

*Technical Publication*  
**SM-1207R13**

# **Service Manual**

**Standard & Auto-tracking  
Ceiling Suspensions**

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

**Ceiling Suspension NOVA:**  
**NOVA ST & NOVA AT**

**Manufactured by:**  
**Fabricado por:**  
**Fabriqué par:**

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## REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE
0	JUL 11, 2011	First Edition
1	MAR 20, 2012	Calibration and Configuration Section upgraded
2	OCT 25, 2012	Auto-tracking Model Upgrade New Collimator Update Schematics Update Renewal Parts Update IEC Standards update
3	JUL 24, 2013	Collimator Renewal Parts Upgrade
4	MAR 12, 2014	New Gage Board New Vertical Motor New Transversal Potentiometer Schematics Update
5	JUN 23, 2014	Installation Checking List Upgrade Schematics Update
6	SEP 19, 2014	Hose Cables Updates Mechanical Detents updates Calibration Updates Schematics Update
7	NOV 13, 2014	Collimator Light with Hand Switch option Hose Update Schematics Update
8	NOV 28, 2014	New Auto-tracking Vertical Servo Power Board and Control Board for Dunker Rigid Vertical Motor Schematics Update
9	MAR 10, 2015	Fastener Torque Specifications Inclusion Tube Installation Procedure Update Longitudinal Rails End Stops Update
10	FEB 23, 2016	Vertical Potentiometer Adjustment Procedure Upgrade
11	MAY 31, 2016	SID Labels and Alignment Kit Update
12	FEB 09, 2018	Calibration Update Renewal Parts Update Schematics Update

REVISION	DATE	REASON FOR CHANGE
13	JUL 23, 2018	Specifications Update New Mounting Bridge of the Shipping crate Transverse Rails Fixation procedure Upgrade Collimator light cable code updated Periodic Maintenance Upgrade General Upgrades

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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 HEHEDED OR AVOIDED WILL CAUSE SERIOUS PERSONAL INJURY OR DEATH.***



***ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEHEDED 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.***

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## SECTION 1      PREVIOUS CONSIDERATIONS

### 1.1    PURPOSE AND SCOPE OF THIS MANUAL

This manual provides a sequential listing of tasks and procedures for the complete installation of the Standard and Auto-tracking models of the Ceiling Suspension.

Installation is divided into two primary tasks: mechanical installation and configuration and calibration. Most mechanical tasks focus on the physical aspects of hardware assembly, equipment positioning and cabling. Calibration refers to the calibration of the SID Display, vertical motion and Auto-tracking calibration and Detents configuration.

The installation procedure of the other components of the X-ray system, as tables, vertical detector/bucky stands, X-ray generators, etc. must be consulted and completed according to their own service or installation documentation.

**Note** 

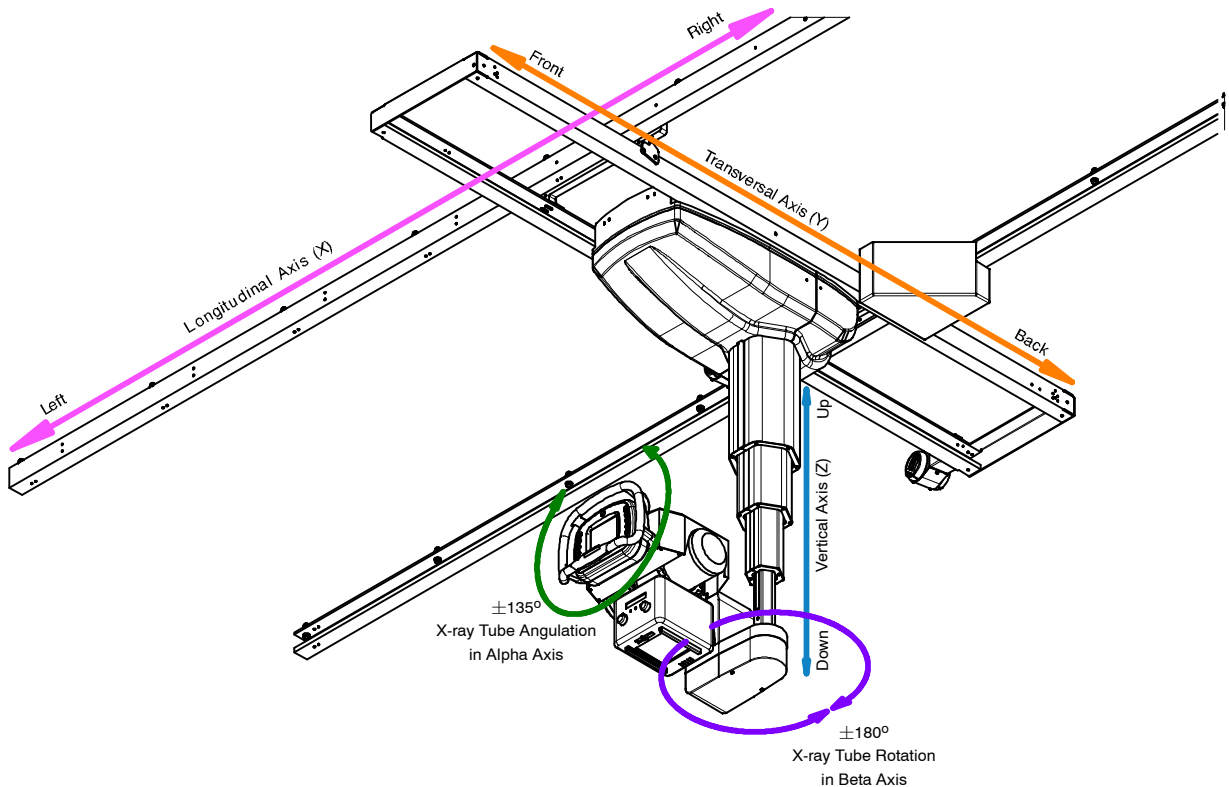
*It is mandatory to install the Ceiling Suspension before installing all other equipment of the X-ray room. Refer to the System installation chapter of this manual for the installation sequence and X-ray room calibration and adjustment.*

**Note** 

*Depending on each Ceiling Suspension model characteristics the installation flowchart and calibration procedures change.*

## 1.2 CEILING SUSPENSION AXES AND TRAVELS

**Illustration 1-1**  
**Ceiling Suspension Axes and Travels**



The Ceiling Suspension can be moved manually in the Longitudinal (referred as X), Transverse (Y) and Vertical (Z) axes. But there are another two movements called BETA or X-ray tube rotation and ALPHA or X-ray tube angulation. So it can cover almost all volume of the room where it is installed and operate with horizontal and vertical receptors.

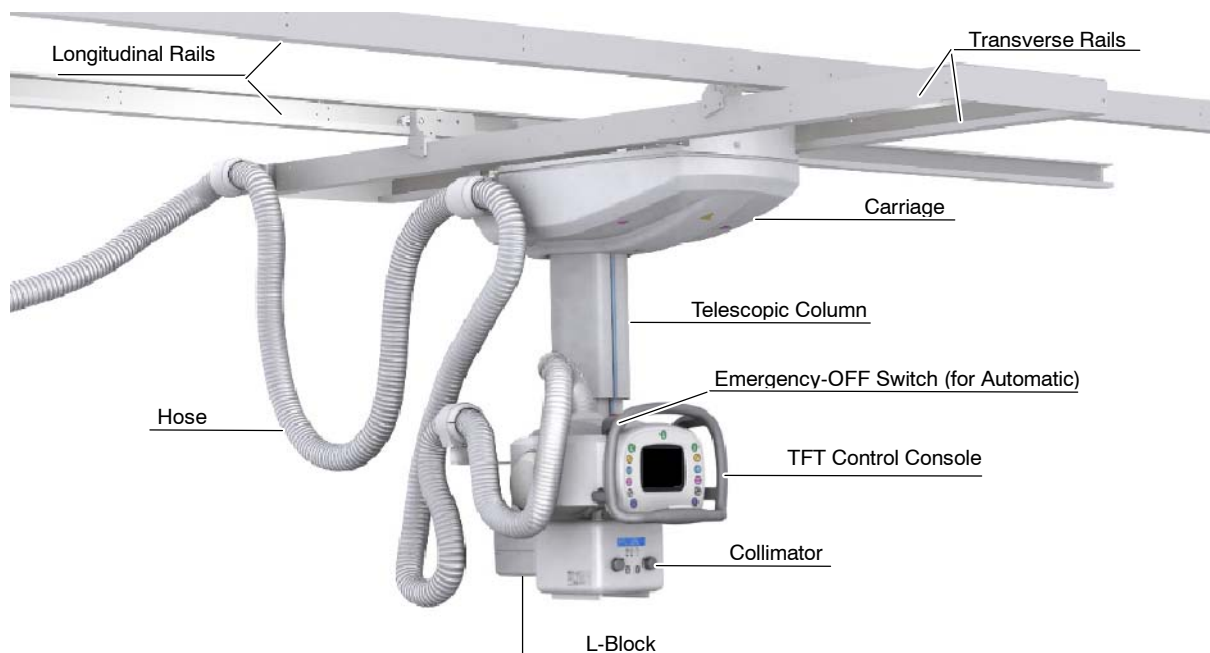
It is a Ceiling Suspension with almost complete manual operation in Longitudinal and Transverse axes. But vertical movement is motorized and Servo-controlled. It operates with a motor that expands or contracts the Telescopic Column and carries out blocking functions.

**Note** 

*Motorized movement means that the vertical movement is helped by motor as soon as the user initiates the motion after releasing the Brake and moves up and down the Tube and Collimator Assembly. The speed is calibrated during the installation procedure.*

### 1.3 CEILING SUSPENSION LONGITUDINAL AND TRANSVERSE MOVEMENTS

**Illustration 1-2**  
**Ceiling Suspension Nomenclature**



Both Ceiling Suspension models have the same components and nomenclature.

The required elements for the Longitudinal (X) and Transverse (Y) movements are installed on the Rail System.

**Rail with Potentiometer and Belt.** Depending on the Room configuration, the potentiometer and belt should be mounted just in the Longitudinal or Transverse rails, as it is mandatory to install it in the same axis where the Wall Stand will be located. The Potentiometer and Belt are the required elements to drive the Suspension along the axis. Their position is on the right Transverse rail, Detail J, or on the back Longitudinal rail, Detail F.

**Braking Rail,** the left Transverse and front Longitudinal rails are provided with a metal plate used by the brakes to stop the movement. The Transverse brake is mounted on the Left Carriage Fixation Bearing, Detail I, and the Longitudinal brake on the Back Transverse rail Bearing, Detail D.

**Bearings Set**, there are two different sets:

- **Transverse Rails Bearings** fix the Transverse rails to the Longitudinal Rails and allow the Longitudinal movement.
- **Carriage Bearings** fix the Carriage to the Transverse rails and allow the Transverse movement.

All rails except the right Transverse rail are provided with **End Stops Kits** which allow to stop the movement softly and without bounces.

Transverse and Longitudinal Axes can be configured to have mechanical Detent Points. At these points, the equipment will stop the movement. To continue with the movement, press the corresponding button or just push the Omni-directional Button to release the brake and initiate the movement manually along the same axis.

Their location depends on the Room Configuration, check the position of the Table and the Wall Stand, as each detent must be located in a position which indicates their center, it can be installed up to two different Detents:

- Install a Detent right in the center of the Table Longitudinal axis.
- Second one must be installed in the center of the Wall Stand Bucky. Its location depends on the Room Configuration, check the position of the Table and the Wall Stand, as each detent must be located in a position.

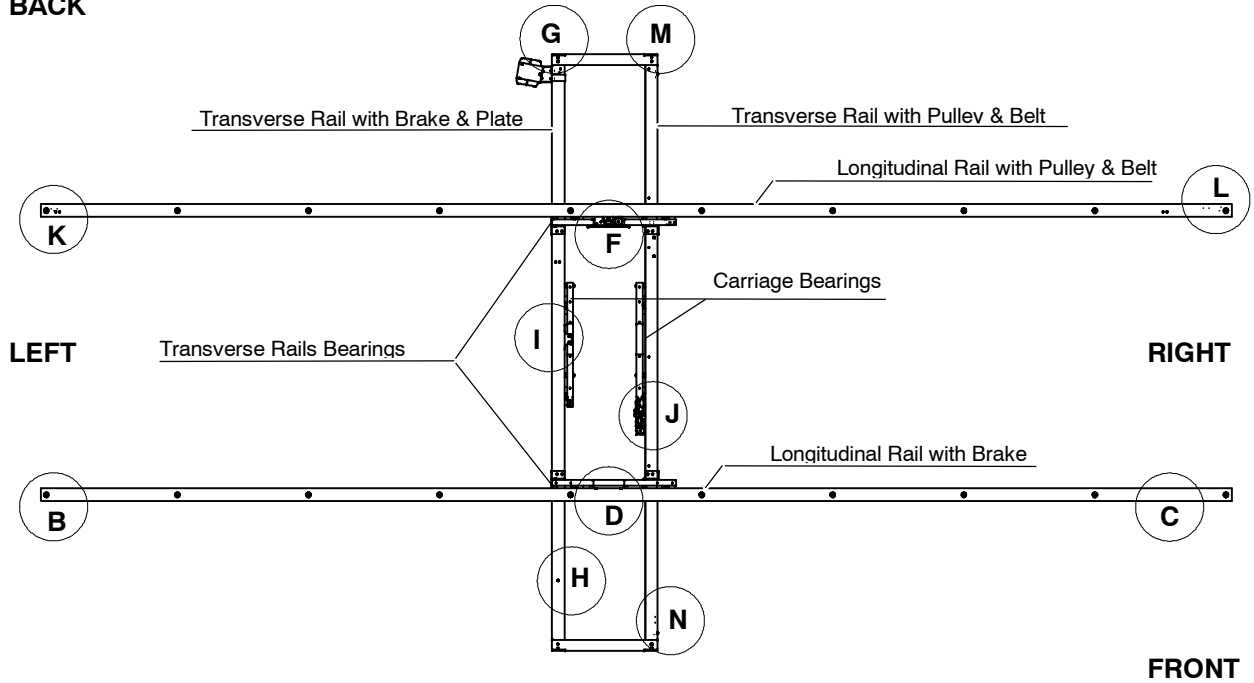
Depending on the configuration they can be installed on the Transverse or Longitudinal rails. But always at the contrary of the Longitudinal or Transverse Pulley Set and Potentiometer, so at the left of the Bridge and/or at the front of the room. Both detents also can be installed in the same axis, but always must be a minimum security distance of 20 mm (0.79").

It is recommended to install both Detents after installing and getting aligned the System.

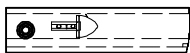
**Illustration 1-3**

**Ceiling Suspension Longitudinal and Transverse Movement**

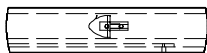
**BACK**



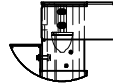
**DETAIL B**  
Longitudinal End Stop  
(Left Side)



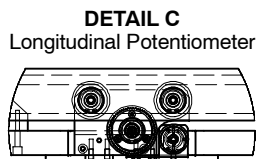
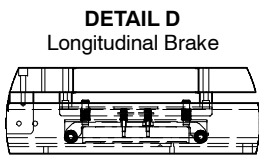
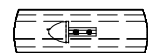
**DETAIL C**  
Longitudinal End Stop  
(Right Side)



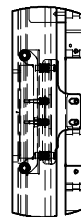
**DETAIL G**  
Back Transverse End Stop



**DETAIL M**  
Front Transverse End Stop



**DETAIL I**  
Transverse Brake



**DETAIL J**  
Transverse Motor



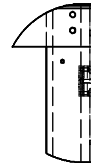
**DETAIL K**  
Longitudinal Belt Holder



**DETAIL L**  
Longitudinal Belt Tensor



**DETAIL M**  
Transverse belt holder



**DETAIL N**  
Transverse Belt Tensor



### 1.4 INSTALLATION REQUIRED TOOLS

The following hand tools are required for the Installation:

- Standard service engineers tool kit, including Allen and Torx key sets
- Electric drill motor and assorted bits
- Hammer drill
- Step Ladder
- Digital Level
- Laser alignment tool
- Meter
- Torque wrench set 0 - 200 Nm (0 - 150 ft.-lbs.)
- Hexagonal or Allen wrench set
- Loctite 243
- Voltmeter
- Dynamometer
- Optionally Lifting Tool for the Suspension main assembly.



**INJURY HAZARD! AT LEAST TWO SERVICE PERSONNEL ARE REQUIRED FOR THE SUSPENSION INSTALLATION. DUE TO THE EQUIPMENT AND RAILS HEAVY WEIGHT, IT CAN FALL DOWN WHEN LIFTING AND INSTALLING, WHAT COULD CAUSE SERIOUS DAMAGES TO EQUIPMENT AND PERSONNEL.**

## 1.5 PRE-INSTALLATION CHECKS & EQUIPMENT SPECIFICATIONS

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.

Note 

*The ceiling should have been previously prepared before beginning with the installation. Ceiling preparation requires to drill anchorage holes and routing the cables under the Table. Refer to Pre-installation Manual of this equipment for further pre-installation details.*



**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 CEILING AND THE ANCHORING SYSTEM ARE STRONG ENOUGH (2000 NEWTON TRACTION FORCE) TO ENSURE A SAFE INSTALLATION. THE CEILING MUST HAVE A STRUCTURE WHICH ACCEPTS, AT LEAST 500KG/M (336 LB/FT), FOR A SAFETY OPERATION AND ANCHORS MUST SUPPORT 156 KG (343.92 LBS) LOAD PER BOLT.**

### POWER LINE REQUIREMENTS

Power Line for Ceiling Suspension:

Voltage .....	115 - 240 V~
Maximum Current .....	3.5 - 1.6 A
Frequency .....	50 / 60 Hz
Input Power .....	0.5 kVA

Power line for Collimator Lamp	24 VAC,
	6.5 A
	50 / 60 Hz

The Ceiling Suspension is provided with one fuse in the Power Supply with the next features: **3.15A, 250V SB**  
**Breaking Capacity 3.50A.**

### OPERATING ENVIRONMENTAL CONDITIONS

Temperature range .....	10 °C to 40 °C
Relative Humidity range (non-condensing) .....	20% to 85%
Atmospheric Pressure range .....	700 to 1060 hPa

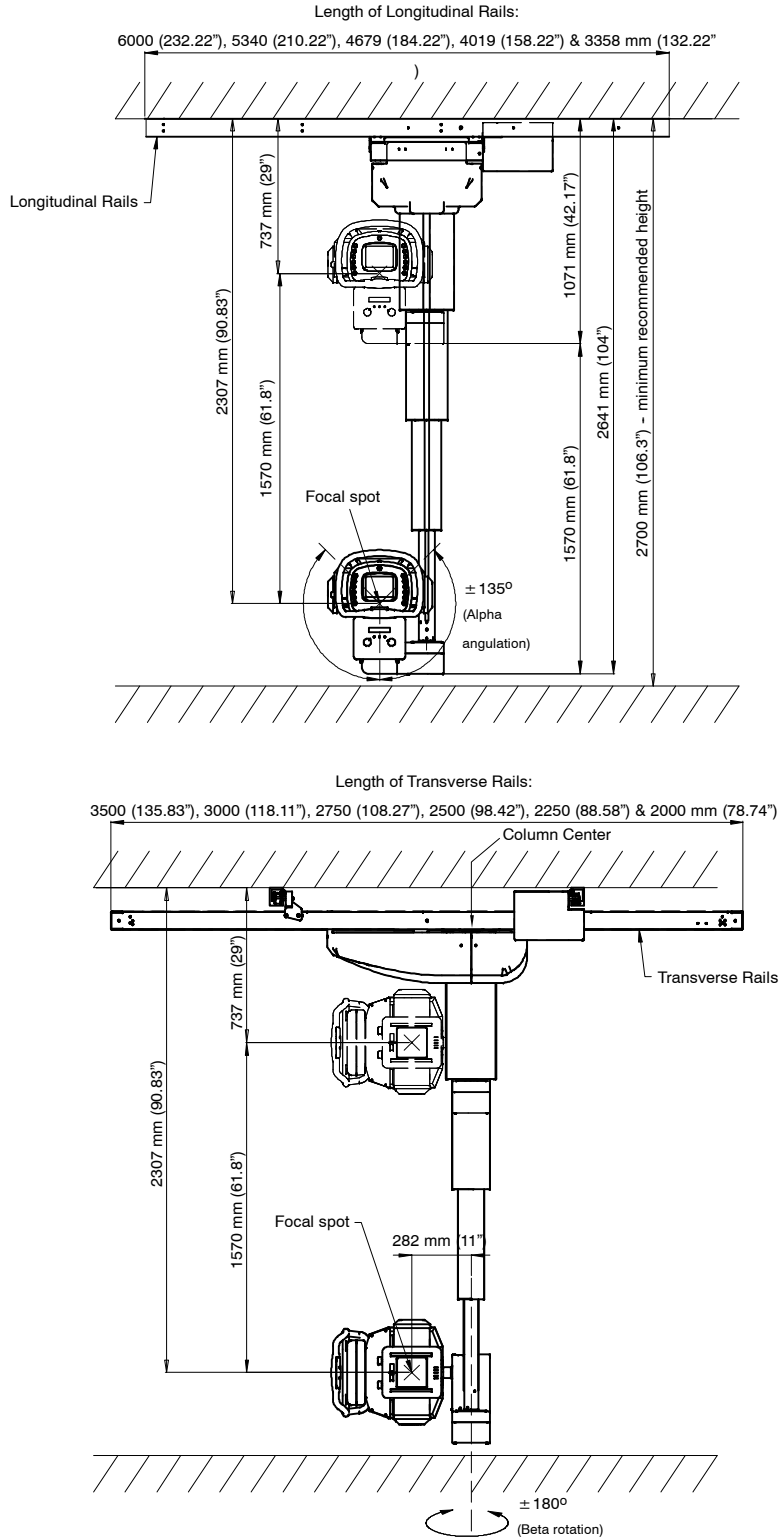
**STORAGE / TRANSPORT ENVIRONMENTAL CONDITIONS**

Temperature range .....	-20 °C to 70 °C
Relative Humidity range (non-condensing) .....	10% to 95%
Atmospheric Pressure range .....	500 to 1060 hPa

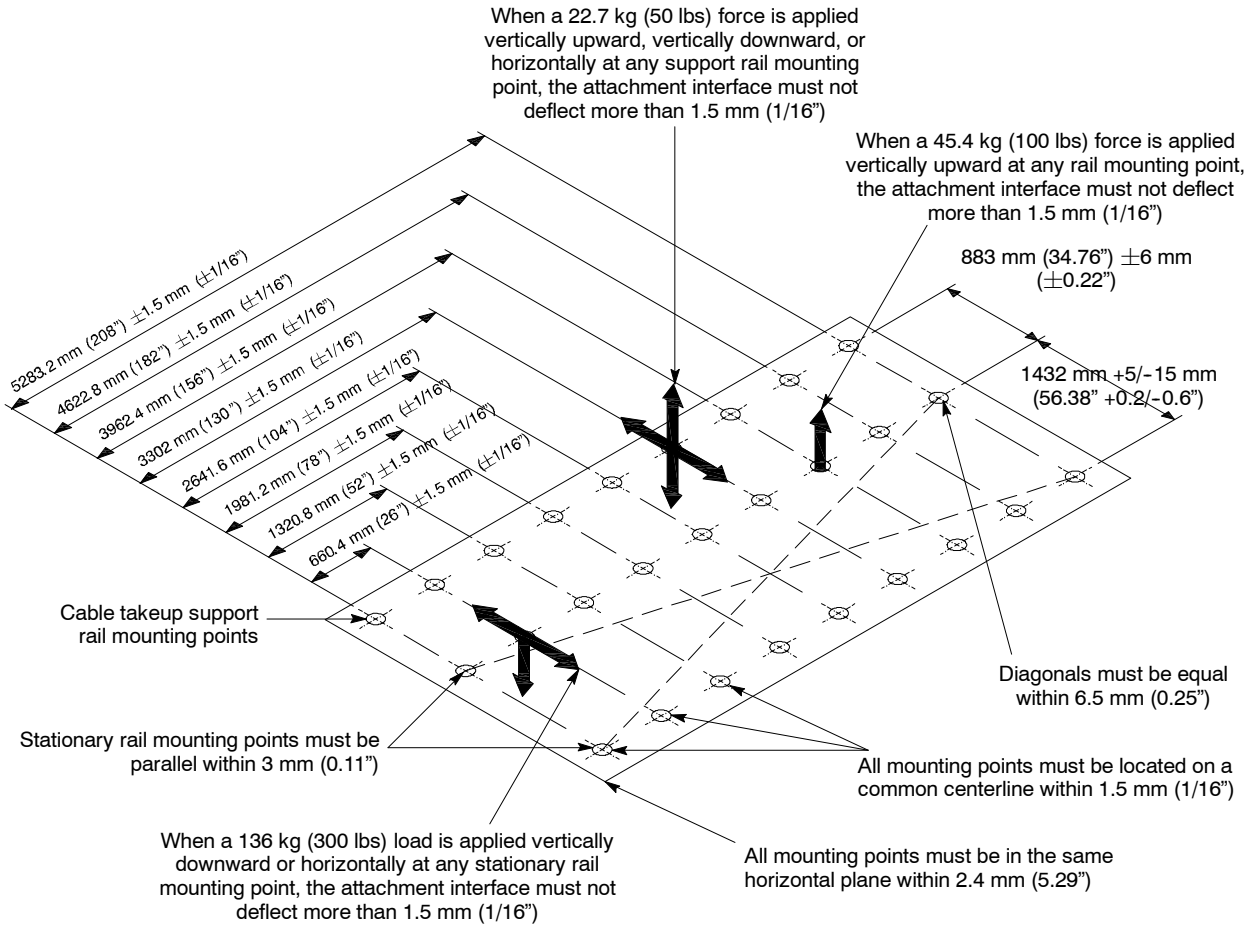
**CEILING SUSPENSION SPECIFICATIONS**

- Dimensions
  - Maximum Height ..... 2641 mm (103.98")
  - Minimum Height ..... 1068 mm (42.05")
  - Width ..... 3500 mm (137.80") Max
  - Length ..... 6000 mm (236.22") Max
  
- Distance between Longitudinal Rails ..... 1432 +5/-15 mm  
(56.38" +0.2/-0.6)
  
- Weights
  - Main assembly and Control Console ..... 230 kg (507.06 lb)
  - Longitudinal and Transverse Rails .... 85 kg (187.39 lb) Max
  - X-ray Tube, Collimator, Hose and cables .. 80 kg (176.37 lb)
  
- Travels
  - Longitudinal travel (default) ..... 4866 mm (191.57") Max
  - Longitudinal travel (End Stop at the end) 5166 mm (203.39") Max
  - Transverse travel ..... 1901 mm (74.84") Max
  - Vertical travel ..... 1570 mm (61.81")
  
- X-ray Tube rotation (Beta Axis) ..... ±180°
  
- X-ray Tube angulation (Alpha Axis) ..... ±135°
  
- Maximum and Minimum SID from X-ray Tube facing the Table and Wall Stand depends on the Room dimensions and Longitudinal Rails of the unit.
  
- Ceiling Height. The recommended height is 2700 mm (106.30"). A height up to 2800 mm (110.23") can be used, but, in that case, the Ceiling Suspension cannot be aligned with the Wall Stand at the lowest part of the Wall Stand travel.

**Illustration 1-4**  
**Dimensions and Travels**



**Illustration 1-5  
Rail Mounting Specifications**



**Table 1-1**  
**Rails Dimensions and Carriage Travels**

Longitudinal Rails Length	Carriage Longitudinal Travel *	Distance from the column's center	
		To the Left	To the Right
3358 mm (132.22")	2224 mm (87.57")	405 mm (min) 15.94" (min)	729 mm (min) 28.70" (min)
4019 mm (158.22")	2885 mm (113.57")		
4679 mm (184.22")	3545 mm (139.57")		
5340 mm (210.22")	4206 mm (165.57")		
6000 mm (236.22")	4866 mm (191.57")		

\* With the End Stops position changed the travel can be increased 300 mm (11.81") (Refer to Section 2.3).

Transverse Rails Length	Carriage Transverse Travel	Distance from the column's center	
		To the Front	To the Back
2000 mm (78.74")	901 mm (35.4")	762 mm (min) 30" (min)	343 mm (min) 13.50" (min)
2250 mm (88.58")	1151 mm (45.3")		
2500 mm (98.42")	1401 mm (55.1")		
2750 mm (108.27")	1651 mm (65")		
3000 mm (118.11")	1901 mm (74.8")		
3500 mm (137.80")	2401 mm (94.5")		

**Illustration 1-6**  
**Focal Spot Travel**

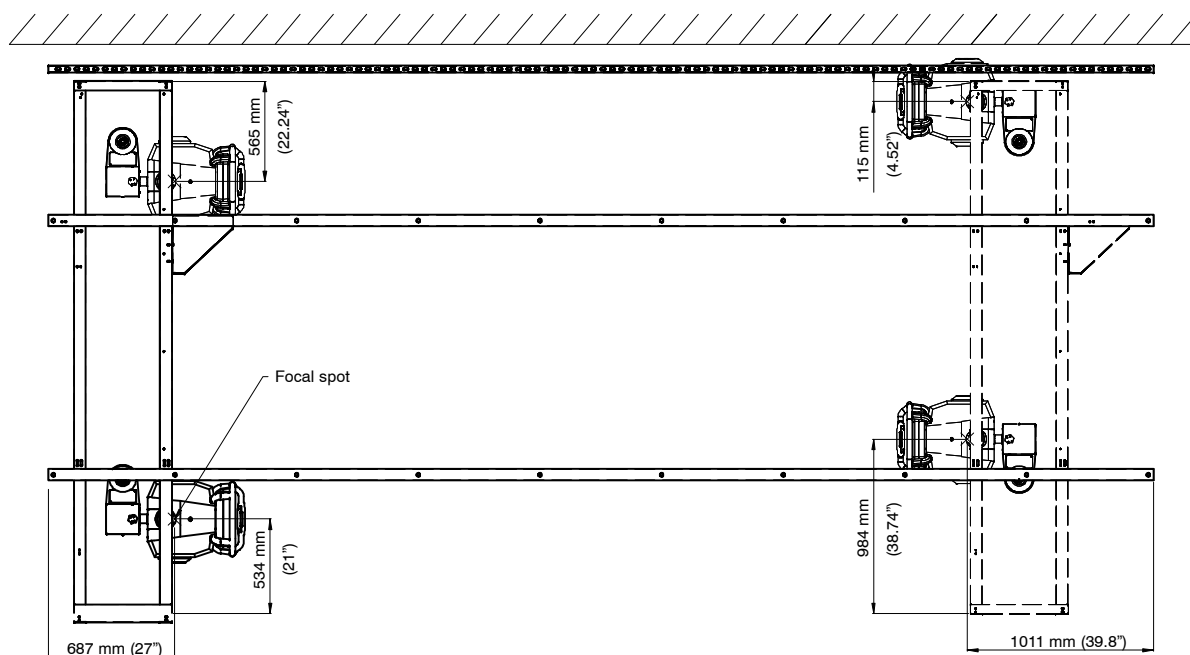


Illustration 1-7

Rails Dimensions and Travels

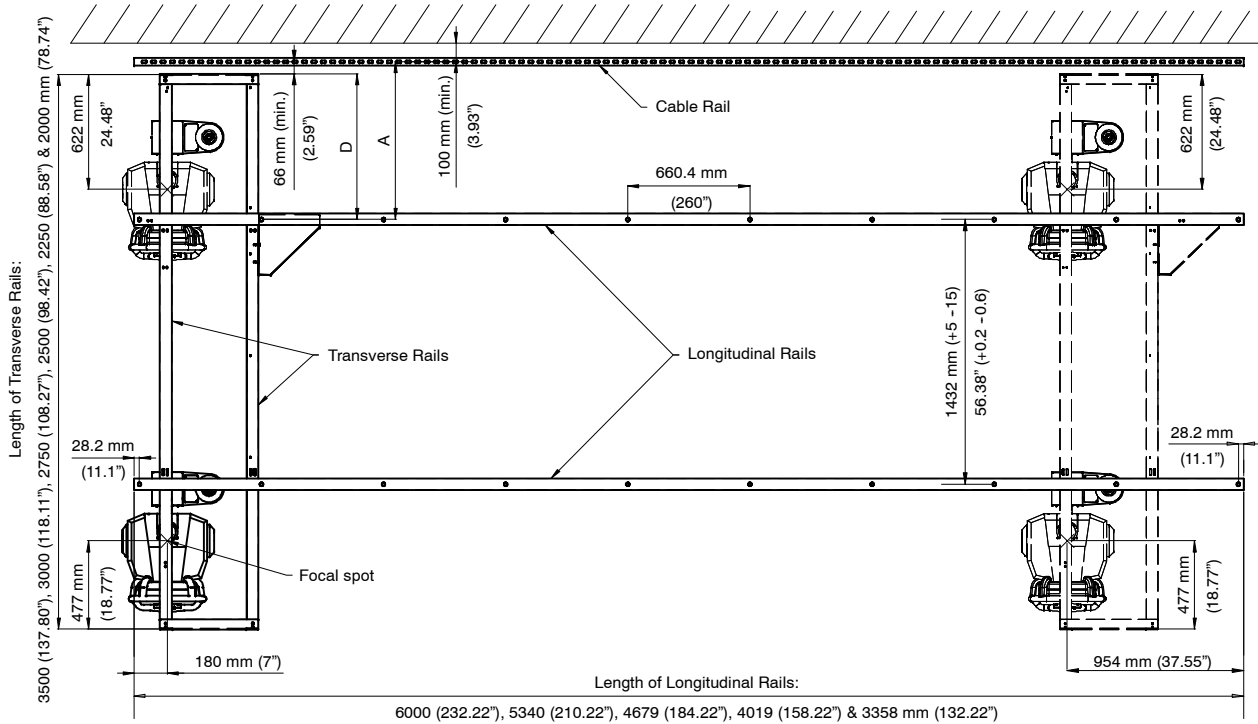


Table 1-2

Distances between Longitudinal Rail and Transverse and Cable Rails

Transverse Rails Length	D	A
2000 mm (78.74")	284 mm (11.18")	330 mm (12.99")
2250 mm (88.58")	409 mm (16.10")	455 mm (17.91")
2500 mm (98.42")	534 mm (21.02")	580 mm (22.83")
2750 mm (108.27")	659 mm (25.94")	705 mm (27.75")
3000 mm (118.11")	784 mm (30.87")	830 mm (32.68")
3500 mm (137.80")	1034 mm (40.71")	1080 mm (42.52")

D = (Length of Transverse rail - 1432 mm) / 2  
A = D + 46 mm

## 1.6 SHIPPING

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. Preliminary checks:

- Do not discard any packing material such as envelopes, boxes, bags until all parts are compared with the Checking List.
- Check the general condition and external appearance of all parts for possible damages or missing items.
- Notify the distribution center immediately of any damaged or missing parts.

### 1.6.1 CRATES AND PACKING BOXES

The Suspension is shipped in different wood crates to facilitate transportation and installation:

- **Rails Crate.** It contains everything needed for installation of the Rail System. Refer to **FIC-INS-1584-05**, which is valid for both Ceiling Suspension models, for detailed list of all spares needed for the rail system installation.
- **Main Crate.** It contains the main assembly of the suspension. Refer to the **FIC-INS-1575-09**, valid for Standard model, or **FIC-INS-1575-11**, valid for Auto-tracking model, documents for detailed list of all required items for the installation of the:
  - Carriage, Column and L-Block, which are already assembled
  - Tube Support, X-ray Tube and Collimator Assembly
  - Control Console
  - External Hose
  - Bearings
  - Covers

Optionally depending on the Ceiling Suspension configuration it may be necessary to ship some components in an **Auxiliary Crate**.

**Illustration 1-8  
Ceiling Suspension Shipping Main Crate and Rails Crate**



In both crates most of the items are packed in plastic bags and identified with their Part Number written in the plastic. These bags are packed in cardboard boxes, each one identified by a number, in the case of the Rails Crate, or by a letter, in the case of the Main Crate and its content is indicated in both CHK documents.

**Illustration 1-9  
Packing Box and Contents**



**WARNING**

**TO AVOID PERSONAL INJURIES OR EQUIPMENT DAMAGE, DO NOT REMOVE YET ANY SHIPPING RETAINING PIN, BRACKETS OR HARDWARE FROM THE CEILING SUSPENSION UNTIL INSTRUCTED TO DO SO.**

*Note*

*When indicated and required, get out all Packing boxes carefully. Avoid mixing all boxes contents and items, so installation procedure will be more effective.*

1.6.2 PACKING LISTS

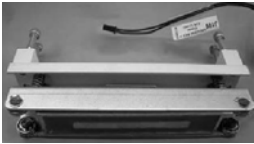
Both crates are provided with their corresponding Packing Lists:

- Main Crate. The **FIC-INS-1575-09** for the Standard Ceiling Suspension or **FIC-INS-1575-11** for the Auto-tracking model.
- Rails Crate. The **FIC-INS-1584-05** for both models.

All the required elements for the installation are listed and identified by their part numbers and images, it is also indicated the Packing Box where they are shipped and the delivered quantity.

The main item is highlighted in grey and all items required for its installation or its parts are indicated below.

**Table 1-3  
Packing List Detail**

FRENO/BRAKE							
Foto/Photo	P/N	Descripción	Description	Box	Qty.	Final	Verif
	S0016937	Freno Longitudinal (Montado)	<b>Longitudinal Brake (assembled)</b>	C	1		
	51212P72	TORN. EX. INT.	SCREW M6x45 (assembled)		4		
	51390P12	ARANDELA AET M6 (motado)	WASHER AET M6 (assembled)		4		

**Note** 

*Please refer always to both Checking Lists to know which items are required for the installation of the Ceiling Suspension.*



***Please before starting the installation procedure check that all items has been received and are in proper conditions. If not please get in contact with your provider before starting any task.***

### 1.6.3 Required Conditions

#### Required Conditions

Before proceeding to the Suspension installation there are some requirements which are obligatory or recommendable to fulfil to accomplish successfully the Installation procedure.

- Study the Equipment Nomenclatures and Parts in Operator Manual.
- It will be helpful to keep a printed copy of the Equipment Description and drawings when proceeding to the installation work.
- Read first this manual completely before starting with the Suspension installation procedure.
- Plan the Equipment position. The Longitudinal frontal rail must be installed on the frontal side of the room. Refer to the Pre-Installation Manual, which is provided together with this manual.
- Refer always to the complete Steering Guide.

#### Note

*In main crate Packing List (P/N FIC-INS-1575-03/FIC-INS-1575-01) items must be listed in the order they are required for the installation. So it is highly recommended to check this document during installation procedure.*

## 1.7 TORQUE VALUES FOR SCREWS

Generally, when any screw is installed during the installation procedure described in this document, it is recommended to apply the torque listed in *Table 1-4*, except in case that the torque value to be applied is specified in the corresponding procedure.



***Apply only the tightening torques listed in Table 1-4 for mounting the mechanical parts of the unit (metallic parts to metallic parts), never for mounting electrical or electronic parts (e.g. electronic boards).***

**Note**

*It is also recommended to apply a drop of Loctite 243 to the end of the metallic screws before tightening them definitely.*

**Table 1-4**  
**Screws Torque Specifications**

SCREW SIZE (Metric ISO Screw Thread)	APPLIED TORQUE
M3	0.11 Nm
M4	2.9 Nm
M5	5.7 Nm
M6	10 Nm
M8	24.1 Nm
M10	47.7 Nm
M12	82 Nm

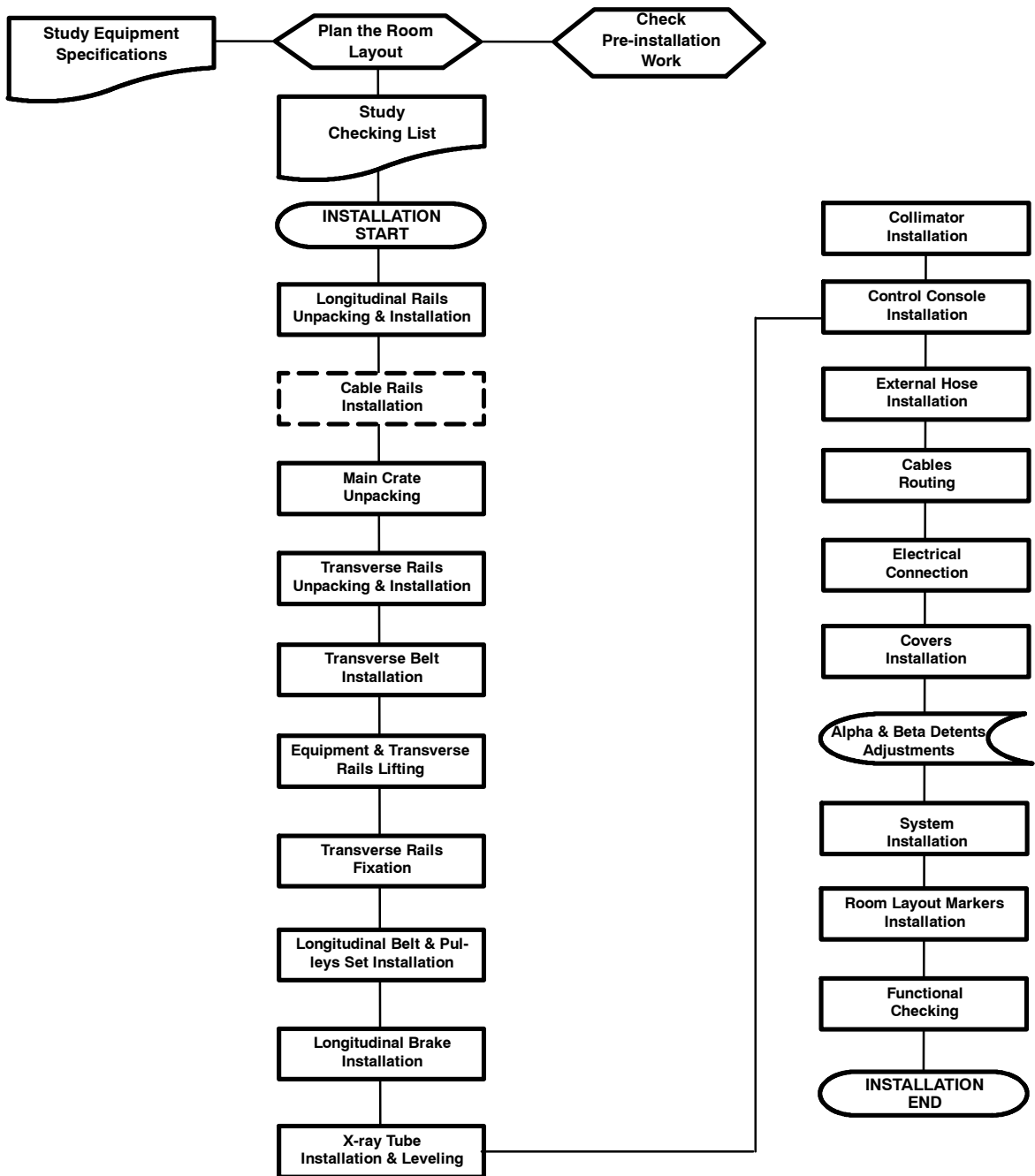
**Note.** - Conversion Factor: 1 Nm = 0.10197 kgf\*m ; 1 Kgf\*m = 9.80665 Nm.

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## SECTION 2 INSTALLATION

### 2.1 SUSPENSION INSTALLATION PROCEDURE

Mechanical Installation tasks are designed to be performed in sequence.



INSTALLATION CHECKING LIST

1 PRE-INSTALLATION CHECK		DONE	
1.1	<p><b>Does X-ray Room meet the Pre-Installation requirements?</b></p> <p>Check the following points:</p>		<input type="checkbox"/>
	Complete room floor, ceiling and wall finish.	<input type="checkbox"/>	
	Installation of conduits, ducts, raceways and junction boxes with covers.	<input type="checkbox"/>	
	Environmental requirements	<input type="checkbox"/>	
	<p>Electrical requirements.</p> <p>Installation of line power with proper voltage output and adequate kVA rating.</p> <p>Installation of all safety devices according to Pre-Installation document and Local Codes.</p>	<input type="checkbox"/>	

2 RECEIVE, UNPACK AND INVENTORY OF THE EQUIPMENT		DONE	
2.1	Upon receipt of the equipments, inspect all shipping crates for signs of damage. If damage is found, notify carrier or his agent immediately.	<input type="checkbox"/>	
2.2	<p>Place crates close to its final location at room and unpack the equipment.</p> <p><b>WARNING: AT LEAST TWO/THREE PEOPLE ARE REQUIRED TO REMOVE ALL HEAVY COMPONENTS FROM THE SHIPPING PALLET.</b></p>	<input type="checkbox"/>	
2.3	Check the packing list, part numbers and serial numbers of each component. Verify that all items on the customer order are present.	<input type="checkbox"/>	

3 INSTALLATION OF THE CEILING SUSPENSION		DONE		
3.1	<b>Longitudinal Rails Installation</b>		<input type="checkbox"/>	
	- Remove Longitudinal and Cable Rails from the Shipping Crate	<input type="checkbox"/>		
	- Install Longitudinal Rails	<input type="checkbox"/>		
	- Check leveling and parallelism between rails	<input type="checkbox"/>		
	- Install Cable Rail	<input type="checkbox"/>		
	- Check all fixations of the Rails to the ceiling	<input type="checkbox"/>		
3.2	<b>Transverse Rails Installation</b>		<input type="checkbox"/>	
	- Remove Transverse Rails from Shipping	<input type="checkbox"/>		
	- Mount Transverse Rails on the Main Assembly	<input type="checkbox"/>		
	- Check parallelism between rails	<input type="checkbox"/>		
	- Install Transverse Belt	<input type="checkbox"/>		
3.3	<b>Lift Ceiling Suspension and Fix it to the Longitudinal Rails</b>		<input type="checkbox"/>	
	- Lift the Ceiling Suspension and Crate	<input type="checkbox"/>		<input type="checkbox"/>
	- Remove Crate	<input type="checkbox"/>		<input type="checkbox"/>
	- Fix Transverse Rails to the Longitudinal Rails	<input type="checkbox"/>		<input type="checkbox"/>
	- Check distances between Longitudinal Rails and Fixations.	<input type="checkbox"/>		<input type="checkbox"/>
	- Check Transverse Rails parallelism and leveling	<input type="checkbox"/>		<input type="checkbox"/>
3.4	<b>Longitudinal Belt and Pulleys Set Installation</b>		<input type="checkbox"/>	
	- Install Longitudinal Belt	<input type="checkbox"/>		
	- Auto-tracking Ceiling Suspension. Install Longitudinal Potentiometer	<input type="checkbox"/>		
	- Install Longitudinal Brake	<input type="checkbox"/>		

3.5	<b>X-ray Tube, Collimator, DAP and Console Installation</b>		<input type="checkbox"/>
	- Install X-ray Tube	<input type="checkbox"/>	
	- Check Tube leveling	<input type="checkbox"/>	
	- Install Collimator	<input type="checkbox"/>	
	- Install DAP Device (just in case of manual Collimators)	<input type="checkbox"/>	
	- Install Control Console	<input type="checkbox"/>	
	- Check Tube leveling again	<input type="checkbox"/>	
3.6	<b>Hose and Cables Installation</b>		<input type="checkbox"/>
	- Install Hose fixation brackets	<input type="checkbox"/>	
	- Route Hose with Cables	<input type="checkbox"/>	
	- Check that Hose allows the rotation and tilting of the X-ray Tube.	<input type="checkbox"/>	
3.7	<b>Electrical Connection</b>		<input type="checkbox"/>
	- Connect cables	<input type="checkbox"/>	
	- Check Power Supply	<input type="checkbox"/>	
	- Power ON the equipment	<input type="checkbox"/>	
3.8	<b>System Alignment and Perpendicularity Adjustment</b>		<input type="checkbox"/>
	- Check and adjust the Vertical Bucky Stand or Wall Stand	<input type="checkbox"/>	
	- Switch ON the Collimator Lamp and check alignment and perpendicularity	<input type="checkbox"/>	
	- Check and adjust the Table leveling	<input type="checkbox"/>	
	- Switch ON the Collimator Lamp and align the Table respect to the X-ray Tube	<input type="checkbox"/>	

4 CEILING SUSPENSION CALIBRATION		DONE	
4.1	- Display Adjustment	<input type="checkbox"/>	<input type="checkbox"/>
	- Detents & Alignment Adjustment	<input type="checkbox"/>	
	- Vertical Motion Adjustment	<input type="checkbox"/>	
	- Gage Calibration	<input type="checkbox"/>	
4.2	- <b>Install Ceiling Suspension covers</b>		<input type="checkbox"/>
4.3	- SID Markers Installation	<input type="checkbox"/>	<input type="checkbox"/>
	- Mechanical Detents Installation	<input type="checkbox"/>	
4.4	<b>Functional Checking</b>		<input type="checkbox"/>

## 2.2 LONGITUDINAL RAILS UNPACKING AND INSTALLATION

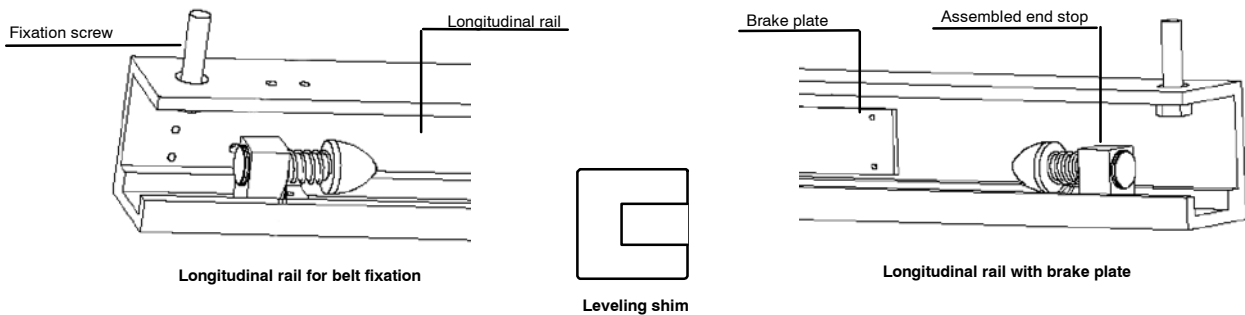
### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
N/A	Variable depending on the length	Longitudinal rail with Brake plate	1
	Variable depending on the length	Longitudinal rail	1
	00574P01	Bumper * (For rail end stops)	2
	S0017044	Bumper Support * (For rail end stops)	1
	S0017043	Bumper Support * (For rail end stops)	1
	S0004605	Slotted Cheese Head Screw M5x20 * (For rail end stops)	4
1	07696P01	Leveling Shim 1 mm.	30
	07696P02	Leveling Shim 2 mm.	25
	07696P03	Leveling Shim 3 mm.	20
	51202P33	Screw M12x50 AOCL 8.8	24
	51380P31	Washer M12	48
	51350P15	Nut EX M12	24

**Note** 

*Rail End stop bumpers are shipped already assembled and mounted on rails.*

**Illustration 2-1**  
**Longitudinal Rails required Elements**



**PROCEDURE**

1. Move the rails shipping container to the installation area and leave it in horizontal position just down where the rails are to be installed definitely.
2. Open the crate, loosen all the screws of the top cover.
3. Move away all shipping material, but do not remove the plastic bag or any other shipping material until checking completely the equipment proper status and that all elements have been received.
4. Locate the frontal and back Longitudinal rails in their correct position.
  - The front rail has the brake plate assembled, to work with the brake.
  - The back one does not have any brake installed. There will be installed the Longitudinal belt.

**Illustration 2-2**  
**Fix Longitudinal Rails to Ceiling**



5. Install first the front rail by tightening totally the fixing screws, the frontal rails goes always nearest to the operator position. It is recommended to tighten first both extreme screws, and then all intermediate screws.

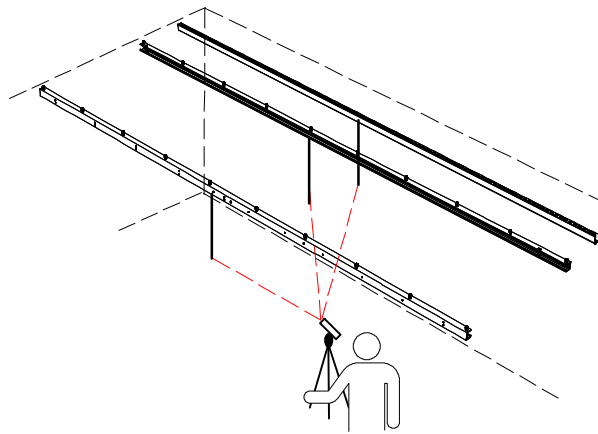
**Note** 

*It is recommendable to use the in optional Installation Kit, P/N A11160-01. In case of use any other tool, it must comply with all the ceiling, installation and safety requirements.*

6. Use to fix all the Longitudinal Rails, all of them are in Packing Box 1.
  - 51202P33 SCREW M12 X 50 AOCL 8.8
  - 51380P31 WASHERS
  - 51350P15 NUTS

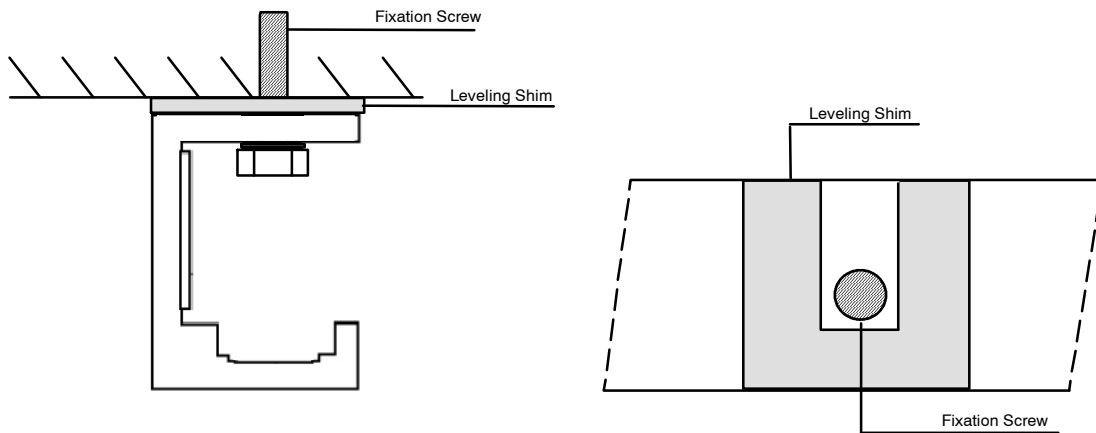
7. **Make sure that the rail is properly level.** Use the digital Level. The maximum tolerance must be  $0.1^\circ$ . If rails are not properly level, check that all screws are tightened totally; but it may be also because the Ceiling is not level. Use a Laser Alignment Tool or Digital Level to check the Rails leveling.

**Illustration 2-3**  
**Check Rails Leveling**



8. Use the leveling shims to get the proper balance and horizontality. Mount the shims between Longitudinal rails and ceiling or alphen rail, if used, and fixed by the rail fixing screws.

**Illustration 2-4**  
**Use the Leveling Shims to get Rails level**



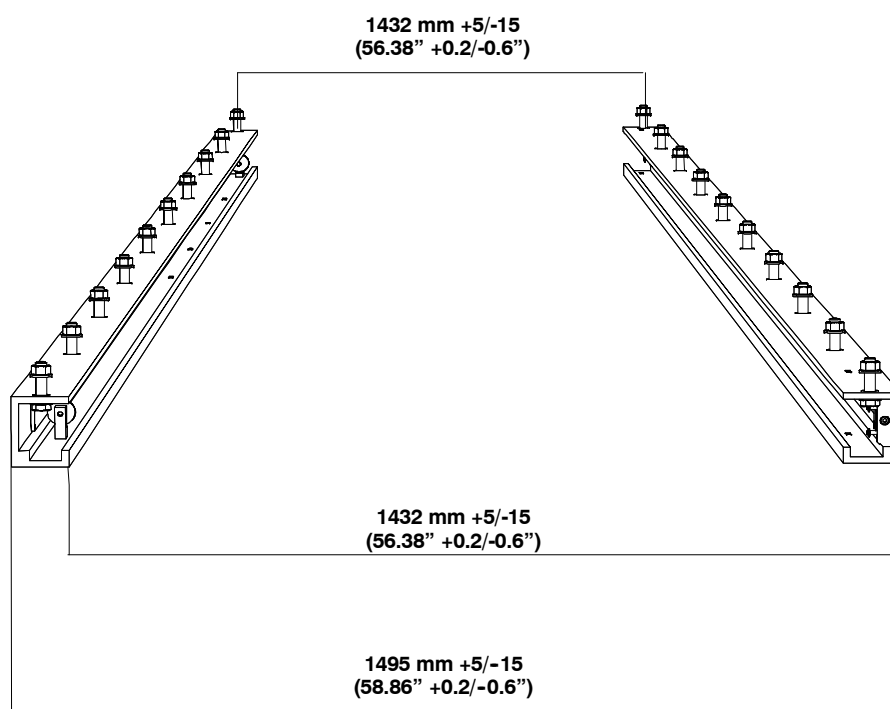
9. Install the back Rail. Make sure that the distance between both rails external sides is 1495 mm  $\pm$  15 mm in all points. Check in different points (between holes center), if the distance is always the same one.



**MAKE SURE THAT ALL FIXATION SCREWS ARE WELL TIGHTENED AND FIXED, AND THAT RAILS ARE LEVEL AND PARALLEL. IN CASE THAT THE RAILS ARE NOT PROPERLY INSTALLED AND LEVEL THE EQUIPMENT WILL NOT OPERATE PROPERLY.**

#### Illustration 2-5

#### Recommended Distance between both Longitudinal Rails

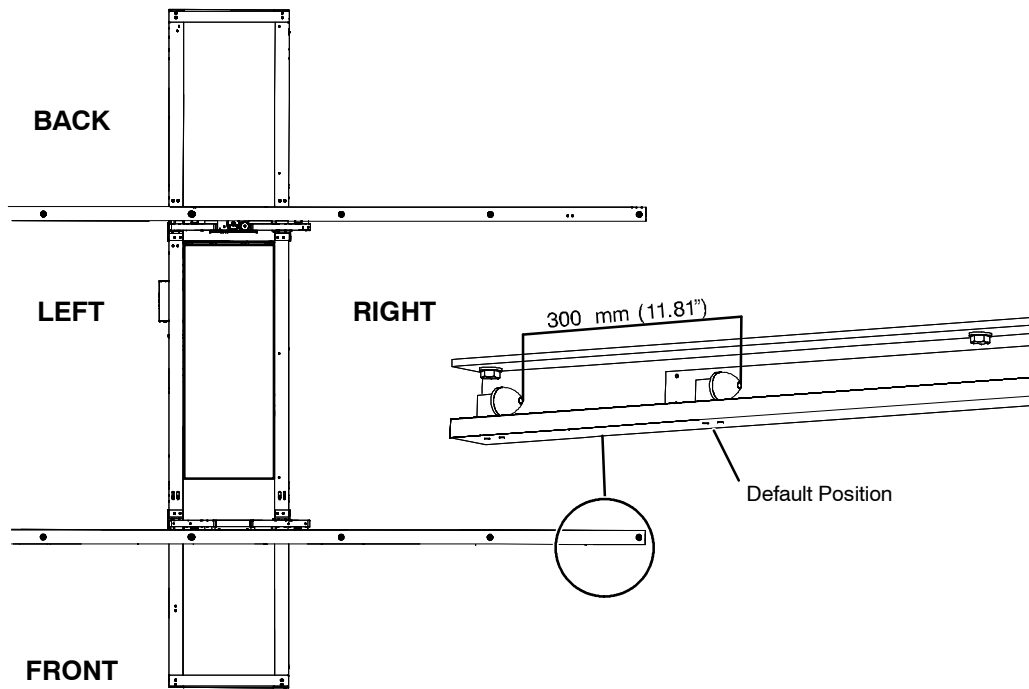


### 2.3 LONGITUDINAL TRAVEL MODIFICATION (OPTIONAL)

Proceed to complete this optional procedure when desired to increase the Longitudinal displacement of the Suspension, specially when working in Single Panel Systems. With this change the Longitudinal displacement can be 300 mm (11.81") longer.

To increase the Longitudinal travel, proceed to change the position of the End Stop located at the right of the front Longitudinal Rail.

**Illustration 2-6**  
**Auto-tracking Ceiling Suspension Longitudinal and Transverse Movement**



Loosen both fixation screws of the End Stop and install the End Stop in the position at the end of the rail, use the drill holes located at 45 and 25 mm (1.77" and 0.98") from the end of the Rail.

## 2.4 CABLES RAIL INSTALLATION

**Note** 

*Cables rails are optional. In case of use any different Cable Rail, it is absolutely mandatory that it complies with all the ceiling, installation and safety requirements. Refer to the Pre-installation Manual for further details.*

### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
n/a	51202P33	Screw M12 x 50 AOCL 8,8	10
	51380P31	Washer M12	20
	51350P15	Nut Ex M12	10
n/a	S0022010	Cable Rail Tube Hose	1
	S0019737	Cable Rail Velcro Hose	1
	S0019739	Unistrut Carriage	1
	S0019740	Brace/Case/Washer	1
	S0019741	Threaded Hook	1
n/a	S0019972	Spring Nut M6	2
	S0020454	Nut Fixation	2
	51212P67	Socket Cap Screw Din912 M6 X 20	2
	51390P12	Aet Washer 6	2

**Note** 

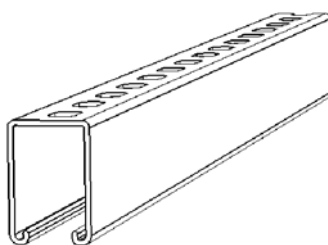
*There are two different Cable rails depending on the type of hose, if it is Velcro covered or tubular, they are provided with different Hose sliding fixation kit. Installation procedure is the same for both Cable Rails.*

### Illustration 2-7

#### Cable rail and fixation screws



Hose Fixation Kit



Cable Rail



Rail Fixation Screws

### PROCEDURE

1. Install the Cable Rail at the back of the room. It is recommended to begin tightening the rails end screws, and then all intermediate screws.
2. Open Packing Box 2 of the Rails Crate.
3. Fix the Cable Rail, use:
  - 51202P33 SCREWS M12X50 AOCL 8,8
  - 51350P15 NUTS EX M12
  - 51380P31 FLAT WASHER B13 A0

**Illustration 2-8**  
**Cable Rail Fixation**



4. Install the three Hose Fixation Kits.
  - S0019737 HOSE SLIDING FIXATION for Velcro Hose  
or  
S0022010 Longitudinal SLIDING FIXATION for Tubular
  - S0019739 UNISTRUT CARRIAGE
  - S0019740 BRACE/CASE/WASHER
  - S0019741 THREADED HOOK

**Illustration 2-9**  
**Hose Fixation Kits**



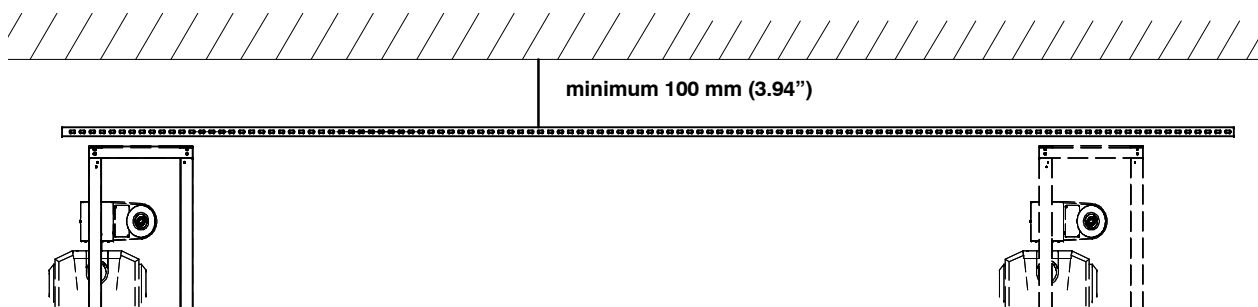
5. Install the Spring Nut Assembly, P/N S0019972, at the ends of the Cable Rails.
  - S0019972 SPRING NUT M6
  - S0020454 NUT FIXATION
  - 51212P67 SOCKET CAP SCREW DIN912 M6 X 20
  - 51390P12 AET WASHER 6

**Illustration 2-10**  
**Spring Nut Assembly**



6. Check that all screws are properly fixed.
7. Check that the distance of the Cable rail to the rear wall is the minimum required or higher. Refer to *Section 1.5 Pre-installation Checks & Equipment Specifications*.

**Illustration 2-11**  
**Minimum Distance Cable Rail to Wall**



## 2.5 TRANSVERSE RAILS AND MAIN ASSEMBLY INSTALLATION

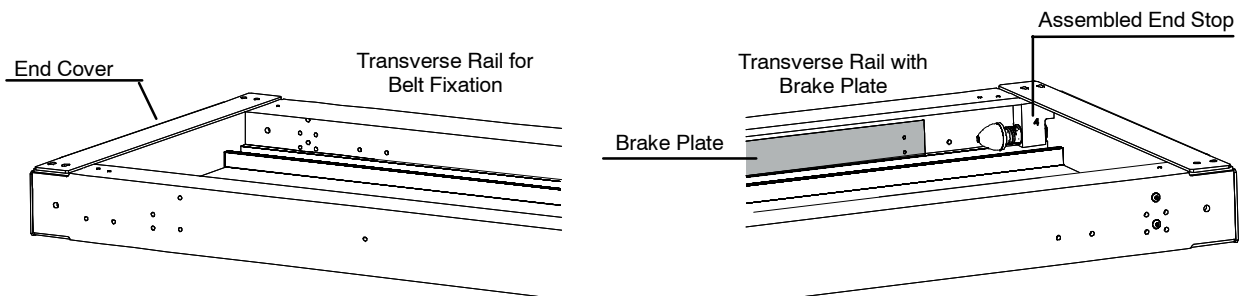
### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
N/A	Variable depending on the length	Transverse Rail with Brake Plate	1
	Variable depending on the length	Transverse Rail	1
	00574P01	Bumper * (For Rail End stops)	2
	S0006442	Bumper Support * (For rail end stops)	2
	S0004599	Slotted Cheese Head Screw M5x20 * (For rail end stops)	4
	S0021351	End Covers Transverse Rail	2
	--	Telescopic Column	1
3	S0004605	Screw M5x20 ISO7380	6
	51383P30	Big Washer M5	6
	51361P03	Lock Nut M5	6
	53054P01	Tie Wrap UNEX1201	6
	51212P25	Socket Cap Screw DIN912 M4x12	6
	51380P26	Washer DIN125 M4	6
	51390P10	AET Washer M4	6

**Note** 

*Rail End stop bumpers are shipped already assembled and mounted on rails.*

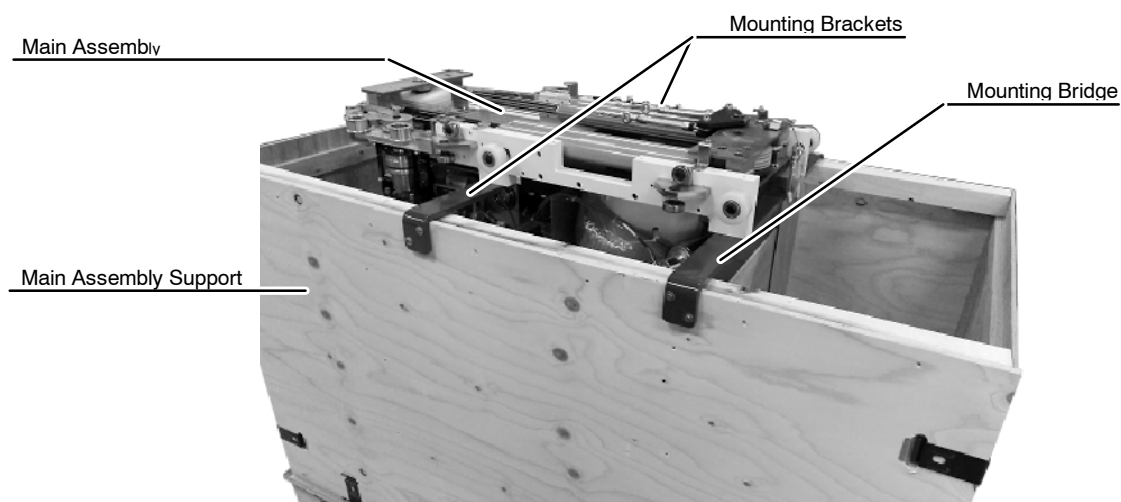
**Illustration 2-12**  
**Required Elements**



### MAIN CRATE UNPACKING

1. Place the Main Assembly at the center of the already installed longitudinal rails to make easier the lifting procedure. It must be lifted to the ceiling and fixed to the longitudinal rails together with the Main Assembly Support.
2. Remove the upper and all lateral covers of the crate.
3. The Main Assembly is hanged on the Mounting Brackets and Mounting Bridge, and on the Main Assembly Support.
4. Remove all shipping materials and all Suspension elements as hoses, bearings, etc. Keep on the pallet just the Main Assembly Support with the Main Assembly and Mounting Brackets and Bridge.

**Illustration 2-13**  
**Main Assembly without Shipping Bags and Boxes**



**DO NOT LOOSEN THE MOUNTING BRACKETS AND THE MOUNTING BRIDGE YET. IT IS MANDATORY TO KEEP THE CEILING SUSPENSION FIXED TO THE MAIN ASSEMBLY SUPPORT UNTIL IT IS INSTALLED AND FIXED TO THE LONGITUDINAL RAILS.**

INSTALLATION PROCEDURE



PROCEED TO THE INSTALLATION OF THE TRANSVERSE RAILS AS CAREFULLY AS POSSIBLE. MAKE SURE THAT NO ELEMENT OF THE CARRIAGE OF THE SUSPENSION OR THE COLUMN HAS BEEN DAMAGED DURING THIS PROCEDURE.



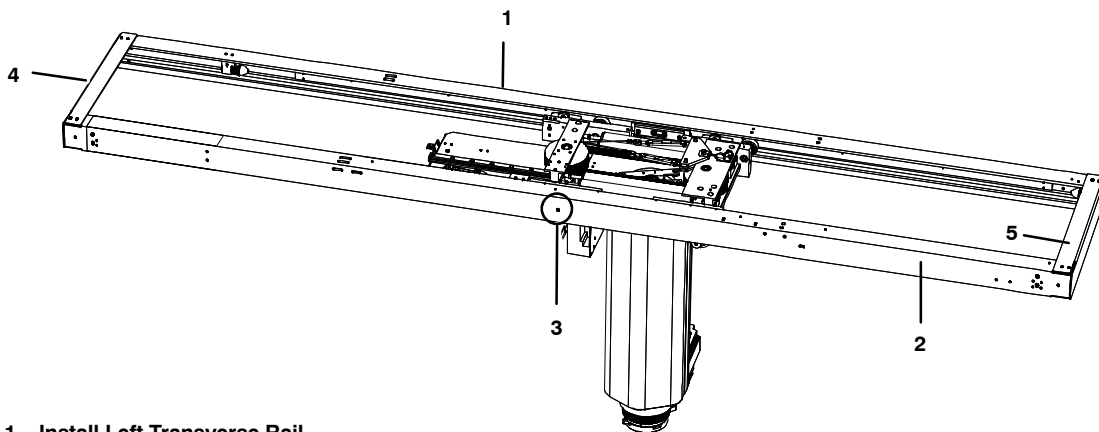
MAKE SURE THAT THE CEILING SUSPENSION AND TRANSVERSE RAILS ARE MOUNTED TOTALLY PERPENDICULAR TO THE LONGITUDINAL RAILS.



MODIFYING BRIDGE LENGTH IS NOT RECOMMENDED. IF MODIFICATION OF THE BRIDGE IS REQUIRED, YOU MUST CHECK WITH YOUR INSTALLATION SPECIALIST. CONFIRM THAT THE LENGTH YOU DESIRE WILL NOT LIMIT YOUR ABILITY TO PURCHASE FUTURE PRODUCT OPTIONS OR UPGRADES (I.E. VOLUME RAD).

Illustration 2-14

Proceed to mount the Transverse Rails in the next Order

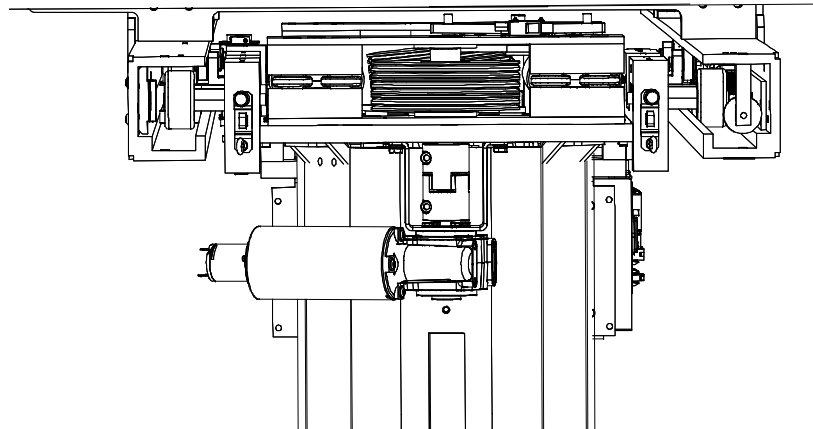


1. Install Left Transverse Rail
2. Install Right Transverse Rail
3. Fix the Rail to the Carriage
4. Install Front End-cover
5. Install Back End-cover

1. Mount the Carriage wheels on the Left Transverse Rail (Brake Plate rail). The wheels must run without obstacles. Just fit the carriage wheels into the Transverse Rail end and roll until locating the Column in the center of the rail.

