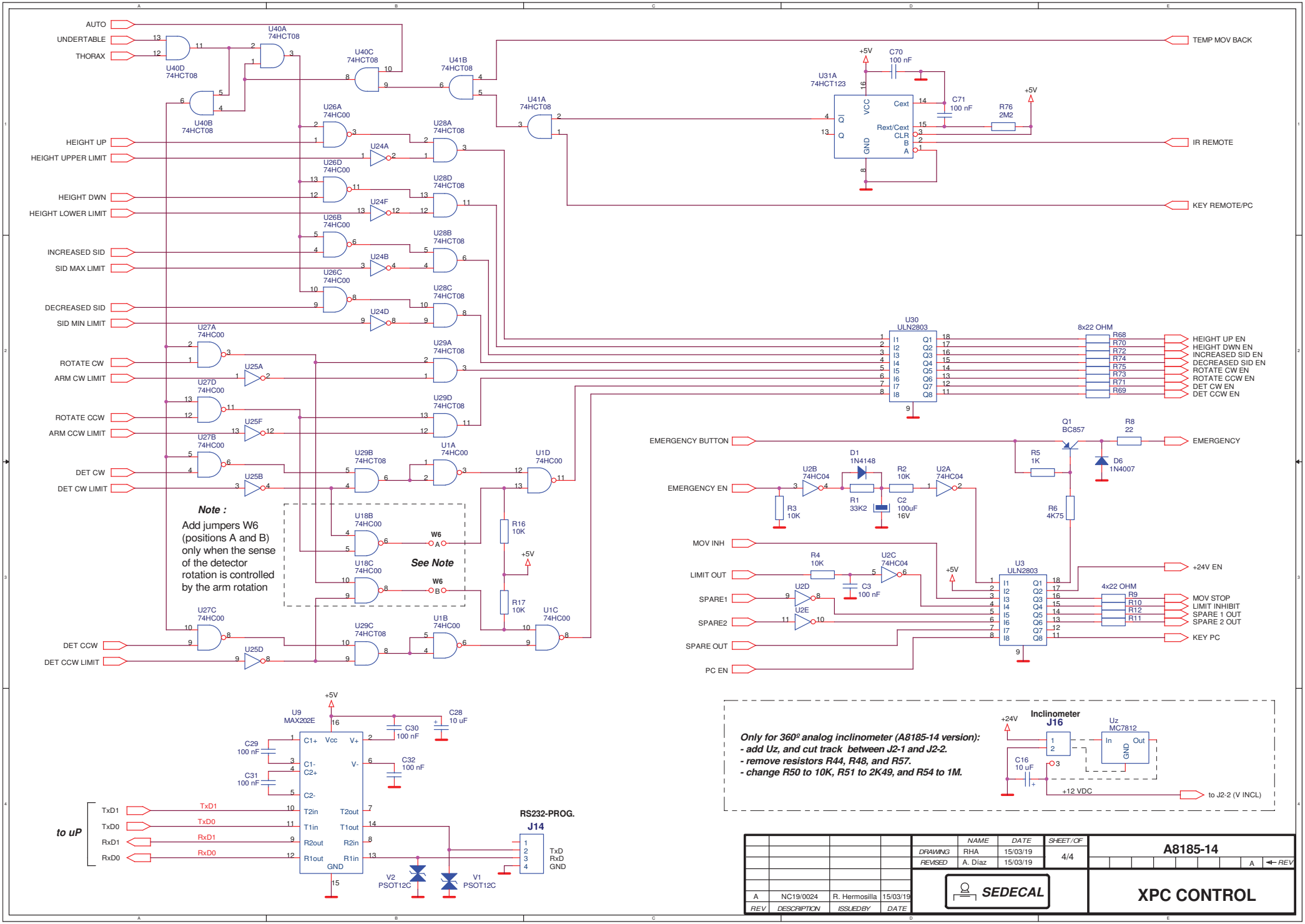
SHEET/OF: 3/4

A8185-14

REV: A

SEDECAL

XPC CONTROL



REV	DESCRIPTION	ISSUED BY	DATE
A	NC19/0024	R. Hermosilla	15/03/19

	NAME	DATE
DRAWING	RHA	15/03/19
REVISED	A. Diaz	15/03/19

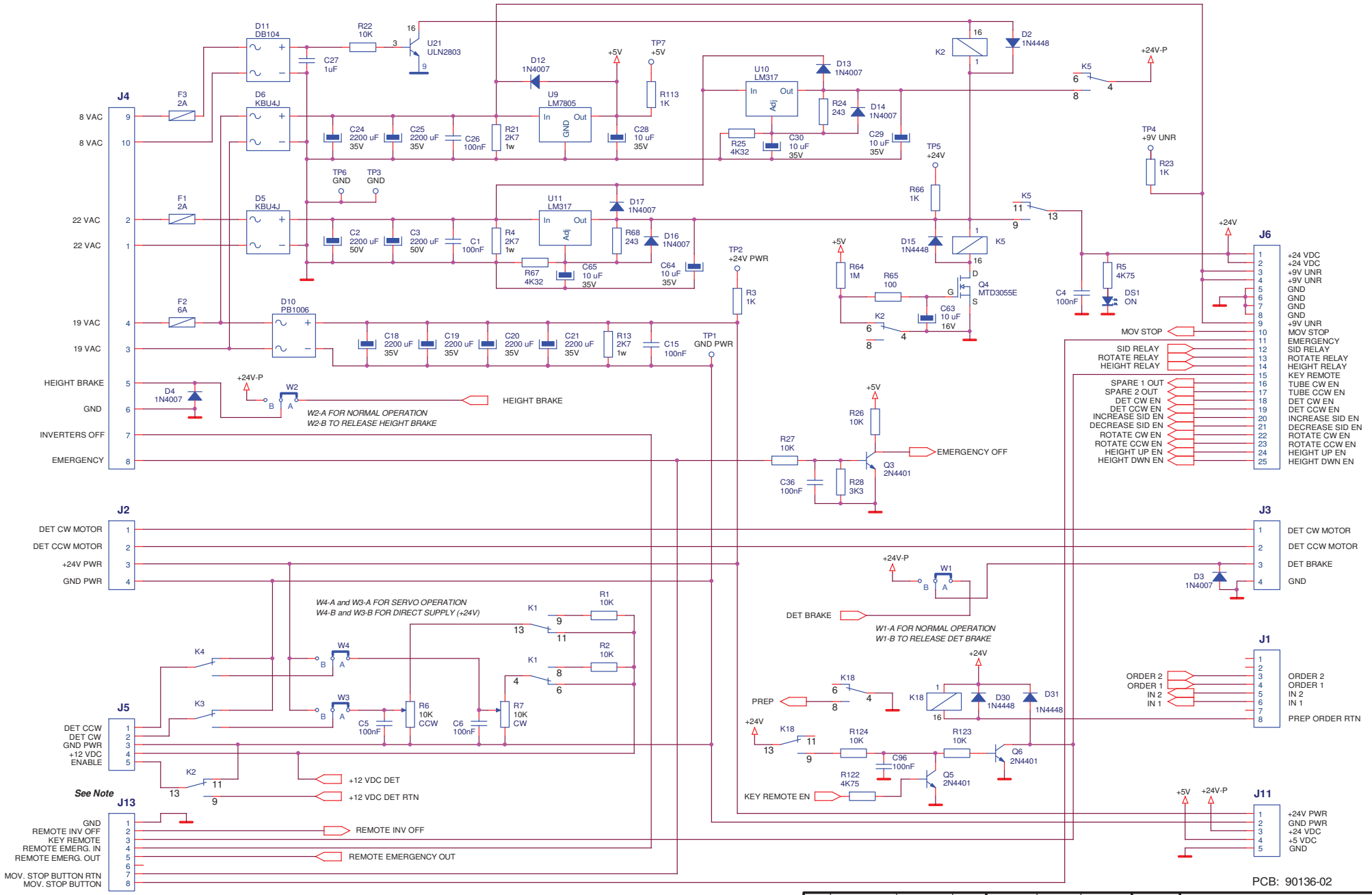
SHEET/OF: 4/4

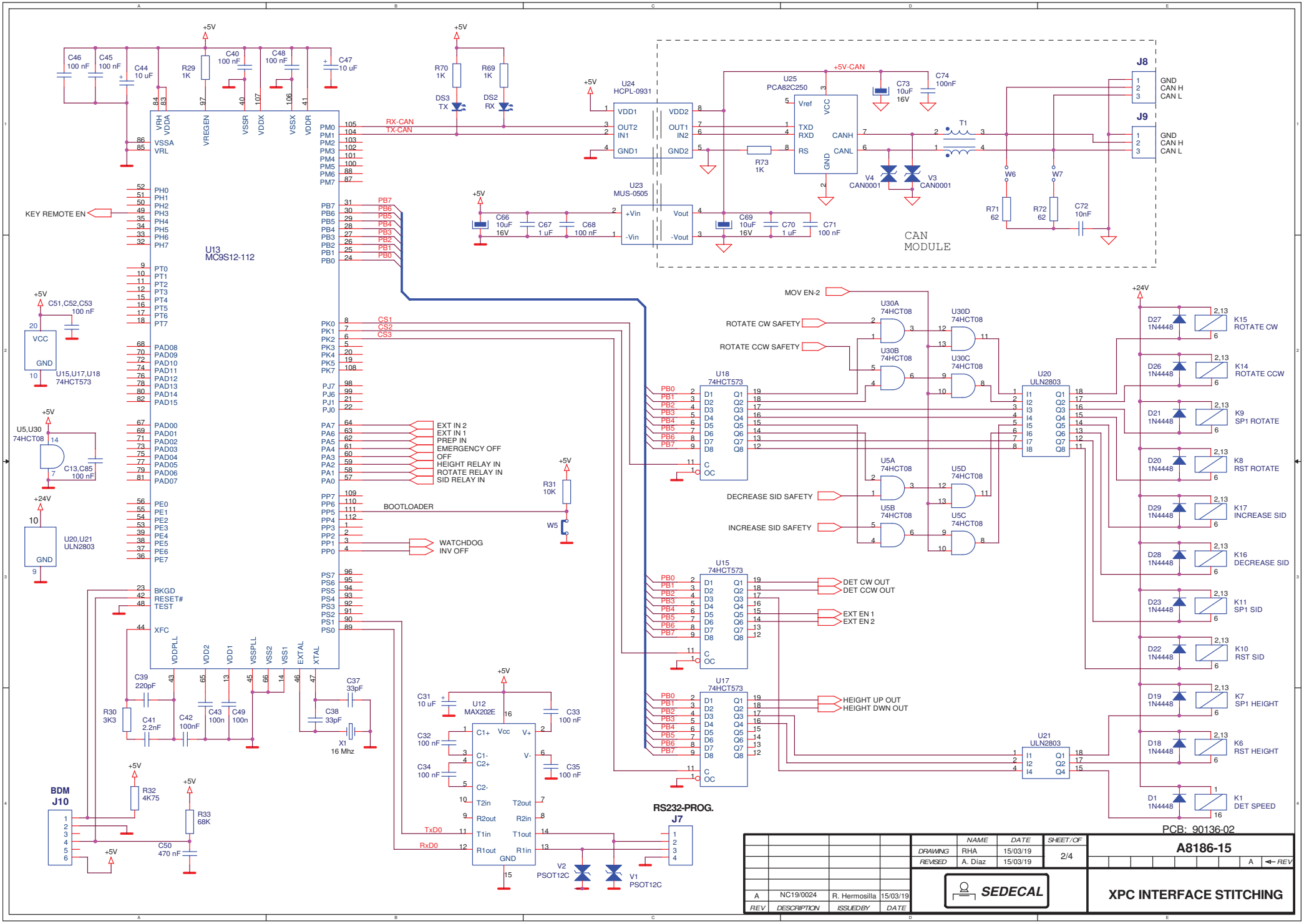
SEDECAL

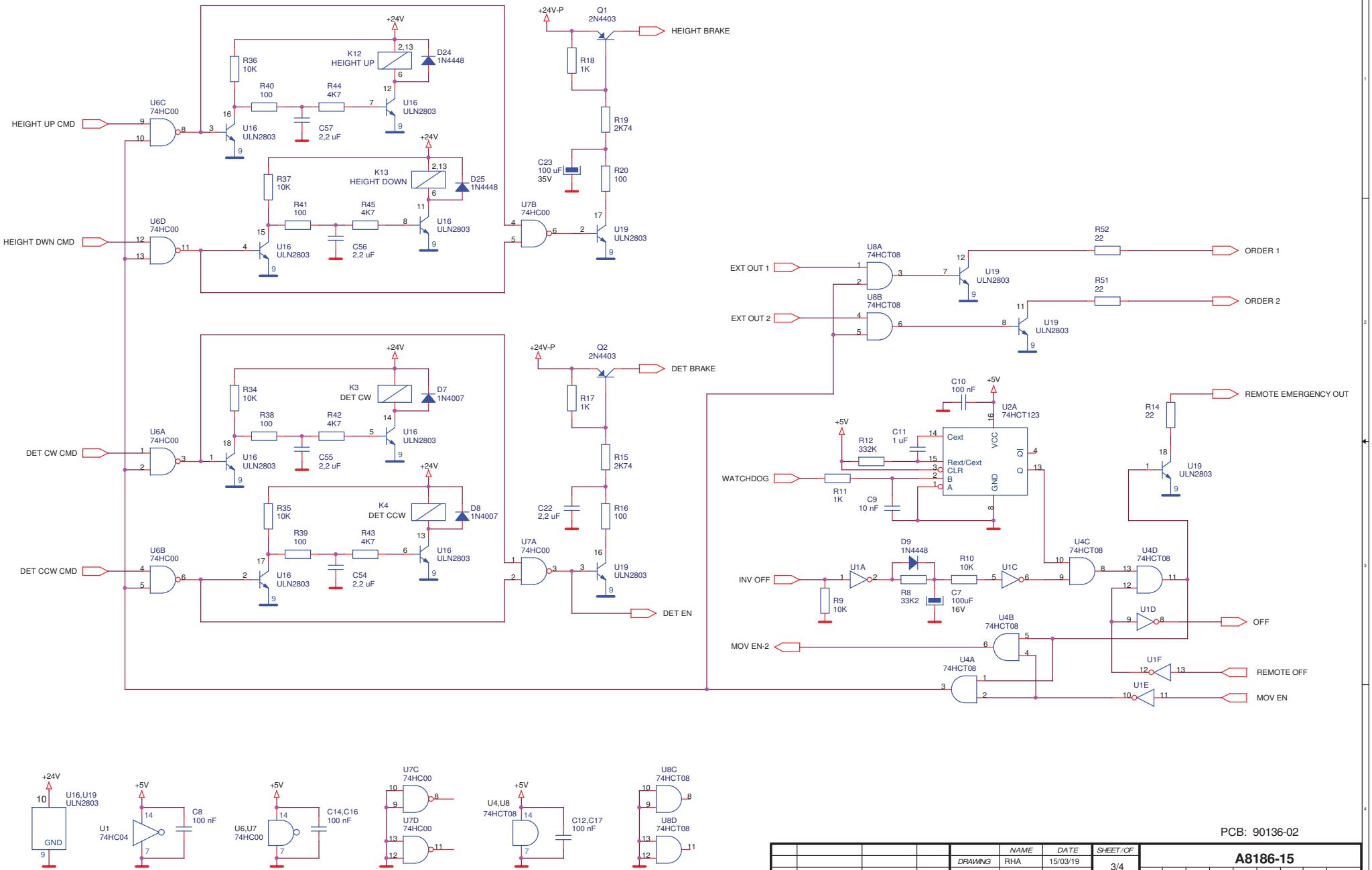
A8185-14

A ← REV

XPC CONTROL


J4
8 VAC
8 VAC
22 VAC
22 VAC
19 VAC
19 VAC
HEIGHT BRAKE
GND
INVERTERS OFF
EMERGENCY
F1 2A
F2 6A
F3 2A
D5 KBU4J
D6 KBU4J
D10 PB1006
D11 DB104
C1 100nF
C2 2200 uF 50V
C3 2200 uF 50V
C4 100nF
C5 100nF
C6 100nF
C15 100nF
C18 2200 uF 35V
C19 2200 uF 35V
C20 2200 uF 35V
C21 2200 uF 35V
C24 2200 uF 35V
C25 2200 uF 35V
C26 100nF
C27 1uF
C28 10 uF 35V
C29 10 uF 35V
C30 10 uF 35V
C36 100nF
C63 10 uF 16V
C64 10 uF 35V
C65 10 uF 35V
C96 100nF
R1 10K
R2 10K
R3 1K
R4 2K7 1w
R5 4K75
R6 10K CCW
R7 10K CW
R13 2K7 1w
R21 2K7 1w
R22 10K
R23 1K
R24 243
R25 4K32
R26 10K
R27 10K
R28 3K3
R64 1M
R65 100
R66 1K
R67 4K32
R68 243
R113 1K
R122 4K75
R123 10K
R124 10K
U9 LM7805
U10 LM317
U11 LM317
U21 ULN2803
D1 1N4007
D2 1N4448
D3 1N4007
D4 1N4007
D12 1N4007
D13 1N4007
D14 1N4007
D15 1N4448
D16 1N4007
D17 1N4007
D30 1N4448
D31 1N4448
Q3 2N4401
Q4 MTD3055E
Q5 2N4401
Q6 2N4401
K1
K2
K3
K4
K5
K18
W1
W2
W3
W4
DS1 ON
TP1 GND PWR
TP2 +24V PWR
TP3 GND
TP4 +9V UNR
TP5 +24V
TP6 GND
TP7 +5V
+5V
+24V
+24V-P
W2-A FOR NORMAL OPERATION
W2-B TO RELEASE HEIGHT BRAKE
W4-A and W3-A FOR SERVO OPERATION
W4-B and W3-B FOR DIRECT SUPPLY (+24V)
W1-A FOR NORMAL OPERATION
W1-B TO RELEASE DET BRAKE
J6
+24 VDC
+24 VDC
+9V UNR
+9V UNR
GND
GND
GND
GND
+9V UNR
MOV STOP
EMERGENCY
SID RELAY
ROTATE RELAY
HEIGHT RELAY
KEY REMOTE
TUBE CW EN
TUBE CCW EN
DET CW EN