**Illustration 2-15**

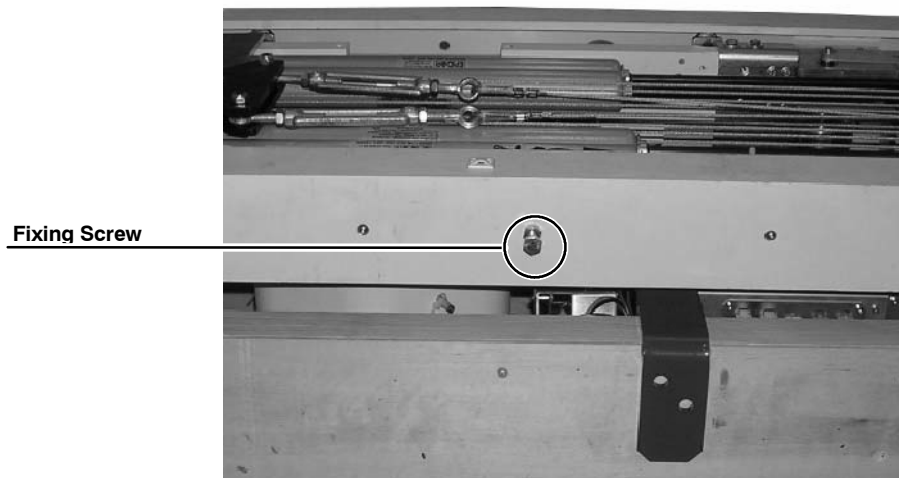
**Mount the Rails on the Bearings Wheels and slide carefully**



2. Mount the Right Transverse Rail (The one without metal Brake Plate).
3. Fix the rails position with the Fixing Screw. This is highly important to avoid unexpected movements of the Main Assembly along Transverse rails. Insert the Fixing Pin provided with the Suspension, or any other bar, in the lateral hole of the Right Transverse Rail.

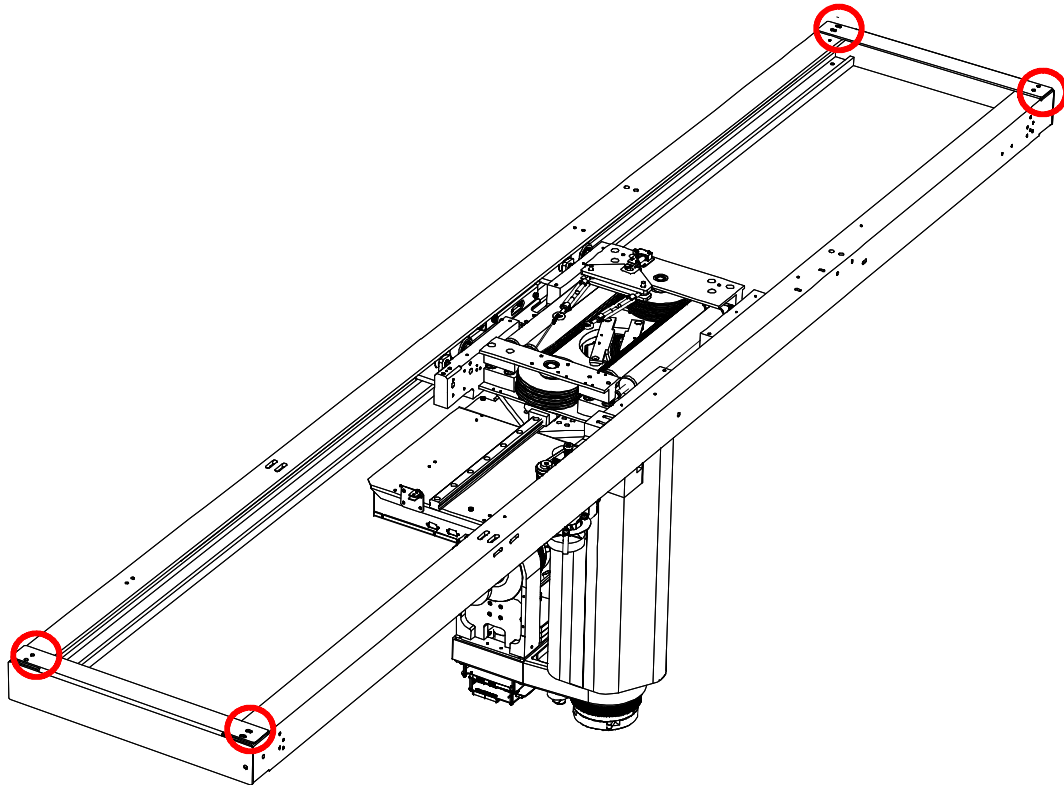
**Illustration 2-16**

**Use the pin to fix the Ceiling Suspension**



4. Place the End Cover at each Rails end.
5. Open Packing Box 3. Each End Cover is tighten to the rails in two points.

**Illustration 2-17**  
**Transverse Rails End Covers Fixation**



6. Use to fix both End Covers:
  - S0004605 SCREW M5 x 20 ISO 7380
  - 51383P30 BIG WASHER M5
  - 51361P03 LOCK NUT M5

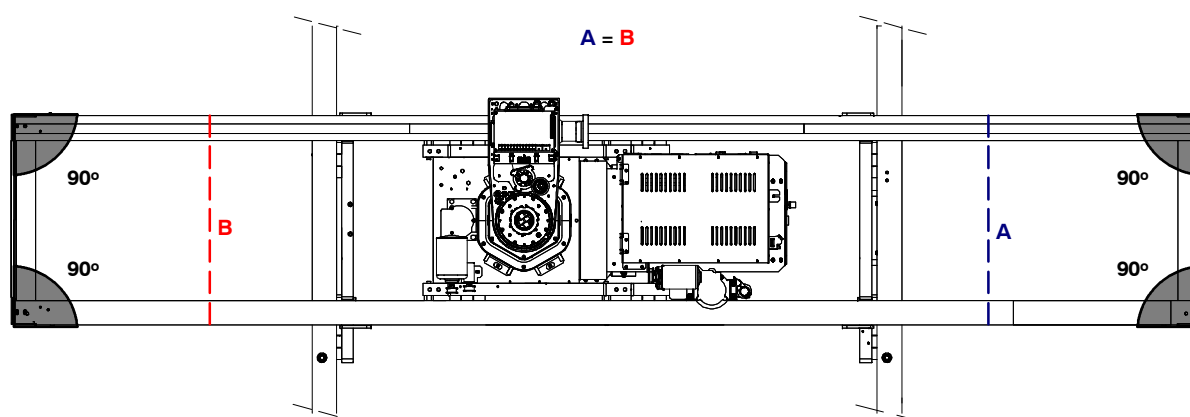
7. Mount the Washer and Lock Nut under the Cover and the Screw on top of the Cover.

**Illustration 2-18**  
Transverse Rails End Cover



8. **Check if Transverse Rails are properly level and parallel:**
  - The distance between both rails must be the same in every point, with a tolerance of  $\pm 1$  mm (0.039"). Recommended checking points are located at a distance of 5 cm to 10 cm (1.97" to 3.94") from the end of every rail. Measure the distance from the external part of one rail to the external part of the other one.
  - All angles must be of  $90^\circ$ .

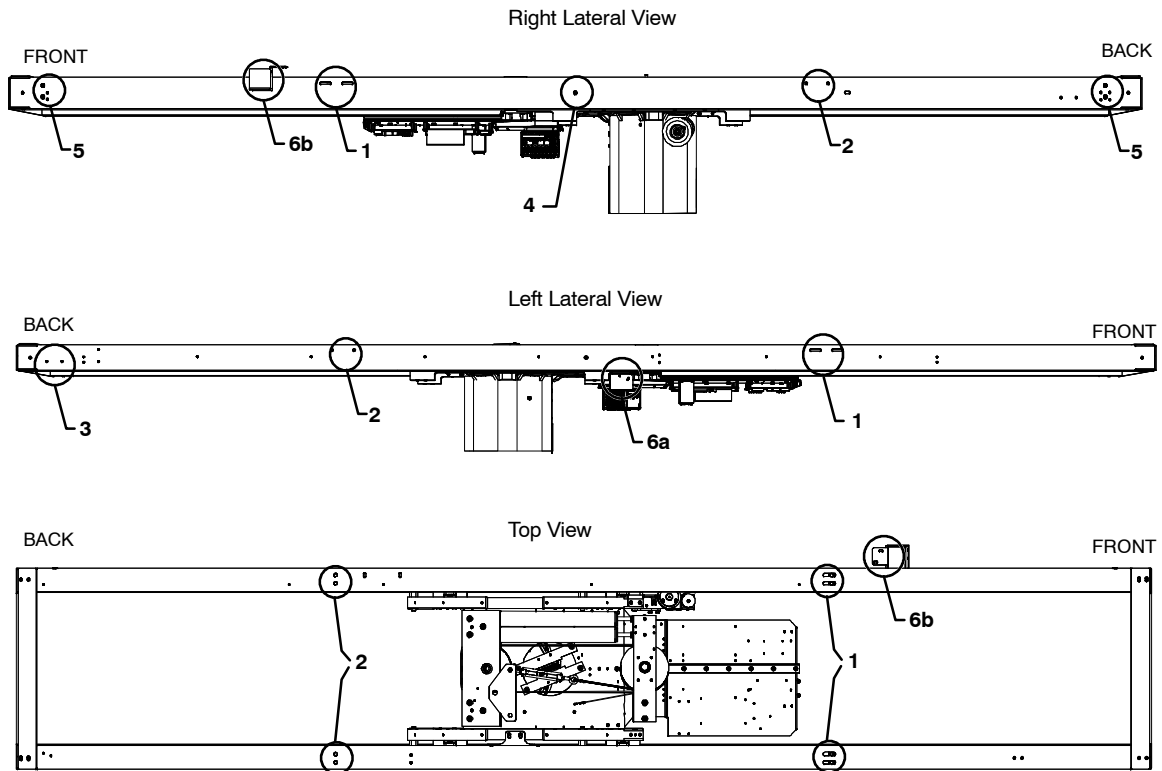
**Illustration 2-19**  
Check all angles and distances (Bottom View)



**PARALLELISM MUST BE CHECKED BEFORE LIFTING THE CEILING SUSPENSION TO FIX IT TO THE LONGITUDINAL RAILS, AND CHECKED AGAIN AFTER COMPLETING THE FIXATION PROCEDURE.**

Several parts of the Ceiling Suspension are fixed in Transverse Rails. Refer to illustration below for information about parts of the equipment fixed and their fixation points.

**Illustration 2-20**  
**Transverse Rails Fixations**



1. Front Transverse Rails Fixation
2. Back Transverse Rails Fixation
3. Bracket-Cable Mounting to the Transverse Rails
4. Mains Assembly Fixing Screw
5. Transverse Belt Fixation
6. Automatic Collimation Kit. Positions a & b

## 2.6 TRANSVERSE BELT INSTALLATION

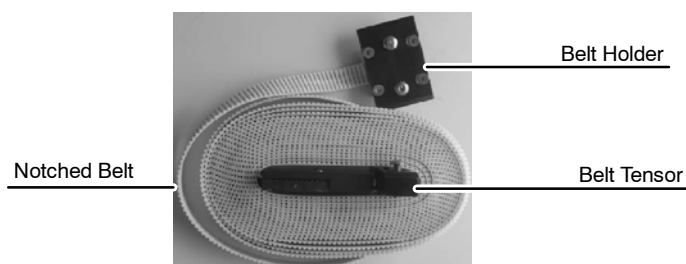
Note 

*Install always the Transverse Belt before lifting the Ceiling Suspension and fixing it to the Longitudinal Rails.*

### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
B	S0022488	Transverse Rail Belt Assembly *	3.7 m 145.6"

**Illustration 2-21**  
**Transverse Belt Assembly**



***Transverse and Longitudinal Belts are packed in the same shipping box, B, in the Main Crate. Please make sure that the required Belt for each rail is used. The use of the wrong Belt will result in the impossibility to continue with the whole installation procedure.***

***Check the lengths of both Belts. Transverse Belt is the shortest one (3700 mm/145.6”).***

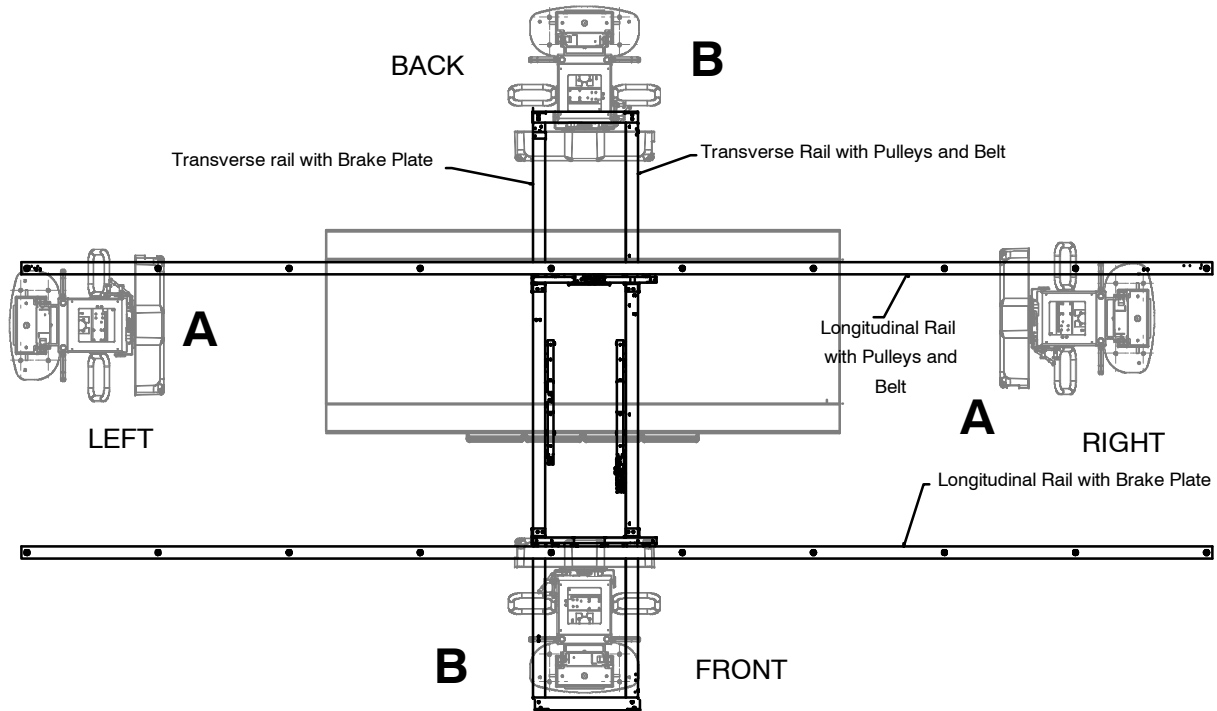


***For Auto-tracking Ceiling Suspensions it is not necessary to install both Belts, Transverse or Longitudinal. Depending on the Room configuration it will be necessary to install the Belt and Pulley Set in the Transverse Axis instead of the Longitudinal one. So, just one Belt is shipped for both axis, make sure that the required length is used to the installation in the axis. For the Transverse Belt it is required almost 3700 mm (145.6”). Install the Pulleys Set and Belt in the same axis where the Wall Stand will be installed.***

Check the next drawing just in case that the equipment to be installed is an Auto-tracking Ceiling Suspension. Depending on the location of the Wall Stand A or B it will be required to install the Transverse or Longitudinal Belt.

### Illustration 2-22

Install the Pulleys and Belt in the same axis where the WS will be installed



A Wall Stand on Ceiling Suspension Longitudinal Axis, Pulleys and Belt installed only on the Longitudinal Axis.

B Wall Stand on Ceiling Suspension Transverse Axis, Pulleys and Belt installed only on the Transverse Axis.

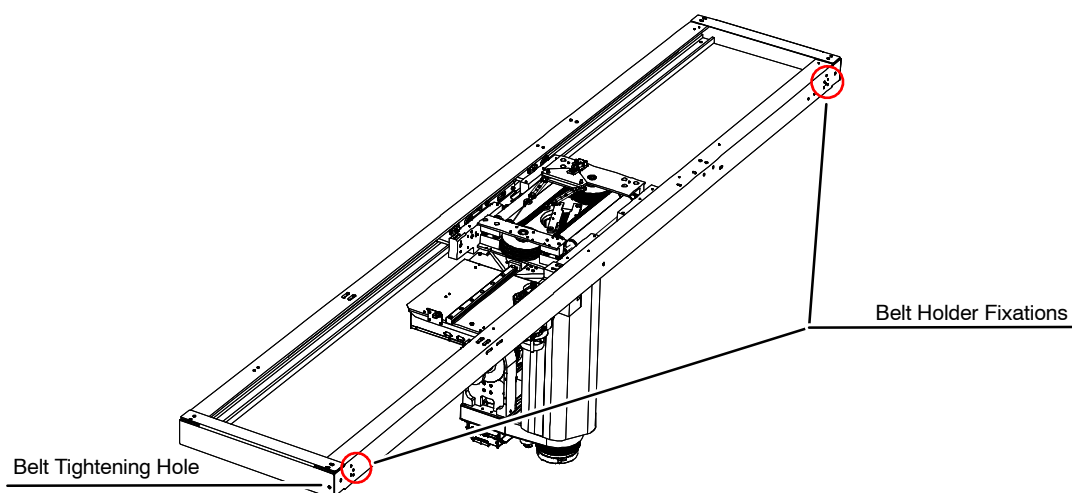
### INSTALLATION PROCEDURE

The Transverse Belt is already assembled for the shipping, so it will be necessary to disassemble the Belt Holder to install it properly:

1. Open Packing Box B of the Main Crate. Use just the Transverse Belt, if provided with two different Belts, which is minimum 3700 mm (145.6") long.

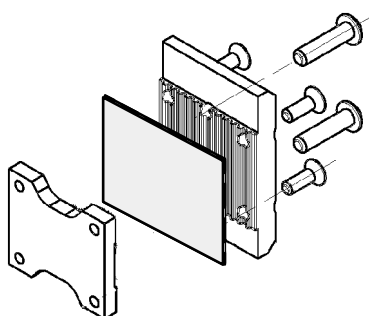
2. Belt Tensor must be installed at the front of the Right Transverse Rail.
3. Belt Holder must be installed at the end of the Right Transverse Rail.

**Illustration 2-23**  
**Transverse Belt fixation points**



4. Open the Belt Holder completely as it is necessary to match the Belt with the Holder Notches.
5. Tighten and adjust the Notched Belt to match it with the Holder.

**Illustration 2-24**  
**Loosen the Belt Holder to match it with the Notched Belt**



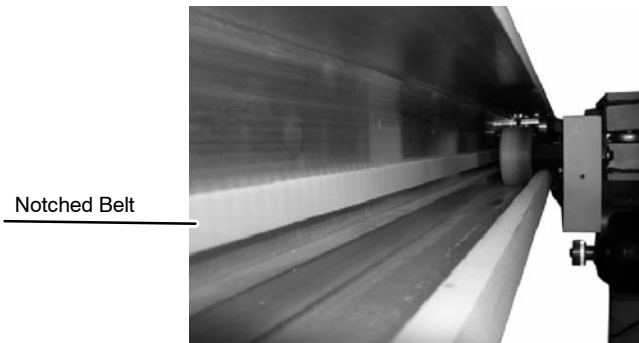
6. Mount again the Belt Holder and fix it to the Rail.
7. Place the Belt along the right Transverse Rail, the one without the metal plate. The Notched Belt must run with all notches looking inwards.

*Note* 

*Check that the Belt is completely tightened. It is very important for the correct travel of the Carriage along the Transverse Rails.*

**Illustration 2-25**

**Place the Belt along the Right Rail. Belt notches must look inwards**



8. Loosen the Jam Nut of the Belt Tensor, it must be a little bit loose.

**Illustration 2-26**

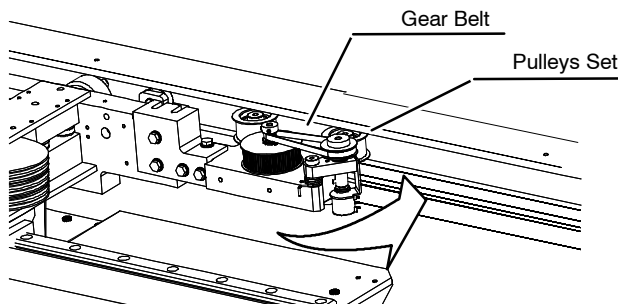
**Loosen the Belt Tensor Jam Nut**



9. Remove the Gear Belt of the Transverse Potentiometer. Turn the Potentiometer to the right to remove it easily.

**Illustration 2-27**

**Transverse Potentiometer**

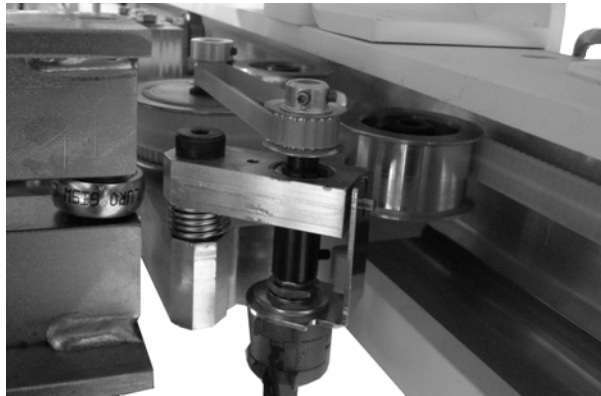




TRANSVERSE MOTOR/PULLEYS SET IS ALREADY INSTALLED, IT IS NOT REQUIRED TO REMOVE THE POTENTIOMETER. DO NOT CHANGE ITS POSITION EITHER. IF CHANGED, POTENTIOMETER MAY GET DAMAGED.

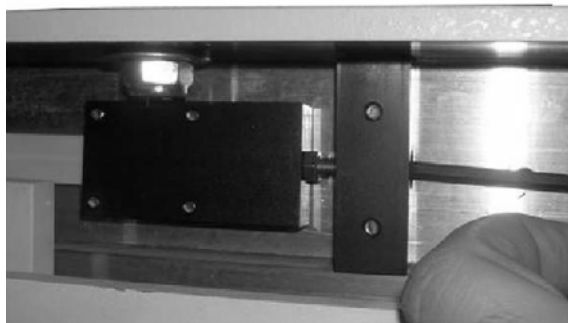
10. Loop the Belt into the Transverse Pulley Set.
11. Mount back the Gear Belt of the Potentiometer.

**Illustration 2-28**  
**Transverse Belt and Pulleys**



12. Get the Belt tightened.
13. Fix the Belt Tensor at the front of the right Transverse Rail.
14. Put an Allen wrench through the End Cover hole for Belt adjustment and tighten the Belt Tensor.

**Illustration 2-29**  
**Belt Tensor**



## 2.7 LIFTING & LOWERING

Note 

*In case of using another lifting tool, remember that it must comply with all the ceiling installation and safety requirements.*



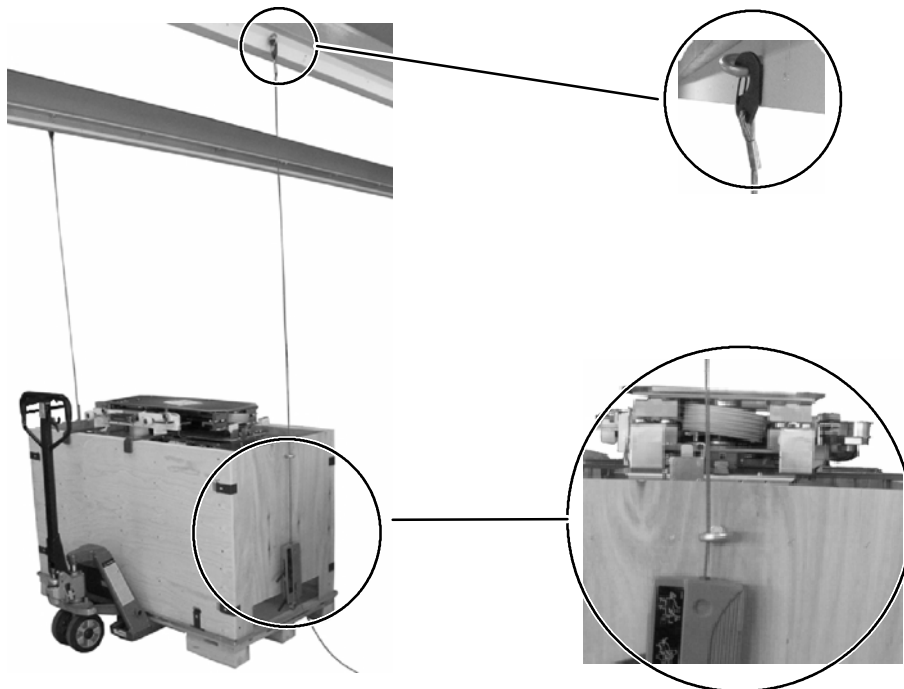
**TO LIFT THE CEILING SUSPENSION NEITHER REMOVE ANY COVER OF THE MAIN ASSEMBLY SUPPORT, NOR MOUNTING BRACKETS, NOR MOUNTING BRIDGE.**



The Lifting Tool provided by the manufacturer is an optional tool, P/N S0006600. It can be used another tractel or lifting equipment, as long as it is capable to lift the main crate and the Transverse rails, refer to the *Section 1.5 Pre-installation Checks* for information about the equipment and crate weight.

It is required to use two Lifting Tools, install one at each Lateral of the crate.

**Illustration 2-30**  
**Lifting Tool and Rings Installation**



### 2.7.1 LIFTING TOOL INSTALLATION

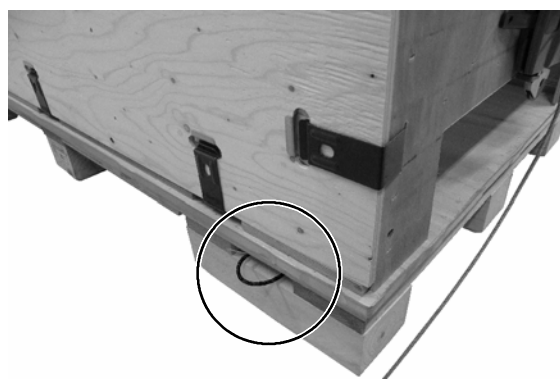
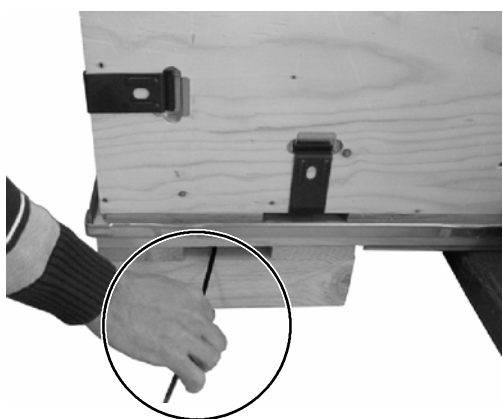
1. Mount the rings required to the Lifting Tool installation. Two at the Longitudinal Rail, one at each rail. Other Two at the top of the Ceiling Suspension Crate, one at the front and at the back of the Crate (refer to *Illustration 2-30*).
2. Pass the Lifting Tool cables through the Crate rings.

**Illustration 2-31**  
**Crate Ring with Cable installed**



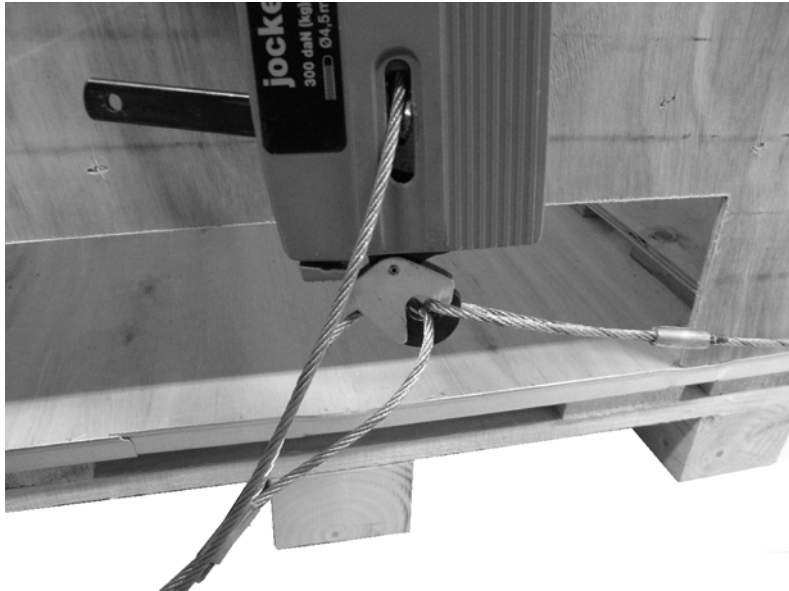
3. Pass the other lifting Cables through the gaps of the skids under the Crate to avoid unexpected overturns of the Crate during the lifting procedure.

**Illustration 2-32**  
**Drive the Cable through the Crate Skids**



4. Hook the cables with the bottom hook of the Lifting Tool.

**Illustration 2-33**  
**Hook the Cables**



5. Adjust the steel cables just lifting a little bit the Crate. Make sure that there are not knots, cables are tightened and that Ceiling Suspension can be lift safely.

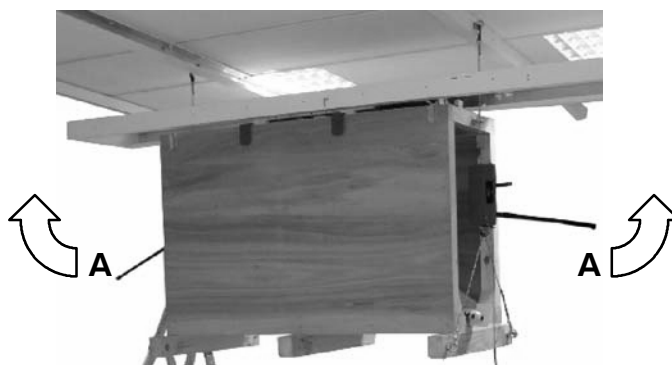
**Illustration 2-34**  
**Make sure that Lifting Tool is properly installed**



## 2.7.2 LIFTING & LOWERING

1. Place the bar as shown in Illustration 2-34, move up and down bar **A** at the same time in both tractels to lift the Main Crate.
2. Lift the Main Crate with Ceiling Suspension main assembly until the Transverse Rails are at 1 cm (0.39").

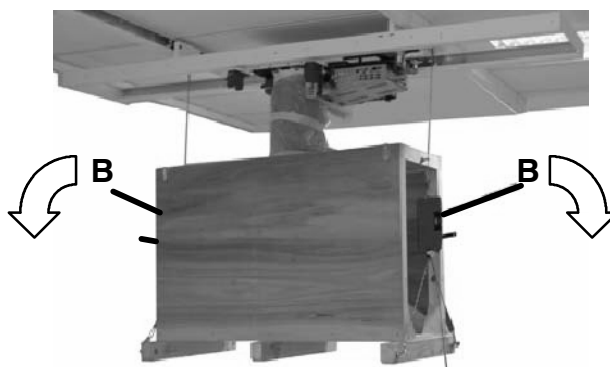
**Illustration 2-35**  
**Ceiling Suspension Lifting procedure**



**PROCEED TO LOWER THE MAIN CRATE ONCE THE TRANSVERSE RAILS HAVE BEEN FIXED COMPLETELY TO THE LONGITUDINAL RAILS.**

3. Once the Transverse Rails and Ceiling Suspension are fixed to the Longitudinal Rails (*refer to Section 2.8*), unscrew the Mounting Brackets and Mounting Bridge from the Main Crate.
4. To lower the Main Crate, move up and down the bar **B** at the same time in both tractels.

**Illustration 2-36**  
**Ceiling Suspension Lowering procedure**



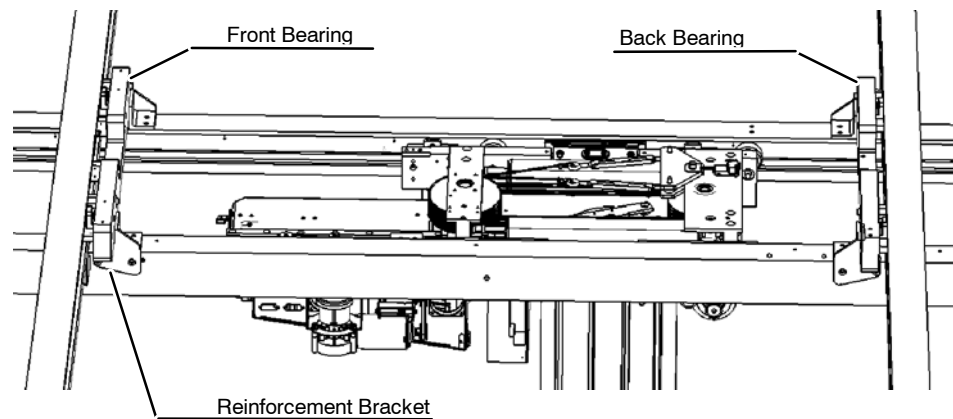
## 2.8 TRANSVERSE RAILS FIXATION

This procedure's target is to provide information about the fixation of the Transverse Rails Fixation Bearings or Rolling Supports that allow the movement of the Ceiling Suspension and the Transverse Rails along the Longitudinal Rails. There are two Fixation Bearings to be installed, Front and Back Bearings. **Remember that they are not interchangeable.**

Note 

*It is highly recommended to get the Ceiling Suspension and Transverse Rails mounted and lifted together to install the Fixation Bearings.*

**Illustration 2-37**  
**Fixation Bearings location**



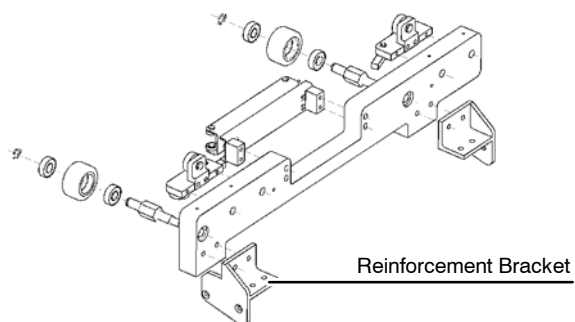
**FRONT AND BACK FIXATION BEARINGS ARE DIFFERENT AND NOT INTERCHANGEABLE. MAKE SURE THAT EACH ONE IS INSTALLED IN ITS CORRECT POSITION. IT IS MANDATORY TO INSTALL FIRST THE BACK BEARING AND THEN THE FRONT ONE.**

**REQUIRED ELEMENTS**

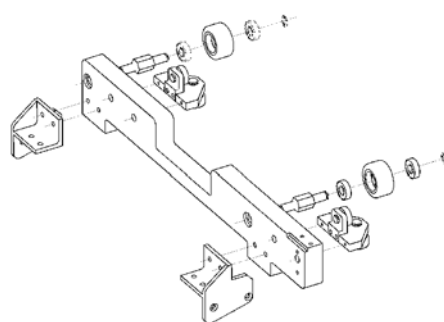
BOX	P/N	DESCRIPTION	QTY.
N/A	S0009430	Conductive Rolling Support (Back Fixation Bearing)	1
	S0009433	Brake Side Rolling Support (Front Fixation Bearing)	1
A	S0009340	Reinforcement Bracket for Rolling (Right Side)	2
	S0009341	Reinforcement Bracket for Rolling (Left Side)	2
	51212P71	Screw DIN 912 M6x40	8
	51221P68	Allen Screw M6x25 DIN7991	8
	51361P04	Nut EX with nylon Lock M6	16
	51380P28	Plate Washer B 6.4	16
2	S0006260	Bracket Plate Fixation Rails (Small)	4
	51390P13	Washer AET M8	8
	51201P48	Screw EX M8x25	8
	51380P29	Washer B 8.4 AO	8

**Illustration 2-38**  
**Rails Fixation and Bearing Assemblies**

**Front Fixation Bearing**



**Back Fixation Bearing**



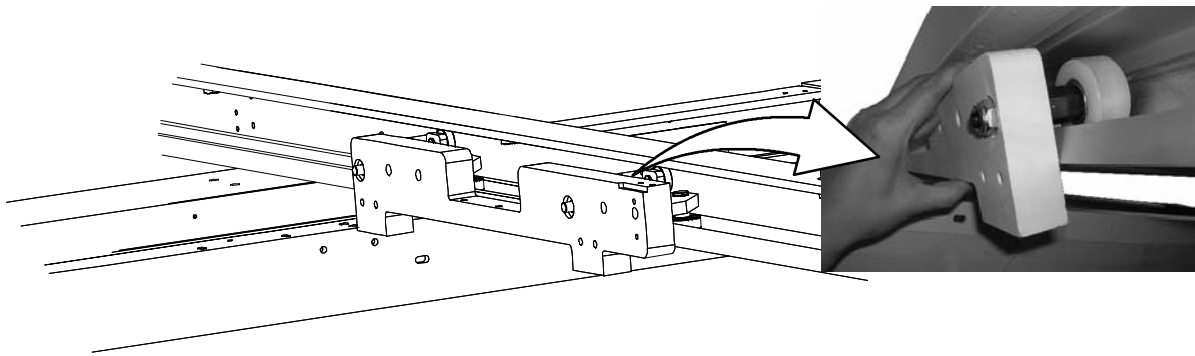
### 2.8.1 BACK BEARING INSTALLATION



**THE CEILING SUSPENSION AND TRANSVERSE RAILS MUST BE ALREADY SUPPORTED BY THE MAIN CRATE AND THE LIFTING TOOL. DO NOT REMOVE ANY UNTIL PROPERLY FIXING THE TRANSVERSE RAILS.**

1. Open Packing Box A.
2. Place the Fixation Bearing in the left lateral of the Transverse Rails. Insert the Bearing into the back Longitudinal Rail.

**Illustration 2-39**  
**Roll the Back Bearing to install it**



3. Roll the Bearing to its final position, it must match the Transverse Rails bores for Bearing fixation.

**Illustration 2-40**  
**Place the Fixation Bearing in the correct position**



4. Each Fixation Bearing is fixed directly to the Transverse Rail with all the screws and items shipped in packing Box 2. Open it.
  - S0006260 Bracket Plate Fixation Rails
  - 51390P13 Washer AET M8
  - 51201P48 Screw EX M8x25
  - 51380P29 Washer B8.4 AO

**Illustration 2-41**  
**Bearings fixation screws**



5. Turn just twice, for the moment do not fix it definitely, the distance of the Fixations Bearings to the Longitudinal rails must be adjusted before definitive fixation.

**Note** 

*Do not fix completely all screws until adjusting the distance of both Fixation Bearings to the Longitudinal Rails.*

### 2.8.2 FRONT BEARING INSTALLATION

Proceed to install the front Bearings completing the same steps as for the back bearings installation.

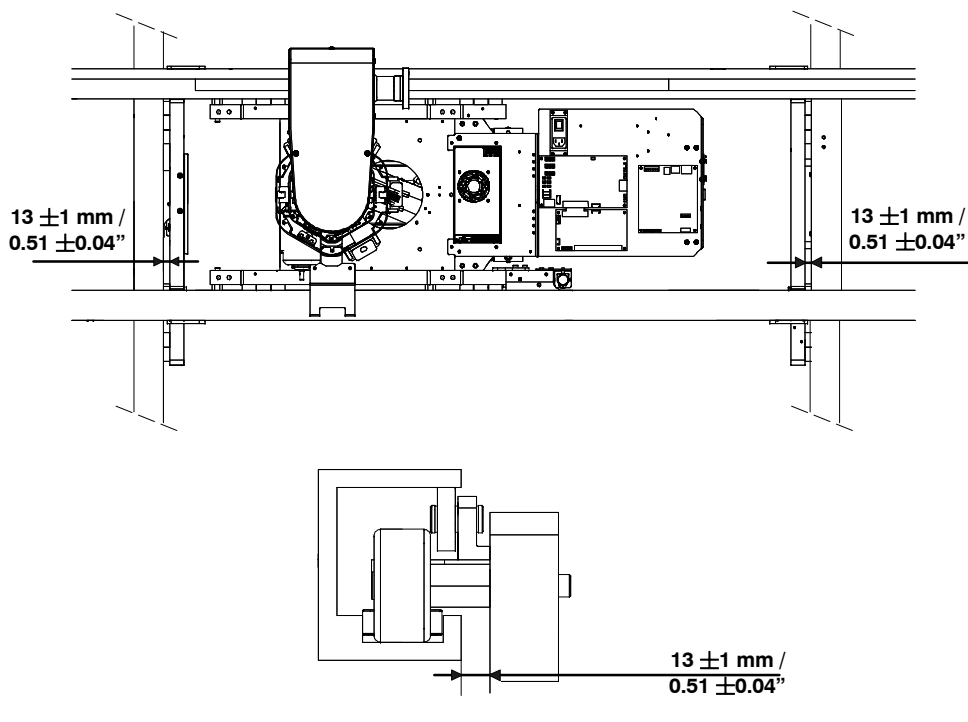
1. Transverse Rails slotted bores allow the correct adjustment of the Bearing distance to the front Longitudinal Rails.

**Illustration 2-42**  
**Front Bearing Fixation Screws**



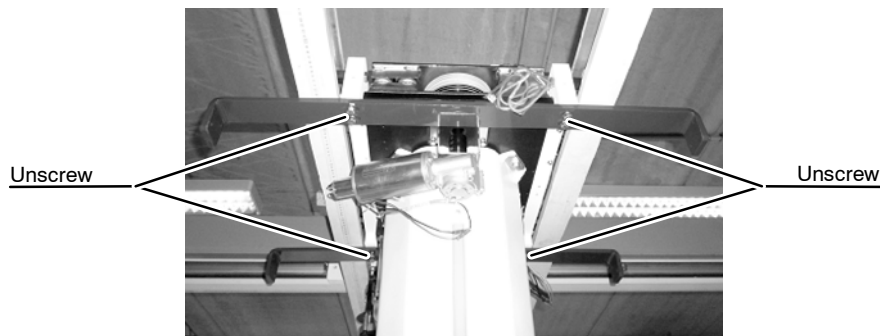
2. Adjust the distance from both bearings to the Longitudinal rails at  $13 \pm 1 \text{ mm}$  ( $0.51 \pm 0.04''$ ). Make sure the distance is the same in all points.

**Illustration 2-43**  
**Check the Distance (Bottom View)**



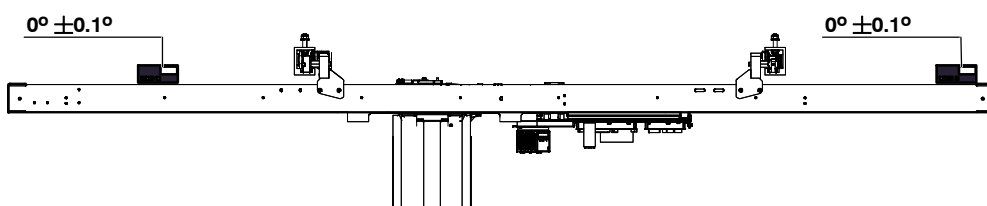
3. Tighten all Bearings fixation screws definitively making sure that the distances between the Bearings and the Longitudinal rails are correct.
4. In case the distances are not correct, proceed to check the installation of the Bearings and use the slotted holes to adjust them.
5. Lower the Main Crate (refer to Section 2.7.2).
6. Unscrew and remove the Mounting Brackets and the Mounting Bridge from the Ceiling Suspension Main Assembly and remove any shipping element from the Ceiling Suspension.

**Illustration 2-44**  
**Mounting Brackets removal**



7. Check the Transverse Rails Leveling.

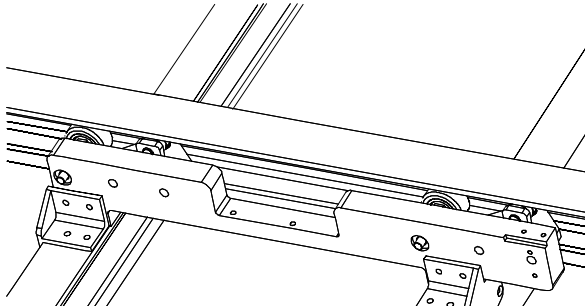
**Illustration 2-45**  
**Check Leveling**



### 2.8.3 REINFORCEMENT BRACKETS INSTALLATION

1. Install the Reinforcement Brackets, there are two different pairs:
  - **S0009340** Reinforcement Bracket for both right Sides.
  - **S0009341** Reinforcement Bracket for both left sides.

**Illustration 2-46**  
**Reinforcement Brackets installation**



2. Use to fix the Brackets to Bearings:
  - Allen Screw M6x25 DIN7991
  - Plate Washer B 6.4

**Illustration 2-47**  
**Reinforcement Brackets Fixation to Bearings**



3. Use to fix the Brackets to the Transverse Rails:
  - 51212P71 Screw DIN 912 M6x40
  - 51361P04 Nut EX with Nylon Lock M6

**Illustration 2-48**

**Fix the Brackets to the Transverse Rail**



## 2.9 LONGITUDINAL POTENTIOMETER & BELT INSTALLATION

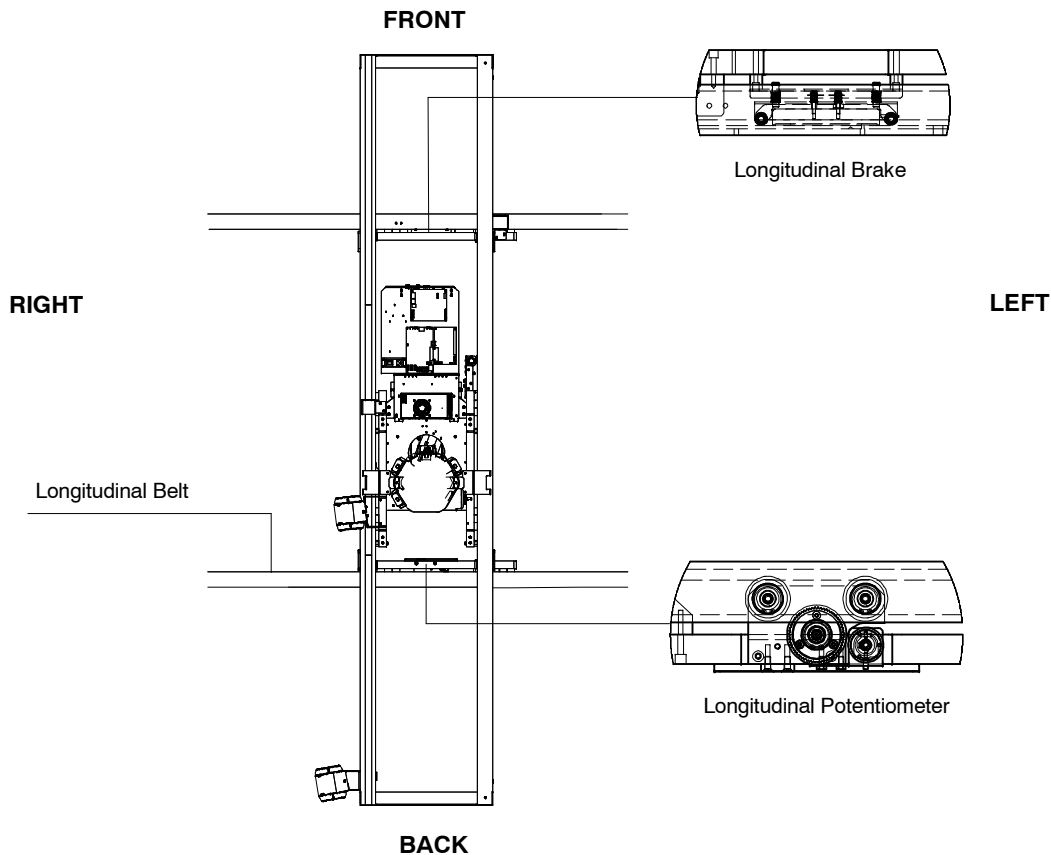
Remember that:

- Longitudinal Belt, P/N S0020135, is installed on the back Longitudinal Rail.
- Longitudinal Potentiometer, P/N S0023450, is installed on the back Fixation Bearings.



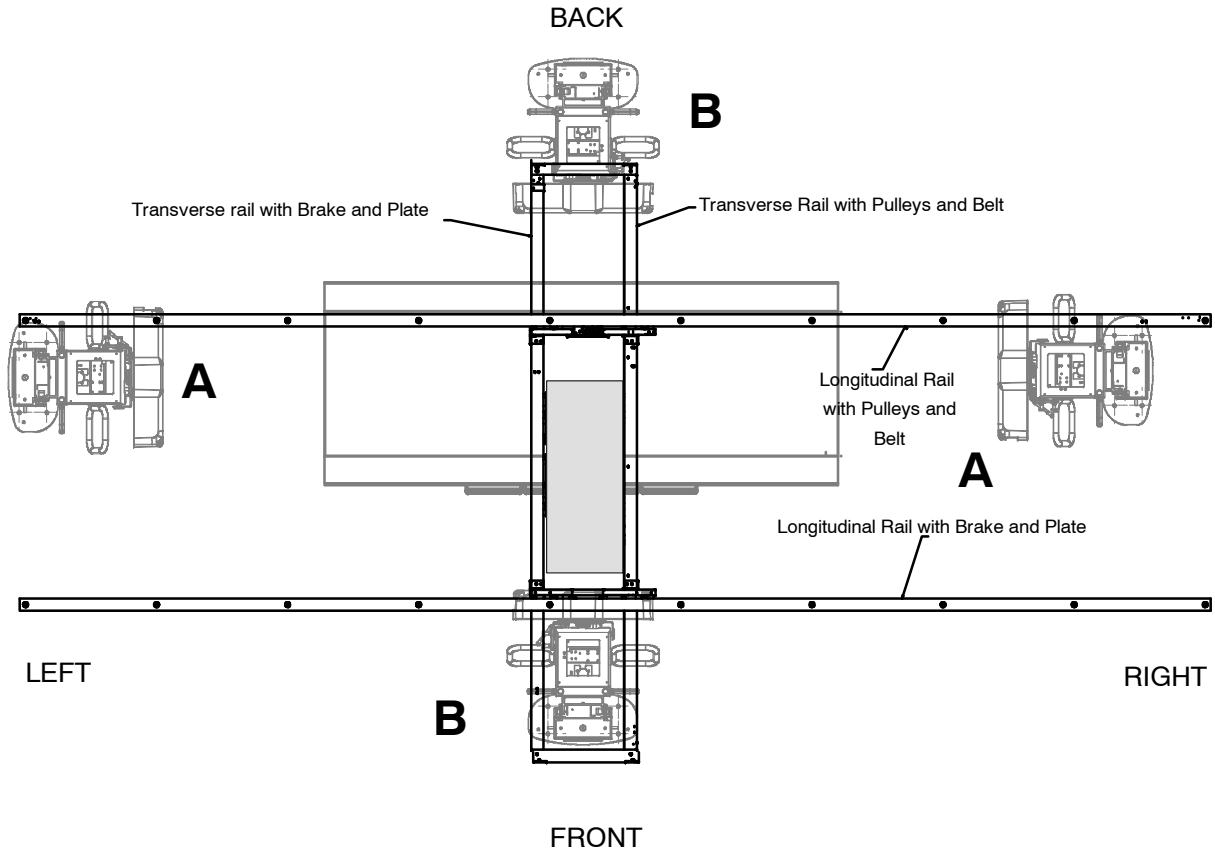
*As just one Belt is shipped for both axis, make sure that the required length is used to the installation in the axis. For the Longitudinal Belt it is required almost 6200 mm (244”).*

**Illustration 2-49**  
**Longitudinal Potentiometer and Belt**



**Illustration 2-50**

**Install the Pulleys and Belt in the same axis where the WS will be installed**

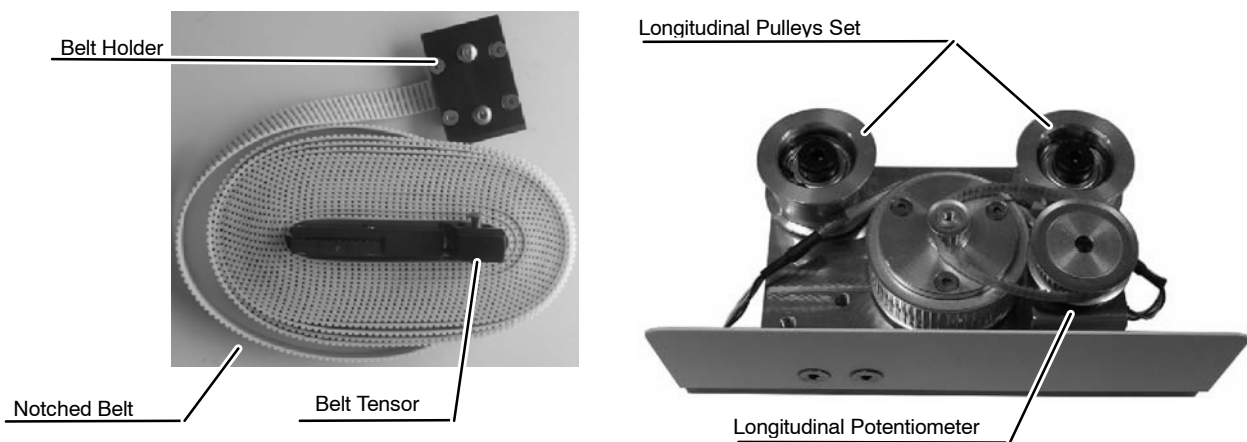


- A** Wall Stand on Ceiling Suspension Longitudinal Axis, Pulleys and Belt installed only on the Longitudinal Axis.
- B** Wall Stand on Ceiling Suspension Transverse Axis, Pulleys and Belt installed only on the Transverse Axis.

**REQUIRED ELEMENTS**

BOX	P/N	DESCRIPTION	QTY.
B	S0020135	Belt Assembly	6.2 m (244")
	S0023450	Longitudinal Potentiometer Assembly (Pulleys Set)	1

**Illustration 2-51  
Longitudinal Belt and Potentiometer**



***For Standard Ceiling Suspensions both Belts, Transverse and longitudinal, are packed in the same shipping box, B, in the Main Crate. Please make sure that the required Belt for each rail is used. The use of the wrong Belt will result in the impossibility to continue with the whole installation procedure.***

***Check the lengths of both Belts. Longitudinal Belt is the longest one (6200 mm, 244").***

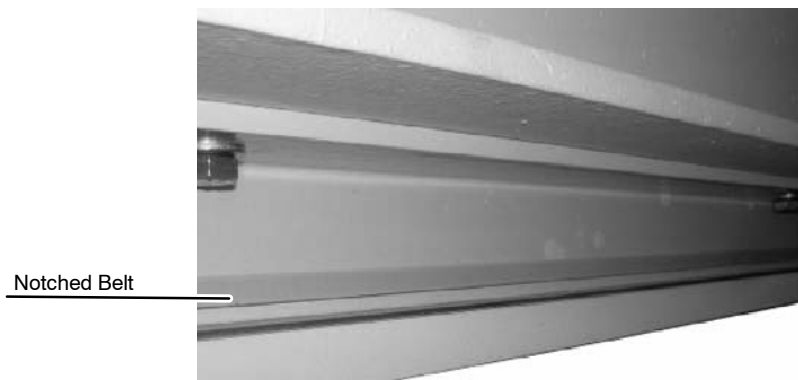


***For Auto-tracking Ceiling Suspensions it is not necessary to install both Belts. Depending on the Room configuration, it will be necessary to install the Belt and Pulley Set in the Transverse Axis or in the Longitudinal one. So, just one Belt is shipped for both axis, make sure that the required length is used to the installation in the axis. For the Longitudinal Belt it is required almost 6200 mm (244"). Install the Pulleys Set and Belt in the same axis where the Wall Stand will be installed.***

**INSTALLATION PROCEDURE**

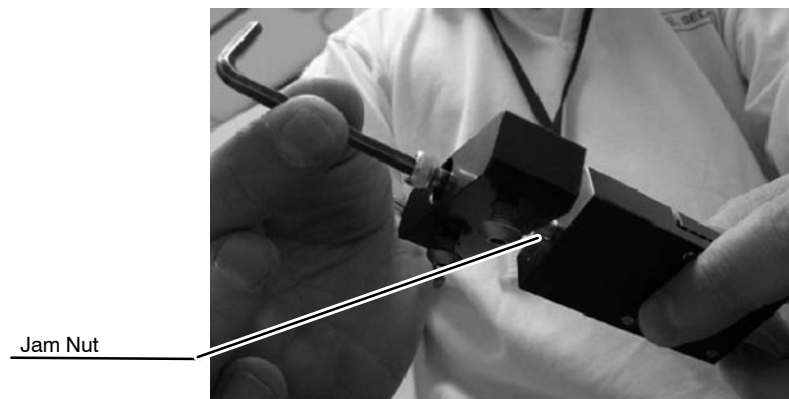
1. Open Packing Box P and use the Longitudinal Belt packed in Packing Box B.
2. Get the Belts along the back Longitudinal Rail (without metallic Brake Plate). The notched Belt must run with all notches facing inwards or to the rail.

**Illustration 2-52**  
**Get the Longitudinal Belt Tightened**



3. Loosen the Jam Nut of the Belt Tensor, it must be a little bit loose.

**Illustration 2-53**  
**Loosen the Belt Tensor Jam Nut**



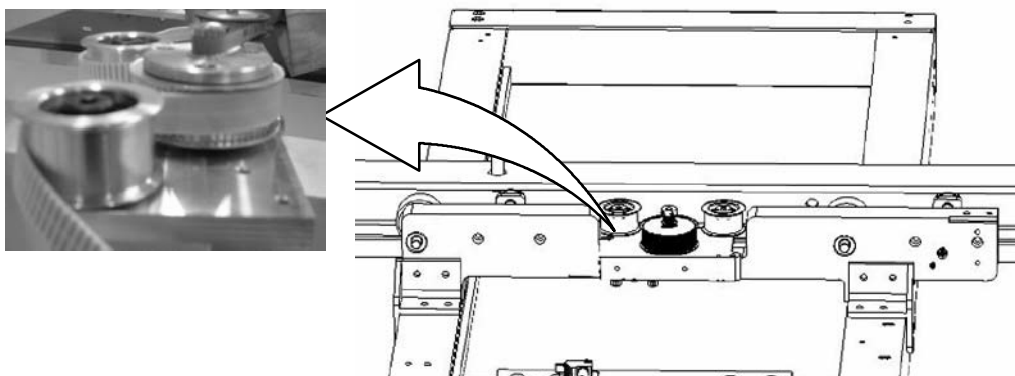
4. Fix the Belt Tensor tightening the two fixing screws in the outer side of the rails.

**Illustration 2-54**  
**Fix the Belt Tensor**



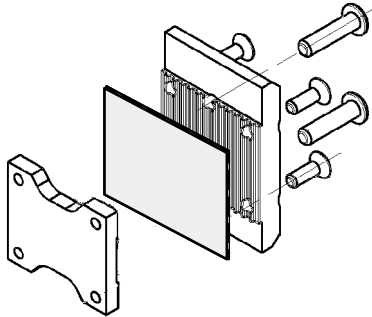
5. Loop the Belt into the Longitudinal Motor Pulleys set as shown in Illustration 2-55.

**Illustration 2-55**  
**Loop the Longitudinal Belt into the Pulleys**



6. Open the Belt Holder to fix the Belt and fit both notches.

**Illustration 2-56**  
**Belt Holder**



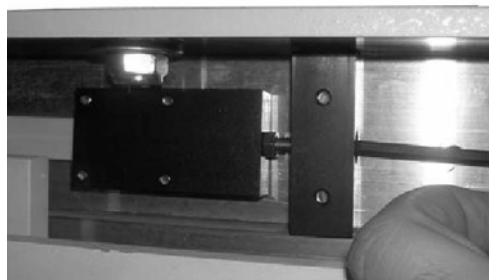
7. Mount again the Belt Holder to fix the Belt and fix it completely to the Rails.

**Illustration 2-57**  
**Fix the Belt Holder**



8. If wanted, cut the remaining tooth Belt as it is not necessary.
9. Finally get the Belt tightened. Turn the Tensioning Screw to get the Belt tightened.

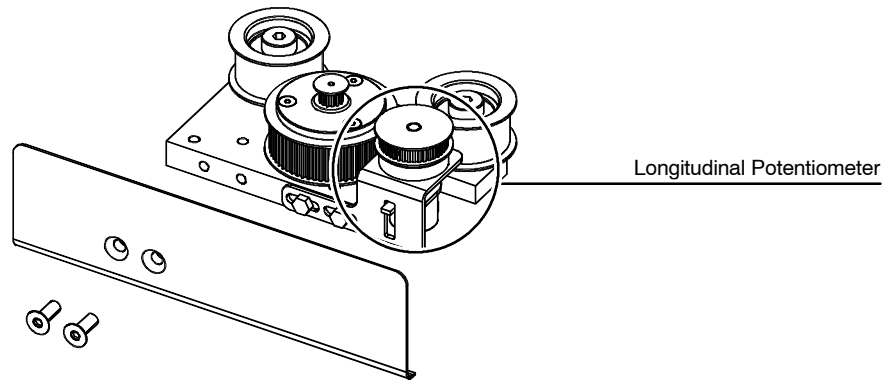
**Illustration 2-58**  
**Adjust the Belt Tensioner**



10. Fix the holder to the Longitudinal Rail.

11. Center the suspension in the room and adjust the Longitudinal Potentiometer at its center too. Give 5 turns, as it is a 10 turns one.

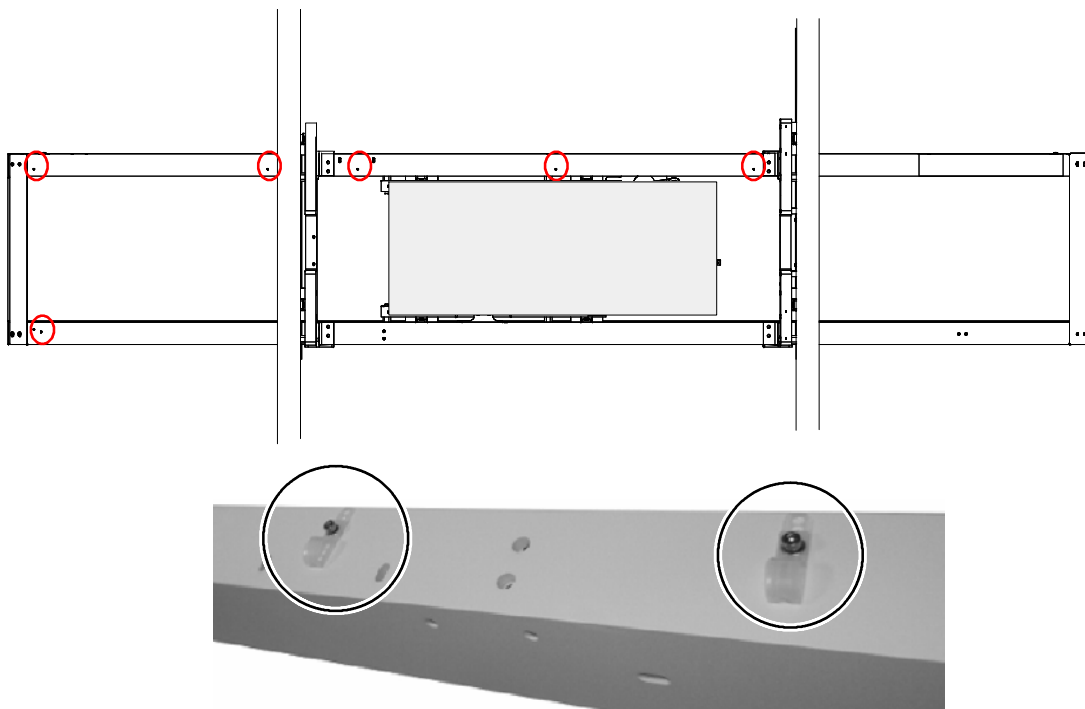
**Illustration 2-59**  
**Longitudinal Potentiometer**



12. Connect the Longitudinal Potentiometer Cable.
13. Fix the Longitudinal Potentiometer Cover.
14. Fix the Cable to the Transverse Rails.

There are six different cables fixation points on Transverse Rails.

**Illustration 2-60**  
**Cables fixation points on Transverse Rails marked in red**

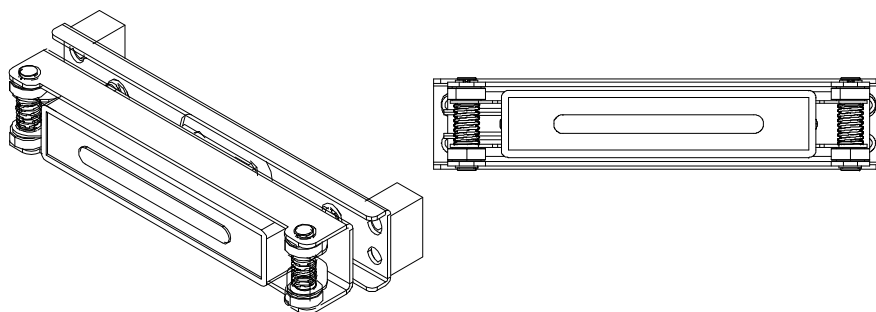


## 2.10 LONGITUDINAL BRAKE INSTALLATION

### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
C	S0016937	Longitudinal Brake	1
	51212P72	Screw M6x45	4
	51390P12	Washer AET M6	4
3	53054P01	Tie Wrap UNEX1201	6
	51212P25	Screw DIN912 M4x12	6
	51380P26	Washer DIN125 M4	6
	51390P10	AET Washer M4	6

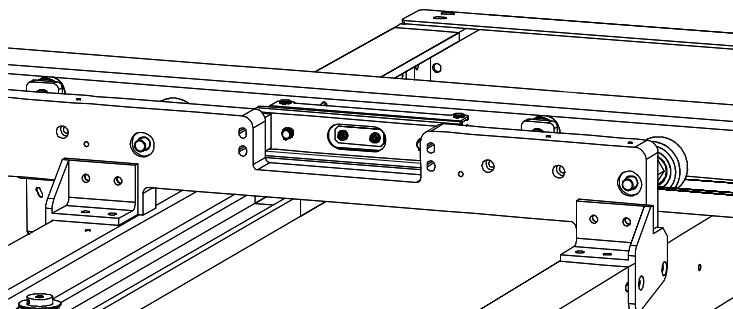
**Illustration 2-61**  
Longitudinal Brake



### INSTALLATION PROCEDURE

1. Insert the Longitudinal Brake between the Front Fixation Bearing and the Front Longitudinal Rail.

**Illustration 2-62**  
Longitudinal Brake Location



2. Tighten the four fixation screws to fix it to the Bearing.
  - 51212P72, Screw M6x45
  - 51390P12, Washer AET M6

**Illustration 2-63**  
**Longitudinal Brake Fixation and Connection**



3. Connect the Brake Cable to the Cable, P/N S0005069, which is connected to the Control Board, P/N S0019874. Refer to the General Connections Schematics:
  - S0024598SCH for the Standard Ceiling Suspension
  - S0024170SCH for the Auto-tracking Ceiling Suspension
4. Fix the Longitudinal Brake Cable to the Transverse Rails, use:
  - 51212P25, Screw DIN912 M4x12
  - 51380P26, Washer DIN125 M4
  - 51390P10, AET Washer M4

## 2.11 TUBE SUPPORT & X-RAY TUBE INSTALLATION

### 2.11.1 TUBE SUPPORT ADAPTATIONS

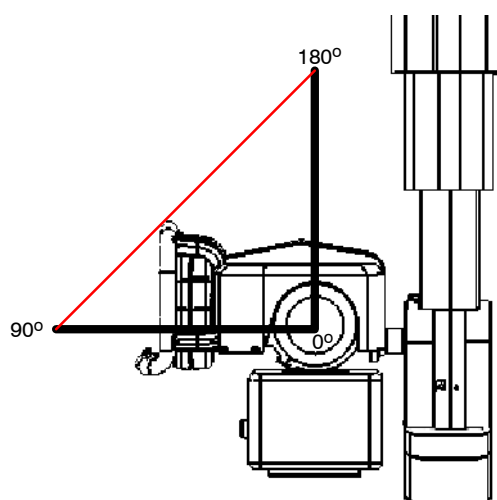
Tube adaptation kits will be supplied to allow the correct assembly and fixation of the X-ray tubes to the ceiling suspension and provide compatibility. Each of these adaptation kits is composed of fixation rings, console fixture and suspension fixture. All components are designed for the specific characteristics of the X-ray tubes (type, dimensions, weight...).

**Note** 

*Only tubes with a horn angle between  $90^{\circ}$  and  $180^{\circ}$  can be mounted on the Ceiling Suspension.*

#### Illustration 2-64

#### Allowed orientations for Tubes



**Note** 

*For further information about X-ray Tubes installation, please refer to their own technical documentation, which is provided together with the Suspension and the X-ray Tube.*



**DUE TO THE HEAVY WEIGHT OF OPTIONAL X-RAY TUBES, PROCEED ALWAYS ACCORDING TO THE LOCAL ERGONOMICS AND WORKING CONDITIONS NORMATIVE.**

## Standard & Auto-tracking Ceiling Suspension

### Service Manual

There are different X-ray Tube Supports Adaptations depending on the tube:

TUBE SUPPORT ADAPTATION	HOUSING	INSERT	FOCAL SPOT	TARGET ANGLE	ANODE HEAT CAPACITY (KHU)	SPEED
<b>A11108-01</b> (Toshiba E7252 Tube Adaptation)	Toshiba E7239X & FX	N/A	1.0 - 2.0	16°	140	Low
	Toshiba E7240X & FX	N/A	0.6 - 1.2	12°	140	Low
	Toshiba E7242X & FX	N/A	0.6 - 1.5	14°	200	Low
	Toshiba E7252X & FX	N/A	0.6 - 1.2	12°	300	High/Low
	Toshiba E7299X	N/A	0.3 - 1	12°	140	Low
	Toshiba E7843X	N/A	0.6 - 1.2	12°	150	Low
	Toshiba E7865X	N/A	0.3 - 1	12°	140	Low
	Toshiba E7876X	N/A	0.6 - 1.2	12°	230	Low
	Toshiba E7884X	N/A	0.6 - 1.2	12°	300	Low
	Varian Diamond	Any one of 71 mm (2,8")	Variable depending on the insert			High/Low
<b>A11109-01</b> (Toshiba E7254 Tube Adaptation)	Toshiba E7254X & FX	N/A	0.6 - 1.2	12°	400	High/Low
	Varian Sapphire	Any one of 100 mm (4")	Variable depending on the insert			High/Low
<b>A11110-01</b> (Toshiba E7869 Tube Adaptation)	Toshiba E7100X	N/A	0.6 - 1.2	12°	300	High/Low
	Toshiba E7869XX	N/A	0.6 - 1.2	12°	600	High/Low
<b>A11113-01</b> (Universal Adaptation)	Varian B130_90°	Any one of 102 mm (4")	Variable depending on the insert			High/Low
	Universal Tube Adaptation	Tube Support Adaptation compatible with non standard tubes: Comet DO-7/DO9/DO-10 Maxiray MX75-09R				
<b>A11113-02</b> (Universal - Varian Adaptation)	Varian B199_90° (SG-292, SG-296, SG-1096) Siemens 100L	Any one of 102 mm (4") and 120 mm 4.75")	Variable depending on the insert			High/Low

**Note** 

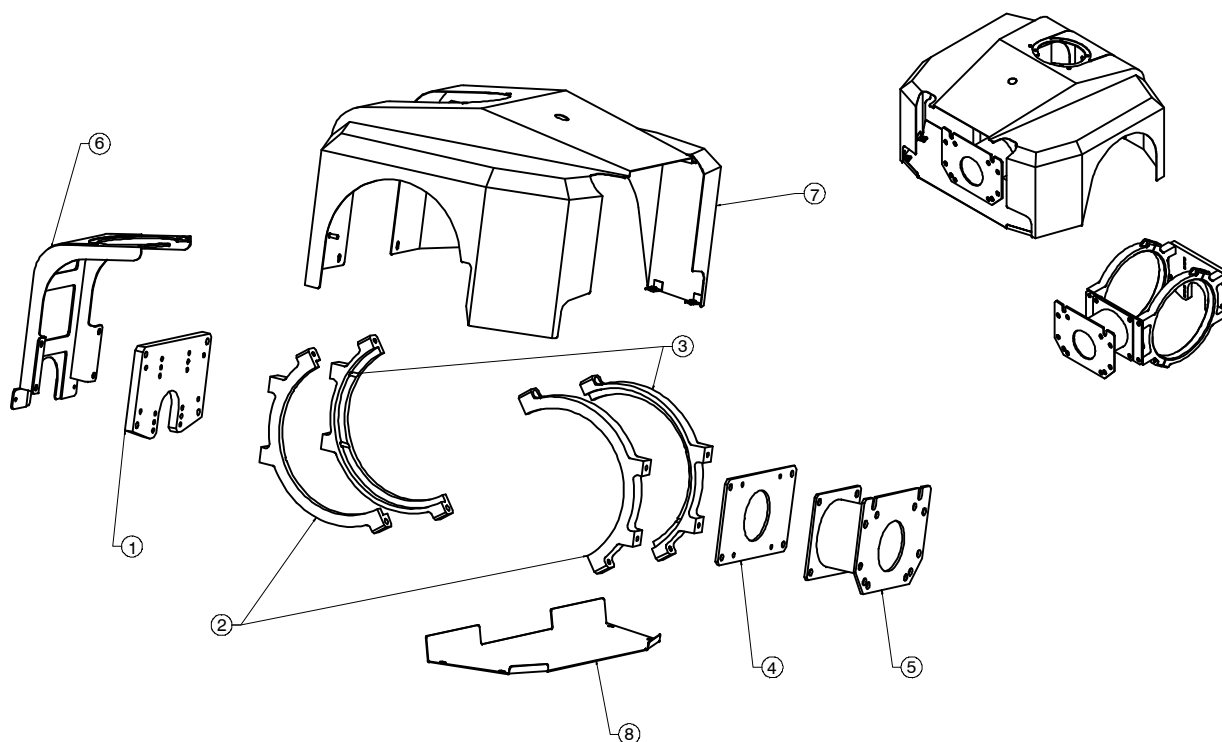
*In case of non Standard X-ray Tubes contact with Technical Service for detailed information.*

**STANDARD TUBE SUPPORT ADAPTATIONS**

The components of the A11108-01, A11109-01 and A11110-01 Tube Support Adaptations are the same but with different measures depending on the Tube size and diameter.

POS.	DESCRIPTION	QTY.	REMARKS
1	Tube Support	1	
2	Symmetric Tube Holder	2	
3	Tube Holder	2	
4	Console Support Adapter	1	
5	Console Support	1	
6	Hose Support	1	
7	Tube Top Cover	1	
8	Tube Bottom Cover	1	

**Illustration 2-65**  
**Standard Tubes Adaptations**

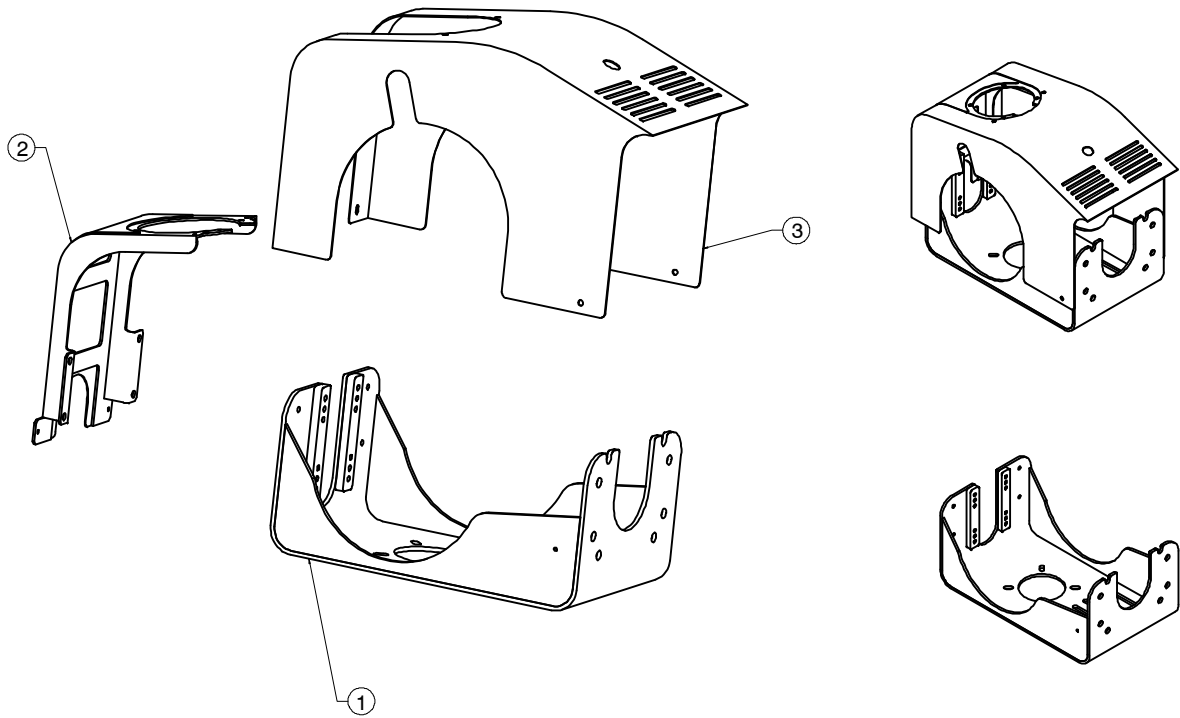


**A11113-01/-02 UNIVERSAL TUBE ADAPTATION**

The components of the A11113-01 and A11113-02 Tube Support Adaptations are the same but with different measures depending on the Tube size and diameter.

POS.	DESCRIPTION	QTY.	REMARKS
1	Tube Support	1	
2	Hose Support	2	
3	Universal Tube Cover	2	

**Illustration 2-66**  
**Universal Tubes Adaptation**

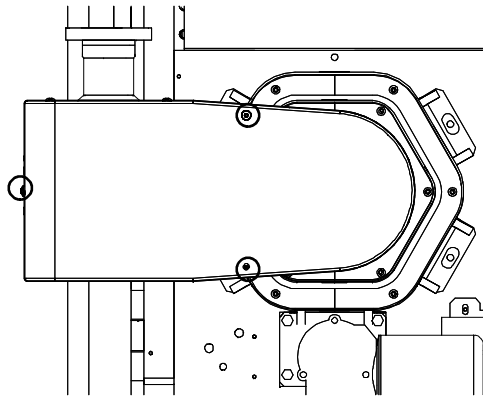


### 2.11.2 BETA AND ALPHA COVERS REMOVAL

To install the X-ray Tube and External hose it will be required to remove both Alpha and Beta Covers.

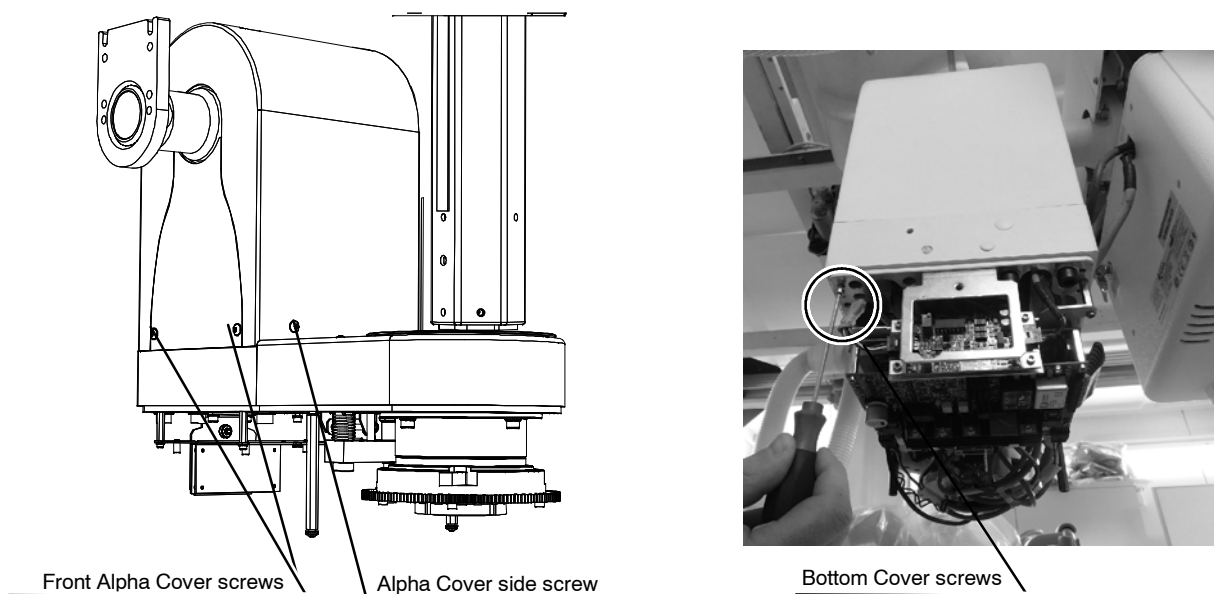
1. **Beta Cover.** Remove both bottom screws.

**Illustration 2-67**  
**Beta Cover Screws**



2. **Alpha Covers:**
  - Loosen both front cover screws to remove the Alpha Front Cover.
  - Loosen the three screws to remove the Alpha Cover. One at the side and two at the bottom (inside the Beta body).

**Illustration 2-68**  
**Alpha Cover Fixation**



### 2.11.3 TELESCOPIC COLUMN LOWERING

Depending on the height of the ceiling the Tube Support may be too high to work properly. Get the Telescopic Column lowered when required to work more comfortably during the X-ray Tube, Collimator and Control Console installation, and use a ladder to complete installation procedures.



**PLEASE, PROCEED ALWAYS ACCORDING TO THE LOCAL ERGONOMICS AND WORKING CONDITIONS NORMATIVE.**

The Vertical Motor is servo assisted. It means that when it is connected, it controls both vertical motions, upwards and downwards, no matter if the Ceiling Suspension is switched ON or OFF, in order to allow a soft movement without unsteady movements or stumblings.

*Note* 

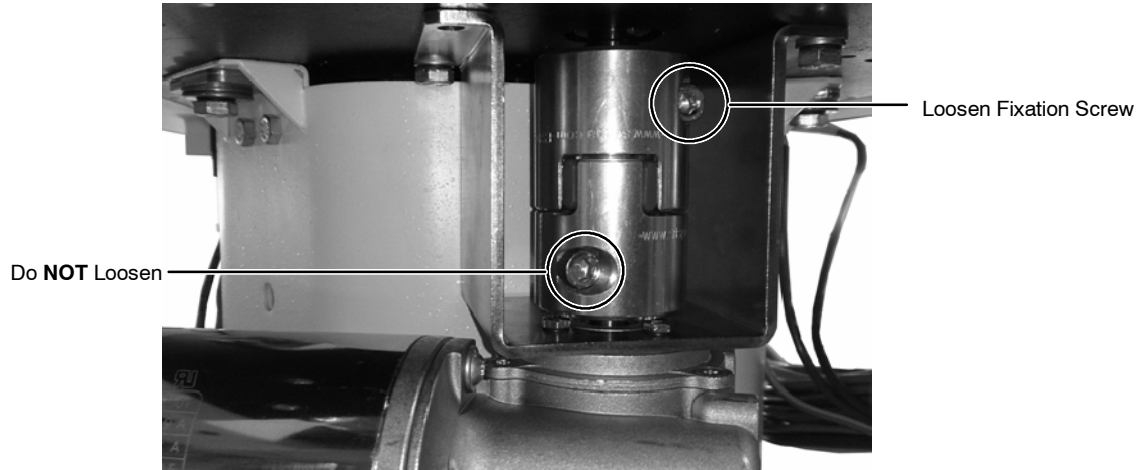
*Due to safety reasons the Motor fixes totally the Telescopic Column, so it will be impossible to move it down without get it free.*

1. The Vertical Motor is tied to the Telescopic Column by a flexible coupling. Loosen **just** the top screw of the coupling to free the Column.

*Note* 

*Do NOT ever loosen the bottom Fixation screw of the Motor Coupling. To free the Column, it is only required to loosen the top screw and as soon as the Telescopic Column has been moved down to the desired position, fix it back.*

**Illustration 2-69**  
**Coupling Fixations**



2. Remove the Fixation Pin from the Telescopic Column, and get this tool stocked as a maintenance tool.

**Illustration 2-70**  
**Remove the Telescopic Column Fixation Pin**



3. Extend the Telescopic Column at approx. 1 meter (40") from the floor.
4. Pick up the Steel Rope, included in the package and access to the Ceiling Suspension carriage with a stepladder.

**Illustration 2-71**  
**Steel Rope**



Steel Rope used to block the ascending movement of the Telescopic Column

5. Install the Steel Rope in the Carriage as shown below.



**INSTALLATION OF THE STEEL ROPE IS MANDATORY TO AVOID INJURIES TO PERSONNEL OR EQUIPMENT. OTHERWISE, THE TELESCOPIC COLUMN MAY SUDDENLY SPRING UP CAUSING SERIOUS DAMAGES TO THE SERVICE ENGINEERS AND/OR THE EQUIPMENT.**



**BE EXTREMELY CAUTIOUS WHEN USING THE STEPLADDER TO ACCESS THE TOP OF THE OVERHEAD TUBE SUPPORT. DO NOT LEAN ON THE RAILS.**

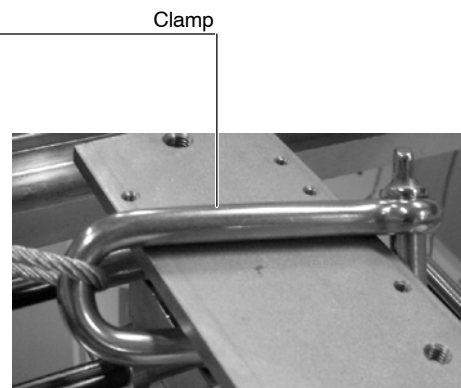
- a. Install first the clamp.

**Illustration 2-72**  
**Steel Rope installation**



Hook

Steel Rope



Clamp

- b. Install the hook (remember that the Telescopic Column has to be extended at approx 1 m (40") from the floor to allow the hook to engage the carriage plate).
  - c. Raise the Telescopic column until the Steel Rope is completely straight.
6. Block the Telescopic Column Movement with the top screw of the Coupling of the Vertical Motor.

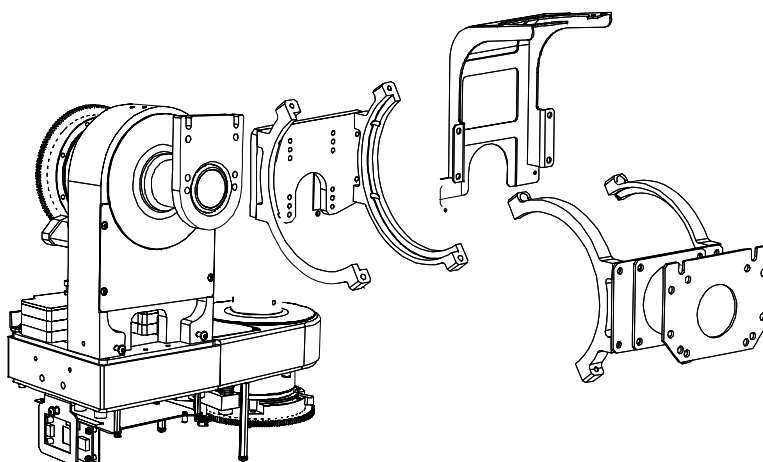
#### 2.11.4 X-RAY TUBE INSTALLATION

Disassemble the Tube Support Adaptation, which is formed by two different assemblies, as it is shipped assembled (*refer to Section 2.11.1*).

1. Remove all the Covers from the Assembly (position 7 and 8 of Standard Adaptation or 3 of the Universal Adaptation.)
2. For Standard tubes adaptations, split the Tube Holder in two. Remove the Symmetric Tube Holder and remove the Hose Support.

#### Illustration 2-73

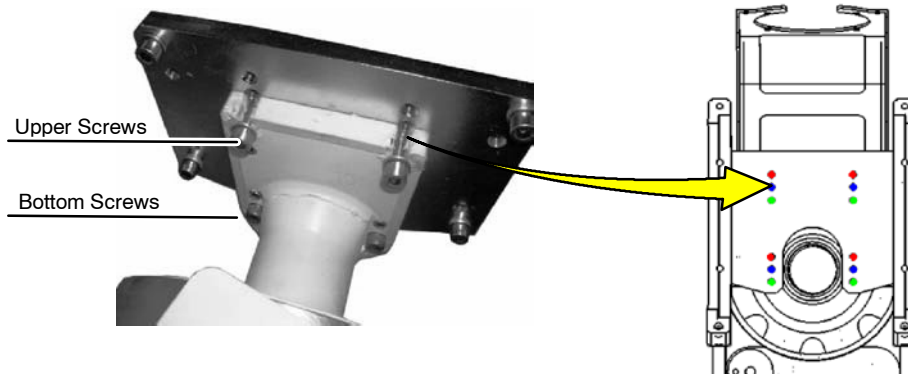
#### Split Tube Holder and remove Console Support



3. Install the Tube Support and Tube Holder on the Alpha/Beta Assembly. Install both upper screws on the Tube Support and hang it on the Adaptation Support. Then Tighten the bottom screws.

4. There are three different pairs fixation holes. Default tubes are mounted on Central Holes.

**Illustration 2-74**  
**Tube Support Configurations**

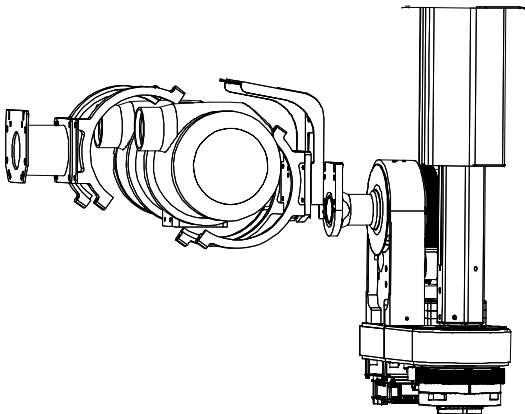


**Note** 

*When mounting different X-ray Tubes and/or Collimators, please get in contact with Manufacturer Technical Service.*

5. Mount the X-ray Tube on the Tube Support.

**Illustration 2-75**  
**Tube Installation on Tube Holder**

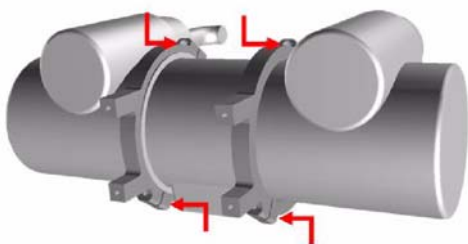


**DUE TO THE HEAVY WEIGHT OF OPTIONAL X-RAY TUBES, TWO FIELD ENGINEERS ARE REQUIRED TO COMPLETE THE X-RAY TUBE INSTALLATION. PLEASE, PROCEED ALWAYS ACCORDING TO THE LOCAL ERGONOMICS AND WORKING CONDITIONS NORMATIVE.**

6. Get the Tube properly centered and fitted to the Tube Holders.
7. Assemble the Symmetric Tube Holder with the Console Support.

**Illustration 2-76****Center the Tube and fix all Holders**

8. Tighten the screw to fix the Tube. Do not fully tighten them, it is required to get the tube properly level and aligned before fixing it definitely.

**Illustration 2-77****Fix both Tube Holder Parts**

**Note** 

***Do not install the X-ray Tube Covers yet. Wait to complete the whole installation procedure before connecting all cables. Proceed when indicated in the following installation steps.***

### 2.11.5 TUBE LEVELING

Proceed first with the X-ray Tube adjusting and leveling, right after its installation and before mounting the Collimator. Once it is installed check the leveling and adjustment of the X-ray Tube.



**IT IS MANDATORY TO COMPLETE THIS PROCEDURE FOR A TOTALLY SUCCESSFUL INSTALLATION. IF THIS PROCEDURE IS NOT FOLLOWED, THE X-RAY BEAM WILL NOT BE PROPERLY ALIGNED WITH THE DETECTORS.**

**Note** 

*Perform this procedure before installing the L-Block Covers and the Tube Support Covers.*

**Note** 

*To successfully complete the X-Ray Tube levelling procedure, the Rail System must be correctly level. Check that Rails are properly installed and level (refer to Section 2.2. Longitudinal Rails Unpacking and Installation and Section 2.5. Transverse Rails and Main Assembly Installation).*

**Note** 

*To complete this procedure, the Suspension must be Switched On and placed in the center of the room.*

#### REQUIRED ELEMENTS

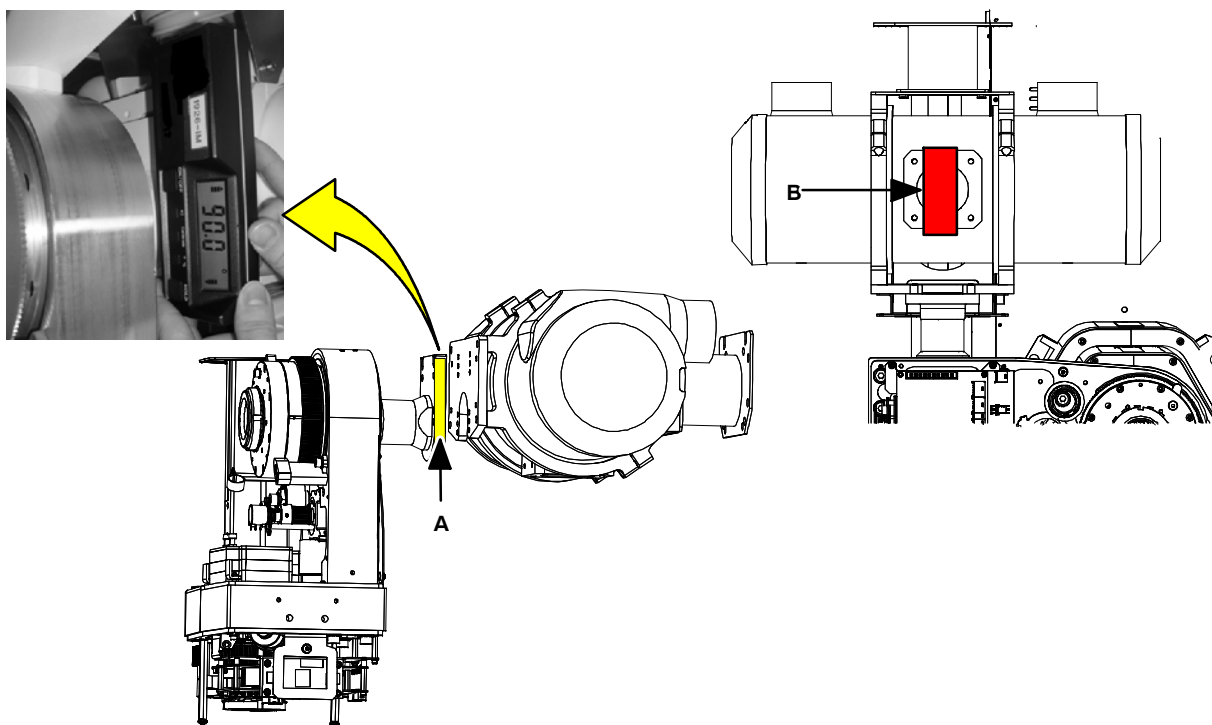
- Allen Wrench Set
- Level
- Marking elements as chalk or an adhesive tape
- Sealing Wax or any other similar locking product.

## ADJUSTING POINTS LOCATION

The Tube leveling adjusting points are:

- a. **Alpha/Beta Axis Adjustment.** Check the proper adjustment of the Alpha Axis with the Beta Axis. If both axes are not correctly adjusted.
- b. **X-ray Tube.** Check the proper adjustment of the X-ray Tube.

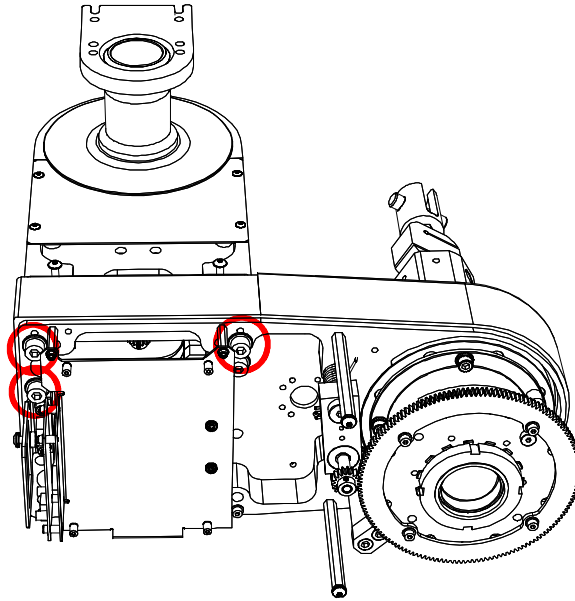
**Illustration 2-78**  
**Tube Leveling Adjusting Points**



1. Rails System. Verify the leveling of the longitudinal and Transverse rails of the Ceiling Suspension. **They should be at  $0^{\circ} \pm 0.1^{\circ}$ .**
2. Adjust the Alpha/Beta Axis first. Put the level on the bottom surface of the Tube Adaptation Kit, on Adjusting Point **A**. It should be at  **$0.2^{\circ} \pm 0.1^{\circ}$**  over the horizontality to compensate the extra deformation when Collimator and cables are installed.

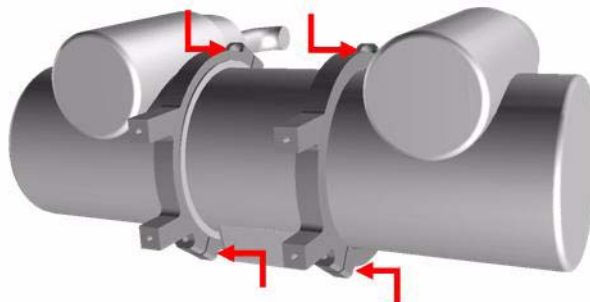
3. Loosen or tighten the Adjusting Screws located at the bottom of the Alpha Axis.

**Illustration 2-79**  
**Adjusting Screws**



4. Adjust the X-ray Tube. Put the level lengthwise on the mounting surface of the Tube, Adjusting Point **A**. It should be at  $0.2^\circ \pm 0.1^\circ$  over the horizontality to compensate the extra-deformation when Collimator and cables will be installed.
5. Loosen or tighten the Tube Support Holder screws to fit better the Tube with the Tube Holders. Move the Tube if required to fit it better too.

**Illustration 2-80**  
**Tighten or loosen to Adjust the X-ray Tube**



6. Check that the Collimator top surface is parallel to the bottom surface of the Tube Adaptation Kit.
7. Switch ON the equipment and the Collimator Light.
8. Mark on the floor with the adhesive tape or use the Collimation Test Tool to get a reference point.
9. Point the Collimator Light to this marked point.
10. Move up and down the Collimator light, it must point all the time to the marked reference point.
11. Once the Tube has been properly level proceed to calibrate the Suspension and finally to complete the whole System Installation and adjustment of the Suspension on regard with the other equipments of the room.

**Note** 

*Once the Collimator is installed it will be necessary to check again the X-ray Tube Leveling. But in that case it will not be possible to use the same adjusting Points.*

## 2.12 COLLIMATOR INSTALLATION

**Note** 

For detailed information related to Collimator Installation refer also to each Collimator technical documentation, provided with the equipment.

### REQUIRED ELEMENTS

The manufacturer provides a set of spacers and screws which are required for the installation of the collimator. Depending on the X-ray Tube and collimator combination the components of this set are:

**Illustration 2-81**  
**Ralco R225 Collimator**



ADAPTATION KIT	HOUSING	COLLIMATOR BRACKET	SPACERS	FIXATION SCREWS
A11108-01	Toshiba E7239X/FX/GX Toshiba E7240X/FX Toshiba E7242X/FX/GX Toshiba E7299X Toshiba E7843X Toshiba E7865X Toshiba E7876X Toshiba E7884X Toshiba E7252X/FX/GX Varian Diamond 90°	Ralco R225 + Rotation Plate RO332 (15 mm / 0.59")	6 mm / 0.23" (x2)	DIN7991 M6x25 (x4)
A11109-01	Toshiba E7254 Varian Shapphire 90°		6 mm / 0.23" (x2) 1.5 mm / 0.05" (x2)	DIN7991 M6x25 (x4)
A11110-01	Toshiba E7100X Toshiba E7864X Toshiba E7867X Toshiba E7869X		6 mm / 0.23" (x1)	DIN7991 M6x20 (x4)
A11113-01	Varian B130_90° (A192/A292/G292)		1.5 mm / 0.05" (x2)	DIN7991 M6x25 (x4)
	Comet DO-7 / DO-9 / DO-10 Maxiray Mx75-09R IAE Tubes		Variable	Variable
A11113-02	Varian B199_90° (SG-292, SG-296, SG-1096)	Special Plate S0016272	NO	DIN 912 M5x20 (x4)

### 2.12.1 RALCO R225 COLLIMATORS

#### INSTALLATION PROCEDURE

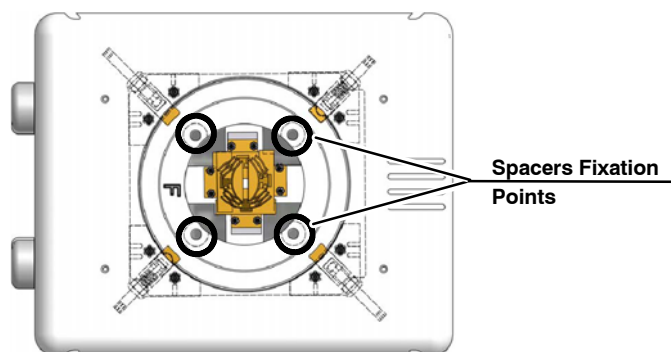
1. Open Packing Box F (Collimator) and N (Spacers and screws).
2. Assemble the X-ray Tube and Collimator Adaptation Ring by tightening its 4 screws to the Tube Support Holder.
3. Turn 135° the X-ray Tube to facilitate the Collimator installation if desired.

**Illustration 2-82**  
Collimator installation



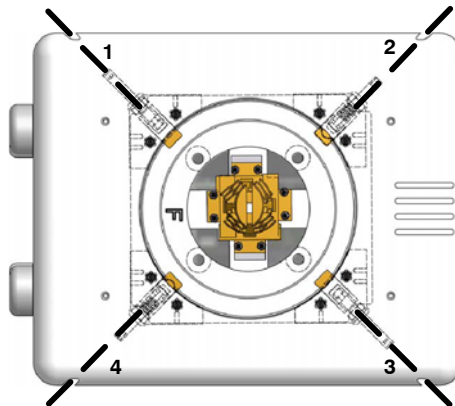
4. Use the provided spacers and screws to fix the Collimator and adjust the correct distance with the Focal Spot. Check also the indications provided in the Collimator documentation and *Section 1.3 Pre-installation Checks*.

**Illustration 2-83**  
Spacers and Fixation Points



5. Mount the Collimator on the Ceiling Suspension as indicated in the collimator installation manual. Screw the four Allen screws as follows:
  - Position 1 & 3 = 6 <sup>1</sup>/<sub>2</sub> turns
  - Position 2 & 4 = 5 <sup>1</sup>/<sub>2</sub> turns

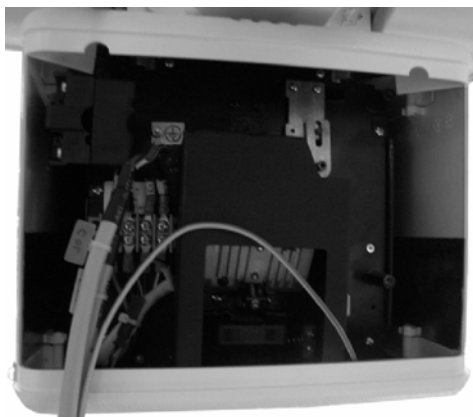
**Illustration 2-84**  
**Collimator Fixation Points**



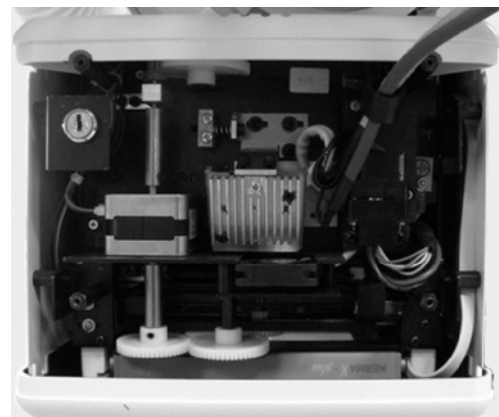
6. Connect the Collimator Cable. Remove the Collimator back Cover.

**Illustration 2-85**  
**Collimator Connection**

**Manual Collimator**



**Automatic Collimator**



7. To check whether it is properly fixed, try pulling and shaking it.
8. With the X-ray Tube at 0° position check that the collimator is properly level.

## 2.12.2 AUTOMATIC COLLIMATOR MICRO-SWITCHES INSTALLATION

**Note** 

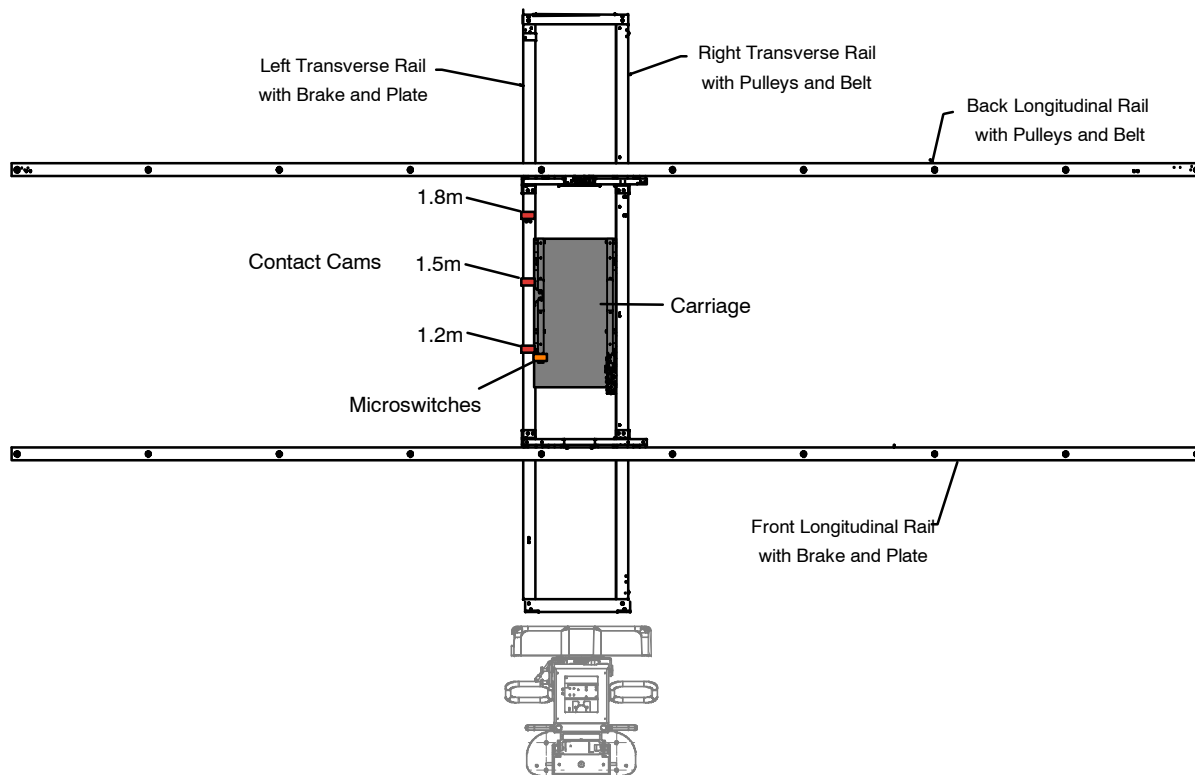
*This procedure is optional and just to be completed with the Ralco R225 ASC automatic collimator.*

Check Wall Stand location in order to define the correct location of the Automatic Collimation Microswitches Kit.

There are two possible positions to install the kit:

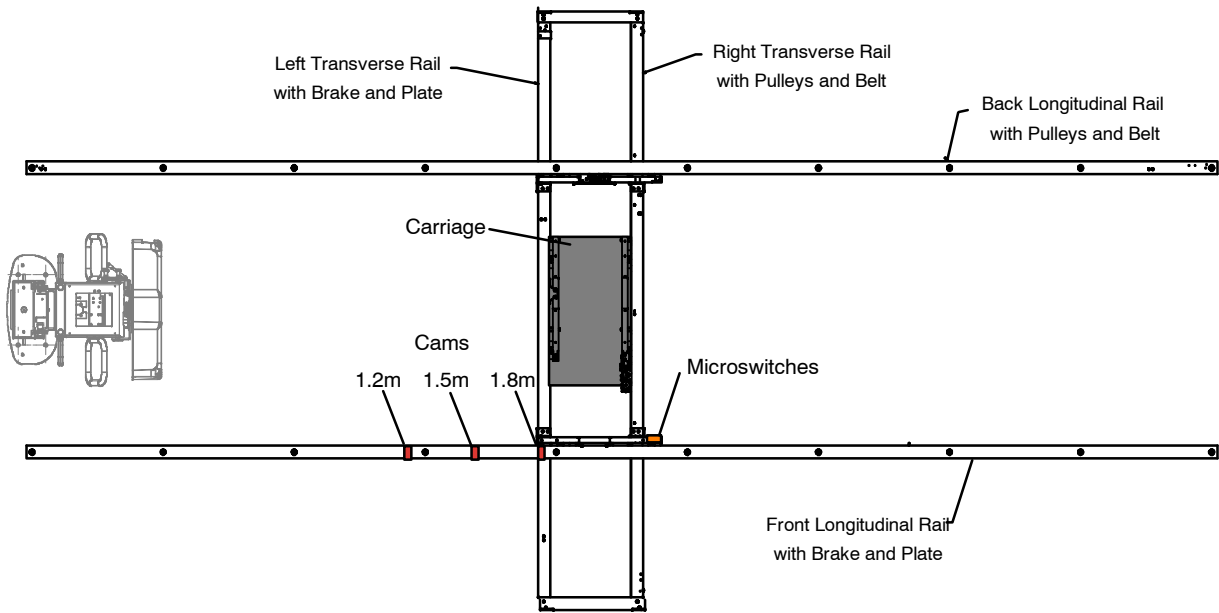
- **Configuration A.** The Wall Stand is Installed in the Transverse Axis of the Ceiling Suspension. The Automatic Collimation switches are installed in the left side of the Carriage and the Contact Cams are installed in the left Transverse Rail.

**Illustration 2-86**  
**Micro-switches position in Configuration A**



- **Configuration B.** The Wall Stand is installed in the Longitudinal Axis of the Ceiling Suspension. The Automatic Collimation Micro-switches are installed in the right side of the front Fixation Bearing and the Contact Cams are installed in the front Longitudinal Rail.

**Illustration 2-87**  
**Micro-switches Position in Configuration B**

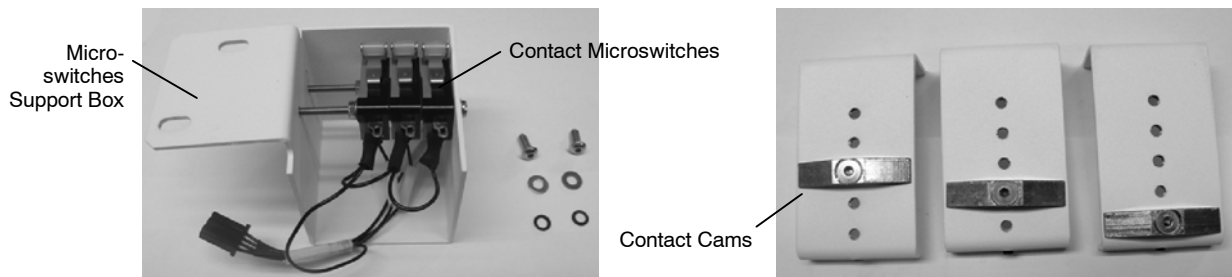


**Note** 

*Depending on the position of the Kit, cable routing will be different.*

Contact Cams and Microswitches are shipped in the packing box N.

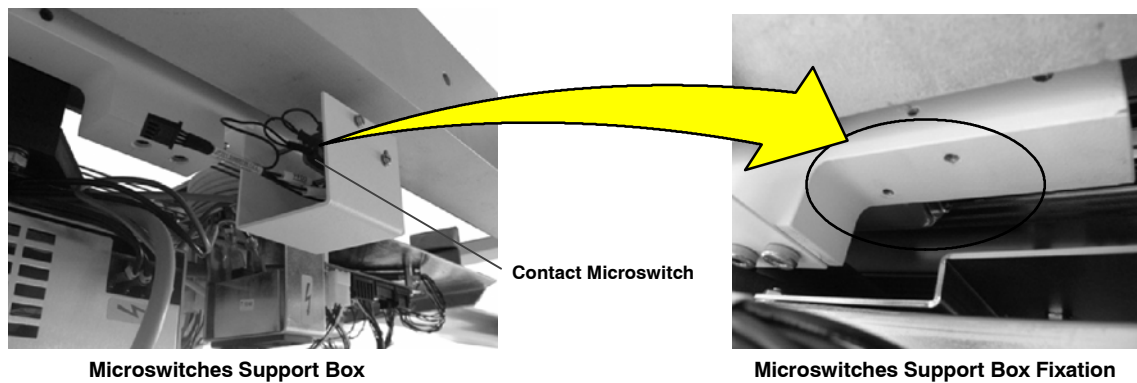
**Illustration 2-88**  
**Contact Cam and Micro-switches**



**INSTALLATION RELATED TO TRANSVERSE AXIS (POSITION A)**

1. Open packing box N.
2. Fix the Micro-switches Support Box in the left Carriage Bearing.

**Illustration 2-89**  
**Support Box Fixation**



3. Install the Contact Cams in the left Transverse Rail. Install the anchor shortest end inside the rail and the largest end outside.

**Illustration 2-90**  
**Contact Cam Installation**



**Note** 

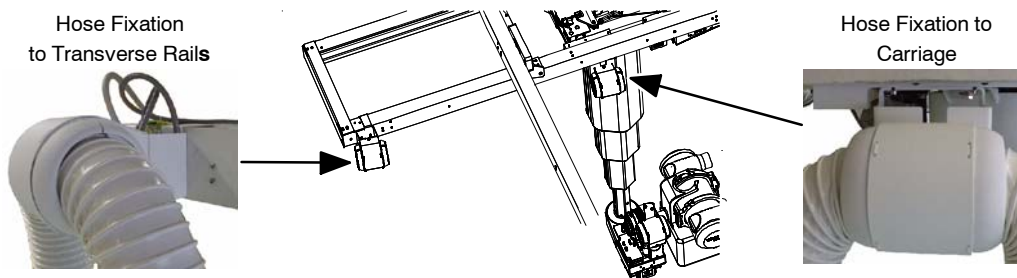
*The Automatic Collimation Microswitches Kit is provided with auto-drilling fixation screws. Use them once the position of the Contact Cams is definitely configured for a better fixation and to keep them from falling down unexpectedly.*

4. Route the Cable from Hose Fixation To Transverse Rail, Y2, up to the Hose Fixation to Carriage, Y1, and connect with the Micro-switches.

FFD Cable is factory routed inside the External Hole just up to the Hose Fixation To Transverse Rail. When installing the Automatic Collimation Kit in Position A, it will be required to change the cables routing.

5. Connect the FFD Cable to the micro-switches during the External Hose installation, refer to *Section 2.16*.

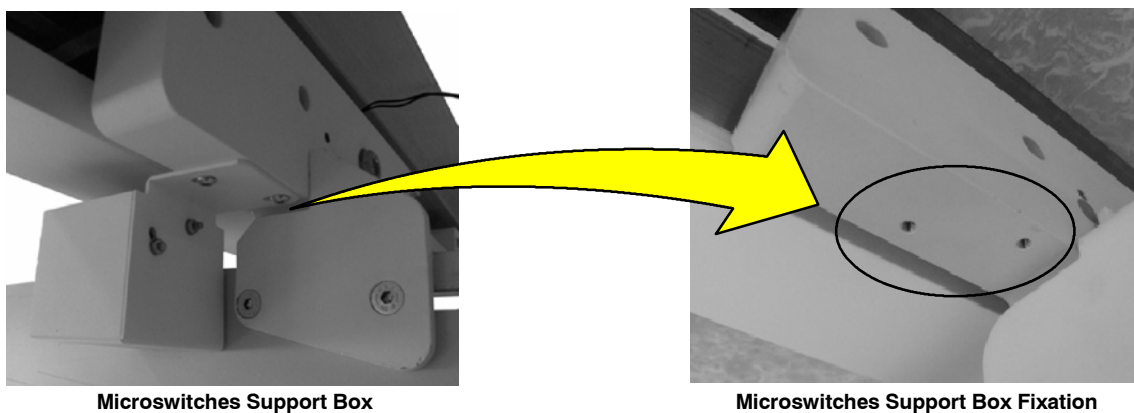
**Illustration 2-91**  
**FFd Cable Connection**



### INSTALLATION RELATED TO LONGITUDINAL AXIS (POSITION B)

1. Open packing box N.
2. Fix the Micro-switches Support Box to the front Transverse Rail Fixation Bearing.

**Illustration 2-92**  
**Support Box Fixation**



3. Install Contact Cams in the left Longitudinal Rail. Install the anchor shortest end inside the rail and the largest end outside.

**Illustration 2-93**  
**Contact Cam Installation**

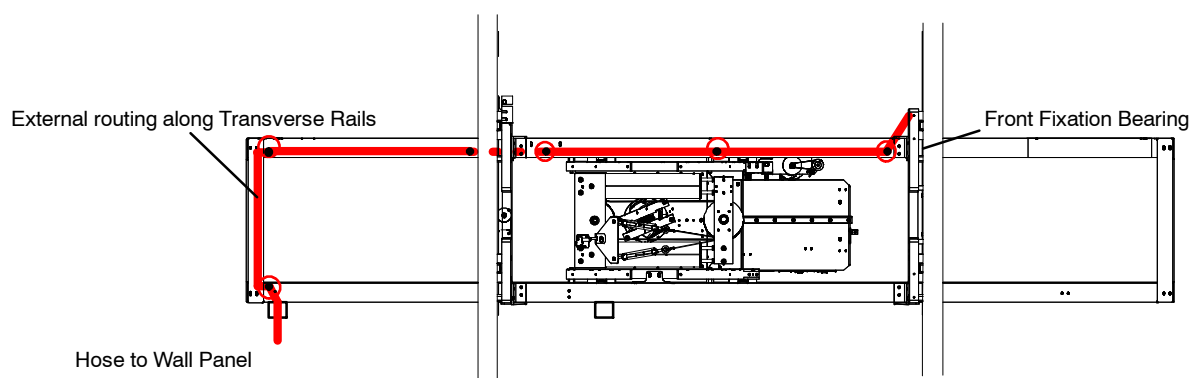


**Note** 

*The Automatic Collimation Microswitches Kit is provided with auto-drilling fixation screws. Use them once the position of the Contact Cams is definitely configured for a better fixation and to keep them from falling down unexpectedly.*

4. Connect the FFD Cable to the micro-switches during the External Hose installation, refer to *Section 2.16*. Route the Cable along the Transverse Rail. Use the Cables Fixation Points to fix the Cable to Rails.

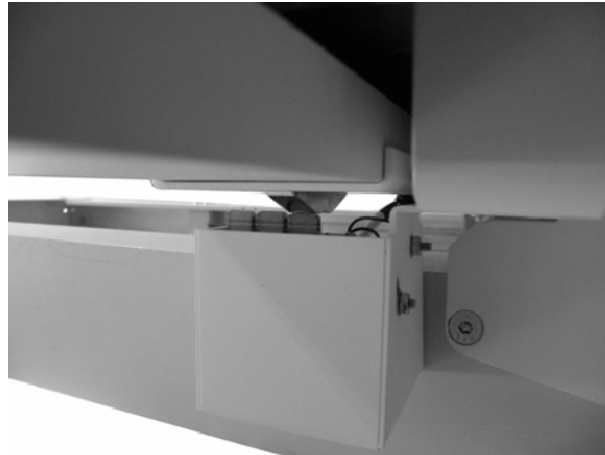
**Illustration 2-94**  
**FFD Cable Installation**



**MICRO-SWITCHES DISTANCE AND HEIGHT ADJUSTMENT**

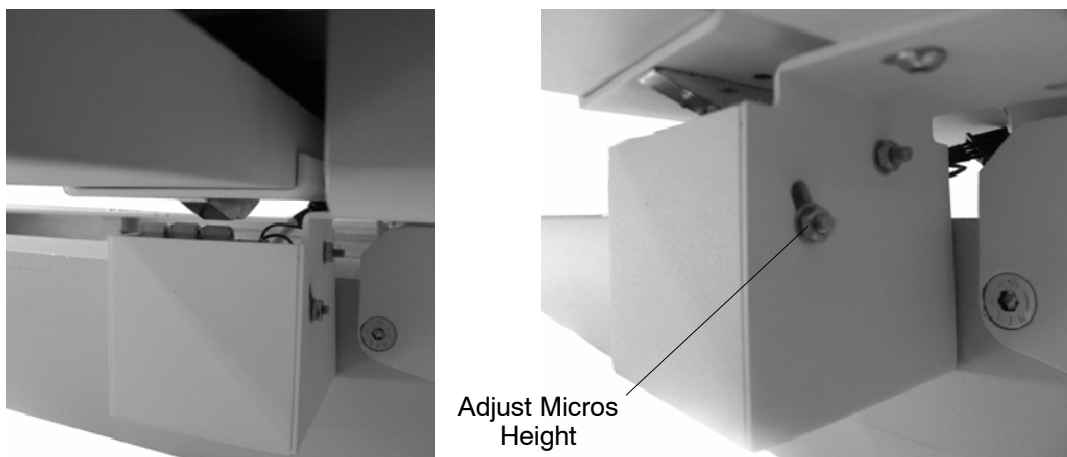
Adjust the distance of the Contact Cams. There are three cams with different positions, so they make contact with the corresponding micro.

**Illustration 2-95  
Distance Adjustment**



Make sure that the Contact Cam and its corresponding micro-switch get in contact. If not, adjust the height of the micro-switches.

**Illustration 2-96  
Height Adjustment**



## 2.13 CONTROL CONSOLE INSTALLATION

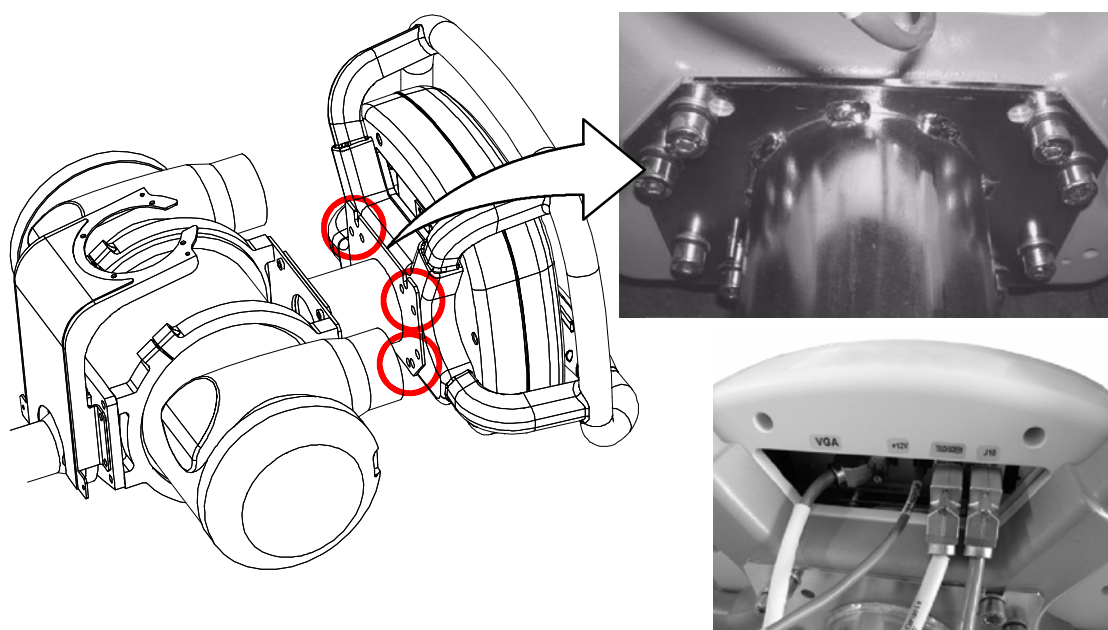
### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
I	--	Handle Console (Steering Wheel Control Console)	1
	51212P66	Screw M6x16	4
	51390P12	Washer AET M6	4

### INSTALLATION PROCEDURE

1. Open the Packing Box I.
2. The console is packed already assembled. It is not necessary to split the Control Console to install it or to get it connected.
3. Assemble the console back cover with the Console Support that had been previously removed from the Tube Support Assembly.
4. Tighten the eight screws that fix the Console back Cover to the Console Support.
5. Once installed the External Hose, connect the Control Console.

**Illustration 2-97**  
Control Console Installation and Connection



## 2.14 EXTERNAL HOSE INSTALLATION

### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
L	S0024163	Standard Hose Cables	1
	S0024164	Auto-tracking Hose Cables	1
	S0024135	Velcro Hose	1
	S0024136	Tubular Hose	1
--	S0004845	Wall Panel	1

### 2.14.1 EXTERNAL HOSES

Before routing and connecting all cables proceed to install the External Hose. There are two different options of Hoses for each Ceiling Suspension Model depending on the different available covers and fixation brackets:

- Tubular Hose With Rotation Tunnel Alpha, P/N S0024136.
- Velcro Hose With Rotation Tunnel Alpha, P/N S0024135.

The cables are the same and with the same connection, but the required distance between the Bracket-Cable Mounting to L-Block and the Hose Support Cover is different:

- For Tubular Hose it is 1260 mm (49.6")
- For Velcro Hose it is 600 mm (23.6")

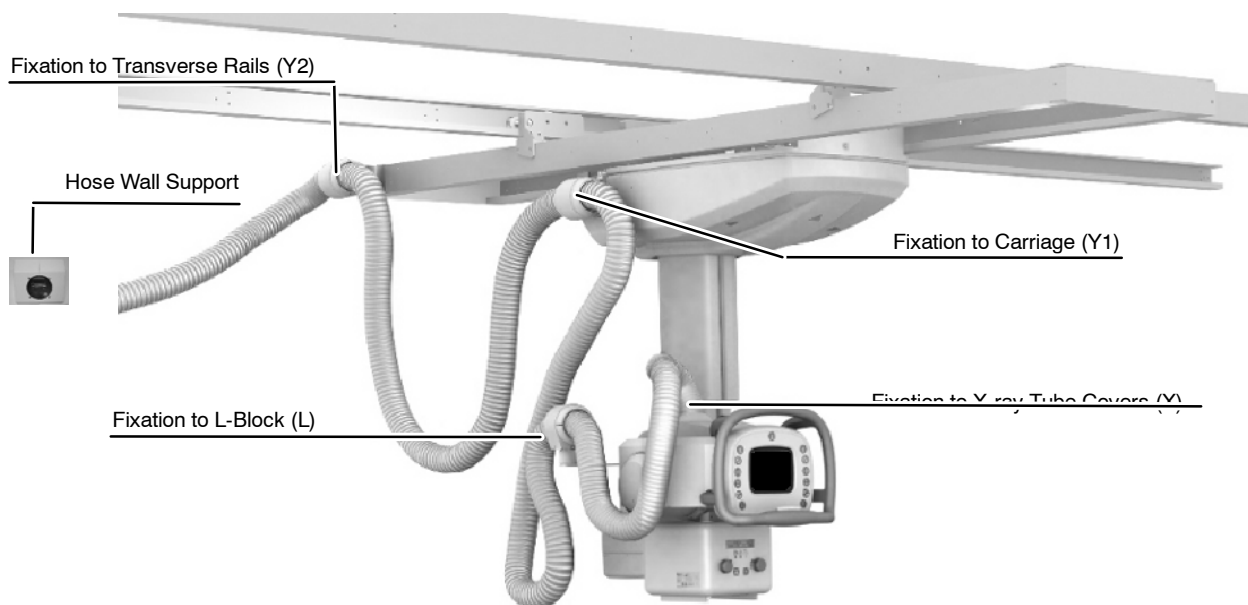
Required Cables and connections are different depending on the Ceiling Suspension Model. Refer to the next Drawings for the detailed cables descriptions and connections (*refer to Section 2.16*):

- Standard Ceiling Suspension, S0024163 Hose
- Auto-tracking Ceiling Suspension, S0024164 Hose

The functions of the Hose Fixation brackets are to Support the External Hose and to provide cables entrance to the different connection points. Each cable will connect in a different connection point. These points are:

- **Y2** Connect ground cables to Transverse Rail (Axis Y).
- **Y1** Connect cables to Carriage.
- **L** Connect Cables to L-Block (Alpha/Beta Axes).
- **X** Connect cables to X-ray Tube, Collimator or Control Console.

**Illustration 2-98**  
**Hose Fixation Brackets**

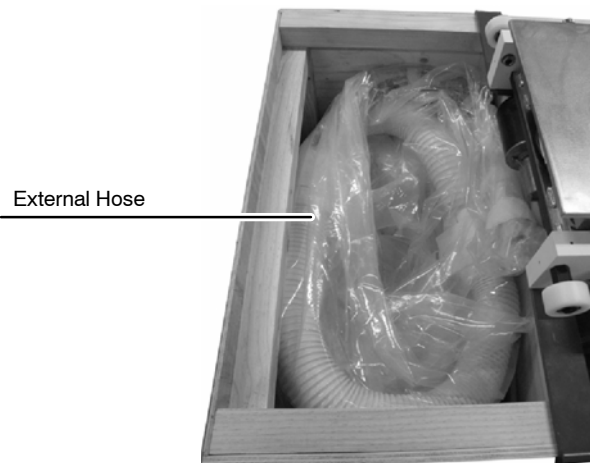


### 2.14.2 TUBULAR HOSE INSTALLATION

1. Prepare all the elements for the installation. Remove all shipping material and straighten out the twists in the cables before installing.

#### Illustration 2-99

External Hose is shipped in the Main Crate



2. Stretch the Hose on the floor and place it in the same position where it will be installed. Check the distances on *Illustration 2-115*.
3. Fix the Bracket-Cable Mounting to the L-Block. Tighten the two screws to the top of the L-Block. It is important to install the alpha cover before installing this bracket. If not, dismount the bracket for cover installation.

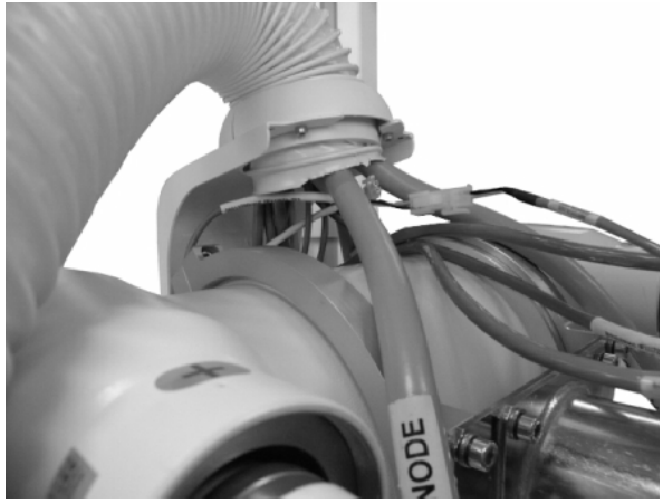
#### Illustration 2-100

Bracket-Cable Mounting to the L-Block



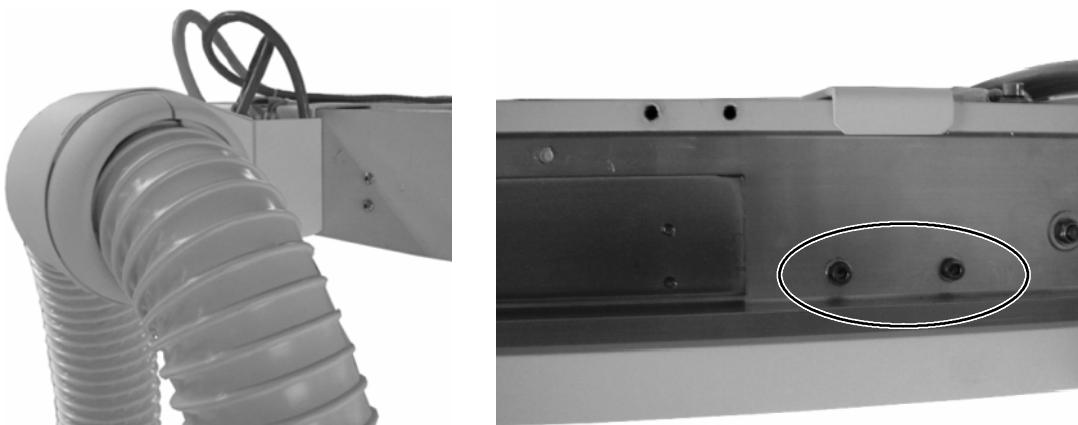
4. Install the Hose Support Cover. Screw the Tubular Hose into the Hose Support.
5. Tighten the four fixing screws.

**Illustration 2-101**  
**Hose Support**



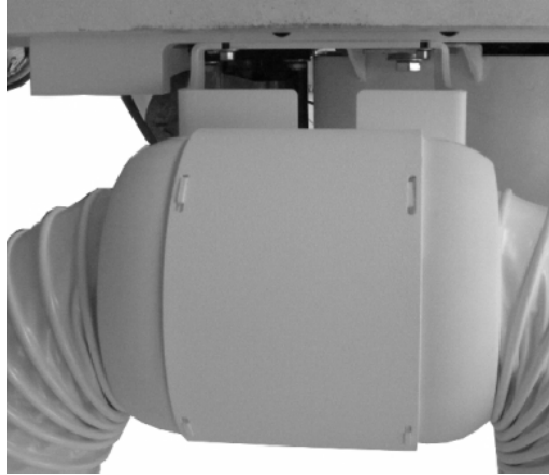
6. Fix the Bracket-Cable Mounting, P/N S0012040, to the Transverse Rails. Fit the Upper plate to the bridge and tighten the fixing screws to the Bridge.

**Illustration 2-102**  
**Bracket-Cable Mounting to the Transverse Rails**



7. Fix the Bracket-Cable Mounting to the Carriage. Screw the hook of the Hose Bracket in the Carriage.

**Illustration 2-103**  
**Bracket-Cable Mounting to the Carriage**



**Note** 

*Make sure that hose with cables to tube support is long enough to allow proper rotation movements of the tube.*

8. Fix the Hose Wall Support to the wall.
  - a. Route all cables along Electrical Ducts.
  - b. Install the Connection Support.
  - c. Install both Covers.

**Illustration 2-104**  
**Hose Wall Support Installation**



### 2.14.3 VELCRO HOSE INSTALLATION

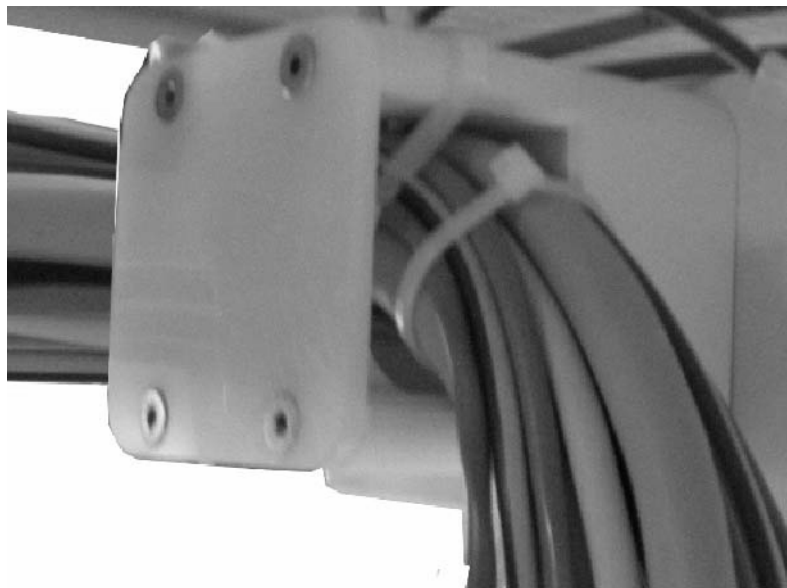
1. Prepare all the elements for the installation. Remove all shipping material and straighten out the twists in the cables and the hose before installing.
2. Stretch the Hose on the floor and place it in the same position where it will be installed. Check the distances in *Illustration 2-115*.

**Note** 

*Make sure that Hose with cables to Tube Support is long enough to allow proper rotation movements of the Tube.*

3. Fix the Bracket-Cable Mounting, P/N S0020447, to the Bridge. Use the two holes located at the back of the Bridge. It is necessary to fix only the bottom of the Bracket with the two fixing holes.

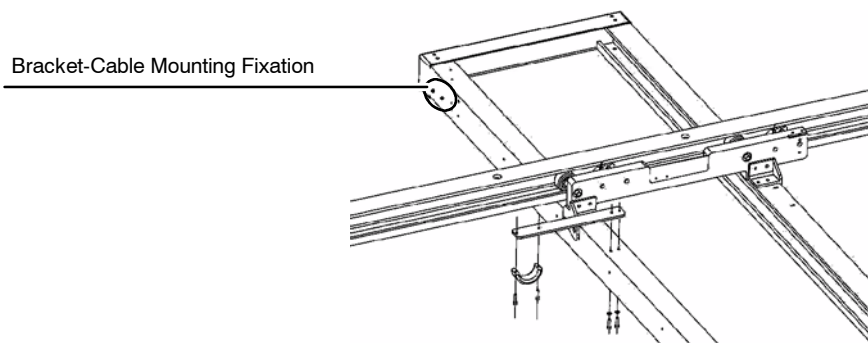
**Illustration 2-105**  
**Bracket-Cable Mounting to the Bridge**



4. Install the Additional Hose Fixation, P/N S0021956. It must be located on the left Transverse Rail and fixed at the top of the rail. It is composed by:
  - S0021988 HOSE FIXATION \*
  - S0021989 HOSE TIE WRAP \*

5. Open Box 4, shipped in the Rails Crate, P/N S0019682CHK.
6. Fix the Hose Fixation Plate to the top of the left Transverse Rail. Use the next Items:
  - 51212P47 SCREW. M5x20 DIN912
  - 51380P27 WASHER B 5.3 AO DIN125
  - 51390P11 WASHER AET M5

**Illustration 2-106**  
**Hose Fixation to the Transverse Rails**



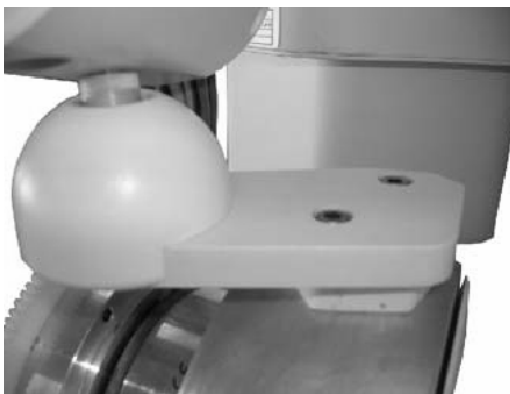
7. The Hose must be completely stretched from the Bracket to the Bridge.
8. Install the hose and fix it with the Hose Clamp. Use the next Items:
  - 51212P47 SCREW. M5x20 DIN912
  - 51390P11 WASHER AET M5
9. Fix the Bracket-Cable Mounting to the Carriage. Screw the hook of the Hose Bracket in the Carriage.

**Illustration 2-107**  
**Hose Fixation to the Carriage**



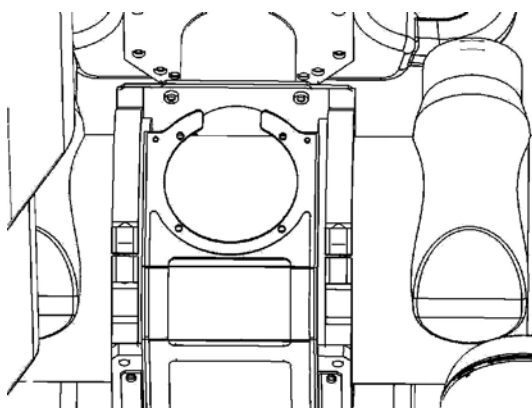
10. Fix the L-Block Hose Bracket. Tighten its two screws to the top of the L-Block. It is important to install the alpha cover before installing this bracket as it is not possible to install the cover after installing it without disassembling it.

**Illustration 2-108**  
**L-Block Hose Bracket**



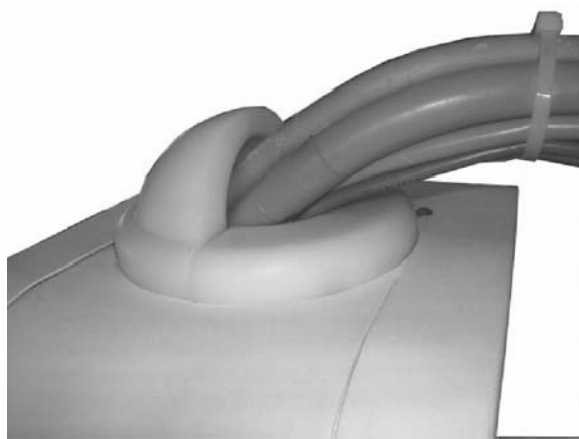
11. Open the Packing Box L. Use the Tie Wraps to fit properly the cables before being covered. Cover all cables with the cable Cover.
12. After installing the whole Hose, proceed to install the Hose Support on Tube.
13. Fix the Hose Cover Plate to the Hose Support left side. Fix the Cables Output Plate Statorix Tube Hose Support right side. Use:
  - 51212P23 SOCKET CAP SCREW M4X8 DIN912
  - 51380P26 FLAT WASHER B 4.2 AO DIN125
  - 51390P10 AET WASHER M4

**Illustration 2-109**  
**Hose Fixation to the Tube Support**



14. With the Tie Wrap, fix the Hose to the right side of the Hose Support. Get the Hose in its correct position, towards the left side.

**Illustration 2-110**  
**Use a Tie Wrap to fix the Cables**



15. Fix the Hose Wall Support to the wall.

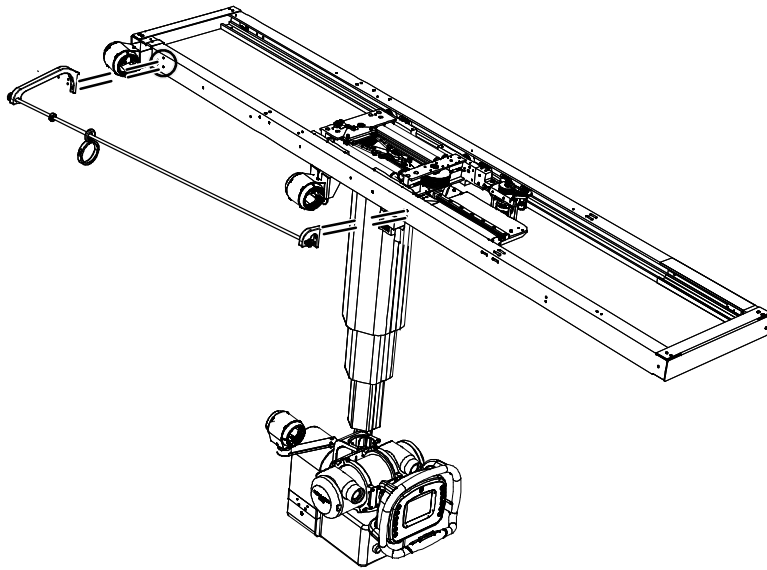
**Illustration 2-111**  
**Hose Wall Support**



#### 2.14.4 TRANSVERSE HOSE CLAMP SLIDE ASSEMBLY OPTION INSTALLATION

The Transverse Hose Clamp Slide Assembly is optional. It is intended to allow an easy and safe performance of the Hose, and to avoid interferences with other parts of the Ceiling Suspension and equipment of the System.

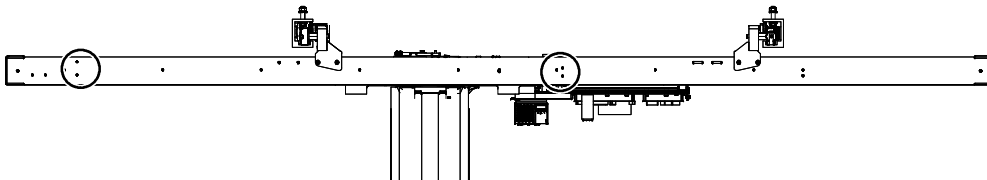
**Illustration 2-112**  
**TRANSVERSE Hose Clamp Slide Assembly**



**Note** 

*In the case that the System is provided with this option, proceed to install it when installing all hose brackets and before routing the Hose.*

1. Fix both Assembly ends to the Left Transverse Rail.



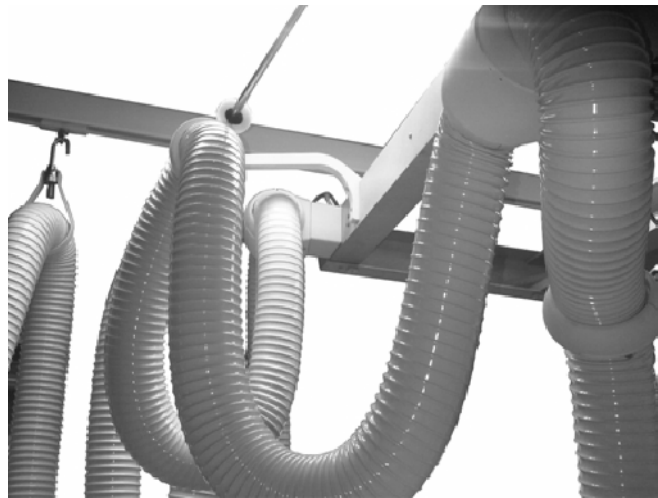
2. Place the Slide Clamp to the back of the Ceiling Suspension. Split it.

3. Get the Hose clamped and fix the Slide Clamp.

**Note** 

*Try to get the Hose clamped in the most comfortable position for the Room configuration, as depending on the Room layout, this position may be different.*

**Illustration 2-113**  
**Transverse Hose Clamp**



4. Check that the Hose can move freely along all axes.

## 2.15 CABLES



**TO COMPLY WITH THE REGULATIONS ON ELECTROMAGNETIC INTERFERENCES, THIS EQUIPMENT MUST BE USED IN SHIELDED AREAS, AND ALL INTERCONNECT CABLES TO PERIPHERAL DEVICES MUST BE SHIELDED AND PROPERLY GROUNDED.**

### 2.15.1 GENERAL OVERVIEW

There are different groups of cables, depending on the connections needed.

- Cables connecting the generator to tube are: HV cable, Stator cable, Ground cable.
- There are also other four Ground Cables. One of them links the Suspension to Earth source.
- Power cable for Collimator links it to the Suspension.
- Power cable for the Suspension links it to the 220V Power Supply.
- As an option there is also a SID Display kit which links the Suspension to the elevating table or Safety Parking Switch Table which links the Suspension to the tilting table.