DET CCW EN
INCREASE SID EN
DECREASE SID EN
ROTATE CW EN
ROTATE CCW EN
HEIGHT UP EN
HEIGHT DWN EN
SPARE 1 OUT
SPARE 2 OUT
DET CW EN
DET CCW EN
INCREASE SID EN
DECREASE SID EN
ROTATE CW EN
ROTATE CCW EN
HEIGHT UP EN
HEIGHT DWN EN
J2
DET CW MOTOR
DET CCW MOTOR
+24V PWR
GND PWR
J3
DET CW MOTOR
DET CCW MOTOR
DET BRAKE
GND
J1
ORDER 2
ORDER 1
IN 2
IN 1
PREP ORDER RTN
J5
DET CCW
DET CW
GND PWR
+12 VDC
ENABLE
+12 VDC DET
+12 VDC DET RTN
J13
See Note
GND
REMOTE INV OFF
KEY REMOTE
REMOTE EMERG. IN
REMOTE EMERG. OUT
MOV. STOP BUTTON RTN
MOV. STOP BUTTON
REMOTE INV OFF
REMOTE EMERGENCY OUT
J11
+24V PWR
GND PWR
+24V VDC
+5 VDC
GND
EMERGENCY OFF
DET BRAKE
KEY REMOTE EN
PREP
Note.- Set jumpers in J13, between 1 and 2, 4 and 5, 7 and 8, when J13 interface (CRIB) is not used.
PCB: 90136-02
A NC19/0024 R. Hermosilla 15/03/19
REV DESCRIPTION ISSUED BY DATE
DRAWING RHA 15/03/19
REVISED A. Díaz 15/03/19
NAME DATE
SHEET/OF 1/4
A8186-15
A REV
SEDECAL
XPC INTERFACE STITCHING


U13
MC9S12-112
KEY REMOTE EN
EXT IN 2
EXT IN 1
PREP IN
EMERGENCY OFF
OFF
HEIGHT RELAY IN
ROTATE RELAY IN
SID RELAY IN
BOOTLOADER
WATCHDOG
INV OFF
RX-CAN
TX-CAN
CS1
CS2
CS3
U24
HCPL-0931
U25
PCA82C250
+5V-CAN
U23
MUS-0505
CAN
MODULE
J8
J9
GND
CAN H
CAN L
MOV EN-2
ROTATE CW SAFETY
ROTATE CCW SAFETY
DECREASE SID SAFETY
INCREASE SID SAFETY
U18
74HCT573
U15
74HCT573
U17
74HCT573
U20
ULN2803
U21
ULN2803
DET CW OUT
DET CCW OUT
EXT EN 1
EXT EN 2
HEIGHT UP OUT
HEIGHT DWN OUT
K15
ROTATE CW
K14
ROTATE CCW
K9
SP1 ROTATE
K8
RST ROTATE
K17
INCREASE SID
K16
DECREASE SID
K11
SP1 SID
K10
RST SID
K7
SP1 HEIGHT
K6
RST HEIGHT
K1
DET SPEED
BDM
J10
RS232-PROG.
J7
X1
16 Mhz
PCB: 90136-02
A8186-15
XPC INTERFACE STITCHING
SEDECAL
NC19/0024
R. Hermosilla
15/03/19
2/4