Refer to *Illustration 2-114*. The cables distances are:

- **Y2 to Y1** is 2200 mm (86.61") or 2600 mm (102.36") for Transverse rails of 3500 mm (137.8").
- **Y1 to L** is 2150 mm (84.65")
- Distance **L to X** is:
  - 1260 mm (49.60") for Tubular Hose
  - 600 mm (23.62") for Velcro Hose

Output of the cables at the back of the bridge is always on the left. But cables can go either towards the right or towards the left of the cable guide rails.

**Note**

*In Position X, Illustration 2-115, cables could have different routing, some of them must be routed through the L-Block Tunnel and others directly to Console and Tube through the Hose Support.*

### 2.15.2 HV CABLE

Commercial reference of the HV is delivered as an option.

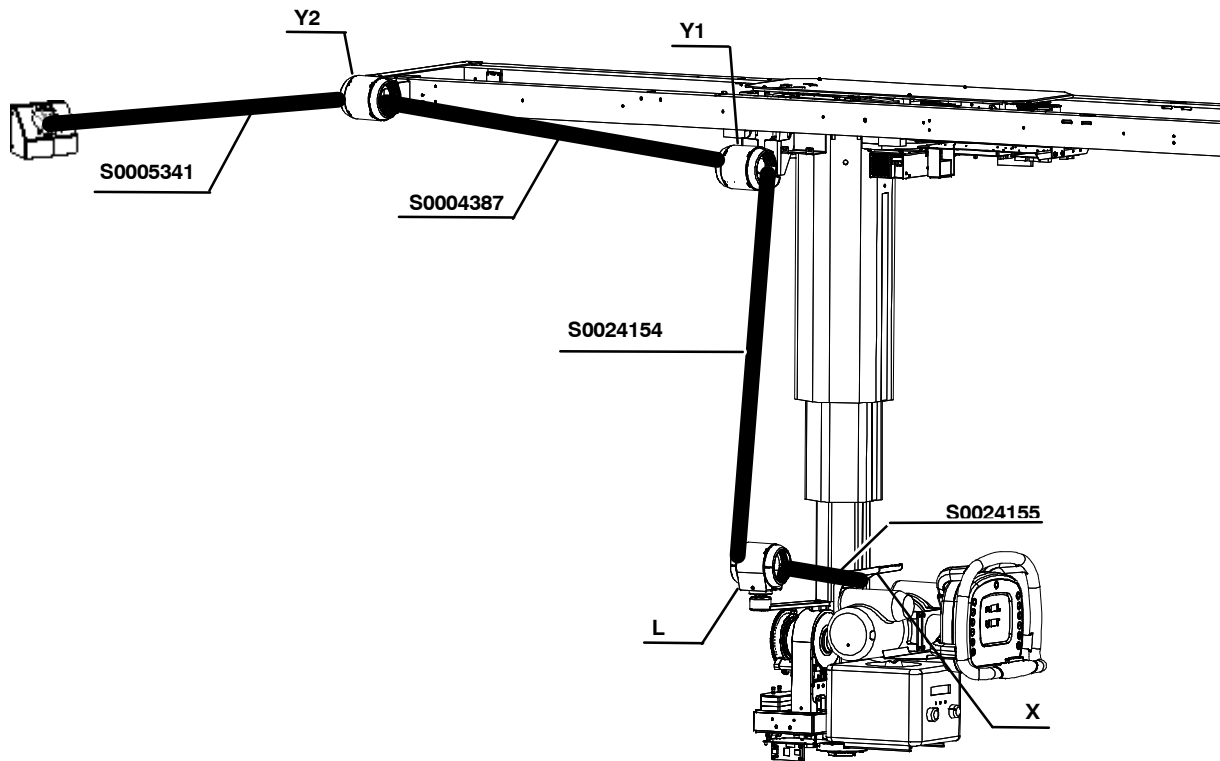
### 2.15.3 GROUND CABLES

In the hose there are five different ground cables, see the table below for their references. All are composed of the material 53314P74, whose description is Cable 5.37 AWG10 A/V UL1011 or UL1015 and its section is 5 mm<sup>2</sup>.

Ground Cables are:

- S0004387 Carriage Ground Cable
- S0005341 Tube Support Ground Cable
- S0016722 Generator Tube Ground Support
- S0024154 L-Block Ground Cable
- S0024155 Cable Console Ground Cable

**Illustration 2-114**  
**Ground Cables Routing**



## 2.16 ELECTRICAL CONNECTIONS AND ROUTING

**Note** 

Refer to Section 11. Schematics for further information on system cabling and connections.

After assembling external hose and console it is necessary to proceed with the electrical connection. It is mandatory to check the Hose Drawing to get further details of the external hose integrating cables and connections. It is indicated:

- Cable P/N and Description.
- Connection and required distance from the Fixation Bracket to the Connector. Indicated in brackets and bold letters.

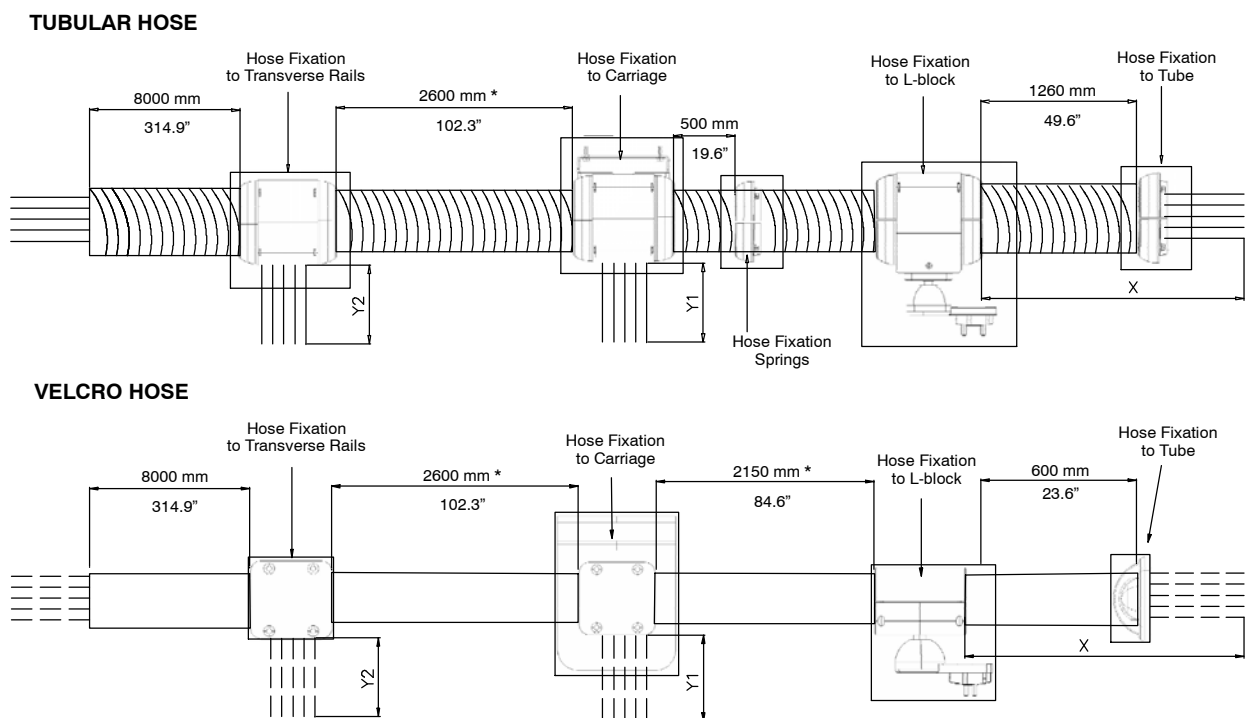
**Note** 

Each cable has at both ends a label with the P/N and where must be connected, also all connections of the suspension are identified.

**Note** 

For further information on Boards Location, refer to Section 4.2.

**Illustration 2-115**  
**Ceiling Suspension Hose Measures**



STANDARD CEILING SUSPENSION HOSE

**Table 2-1**  
**Standard Ceiling Suspension Mandatory Cables**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
S0004227-XX	AC POWER SUPPLY	OUTSIDE (Wall Panel)	Power Line	Y1 = 700 mm	Ceiling suspension Power Supply
S0005244-XX	NET TABLE HEIGHT POTENTIOMETER	OUTSIDE (Wall Panel)	RAD Table + Connector Jumper	Y1 = 600 mm	Control PWA J9/J13
S0005341-XX	GND EXT. - TRANSVERSE RAILS	OUTSIDE (Wall Panel)	System General GND	Y2 = 60 mm	Carriage GND
S0016722-XX	GND GENERATOR - TUBE	OUTSIDE (Wall Panel)	System General GND	X = 1900 mm	Tube GND
S0004242-XX	LONGITUDINAL POTENTIOMETER	Y2 = 1500 mm	Longitudinal Pot. J101	Y1 = 600 mm	Control PWA J11
S0004387-XX	GND TRANSVERSE RAILS - CARRIAGE	Y2 = 60 mm	Transverse Rail GND	Y1 = 350 mm	Carriage GND
S0005069-XX	LONGITUDINAL BRAKE	Y2 = 3000 mm	Longitudinal Brake J106	Y1 = 900 mm	Control PWA J34
S0005307-XX	POTENTIOMETERS TO CONSOLE	Y1 = 700 mm	Control PWA J8	X = 1900 mm	Console Display PWA J12, J13 & J14
S0024154-XX	GND CARRIAGE-L-BLOCK	Y1 = 350 mm	Carriage	X = 1700 mm	L-block GND
S0024155-XX	GND CARRIAGE-CONSOLE	Y1 = 350 mm	Carriage	X = 1900 mm	Console GND
S0019746-XX	KEYBOARD	Y1 = 700 mm	Control PWA J7	X = 1900 mm	Keyboard J5P & J6P
S0019875-XX	DISPLAY	Y1 = 700 mm	Control PWA J12	X = 1900 mm	Console Display PWA J2
S0019967-XX	POWER DISPLAY	Y1 = 900 mm	Control PWA J2	X = 1900 mm	Console Display PWA J1
S0024575-XX	LOAD CELL	Y1 = 900 mm	Interface & Detents PWA J4/J3	X = 2000 mm	Gage J5
S0024584-XX	ALPHA BRAKE	Y1 = 900 mm	Control PWA J5/J32	X = 900 mm	Alpha Brake J5
S0024585-XX	BETA BRAKE	Y1 = 900 mm	Control PWA J10/J33	X = 900 mm	Beta Brake J10

**Table 2-2**  
**HV Cables, Stator and DAP Device Cables**

Note 

*These cables are mandatory but they may not be provided by the Manufacturer. In the case that they are not shipped with the Ceiling Suspension, they must be routed inside the Hose in field.*

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
--	ANODE	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube
--	CATHODE	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube
--	STATOR	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube
--	DAP CHAMBER	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube

**Table 2-3**  
**Collimation Cables**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
RALCO R309/302ACS AUTOMATIC ANALOGIC COLLIMATORS					
A15075-XX	HOSE COLLIMATOR CONTROL CABLE	OUTSIDE (Wall Panel)	J202	X = 1300 mm	Collimator J1
S0008753-XX	SID CABLE	OUTSIDE (Wall Panel)	Collimator box	Y1 = 750 mm	Collimator Pot. JP200
S0008754-XX	FFD CABLE	OUTSIDE (Wall Panel)	Collimator box	Y2 = 2500 mm	Collimator Pot. JP201
RALCO 302DACS AUTOMATIC ANALOGIC COLLIMATOR					
S0023749-XX	COLLIMATOR CONTROL CABLE	OUTSIDE (Wall Panel)	J202	X = 1300 mm	Collimator J1
S0023551-XX	SID CABLE	OUTSIDE (Wall Panel)	Collimator Box	Y1 = 750 mm	Collimator Pot. JP200
S0023552-XX	FFD CABLE	OUTSIDE (Wall Panel)	Collimator Box	Y2 = 2500 mm	Automatic Collimation Kit JP201
MANUAL COLLIMATION					
S0004252-XX	POWER SUPPLY	Y1 = 900 mm	Control PWA J4	X = 1300 mm	Collimator
COLLIMATOR LIGHT (OPTION)					
A15169-XX	COLLIMATOR LIGHT CABLE	Collimator J1	J1 X = 1300 mm	Y1 = 750 mm	X-ray Generator TS3

**Table 2-4**  
**Single Panel System Cables (with mobile Table)**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
S0021066-XX	WALL STAND SUPPLY CABLE	OUTSIDE (Wall Panel)	Wall Stand	Y1 = 900 mm	Ceiling Suspension Power supply
S0021067-XX	COLLIMATOR SUPPLY CABLE	OUTSIDE (Wall Panel)	Wall Stand	Y1 = 900 mm	Ceiling Suspension Power Supply

**Table 2-5**  
**Options Cables**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
S0016091-XX	REMOTE LIGHT	OUTSIDE (Wall Panel)	J4	X = 1900 mm	JB1 + S0016077 Button Light JB2
S0019036-XX	PARKING SWITCH CABLE	OUTSIDE (Wall Panel)	R/F Remote Table	Y2 = Y1 = 600 mm (default)	Parking Switch
A7305-XX	CABLE ALIGM (FAILSAFE)	OUTSIDE (Wall Panel)	R/F Remote Table	X = 1300 mm	



**ONCE THE X-RAY TUBE AND COLLIMATOR ARE INSTALLED,  
MAKE SURE THAT THE VERTICAL BRAKE CABLE IS  
CONNECTED.**

**AUTO-TRACKING CEILING SUSPENSION HOSE**

**Table 2-6  
Auto-tracking Ceiling Suspension Mandatory Cables**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
S0004227	AC POWER SUPPLY	Outside (Wall Panel)	Power Line	Y1 = 700 mm	Ceiling suspension Fuse
S0005244	NET TABLE HEIGHT POTENTIOMETER	Outside (Wall Panel)	RAD Table + Connector Jumper	Y1 = 600 mm	Control PWA J9/J13
S0005341	GND EXT. - TRANSVERSE RAILS	Outside (Wall Panel)	System General GND	Y2 = 60 mm	Carriage GND
S0013370	VERTICAL POTENTIOMETER WS	Outside (Wall Panel)	Wall Stand J31	Y1 = 700mm	Control PWA J3
S0016722	GND GENERATOR - TUBE	Outside (Wall Panel)	System General GND	X = 1900 mm	Tube GND
S0024562	LONGITUDINAL POTENTIOMETER	Y2 = 1500 mm	Longitudinal Pot. J101	Y1 = 600 mm	Control PWA J11
S0004387	GND TRANSVERSE RAILS - CARRIAGE	Y2 = 60 mm	Transverse Rail GND	Y1 = 350 mm	Carriage GND
S0005069	LONGITUDINAL BRAKE	Y2 = 3000 mm	Longitudinal Brake J106	Y1 = 900 mm	Control PWA J12
S0024154	GND CARRIAGE-L-BLOCK	Y1 = 350 mm	Carriage	x = 1700 mm	L-block GND
S0024155	GND CARRIAGE-CONSOLE	Y1 = 350 mm	Carriage	x = 1900 mm	Console GND
S0024566	KEYBOARD	Y1 = 900 mm	Control PWA J6 & J8	x = 1500 mm	Keyboard J1 & J30
S0024567	DISPLAY	Y1 = 900 mm	Control PWA J4	x = 1500 mm	Console Display PWA J2
S0024569	POWER DISPLAY	Y1 = 900 mm	Control PWA J2	x = 1500 mm	Console Display PWA J1
S0024575	LOAD CELL	Y1 = 900 mm	Interface & Detents PWA J4/J3	x = 2000 mm	Gage J5
S0024584	ALPHA BRAKE	Y1 = 900 mm	Control PWA J5/J32	x = 2000 mm	Alpha Brake J5
S0024585	BETA BRAKE	Y1 = 900 mm	Control PWA J10/J33	x = 2000 mm	Beta Brake J10

**Table 2-7  
HV Cables, Stator and DAP Device Cables**

**Note** 

*These cables are mandatory but they may not be provided by the Manufacturer. In the case that they are not shipped with the Ceiling Suspension, they must be route inside the Hose in field.*

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
--	ANODE	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube
--	CATHODE	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube
--	STATOR	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube
--	DAP CHAMBER	OUTSIDE (Wall Panel)	GENERATOR	X = 1800 mm	X-ray Tube

**Table 2-8**  
**Collimation Cables**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
RALCO R309/302ACS AUTOMATIC ANALOGIC COLLIMATORS					
A15075	COLLIMATOR CONTROL CABLE	OUTSIDE (Wall Panel)	J202	X = 1300 mm	Collimator J1
S0008753	SID CABLE	OUTSIDE (Wall Panel)	Collimator box	Y1 = 750 mm	Collimator Pot. JP200
S0008754	FFD CABLE	OUTSIDE (Wall Panel)	Collimator box	Y2 = 2500 mm	Collimator Pot. JP201
RALCO 302DACS AUTOMATIC ANALOGIC COLLIMATOR					
S0023749	COLLIMATOR CONTROL CABLE	OUTSIDE (Wall Panel)	J202	X = 1300 mm	Collimator J1
S0023551	SID CABLE	OUTSIDE (Wall Panel)	Collimator Box	Y1 = 750 mm	Collimator Pot. JP200
S0023552	FFD CABLE	OUTSIDE (Wall Panel)	Collimator Box	Y2 = 2500 mm	Automatic Collimation Kit JP201
MANUAL COLLIMATION					
S0004252	POWER SUPPLY (RALCO R225DHHS)	Y1 = 900 mm	Control PWA J4	X = 1300 mm	Collimator
S0013376	POWER SUPPLY (RALCO R302)	Y1 = 900 mm	Control PWA J4	X = 1300 mm	Collimator
COLLIMATOR LIGHT (OPTION)					
A15169-XX	COLLIMATOR LIGHT CABLE	Collimator J1	J1 X = 1300 mm	Y1 = 750 mm	X-ray Generator TS3

**Table 2-9**  
**Single Panel System Cables (with mobile Table)**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
S0021066	WALL STAND SUPPLY CABLE	OUTSIDE (Wall Panel)	Wall Stand	Y1 = 900 mm	Ceiling Suspension Power supply
S0021067	COLLIMATOR SUPPLY CABLE	OUTSIDE (Wall Panel)	Wall Stand	Y1 = 900 mm	Ceiling Suspension Power Supply

**Table 2-10**  
**Options Cables**

CABLE CODE	CABLE DESCRIPTION	FROM	CONNECTION	TO	CONNECTION
S0016091	REMOTE LIGHT	OUTSIDE (Wall Panel)	J4	X = 1900 mm	JB1 + S0016077 Button Light JB2
S0019036	PARKING SWITCH CABLE	OUTSIDE (Wall Panel)	R/F Remote Table	Y1 = 600 mm	Parking Switch
A7305-XX	CABLE ALIGM (FAILSAFE)	OUTSIDE (Wall Panel)	R/F Remote Table	X = 1300 mm	



**ONCE THE X-RAY TUBE AND COLLIMATOR ARE INSTALLED,  
MAKE SURE THAT THE VERTICAL BRAKE CABLE IS  
CONNECTED.**

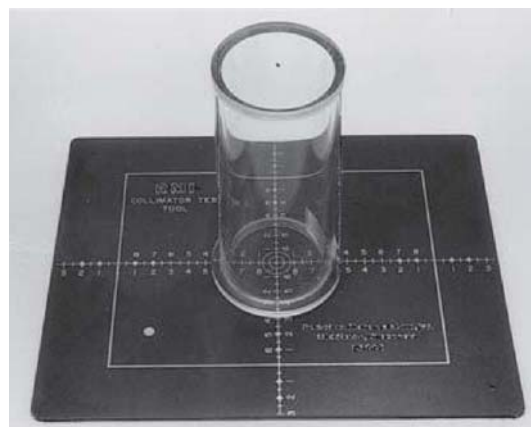
## 2.17 ALPHA/BETA DETENTS & X-RAY BEAM ADJUSTMENT

The Alpha and Beta mechanical Detents are factory adjusted at each 45°. However, they must be checked and if necessary corrected to get a proper Tube adjustment.

1. Switch ON the Ceiling Suspension.
2. Place on floor a collimation alignment tool. This tool must be aligned with the collimator light.

Illustration 2-116

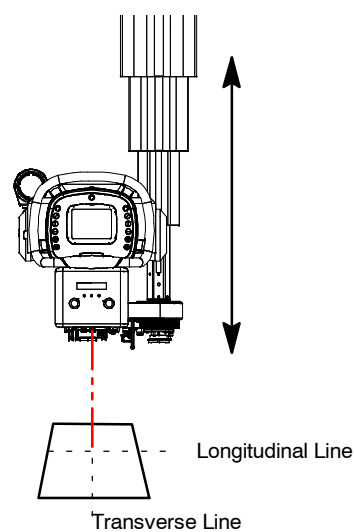
Collimation and Beam Alignment Test Tools



3. Move the Suspension up & down with the collimator light ON.

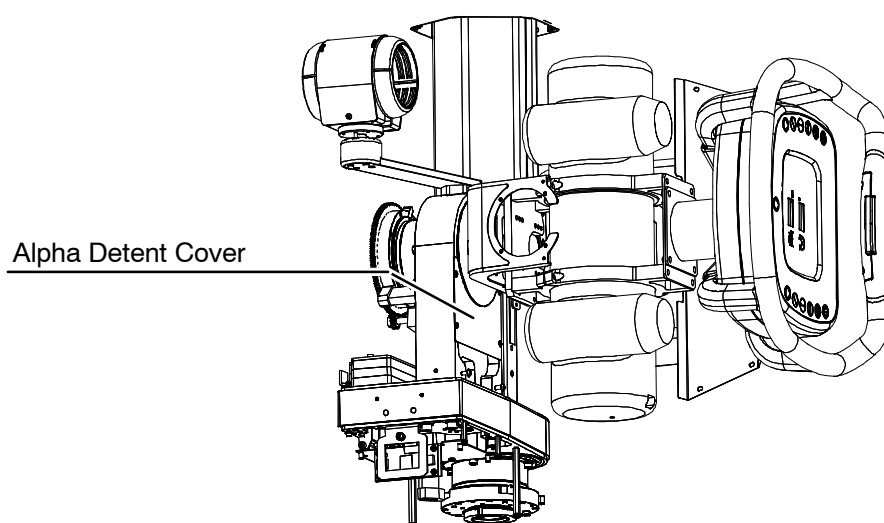
Illustration 2-117

Align and Move Up and Down to Check the Alignment



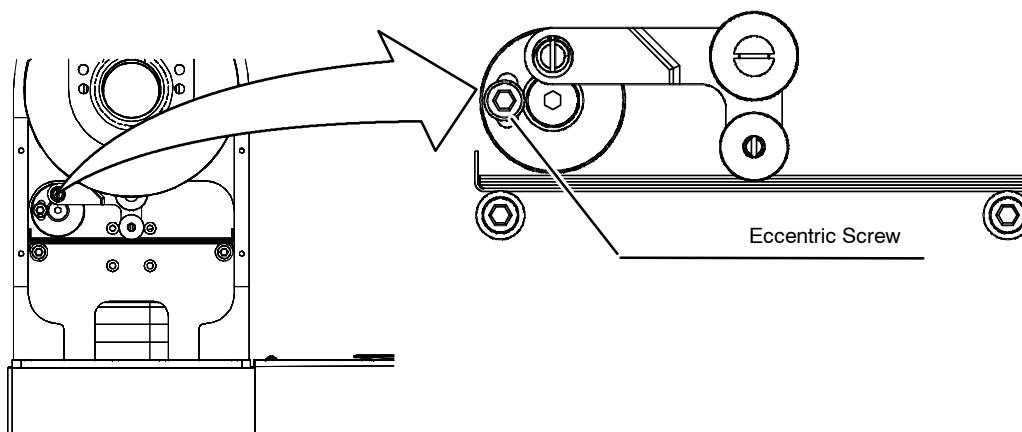
4. Verify that the light and the tool are aligned, and the light does not moves from the transverse and longitudinal lines.
5. Related to the Transverse Line, proceed to adjust the Alpha Detent.
  - a. The Alpha Detent is located behind the Collimator, turn the Tube at  $-90^{\circ}$  to get an easy access to the Detent.
  - b. Remove Alpha Detent Front Cover. Loosen the four fixing screws.

**Illustration 2-118**  
**Alpha Detent Location**



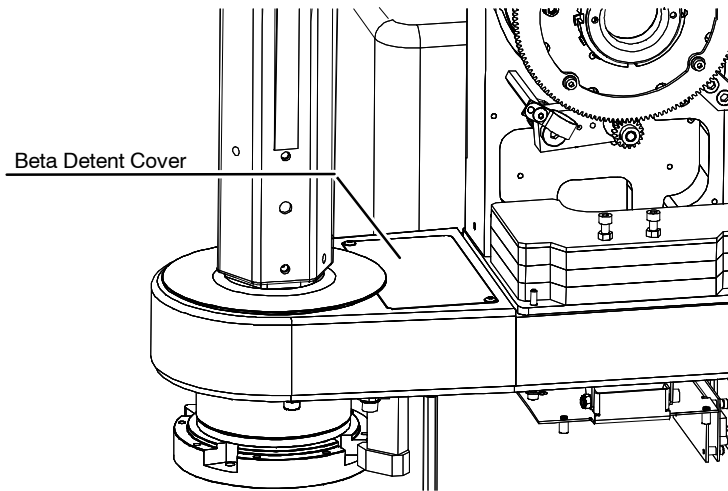
- c. Loosen or tighten the Adjustment Eccentric Screw of the Alpha Detent.

**Illustration 2-119**  
**Alpha Detent Eccentric Screw**



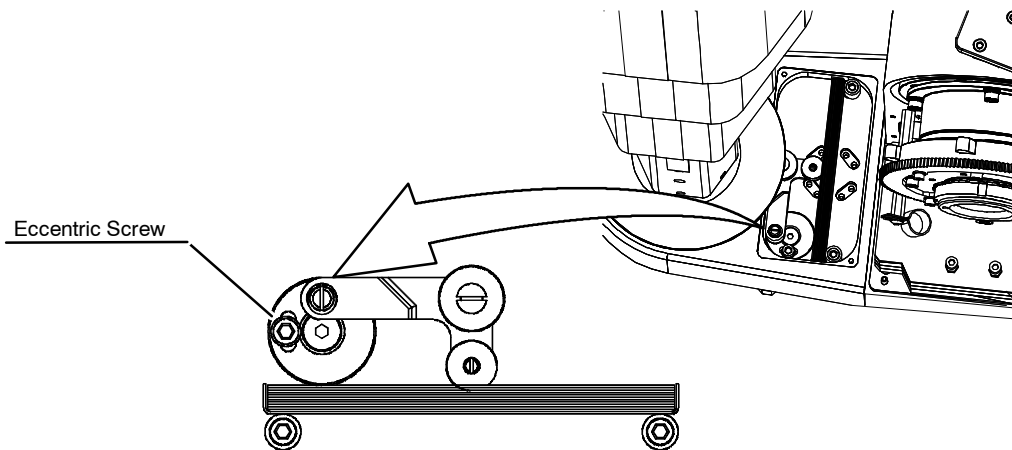
6. Related to the Longitudinal Line, proceed to adjust the Beta Detent.
  - a. The Beta Detent is located in the Beta Axis, between the Alpha Axis and the Telescopic Column.
  - b. Remove Beta Detent Cover. Loosen the fixing screws.

**Illustration 2-120  
Beta Detent Cover**



- c. Loosen or tighten the Adjustment Eccentric Screw of the Beta Detent.

**Illustration 2-121  
Beta Detent Eccentric Screw**



7. Check again if the Detents are adjusted.

## 2.18 COVERS INSTALLATION



**WARNING**

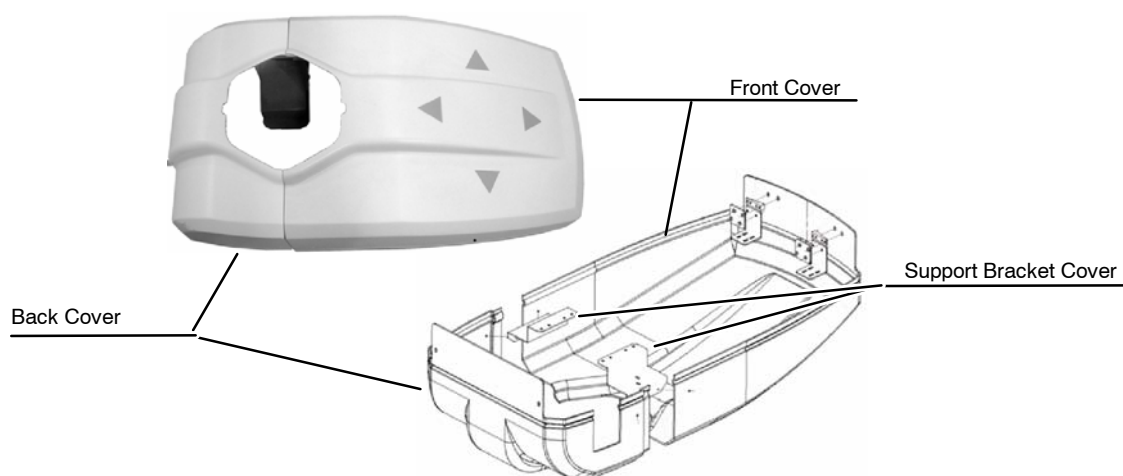
REMEMBER THAT IT IS REQUIRED TO PROCEED TO THE CONFIGURATION AND CALIBRATION PROCEDURE OF THE SUSPENSION BEFORE INSTALLING ALL THE COVERS OF THE L-BLOCK, INSTALL THE ALPHA COVERS JUST BEFORE THE GAGE CALIBRATION.

### 2.18.1 CARRIAGE COVERS INSTALLATION

#### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
N/A	S0007029	Carriage Back Cover	1
	S0007028	Carriage Front Cover	1
	S0009388	Support Bracket Cover	2
	51212P25	Socket Cap Screw DIN912 M4x12	4
	51390P10	Washer AET M4	4
	51380P46	Plate Washer	4
	51383P29	Big Washer 4.3	10
	S0004595	Button Head Screw DIN7380 M4x12	2
	S0005181	Button Head Screw DIN7380 M4x20	8

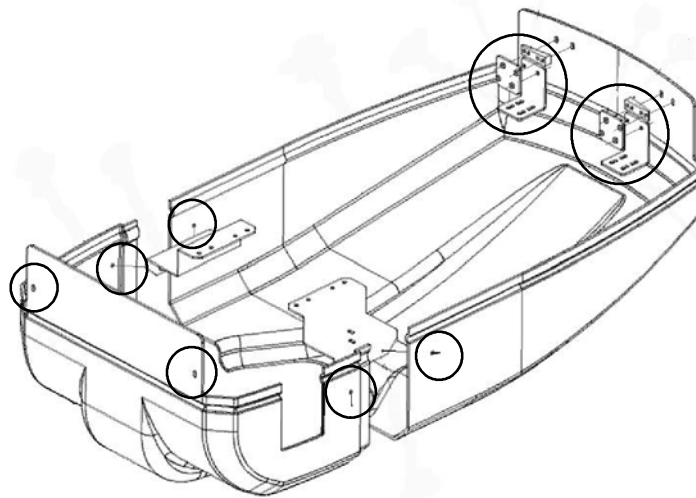
**Illustration 2-122**  
**Carriage Covers**



### INSTALLATION

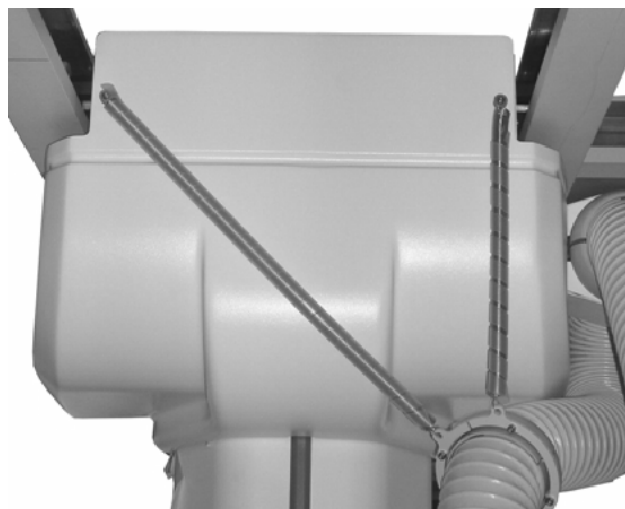
1. Place the rear part of the carriage cover and fix it slightly using the two rear fixing screws. Do not tighten totally yet. Use:
  - S0004595 BUTTON HEAD SCREW DIN7380 M4x12
  - 51383P29 BIG WASHER 4.3

**Illustration 2-123**  
**Carriage Covers Installation**



2. When a Tubular Hose has been installed, mount the Hose Support to Carriage. Just mount the Springs on the Carriage rear screws.

**Illustration 2-124**  
**Hose Springs Support**

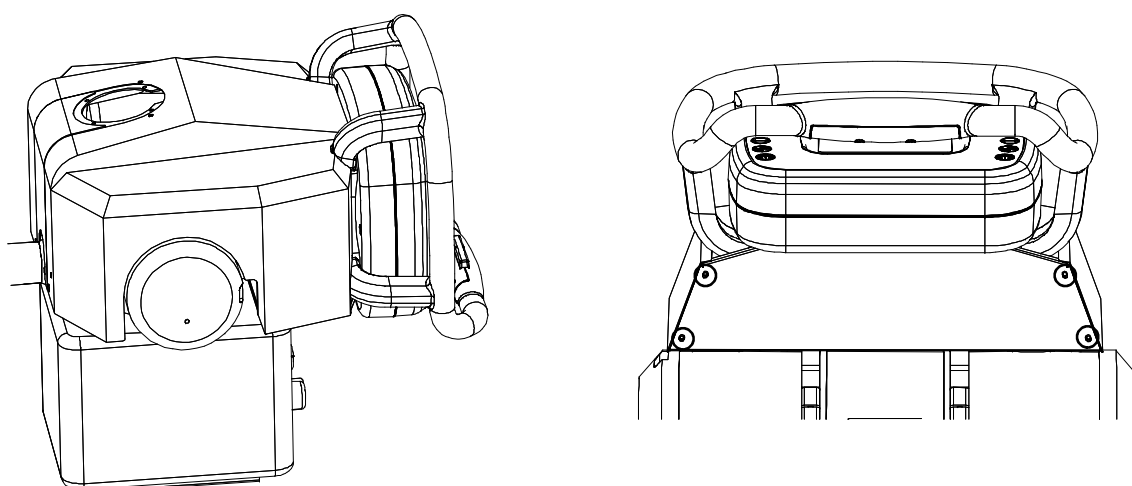


3. Place the front part of the carriage cover and tighten, but not totally yet, the four frontal fixing Screws, use:
  - S0005181 BUTTON HEAD SCREW DIN7380 M4x20
  - 51383P29 BIG WASHER 4.3
4. Both Covers must fit properly. Use the two lateral fixing screws to match both covers and the two Support Brackets. Do not tighten totally yet. Use:
  - S0005181 BUTTON HEAD SCREW DIN7380 M4x20
  - 51383P29 BIG WASHER 4.3
5. Once the Covers are completely installed and match correctly, tighten completely all screws.

### 2.18.2 TOSHIBA TUBES ADAPTATIONS COVERS INSTALLATION

1. Install the Hose Support Back Cover. Fix it to the Hose Support with the two fixing screws. Just when the installed collimator is digital and rotating.
2. Install the Tube Top Cover. Get the Cables ready to install properly the Tube Cover. Make sure that no cable gets damaged or rubbed.
3. Install the Bottom Cover. Fit it with the Tube Cover and fix it.

**Illustration 2-125**  
**X-ray tube top Cover**

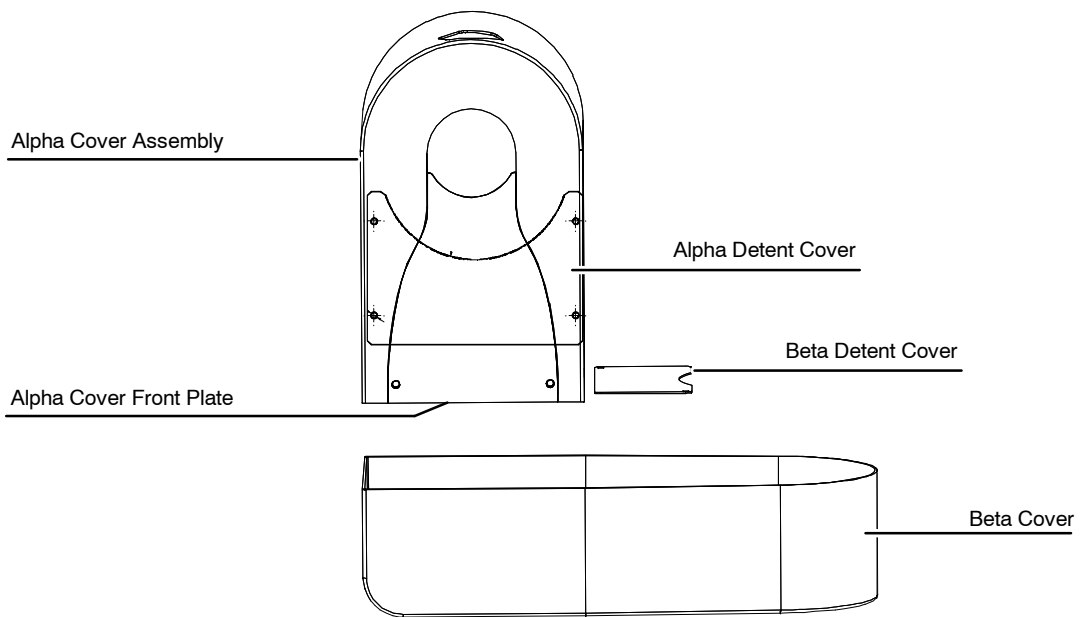


2.18.3 L-BLOCK COVERS INSTALLATION

REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
N/A	S0024151	Alpha/Beta Tunnel Covers Assembly	1
	S0024189	Alpha Cover Assembly	1
	S0023200	Alpha cover Front Plate	1
	S0022745	Beta Cover Fixation Spacers	2
	S0023191	Beta Cover	1
	23902-01	Beta Cover Rear Support	1

Illustration 2-126  
Alpha/Beta Tunnel Covers Assembly



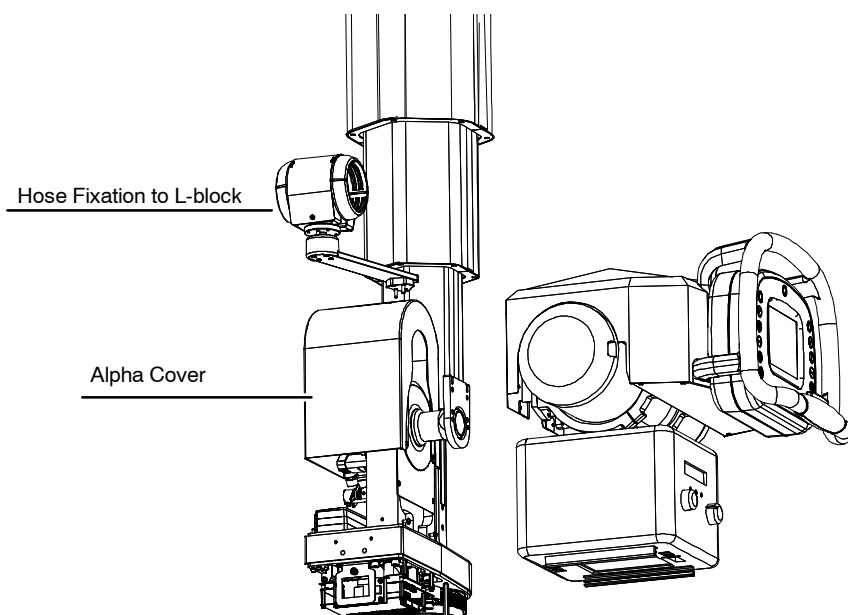
Note 

*There are two different sets of Alpha-Beta Covers, P/N S0024151, one for each axis. It is necessary to install first the Alpha and then the Beta Covers when the tube leveling procedure has been completed and checked again.*

### ALPHA COVERS INSTALLATION

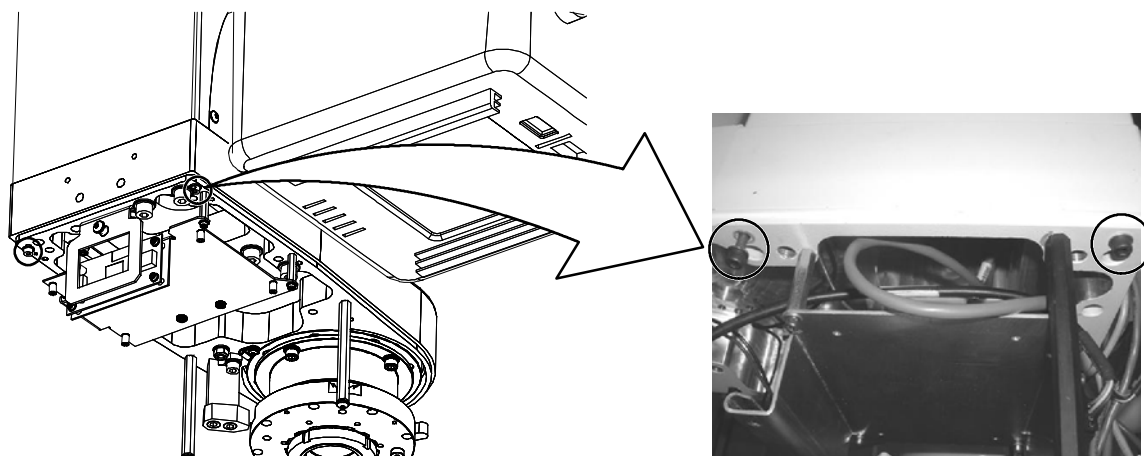
1. It is mandatory to install them before the Hose installation, refer to *Section 2.14 External Hose Installation*, as the brackets must be installed with the Alpha Covers already installed.
2. Mount the Alpha Cover on Alpha Axis.

**Illustration 2-127**  
**Mount Alpha Cover**



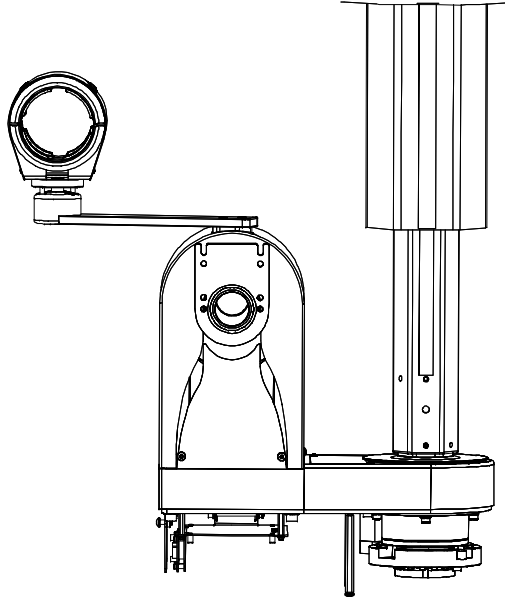
3. Install the Hose Fixation to L-block. Tighten both fixing screws to the top of the Alpha Axis.

**Illustration 2-128**  
**Fixing Points**



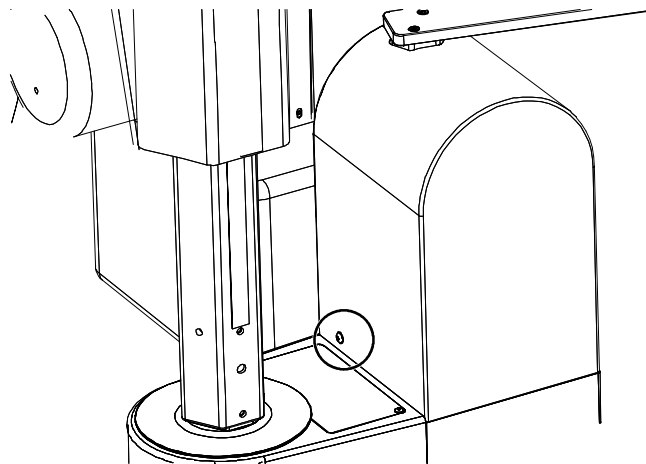
4. Adjust the Alpha Plate to the Alpha Cover. Tighten the front fixing screw and the two screws of the Alpha Plate Cover.

**Illustration 2-129**  
**Alpha Plate**



5. Tighten the lateral screw of the Alpha Cover.

**Illustration 2-130**  
**Alpha Cover Fixation**

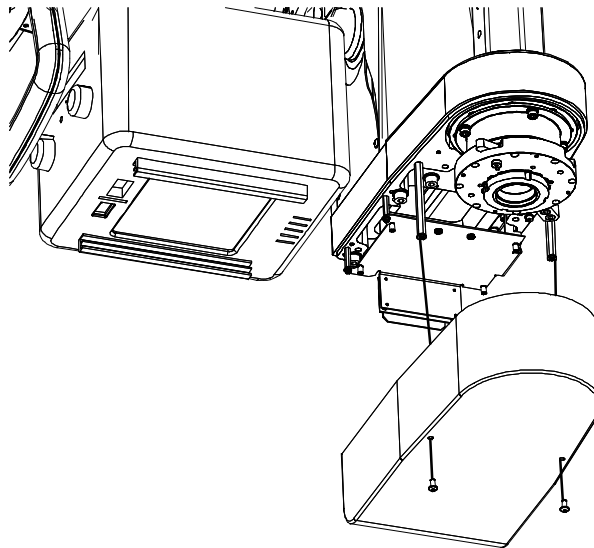


6. Fix the Alpha cover to the L-Block. Tighten the two screws that fix the cover located at the rear bottom of the L-Block.

### BETA COVER INSTALLATION

1. To install the Beta Cover just tighten the two screws which fix the cover to the Fixation Spacers, so they fix the cover to the L-Block.

**Illustration 2-131**  
**Beta Cover Installation**



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## **SECTION 3      SYSTEM INSTALLATION**

### **3.1    INSTALLATION REQUIREMENTS AND PRECAUTIONS**

For the installation of a room there are no specific requirements apart from those of each equipment which is part of the complete System.

The Suspension can be installed within different system configurations. A wide range of Generators, RAD Tables, R & F Tables, Wall Stands can be interconnected with the Suspension, as it can be provided also with different X-ray tubes.

For the room and installation requirements check all the Pre-Installation manuals or documentation of each equipment which is part of the system.

### **3.2    PREPARING THE INSTALLATION WORK**

#### **3.2.1    REQUIRED TOOLS**

Refer to each installation documentation and manuals to get a complete list of the required tools for the installation of the complete X-ray system.

#### **3.2.2    CHECKING PRE-INSTALLATION WORK**

Before beginning the installation, make sure that the pre-installation work is done. All details and information is described in the technical documentation provided with each equipment.

#### **3.2.3    EQUIPMENT EVALUATION AND SHIPPING**

**Preliminary checks:**

- Do not discard any packing material such as envelopes, boxes, bags until all spares are compared to the packing list.
- Check the general conditions and external appearance of all parts for possible damages or missing items.
- Notify the distribution center immediately of any damaged or missing parts.

### 3.2.4 SUSPENSION INSTALLATION AND LEVELING

Once the Ceiling Suspension installation procedure has been done it is absolutely mandatory to complete the Suspension leveling procedure as indicated in *Section 2.11.5 Tube Leveling*. It is just required to proceed to install the Suspension but it is not required already to complete the Calibration procedure.

### 3.2.5 WALL STAND INSTALLATION

Refer to each Wall Stand installation manual and documentation to proceed to the its installation.



***Do not fix already definitely the Wall Stand as it is required to adjust its perpendicularity to the Suspension. Just locate the equipment in the desired position and lifted up, and drill and fix just in one side of the Wall Stand.***

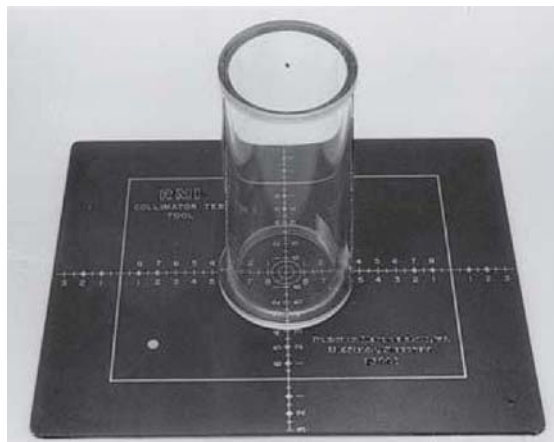
### 3.2.6 WALL STAND AND SUSPENSION PERPENDICULARITY ADJUSTMENT

#### 3.2.6.1 REQUIRED TOOLS

- Collimation Test Tool.
- Beam Alignment Test Tool.

#### Illustration 3-1

#### Collimation and Beam alignment Test Tools

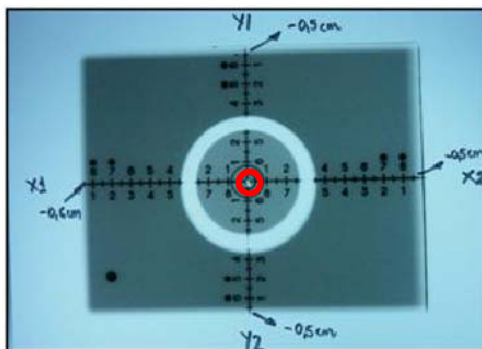


### 3.2.6.2 PROCEDURE

It is necessary to complete one exposition for the perfect perpendicularity or x-ray beam adjustment:

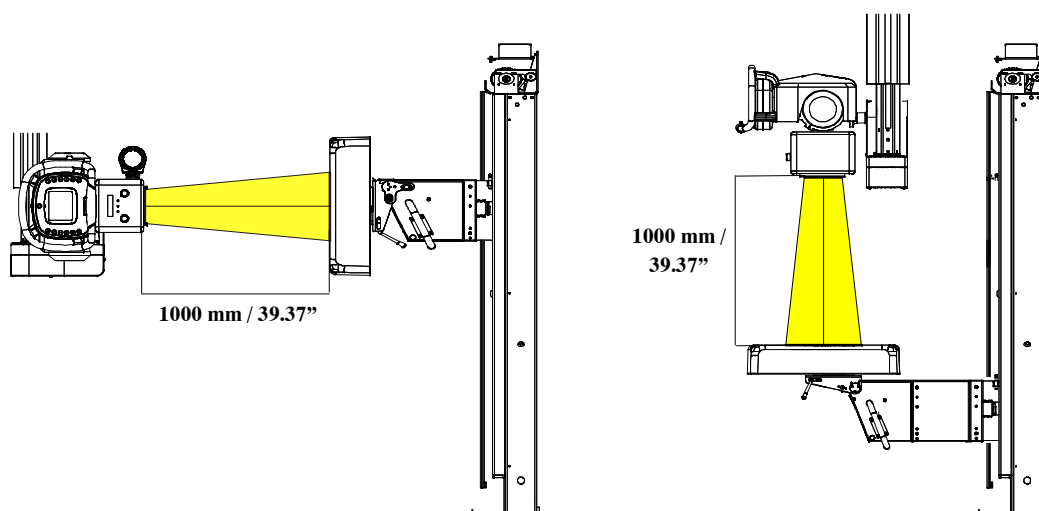
1. The Suspension tube and collimator Assembly must face the Receptor, which can be in horizontal position or vertical. In the case of Double Panel System proceed just with the Receptor tilted at  $0^\circ$ , but for Single Panel Systems proceed also with the Receptor at  $90^\circ$ . The Tube and Collimator Assembly must be perfectly centered with the Receptor.
2. Install the Collimator Testing Tool and the Beam Alignment Tool in the Bucky as indicated in its own technical documentation. Refer to *Illustration 2-116*.

**Illustration 3-2**  
Collimation Testing Tool



3. Get the Suspension to a SID of 1000 mm from the wall Bucky.

**Illustration 3-3**  
RAD Wall Stand and Ceiling Suspension Perpendicularity Checking



4. Turn the Collimator light on and, by means of the Collimator Control Knobs, center the Collimator Test Tool with the light axes projected by the Collimator Lamp.
5. Repeat different exposures until getting the satisfactory results.
6. Check the results of the exposure. Refer to *Illustration 3-2*.
7. If the result is not correct, move the Wall Stand until getting the correct and perpendicular to the Suspension position. Proceed to another exposure to check it.
8. When the result is correct, fix definitely the Wall Stand.

**Note** 

*The exact perpendicularity is required for a correct precision of the X-ray System. If required, check again the alignment and perpendicularity with the X-ray tube after the definitive fixation.*

### 3.2.7 TABLE INSTALLATION

Refer to each Table installation manual and documentation to proceed to its installation.



***Do not fix already definitely the Table as it is required to adjust its parallelism to the Suspension. Just locate the equipment in the desired position and wait to fix until the parallelism adjustment procedure is finished.***

### 3.2.8 TABLE PARALLELISM TO THE RAILS SYSTEM AND THE SUSPENSION

Once the Table has been located in its position.

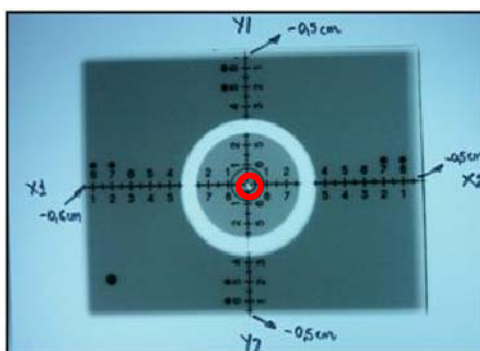
1. Define the longitudinal axis of the Table. Use any element of the Table as the profile of the Tabletop, or draw it on the Table.
2. Switch On the collimator light.
3. Release the longitudinal brake.
4. Move the Suspension with the collimator light passing along the longitudinal axis of the Table. It must be parallel to the Table axes; if not, change the Table position until get it totally parallel.
5. Once it is totally parallel to the Table fix it to the floor.

### 3.2.9 TABLE AND SUSPENSION PERPENDICULARITY ADJUSTMENT

Proceed as indicated for Table:

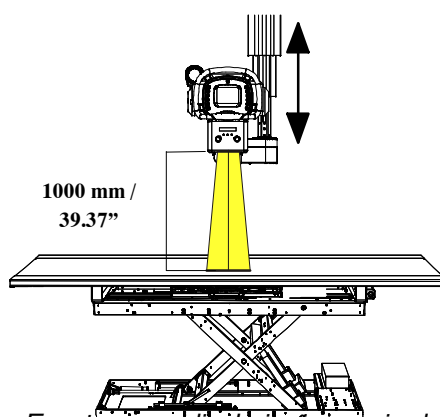
1. The Suspension tube and collimator Assembly must face the Table Receptor. The Tube and Collimator Assembly must be perfectly centered with the DR Receptor.
2. Install the Collimator Testing Tool and the Beam Alignment Tool in the Receptor as indicated in its own technical documentation. Refer to *Illustration 2-116*.

**Illustration 3-4**  
Collimation Testing Tool



3. Position the Suspension to a SID of 1000 mm from the Wall Stand.

**Illustration 3-5**  
Perpendicularity Adjustment Checking



**Note** 

*Exact perpendicularity is required for a correct precision of the X-ray System. If required, check again the alignment and perpendicularity with the X-ray tube after the definitive fixation.*

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## SECTION 4 CONFIGURATION AND CALIBRATION

This section provides information about the configuration and calibration procedure of both models of the Ceiling Suspension, the Standard and the Auto-tracking.

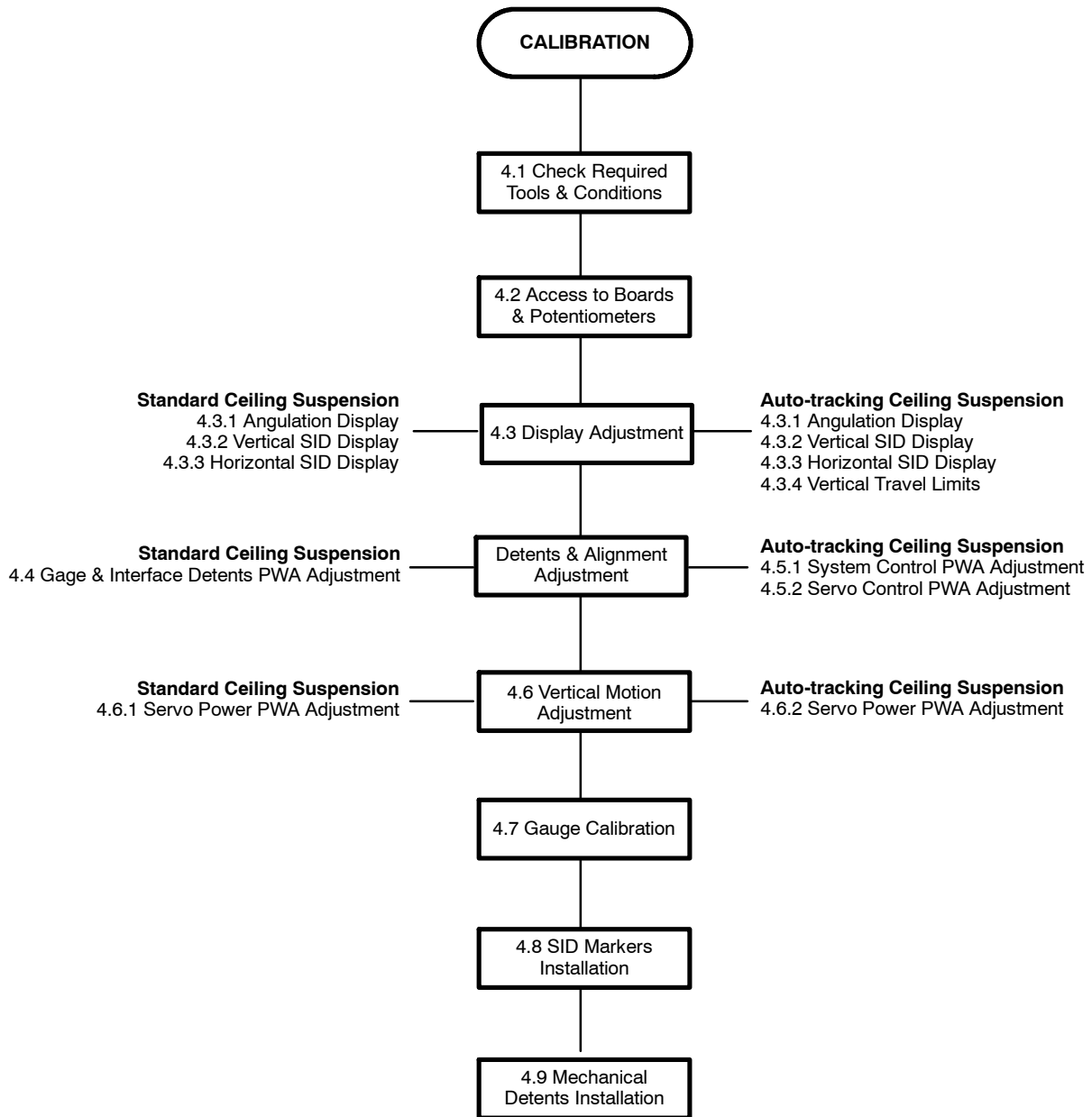
Proceed always to the calibration procedure after completing the installation of the whole system. Refer to *Section 2.18* for Cover removal information.

Complete the next steps for the correct calibration and configuration of the Ceiling Suspension:

- Display Calibration.
  - Angulation display adjustment
  - Vertical and horizontal SID displays adjustment
  - X-ray tube vertical travel limits adjustment, just for Auto-tracking Ceiling Suspension
  - Horizontal SID adjustment
- Interface and detents Calibration
- Vertical motion adjustment
- SID Markers Installation
- Alignment Kit Installation
- Mechanical Detents Installation

In this section it is described the calibration and adjustment procedure for both Ceiling Suspensions. However, remember that the boards and some procedure steps are not the same for both models.

Illustration 4-1  
Calibration Flowchart



## 4.1 REQUIRED TOOLS & CONDITIONS

### CALIBRATION TOOLS

- Hex Key Set
- Digital Multimeter
- Voltmeter
- Oscilloscope
- Dynamometer or any other tool which can operate as counterweight
- Level
- Meter
- Masking Tape

### REQUIRED CONDITIONS

1. Place the Ceiling Suspension in the Center of all its axes.
2. Remove the Beta Cover to gain access to the Gauge Board.
3. Place the cover on the Tube Support and the Console, as all the weight of the Alpha/beta Assembly is necessary for the adjustment.

**Note** 

*Keep the Alpha/beta Assembly free from external objects which can increase the weight of the assembly and cause an incorrect calibration.*

### Illustration 4-2

**Place Beta Cover at the Top of the X-ray Tube Covers**



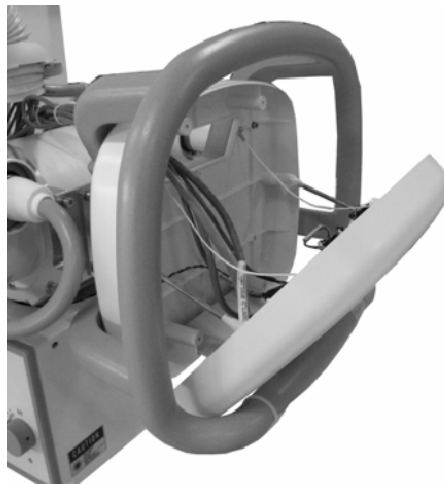
4. Open the Carriage Upper Cover, loosen both central screws that fix it and leave the Carriage hanging by the front hinges.

**Illustration 4-3**  
**Open Carriage**



5. Split the Control Console covers, it is necessary to gain access to the Control Console boards. Use the masking tape to fasten the front cover and the Omni-directional Button.

**Illustration 4-4**  
**Open Control Console**



**Note** 

*Make sure that neither the cables nor the board get disconnected and that the Omni-directional Button does not fall out from the Console.*

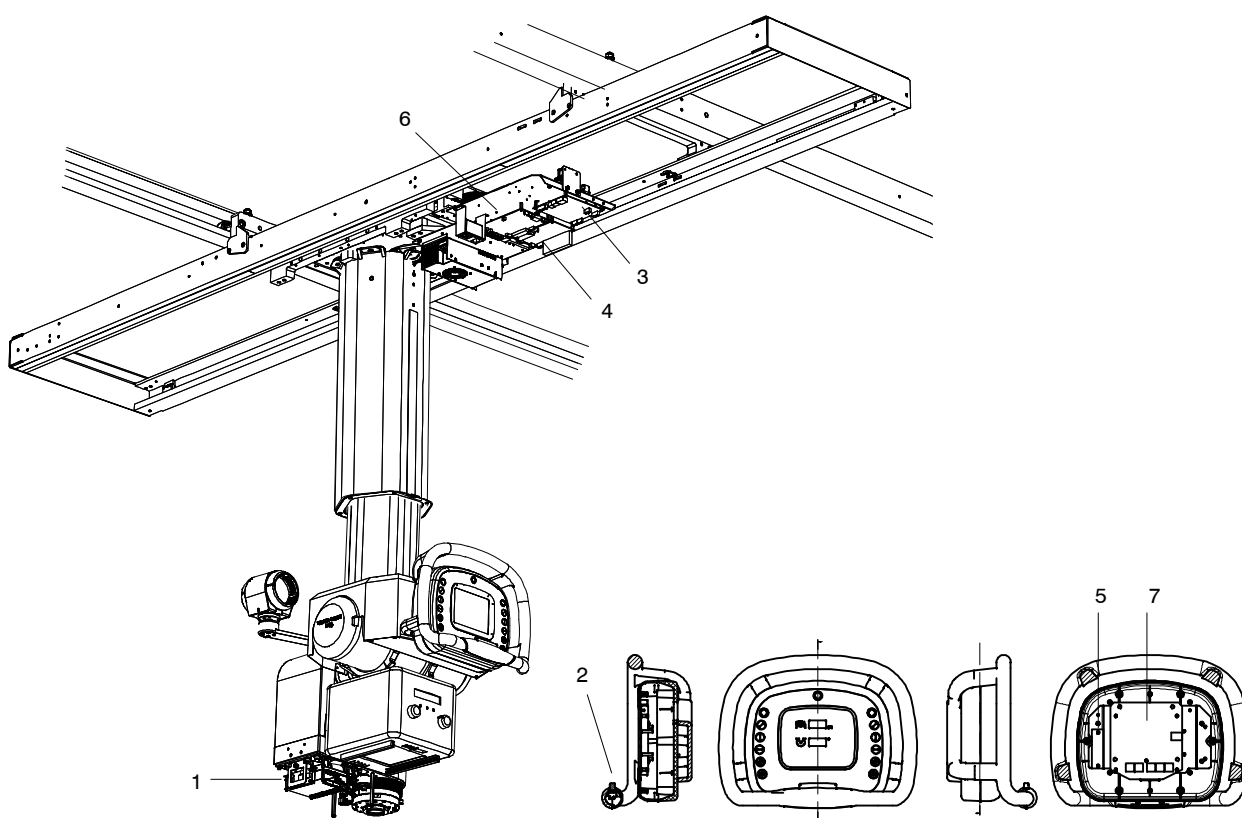
6. Connect the Ceiling Suspension directly to the General Room Cabinet and turn it ON. (Refer to the Operator Manual for further details about Switching ON/OFF.)

## 4.2 BOARDS AND POTENTIOMETERS LOCATION

In this section it is included the information about the location of all boards and potentiometers which are to be calibrated during the Ceiling Suspension configuration and calibration procedures. Remember that it is necessary to get access to all of them.

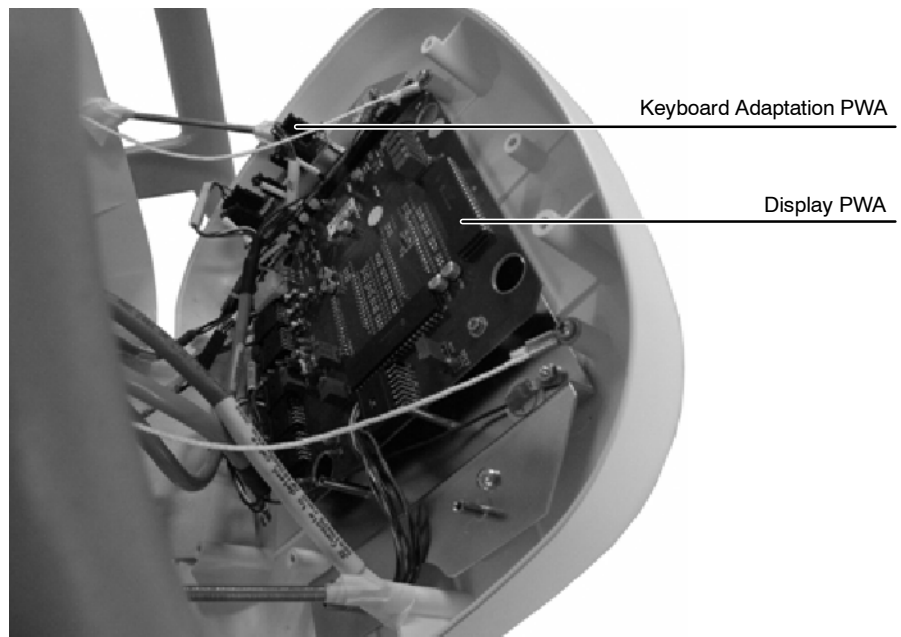
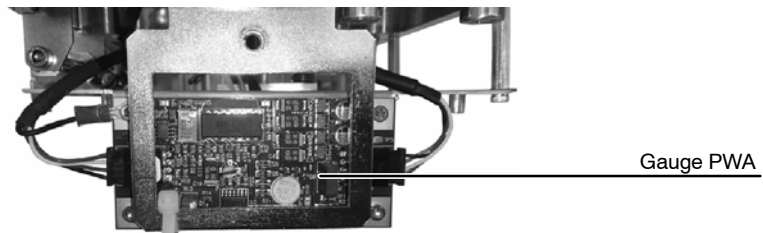
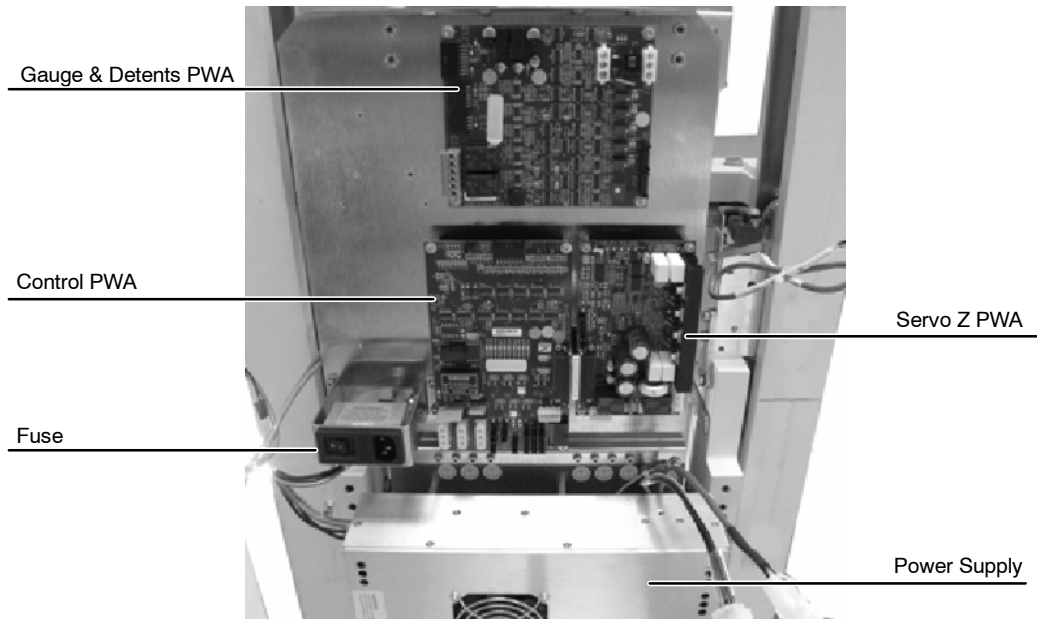
### 4.2.1 STANDARD CEILING SUSPENSION BOARDS

	DESCRIPTION	P/N
1	GAUGE PWA	S0017517
2	OMNI SWITCH	S0019357
3	LOAD CELL INTERFACE & DETENTS PWA	S0019383
4	UPGRADED SERVO POWER PWA	S0019473
5	KEYBOARD ADAPTATION PWA	S0019873
6	CONTROL PWA	S0019874
7	SID & ROTATION DISPLAY ST PWA	S0025490



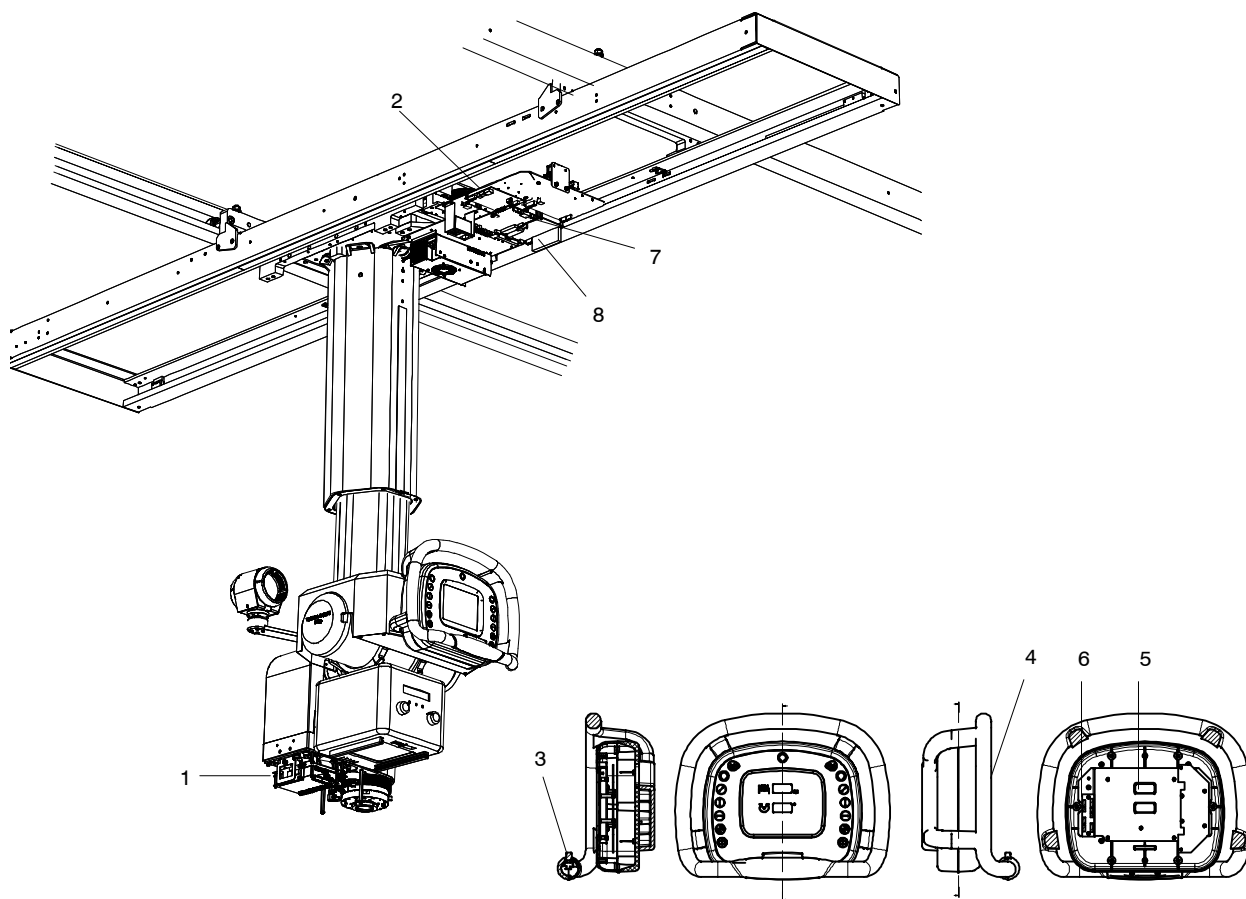
# Standard & Auto-tracking Ceiling Suspension

## Service Manual



4.2.2 AUTO-TRACKING CEILING SUSPENSION

	DESCRIPTION	P/N
1	GAUGE PWA	S0017517
2	SYSTEM CONTROL PWA	S0013450
3	OMNI-BUTTON WITH CABLE PWA	S0019357
4	Z MOTORIZED NOVA TRACKING KEYBOARD	S0024589
5	SID & ROTATION DISPLAY TRACKING PWA	S0025453
6	AUTO-TRACKING KEYBOARD ADAPTATION PWA	S0025488
7	NOVA TRACKING SERVO Z CONTROL PWA	A3704-01
8	AUTO-TRACK Z SERVO POWER PWA	A3705-01



# Standard & Auto-tracking Ceiling Suspension

## Service Manual

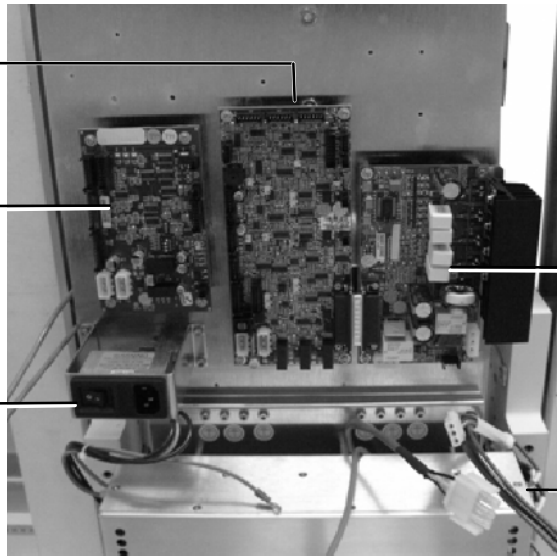
Tracking Servo Z Control PWA

System Control PWA

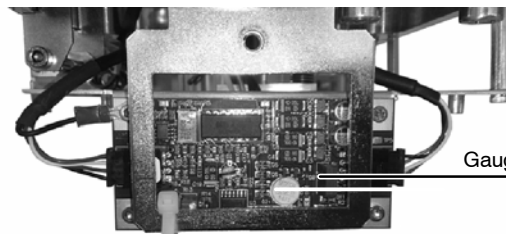
Fuse

Auto-track Z Servo Power PWA

Power Supply



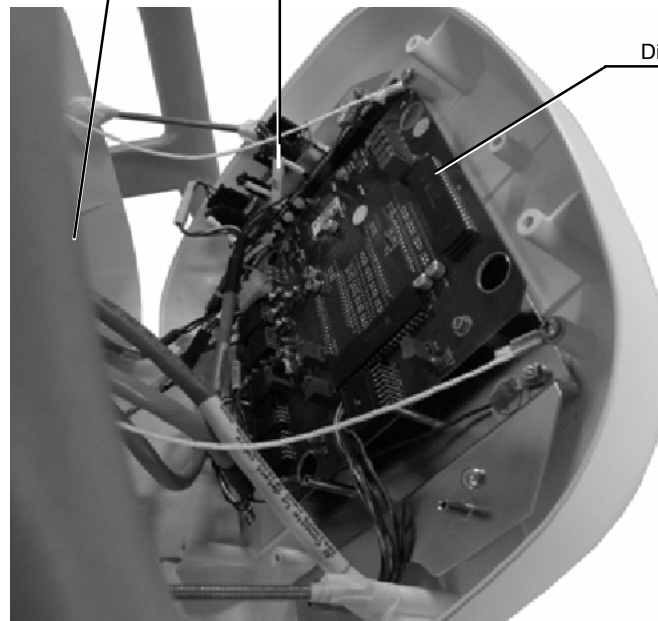
Gauge PWA



Z Motorized Tracking Keyboard

Auto-tracking Keyboard Adaptation PWA

Display PWA



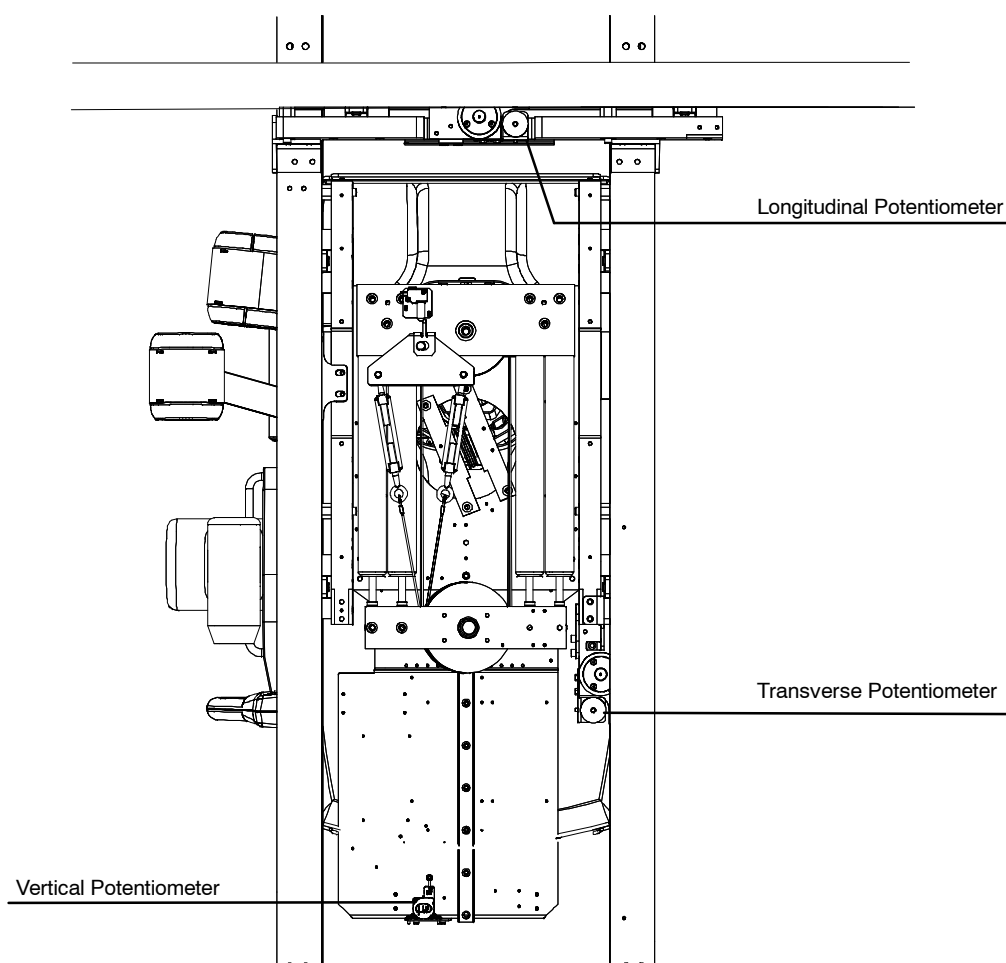
### 4.2.3 POTENTIOMETERS LOCATION

It is required to calibrate some potentiometers of the Table, Wall Stand and Ceiling Suspension.

#### CEILING SUSPENSION POTENTIOMETERS

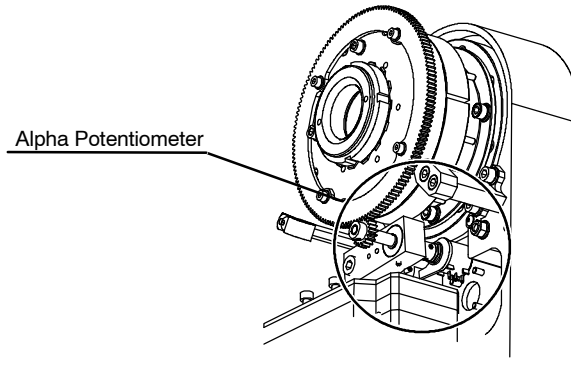
- The Vertical SID Potentiometer, Tube to Floor distance, is mounted on the Suspension at the front of the carriage. It is 10 turns and 5k wired line potentiometer.
- The Horizontal SID Potentiometers, Tube to Wall Stand Distance, are mounted on the Longitudinal axis, on the back Fixation Bearing, and on the transverse one, on the right Carriage Bearing. It is 10 turns and 5k wired line potentiometer.

**Illustration 4-5**  
Top View



- The Alpha Potentiometer for the Angulation adjustment is mounted on the Alpha Axis, at the back of the L-Block. It is also a 10 turns and 5k potentiometer.

**Illustration 4-6**  
**Alpha Potentiometer Location**

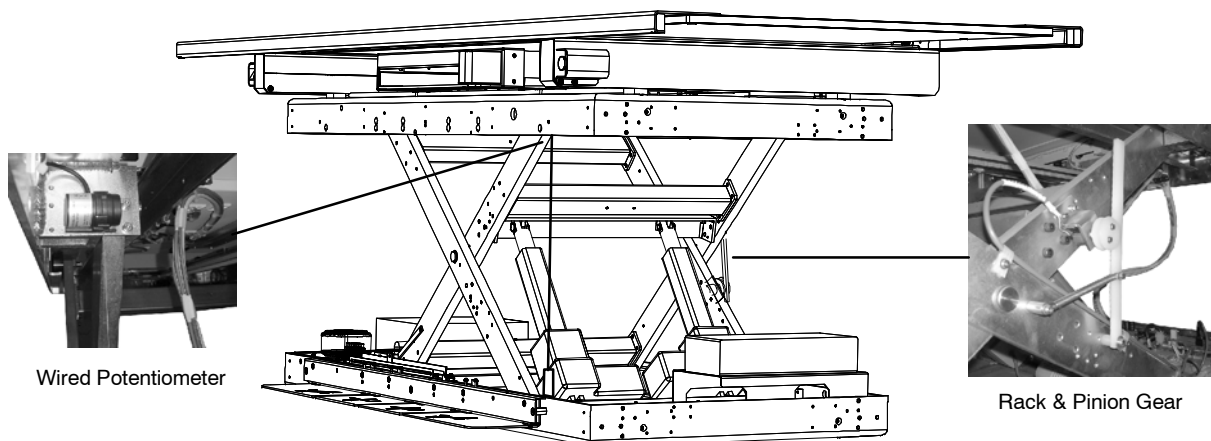


### NET ELEVATING TABLE HEIGHT POTENTIOMETER

The Table height Potentiometer is mounted at the back side of the table. Its cable is **WNT1** and connection **J28**. It is a 3 turns and 5k potentiometer. For further details refer to *Section 11. Schematics* as to The Table Service Manual Schematics.

Depending on the model there are two different models of Height Potentiometer:

**Illustration 4-7**  
**Table Height Potentiometers**



\* only one of these potentiometers will be provided, depending on the model of the Table.

- a. Standard and Auto-tracking w/o I2C models are provided with a rack and pinion gear assembly located at the back of the Table.
- b. Automatic and Auto-tracking with I2C models are provided with the Wired Potentiometer Vertical SID, S0023960. It is already factory configured, it is not necessary to turn or configure it.

**Note** 

*If the Room has automatic collimation, it can be provided with two different potentiometers but with the same look. Remember that the one in the front side of the Table is the automatic collimation potentiometer.*

**MILLENNIUM ELEVATING TABLE HEIGHT POTENTIOMETER**

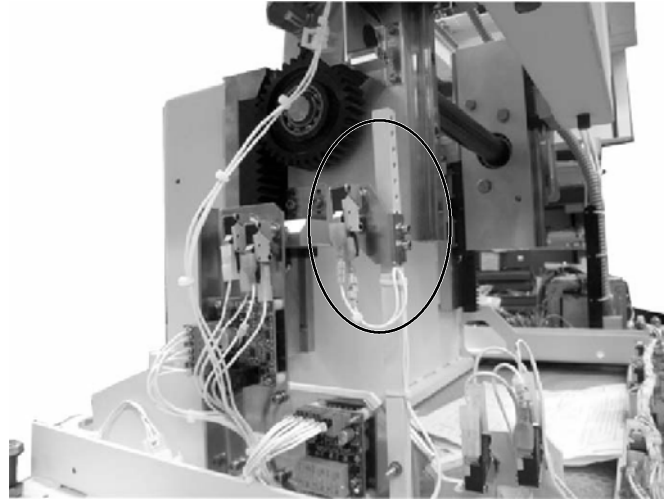
The Table height Potentiometer is mounted at the right side of the table. The Ceiling Suspension connects with cable **WNT1** and Adaptation Kit S0022359 to connector **J4**. For further details refer to *Section 11. Schematics* as to The Table Service Manual Schematics and to the Table Service Manual for height adjustment information.

1. Adjust the Table Potentiometer.

**Illustration 4-8****Millennium Table Height Potentiometer**

2. Adjust the Height Detents.

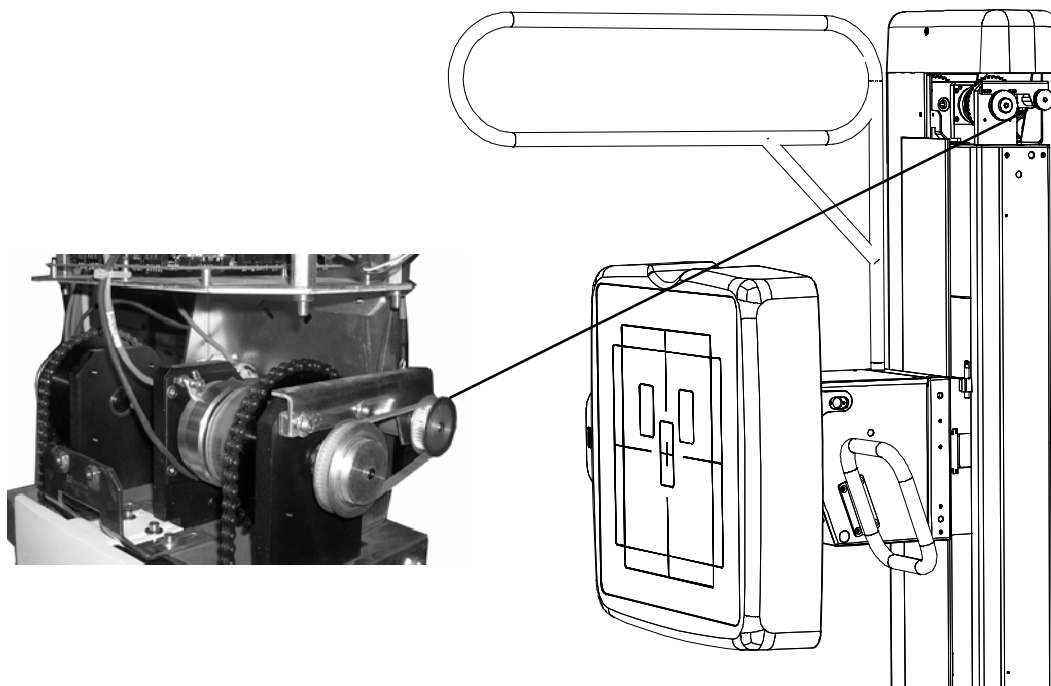
**Illustration 4-9**  
**Millennium Table Height Detent**



**NBS WALL STANDS POTENTIOMETER**

The Wall Stand Vertical Potentiometer is placed at the top of the Wall Stand column. Its cable is **WNT14** and connection is **J31**. It is a 10 turns and 5k potentiometer.

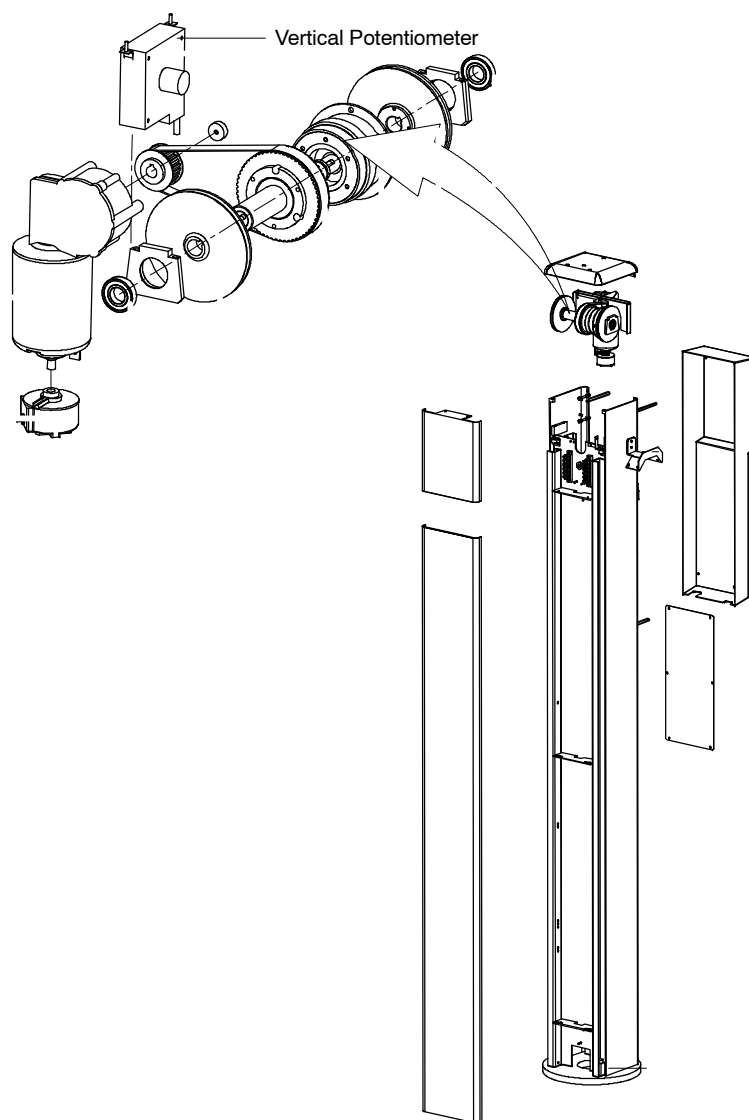
**Illustration 4-10**  
**Wall Stand Vertical Potentiometer**



### MILLENNIUM WALL BUCKY POTENTIOMETER

The Wall Stand Vertical Potentiometer is placed at the top of the Wall Stand column. Its cable is **WNT14** and connection is **J31**. It is a wired potentiometer without any adjustment procedure required.

**Illustration 4-11**  
**Millennium Vertical Potentiometer**



### 4.3 DISPLAY ADJUSTMENT

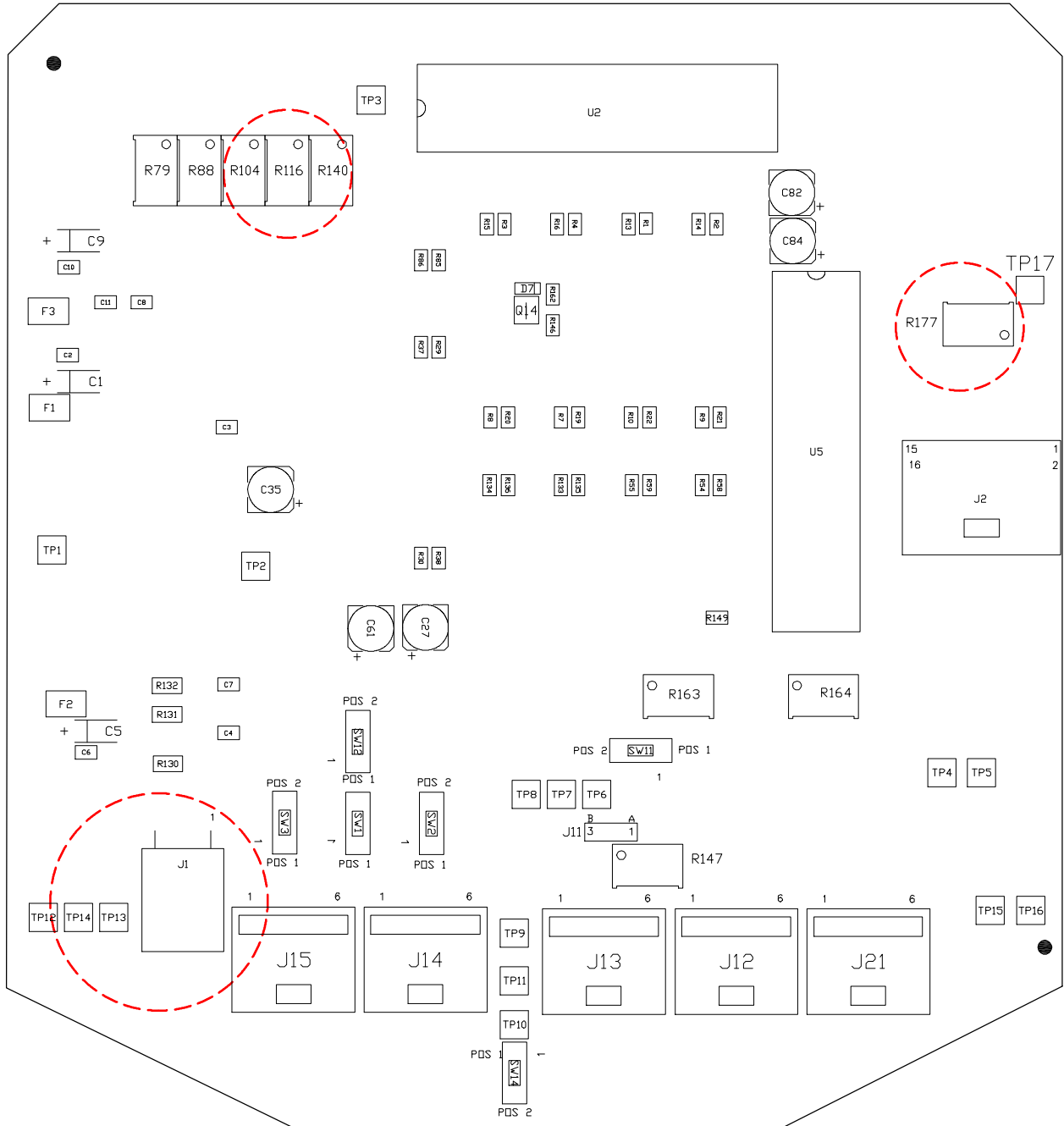
**Note** 

*This Section is valid for both Ceiling Suspension models, Standard and Auto-tracking. Otherwise, it is indicated in the section title and with a NOTE.*

#### 4.3.1 ANGULATION DISPLAY ADJUSTMENT

1. Locate the X-ray tube over the table in horizontal position and stopped in the Alpha Detent position, 45°.
2. Make sure that the Alpha Potentiometer is in the middle of its travel, 5 turns of 10.
3. Check if the tube is correctly level. Use the Spirit level.
4. If not, adjust the mechanical detent.
5. Connect the voltmeter to test points TP14(+) and Pin 2 of J1(-) GND in Display PWA.
6. Check the display data. If it is less than  $\pm 5^\circ$ , adjust to  $0V \pm 2 \text{ mVdc}$  with the voltmeter in potentiometer R116, so the display indicates  $0^\circ$ .
7. Turn the tube  $90^\circ$  facing it to the Wall stand. The display will indicate  $90^\circ$ , if not, adjust again R177.
8. Check again that with the tube faced to the table, the display indicates  $0^\circ$ .

**Illustration 4-12**  
**Display and SID PWA**



### 4.3.2 VERTICAL SID DISPLAY ADJUSTMENT

Proceed to calibrate the SID display when working with radiological tables. Depending if the Table is elevating or not, the procedure is different.

#### REQUIRED CONDITIONS



**THE TUBE MUST BE MOVED ALONG ALL THE VERTICAL AXIS. REMOVE ANY OBSTACLE FROM ITS TRAVEL OR ANY TOOL THAT HAS BEEN USED FOR ITS INSTALLATION OR SERVICE TASKS. OTHERWISE, THE EQUIPMENT OR OPERATOR COULD GET DAMAGED OR INJURED.**

1. Place the tube in horizontal position and locked by the mechanical detent. Check the horizontally with a level.
2. Check that the Angulation display indicates 0°.

**Illustration 4-13**  
**Ceiling Suspension Control Console**



### SUSPENSION VERTICAL POTENTIOMETER ADJUSTMENT. ELEVATING TABLES

1. Remove the Connector J1 from the Display SID & Rotation PWA, P/N S0023347 so display is powered OFF.
2. Adjust R147 Potentiometer to the corresponding value and J11 position as indicated below:

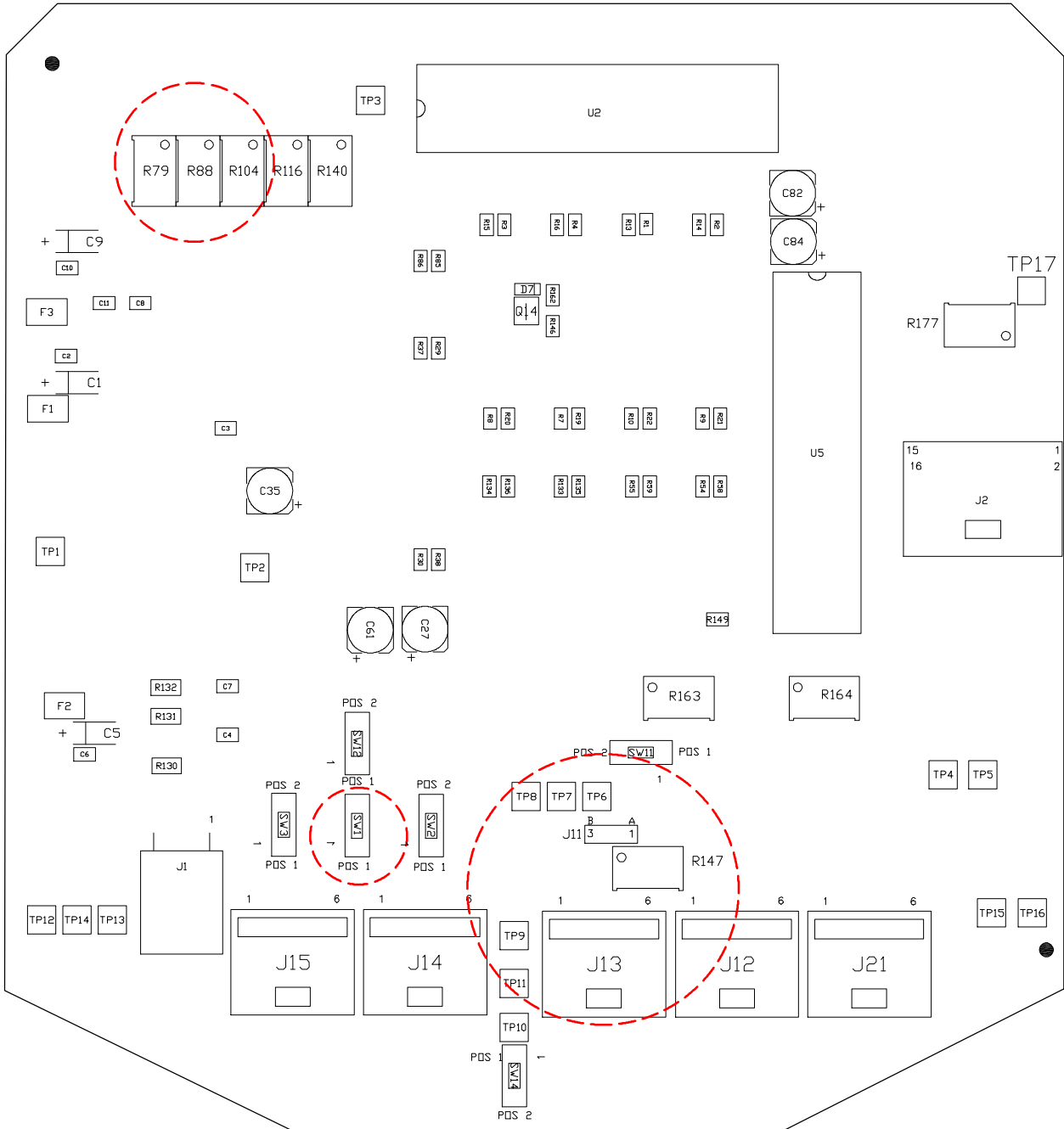
		Wired Potentiometer	Track and Pinion Potentiometer	Millennium
Standard CS	R147	154 K	122 K	151 K
	J11	A		
Auto-tracking CS	R147	∅	857 K	∅
	J11	B	A	B

3. Turn ON the System.
4. In the case that the Table is provided with the Rack & Pinion Potentiometer (with white Pulley), get the table at the middle position of its vertical travel and adjust the Potentiometer also at the middle of its turns. It is a 3 turn potentiometer, so turn it just 1.5 turns.
5. Adjust R88 to have a voltage in TP8 and GND (Pin2 of J1) as lower as possible, nearest to 0V.
6. Connect a voltmeter between TP7 and GND (Pin2 of J1).
7. Check if it is correctly adjusted as indicated below:
  - a. Move the Table to the lowest position and measure the voltage in TP7 to obtain the V1 value.
  - b. Measure the distance from Tabletop to the Floor, to obtain distance D1.
  - c. Move the Table to the highest position a measure the voltage in TP7 to obtain the V2 value.
  - d. Measure the distance from Tabletop to Floor to obtain distance D2.
  - e. Make the following calculations:  

$$(V2-V1)/(D2-D1)=20mV/mm \text{ (Standard Table)}$$

$$(V2-V1)/(D2-D1)=15mV/mm \text{ (Auto-tracking Table)}$$
8. If the result is not 20mV/mm (Standard Table) or 15mV/mm (Auto-tracking Table), proceed to adjust again R147 and repeat all steps 2 to 7.
9. Make sure that the switch SW11 is in position 1 in the Display board.

**Illustration 4-14**  
**Display & SID PWA**



**TABLE VERTICAL POTENTIOMETER ADJUSTMENT**

Note 

*Check that jumper J11 is set to A when using a NET elevating Table and to B when using a Millennium elevating Table.*

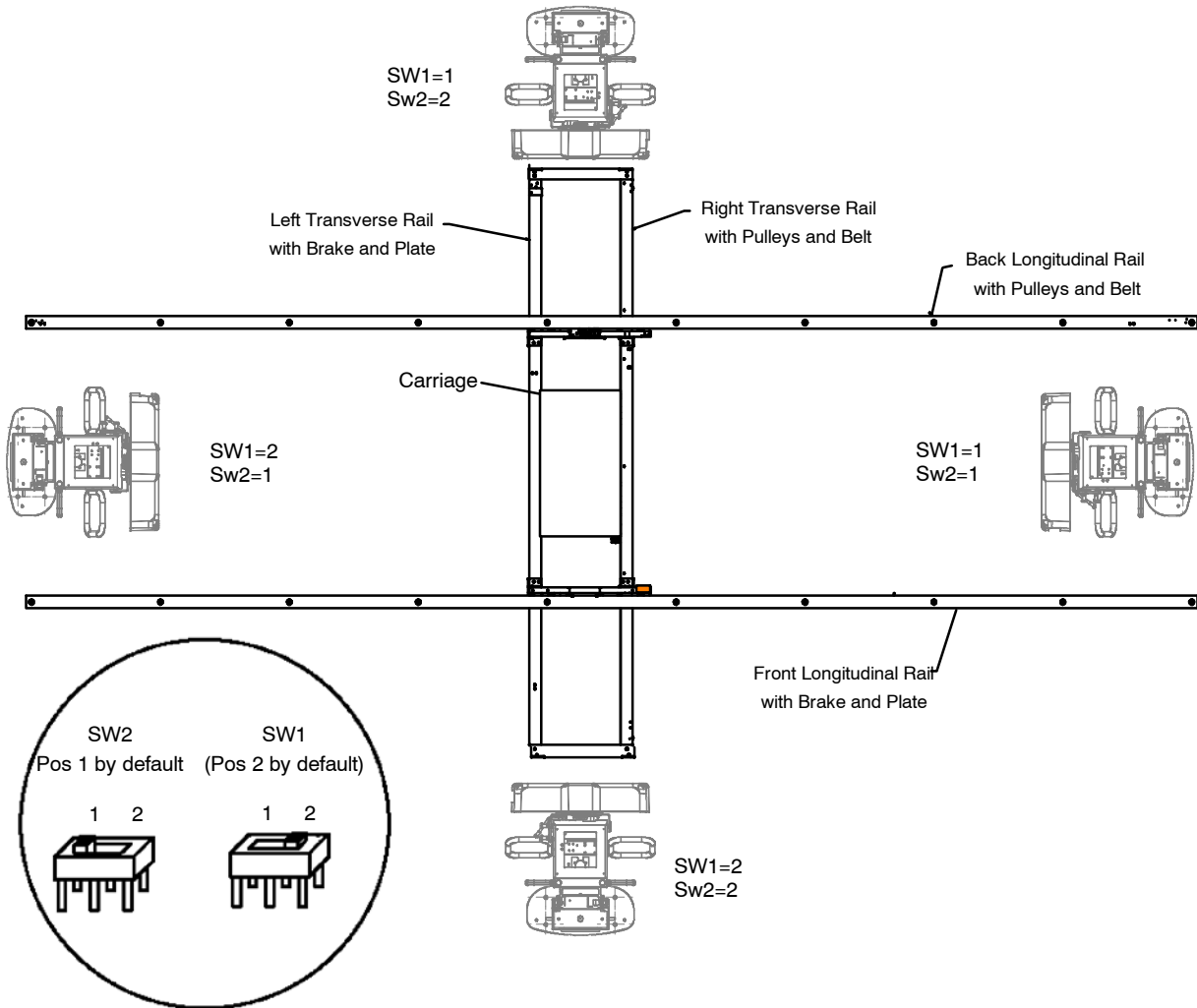
1. Obtain the maximum and minimum height of the table to get a middle height.
2. Place the table in this middle height.
3. Measure to obtain the Film Height, that is, the distance in mm between the film and the floor.
4. Place the Tube and the Focal Point at a 1800mm (70.86") distance from the floor.
5. Put the Table Vertical Potentiometer into the middle of its turns. This potentiometer has 3 turns, so it must be at 1.5 turns.
  - a. Adjust the R88 (gross adjustment) and R79 (fine adjustment) until voltage between TP7(+) and J1(-) terminal 3 is the same as:  
*Film Height in mm. X 15mV ( $\pm 25mV$ )*
  - b. Adjust again R88 to make sure that the Display shows the real distance between the focal point and the table film, the Vertical SID.
6. Repeat step 4 placing the table at its maximum and minimum heights.
7. Depending on the room height it may be necessary to readjust the Suspension Vertical Potentiometer. It is recommended if some of the operational amplifier is in saturation.

**4.3.3 HORIZONTAL SID ADJUSTMENT**

1. Place the Ceiling Suspension in the center of its longitudinal travel.
2. Connect the voltmeter to test points TP15(+) and Pin 2 of J1(-) GND on board Console Display PWA.
3. Take out the potentiometer and adjust it at the center of its range, 5 turns of 10, the voltmeter will indicate  $-5Vdc \pm 100mV$ .
4. Put the potentiometer back in position.
5. Tilt the tube to get it facing the Wall Stand. Press on the Alpha Brake button and move manually. Refer to *Section 6.1.3.* for further details about manual operation.
6. Move it up to get the 1500 mm (59.05") SID.

- Set the SW1 and SW2 switches of the Display PWA in the correct position according on the position of the Wall Stand in the room.

**Illustration 4-15**  
**Switches Configuration depending on the Room Layout**



- Adjust the Potentiometer R104 of the Display PWA until SID value indicates 1500 mm (59.05"). For a fine adjustment, adjust R140 to get the same value.

**Note**

*In some cases depending on the Wall Stand position it may be necessary to jumper the R103 or R142 resistances, in order to adjust properly the display value.*

- Check that moving horizontally the Suspension from 1000 to 2000 mm (39.37 to 78.74"), the SID display indicates the correct distance with a  $\pm 20$  mm tolerance.

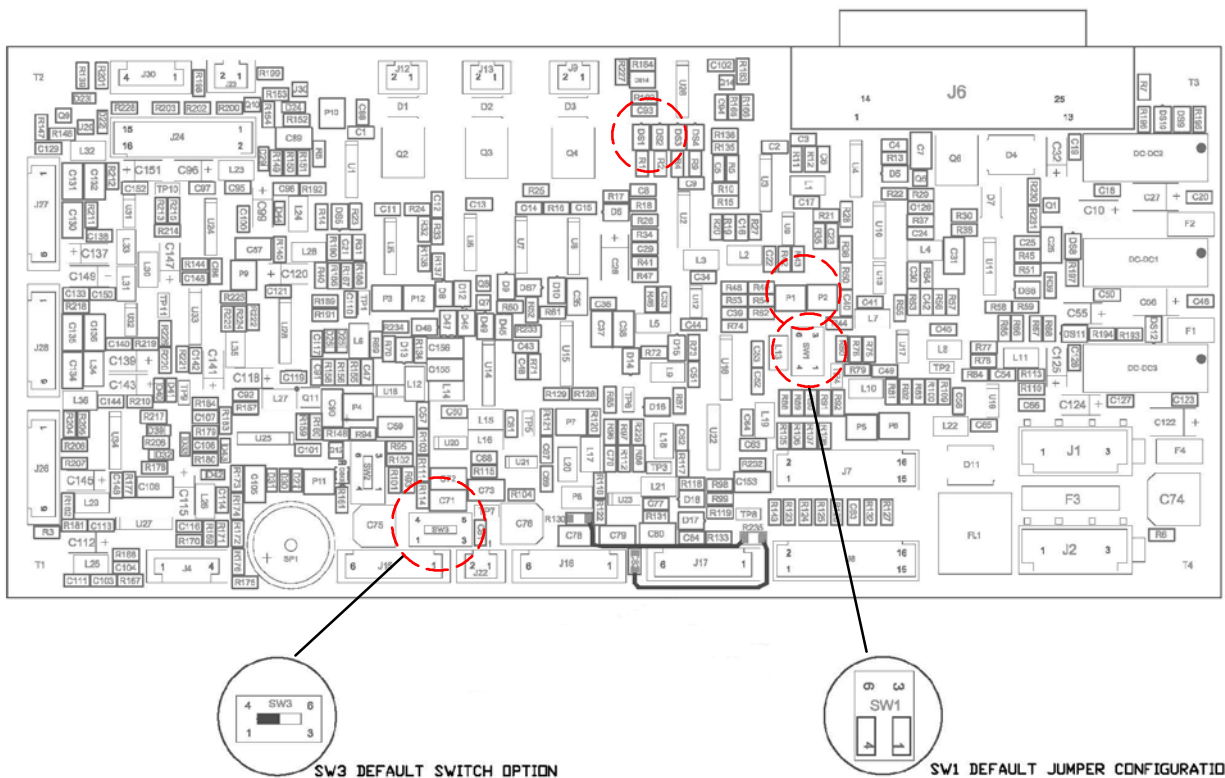
4.3.4 X-RAY TUBE VERTICAL TRAVEL LIMITS ADJUSTMENT. AUTO-TRACKING

Note 

*This Section is just valid for Auto-tracking Ceiling Suspensions. Do not heed in case of Standard Ceiling Suspensions.*

1. Get the X-ray Tube to 20 mm lower than its higher position, adjust the potentiometer P1 to get the Servo Control PWA, P/N S0024910, led DS2 lighted.
2. Get the X-ray Tube to 20 mm higher than its lower position, adjust the potentiometer P2 to get the led DS1 lighted.

**Illustration 4-16**  
**Servo Control PWA**



### 4.4 STANDARD SUSPENSION DETENTS & ALIGNMENT ADJUSTMENT

**Note** 

*This Section is valid just for Standard Ceiling Suspensions. Do not heed in case of Auto-tracking Ceiling Suspensions.*

The electronic detents are programmed to facilitate the operator in the positioning and centering of the Suspension. It will be necessary to calibrate them in the Gauge Interface & Detents PWA, S0019383.

There are five electronic Detents programmed in Longitudinal, Transverse (2 on each) and Vertical axis (just 1). Furthermore, there are also some mechanical detents on the Beta and Alpha axis for the rotation and angulation movements, with the same function. For further information refer to *Section 6.1.4.3*.

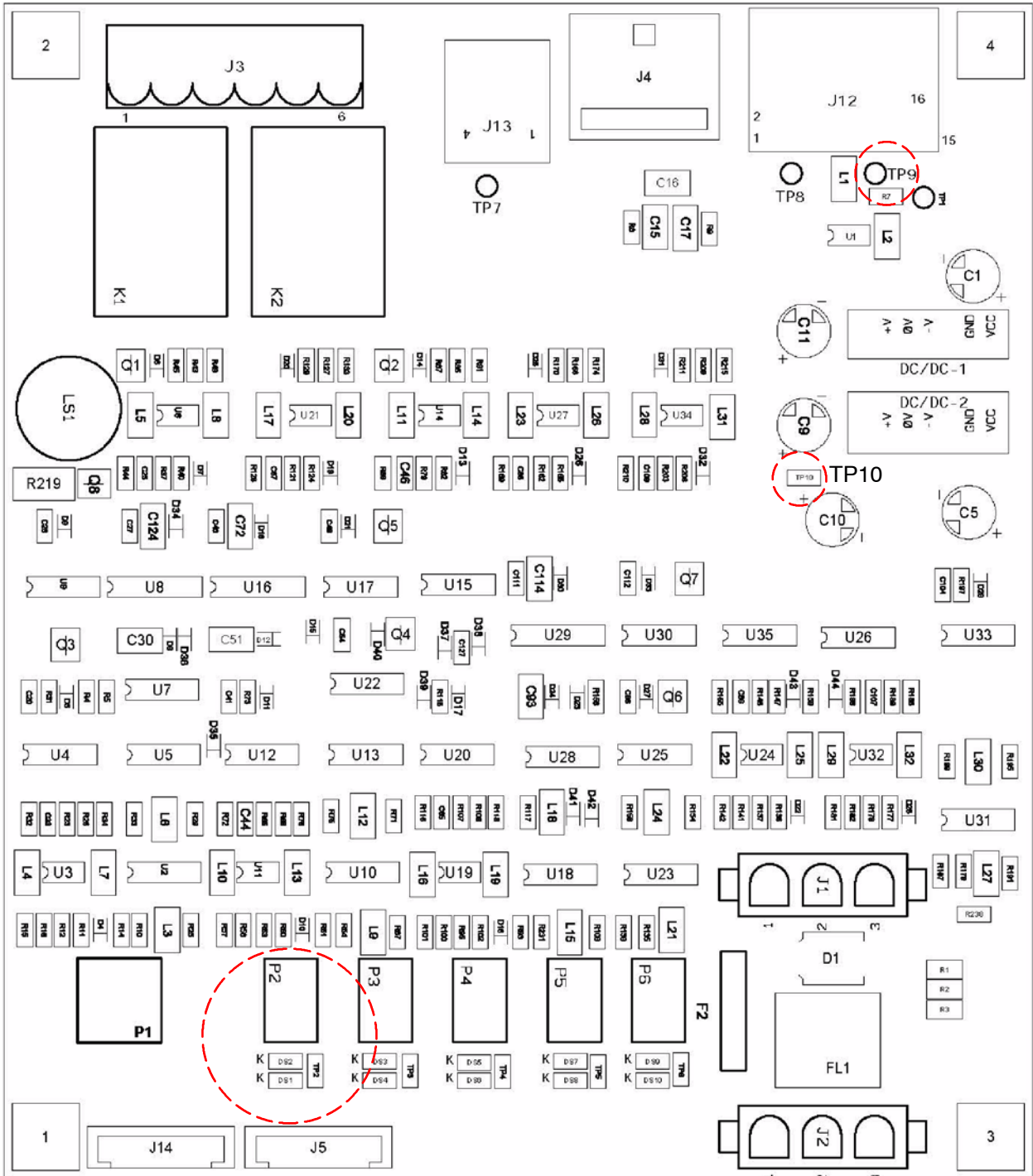
#### REQUIRED CONDITIONS

1. Locate the Suspension in the center of its transverse travel.
2. Connect the voltmeter to test points TP1(+) and TP10(-) GND on board PBA Load Cell Interface & Detent, P/N S0019383.
3. Take out the potentiometer and adjust it at the center of its range, 5 turns of 10, the voltmeter will indicate  $-5Vdc \pm 100mV$ .
4. Put the potentiometer back in its position.

#### 4.4.1 STANDARD VERTICAL DETENT ADJUSTMENT

1. Locate the tube over the table and in vertical position,  $0^\circ$  of angulation. Adjust the SID according to the used grid.
2. Connect a voltmeter in the test points TP8(+) and TP2(-).
3. Adjust the potentiometer of P2 to obtain  $0 \pm 10mVdc$  with the voltmeter, Leds DS1 and DS2 get lighted and a Beep alarm sounds when DS2 is ON.
4. Check that slightly moving up and down the tube & collimator assembly, the detent works properly and at the programmed SID.
5. Afterwards, check that moving at high velocity, it does not work.
6. Check that after modifying the table height, the SID data is the same.

Illustration 4-17  
 Load Cell Interface & Detent PWA



### 4.4.2 STANDARD LONGITUDINAL DETENTS ADJUSTMENT

#### ALIGNMENT WITH THE TABLE

1. Place the table detector in the center of its longitudinal travel.
2. Locate the tube over the table, in vertical position,  $0^{\circ}$  angulation and longitudinally aligned with the detector. Use the collimator light for better centering.
3. Connect the voltmeter to the test points TP9(+) and TP3(-).
4. Adjust the potentiometer of P3 to obtain  $0 \pm 10\text{mVdc}$  with the voltmeter, Leds DS3 and DS4 get lighted and a Beep alarm sounds when DS4 is ON.
5. Check that slightly moving the Suspension longitudinally, the detent works, stopping the tube over the center of the table.
6. Check that repeating the same procedure as before, but with more velocity, it does not work.

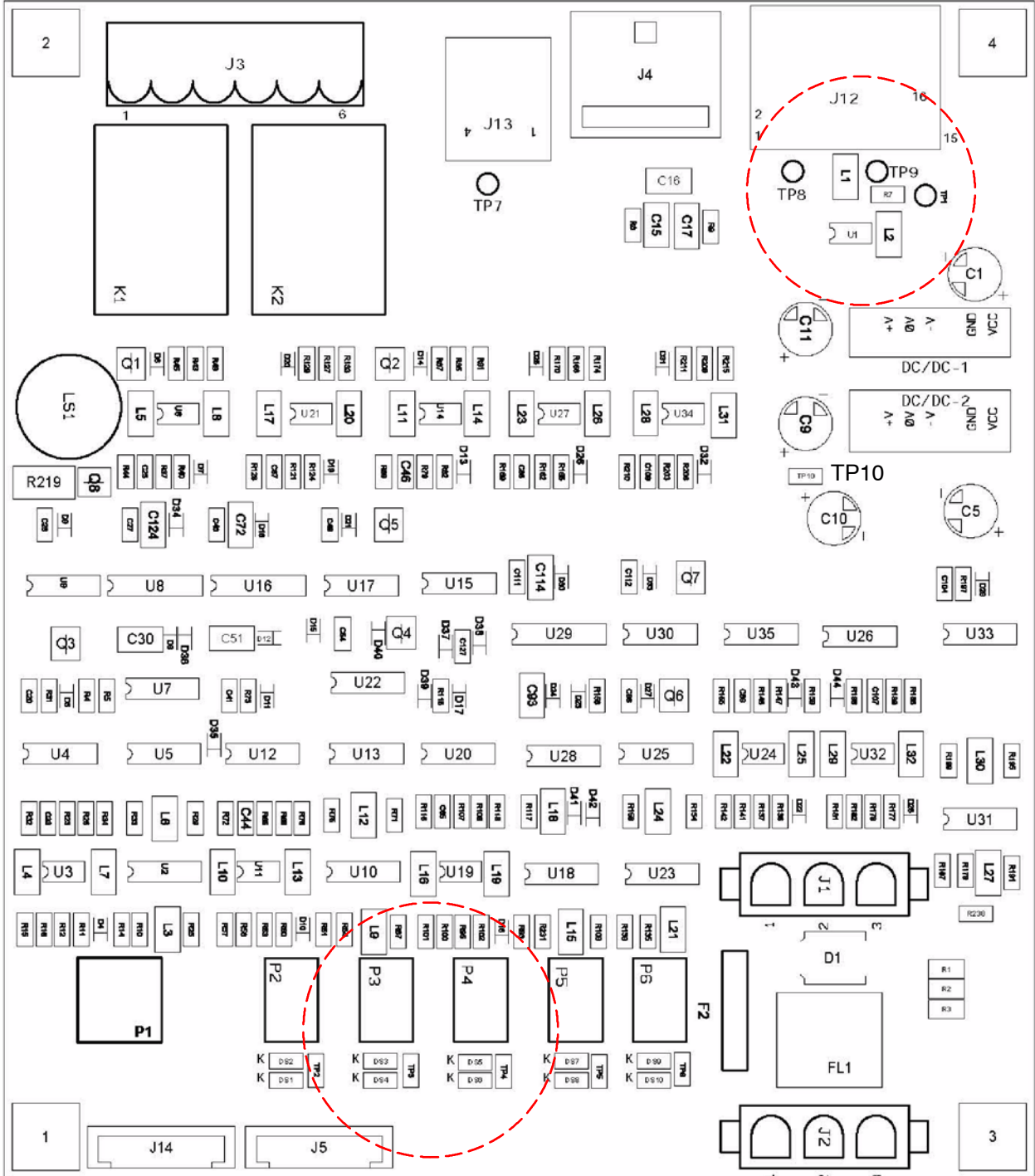
#### HORIZONTAL SID WITH THE WALL STAND ADJUSTMENT

1. Locate the tube with  $90^{\circ}$  of angulation and facing to the Wall Stand.
2. Adjust SID value according to the grid.
3. Connect the voltmeter to TP9(+) and TP4(-).
4. Adjust potentiometer P4 to obtain  $0 \pm 10\text{mVdc}$  with the voltmeter, Leds DS5 and DS6 get lighted and a Beep alarm sounds when DS5 is ON.
5. Check that slightly moving the Suspension longitudinally, the detent works properly, stopping the tube where over configured SID.
6. Check that repeating the same procedure as before, but with more velocity, it does not work.



**MINIMUM DISTANCE BETWEEN BOTH DETENTS MUST BE 100 mm.**

**Illustration 4-18**  
**Load Cell Interface & Detent PWA**



### 4.4.3 STANDARD TRANSVERSE DETENTS ADJUSTMENT

#### ALIGNMENT WITH TABLE CALIBRATION

1. Place the table detector in the center of its transverse travel.
2. Locate the tube over the table, in vertical position, 0° angulation and transversely aligned with the detector. Use the collimator light for better centering.
3. Connect the voltmeter to the test points TP1(+) and TP5(-).
4. Adjust the potentiometer of P5 to obtain  $0 \pm 10\text{mVdc}$  with the voltmeter, Leds DS7 and DS8 get lighted and a Beep alarm sounds when DS8 is ON.
5. Check that slightly moving the Suspension transversely, the detent works, stopping the tube over the center of the table.
6. Check that repeating the same procedure as before, but with more velocity, it does not work.

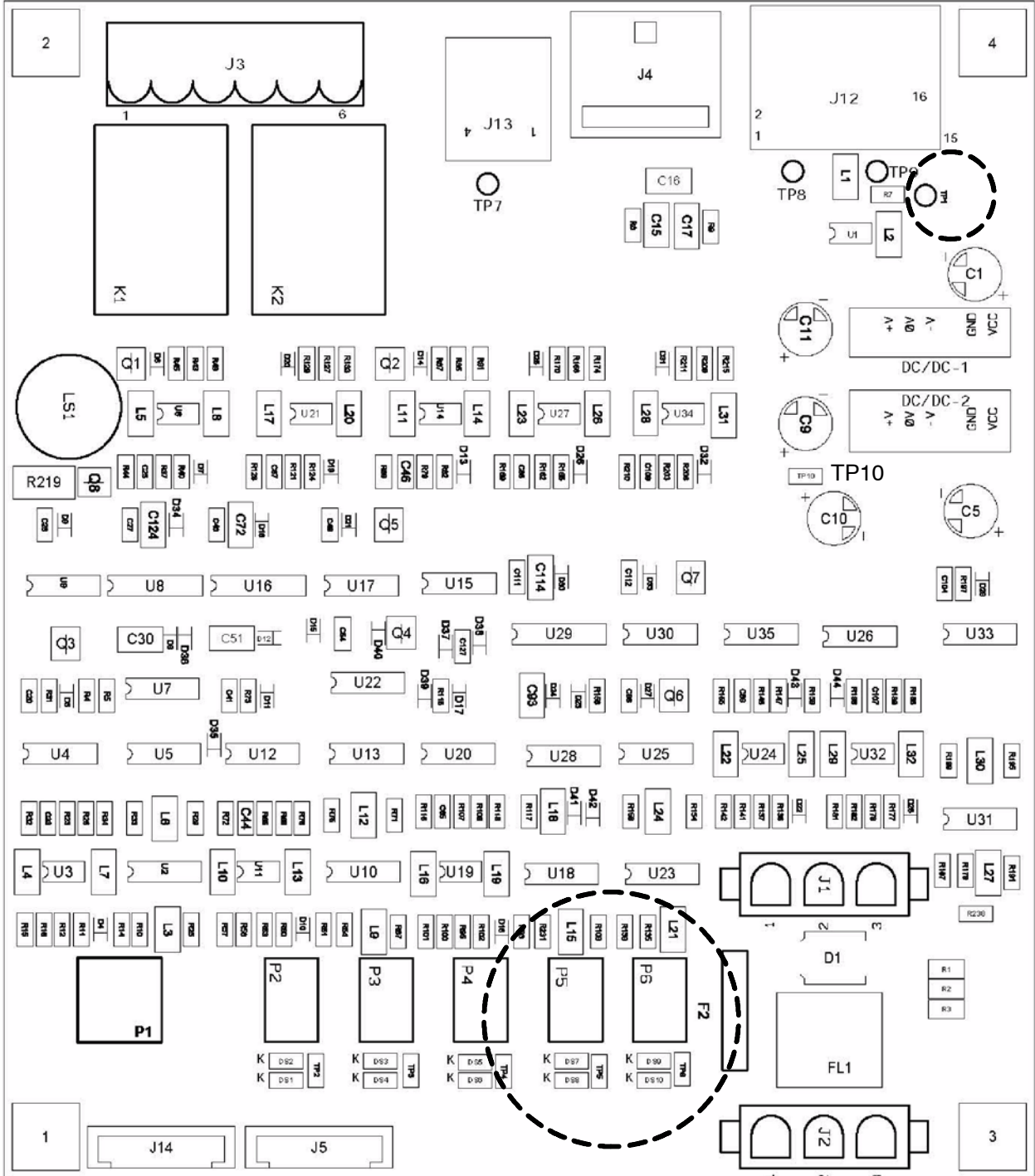
#### ALIGNMENT WITH WALL STAND CALIBRATION

1. Locate the tube with 90° of angulation and facing to the Wall Stand. Use the collimator light for better centering.
2. Connect the voltmeter to TP1(+) and TP6(-).
3. Adjust potentiometer P6 to obtain  $0 \pm 10\text{mVdc}$  with the voltmeter, Leds DS9 and DS10 get lighted and a Beep alarm sounds when DS10 is ON.
4. Check that slightly moving the Suspension transversely, the detent works properly, stopping the tube aligned with the center of the Detector.
5. Check that repeating the same procedure as before, but with more velocity, it does not work.



**MINIMUM DISTANCE BETWEEN BOTH DETENTS MUST BE 100 mm.**

**Illustration 4-19**  
**Load Cell Interface & Detent PWA**



### 4.5 AUTO-TRACKING SUSPENSION DETENTS & ALIGNMENT ADJUSTMENT

Note 

*This Section is just valid for Auto-tracking Ceiling Suspensions.  
Do not heed in case of Standard Ceiling Suspensions.*

#### 4.5.1 AUTO-TRACKING SYSTEM CONTROL PWA ADJUSTMENT

1. Place the Ceiling Suspension in a position where this board can be easy to access. The S0013450 System Control Board is located in the carriage, so the Carriage covers must be opened.
2. Switch OFF the Auto-tracking function. Click on the Auto-tracking ON/OFF Button. It must not be lighted.

##### 4.5.1.1 AUTO-TRACKING ANGULATION DETENT CHECKING

1. Place the tube in horizontal position until assure that the mechanical detent stops it. The Display must show 0° Angulation.
  - a. DS2 led must be lighted.
  - b. Make sure that DS2 is lighted when rotation is in the scale of  $\pm 2^\circ$ . Otherwise, adjust R116 in the S0025453 Display & SID Rotation Tracking Board.
2. Place the tube in a 90° angle, pointing to the Wall Stand.
3. Adjust P1 of the S0013450 System Control Board to get a voltage between TP1(+) and TP2(-) of 0,000V.
  - If the voltage is near to 900mV, this means that SW2 is not in the correct position. Make sure that DS1 is lighted with this conditions.
  - Make sure that DS1 is lighted when rotation is in the scale of  $\pm 2^\circ$ , oriented to the Wall Stand. Otherwise, adjust P1 in the System Control Board.

##### 4.5.1.2 AUTO-TRACKING FUNCTION CHECK

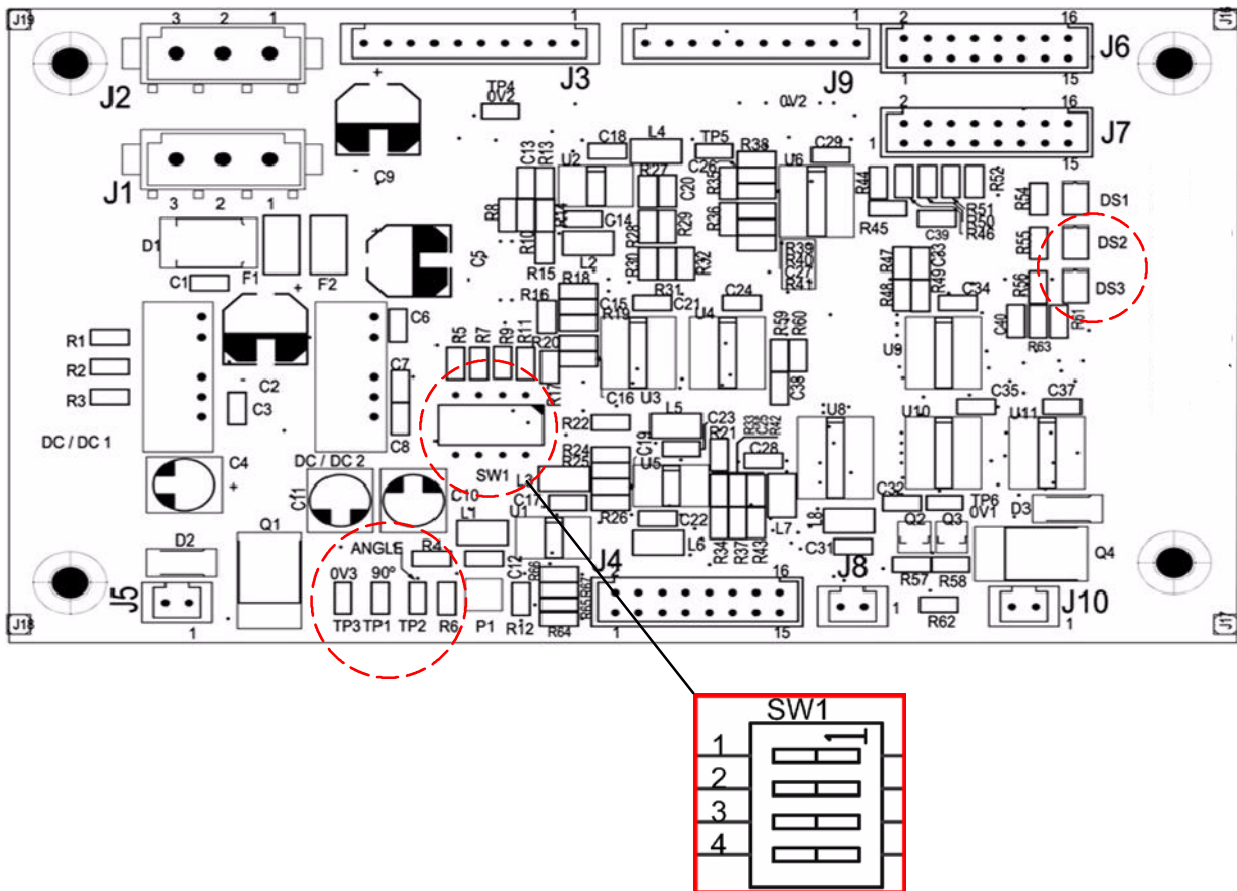
1. Switch ON the Auto-tracking function by clicking once on the Auto-tracking Button.
2. Check that DS3 Led gets lighted.

4.5.1.3 FOCUS TO TABLE BUCKY DISTANCE SELECTION

In Auto-tracking mode, focus to film distance is selected using the switch SW1. Configure one default SID distance, as shown in the table below. It is also possible to select different positions to obtain intermediate SID values.

SW1	SID (mm.)
1-ON 2-OFF 3-OFF 4-OFF	1400 (55.11")
1-OFF 2-ON 3-OFF 4-OFF	1200 (47.24")
1-OFF 2-OFF 3-ON 4-OFF	1000 (39.37")
1-OFF 2-OFF 3-OFF 4-ON	800 (31.49")
1-ON 2-ON 3-OFF 4-OFF	1300 (51.18")
1-OFF 2-ON 3-ON 4-OFF	1100 (43.30")
1-OFF 2-OFF 3-ON 4-ON	900 (35.43")

Illustration 4-20  
Auto-tracking System Control Board



4.5.2 SERVO CONTROL PWA ADJUSTMENT

1. Place the ceiling Suspension in the center of its longitudinal and transverse travel.
2. Place the tube in horizontal position until making sure that the mechanical detent stops it. Check the horizontality with a lever. Angulation display must indicate 0°.
3. The tube is going to be moved along all the vertical axis. Remove any obstacle from its travel.
4. Switch ON the equipment and the Auto-tracking function. Click on the Auto-tracking ON/OFF Button. It must be green lighted, red means that the Suspension and Detector are not aligned, green means that they are aligned.
5. The target is to adjust the Auto-tracking velocity and movements limits of the Tube. There are two different velocities:
  - Wall Stand Alignment Velocity, which is fixed and not adjustable.
  - Table Alignment Velocity, which is a low speed movement and adjustable. Its value is smaller than the table velocity to avoid oscillations that will be produced if the ceiling Suspension would reach the selected focus to film distance before the table stops.
6. First, adjust the vertical movements limits and then the vertical velocity or Table Alignment Velocity.

Illustration 4-21  
Servo Control PWA



#### 4.5.2.1 TABLE ALIGNMENT VELOCITY ADJUSTMENT

There are two different velocities:

- a. **Upwards.** Adjust P3 in the Servo Control PWA to get a smooth tracking movement. Then, measure the voltage value obtained between TP1 and Ground and write it down. The Velocity is proportional to the absolute value of the voltage of TP1. The Polarity is positive when rising and negative when lowering.
- b. **Downwards.** Adjust P12 in the Servo Control PWA until the voltage value measured between TP1 and Ground is the same value measured in the previous step. The Velocity is proportional to the absolute value of the voltage of TP1. The Polarity is positive when rising and negative when lowering.

**Note** 

*The voltage value measured in TP1 varies depending on the Table vertical speed.*

The Suspension vertical movement is temporized. There is a determined time, 30", to complete the whole vertical travel. This time is longer than the necessary to avoid the motor overheat that would be produced if the Suspension is stopped because there is any obstacle that stops it or it has arrived to the limit of the travel. If not reaching, the motor will stop, and will be necessary to press the Auto-tracking ON/OFF Button twice to get the function ON.

#### 4.5.2.2 SERVO VERTICAL GAIN ADJUSTMENT

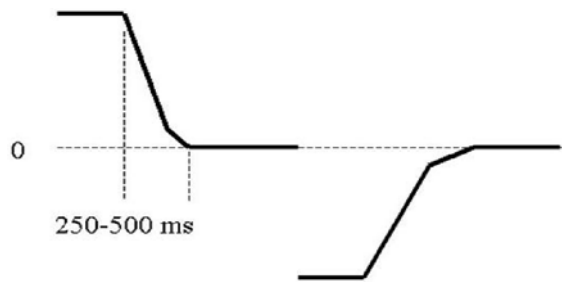
This gain is the responsible of the way of reaching the desired position, An over gain value would produce overshoot or oscillations when reaching the position. A lower value of the gain would make a smooth stop, but the Suspension would not reach the position. Adjust P4 to adjust the gain:

1. Measure the voltage in TP1 (scope 2V/div., 250ms/div).
2. Move up and down the Wall Stand quickly.
3. Take note of the voltage falling time when the Suspension stops. This time should be over 250 and 500 ms.

4. Measure with a polimeter the error signal at TP1 when the Suspension stops. The typical value is  $\pm 5\text{mV}$ . Overcoming  $10\text{mV}$  means a low value of gain.

### Illustration 4-22

#### Servo Vertical Gain Adjustment



#### 4.5.2.3 WALL STAND TO SUSPENSION CENTERING ADJUSTMENT

1. Turn off the system and measure between U23-1 and U23-8 to check that P8 is adjusted to the correct value:
  - 488 k for Millennium Wall Stand.
  - 1 MOhm for NBS Wall Stand.
2. Adjust P8 if necessary.
3. Turn on the system and place the Suspension at the end of its longitudinal travel and with the tube pointing to the Wall Stand. The SID must be 900 mm (35.43").
4. Switch ON the Auto-tracking function. Click on the Auto-tracking ON/OFF Button. It must be green lighted, amber means that the Suspension and Detector are not aligned, green means that they are aligned.
5. In the Servo Control PWA adjust P6 to get the DS4 led lighted.
6. Move the Suspension longitudinally between 900 and 2200 mm (35.43" and 86.61"). DS4 led must remain lighted.
7. Move vertically the Wall Stand, the tube must follow the movement.
8. With the collimator light (or laser system) check the alignment of the tube focus with the Wall Stand Bucky center. Refer to *Section 3. System Installation*.
9. In case of misalignment:
  - Make a fine tuning with P7 if the misalignment is smaller than  $\pm 5$  cm.

- Adjust the WS potentiometer in the Servo Control PWA if the misalignment is higher than  $\pm 5$  cm. To do so:
    - Loosen the set screw that fixes the toothed pulley to the potentiometer.
    - In the Servo Control PWA adjust the WS potentiometer to a  $5.00 \pm 25$ mV voltage with a plane screwdriver until the Suspension is aligned as much as possible. Do not move the Bucky.
    - Tighten the set screw back.
    - Make a fine tuning with P7.
10. Check this adjustments moving the Suspension forwards and backwards along the Longitudinal Axis and then, vertically. It must point all the time to the center of the Wall Stand.
  11. Otherwise, adjust again P7 or the Wall Stand Potentiometer.

**Illustration 4-23**  
**Servo Control PWA**



### 4.6 VERTICAL MOTION ADJUSTMENT

The Suspension vertical motion is possible due to the Servo Power Board that helps the vertical motion by the vertical motor that is controlled by the strain gauge or Load Cell.

**Note** 

*This Section is valid for both Ceiling Suspensions models, Standard and Auto-tracking. Otherwise, it is indicated in the section title and with a NOTE.*

#### 4.6.1 STANDARD CEILING SUSPENSION. SERVO POWER BOARD ADJUSTMENT



**EVERY ADJUSTMENT OF THIS PWA CAN AFFECT SERIOUSLY THE CORRECT PERFORMANCE OF THE EQUIPMENT. IT IS ABSOLUTELY NOT ALLOWED ANY OTHER POSITION THAN THE SPECIFIED BELOW.**

Adjust in Servo Power Board:

1. SW1 bridge always between pins 1 and 2
2. SW2 always in position F



4.6.2 AUTO-TRACKING VERTICAL. Z SERVO POWER BOARD ADJUSTMENT

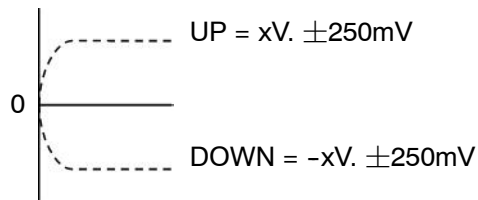


IT IS ABSOLUTELY MANDATORY TO CHECK THE CORRECT BALANCE OF THE SUSPENSION WEIGHTS, AS DEPENDING ON THE INSTALLED TUBE AND COLLIMATOR, WEIGHT BALANCE CAN BE MODIFIED.

IF IT IS NOT CORRECT IT CAN AFFECT SERIOUSLY THE SUSPENSION PERFORMANCE AND GET THE GAS SPRINGS SERIOUSLY DAMAGED.

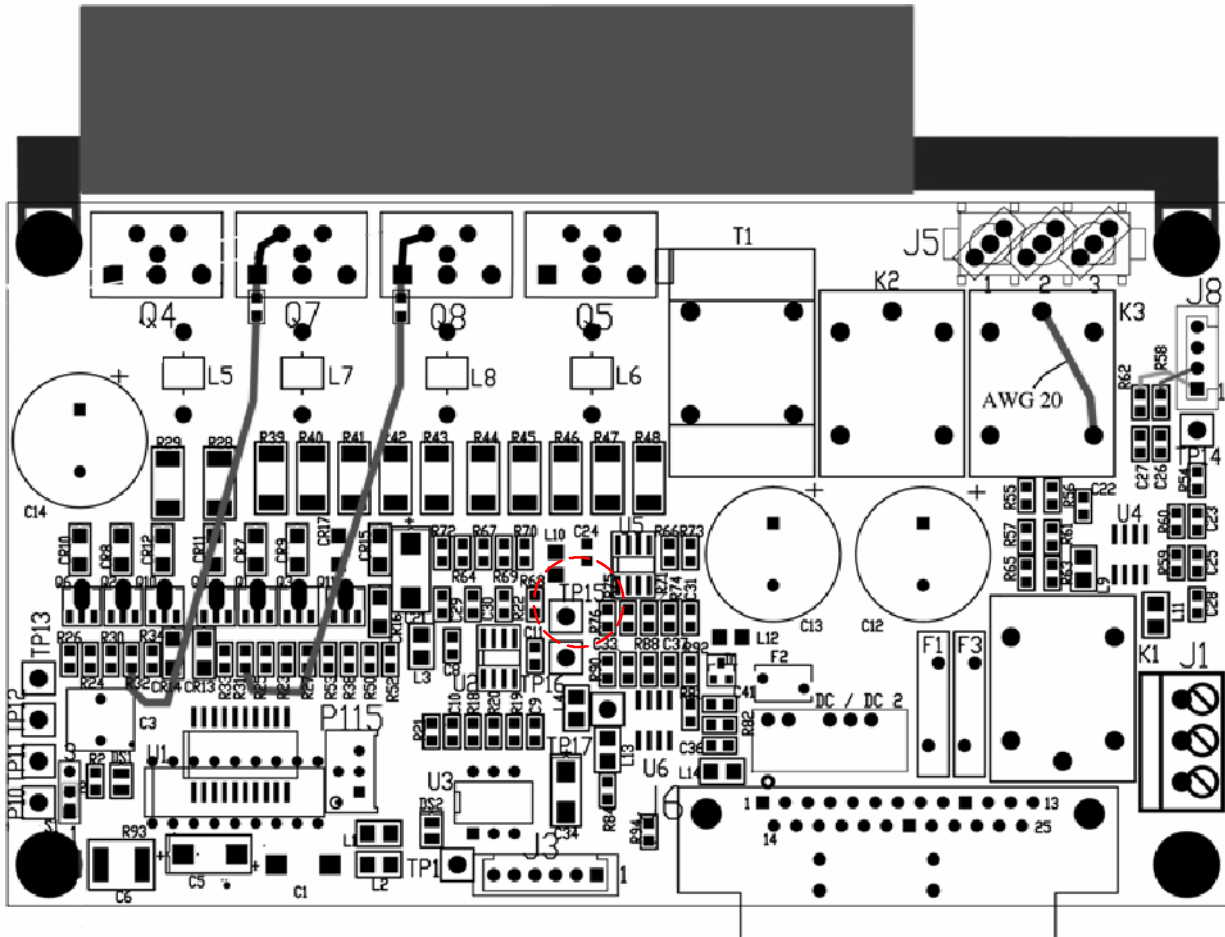
1. Disconnect the Vertical Motor Cable.
2. Connect the oscilloscope to the TP15 on Z Servo Power Board.
3. Move up and down the Tube. Use a dynamometer to control that the same or equal strength is applied in both directions.