PCB: 90136-02

REV	DESCRIPTION	ISSUED BY	DATE
A	NC19/0024	R. Hermosilla	15/03/19

	NAME	DATE
DRAWING	RHA	15/03/19
REVISED	A. Díaz	15/03/19

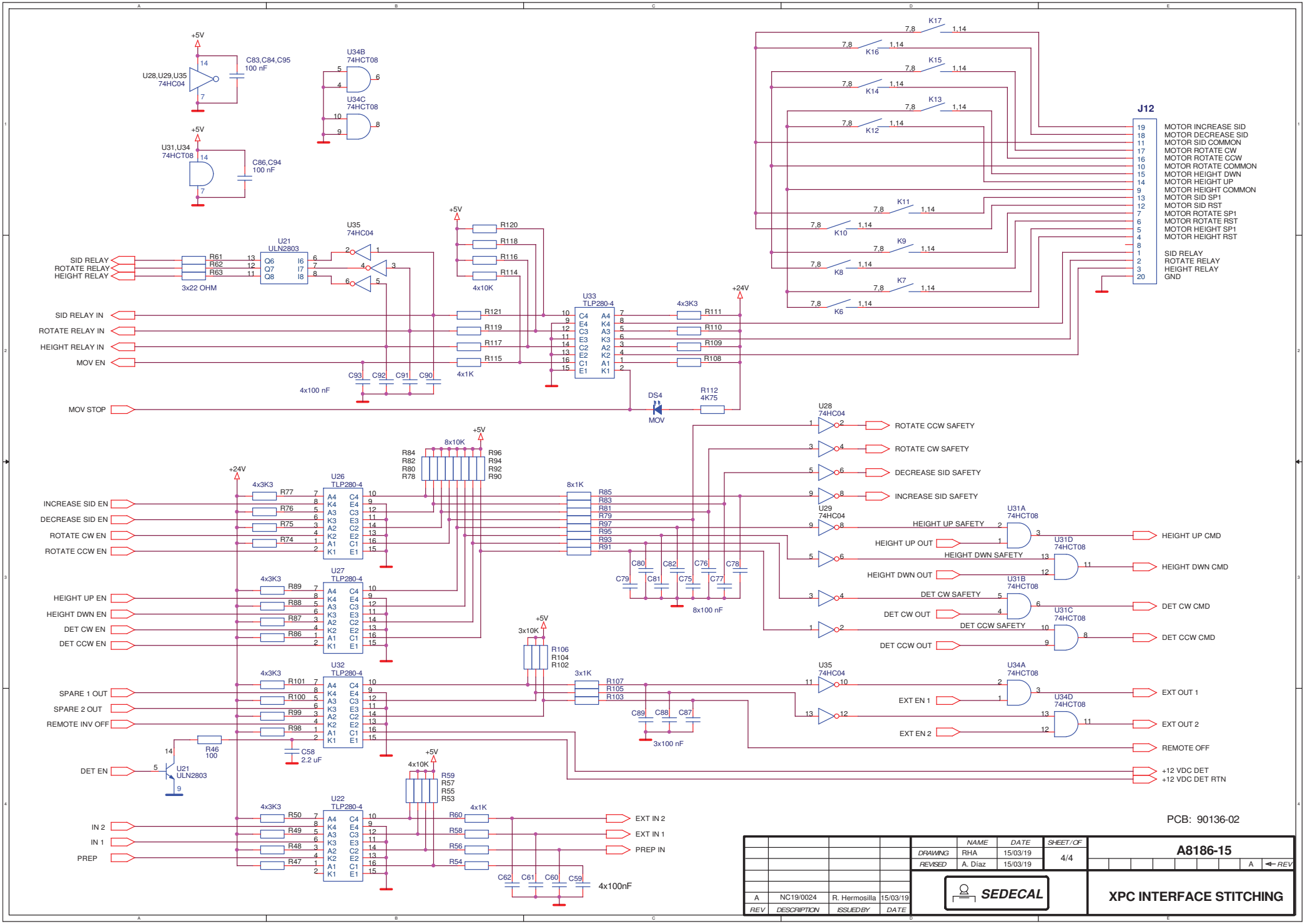
SHEET/OF: 3/4

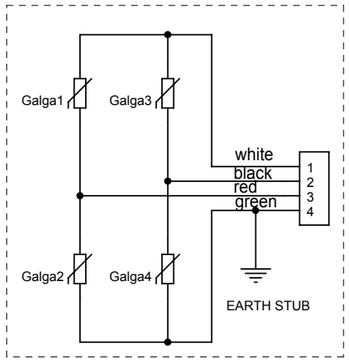
SEDECAL

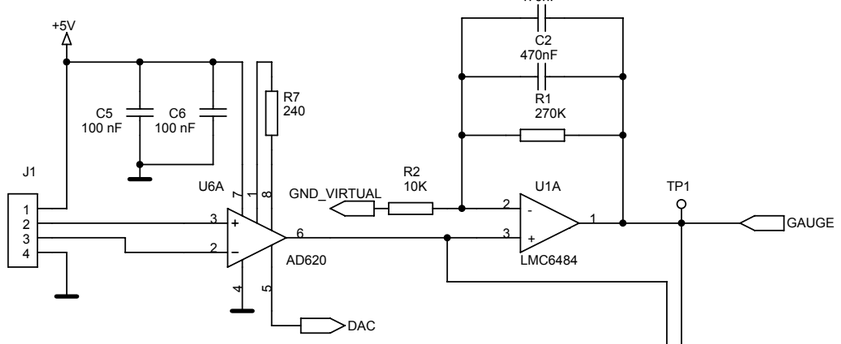
A8186-15

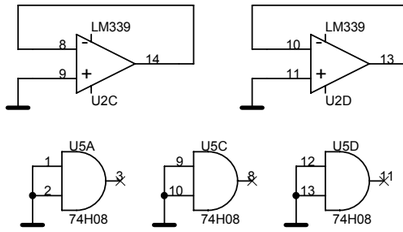
REV: A

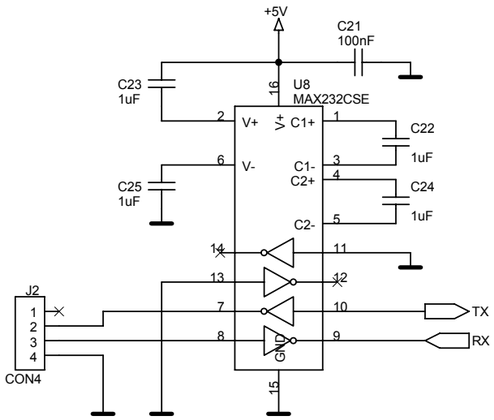
XPC INTERFACE STITCHING

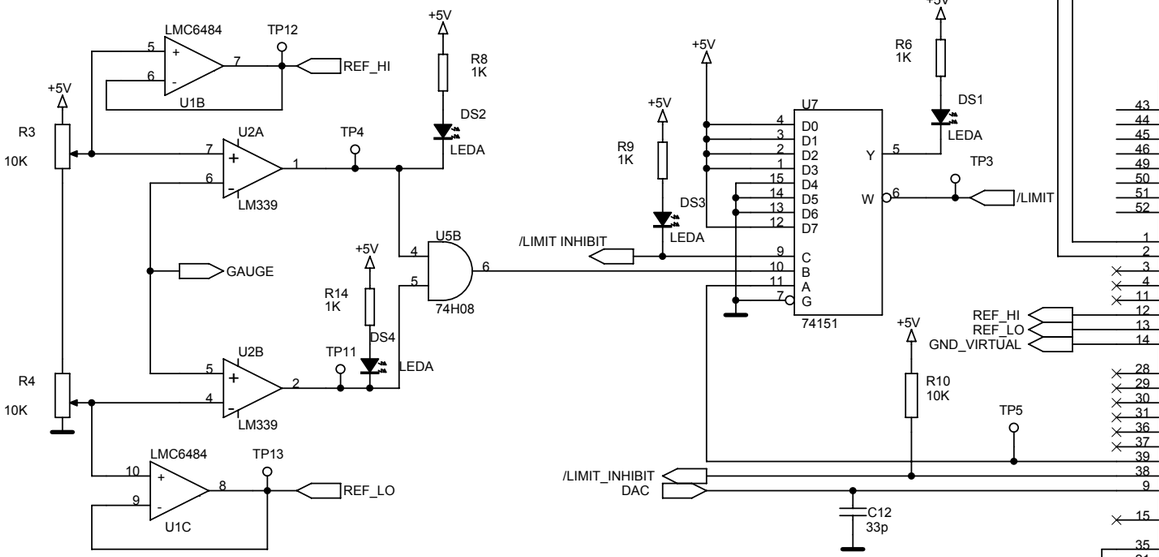

+5V
U28,U29,U35
74HC04
C83,C84,C95
100 nF
U34B
74HCT08
U34C
74HCT08
U31,U34
74HCT08
C86,C94
100 nF
K17
K16
K15
K14
K13
K12
K11
K10
K9
K8
K7
K6
J12
MOTOR INCREASE SID
MOTOR DECREASE SID
MOTOR SID COMMON
MOTOR ROTATE CW
MOTOR ROTATE CCW
MOTOR ROTATE COMMON
MOTOR HEIGHT DWN
MOTOR HEIGHT UP
MOTOR HEIGHT COMMON
MOTOR SID SP1
MOTOR SID RST
MOTOR ROTATE SP1
MOTOR ROTATE RST
MOTOR HEIGHT SP1
MOTOR HEIGHT RST
SID RELAY
ROTATE RELAY
HEIGHT RELAY
GND
U21
ULN2803
U35
74HC04
R61
R62
R63
3x22 OHM
R120
R118
R116
R114
4x10K
U33
TLP280-4
4x3K3
R111
R110
R109
R108
R121
R119
R117
R115
4x1K
C93
C92
C91
C90
4x100 nF
+24V
SID RELAY IN
ROTATE RELAY IN
HEIGHT RELAY IN
MOV EN
MOV STOP
DS4
MOV
R112
4K75
U28
74HC04
ROTATE CCW SAFETY
ROTATE CW SAFETY
DECREASE SID SAFETY
INCREASE SID SAFETY
8x10K
R84
R82
R80
R78
R96
R94
R92
R90
U26
TLP280-4
INCREASE SID EN
DECREASE SID EN
ROTATE CW EN
ROTATE CCW EN
R77
R76
R75
R74
8x1K
R85
R83
R81
R79
R97
R95
R93
R91
C80
C82
C76
C78
C79
C81
C75
C77
8x100 nF
U29
74HC04
U31A
74HCT08
HEIGHT UP SAFETY
HEIGHT UP OUT
HEIGHT UP CMD
U31D
74HCT08
HEIGHT DWN SAFETY
HEIGHT DWN OUT
HEIGHT DWN CMD
U31B
74HCT08
DET CW SAFETY
DET CW OUT
DET CW CMD
U31C
74HCT08
DET CCW SAFETY
DET CCW OUT
DET CCW CMD
U27
TLP280-4
HEIGHT UP EN
HEIGHT DWN EN
DET CW EN
DET CCW EN
R89
R88
R87
R86
3x10K
R106
R104
R102
U32
TLP280-4
3x1K
R107
R105
R103
C89
C88
C87
3x100 nF
U35
74HC04
U34A
74HCT08
EXT EN 1
EXT OUT 1
U34D
74HCT08
EXT EN 2
EXT OUT 2
REMOTE OFF
+12 VDC DET
+12 VDC DET RTN
SPARE 1 OUT
SPARE 2 OUT
REMOTE INV OFF
R101
R100
R99
R98
R46
100
C58
2.2 uF
DET EN
U21
ULN2803
4x10K
R59
R57
R55
R53
U22
TLP280-4
IN 2
IN 1
PREP
R50
R49
R48
R47
R60
R58
R56
R54
4x1K
EXT IN 2
EXT IN 1
PREP IN
C62
C61
C60
C59
4x100nF
PCB: 90136-02
A
NC19/0024
R. Hermosilla
15/03/19
REV
DESCRIPTION
ISSUED BY
DATE
NAME
DATE
SHEET/OF
DRAWING
RHA
15/03/19
4/4
REVISED
A. Díaz
15/03/19
A
REV
SEDECAL
A8186-15
XPC INTERFACE STITCHING