**Illustration 4-25**  
**Applied strength in both directions**



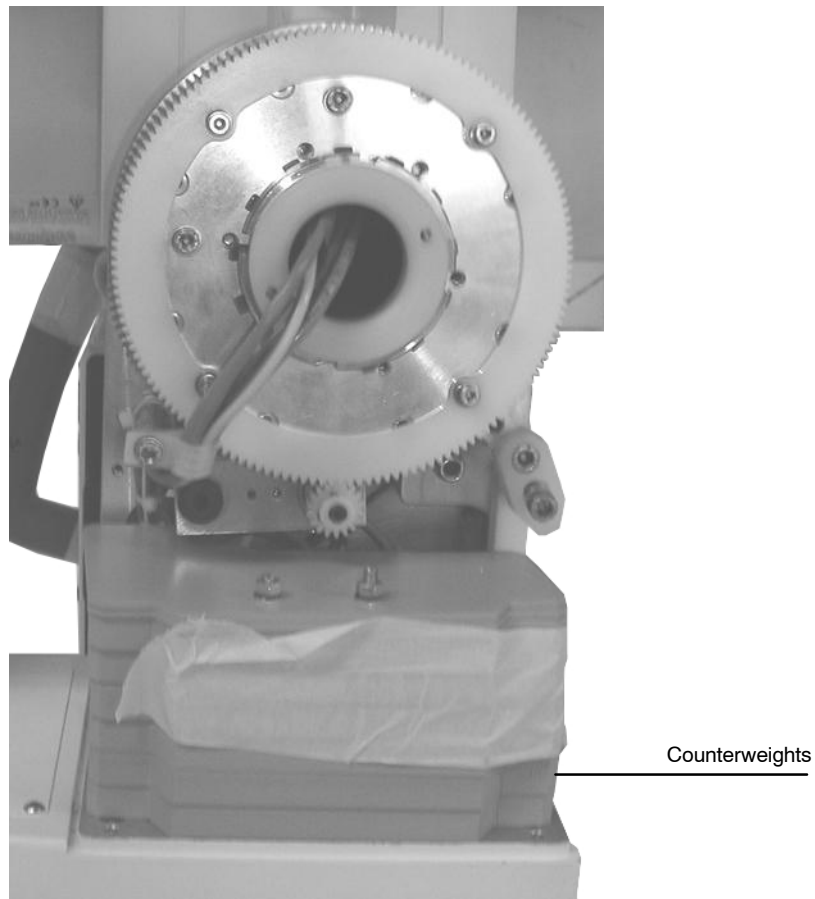
4. Get the data on TP15 in both directions. Both data must be the same or similar, but positive for upwards movement and negative for downwards movement. It is important to apply the same strength in both directions.

**Illustration 4-26**  
**Servo Power Board**



5. If it is not correct, check Collimator and Tube installation and leveling, and rails leveling.
6. Modify and correct the counterweights configuration of the Suspension.  
They are mounted on the Alpha Axis.
  - Remove the counterweights in the case that the Suspension gets down too easily.
  - Mount more counterweights in the case that the Suspension gets up too easily.

**Illustration 4-27**  
**Ceiling Suspension Counterweights**



### 4.7 GAUGE CALIBRATION

**Note** 

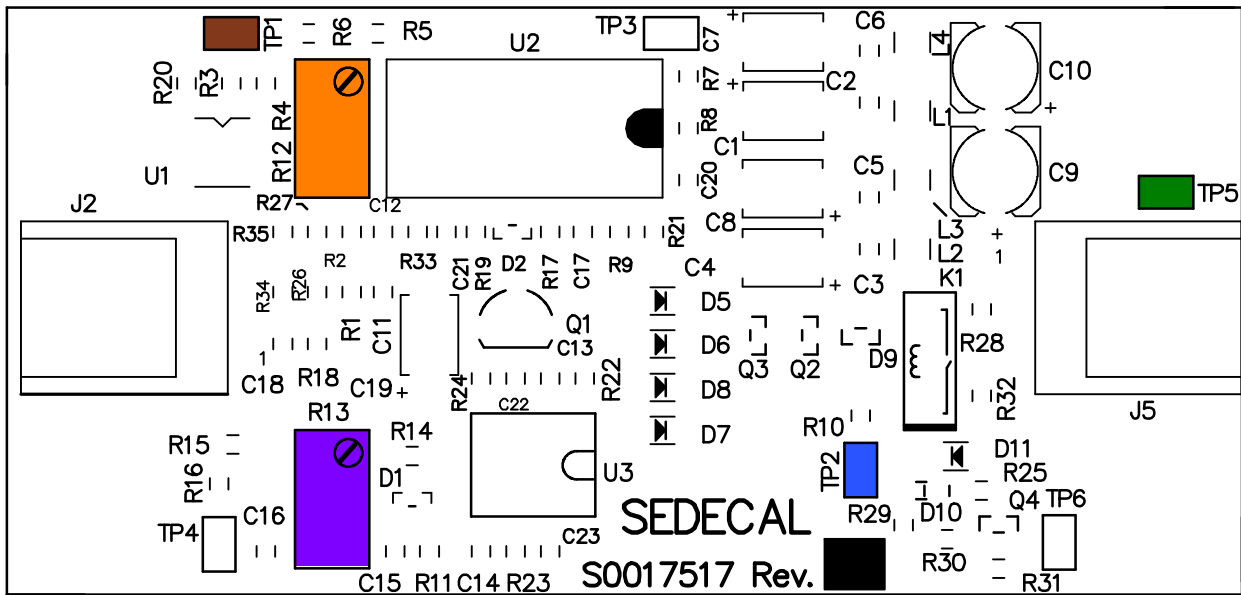
*This Section is valid for both Ceiling Suspension models, Standard and Auto-tracking. Otherwise, it is indicated in the section title and with a NOTE.*

**Note** 

*The Gauge is factory calibrated but it is recommended to check that during shipping and transportation has not been uncalibrated.*

R12, Gain Potentiometer, and R13, Offset Potentiometer, must be in the middle of their travel.

**Illustration 4-28**  
Gauge Board Drawing (Same Orientation on Field)



***It is very important to get both potentiometers in the middle of their travel for the correct accuracy of the adjustment.***

### AMPLIFIER GAIN ADJUSTMENT PROCEDURE

First proceed to adjust the Amplifier Gain on the Gauge Board to get the softer vertical movement.

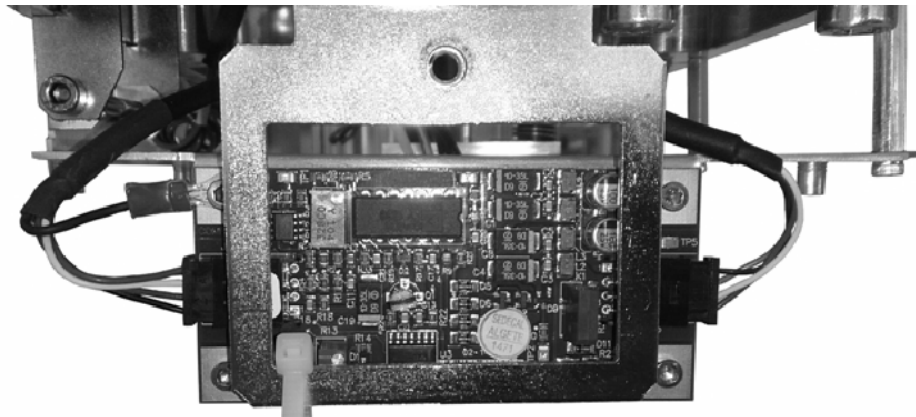
**Note** 

*It is mandatory to adjust first the Amplifier Gain and the Amplifier Offset. If the Gain adjustment is modified, the Offset must be also adjusted again.*

The target of the procedure is to get the same effort to move up and down the Telescopic Column.

1. Connect the voltmeter on TP5 (-) and TP2 (+).
2. Apply 1.5 Kg to the console and take note of the value of the voltmeter. It may be either positive or negative.
3. Apply 2.5 Kg and adjust R12 to have + 15mVdc  $\pm$ 2mv of difference with the previously obtained value (e.g. if the previous value was -32, adjust R12 to get -17).

**Illustration 4-29**  
**Gauge Board**



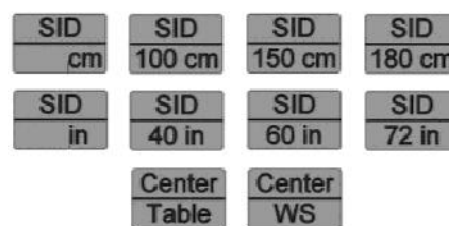
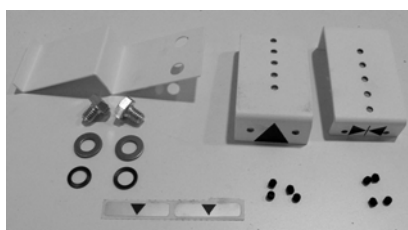
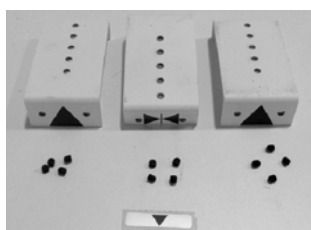
4. Repeat step 2. and 3. until a difference of + 15mVdc  $\pm$ 2mv is obtained. Once it is properly adjusted, the vertical movement of the Suspension should be soft and steady.
5. As the adjustment of R12 affects R13, proceed always to adjust it after R12. Make sure to remove the counterweight before adjusting R13.

## 4.8 SID & ALIGNMENT MARKERS INSTALLATION

### REQUIRED ELEMENTS

Box	P/N	Description	Qty.
J	S0024850	SID WS Markers Kit	1
	S0007416	U for Cams	3
	51255P21	Set Screw DIN 916 M4 x 4	12
	S0017497	Markers Arrow Label	1
	S0004763	Screw Hex. DIN 7504	6
	S0024851	Centering Table-WS Markers Kit	1
	S0007416	U for Cams	2
	51255P21	Set Screw DIN 916 M4 x 4	8
	S0004763	Screw Hex. DIN 7504	4
	S0017497	Markers Arrow Label	2
	S0015846	Transverse NOVA Position Marker	1
	51201P44	Screw DIN 933 M8x10	2
	51380P29	Plate Washer DIN 125B M8	2
	51390P13	AET Washer M8	2
	A11139-01	SID + Centering Labels	1

**Illustration 4-30**  
Kit of the SID & Alignment Markers



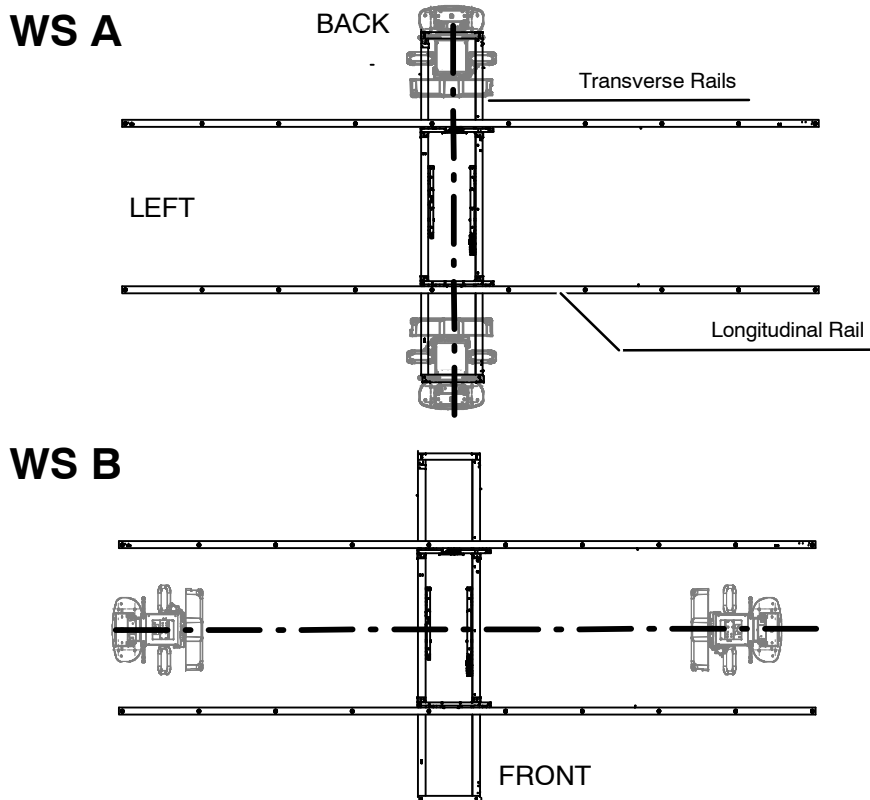
**Note**

*Both kits of Markers are provided with auto-drilling fixation screws each. Use them once the position of the U for Cams are definitely configured for a better fixation and to keep them from falling down unexpectedly.*

These Markers help the operator:

- To mark the exact alignment point with Table and Wall Stand in Longitudinal and Transverse Axes.
  - To mark defined SID distances from the Wall Stand.
1. To configure the Wall Stand Mark Stickers location it is important to check the room configuration, as depending on the location of the Wall Stand and the Suspension in the room, they must be stuck on the Longitudinal or Transverse rails.
- When the Wall Stand is located on A positions proceed to install the SID stickers on the Transverse rails and Arrow Sticker on the Longitudinal ones.
  - When the Wall Stand is located on B positions proceed to install the SID on the Longitudinal rails and Arrow Sticker on the Transverse ones.

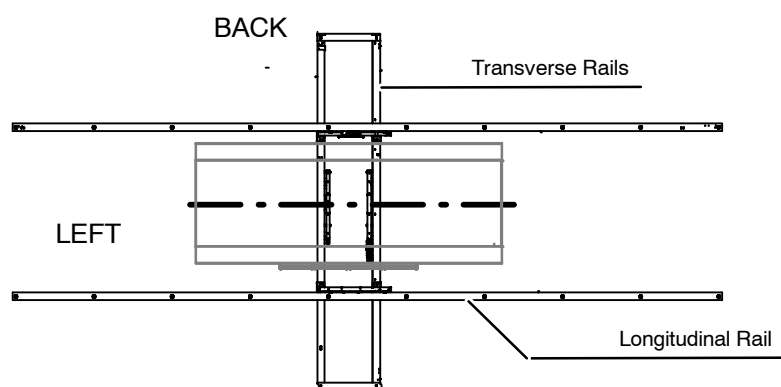
**Illustration 4-31**  
**Configuration with Wall Stand**



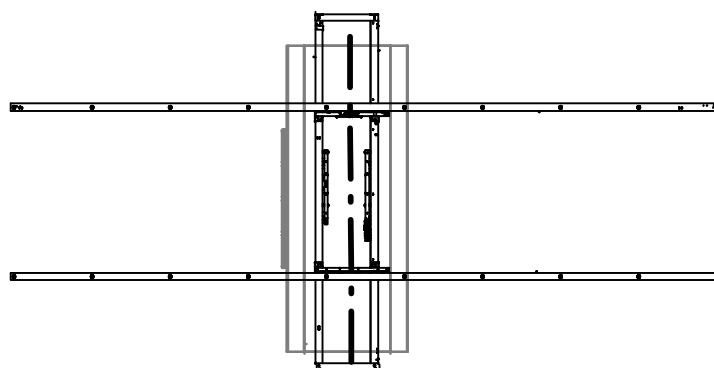
2. To configure the Wall Stand Marks Stickers location it is important to check the room configuration, as depending on the location of the Wall Stand and the Suspension in the room, they must be stuck on the Longitudinal or Transverse rails.
  - When the Wall Stand is located on A positions proceed to install the SID stickers on the Transverse rails and Arrow Sticker on the Longitudinal ones.
  - When the Wall Stand is located on B positions proceed to install the SID on the Longitudinal rails and Arrow Sticker on the Transverse ones.

**Illustration 4-32**  
**Configuration with Table**

**Table A**

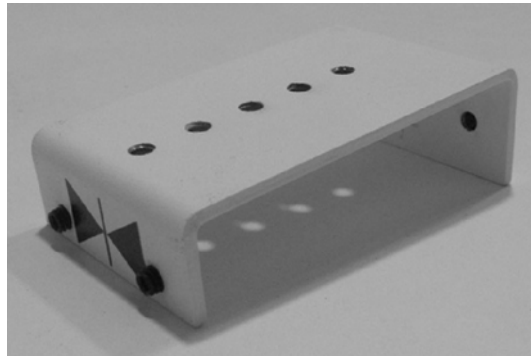


**Table B**



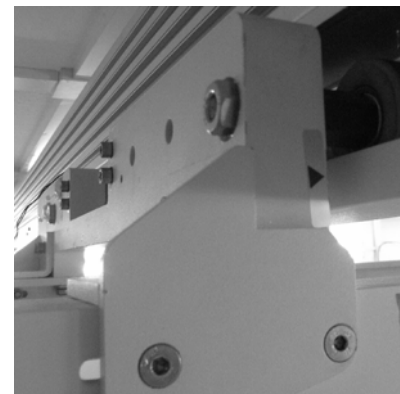
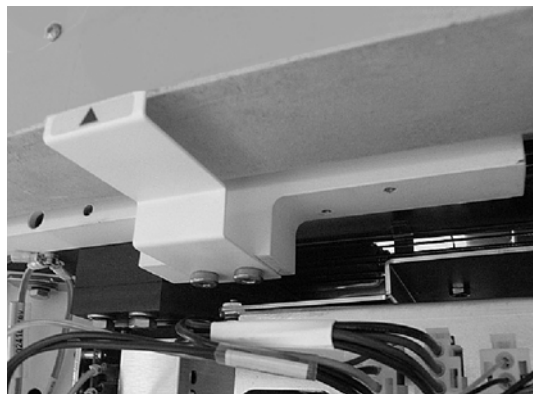
3. Mount the Set Screws in both sides of the anchors.

**Illustration 4-33**  
**Anchor with SID Marker**



4. Open Packing Box J.
5. Check the room configuration and decide the position of each sticker. Use the Collimator Meter to measure exactly the SID. If required mark in the rail the exact distance.
6. Install the Marking Arrow Sticker. The recommended positions are:
  - SID Mark in Transverse Rail. Use the Marking Arrow Support and mount it on the Carriage right Bearing.
  - Install the Sticker in the front Fixation Bearing of the Transverse Rail.

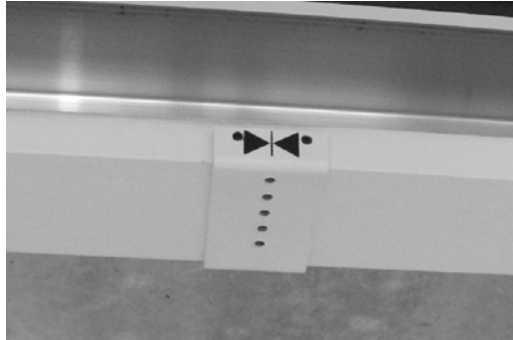
**Illustration 4-34**  
**Marking Arrow Installation**



7. Locate the Anchor in its exact position, the central line of the Sid Marker must match exactly with the Marking Arrow Sticker position.

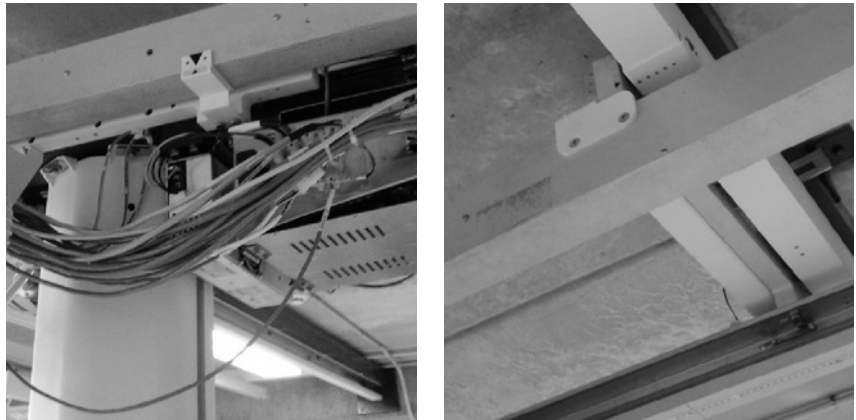
8. Tighten completely the set screws of the anchor to fix the anchor in the rail. Install the anchor shortest side inside the rail and largest outside.

**Illustration 4-35  
Anchor**

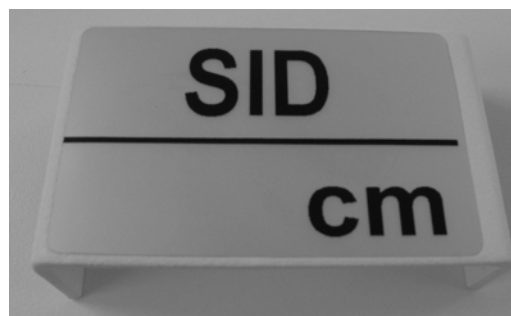


9. Check that the SID and alignment positions are correct.

**Illustration 4-36  
Anchor Installation**



10. Mount all the SID and Alignment labels in the corresponding Anchors.



11. Use the auto-drilling screws to fix definitely all cams to avoid any possible fall down of the cams.

## 4.9 MECHANICAL DETENTS INSTALLATION



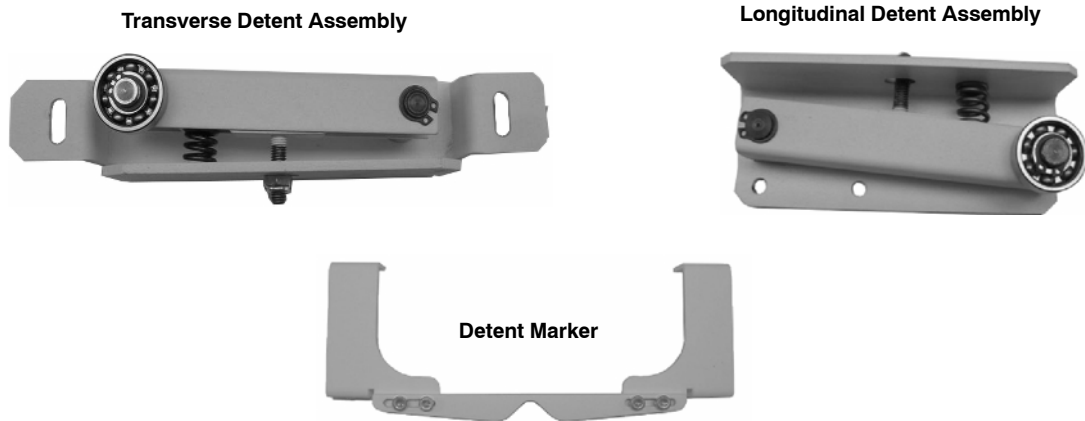
THE DETENTS MUST BE INSTALLED AFTER GETTING THE SYSTEM COMPLETELY ALIGNED AND INSTALLED

### 4.9.1 LONGITUDINAL AND TRANSVERSE DETENTS INSTALLATION

#### REQUIRED ELEMENTS

BOX	P/N	DESCRIPTION	QTY.
M	S0007636	Longitudinal Detent Assembly	1
	S0007642	Transverse Detent Assembly	1
	S0013552	Detent Marker	2

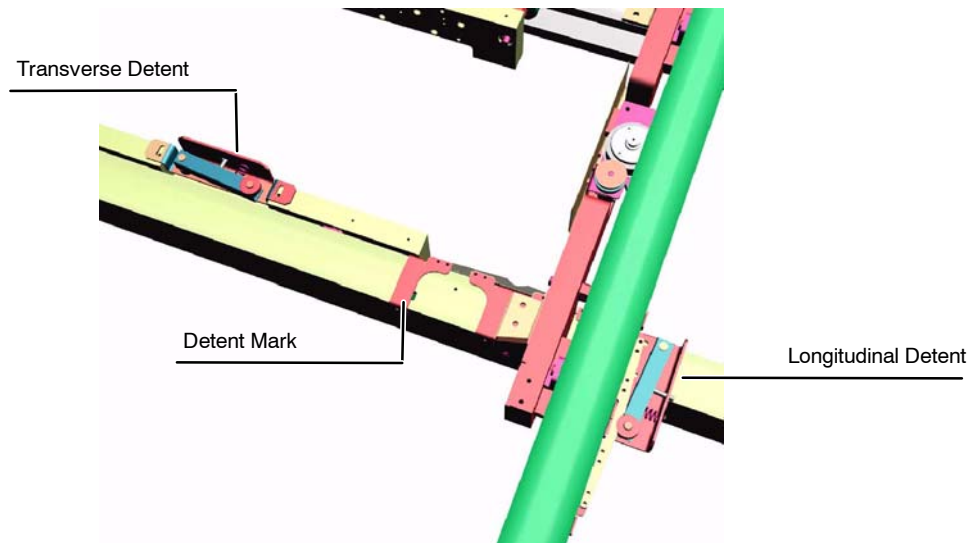
Illustration 4-37  
Mechanical Detents



## DETENTS CONFIGURATION

The Longitudinal and Transverse Detents Markers Location depends on the Room Configuration. They are configured according to useful positions in normal radiological studies check.

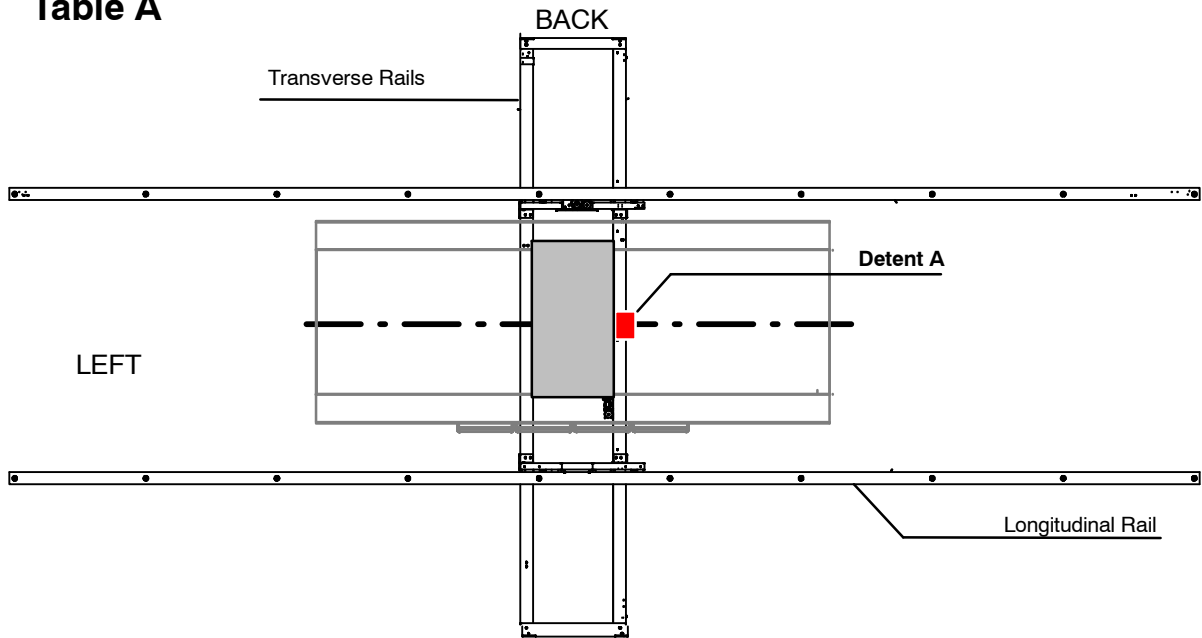
**Illustration 4-38**  
**Detents Position**



- Install the Detent Assembly and Marker on the same axis where the Detector is installed:
  - If Wall Stand or Table is on the Ceiling Suspension's Transverse axis, install the Transverse Detent.
  - If Wall Stand or Table is on the Ceiling Suspension's Longitudinal axis, install the Longitudinal Detent.
- Install the Detents at the opposite rail of the axis brake. If it is installed on the Longitudinal axis, install the Detents at the opposite of the Longitudinal Brake; and opposite to the Transverse Brake, if installed on the Transverse Axis.
- The position of the Detent on the rail:
  - One Marker must be installed just in the center of the Longitudinal axis/travel of the Table.
  - Second Marker must be installed in the center of the Wall Stand Receptor.

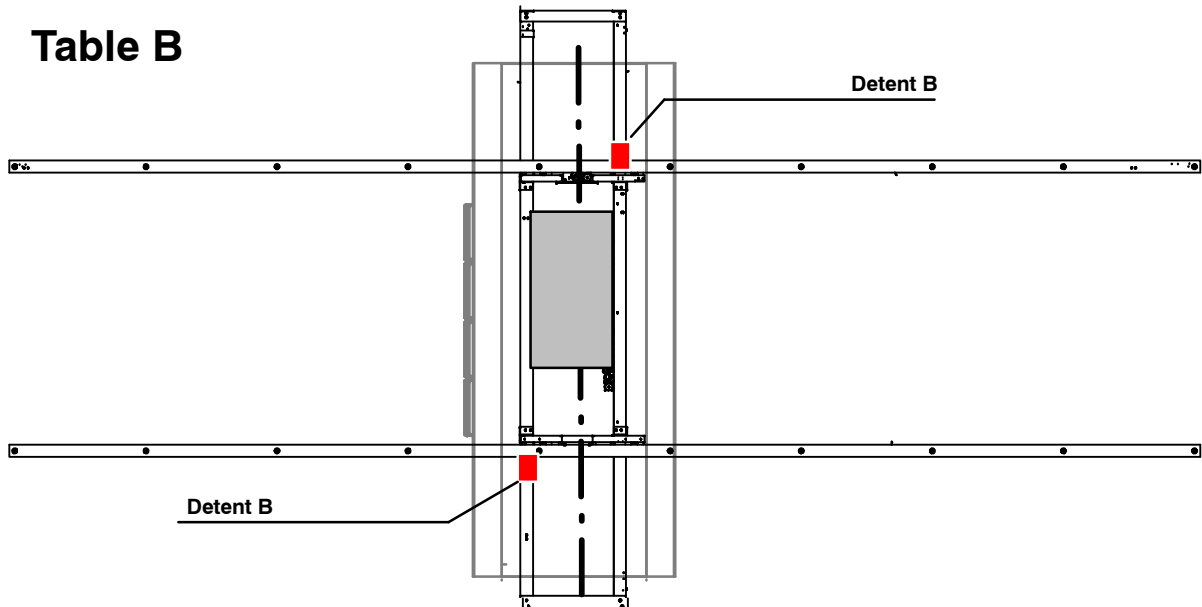
Illustration 4-39  
Table Mechanical Detents Configuration

Table A

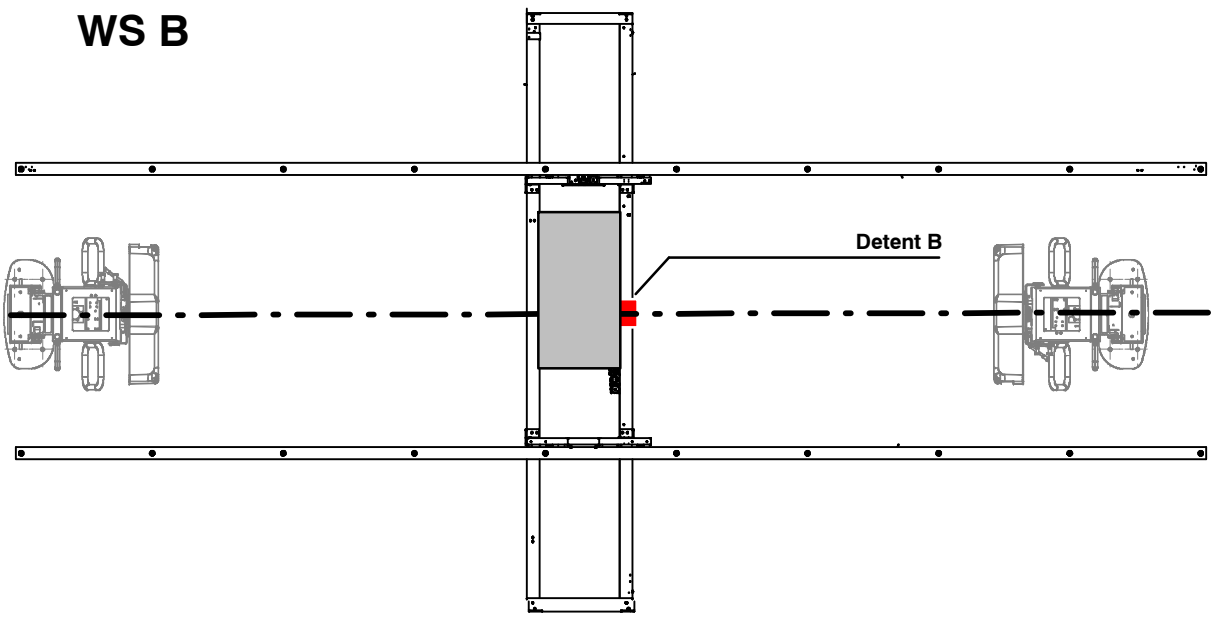
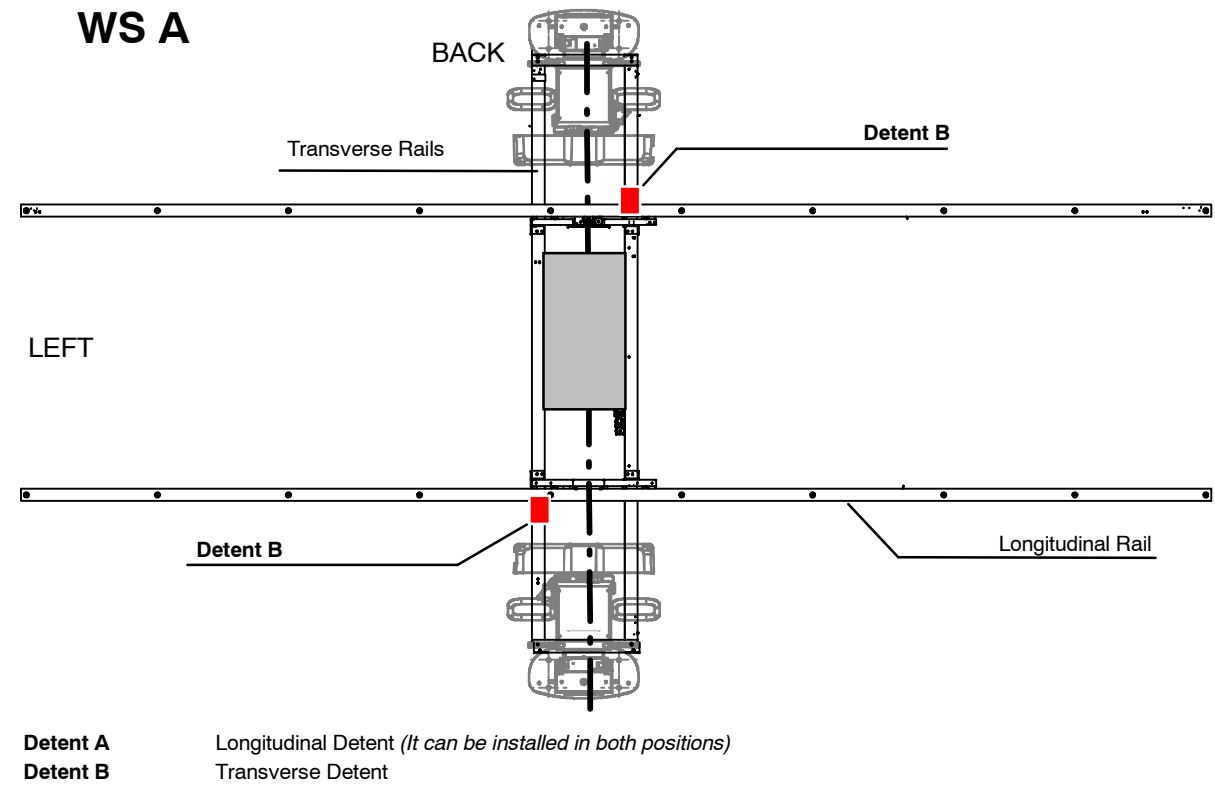


- Detent A Transverse Detent
- Detent B Longitudinal Detent (It can be installed in both position)

Table B



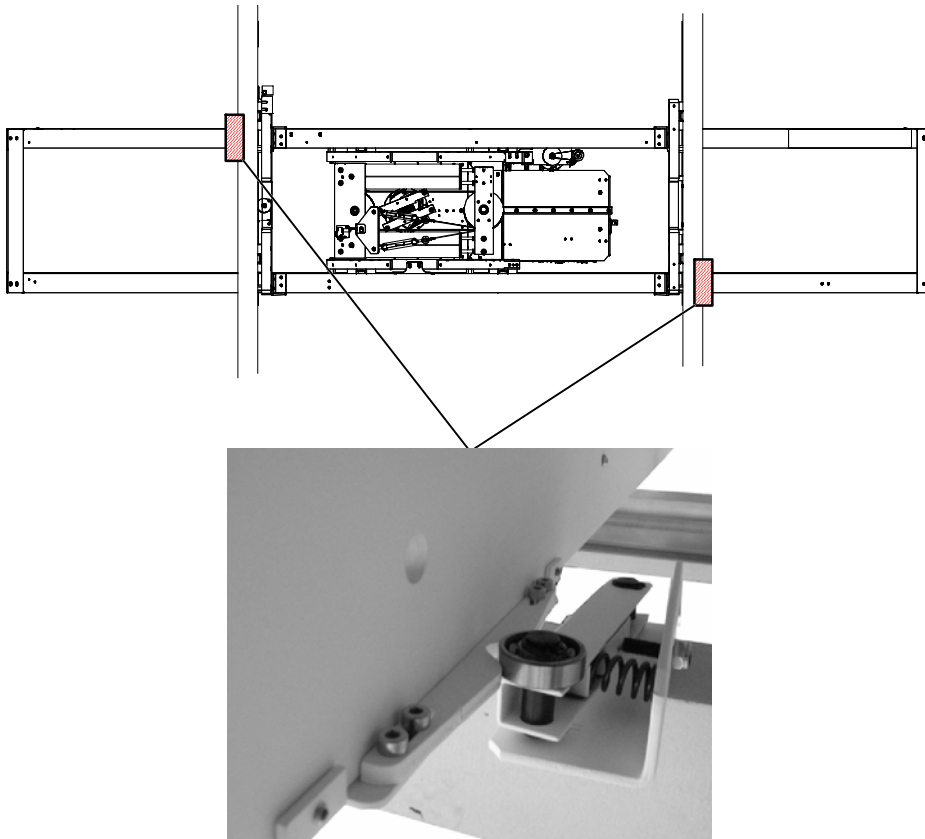
**Illustration 4-40**  
**Wall Stand Mechanical Detents Configuration**



### INSTALLATION PROCEDURE

1. Check the Room and detents configuration, refer to *Illustration 4-39* and *Illustration 4-40*, to locate exactly the position of both Detents.
2. **Install the Longitudinal Detent and its Marker.** Mount the Detent on the Transverse Rail, use the set screws to fix it at the top of the Rail. The Detent and the Marker can be mounted in the positions indicated in *Illustration 4-41*.

**Illustration 4-41**  
**Longitudinal Detent and Marker**



3. Move the Suspension to check if it is correctly aligned and centered with the Receptor center.
4. Install the Detent Marker in the Longitudinal Rail, matching the bearing of the Detent and the step of the Marker. Do not tighten the Marker completely. It must be checked if it is the correct position before tightening it definitely.

5. Proceed again to check if the Ceiling Suspension is correctly aligned and Centered. If required move the Marker to the correct position.
6. Once the Longitudinal Detent and the Marker are properly installed and centered, fix all the set screws to the Rail.



**TO FIX TOTALLY THE MARKER AND THE LONGITUDINAL DETENT ASSEMBLY TO AVOID UNEXPECTED FALLS, USE THE SELF DRILLING SCREWS REPLACING SOME SET SCREWS PREVIOUSLY USED TO FIX THE MARKER AND THE LONGITUDINAL DETENT.**

7. For the Longitudinal Detent it is required just one Self Drilling Screw. Remove one of the set screws of the Detent and with a bit of 2.5 drill a little bit the Rail to help the screw.
8. For the Marker replace two set screws, one at each side.

*Note* 

*After removing the set screws, It is recommended to pre-drill in the rail in order to help the self drilling screws. Use a 2.5 bit to drill.*

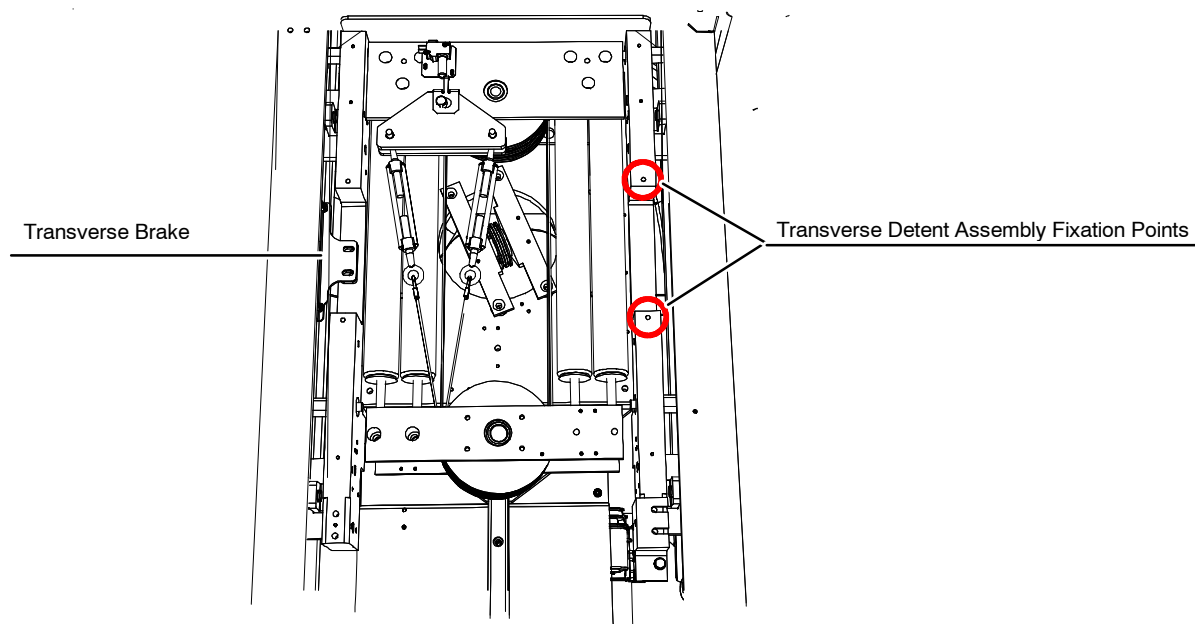
#### Illustration 4-42

Replace one set screw at each side



9. **Install the Transverse Detent** on the Right Bearing of the Transverse Rails, opposite to the Transverse Brake.
10. Tighten the provided screws and washer to fix the Detent to the top of the Bearing. It is not required to use any self drilling screw to fix the Transverse Detent.

**Illustration 4-43**  
**Transverse Detent Fixation Points**

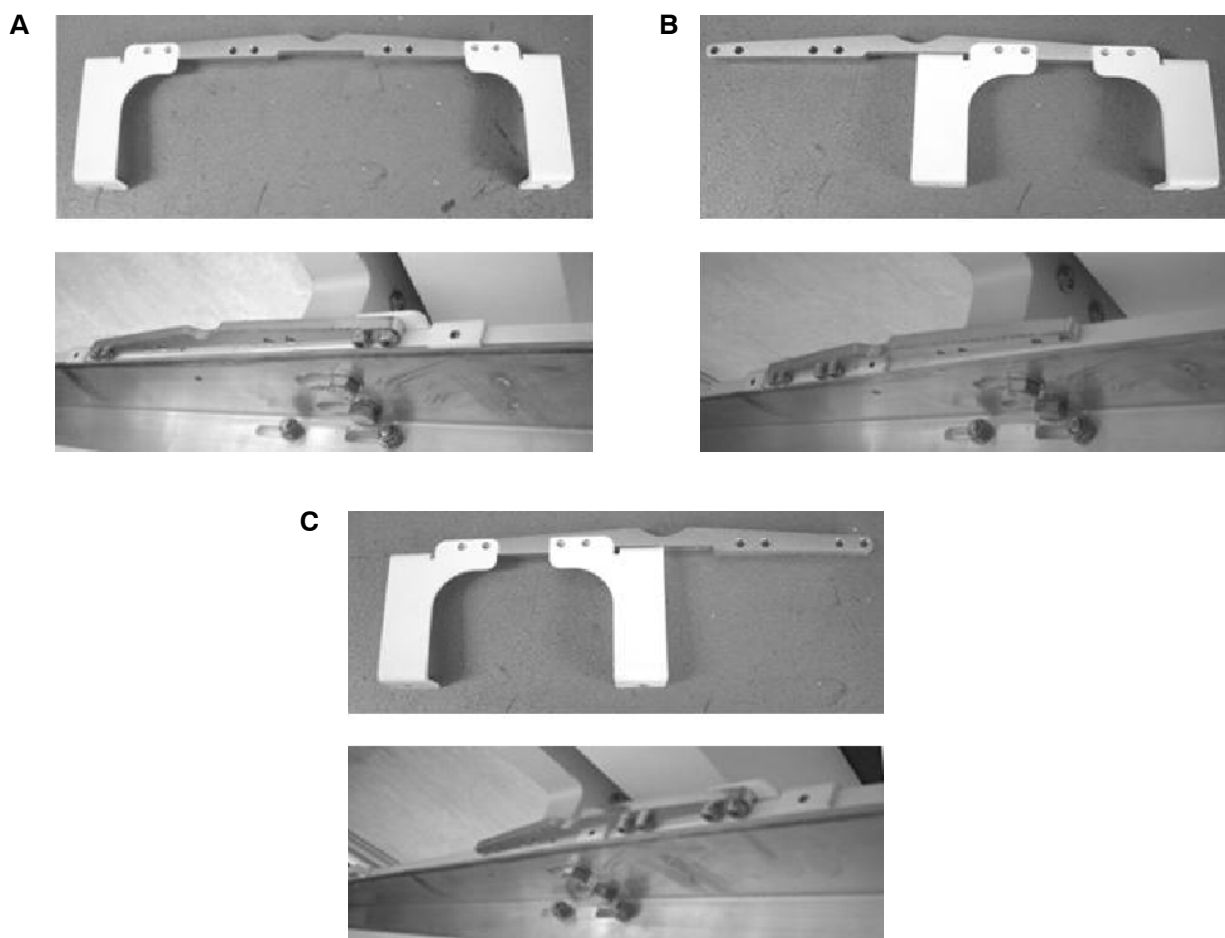


11. **Install the Detent Markers**, which help the operator to identify visually where the Mechanical Detents are set. Proceed as indicated for the Longitudinal Detent Marker, use the self drilling screws to replace two set screws.

The Transverse Marker design allows to install it avoiding the interference with the Longitudinal Bearings if the Detent position is located just under them. The configuration of the Markers can be modified to avoid the interference. Change the Support setup depending if it is the left or right support the one which makes contact the Bearings.

- a. **DEFAULT CONFIGURATION.** There is not contact between Marker and Bearing. Do not change the Marker setup.
- b. **RIGHT CONFIGURATION.** There is contact between left support of the Marker and the Bearing, change its setup. Move the left Support to the right Side.
- c. **LEFT CONFIGURATION.** There is contact between right support of the Marker and the Bearing, change its setup. Move the right Support to the left Side.

**Illustration 4-44**  
**Marker Configurations**



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## SECTION 5 FUNCTIONAL CHECKS

Checks should be performed as the final task of installation procedure, for further details refer to *Section 4. Installation*.

**Table 5-1**  
**Checking procedure list**

FUNCTION	CONDITIONS	PERFORMANCE
<p style="text-align: center;"><b>LONGITUDINAL MOTION</b></p>	<p>Longitudinal brake OFF. Moving effort, measured at a velocity of 25 mm/s, at the Console Handle.</p> <ol style="list-style-type: none"> <li>1. Bridge positioned at right end of Longitudinal travel, moving to left.</li> <li>2. Bridge positioned at left end of Longitudinal travel, moving to right.</li> <li>3. Bridge positioned at right end of Longitudinal travel, moving to left, and with longitudinal cable concealment.</li> <li>4. Bridge positioned at left end of Longitudinal travel, moving to right, and with longitudinal cable concealment.</li> </ol>	<p>4 kg. maximum required to move longitudinally the Suspension.</p>
<p style="text-align: center;"><b>LONGITUDINAL BRAKE</b></p>	<p>Longitudinal brake ON. Holding force to be measured at the Console handle.</p> <ol style="list-style-type: none"> <li>1. Bridge positioned 300 mm or <math>\pm 1</math>ft. from right end of longitudinal travel.</li> <li>2. Bridge positioned in center of longitudinal travel.</li> <li>3. Bridge positioned 300 mm or <math>\pm 1</math>ft. from left end of longitudinal travel.</li> </ol>	<p>20 kg. minimum are necessary to move longitudinally the Suspension with brake ON.</p>

## Standard & Auto-tracking Ceiling Suspension

Service Manual

**Table 5-1 (cont.)  
Checking procedure list**

FUNCTION	CONDITIONS	PERFORMANCE
<b>TRANSVERSE MOTION</b>	Transverse brake OFF. Moving effort, measured at a velocity of 25 mm./s, the focal spot shall stop over the centerline of the table when moving front to rear, and rear to front within.	4 kg. maximum required to move Transversely the Suspension.
<b>TRANSVERSE BRAKES</b>	Transverse brake ON. Holding force to be measured at the console handle. <ol style="list-style-type: none"> <li>1. Carriage positioned 150 mm from rear bumpers.</li> <li>2. Carriage in the center of the Bridge.</li> <li>3. Carriage positioned 150 mm from front Bumpers.</li> </ol>	20 kg. minimum are necessary to move longitudinally the Suspension with brake ON.
	Transverse brake ON. Light-beam Centering Device ON. The focal sport aligned with center lines in Wall Stand and Horizontal Table. Jerk the tube assembly around the vertical axis by applying force to the console handle.	Alignment is retained.
<b>VERTICAL ASSISTED MOTION</b>	Vertical travel of focal spot must be the indicated in Equipment Specifications.	Refer to the Equipment Specifications in <i>Section 1.5</i> .
	Vertical brakes OFF. Moving effort, measured at a velocity of 25 mm/s, at the console handle. <ol style="list-style-type: none"> <li>1. Tube up - Moving down.</li> <li>2. Tube down - Moving up.</li> </ol>	There are not Mechanical Frictions and it is required the same effort to move the Suspension up and down.
<b>VERTICAL BRAKE</b>	Vertical brake ON. Holding force to be measured at the console handle. Tube at 100 mm. from SID.	30 kg. minimum are necessary to move vertically the Suspension with brake ON.
<b>IMPACT SECURITY STOP (for Auto-tracking Ceiling Suspension)</b>	Vertical brake OFF. Moving effort, measured at a velocity of 25 mm/s, at the console handle. <ol style="list-style-type: none"> <li>1. Get any box or obstacle over the tabletop.</li> <li>2. Tube up over the Table - Moving down.</li> <li>3. Run into the tabletop obstacle.</li> </ol>	Impact Security Stop activates correctly. The Suspension must lift automatically once it finds the obstacle.

**Table 5-1 (cont.)**  
**Checking procedure list**

FUNCTION	CONDITIONS	PERFORMANCE
<b>AUTOMATIC BRAKE</b>	Detents kits are provided to automatically apply brake if movement is slow, 125mm/s, when the tube is positioned at specific SID: <ul style="list-style-type: none"> <li>• When the X-ray tube is at the table lateral centerline or the wall stand lateral centerline.</li> <li>• When the X-ray tube is at specific distance from detector or film.</li> <li>• When the X-ray tube is at 100 cm above the detector or film.</li> </ul>	
<b>TUBE ANGLE MOTION (ALPHA)</b>	Tube Angulation brake OFF. The tube & collimator assembly shall rotate freely when grasped at console handle. Mechanical detents shall position the X-ray beam at 0° (Port Down) and at ±90° within. When the detent removal lever is raised there will not be any detecting action at any angular position of the tube.	±1/2°.
<b>TUBE ANGLE BRAKE (ALPHA)</b>	Tube Angulation brake ON. The tube & collimator assembly will be held at any desired rotational angle.	
<b>TUBE ROTATION MOTION (BETA)</b>	The rotational detent will position the tube about the vertical centerline of the telescopic column at 0°, ±45°, ±90°, ±135° and ±180° within.	
<b>OMNI-DIRECTIONAL MOTION</b>	Proceed to move the Suspension in Transverse, Vertical and Longitudinal motion with Omni-directional brake ON. Moving effort, measured at a velocity if 25 mm/s.	4 kg. maximum required to move omni-directionally the Suspension.
<b>COMPATIBILITY WITH RAD TABLES*</b>	Check that the value displayed by the vertical SID display is the same as the one manually measured.	Refer to <i>Sections 3.2.8 Table Parallelism to the Rails System</i> and the <i>Suspension</i> , and <i>Section 3.2.9 Table and Suspension Perpendicularity Adjustment</i> .
<b>COMPATIBILITY WITH R&amp;F TABLES*</b>	Check that the table can not be tilted if the Suspension is not in parking position. Safety Parking Kit.	
<b>COMPATIBILITY WITH WALL STANDS (for Auto-tracking Ceiling Suspension)</b>	Check that the value displayed by the SID display is the same as the one manually measured.	Refer to <i>Section 3.2.6 Wall Stand and Suspension Perpendicularity Adjustment</i> .
* These are delivered as options, check just in case that you are provided of RAD or R&F Tables.		

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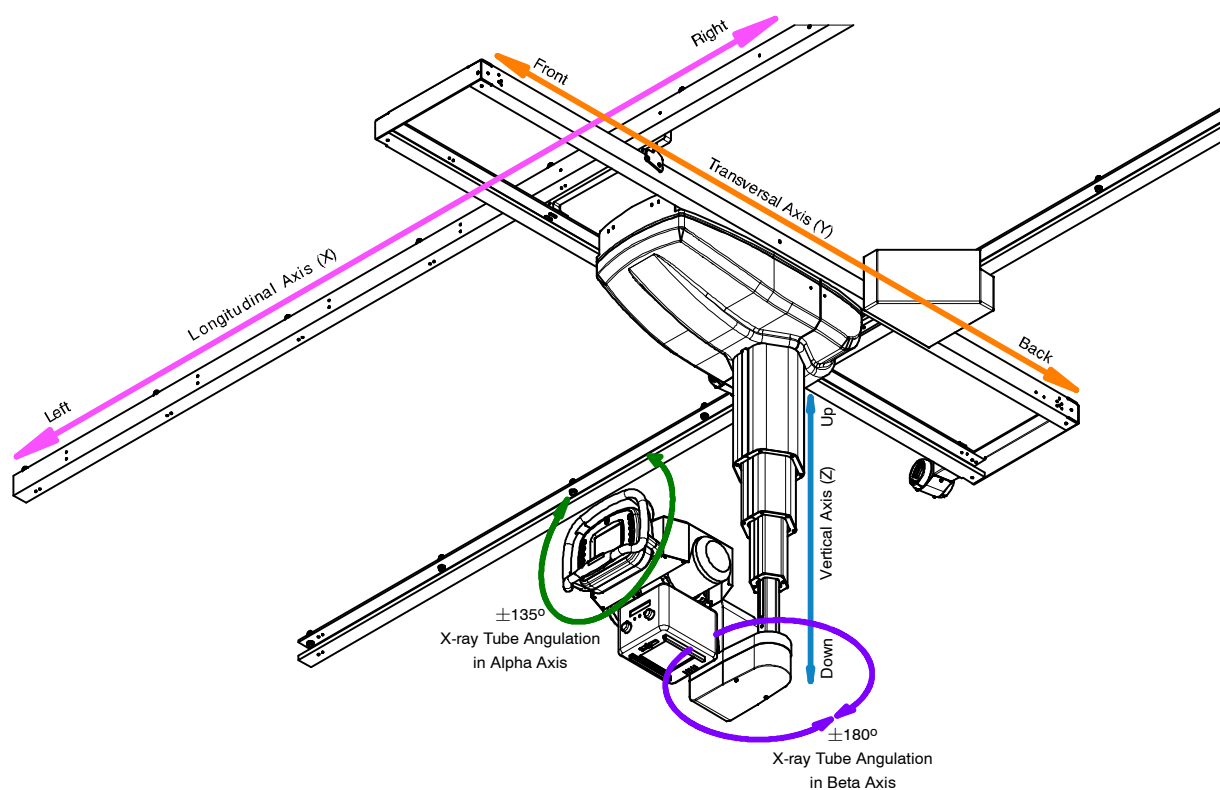
## SECTION 6 THEORY OF OPERATION

### 6.1 EQUIPMENT OVERVIEW

#### 6.1.1 PURPOSE

This equipment is a heavy-duty X-ray Overhead Tube Support equipment characterized by its simple and functional design. With its new light weight design, it guarantees highly precise positioning for an optimal radiographic result. Thanks to its vertical and horizontal displacements, it can cover almost all volume of the room where it is installed.

**Illustration 6-1**  
Suspension movements and axes



6.1.2 SUSPENSION BASIC CONCEPTS. MOVEMENTS

The Ceiling suspension can be moved along its longitudinal, transverse and vertical axis. A motor for the vertical movement and brakes for the rest are responsible of these movements. These movements are called Longitudinal movement, Transverse movement and Vertical movement (refer to Illustration 6-1 for graphical information about the axes movements). But there are another two movements called BETA, or Rotation, and ALPHA, or Angulation (refer to Illustration 6-2 and Illustration 6-3).

Illustration 6-2  
Tube Support extreme Positions when Angulation or ALPHA Movements

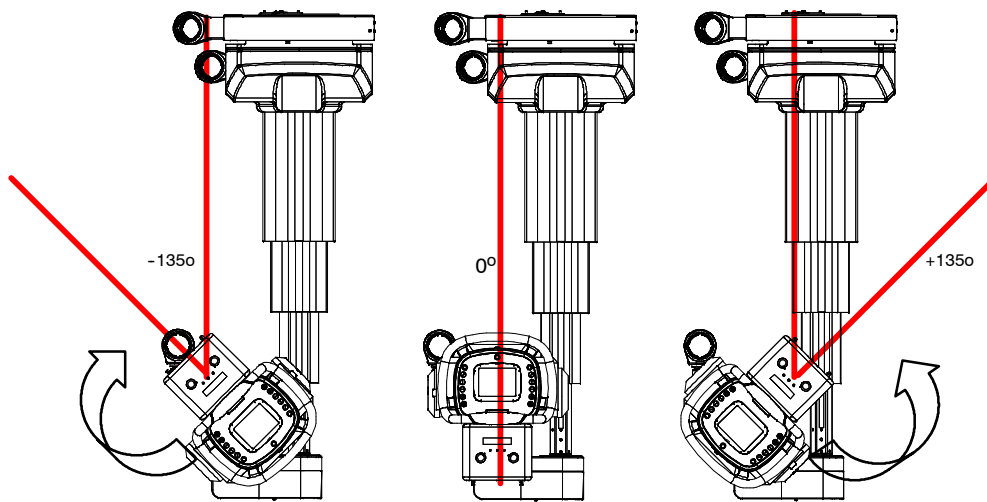
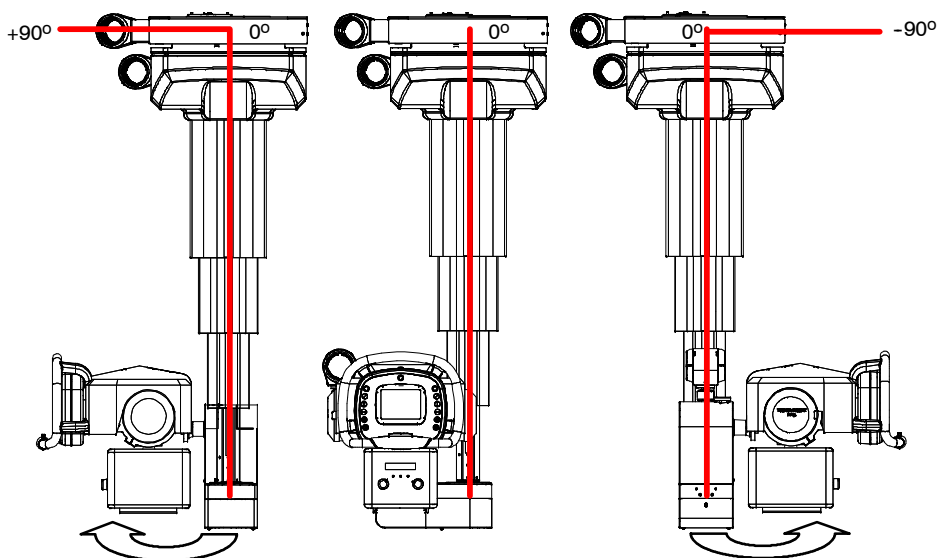


Illustration 6-3  
Tube Support Positions when Rotation or BETA Movements



### **6.1.2.1 ELECTROMAGNETIC COMPONENTS**

The Electromagnetic components are the same in every axis but the vertical one, which is motorized. These components are:

- Brakes
- Potentiometers
- Tachometer, just in case of the Vertical axis

### **6.1.2.2 ELECTRONIC COMPONENTS**

- System Control Board
- Z Servo Control board
- Z Servo Power board
- Display Board
- Gauge Board

### **6.1.2.3 MECHANICAL COMPONENTS**

#### **LONGITUDINAL & TRANSVERSE MOVEMENTS**

The movements in these axes are possible by means of:

- Longitudinal and Transverse rails
- Longitudinal and Transverse Bearing Sets

#### **VERTICAL MOVEMENTS**

The up and down movements of the telescopic column are possible by means of:

- The telescopic column with the central pulley and cable
- Carriage gas springs
- Linear guides

#### **ALPHA MOVEMENT**

The rotation movement is possible due to:

- Gears
- Axis with conic bearings
- Detents at 90°, 45°, 0°, -45° and -90°

### BETA MOVEMENT

The Angulation movement is possible due to:

- Gears
- Axis with plain bearings

### 6.1.3 MANUAL MOTION

The Suspension can be moved manually by pressing the buttons to disable the brakes (refer to *Illustration 6-4*).

When a button is pressed, the brake of the corresponding axis is released and the Suspension can be moved along this axis. The brake will activate, blocking the movement, when either the button is released or the Suspension is at a detent point. To go on with the movement, the user has to press the Brake Button again.

Two limit switches detect the limit of movement (max and min travel) and the system control sets off the brakes and stops the movement. When pressing a brake release, the axis moves until the next detent. These are software detents and are only implemented at the next axis:







- ALPHA (angulation): one detent every 45° degrees.
- BETA (rotation): one detent every 45° degrees.

### ASSISTANCE FOR VERTICAL MOTION

There is a gage that assists the vertical manual movement like the power steering of a car. When the gage detects an upper movement, its function helps making this movement.

**Illustration 6-4**  
**Control Console and Brake Buttons**

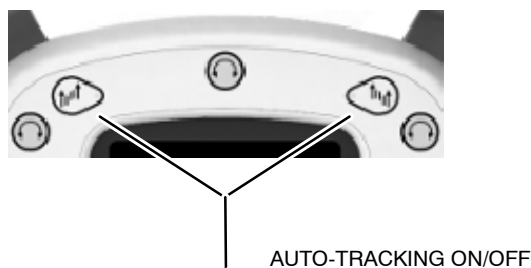


 <b>Alpha Axis Brake.</b> Angle of the X-ray Tube.	 <b>Longitudinal Axis Brake.</b> Right & Left.
 <b>Transverse Axis Brake.</b> Back & Front.	 <b>Omni-directional Brake.</b> Transverse and Longitudinal. Other Axes could be also activated according to the configuration during installation.
 <b>Vertical Axis Brake.</b> Up & Down.	 <b>Beta Axis Brake.</b> Rotation of the X-ray Tube.
<b>Wheel Omni-directional Brake.</b> Transverse and Longitudinal. Other Axes could be also activated according to the configuration during installation.	

### 6.1.4 AUTO-TRACKING FUNCTION (AUTO-TRACKING CEILING SUSPENSION)

This function allows the Suspension X-ray Tube to track the selected Bucky/Detector once it initiates the movement to change its position; both must be properly aligned. The relative distance and the SID are kept constant. The Bucky/Detector of both, Table and Wall Stand, is the master (the equipment which initiates the movement), and the Tube of the Suspension is the slave (the equipment which follows them to get aligned again with the Bucky/Detector).

**Illustration 6-5**  
**Auto-tracking ON/OFF Buttons**



#### 6.1.4.1 OPERATION WITH ELEVATING TABLES

With the AUTO-TRACKING function OFF:

1. Turn the X-ray Tube to 0° to work with the Table, pointing to the Bucky/Detector.
2. Release manually the brakes and locate the Suspension on Transverse and Longitudinal Detent position, centered with the Bucky/Detector of the Table.
3. Activate the Autotracking function ON. Push once the console AUTO-TRACKING ON/OFF Button (*refer to Illustration 6-5*).
4. The Suspension will move vertically to reach the set SID distance.
5. When the Table, which is always the master equipment, moves up and down, the Suspension, always the slave equipment, tracks its movement and moves up or down too, maintaining the same SID.

#### 6.1.4.2 OPERATION WITH WALL STAND

With the AUTO-TRACKING function OFF:

1. Turn the X-ray Tube  $\pm 90^\circ$  pointing to the Bucky/Detector of the Wall stand.
2. Locate the Suspension on Longitudinal and Transverse Detents, at specific horizontal SID from the Wall Stand.
3. Activate the AUTO-TRACKING function ON. The Suspension will move vertically to align the central X-ray beam with the center position of the Wall Stand Bucky/Detector.
4. The Suspension keeps the alignment once the Wall Stand is relocated up or down the initial position.

#### 6.1.4.3 DETENT POINTS

Each axis can be configured to have several Detent Points that allow to get the Suspension exactly at the correct position to work with the Table and Wall Stand.

Move the equipment slowly to place it at the Detent position.

Depending on the Ceiling Suspension model, these working positions are different:

- Standard Ceiling Suspension: There are five electronic Detents programmed in Longitudinal, Transverse (2 on each) and Vertical axis (only 1 configured at the desired default SID to the Table).
- Auto-tracking Ceiling Suspension: On the Longitudinal and Transverse Axes, the Detent Assemblies are mechanical, they are composed by Position Markers and the Detent Assemblies. The Position Markers are installed on the Transverse Rail and the Carriage, they indicate the exact position for the proper alignment of the X-ray Tube with both Receptors and the SID distances from the Wall Stand.
- On the Alpha and Beta Axes of both Ceiling Suspension models, Detent Points are configured by default at each  $45^\circ$ .

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## SECTION 7 TROUBLESHOOTING GUIDE

A guide for a quick solution of main typical problems in the use of this equipment follows. It is recommended to keep this troubleshooting guide with you when operating with the equipment.

Some of the actions to be completed after checking the problem reason are referenced during installation procedures *Section 1. Installation*, *Section 4. Configuration and Calibration* or in *Section 5. Functional Checks*.

In some of the problems there are some flowcharts included in this chapter, that are helpful to know how to proceed to the problem reason detection.



**THE MAINTENANCE ACTIVITIES SHOWN IN THIS CHAPTER HAVE TO BE CARRIED OUT BY AUTHORIZED MAINTENANCE PERSONNEL ONLY. HOWEVER, THE OWNER OR THE EQUIPMENT OPERATOR, HAS TO PROGRAM THE SUGGESTED SERVICE TASKS, WHEN NECESSARY, CONTACTING MANUFACTURER TECHNICAL SERVICE.**

### 7.1 TROUBLES LIST

**Table 7-1**  
**Troubleshooting Guide**

PROBLEM	CHECK IF	ACTION
<b>SYSTEM NOT GOING ON</b> Refer to FC 7.2.1	Steel Cable probably damaged or broken.	Replace Steel Cable.
	The Steel Cables Breaking Safety Switch <b>SW10</b> does not work properly.	Replace <b>SW10</b> . (Refer to <i>Section 8.5 Steel Cables Breakdown Safety Switch</i> ).
	Problem with the Power Supply Fuse.	Replace the Fuse.
	Damaged Control PWA.	Replace the board.
	Problem with the Power Supply.	Replace the Power supply.

## Standard & Auto-tracking Ceiling Suspension

Service Manual

**Table 7-1 (cont.)  
Troubleshooting Guide**

PROBLEM	CHECK IF	ACTION
<b>CEILING SUSPENSION ON, BUT DISPLAY LIGHTS OFF</b> Refer to FC 7.2.2	Servo Z Control PWA (P/N <b>S0024910</b> for Auto-tracking Ceiling Suspension; P/N <b>S0019473</b> for Standard Ceiling Suspension), is damaged.	Replace the board.
	System Control PWA (P/N <b>S0013450</b> for Auto-tracking Ceiling Suspension; P/N <b>S0019874</b> for Standard Ceiling Suspension), is damaged.	Replace the board.
	Display SID Rotation PWA is damaged.	Replace the board.
	Console Power Supply Cable (P/N <b>S0024569</b> for Auto-tracking Ceiling Suspension; P/N <b>S0004373</b> for Standard Ceiling Suspension), is damaged.	Replace the Cable.
<b>WRONG DISPLAY MEASURES</b> Refer to FC 7.2.3	Wrong calibration.	Calibrate again. (Refer to <i>Section 4. Configuration and Calibration</i> ).
	Problems with external potentiometers.	Replace external potentiometers.
	Display SID Rotation PWA is damaged.	Replace the board.
<b>LONGITUDINAL BRAKE NOT WORKING PROPERLY</b> Refer to FC 7.2.4	Servo Z Control PWA (P/N <b>S0024910</b> for Auto-tracking Ceiling Suspension; P/N <b>S0019473</b> for Standard Ceiling Suspension), is damaged.	Replace the board.
	Cable <b>S0005069</b> and Longitudinal Brake damaged.	Replace Cable and Longitudinal Brake.
	System Control PWA (P/N <b>S0013450</b> for Auto-tracking Ceiling Suspension; P/N <b>S0019874</b> for Standard Ceiling Suspension), is damaged.	Replace the board.
<b>VERTICAL BRAKE NOT WORKING PROPERLY</b> Refer to FC 7.2.5	Wrong adjustment of the Gage Board.	Check and adjust if necessary the Gage (Refer to <i>Section 4.7 Gage Calibration</i> ).
	Cable <b>S0024566</b> (for Auto-tracking Ceiling Suspension) or <b>S0019746</b> (for Standard Ceiling Suspension), is damaged.	Replace the cable.
	Cable <b>S0024568</b> (for Auto-tracking Ceiling Suspension) is damaged.	Replace the cable.
	Auto-tracking Keyboard Adaptation PWA, P/N <b>S0024655</b> , is damaged (Auto-tracking Ceiling Suspension).	Replace the board.
	Z Motorized Tracking Keyboard PWA, P/N <b>S0024589</b> , is damaged (Auto-tracking Ceiling Suspension).	Replace the board.
	Control Board, P/N <b>S0019874</b> PWA, is damaged (Standard Ceiling Suspension).	Replace the board.

**Table 7-1 (cont.)**  
**Troubleshooting Guide**

PROBLEM	CHECK IF	ACTION
<b>TRANSVERSE BRAKE NOT WORKING PROPERLY</b> Refer to FC 7.2.6	Servo Z Control PWA (P/N <b>S0024910</b> for Auto-tracking Ceiling Suspension; P/N <b>S0019473</b> for Standard Ceiling Suspension), is damaged.	Replace the board.
	Cable <b>S0005070</b> and Transverse Brake damaged.	Replace Cable and Transverse Brake.
	Control Board, P/N <b>S0019874</b> PWA, is damaged (Standard Ceiling Suspension).	Replace the board.
<b>ANGULATION BRAKE NOT WORKING PROPERLY</b> Refer to FC 7.2.7	System Control PWA (P/N <b>S0013450</b> for Auto-tracking Ceiling Suspension; <b>S0019874</b> for Standard Ceiling Suspension) is damaged.	Replace the board.
	Cable P/N <b>S0024584</b> and Alpha Brake is damaged.	Replace Cable and Transverse Brake.
<b>ROTATION BRAKE NOT WORKING PROPERLY</b> Refer to FC 7.2.8	System Control PWA (P/N <b>S0013450</b> for Auto-tracking Ceiling Suspension; <b>S0019874</b> for Standard Ceiling Suspension) is damaged.	Replace the board.
	Cable P/N <b>S0024585</b> and Beta Brake is damaged.	Replace Cable and Transverse Brake.
<b>VERTICAL DETENTS NOT WORKING PROPERLY</b> Refer to FC 7.2.9	Wrong adjustment of the Gage Board.	Check and adjust if necessary the Gage (Refer to <i>Section 4.7 Gage Calibration.</i> )
	Control Board, P/N <b>S0019874</b> PWA, is damaged (Standard Ceiling Suspension).	Replace the board.
	Z Servo Control PWA, P/N <b>S0024910</b> , is damaged (Auto-tracking Ceiling Suspension.)	Replace the board.
	Gage Board, P/N <b>S0017517</b> , damaged.	Replace the board.
<b>LONGITUDINAL DETENTS NOT WORKING PROPERLY</b> Refer to FC 7.2.10	Wrong adjustment of the Gage Board.	Check and adjust if necessary the Gage (Refer to <i>Section 4.7 Gage Calibration.</i> )
	Control Board, P/N <b>S0019874</b> PWA, is damaged (Standard Ceiling Suspension.)	Replace the board.
	Z Servo Control PWA, P/N <b>S0024910</b> , is damaged (Auto-tracking Ceiling Suspension.)	Replace the board.
	Gage Board, P/N <b>S0017517</b> , damaged.	Replace the board.