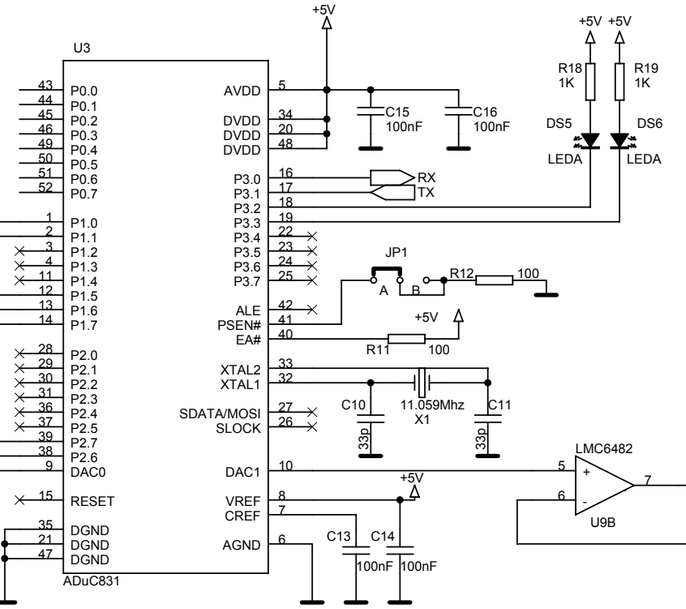


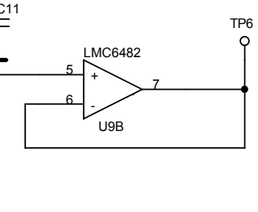


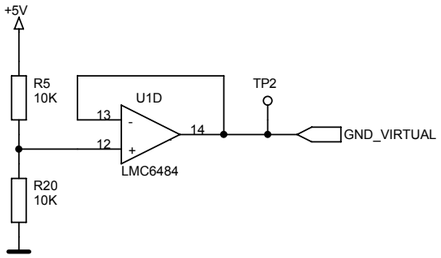


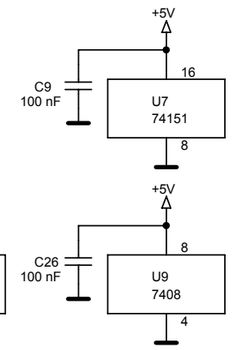


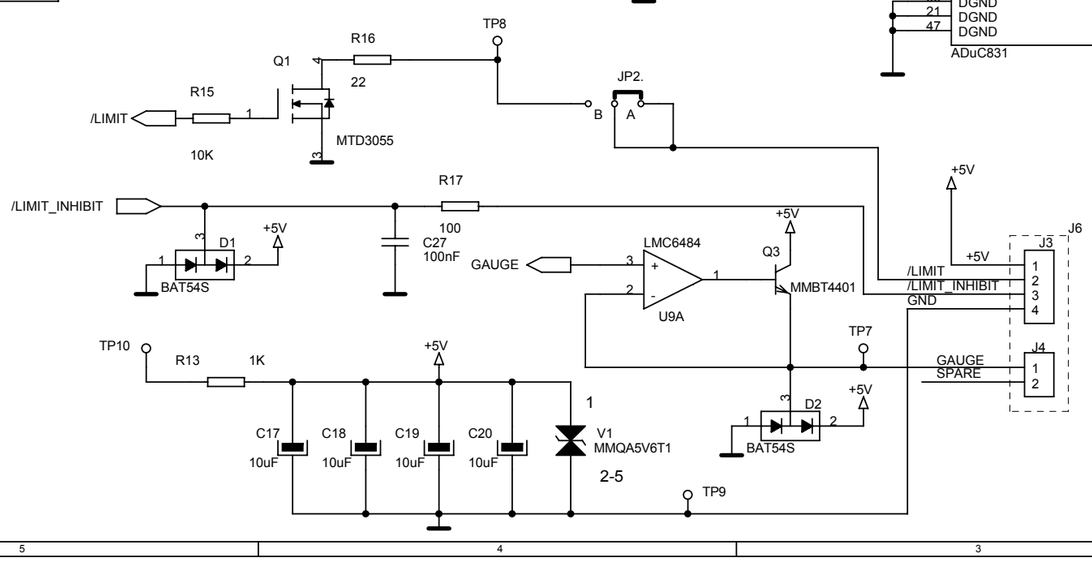












Nº P.C.B. 90045-07

REV	DESCRIPTION	ISSUED BY	DATE
Bb1	N.C. 06/050	R. Frutos	16/02/06

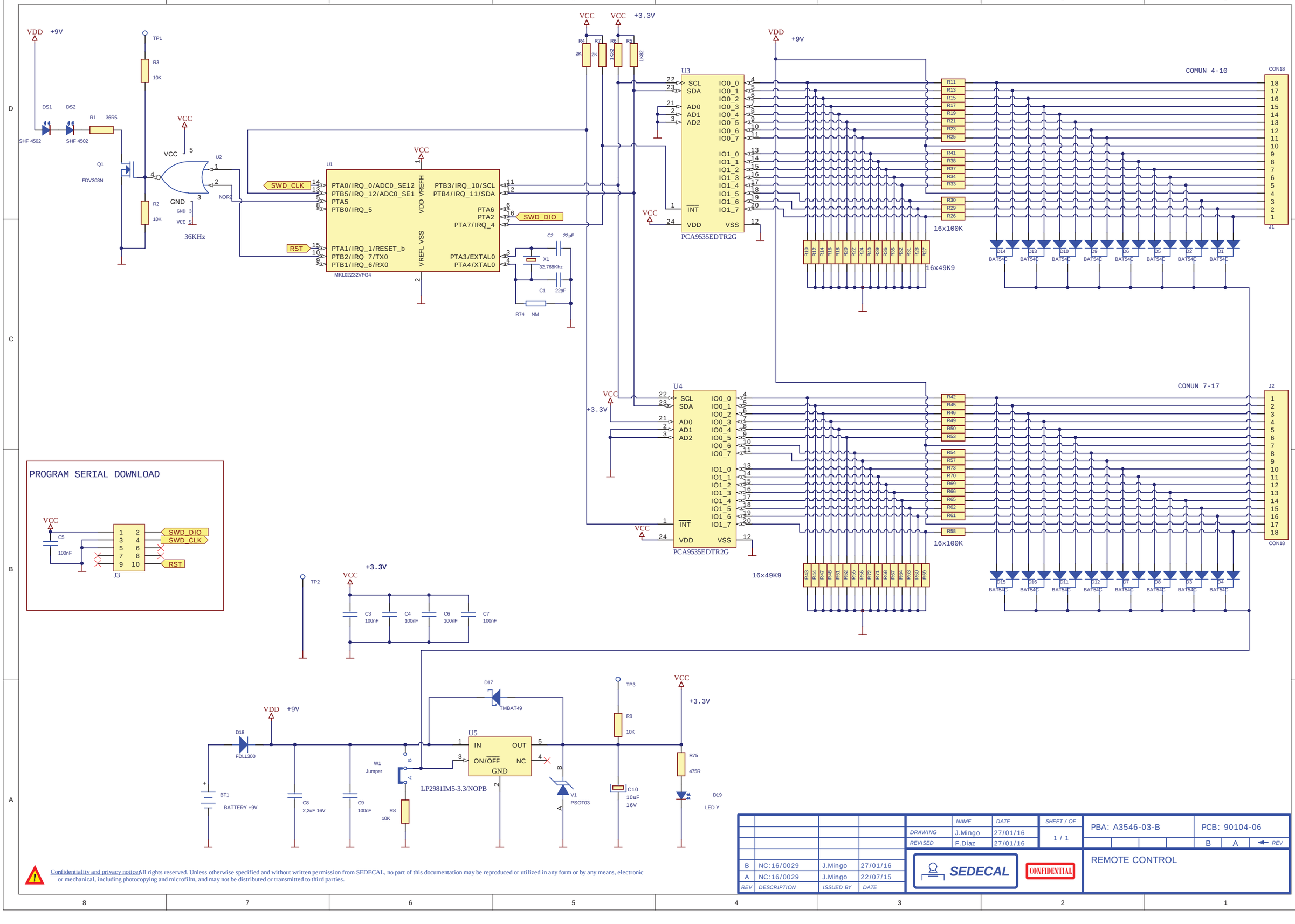
	NAME	DATE	SHEET / OF
DRAWING	F. DIAZ	30/12/05	1/1
REVISED	A. DIAZ	30/12/05	

A3531-11

Bb1 | Ab1 | ◄ REV

SEDECAL

ANTICRUSHING

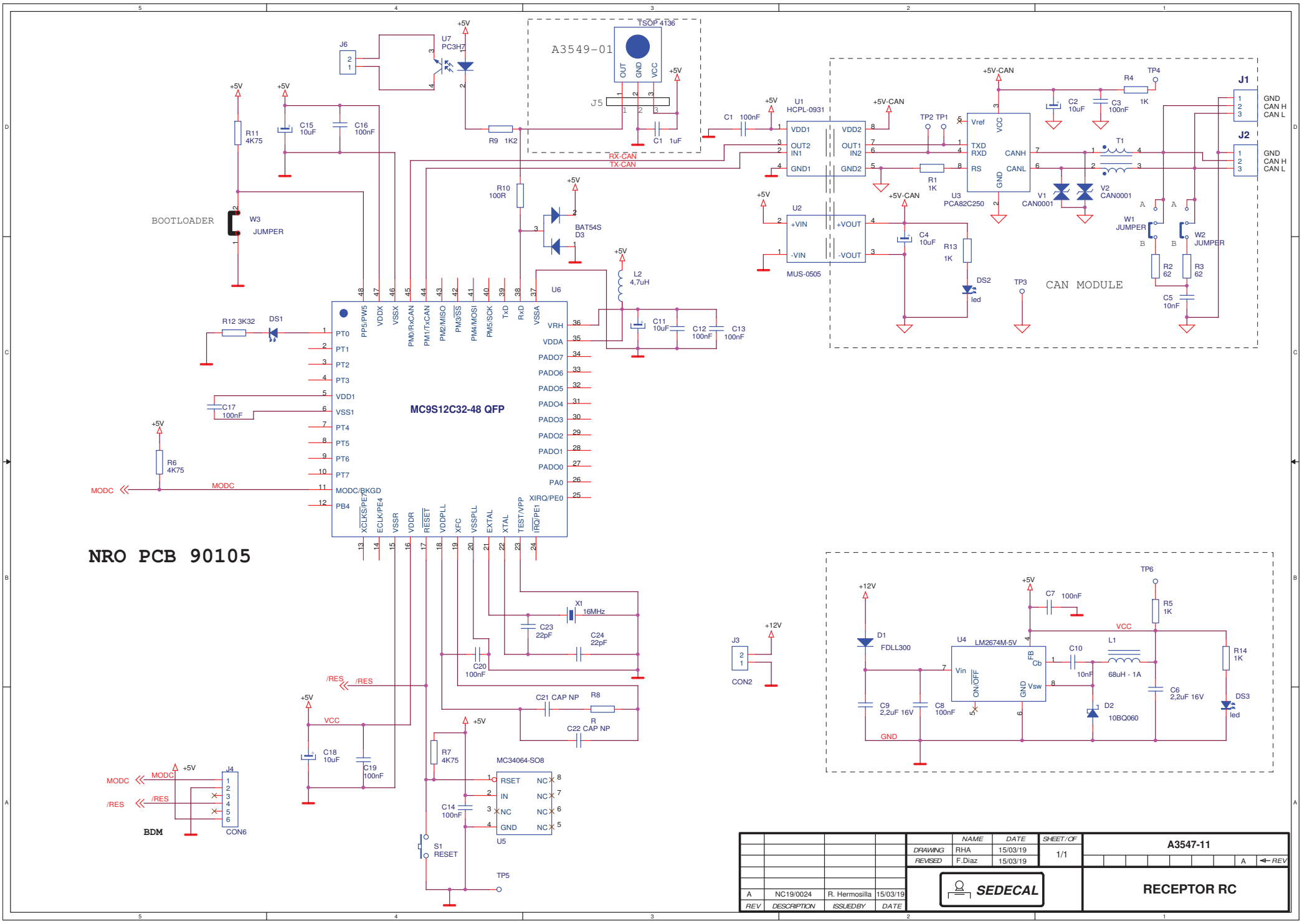


					NAME	DATE	SHEET / OF
				DRAWING	J.Mingo	27/01/16	1 / 1
				REVISED	F.Diaz	27/01/16	
B	NC:16/0029	J.Mingo	27/01/16				
A	NC:16/0029	J.Mingo	22/07/15				
REV	DESCRIPTION	ISSUED BY	DATE				

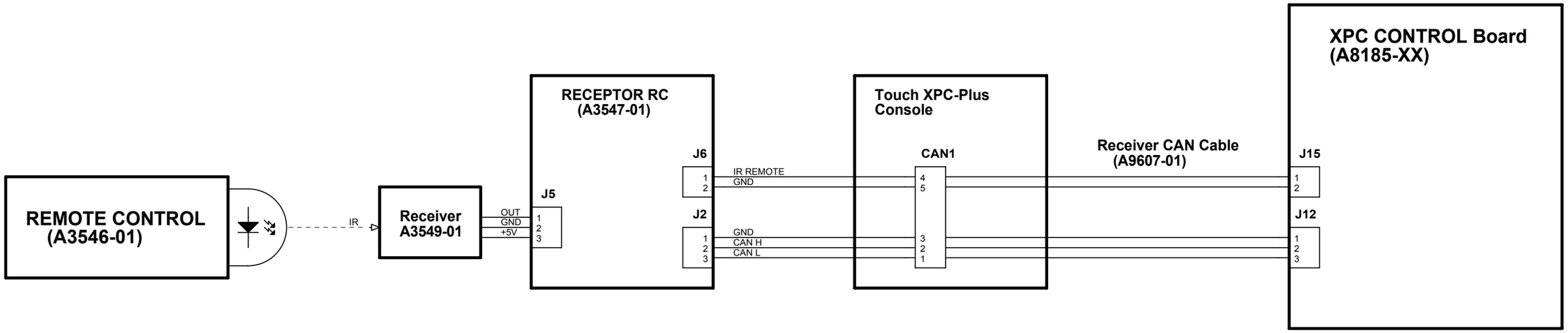
PBA: A3546-03-B | PCB: 90104-06 | B | A | REV

SEDECAL | CONFIDENTIAL

REMOTE CONTROL



					NAME	DATE	SHEET/OF	A3547-11
				DRAWING	RHA	15/03/19	1/1	A ← REV
				REVISED	F.Diaz	15/03/19		
A	NC19/0024	R. Hermosilla	15/03/19	SEDECAL				RECEPTOR RC
REV	DESCRIPTION	ISSUED BY	DATE					



REV	DESCRIPTION	ISSUED BY	DATE

	NAME	DATE
DRAWING	F.GARCIA	18/03/10
REVISED	A.DIAZ	18/03/10

SHEET / OF: 1/1

SEDECAL

IF - 057

A ◄ REV

Remote Control

Detector Assembly

XPC CONTROL Board (A8185-01)

J6

EMERGENCY Cable (A8197-01)

1	+5 VDC	1
2	DET CW LIMIT	5
3	DET CCW LIMIT	6
4		
5	GRID 1 SEL	7
6	GRID 2 SEL	8
7		
8	SAFETY 1	9
9	SAFETY 2	2
10	DET ROT	4
11	GND	3
12		
13	EMERGENCY	11
14	+24 VDC	12
15	GND	10
	Shield	

TS9

CW Limit

CCW Limit

R1

ROT. POT

TS4

4	Grid 1	
3	Grid 2	
2	Safety 1	
	Emergency Motors Stop Button	
5		11
6		12
1		10
7		

XPC-Plus Unit

Servoamplifier

Power

+Motor	1
-Motor	2
+Vcc	4
Power Gnd	5
Earth	3

Signal

+Set Value	1
-Set Value	2
Gnd	4
+12V/12mA OUT	10
Enable	3
GND	12
+Tacho Input	5
-Tacho Input	6
Monitor n	7
Monitor I	8
Ready	9
-12V/12mA OUT	11

See Note 1

Servo Power Cable (A9615-01)

DET CW MOTOR	1
DET CCW MOTOR	2
+24V PWR	3
GND PWR	4

Servo Signal Cable (A9616-01)

DET CCW	1
DET CW	2
GND PWR	3
+12 VDC	4
ENABLE	5
Shield	

XPC INTERFACE Board (A8186-01)

J2

1	
2	
3	
4	

J5

1	
2	
3	
4	
5	

Jumpers W4 and W5 of the board in position A

J3

Detector Motor Cable (A8199-XX)

1	DET CW MOTOR	1
2	DET CCW MOTOR	2
3	DET BRAKE	3
4	GND	4
	Shield	

J5

1	black
2	red
3	red
4	blue

ROT Motor

Note 1.- Configurate switches as IxR mode: SW1-OFF, SW2-ON, SW3-ON, SW4-OFF, SW5-OFF, and SW6-OFF (see documentation of the Servoamplifier)

REV	DESCRIPTION	ISSUED BY	DATE

	NAME	DATE
DRAWING	F.GARCIA	10/10/05
REVISED	A.DIAZ	10/10/05

SHEET / OF: 1/1

SEDECAL

IM - 367

A ← REV

XPC-Plus/Tilting Detector with Servo

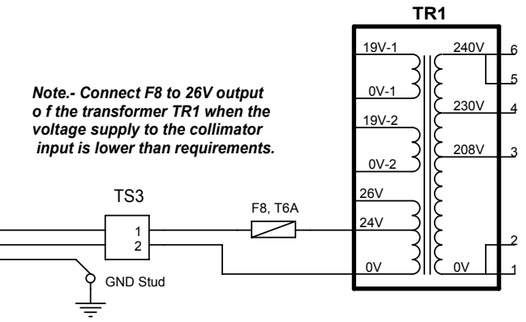
X-Plus LP Plus (Device)

COLLIMATOR
Ralco (Manual)

COLLIMATOR POWER CABLE (A3388-XX)

24 VAC LAMP
0 VAC LAMP
GND

X-Plus LP Plus (Control Cabinet)



Note.- Connect F8 to 26V output o f the transformer TR1 when the voltage supply to the collimator input is lower than requirements.

REV	DESCRIPTION	ISSUED BY	DATE

	NAME	DATE
DRAWING	F.GARCIA	10/10/06
REVISED	A.DIAZ	10/10/06

SHEET / OF: 1/1

IM - 373

REV

SEDECAL

X-Plus LP Plus Interface with Manual Collimator Ralco

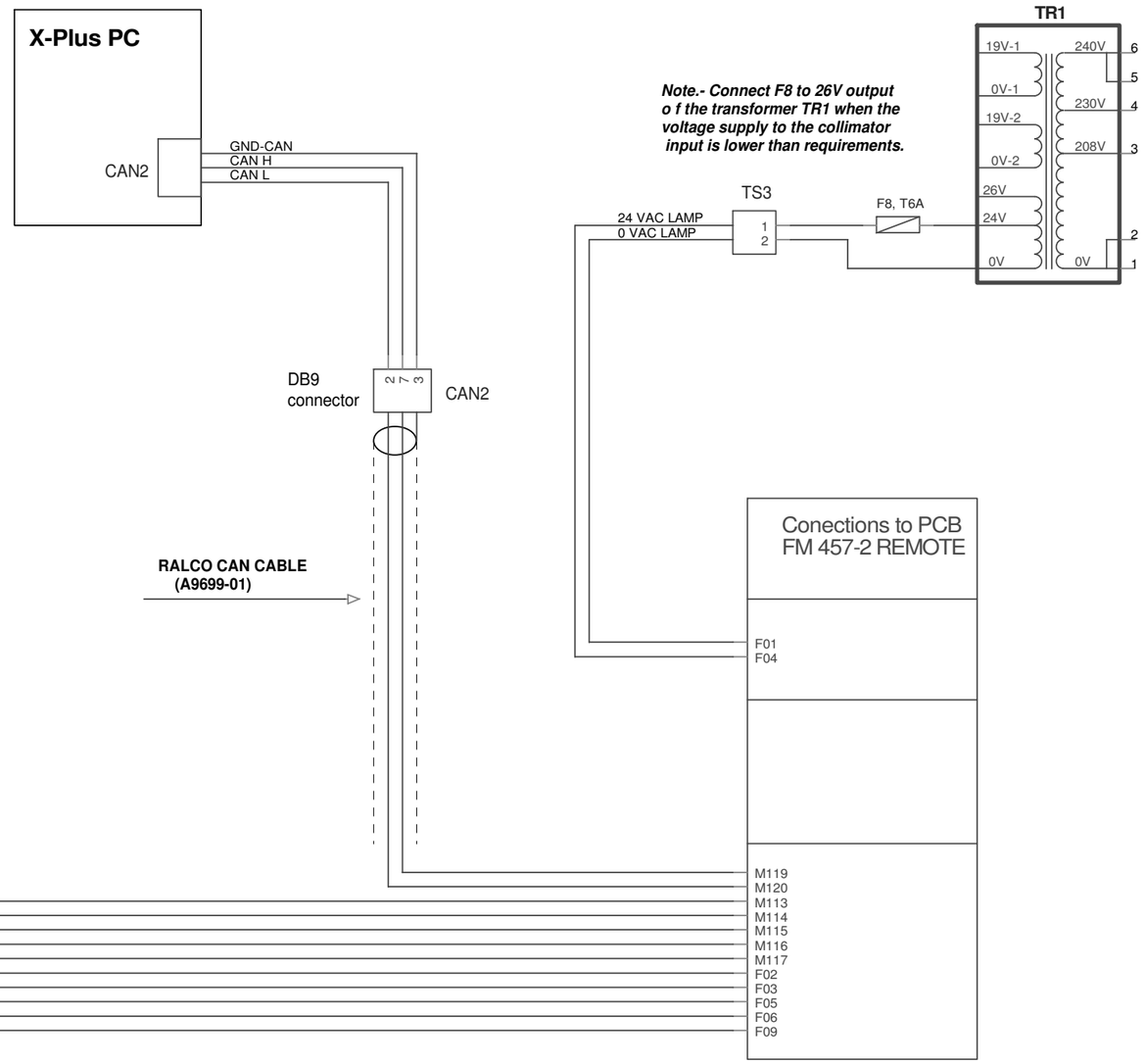
X-Plus LP Plus (U-Arm)

Note.- Configure Collimator according to the specific document (see also Collimator documentation).

COLLIMATOR Ralco - Model R 302 ACS/A

COLLIMATOR CABLE

X-Plus LP Plus (Control Cabinet)



REV	DESCRIPTION	ISSUED BY	DATE
F	NC15/0194	R. Hermosilla	24/06/15
E	NC 12/003	M.González	04/01/12
D	NC 11/330	S.Pérez	24/10/11
C	new interface	F. García	25/05/10
B	sheet 3 added	F. García	09/09/09
A	CN 08/337	F. García	11/11/08

	NAME	DATE
DRAWING	F.GARCIA	26/03/07
REVISED	A.DIAZ	22/09/07

SHEET/OF: 1/3

SEDECAL

IM - 378

F E D C B A ← REV

X-Plus LP Plus with Auto Collimator Ralco

X-Plus LP Plus (U-Arm)

Note.- Configure Collimator according to the specific document (see also Collimator documentation).

COLLIMATOR Ralco - Model R302-DACS/A

E J K D F B

CAN-H
CAN-L
CAN-GND
SUPPLY
SUPPLY

CHASSIS GND

A8529-01 Adapter cable

CAN COLL

7 2 3 — 7 2 3

CAN-H
CAN-L
CAN-GND

A7139-01 Can cable

J5

1 2 3 — 1 2 3

SUPPLY
SUPPLY
CHASSIS GND

A9688-04 Power Cable

X-Plus LP Plus (Control Cabinet)

X-Plus PC

CAN2

CAN-GND
CAN-L
CAN-H

DB9 connector — 7 2 3 — CAN2

RALCO CAN CABLE (A9699-01)

M119 M120 — Connection

TS3

1 2

GND Stud

F8, T6A

TR1

19V-1	240V — 6
0V-1	5
19V-2	230V — 4
0V-2	208V — 3
26V	
24V	2
0V	0V — 1

Note.- Connect F8 to 26V output o f the transformer TR1 when the voltage supply to the collimator input is lower than requirements.