## Standard & Auto-tracking Ceiling Suspension

Service Manual

**Table 7-1 (cont.)  
Troubleshooting Guide**

PROBLEM	CHECK IF	ACTION
<b>TRANSVERSE DETENTS NOT WORKING PROPERLY</b> Refer to FC 7.2.11	Wrong adjustment of the Gage Board.	Check and adjust if necessary the Gage (Refer to <i>Section 4.7 Gage Calibration</i> ).
	Control Board, P/N <b>S0019874</b> PWA, is damaged (Standard Ceiling Suspension).	Replace the board.
	Z Servo Control PWA, P/N <b>S0024910</b> , is damaged (Auto-tracking Ceiling Suspension).	Replace the board.
	Gage Board, P/N <b>S0017517</b> , damaged.	Replace the board.
<b>LONGITUDINAL MOVING EFFORT TOO HIGH</b> Refer to FC 7.2.12	Longitudinal rails are not parallel.	Mount the Longitudinal Rails parallel. (Refer to <i>Section 2.2. Longitudinal Rails Unpacking &amp; Installation</i> ).
	Longitudinal rails are not level.	Checks rails for level. If not level, proceed to level them. (Refer to <i>Section 2.2. Longitudinal Rails Unpacking &amp; Installation</i> ).
	Rails or wheels are dirty.	Clean the longitudinal rails and bearings wheels. (Refer to <i>Section 8.3 Service Tasks and Section NO TAG Visual Checking</i> ).
	Longitudinal belt is not correctly assembled. Remember that the Ceiling Suspension is provided just with one belt depending on the Room Configuration.	Check the longitudinal belt installation, without twist and well tensioned. If not install again. (Refer to <i>Section 2.2. Longitudinal Rails Unpacking &amp; Installation</i> ).
<b>TRANSVERSE MOVING EFFORT TOO HIGH</b> Refer to FC 7.2.13	Transverse Rails are not level.	Check Transverse Rails for leveling. If not level, proceed to level them. (Refer to <i>Section 2.5. Transverse Rails and Main Assembly Installation</i> ).
	Transverse Rail not correctly fixed or adjusted.	Adjust correctly Transverse Rails Fixation. (Refer to <i>Section 2.8 Transverse Rails Fixation</i> ).
	Rails or wheels are dirty.	Clean the Transverse rails. (Refer to <i>Section 8.3 Service Tasks and Section NO TAG Visual Checking</i> ).
	Transverse belt is not correctly assembled. Remember that the Ceiling Suspension is provided just with one belt depending on the Room Configuration.	Check the longitudinal belt installation, without twist and well tensioned. If not install again. (Refer to <i>Section 2.8 Transverse Rails Fixation</i> ).
<b>VERTICAL MOVING EFFORT TOO HIGH</b> Refer to FC 7.2.14	If efforts are higher moving up and tube tends to drift downward.	Check central pulley, steel cable and gas springs status.
	Lock is off or there is no power to lock.	Check fuse on circuit board.
	Insufficient power to lock.	Check line voltage and position circuit board jumper accordingly.

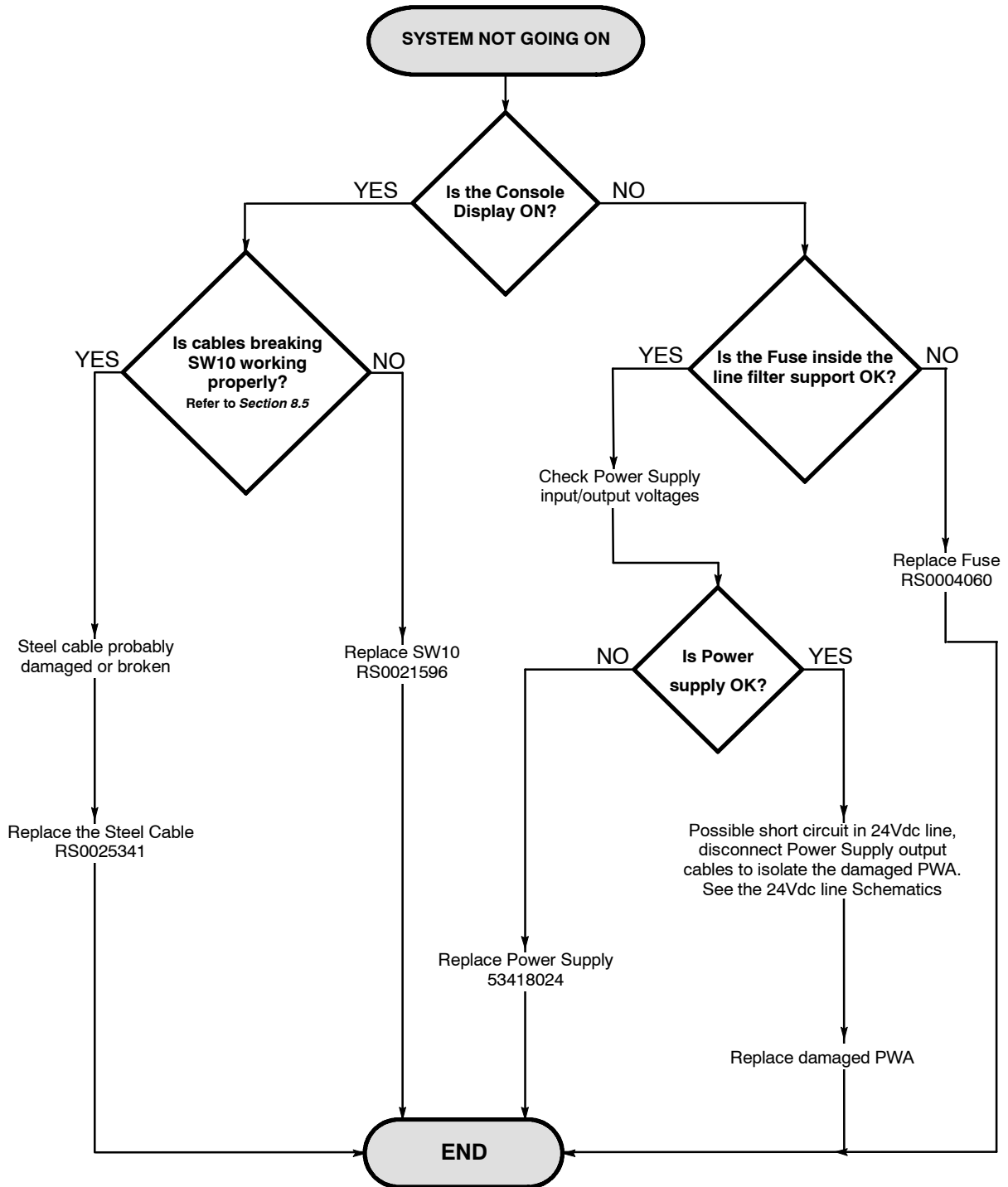
**Table 7-1 (cont.)**  
**Troubleshooting Guide**

PROBLEM	CHECK IF	ACTION
<b>DEFECTIVE TUBE ANGULATION &amp; INCORRECT ALIGNMENT</b> Refer to FC 7.2.15	Detent not correctly adjusted. The eccentric bolt on the Detent Lever is not adjusted properly.	Adjust correctly the detent marker.
	The X-ray tube is not level.	Adjust properly the Tube. <i>(Refer to Section 2.11.5 Tube Leveling).</i>
<b>LOCK DOES NOT HOLD TUBE IN ANGULAR POSITION</b> Refer to FC 7.2.16	Angulation switch is shorted on.	Check and replace switch, if necessary.
	Lock is faulty.	Replace lock.
	Board is faulty.	Check and replace circuit board, if necessary.
<b>SUSPENSION DOES NOT TRACK WITH TABLE</b> (Just for Auto-tracking Ceiling Suspension) Refer to FC 7.2.17	System Control PWA, P/N S0013450, is damaged.	Replace the board
	Auto-tracking Z Servo Power PWA, P/N S0013392, is damaged.	Replace the board
	Cable S0013448 is damaged.	Replace the cable
<b>SUSPENSION DOES NOT TRACK WITH WALL STAND</b> (Just for Auto-tracking Ceiling Suspension) Refer to FC 7.2.18	System Control PWA, P/N S0013450, is damaged.	Replace the board
	Auto-tracking Z Servo Power PWA, P/N S0013392, is damaged.	Replace the board
	Cable S0013448 is damaged.	Replace the cable

## 7.2 TROUBLESHOOTING FLOW CHARTS

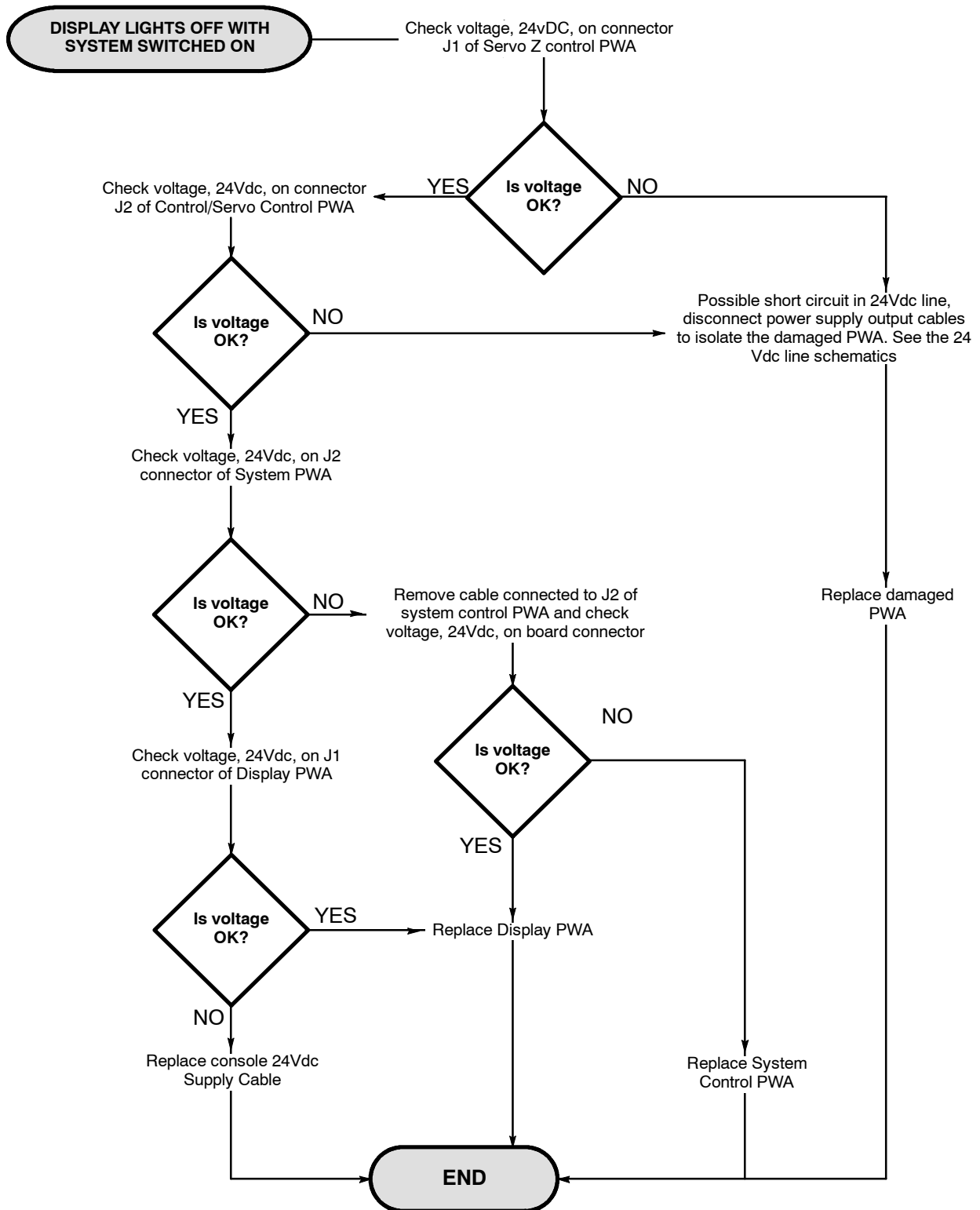
### 7.2.1 SYSTEM NOT GOING ON

#### STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS



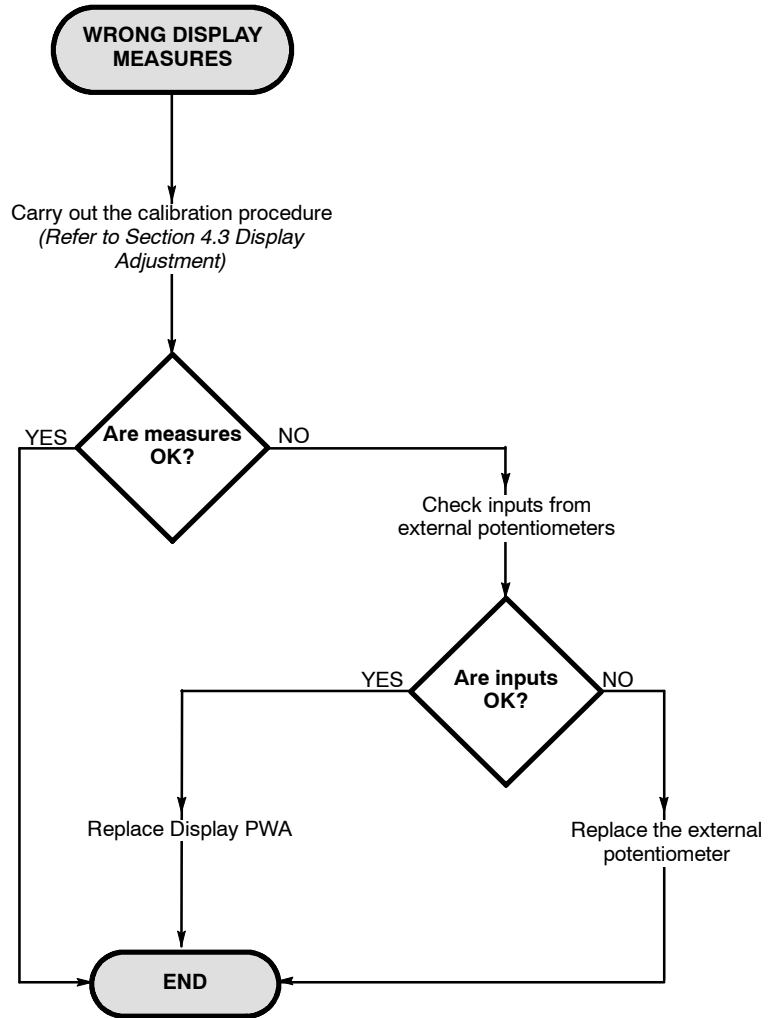
7.2.2 DISPLAY LIGHTS OFF WITH CEILING SUSPENSION ON

STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS



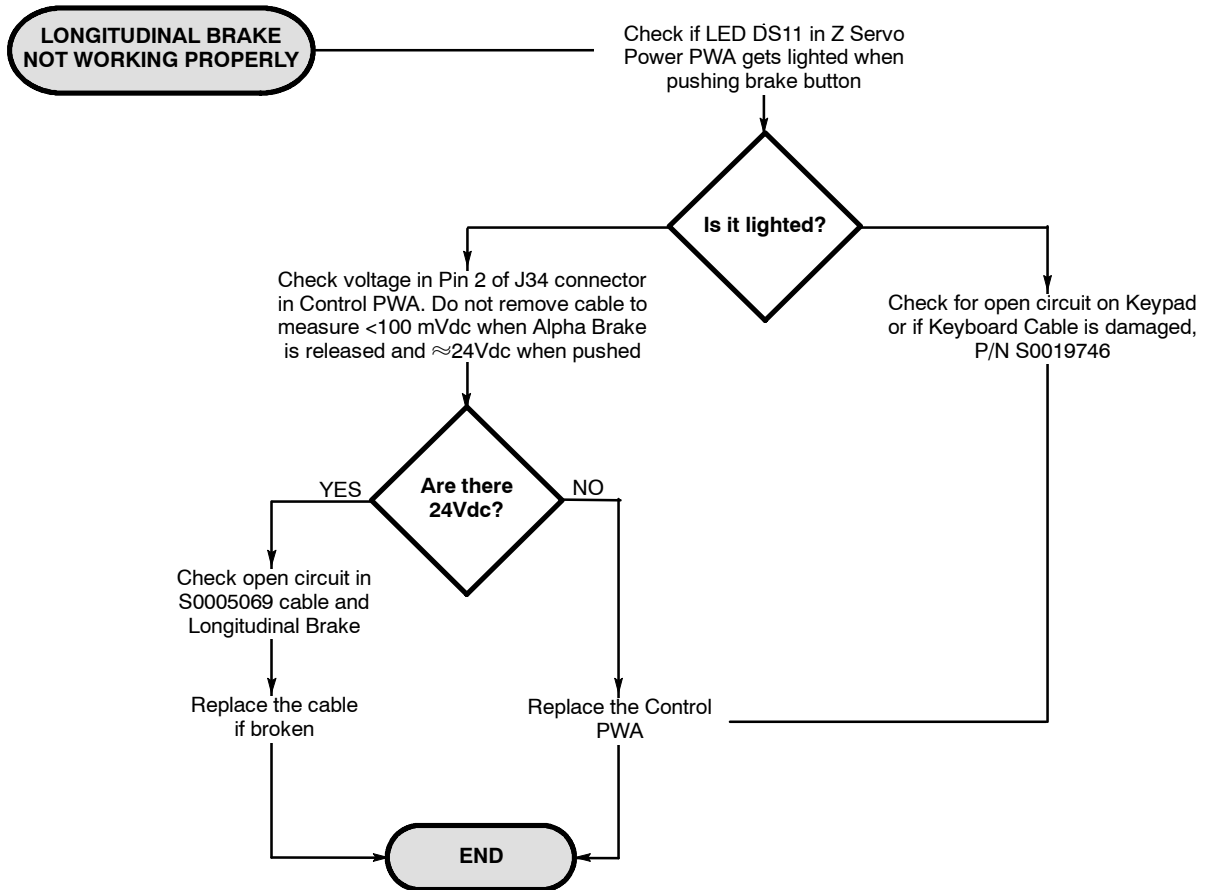
7.2.3 WRONG DISPLAY MEASURES

STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS

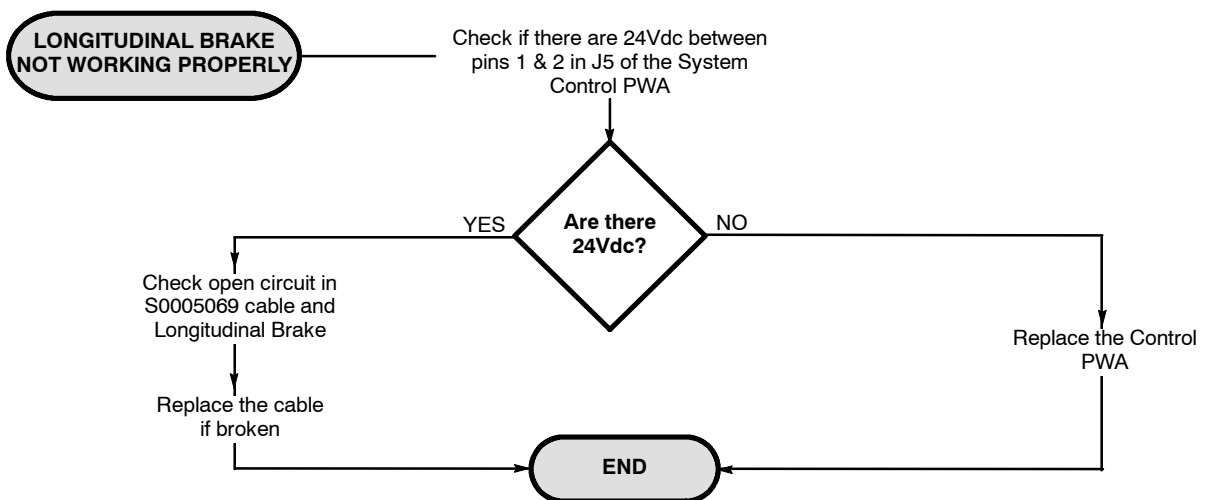


7.2.4 LONGITUDINAL BRAKE NOT WORKING PROPERLY

STANDARD CEILING SUSPENSION

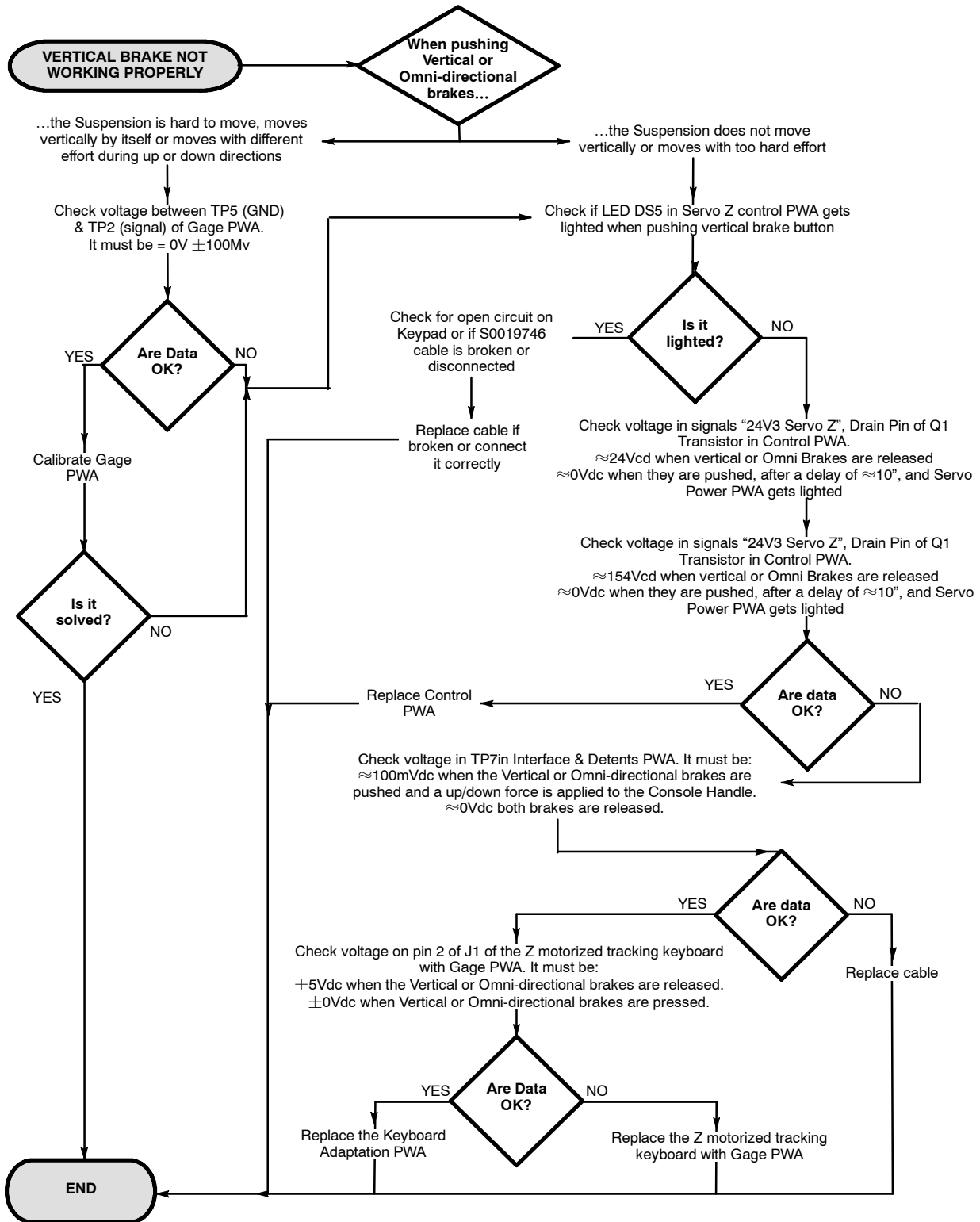


AUTO-TRACKING CEILING SUSPENSION

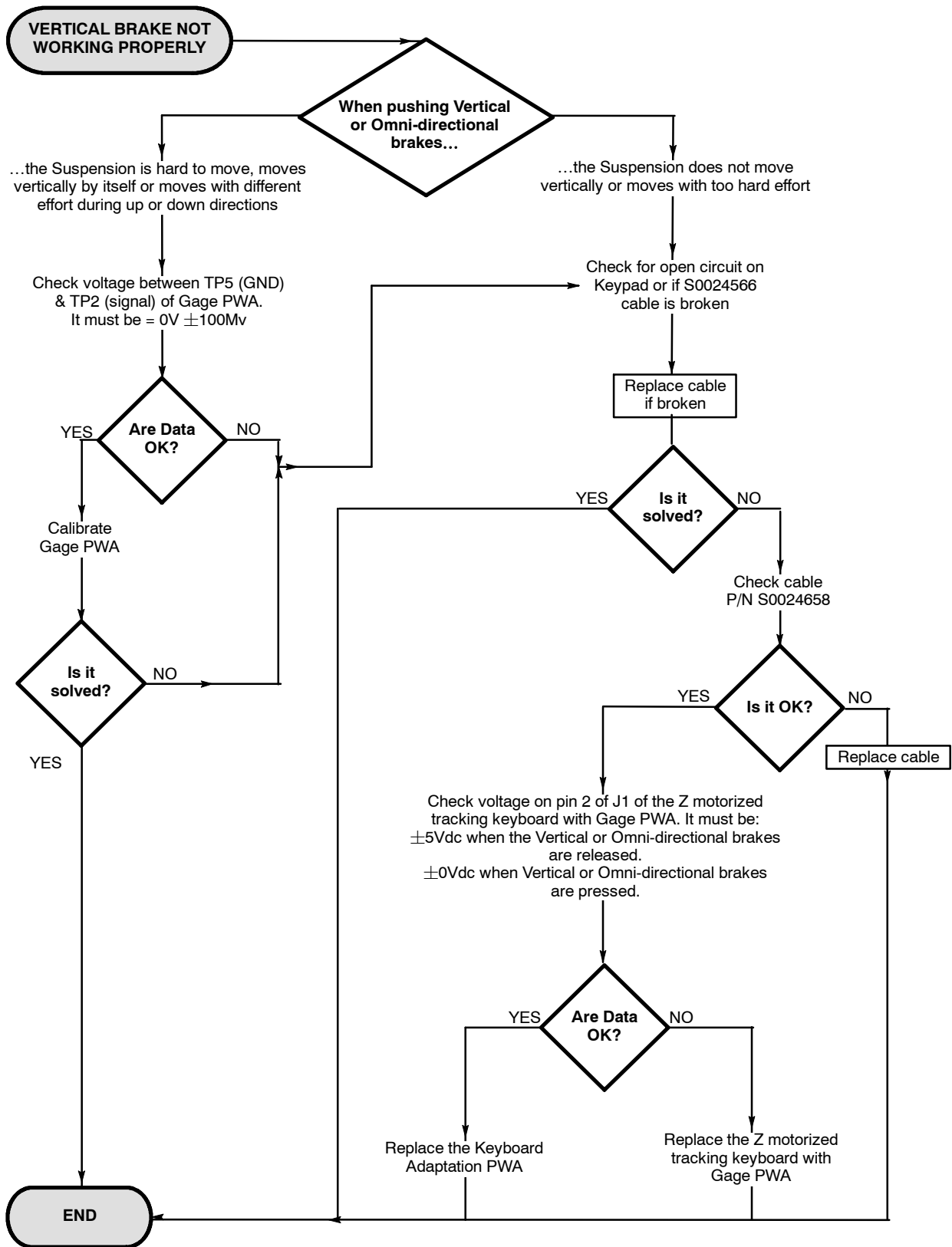


7.2.5 VERTICAL BRAKE NOT WORKING PROPERLY

STANDARD CEILING SUSPENSION

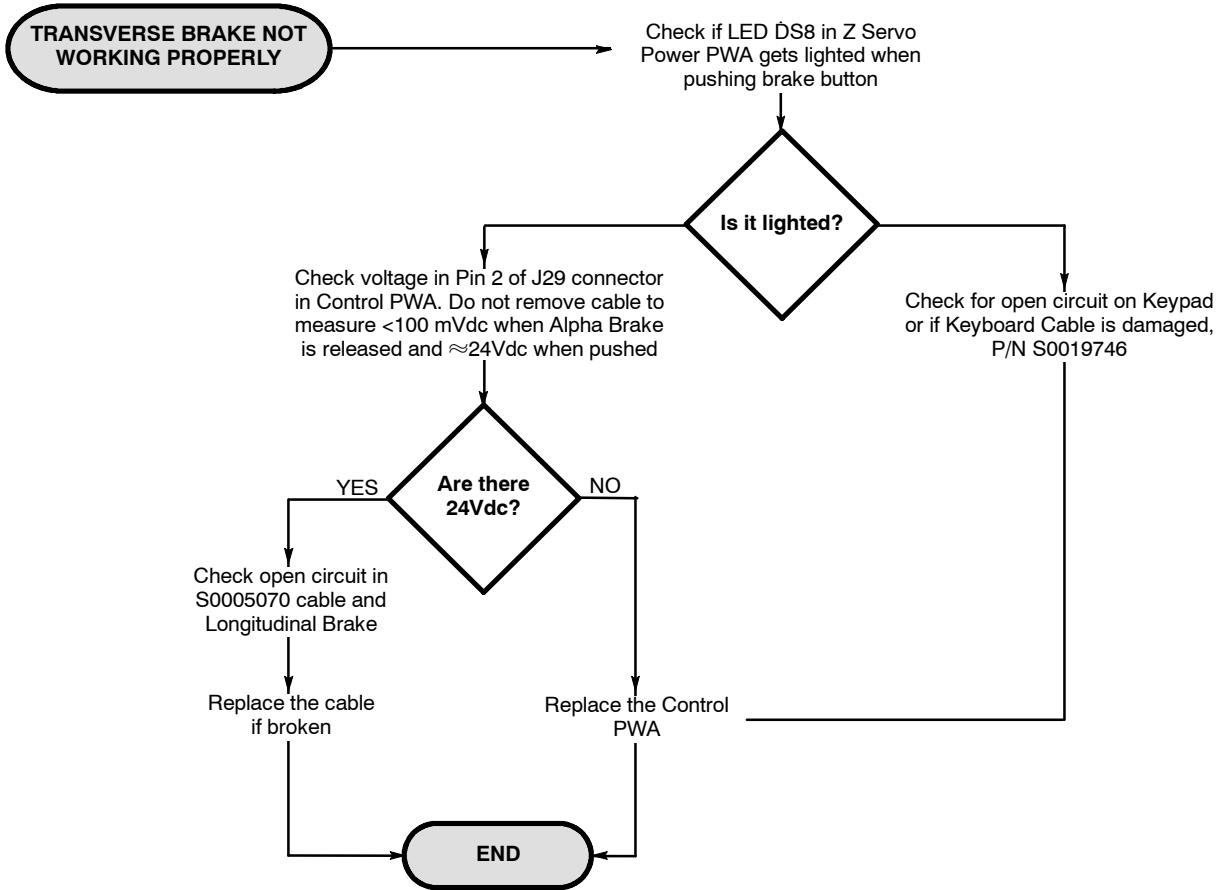


**AUTO-TRACKING CEILING SUSPENSION**

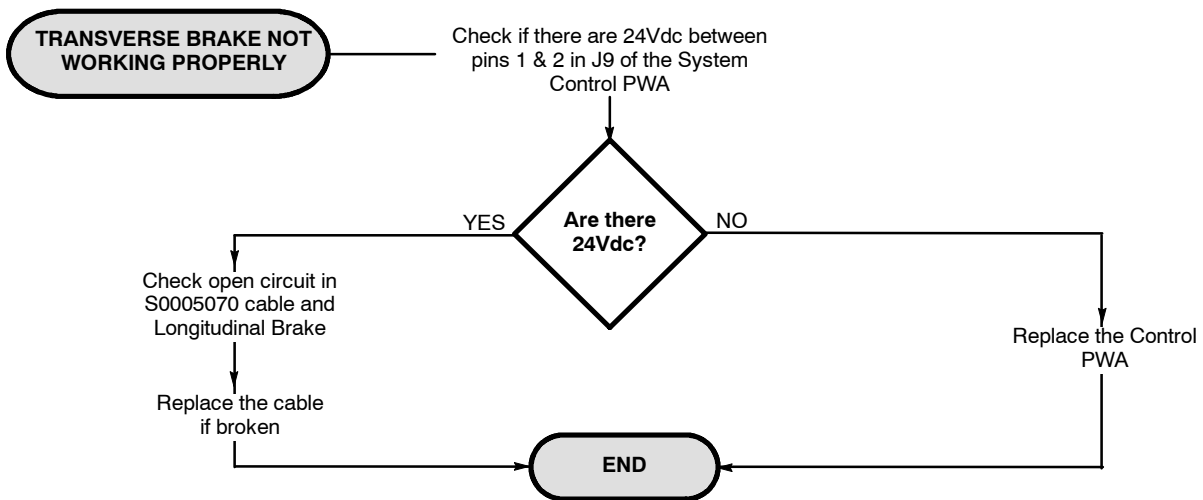


7.2.6 TRANSVERSE BRAKE NOT WORKING PROPERLY

STANDARD CEILING SUSPENSION

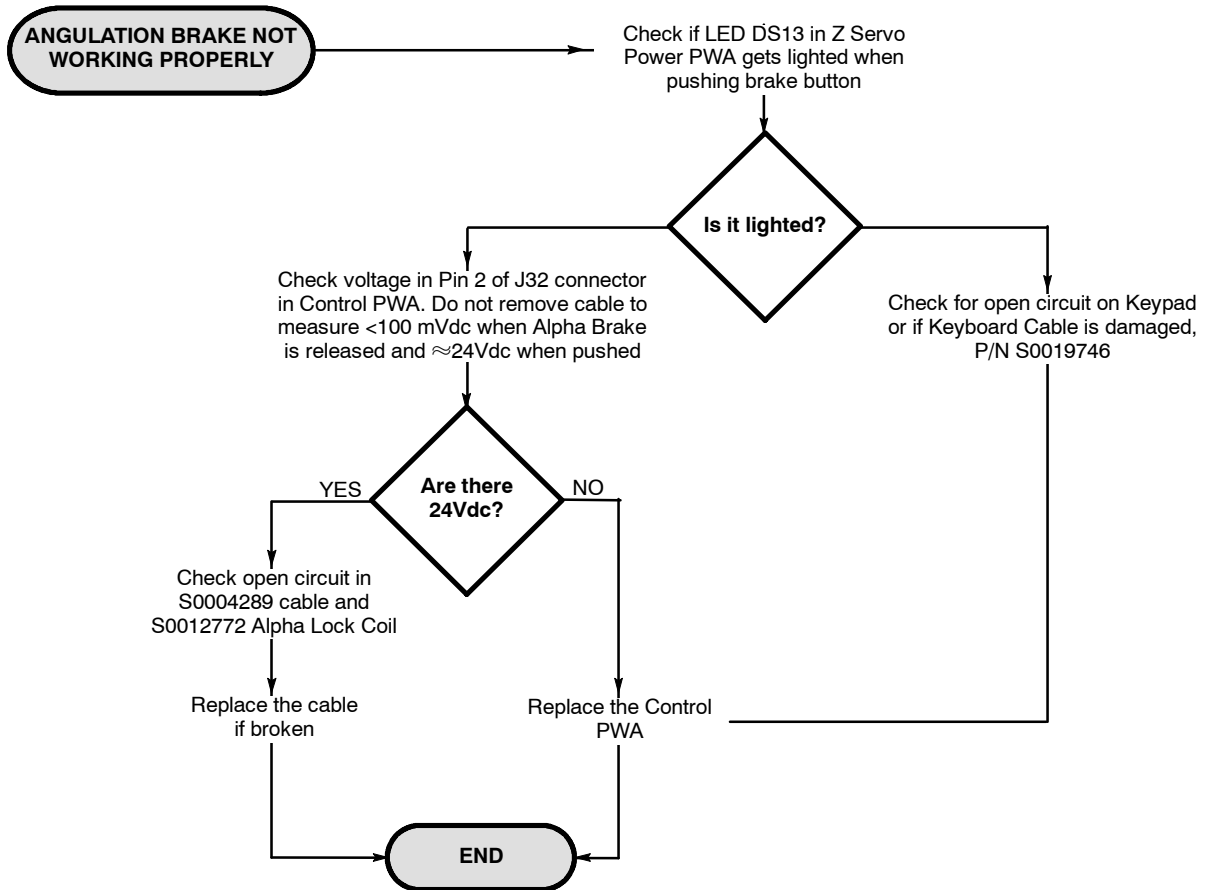


AUTO-TRACKING CEILING SUSPENSION

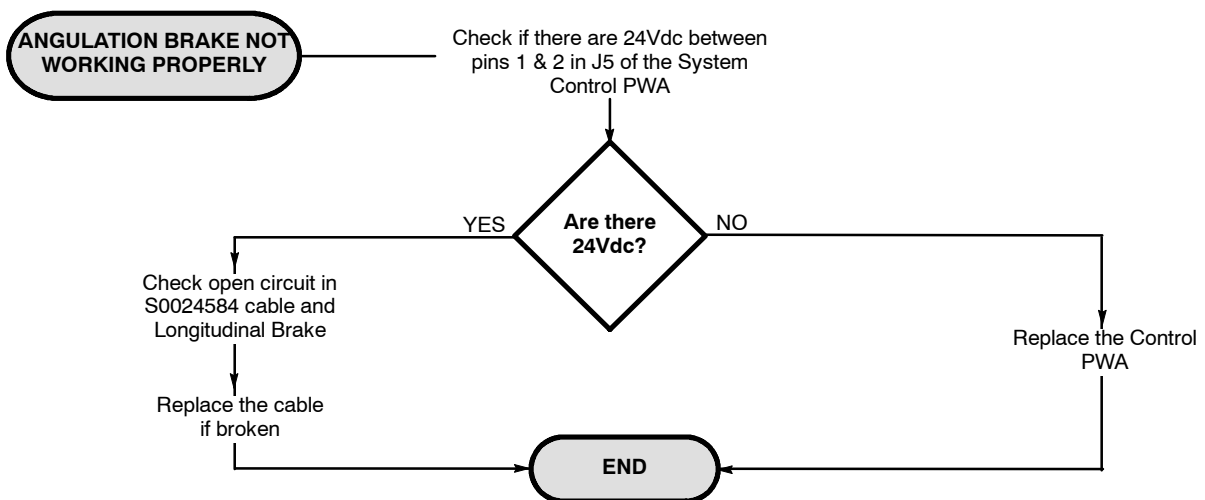


7.2.7 ANGULATION BRAKE NOT WORKING PROPERLY

STANDARD CEILING SUSPENSION

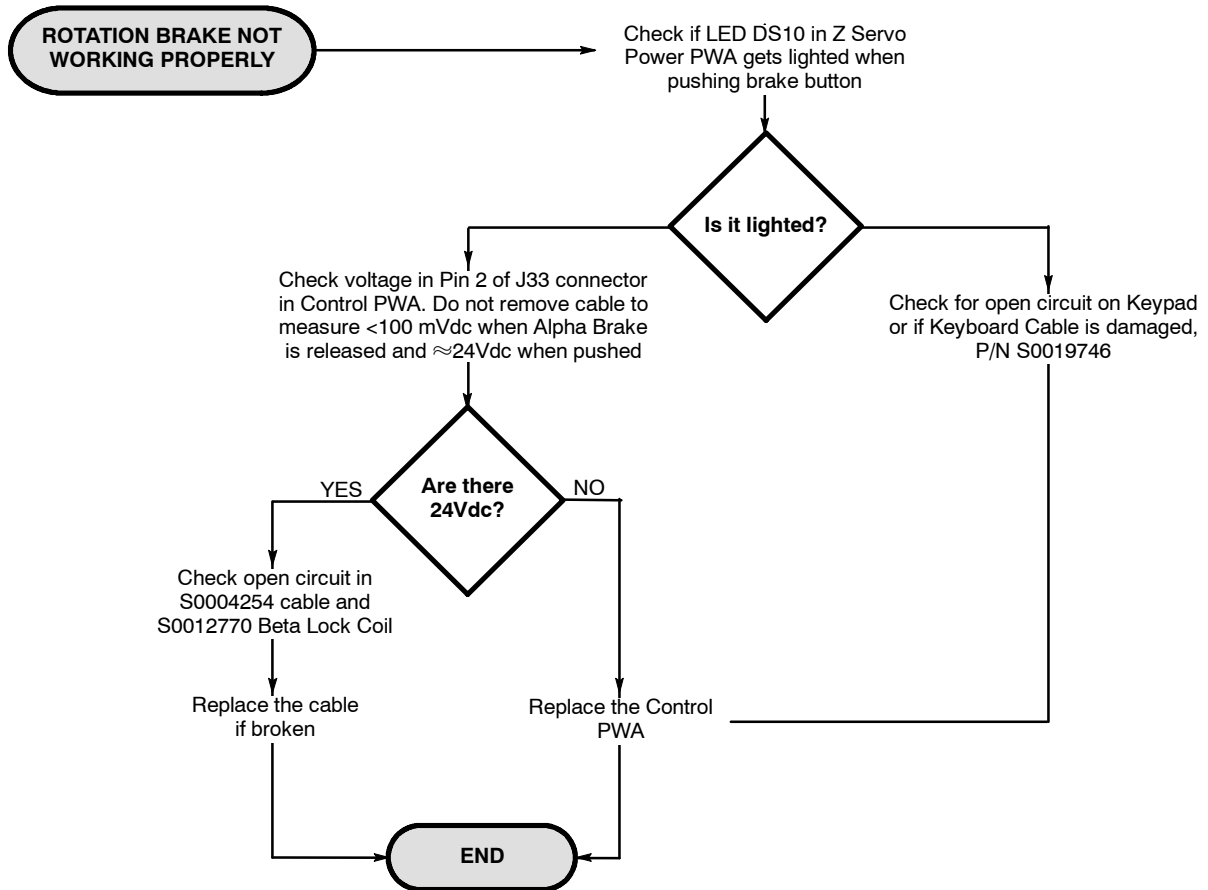


AUTO-TRACKING CEILING SUSPENSION

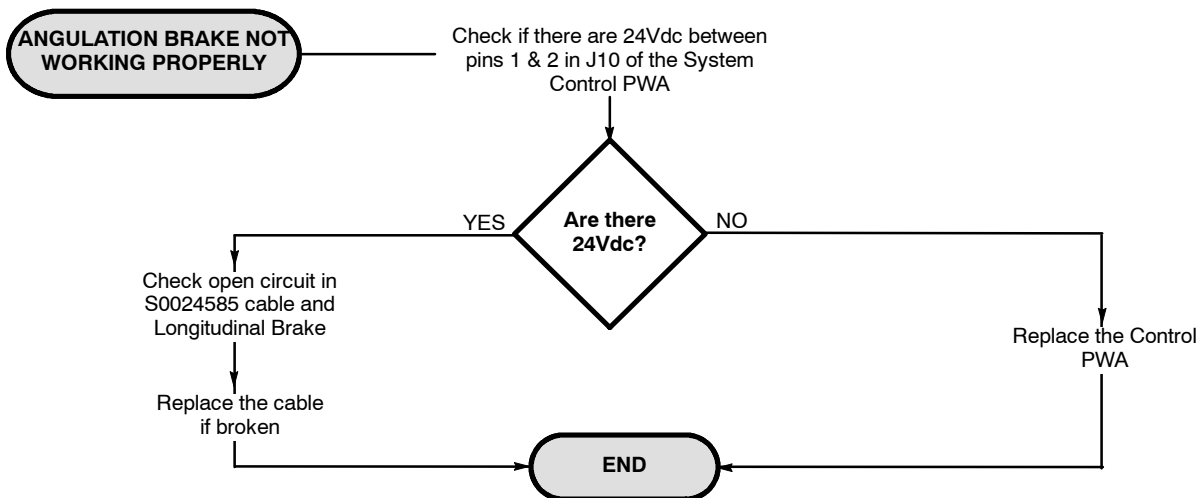


7.2.8 ROTATION BRAKE NOT WORKING PROPERLY

STANDARD CEILING SUSPENSION

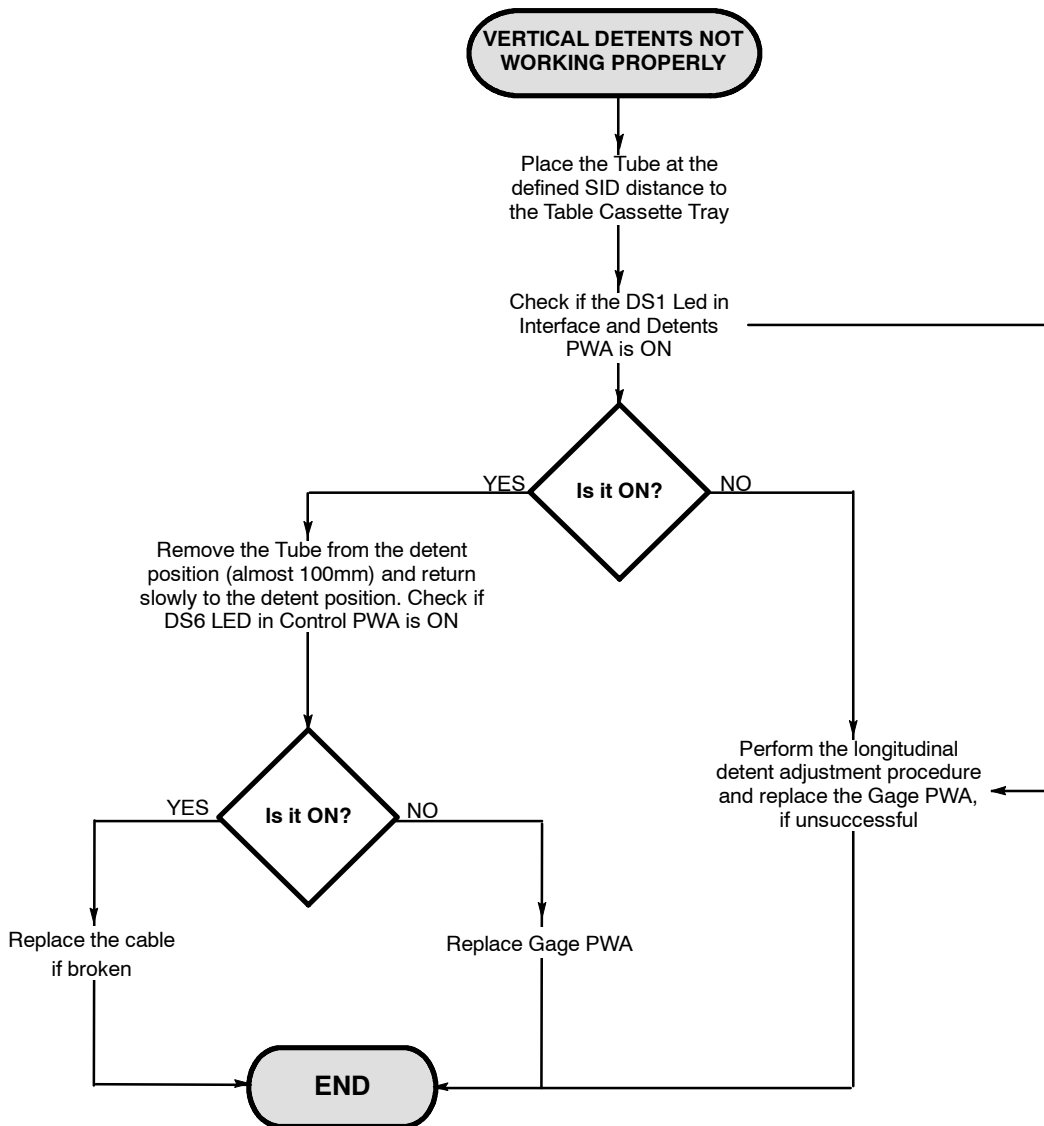


AUTO-TRACKING CEILING SUSPENSION

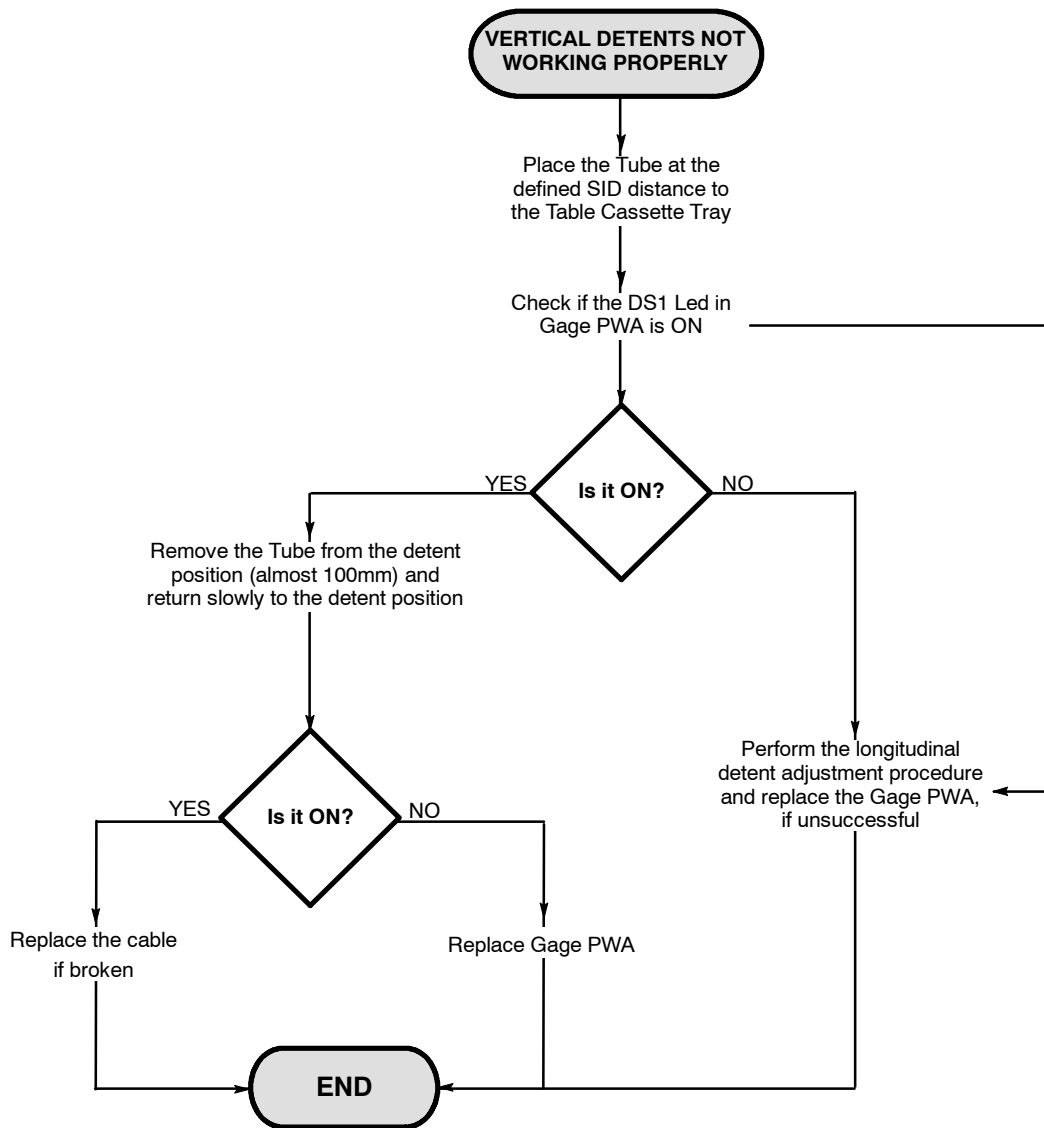


7.2.9 VERTICAL DETENTS NOT WORKING PROPERLY

STANDARD CEILING SUSPENSION

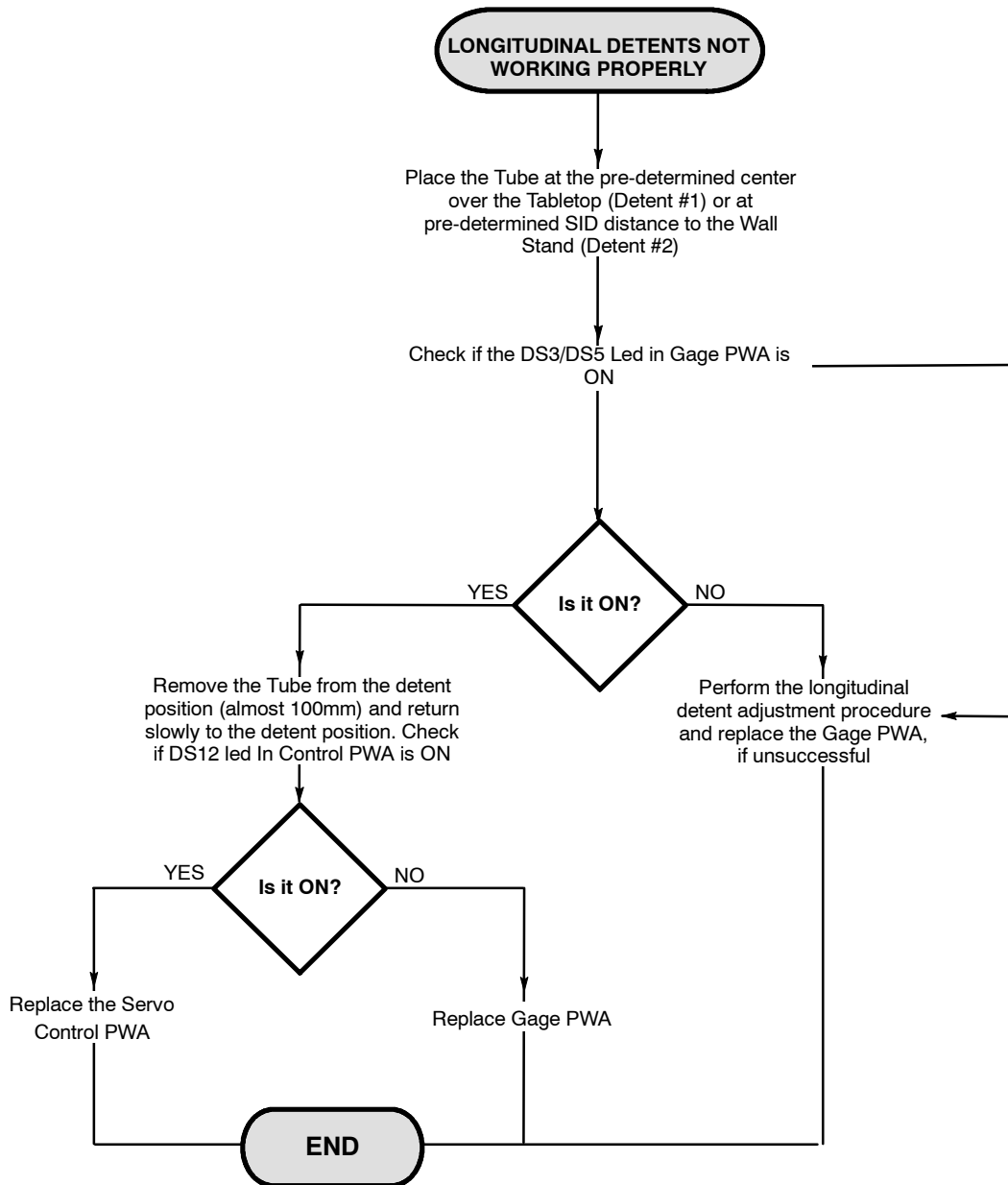


**AUTO-TRACKING CEILING SUSPENSION**



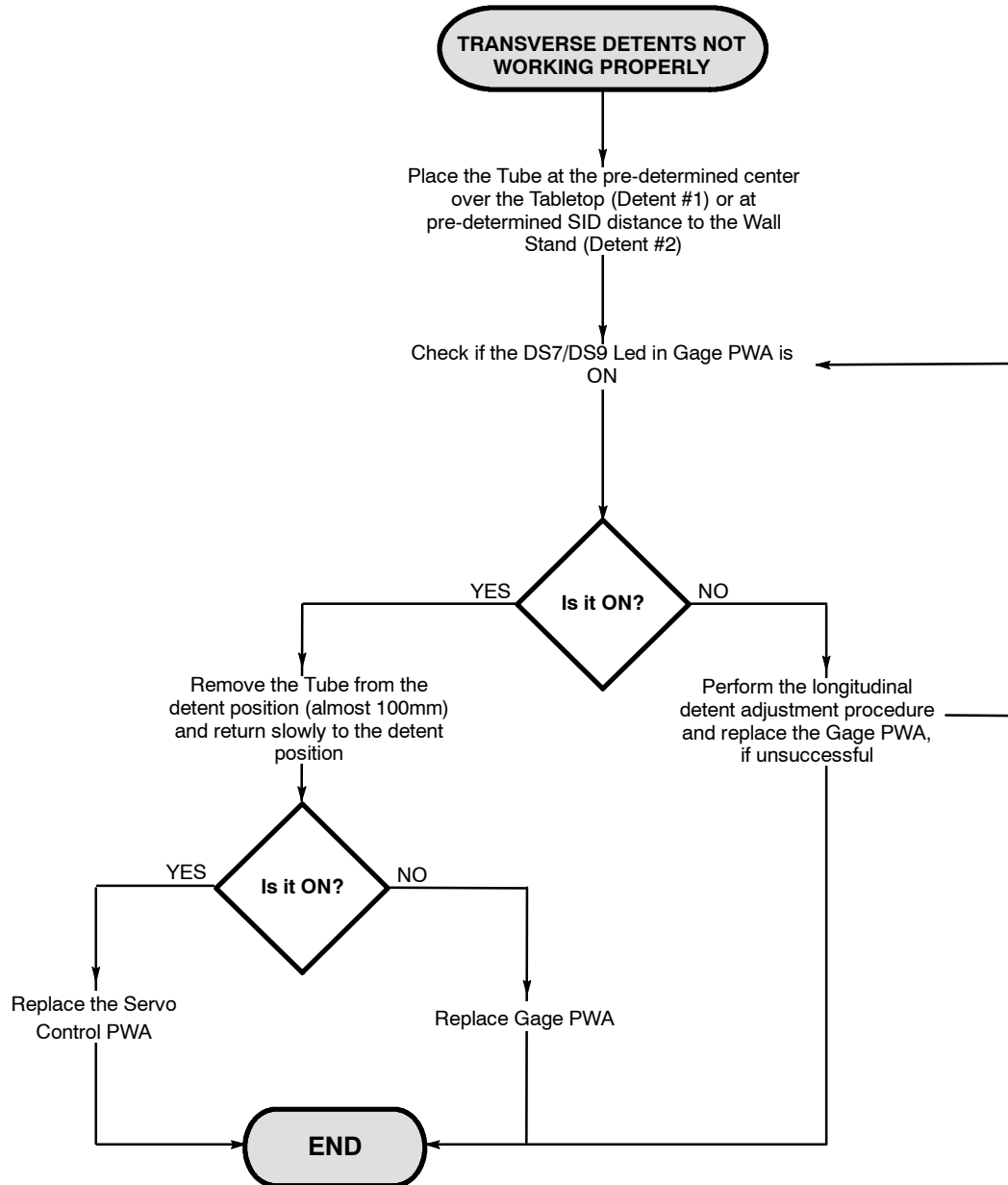
7.2.10 LONGITUDINAL DETENTS NOT WORKING PROPERLY

STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS



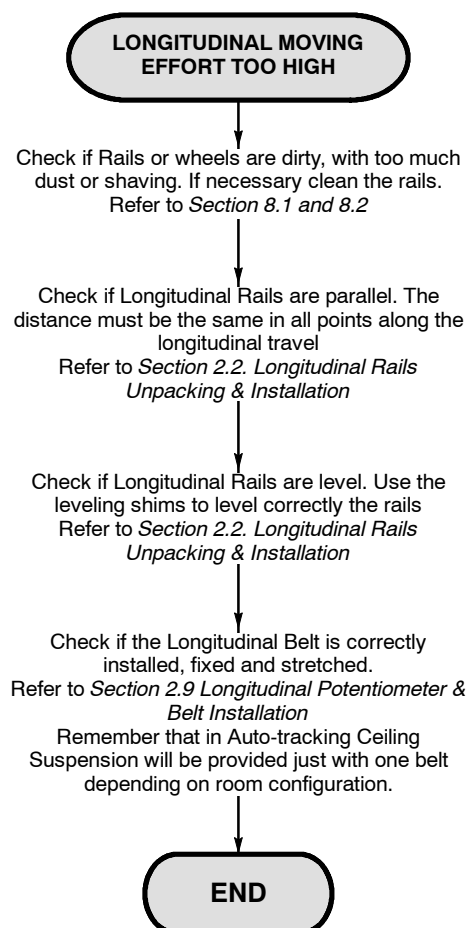
7.2.11 TRANSVERSE DETENTS NOT WORKING PROPERLY

STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS



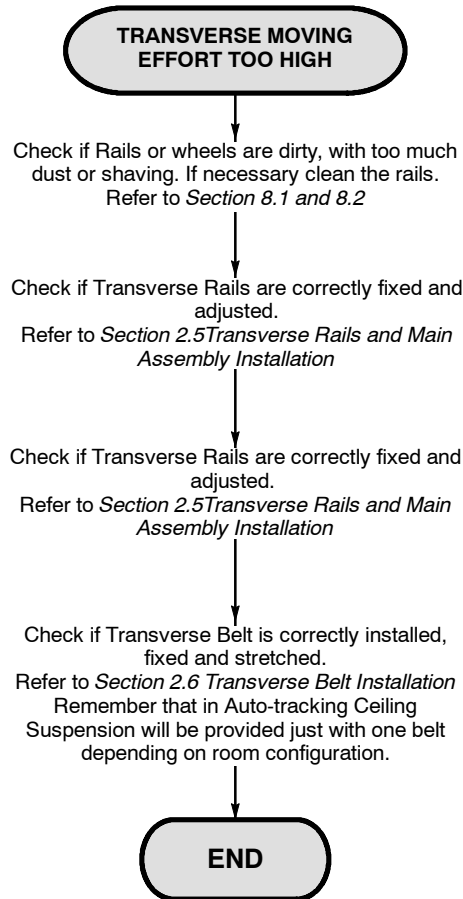
## 7.2.12 LONGITUDINAL MOVING EFFORT TOO HIGH

## STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS



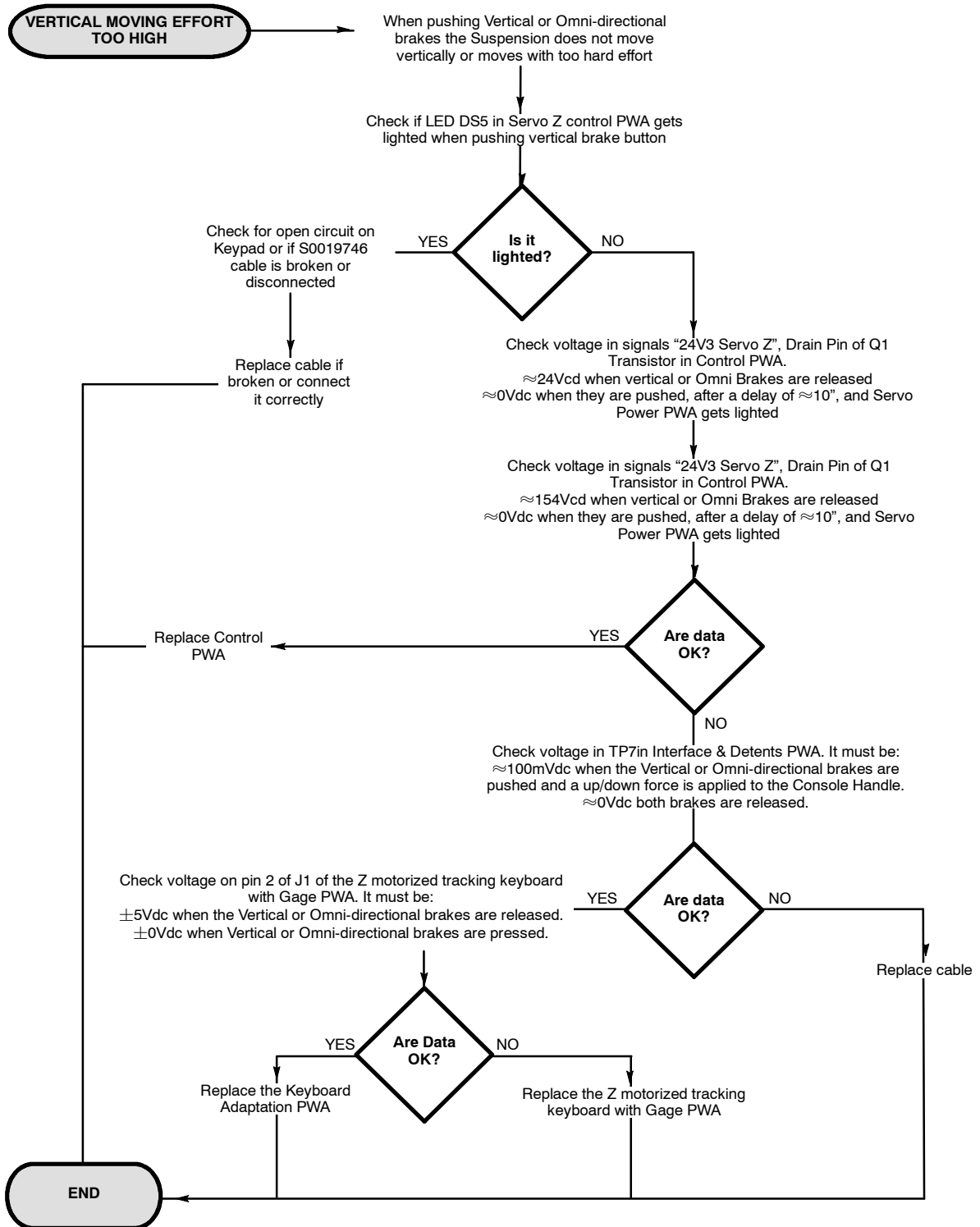
7.2.13 TRANSVERSE MOVING EFFORT TOO HIGH

STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS

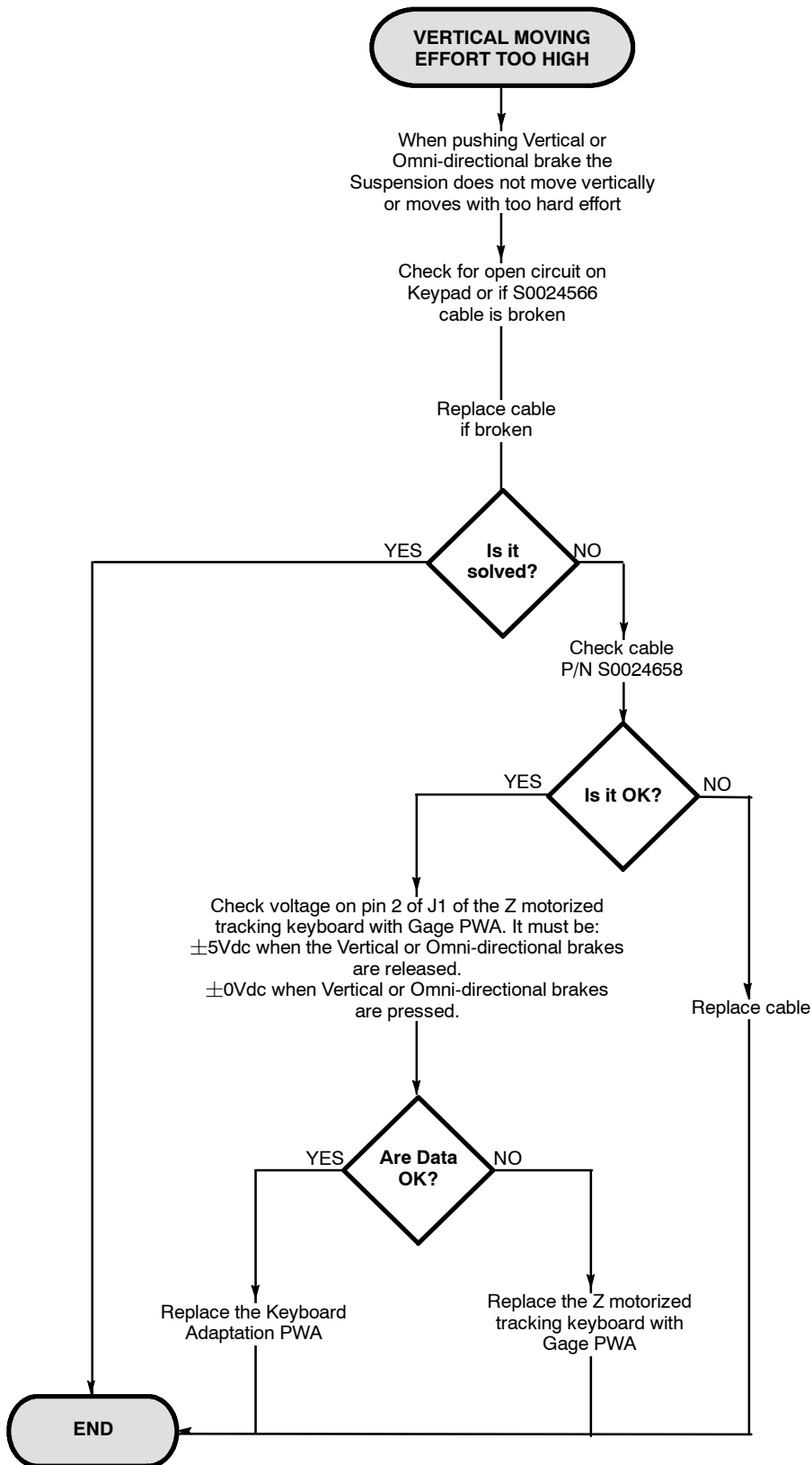


7.2.14 VERTICAL MOVING EFFORT TOO HIGH

STANDARD CEILING SUSPENSIONS

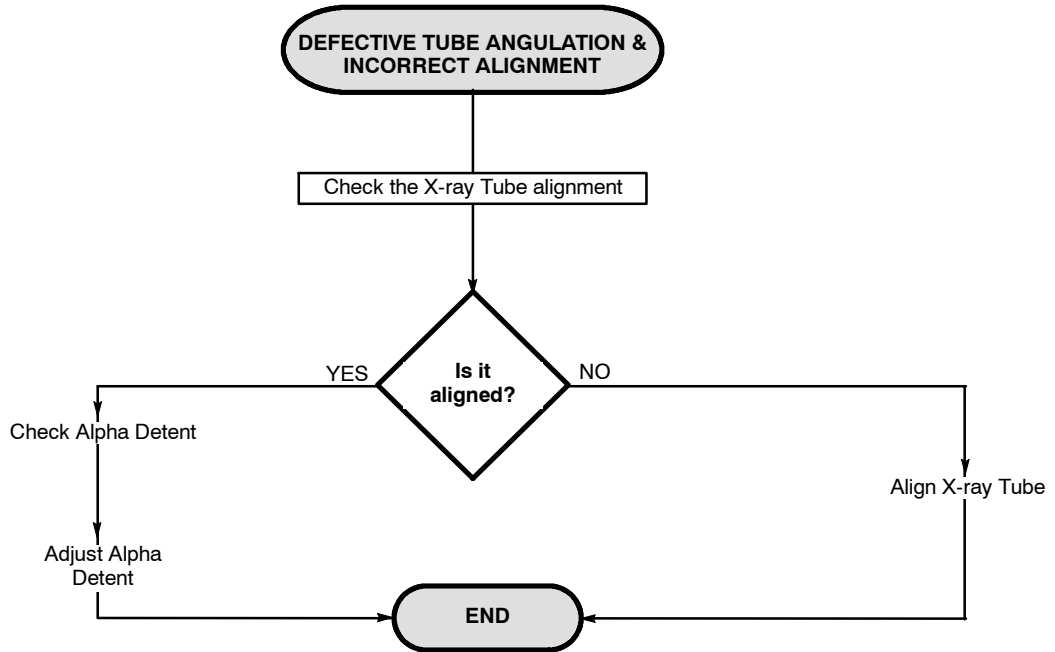


**AUTO-TRACKING CEILING SUSPENSIONS**



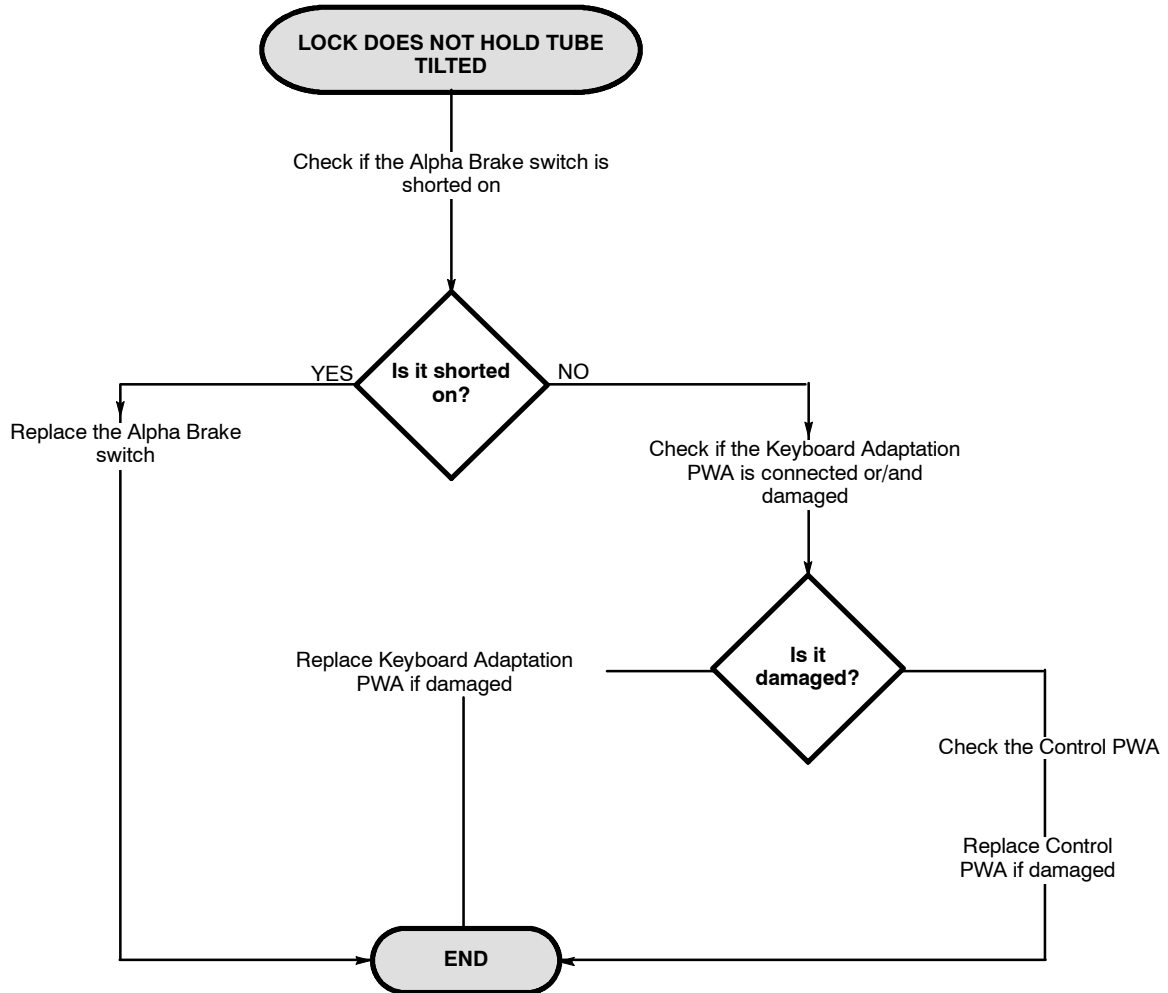
7.2.15 DEFECTIVE TUBE ANGULATION & INCORRECT ALIGNMENT

STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS



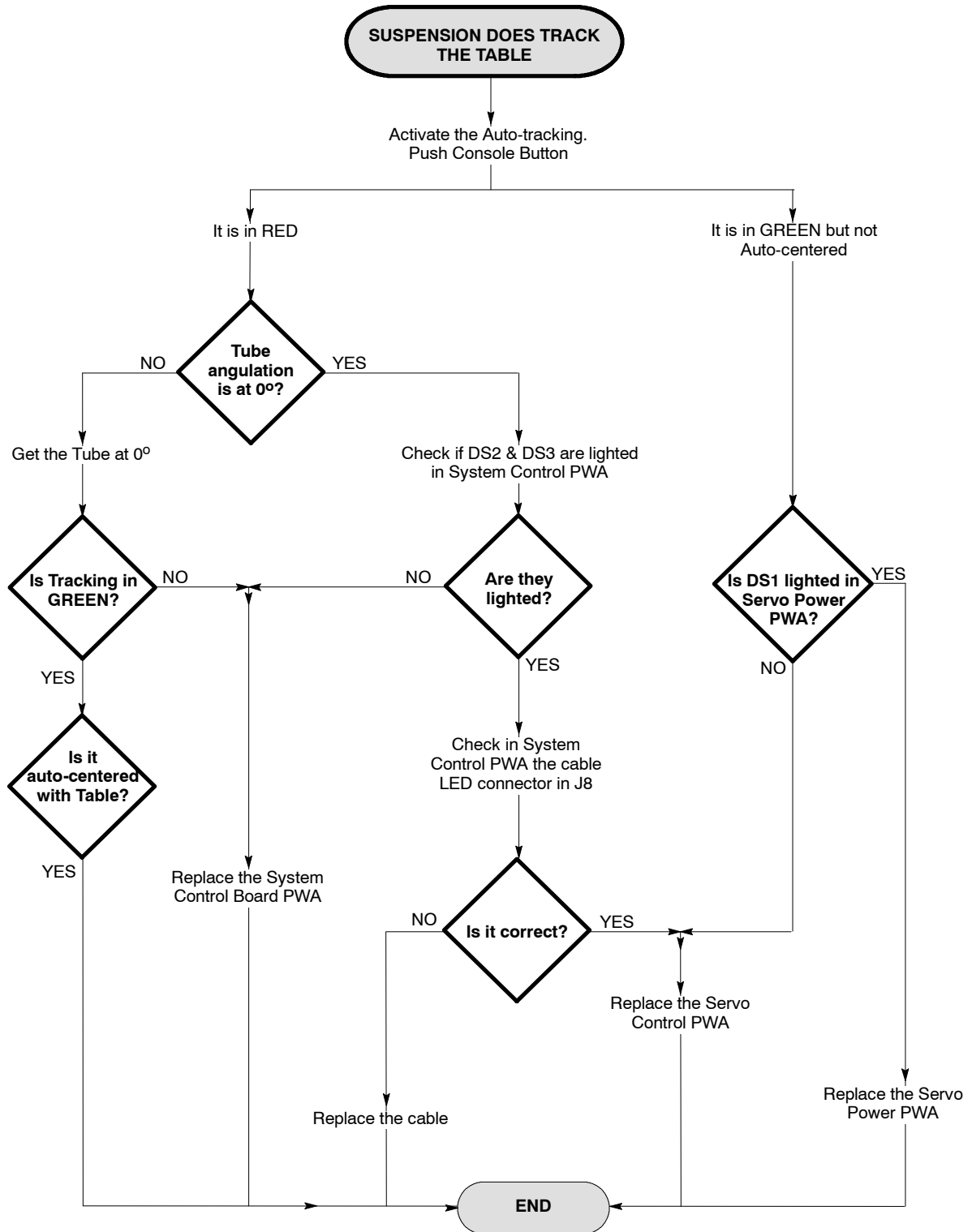
7.2.16 LOCK DOES NOT HOLD TUBE IN ANGULAR POSITION

STANDARD AND AUTO-TRACKING CEILING SUSPENSIONS



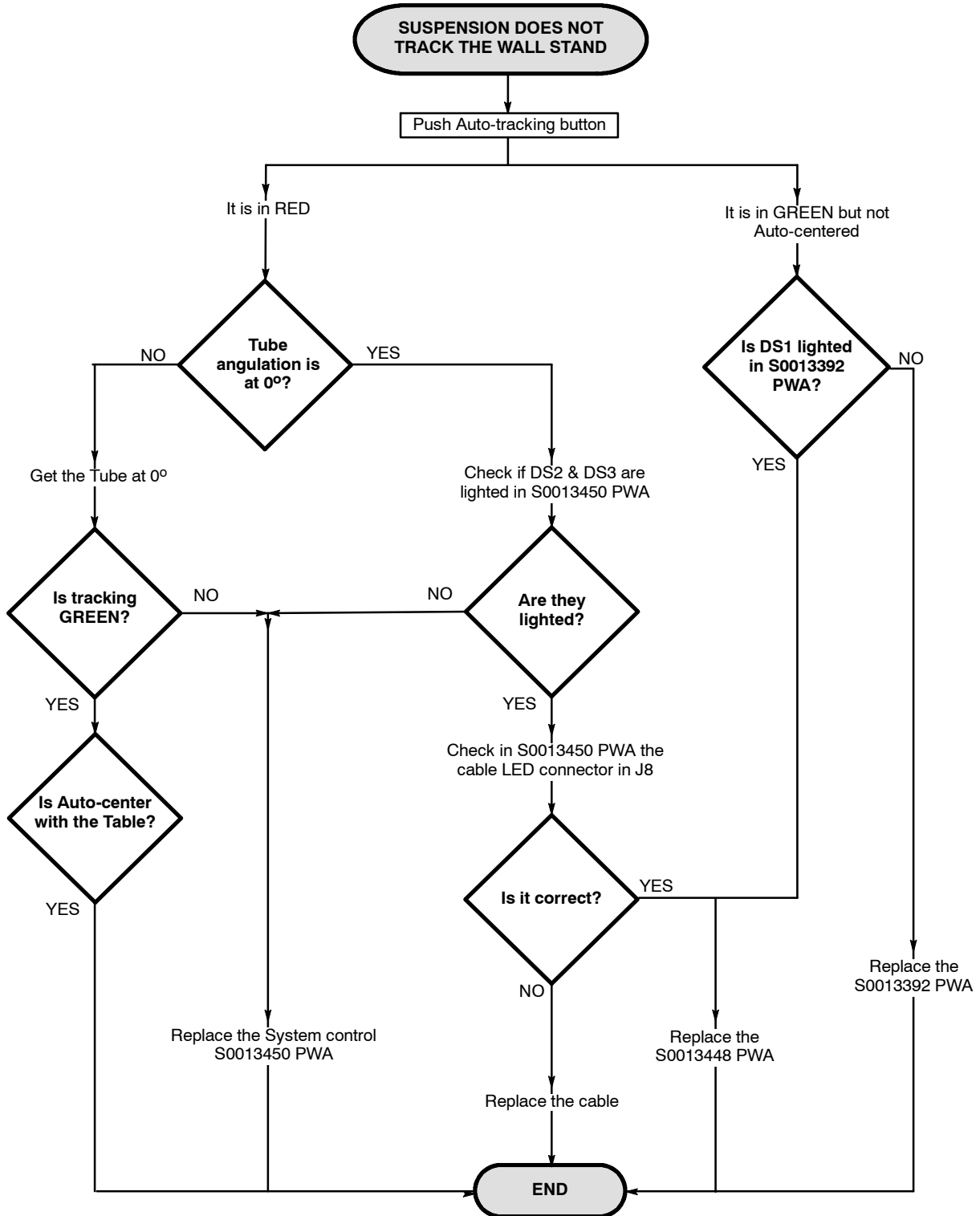
7.2.17 SUSPENSION DOES NOT TRACK THE TABLE

AUTO-TRACKING CEILING SUSPENSION



7.2.18 SUSPENSION DOES NOT TRACK THE WALL STAND

AUTO-TRACKING CEILING SUSPENSION



## SECTION 8 PERIODIC MAINTENANCE

### 8.1 MAINTENANCE INFORMATION

For a secure and continuous operation of the X-ray equipment, a periodical maintenance program has to be established. It is the owner's responsibility to maintain the system. Once the installation is finished, the Ceiling Suspension needs a maintenance every twelve (12) months.