REV	DESCRIPTION	ISSUED BY	DATE
F	NC15/0194	R. Hermosilla	24/06/15
E	NC 12/003	M.González	04/01/12
D	NC 11/330	S.Pérez	24/10/11
C	new interface	F. García	25/05/10
B	sheet 3 added	F. García	09/09/09
A	CN 08/337	F. García	11/11/08

	NAME	DATE
DRAWING	F.GARCIA	26/03/07
REVISED	A.DIAZ	22/09/07

SHEET/OF 2/3

SEDECAL

IM - 378

F E D C B A ← REV

X-Plus LP Plus with Auto Collimator Ralco

X-Plus LP Plus (U-Arm)

Note.- Configure Collimator according to the specific document (see also Collimator documentation).

COLLIMATOR
Ralco - Model
R225 ACS DHHS

E CAN-H
J CAN-L
K CAN-GND
D SUPPLY
F SUPPLY
B
CHASSIS GND

A8529-01 Adapter cable

CAN COLL

7	7
2	2
3	3

A9689-XX Collimator cable

CAN-H
CAN-L
CAN-GND

J5

1	1
2	2
3	3

A9688-XX Power Cable (*)

SUPPLY
SUPPLY
CHASSIS GND

(*) cable lenght according with XPLUS LP PLUS interconnection cables (KIT cables)

X-Plus LP Plus (Control Cabinet)

X-Plus PC

CAN2
CAN-GND
CAN-L
CAN-H

Adapter ribbon cable

DB9 connector
7 2 3
CAN2

Adapter RJ45-DB9 (CAN) (A8599-02)

TR1

19V-1 — 240V — 6
0V-1 — 5
230V — 4
19V-2
0V-2 — 208V — 3
26V
24V — 2
0V — 0V — 1

TS3
1
2

F8, T6A

GND Stud

Note.- Connect F8 to 26V output o f the transformer TR1 when the voltage supply to the collimator input is lower than requirements.

REV	DESCRIPTION	ISSUED BY	DATE
F	NC15/0194	R. Hermosilla	24/06/15
E	NC 12/003	M.González	04/01/12
D	NC 11/330	S.Pérez	24/10/11
C	new interface	F. García	25/05/10
B	sheet 3 added	F. García	09/09/09
A	CN 08/337	F. García	11/11/08

	NAME	DATE
DRAWING	F.GARCIA	26/03/07
REVISED	A.DIAZ	22/09/07

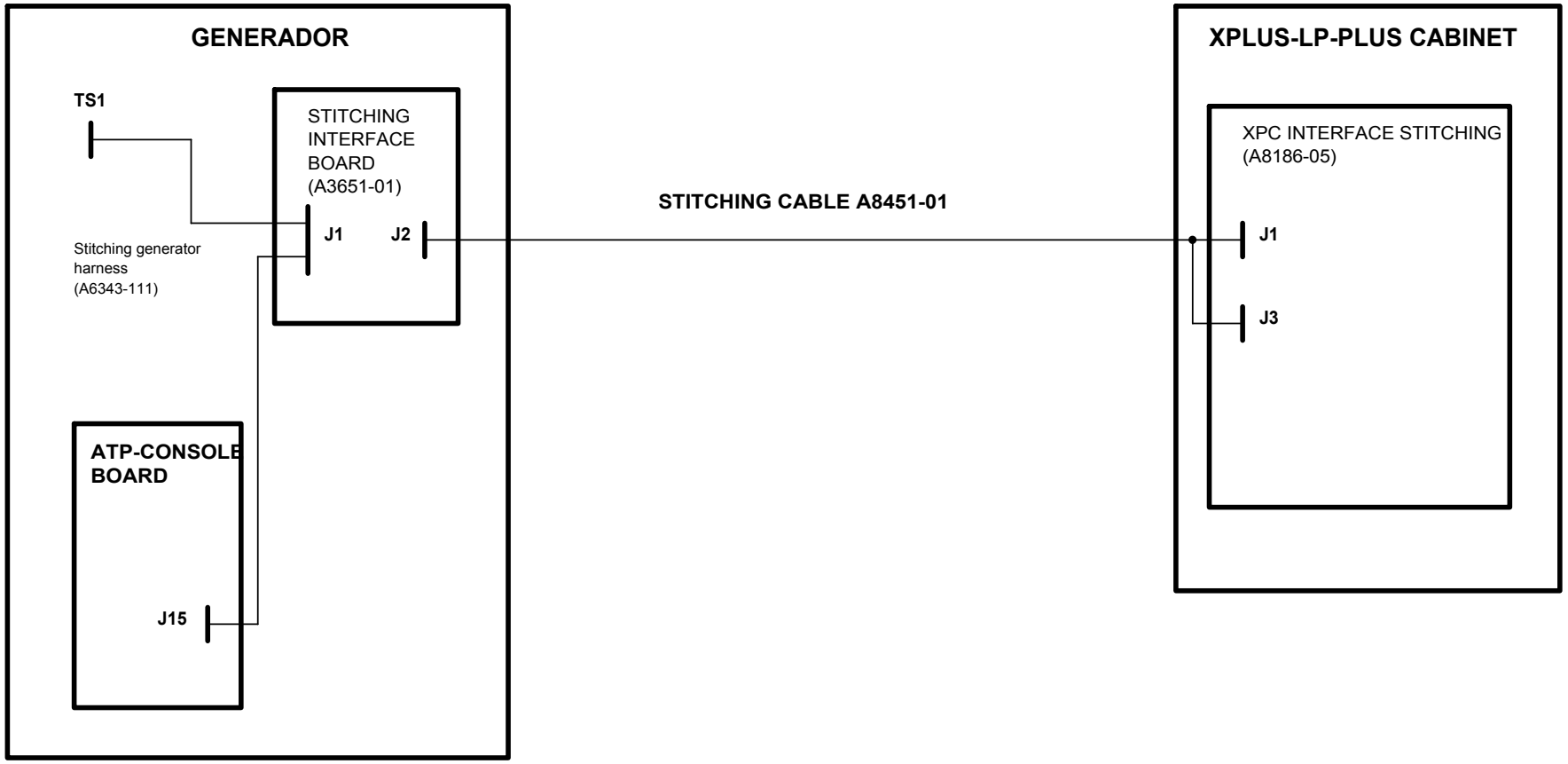
SHEET/OF: 3/3

SEDECAL

IM - 378

F E D C B A ← REV

X-Plus LP Plus with Auto Collimator Ralco



REV	DESCRIPTION	ISSUED BY	DATE
B	NC 12/125	M.González	09/04/12
A	NE 240/11	M.González	19/07/11

	NAME	DATE
DRAWING	MGonzález	19/07/11
REVISED	A. Díaz	19/07/11

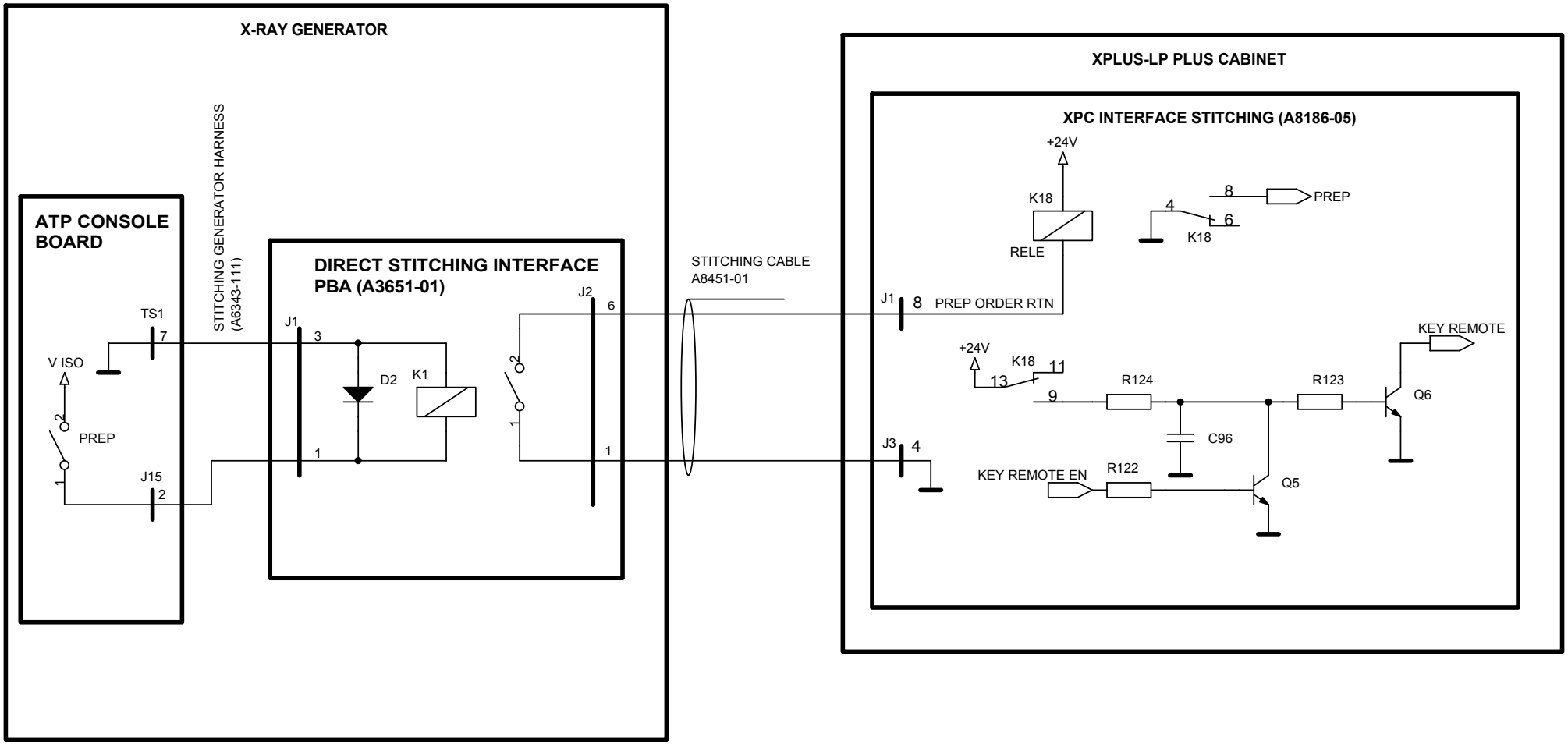
SHEET / OF: 1/2

SEDECAL

IM-404

REV: B A

XPLUS-LP PLUS STITCHING INTERFACE



REV	DESCRIPTION	ISSUED BY	DATE
B	NC 12/125	M.González	09/04/12
A	NE 240/11	M.González	19/07/11

	NAME	DATE
DRAWING	MGonzález	19/07/11
REVISED	A. Díaz	19/07/11

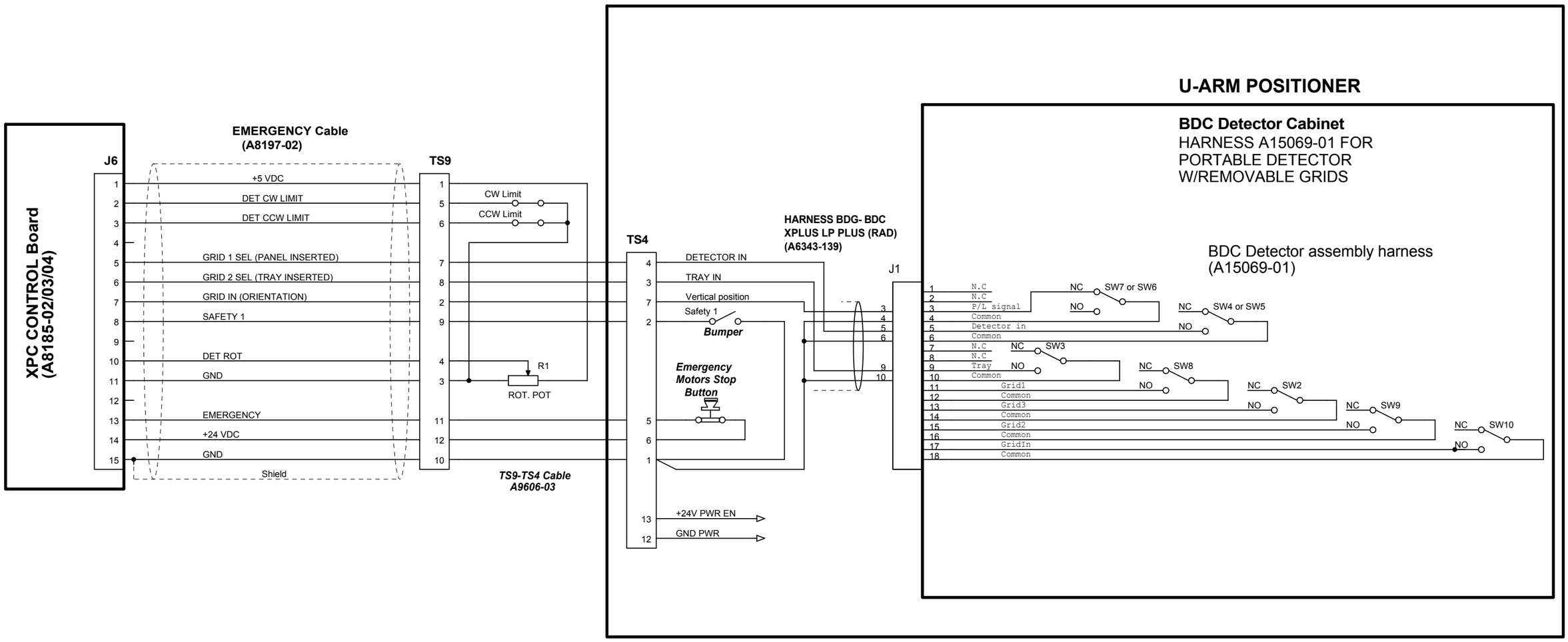
SHEET / OF: 2/2

SEDECAL

IM-404

REV: B A

XPLUS-LP PLUS STITCHING INTERFACE



DETECTOR POSITION	SW7	P/L SIGNAL	
PORTRAIT POSITION (vertical)	NOT PRESSED	OPEN	DETECTOR NOT ROTATED
LANDSCAPE POSITION (horizontal)	PRESSED	CLOSED	DETECTOR ROTATED

REV	DESCRIPTION	ISSUED BY	DATE
C	NC 13/158	S.Pérez	29/04/13
B	NC 12/332	S.Pérez	18/09/12
A	First release	M.González	02/08/12

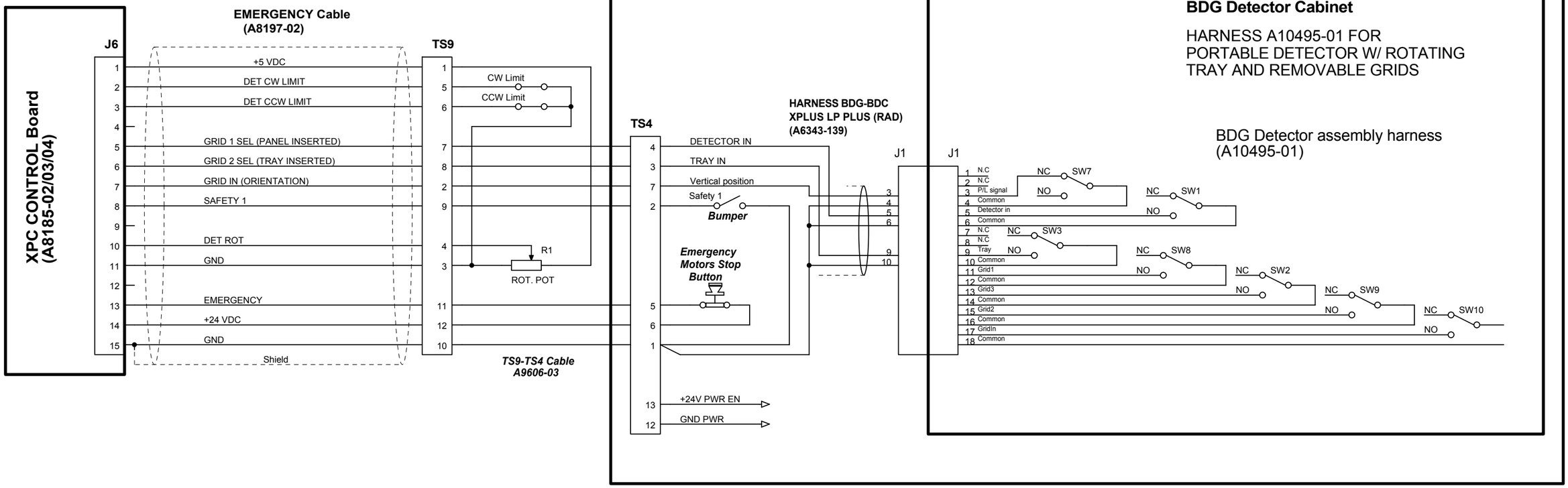
	NAME	DATE	SHEET / OF
DRAWING	M.González	02/08/12	1/3
REVISED	A.DIAZ	02/08/12	

SEDECAL

IM - 410

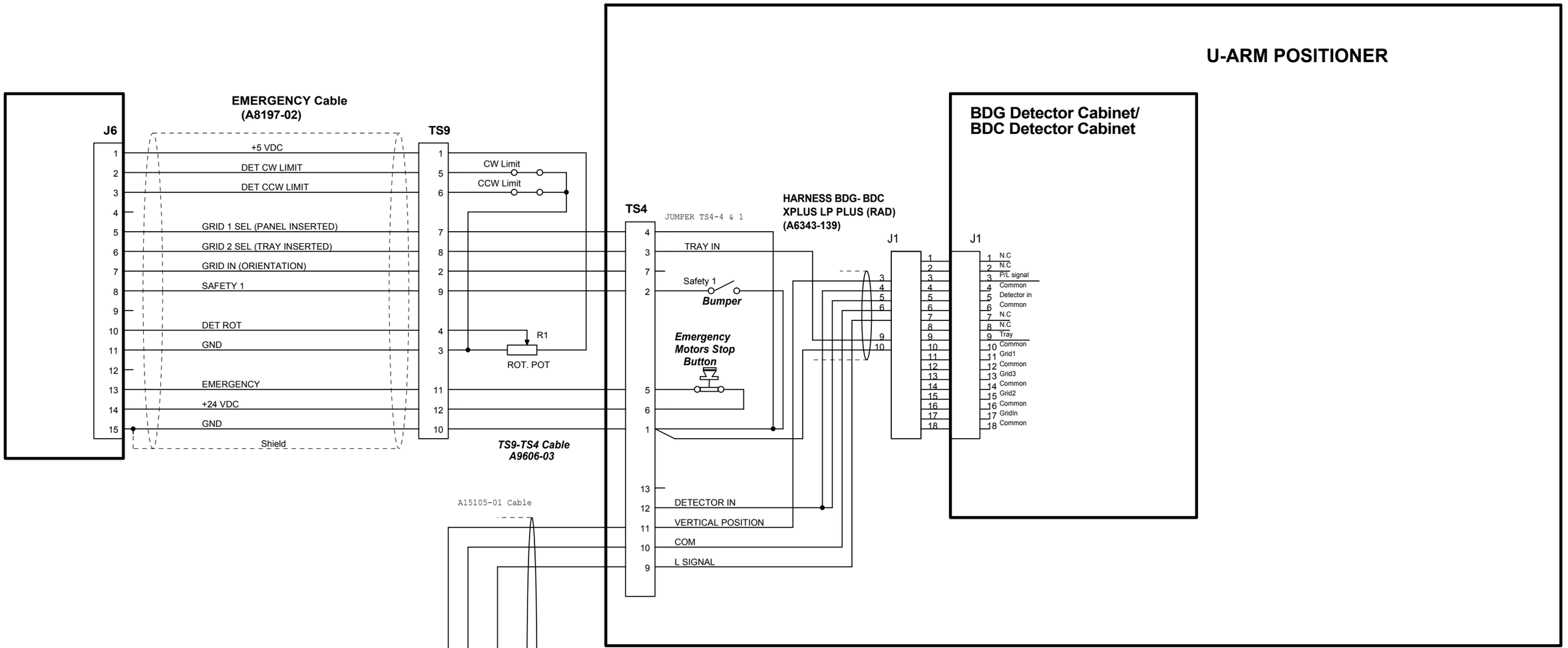
C B A ◄REV

DETECTOR CABINET U-ARM POSITIONER INTERCONNECTIONS



					NAME	DATE	SHEET / OF	IM - 410	
				DRAWING	M.González	02/08/12	2/3		
				REVISED	A.DIAZ	02/08/12		C B A ← REV	
C	NC 13/158	S.Pérez	29/04/13	SEDECAL				DETECTOR CABINET	
B	NC 12/332	S.Pérez	18/09/12					U-ARM POSITIONER	
A	First release	M.González	02/08/12					INTERCONNECTIONS	
REV	DESCRIPTION	ISSUED BY	DATE						

IN CASE OF CMT-THALES INTERFACE WITH U-ARM



DETECTOR POSITION	SW7	P/L SIGNAL
PORTRAIT POSITION (vertical)	PRESSED	OPEN _____ DETECTOR NOT ROTATED
LANDSCAPE POSITION (horizontal)	NOT PRESSED	CLOSED _____ DETECTOR ROTATED

REV	DESCRIPTION	ISSUED BY	DATE
C	NC 13/158	S.Pérez	29/04/13
B	NC 12/332	S.Pérez	18/09/12
A	First release	M.González	02/08/12

	NAME	DATE
DRAWING	M.González	02/08/12
REVISED	A.DIAZ	02/08/12

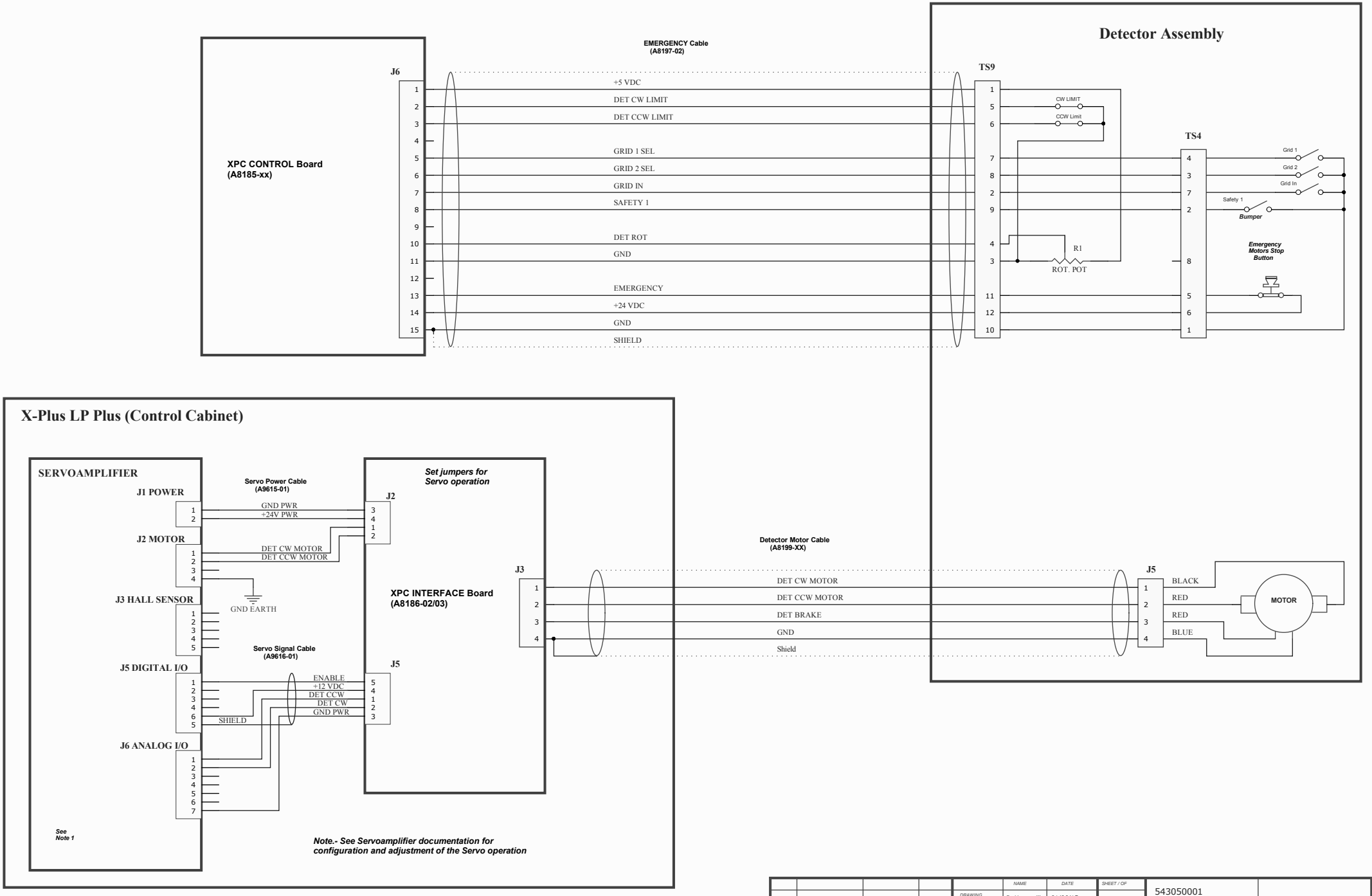
SHEET / OF: 3/3

SEDECAL

IM - 410

REV: C B A

DETECTOR CABINET
U-ARM POSITIONER
INTERCONNECTIONS



REV	DESCRIPTION	ISSUED BY	DATE
A	NC15/0009	R. Hermosilla	01/06/15

	NAME	DATE
DRAWING	R. Hermosilla	01/06/15
REVISED	R. Asenjo	01/06/15

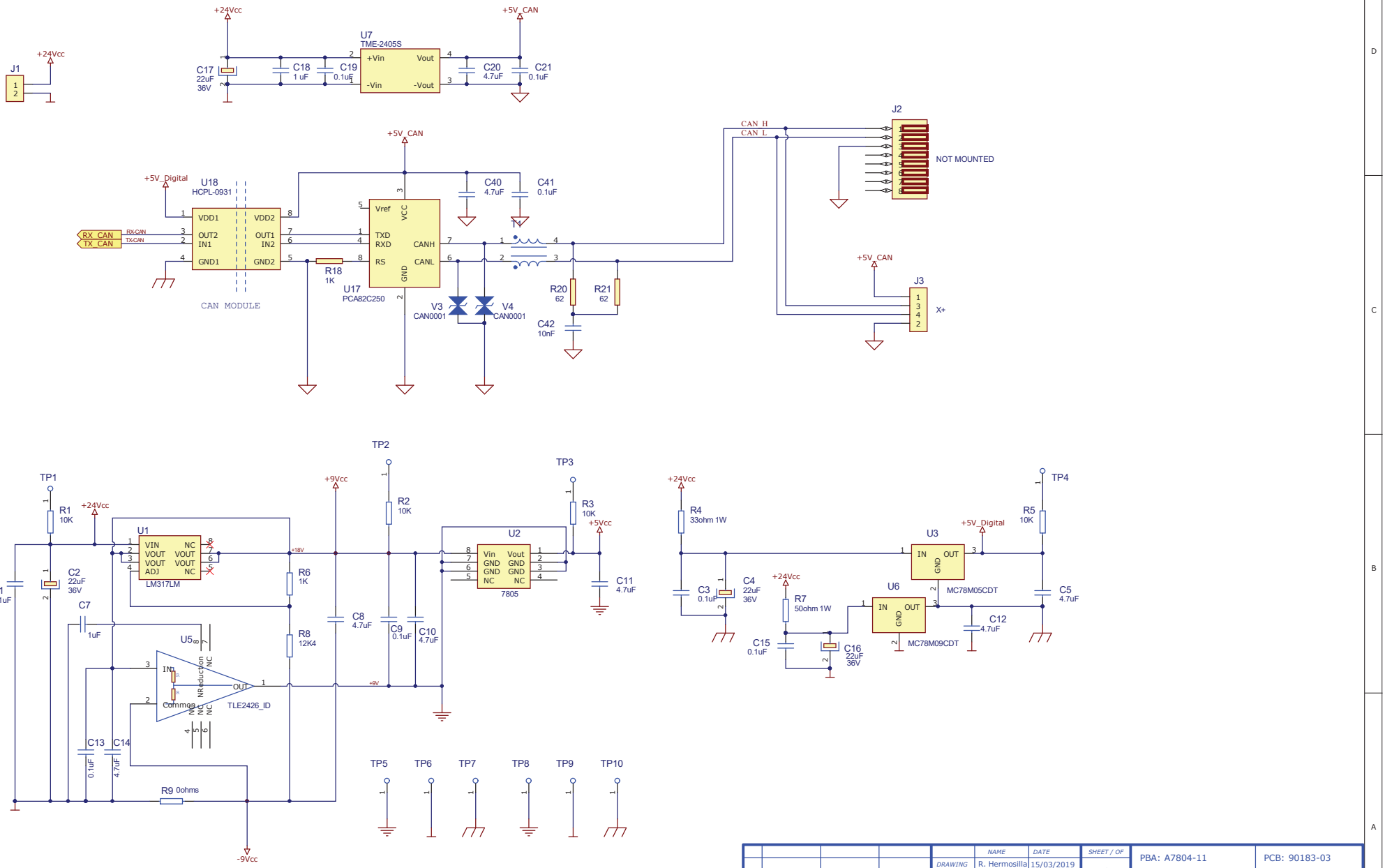
SHEET / OF: 1 / 1

SEDECAL

543050001

A REV

XPLUS LP PLUS TILTING DETEC. INTER.

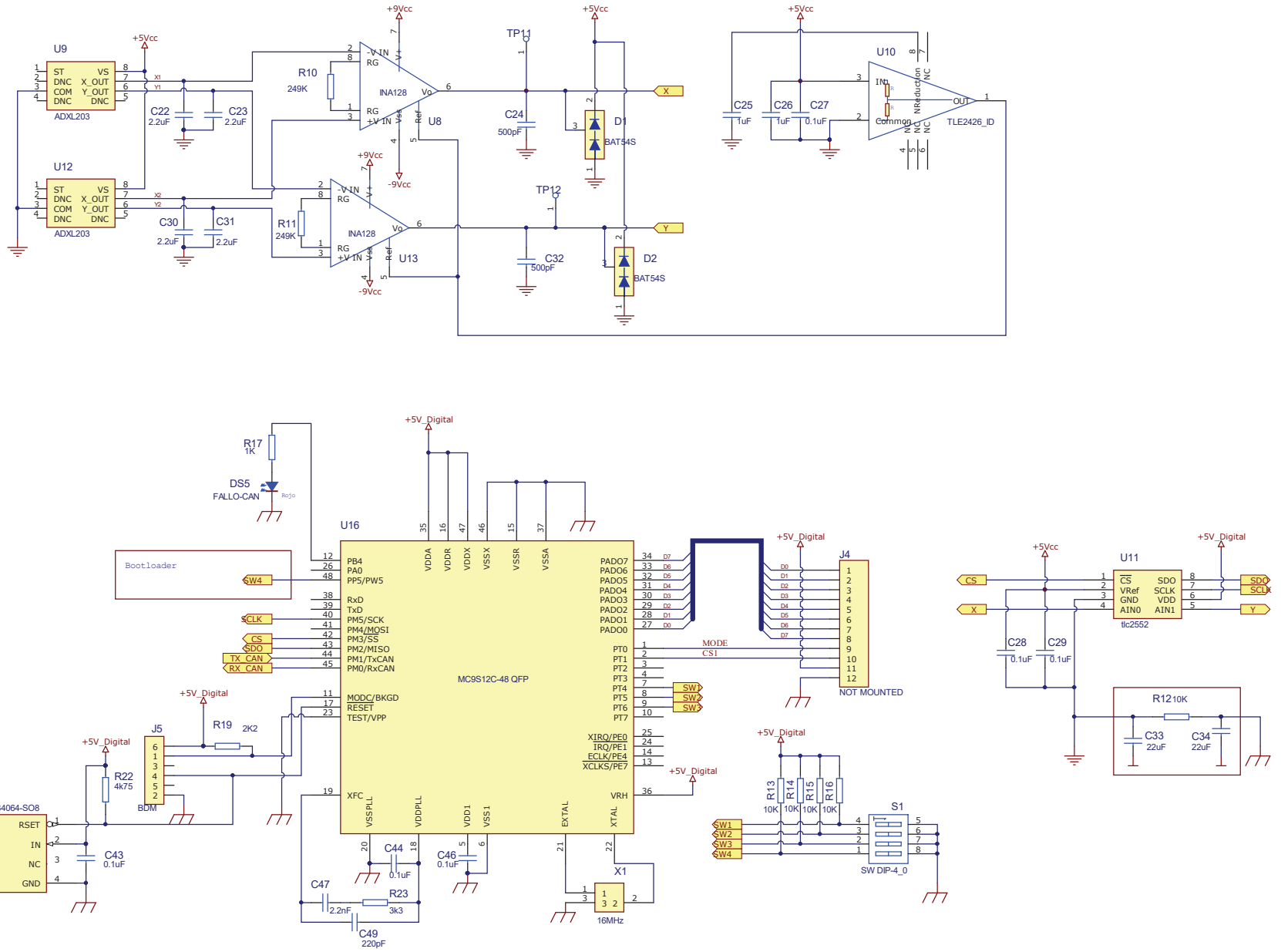


					NAME	DATE	SHEET / OF
				DRAWING	R. Hermosilla	15/03/2019	1 / 2
				REVISED	F. Díaz	15/03/2019	
A	NC19/0024	R. Hermosilla	15/03/2019				
REV	DESCRIPTION	ISSUED BY	DATE				

PBA: A7804-11 | PCB: 90183-03 | A | REV

SEDECAL CONFIDENTIAL

INCLINOMETER



REV	DESCRIPTION	ISSUED BY	DATE
A	NC19/0024	R. Hermosilla	15/03/2019

	NAME	DATE
DRAWING	R. Hermosilla	15/03/2019
REVISED	F. Díaz	15/03/2019

SHEET / OF: 2 / 2

PBA: A7804-11

PCB: 90183-03 A REV

SEDECAL CONFIDENTIAL

INCLINOMETER