**NEVER ATTEMPT TO PERFORM MAINTENANCE TASKS WHILE THE ME EQUIPMENT IS IN USE WITH A PATIENT.**



**NEVER ATTEMPT TO CLEAN ANY PART OF THE EQUIPMENT WHEN THE EQUIPMENT IS POWERED ON. SWITCH OFF THE LINE POWER SUPPLY BEFORE CLEANING.**



**ONLY SERVICE PERSONNEL SPECIFICALLY TRAINED ON MEDICAL X-RAY EQUIPMENT SHOULD WORK ON OR MAINTAIN THIS EQUIPMENT. ALL MAINTENANCE MUST BE DONE BY THE APPROPRIATE MAINTENANCE PERSONNEL, QUALIFIED FOR THE MAINTENANCE OF THIS EQUIPMENT AND AWARE OF THE POTENTIAL DANGERS ASSOCIATED WITH THIS EQUIPMENT.**



***Do not use cleaners or solvents of any kind as they may dull the finish or blur the lettering. Polish with clean water.***

Note 

*Maintenance frequency can depend on determinate legal requirements of the country or state in which the equipment is installed.*

*Always check the legislation and local normative when determining the maintenance calendar.*

## 8.2 OPERATOR TASKS

The task of this periodic maintenance shall include the following items:



**DO NOT REMOVE ANY COVER, DISASSEMBLE OR MANIPULATE INTERNAL COMPONENTS OF THE EQUIPMENT. THESE ACTIONS COULD CAUSE SERIOUS PERSONAL INJURIES AND/OR EQUIPMENT DAMAGE.**



**NEVER ATTEMPT TO CLEAN ANY EQUIPMENT PART WHEN IT IS SWITCHED ON. ALWAYS SWITCH OFF THE SYSTEM BEFORE CLEANING AND ISOLATE THE MAINS ELECTRICAL SUPPLY BEFORE CLEANING.**

1. Switch the System OFF.
2. Externally check the proper cable connections between each major component in the X-ray System.
3. Clean the equipment frequently, particularly if corroding chemicals are present. Clean external covers and surfaces, especially parts in contact with patients.
  - Clean the stainless steel surfaces (patient support side rails) with a plastic scouring pad (Scotchbrite or similar).
  - Clean the other surfaces with a lukewarm water moistened cloth and a soft cleaner.
  - Rinse rubbing with a clean water moistened cloth.
  - Do not use anything but water and soft soap to clean the plastic surfaces. Other cleaning products may damage the plastic cover.
  - Never use detergents, corrosive polishers, solvents or abrasives.
  - Be sure that neither water nor other liquids can penetrate the equipment. This caution avoids short-circuits and corrosive formation in components.
  - Disinfectant methods in use have to conform to legal regulations as well as any directives for disinfectants and protection against explosions.

- If disinfectants which may form explosive gas mixtures are in use, these gases must be dissipated before the equipment is switched on again.
- Aspersation decontamination is not recommended because the disinfectant may penetrate in the X-ray equipment.
- If the room decontamination is carried out with an atomizer, it is recommended to switch OFF the equipment, to let it cool, and to cover it with a plastic bag. When the disinfectant cloud has disappeared, the plastic bag can be removed and the equipment can be disinfected just with a cloth.

### 8.3 SERVICE TASKS



**WARNING**

**THE MAINTENANCE ACTIVITIES SHOWN IN THE FOLLOWING TABLE HAVE TO BE CARRIED OUT BY AUTHORIZED MAINTENANCE PERSONNEL ONLY. HOWEVER, THE OWNER OR THE EQUIPMENT OPERATOR, HAS TO PROGRAM THE SUGGESTED MAINTENANCE ACTIVITIES, WHEN NECESSARY, CONTACTING THE TECHNICAL SERVICE OF THE MANUFACTURER.**

MAINTENANCE TASKS	FREQUENCY (Months)	REQUIRED TIME (min.)	PROCEDURE
<b>GENERAL</b>			
VISUAL INSPECTION	12	20'	Search for evidences that indicate wrong operation.
CLEANING AND GENERAL PAINTING	When necessary	60'	Refer to Section 8.2 for cleaning advices.
FUNCTIONAL CHECKING	12	10'	Carry out the tasks described in Section 5. Functional Checks.
ELECTRICAL CABLES	12	10'	Check the Cables state.
			Check if they are not rubbed nor damaged.
			Change them every 10 years.
<b>TRANSVERSE RAILS</b>			
FIXING POINTS	12	10'	Check if the Bridge screws are tightened.
LEVELING	12	10'	Check the Bridge leveling and adjust again, if necessary.
GREASING	12	15'	Clean the Bridge rail inside and lubricate it.
TRACK ENDS	12	5'	Check the Track End state.

## Standard & Auto-tracking Ceiling Suspension

### Service Manual

MAINTENANCE TASKS	FREQUENCY (Months)	REQUIRED TIME (min.)	PROCEDURE
<b>LONGITUDINAL RAILS</b>			
FIXING POINTS	12	15'	Check if the screws are tightened to the ceiling anchorage.
LEVELING	12	10'	Check if the rail leveling and adjust again, if necessary.
GREASING	12	15'	Clean the rail inside and lubricate it.
BELT	12	5'	Check the belt state and if it is properly tightened.
TRACK ENDS	12	5'	Check the Track End state.
<b>MAIN CARRIAGE</b>			
FIXING POINTS	12	10'	Check the screw fixing points tightening of the Gas Springs.
WAGON GUIDE OF THE GAS SPRINGS	12	20'	Check the guide and the skate state. Clean and grease them with light machine oil, if necessary.
STEEL WIRE	12	5'	Check their state, that rubbings nor threads appear. Change them every 10 years.
GAS SPRINGS	12	5'	Check their state, that no oil lacks nor piston deformations appear. Change them when the Suspension has reached $\pm 100.000$ cycles (5 to 10 years).
PULLEYS	12	10'	Check their state, that no shavings, wears nor deformations appear.
<b>TELESCOPIC COLUMN</b>			
MOVEMENT	12	5'	Check that up and down movements are soft and without jumps.
<b>TUBE SUPPORT</b>			
MOVEMENT	12	5'	Check that the rotation movements are soft and without jumps.
<b>OPTIONS</b>			
<b>Mechanical Detents</b>	12	5'	Check that there are not damages and that fixations are tightened.
<b>SID &amp; Alignment Markers</b>	12	5'	Check that there are not damages and that fixations are tightened.
<b>Collimator</b>	12	5'	Check that it is properly fixed by pulling and shaking it. Refer to Section NO TAG if any adjustment is needed.

**Note** 

*A cycle means one up and down movement of the Tube and Collimator Assembly.*



**FOR THE SECURITY OF BOTH THE OPERATOR AND PATIENT REPLACE ALL STEEL CABLES EVERY TEN YEARS, AS WELL AS ACCOMPLISHING WITH MAINTENANCE SCHEDULE.**

**8.3.1 REQUIRED TOOLS**

- Laser alignment tool
- Torque wrench 10 - 100 Nm.
- Hexagonal (Allen) tool bits
- Stepladders
- Soft cloth
- Soft soap
- Light machine oil.

**8.3.2 PMS LABEL**

In order to control the periodic maintenance inspections there is available a PMS label stick in the telescopic column, where it must be indicated the date and technician in charge of each PMS.

The Service Representative is required to ensure this label is completed after each PMS.

**Illustration 8-1  
Preventive Maintenance Label**

<b>ATTENTION</b>			
FOR THE SECURITY OF BOTH THE OPERATOR AND THE PATIENT, AND TO ENSURE A PROPER FUNCTIONING OF THE SYSTEM, OBSERVE THE FOLLOWING INSTRUCTIONS: INSPECT STEEL CABLES: ONCE A YEAR REPLACE STEEL CABLES: EVERY 10 YEAR			
<b>INSPECTIONS</b>			
DATE	TECHNICIAN	DATE	TECHNICIAN
/ /		/ /	
/ /		/ /	
/ /		/ /	
/ /		/ /	
/ /		/ /	
/ /		/ /	
/ /		/ /	
/ /		/ /	
/ /		/ /	
<b>REPLACEMENTS</b>			
DATE	TECHNICIAN	DATE	TECHNICIAN
/ /		/ /	
/ /		/ /	

### 8.4 PREVENTIVE MAINTENANCE PROCEDURES

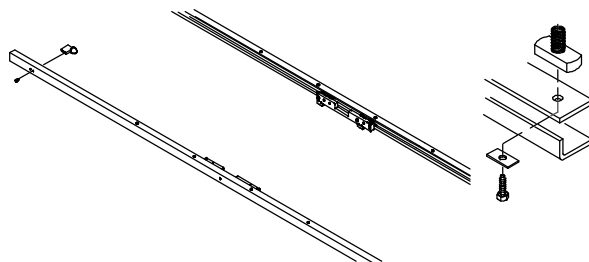
#### 8.4.1 REQUIRED TOOLS

- Isopropyl alcohol
- Insulating oil and insulating washer
- Detergent
- Loctite 243

#### 8.4.2 VISUAL CHECKING

1. Disconnect and do LOCKOUT of the main power.
2. Check the Suspension for indications of abnormal operation:
  - Metal Shavings
  - Excessive dust
3. Use mild soap to clean the exterior areas of the Suspension.
  - Carriage
  - Telescopic Column
  - X-ray tube
  - Collimator
  - Console
4. Use mild Soap to clean the bearings, longitudinal rails and the Bridge, both interior and exterior surfaces.
5. Check that all the mounting bolts holding longitudinal rails are tightened to the correct torque of 70 Nm.

#### Illustration 8-2 Check Tightening Bolts

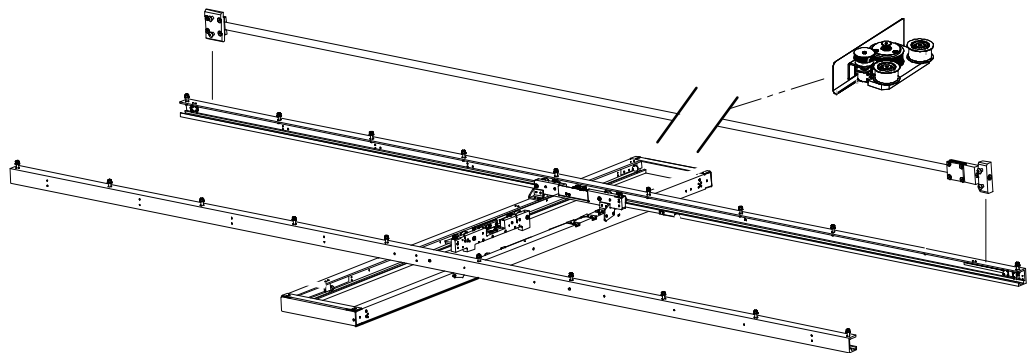


### 8.4.3 CHECKING AND ADJUSTMENT OF THE LONGITUDINAL BELT

Each Suspension must have four two pairs End-stop bumpers, two at the front Longitudinal Rail and two at the left Transverse Rail, always at the rail where the brake is installed.

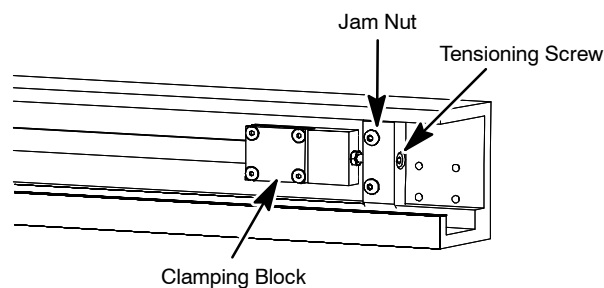
1. Check the End-Stop Bumpers for damage or tightness of screws.
2. Check the Belts for damage or excessive wear. In case of damage replace it.

#### Illustration 8-3 Check and adjust Longitudinal Belt Tensors



3. Place the Suspension in the center of Longitudinal and Transverse axes.
4. Locate the Belt Tensor for the Belt.
5. Loosen the Jam Nut.

#### Illustration 8-4 Belt Tensor



6. Rotate the Tensioning Screw counter-clockwise until the Tensioning Screw is out of the Clamping Block.
7. Rotate the Tensioning Screw into the Clamping Block one rotation.
8. At the other end of the rail, loosen the 4 screws.

9. Tighten the Belt.
10. Tighten the 4 screws back.
11. Rotate the tensioning screw clockwise to set the maximum tension of the belt.
12. Tighten the locking nut.

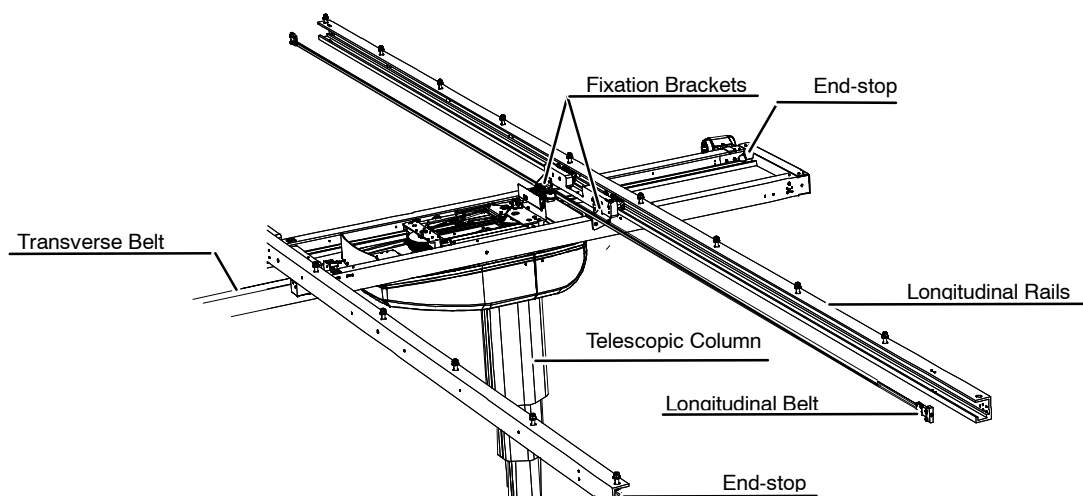
### 8.4.4 CHECKING AND TIGHTENING THE SCREWS

1. Check that all screws and bolts are tight for:
  - Longitudinal Rails
  - End-stop Bumpers
  - Longitudinal and/or Transverse Belts
  - Transverse Rails End Covers
  - Transverse Rails Fixation Brackets
  - Telescopic Column
2. Tighten them in case that they are loose.

**Note** 

*For better fixing of the screws and bolts, Loctite 243 can be applied before tightening.*

**Illustration 8-5**  
**Check all screws and bolts**



#### 8.4.5 STEEL CABLES PREVENTIVE MAINTENANCE

Steel cable (wire rope) in pulley is regarded as an expendable component, requiring replacement when the results of inspection indicate that its condition has diminished to the point where further use would be unwise from a safety standpoint.

While a new steel cable with a faulty strand wire will not create an issue, in older assemblies (over 2 years from cable installation), one faulty strand may cause a problem as the number of additional broken strands may be unknown and/or hidden within the cable and it can lead to an accelerated decay of the steel cable.

Note 

*The rate of broken wires will depend on usage, and thus heavily used equipments may accelerate the process.*



***Though visual inspection cannot determine cable degradation, visual inspection of the external surface deterioration of the cable can be used to determine the need of a cable replacement. It is recommended for older equipment to exchange them as soon as signs of wear and tear appear on the cables.***

***Clean steel cable surface with a soft cloth or cotton bud. Do not use any type of cleaner or detergent as that can cause chemical reaction, degradation and rust on the steel cable.***

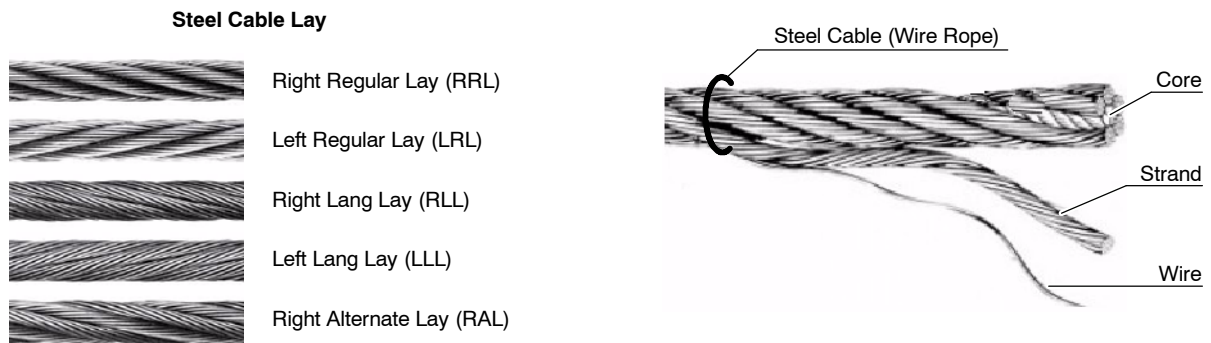
***Remove excess grease or oil and dust accumulation so that the cable can be properly inspected. Coated steel cables do not require any lubrication.***

Visual inspection, plus running a soft cloth or cotton bud over the cable's surface should be used to detect broken wires, cable abrasion and cable corrosion which are major types of cable deterioration.

When inspecting a cable at the pulleys, be sure to mark the cable at that point and then move the cable so that when the mark reappears, no portion of the cable that passes over the pulley or that is subjected to abrasion is neglected.

Standard recommendations which are in line with ISO 4309, call for the following signs to promote a replacement:

- Replace the steel cable if there are:
  - 6 or more broken wires in one lay of the steel cable.
  - 3 or more broken wires in one strand (in one lay) of the steel cable.
  - 3 or more broken wires in one lay in standing steel cables.



- Worn / Abraded wires. Reduced diameter.  
Replace if there are flat areas along cable outer surface, which would indicate friction. Look for brighter areas along the cable.
- Stretch.
- Corrosion.  
Look for any signs of rust and discoloration along the cable, should there be any replace cables.
- Core protrusion.  
Replace the steel cable when inner core starts poking through strands.
- Kinks.  
Kinks seriously reduce steel cable strength. If there are sections with kinks, the steel cable should be discarded.
- Damages on the Nylon-coated Steel Cable.  
Replace if there are any signs of damage on cable cover (abrasion, cuts, etc.) or if the cable is damaged.



***Close inspection should be made of cable terminations. Broken wires at cable terminals will require immediate cable replacement.***

**THE STEEL CABLES MUST BE REPLACED EVERY 10 YEARS.**

After inspection or replacement, standard multipurpose lithium grease should be used to lubricate the steel cable. Again, using a cotton bud or soft cloth apply a thin coat of grease through the length of the cable.

*Note* 

*Nylon-coated steel cables do not require lubrication.*

The cable revision can be scheduled during the regular yearly preventive maintenance revision.

**8.4.6 CENTRAL PULLEY CHECK**

The friction of the Steel Cables against the Central Pulley during the raising and lowering movements of the Ceiling Suspension cause the Central Pulley to wear away over time, so it is mandatory to check it periodically.

An excessive amount of metal shavings (chips) around the Central Pulley could be an indication of the deterioration of this pulley or cables.

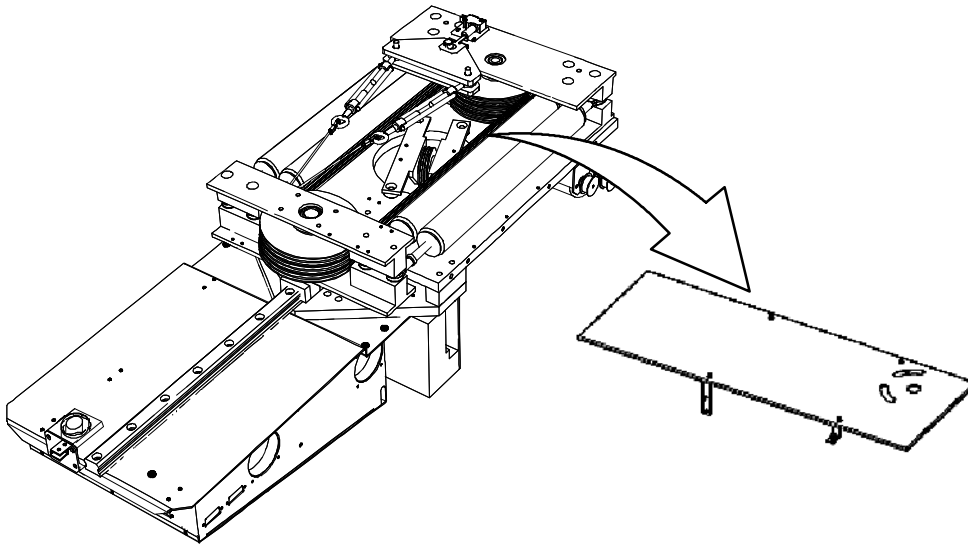
To perform this maintenance task a specific measurement tool is needed (*refer to Illustration 8-6*) to check that the distance from the pulley outside diameter to the steel cable is less than 3.37 mm.

**Illustration 8-6  
Measurement Tool**

To check the state of the Central Pulley, perform the following steps:

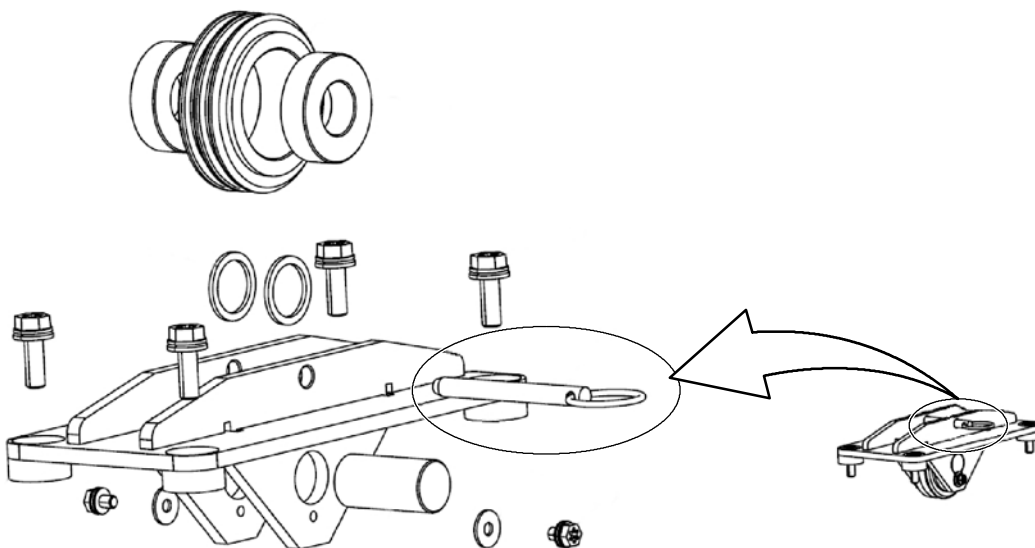
1. Remove the Gas Springs Cover to be able to access the Central Pulley of the Ceiling Suspension installed in the Center of the Carriage (*refer to Illustration 8-7*).

**Illustration 8-7**  
Gas Springs Cover



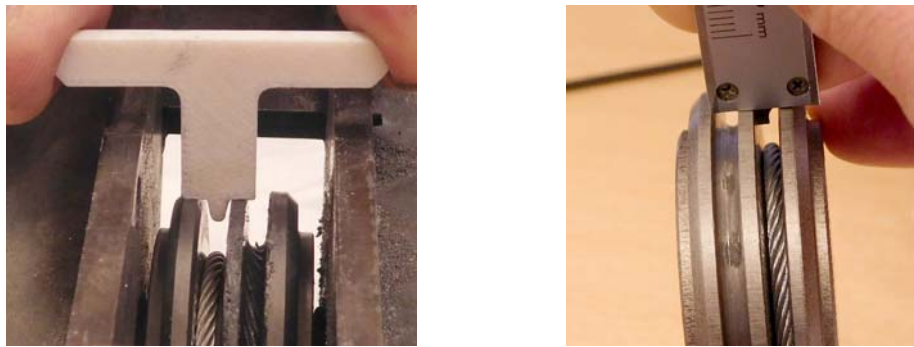
2. Remove the safety pin located in the Central Pulley assembly (*refer to Illustration 8-8*).

**Illustration 8-8**  
Safety Pin



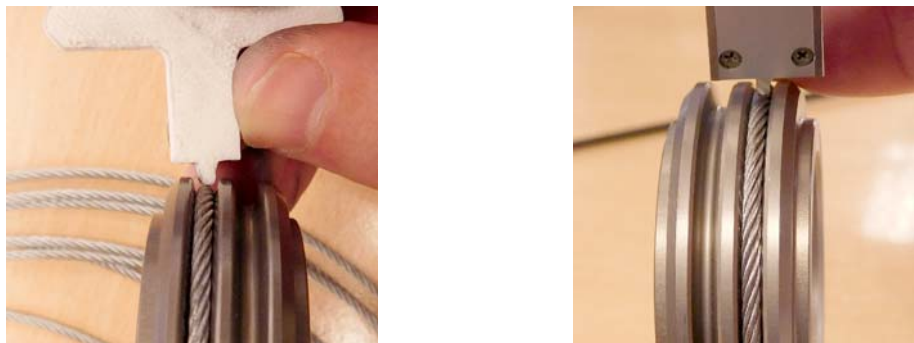
3. Check that the two Steel Cables located in the two grooves of the Central Pulley are at the same high using the measurement tool provided for this purpose (*refer to Illustration 8-6*) or with the depth rod of a caliper adjusted to less than 3.37 mm.
  - If the wide faces of the measurement tool touch the outer diameter of the Central Pulley as seen in *Illustration 8-9*, it means that the pulley is worn out. If this is the case, both the Central Pulley and the Steel Cables have to be replaced. (*Refer to JOB CARD 1.2 and JOB CARD 1.3 for the Steel Cables and Central Pulley replacement procedures.*)

**Illustration 8-9**  
**Worn out Pulley**



- If the wide faces of the measurement tool do not touch the outer diameter of the Central Pulley simultaneously, that is, the depth is less than 3.37 mm (*refer to Illustration 8-10*), it will not be necessary to replace the Pulley. In any case, the status of the Steel Cables must be checked (*refer to Section 8.4.5*). If any of the Steel Cables are found to be damaged during the inspection, their replacement is mandatory. (*Refer to JOB CARD 1.2 for the Steel Cables replacement procedure.*)

**Illustration 8-10**  
**Completely functional Pulley**



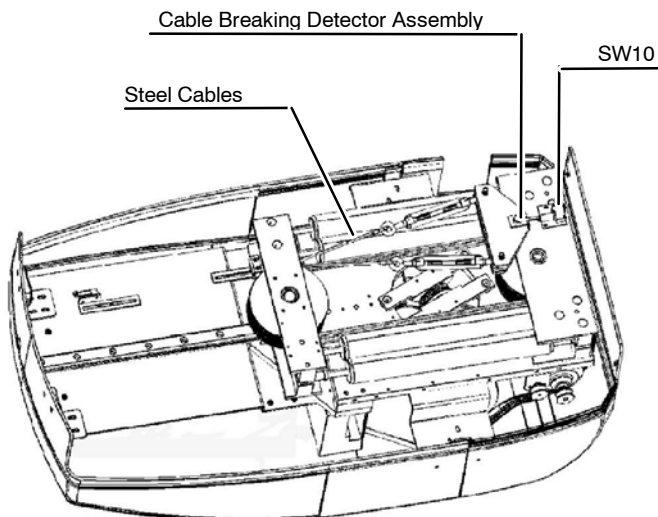
4. Once all the previous tasks have been completed, clean all the remaining metal shavings around the Central Pulley.
5. Install the safety pin that was removed in step 2.
6. Install the Gas Springs Cover that was removed in step 1.
7. Perform a functional test to verify that the system works properly.

### 8.5 STEEL CABLES BREAKDOWN SAFETY SWITCH

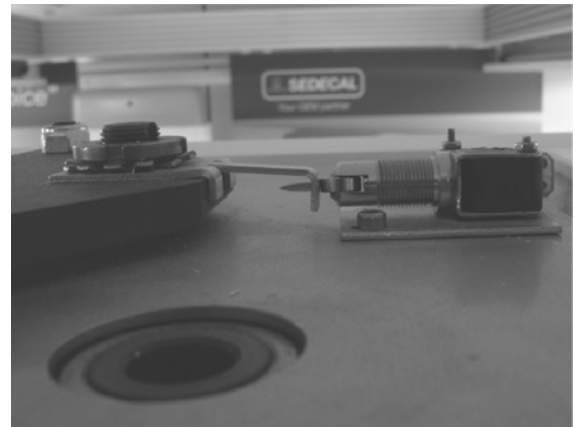
The **SW10** is located on the Carriage together with the whole Cable Breaking Detector Assembly (refer to *Illustration 8-11*).

In normal conditions the Micro-detector is in touch with the Sensor. Once the Cables get loosen or broken the Sensor and the Micro-detector split up, the Safety Switch turns the Suspension Off completely. It is impossible to operate with the Suspension.

**Illustration 8-11**  
**SW10 Location**



**SW10 Normal Conditions**



## 8.6 GAS SPRINGS WEAR DETECTION

This procedure consists in monitoring permanently the power consumption by the vertical Motor, checking that it does not exceed a certain limit equivalent to a loss of torque of  $400\text{ N} \pm 100\text{ N}$ , equivalent to approximately 6.5 kg placed on the X-ray Tube.

### 8.6.1 ADJUSTMENT PROCEDURE

Adjust the Power limit on **P9** (higher limit) and **P10** (lower limit) potentiometers, in **S0019874** PWA.

1. Place 6.5 Kg on the X-ray Tube.
2. Adjust the **P9** potentiometer to trigger the alarm when the Suspension is at 10 cm of the maximum height.
3. Adjust the **P10** potentiometer to trigger the alarm when the thrust is equivalent to approximately 400 N.

If the power is the sale to the adjusted limit, the Suspension alarm gets triggered and the Suspension gets blocked. To inhibit this protection, press the right Longitudinal Brake Button on Control Console.

### 8.6.2 GAS SPRINGS WEAR-ALARM VOLUME ADJUSTMENT

Adjust on **P11**, in S0019874 PWA, the Gas Springs Wear-alarm volume.



*The alarm volume must be high enough to be heard with all covers mounted.*

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## SECTION 9 DISASSEMBLE/REASSEMBLE

### 9.1 JOB CARDS LIST

This chapter covers service procedures which provides information for making adjustments to the Ceiling Suspension after installation on field. It also provides service and repair so that the equipment functions properly and meets the functional check specifications.

If the Ceiling Suspension fails to meet any of these Functional checks, refer to specific chapter, then the specific reference to this direction should be followed, and the service adjustment made, to correct the “out of specification” condition.

The Job Cards of this direction are intended to be guides to the most common problems that arise, but not all of them, and to give the instructions for replacing the renewal parts included in *Section 9. Renewal Parts*.

JOB CARD LIST	
JOB CARD	DESCRIPTION
<b>CARRIAGE</b>	
1.1	Vertical Motor (Z) Replacement Procedure
1.2	Steel Cable Replacement Procedure
1.3	Central Pulley Replacement Procedure
1.4	Gas Springs Set Replacement Procedure
1.5	Vertical Potentiometer Replacement Procedure
<b>COLUMN &amp; L-BLOCK</b>	
2.1	Alpha/Beta Assembly Replacement Procedure
2.2	Telescopic Column Replacement Procedure
2.3	Alpha/Beta Mechanical Detents Replacement Procedure
2.4	Alpha/Beta Potentiometers Replacement Procedure
2.5	Gage Replacement Procedure
<b>RAILS SYSTEM</b>	
3.1	Longitudinal Brake Replacement Procedure
3.2	Transverse Brake Replacement Procedure
3.3	Nylon Wheel Replacement Procedure
<b>HOSE &amp; CABLES</b>	
4.1	Power Supply Cable Replacement Procedure

## 9.2 MANDATORY PROCEDURES

It is mandatory to follow the security procedures before any mechanical or electrical intervention.

- **Electrical Safety Procedures.** To isolate all the electrical sources:
  1. Isolate the equipment from mains by turning off the switch located at the room electrical cabinet.
  2. Open the cover of the carriage, disconnect the Power Supply Cable.
- **Mechanical Safety Procedures.** It is mandatory when required in job cards, and realized thanks to the Steel Blocking Rope (steel wire cable blocking the Gas Spring Set and thus the Telescopic Column.)



***ALWAYS PROCEED TO ACCOMPLISH THESE PROCEDURES WITH THE CEILING SUSPENSION SWITCHED OFF. IF IT IS REQUIRED TO TURN IT ON, USE ALWAYS SAFE ELECTRICAL PRACTICES TO SAFEGUARD FROM THE UNEXPECTED ENERGIZATION OR START UP OF THE EQUIPMENT, OR THE RELEASE OF HAZARDOUS ENERGY DURING SERVICE OR MAINTENANCE ACTIVITIES.***



**PERSONAL PROTECTION EQUIPMENT IS A REQUIREMENT WHEN PROCEEDING TO ACCOMPLISH ALL THESE PROCEDURES.**



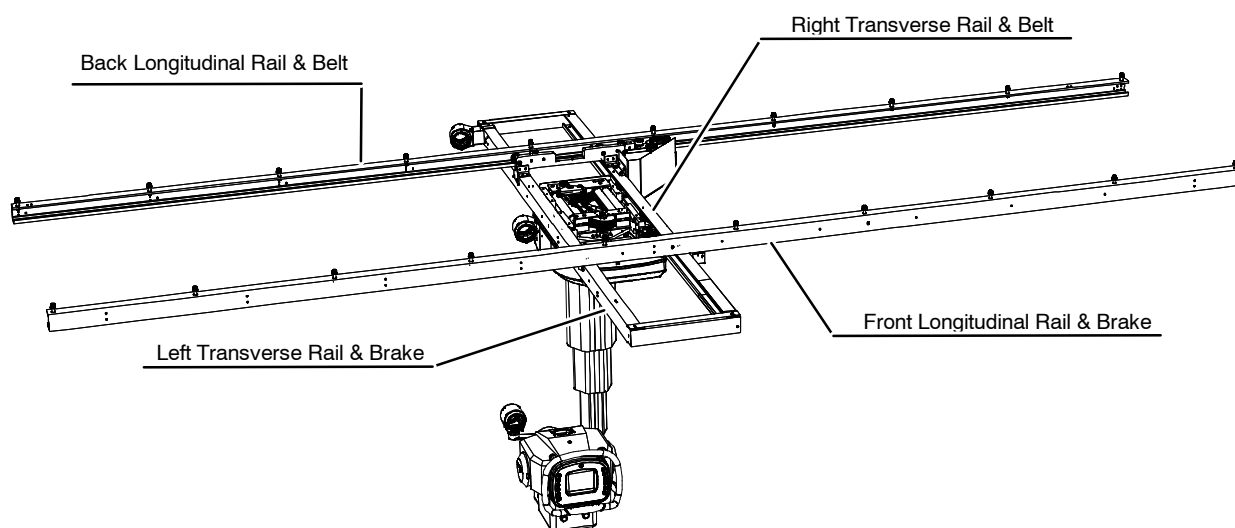
***After accomplishing all these procedures, proceed to check the Ceiling Suspension correct operation, for further information please refer to Section 5. Functional Checks.***

**Note** 

Most of these Service Maintenance procedures can be carried out without lowering the Ceiling Suspension, except in those cases where the opposite is mentioned with a DANGER note (Nylon wheel, etc.).

**Note** 

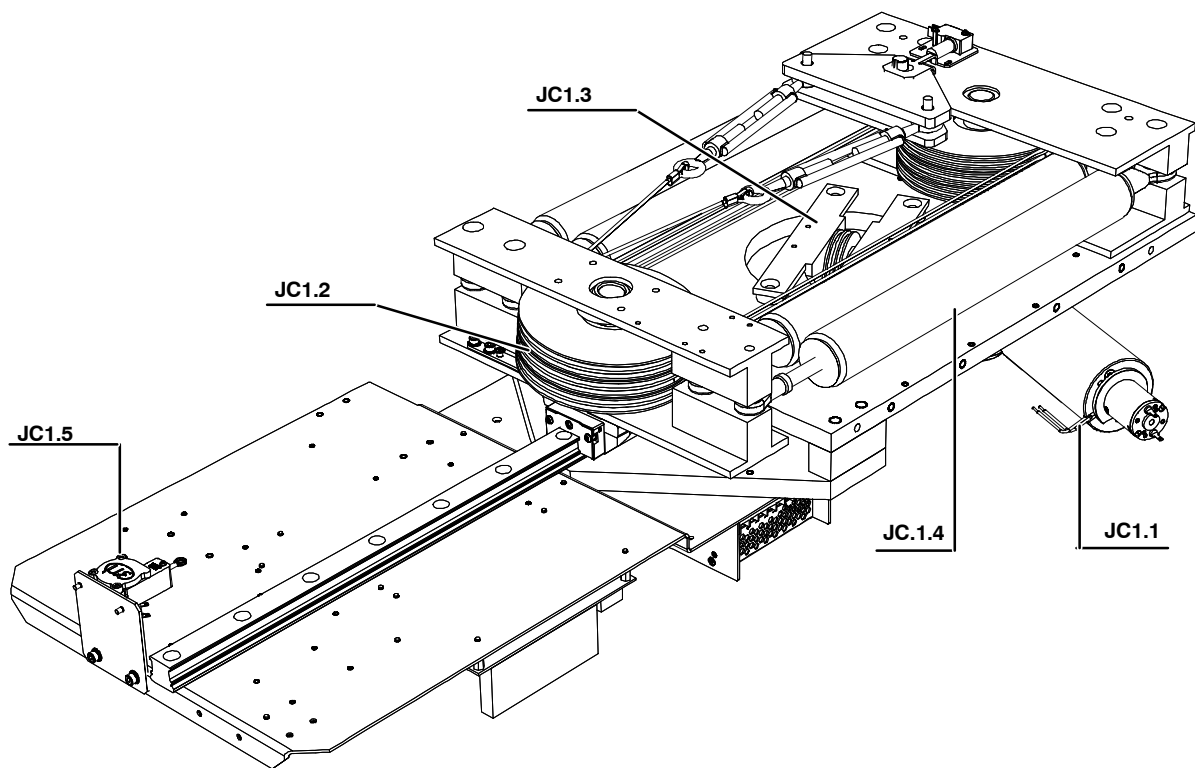
It is highly recommended to work with the Ceiling Suspension located in the center of both longitudinal and transverse axes, without rotation and angulation, except in those cases where the opposite is mentioned.

**Illustration 9-1****The Ceiling Suspension Located in the center of every Axis**

### 9.3 CARRIAGE SERVICE PROCEDURES

Indicated below with each Job Card number the location of each renewal part to replace.

**Illustration 9-2**  
**Carriage Job Cards**



**JOB CARD 1.1: VERTICAL MOTOR (Z) REPLACEMENT PROCEDURE**

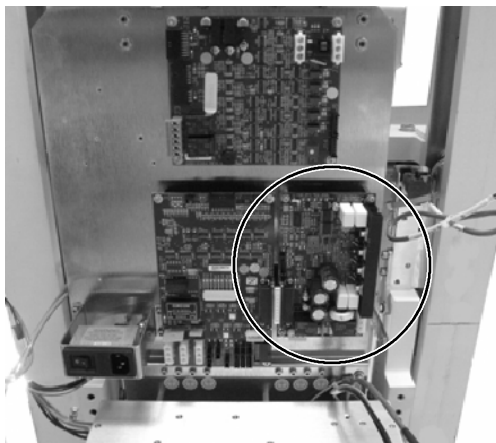
<b>SUBASSEMBLY:</b>	CARRIAGE
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Wrench Set Stepladder Telescopic Column Fixing Pin
<b>PERSONNEL :</b>	One Service Engineer

**PROCEDURE**

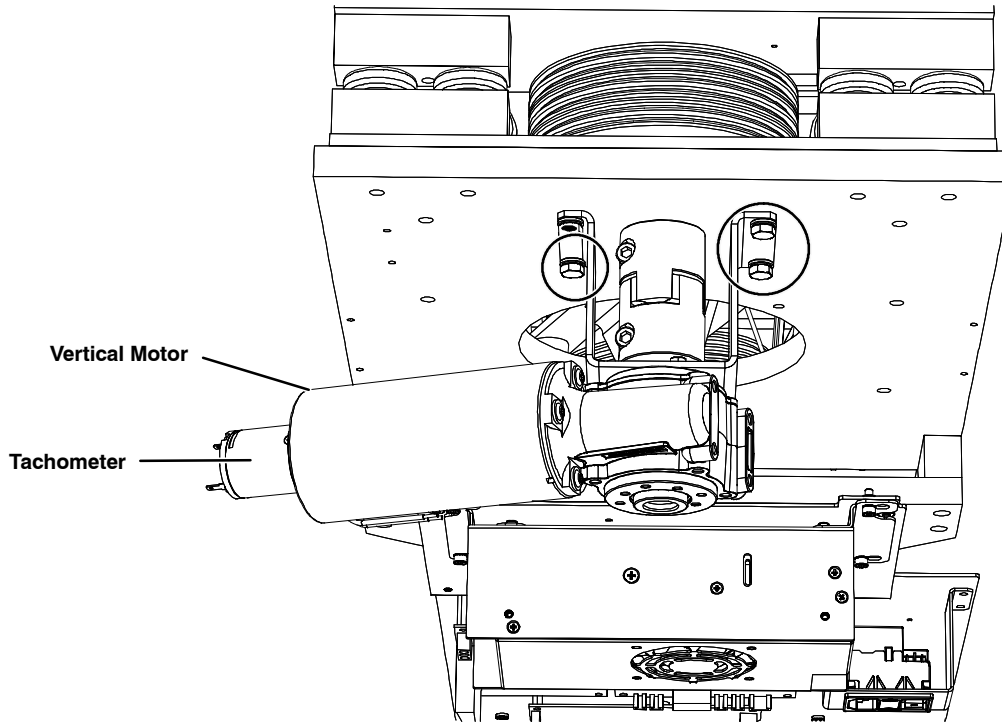
1. Switch the Ceiling Suspension OFF.
2. Remove upper covers, loosen the four central fixing screws of the Carriage Covers.
3. Put the Ceiling Suspension in its higher position and block it with the Pin.



4. Disconnect the Vertical Motor from the Vertical Control PWA in the Carriage.

**Manual Ceiling Suspension****Auto-tracking Ceiling Suspension**

5. In the case of the Auto-tracking Ceiling suspension disconnect the Tachometer too.
6. Remove all the motor cable ties fixed to the Telescopic Column.
7. Loosen the fixation screws of the Vertical Motor to the carriage.



8. Remove the Vertical Motor and Tachometer assembly.

For assembling, proceed in the opposite way as shown in previous steps:

9. Install the Vertical Motor and Tachometer assembly and fix it to the Carriage.

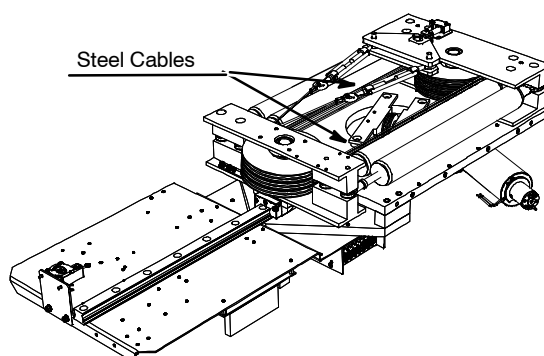
**Note** 

*Make sure that motor shaft enters smoothly and without making efforts.*

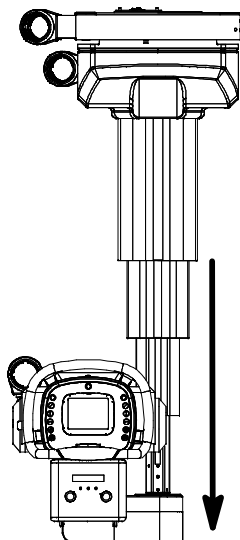
10. Connect the Vertical Motor cables and Tachometer, in Auto-tracking Ceiling Suspension.
11. Proceed to functional checking as indicated in *Section 5. Functional Checks*.

**JOB CARD 1.2: STEEL CABLE REPLACEMENT PROCEDURE**

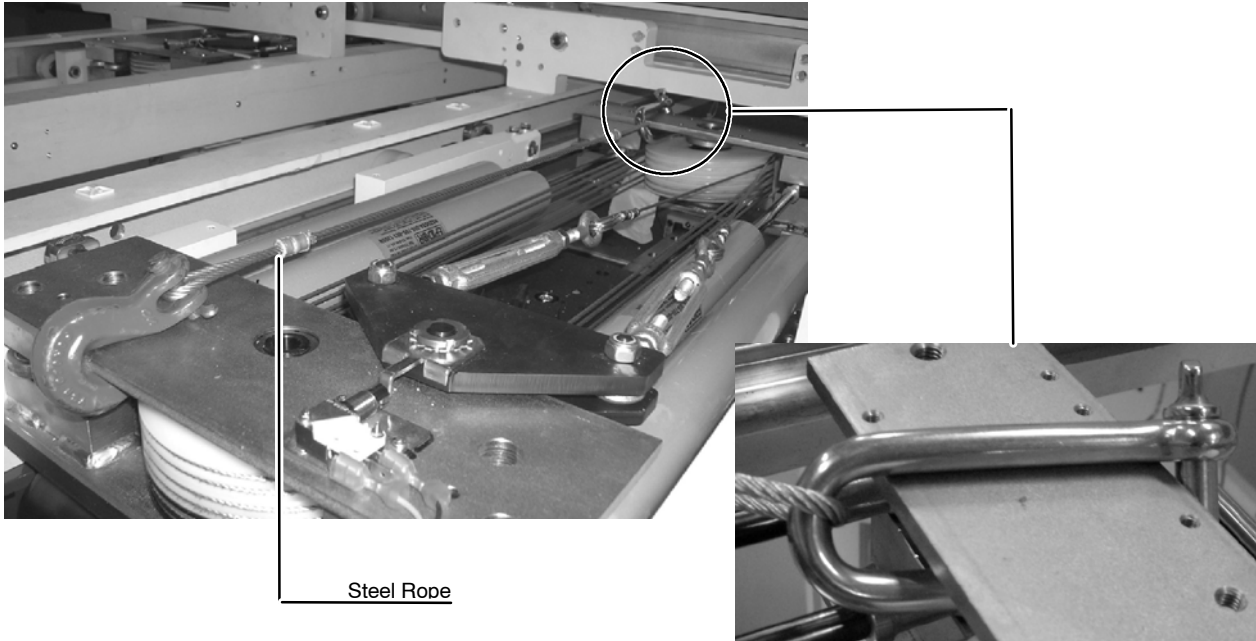
<b>SUBASSEMBLY:</b>	CARRIAGE
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Wrench Set Stepladder Steel Blocking Rope Table or any other supporting element Telescopic Column Fixing Pin
<b>PERSONNEL :</b>	Two Service Engineers

**PROCEDURE**

1. Switch the Ceiling Suspension OFF.
2. Remove Carriage Covers. Including the tip metal Cover.
3. Remove the Gas Springs Cover.
4. Get the Telescopic Column down to its lower position and with the L-block supported by a table or any other supporting element.



5. Install the Steel Blocking Rope in the Carriage. The Telescopic Column must be completely extended to install easily the Steel Blocking Rope, which must not be completely stretched.



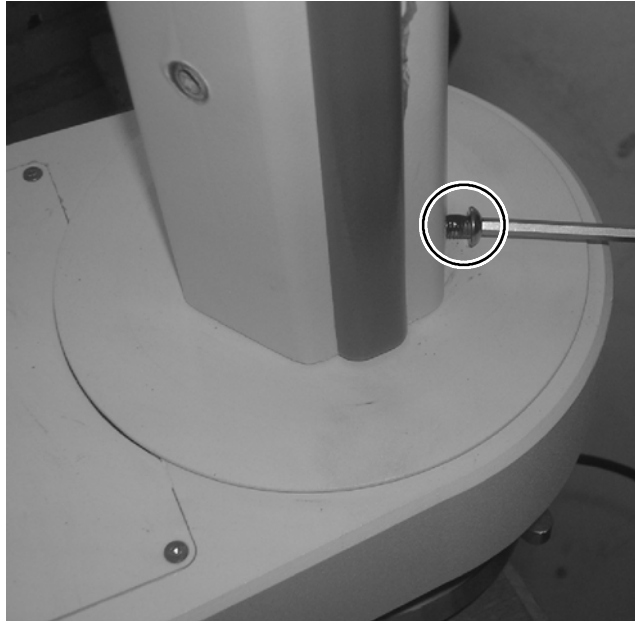
6. Move the Column upwards and slightly until the Steel Rope gets completely stretched and the Telescopic Column gets blocked.
7. To identify the cable to be replaced first, put a stuck of crepe paper on each track of the cable which is not going to be removed yet.



#### **MECHANICAL LOCKING WITH THE STEEL BLOCKING ROPE IS MANDATORY.**

8. Disconnect all the Hoses from the Ceiling Suspension. refer to *Section 2.14 External Hose Installation* to check the installation procedure.
9. Disassemble the Ceiling Suspension Console, Collimator, DAP Device and X-ray Tube Support and place them in a secure place. Refer to *Section 1. Installation* and next sections:
  - Disassemble the Ceiling Suspension Console. Refer to *Section 2.13 Control Console Installation*.
  - Disassemble the Collimator. Refer to *Section 2.12.1 Collimator Installation*.
  - Disassemble the X-ray tube Support. Refer to *Section 2.11 Tube Support & X-ray Tube Installation*.

10. Loosen completely the Telescopic Column bottom screws, which fix the Column Covers to the L-Block.



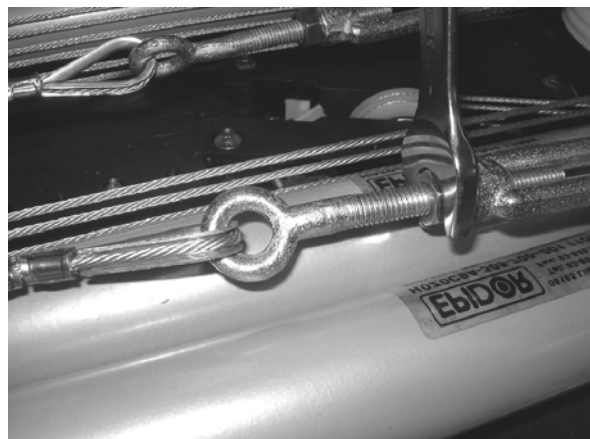
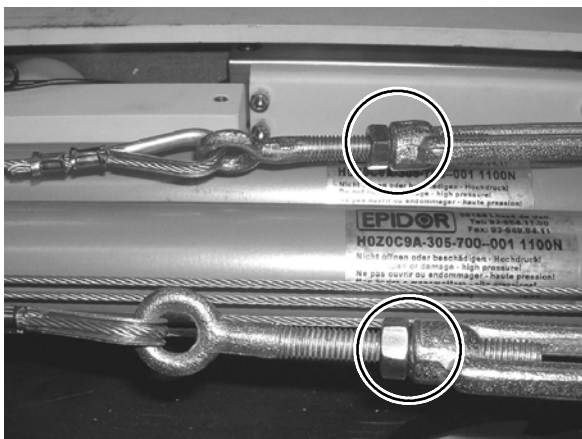
11. Raise the column covers and block them in their higher position with the Fixing Pin.





**PROCEED TO REMOVE AND REPLACE FIRST ONE STEEL CABLE AND THEN THE LAST ONE, SO IT WILL BE EASIER NOT TO MIX THEIR POSITIONS. IT IS VERY IMPORTANT TO PLACE BOTH CABLES IN THEIR CORRECT POSITION.**

12. Loosen completely both cables fasteners and pulleys.

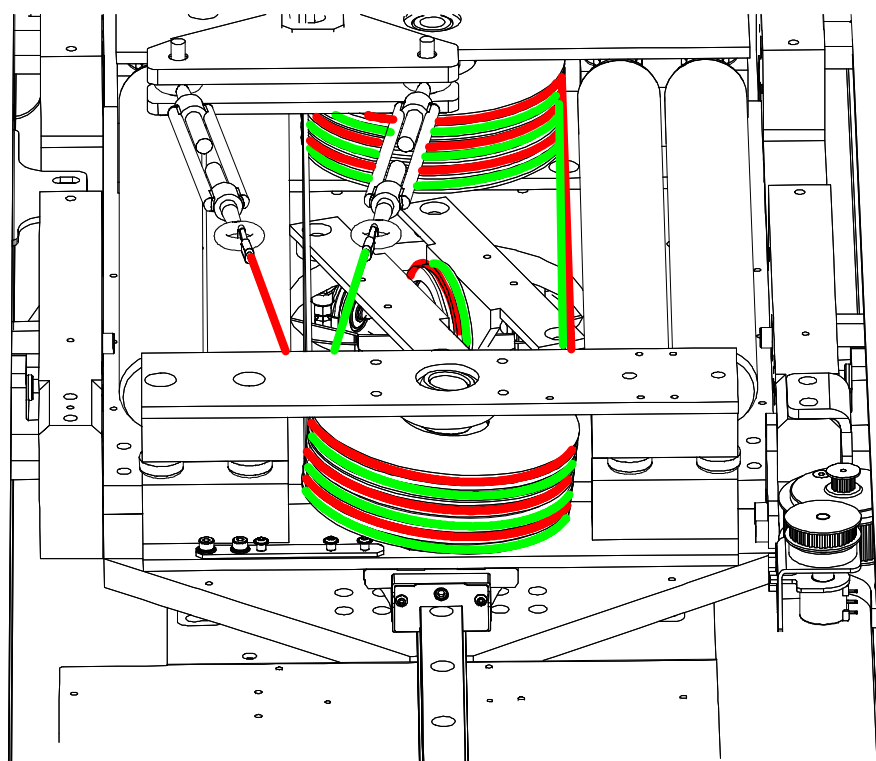


13. Then remove the Steel Rope Fixing Pin from the gage.



14. Proceed in the opposite way to install the new Steel Cable. Make sure that both cables are installed properly and not mixed in their positions.

15. Proceed to functional checking as indicated in *Section 5. Functional Checks*.



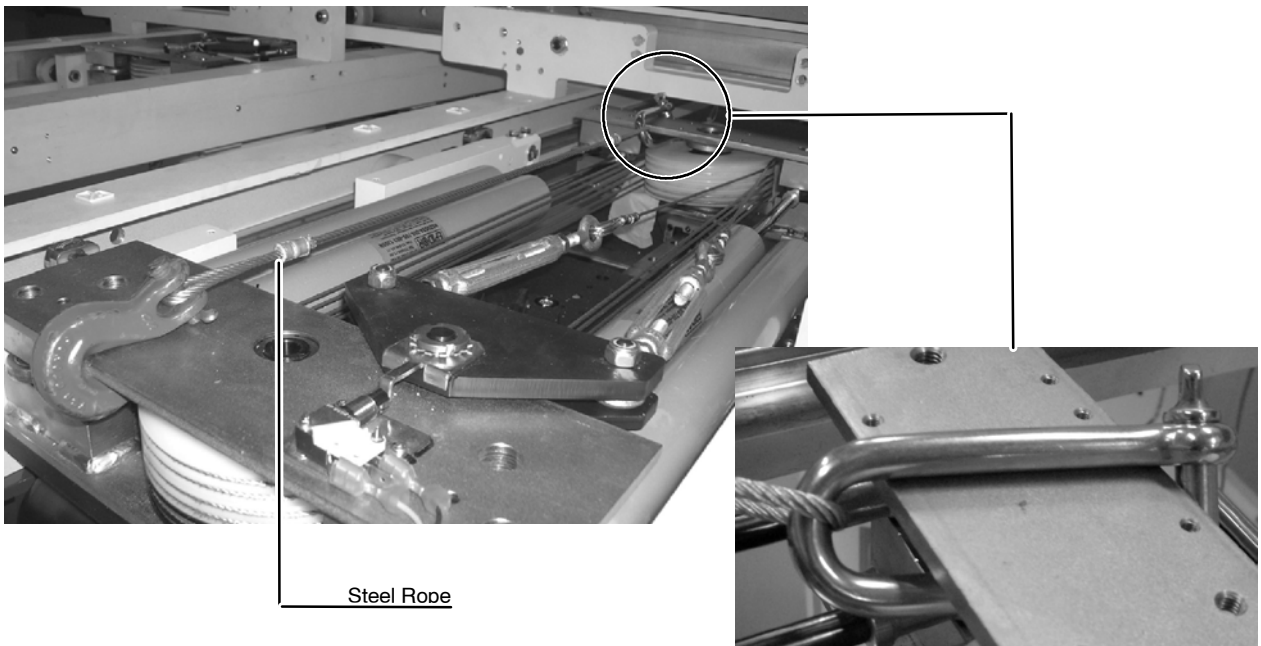
— First cable  
— Second cable

**JOB CARD 1.3: CENTRAL PULLEY REPLACEMENT PROCEDURE**

**SUBASSEMBLY:** CARRIAGE  
**MODEL:** Standard and Auto-tracking Ceiling Suspension  
**TOOLS:** Wrench Set  
Stepladder  
Steel Blocking Rope  
Table or any other supporting element  
Telescopic Column Fixing Pin  
**PERSONNEL :** Two Service Engineers

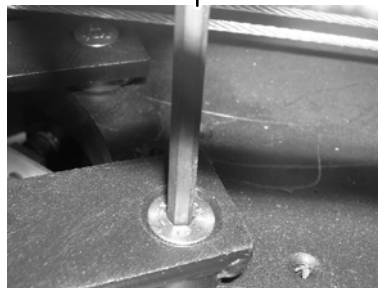
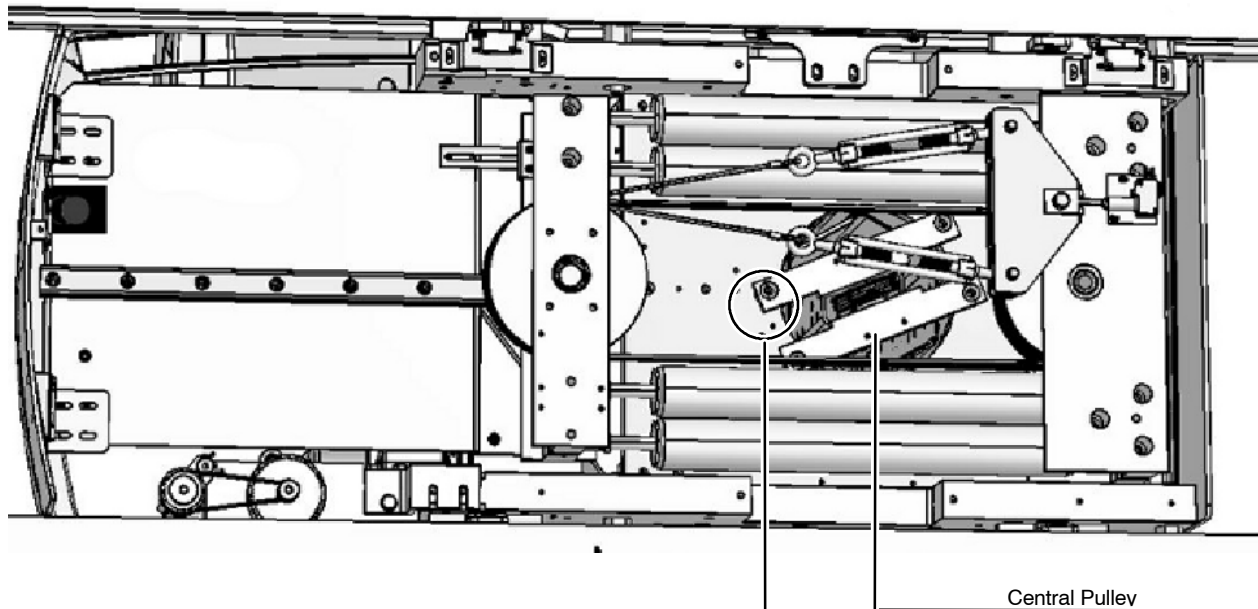
**PROCEDURE**

1. Proceed to remove the Steel Cables (Refer to *JOB CARD 1.2*).



**MECHANICAL LOCKING WITH THE STEEL BLOCKING ROPE IS MANDATORY.**

2. Once the Steel Cable has been removed, proceed to loosen completely and to remove the old Central Pulley.



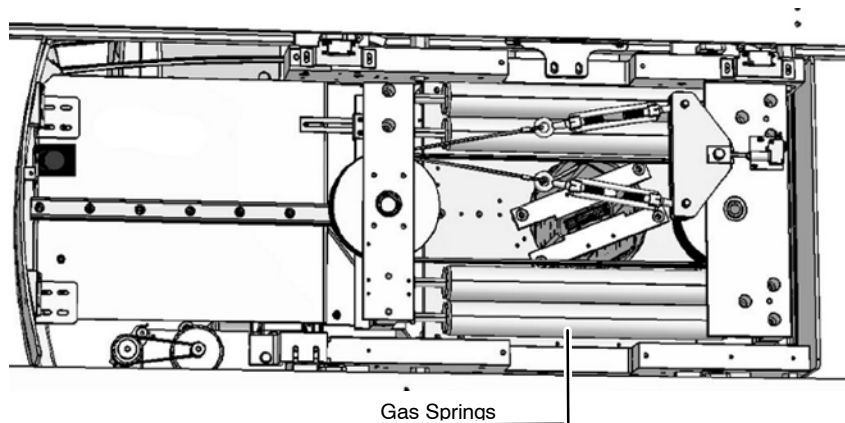
3. Remove the Central Pulley.
4. Install the new Central Pulley.
5. Install the Steel cable (Refer to *JOB CARD 1.2*).
6. Proceed to functional checking as indicated in *Section 5. Functional Checks*.

**JOB CARD 1.4: GAS SPRINGS SET REPLACEMENT PROCEDURE**

**SUBASSEMBLY:** CARRIAGE  
**MODEL:** Standard and Auto-tracking Ceiling Suspension  
**TOOLS:** Stepladder  
Nylon cap hammer  
Wrench Set  
Telescopic Column Fixing Pin  
**PERSONNEL :** Two Service Engineers

**PROCEDURE**

The procedure explained below aims to show all the steps required for dismantling an old Gas Spring and replace it with a new one.



**INJURY HAZARD! AT LEAST TWO SERVICE ENGINEERS ARE REQUIRED TO COMPLETE THIS PROCEDURE. DUE TO THE SUSPENSION AND RAILS HEAVY WEIGHT, THEY CAN FALL DOWN, WHAT COULD CAUSE SERIOUS DAMAGES TO EQUIPMENT AND PERSONNEL.**



**DURING THE WHOLE PROCEDURE TAKE CARE OF THE CEILING SUSPENSION MOVEMENTS AS IT IS SWITCH OFF AND SO, IT CAN MOVES FREELY, WHAT COULD CAUSE SERIOUS DAMAGES TO THE PERSONNEL.**



**DO NOT REMOVE ALL GAS SPRING AT THE SAME TIME, REMOVE AND REPLACE THEM ONE BY ONE OR JUST BY PAIRS.**

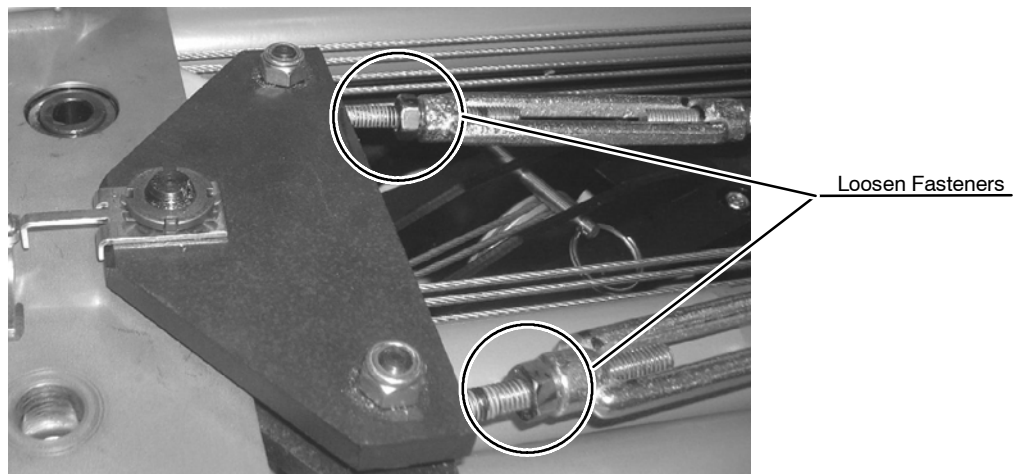
**Note**

*All these Service Maintenance procedures can be carried out without lowering the Ceiling Suspension, except in those cases that will be notified when necessary.*

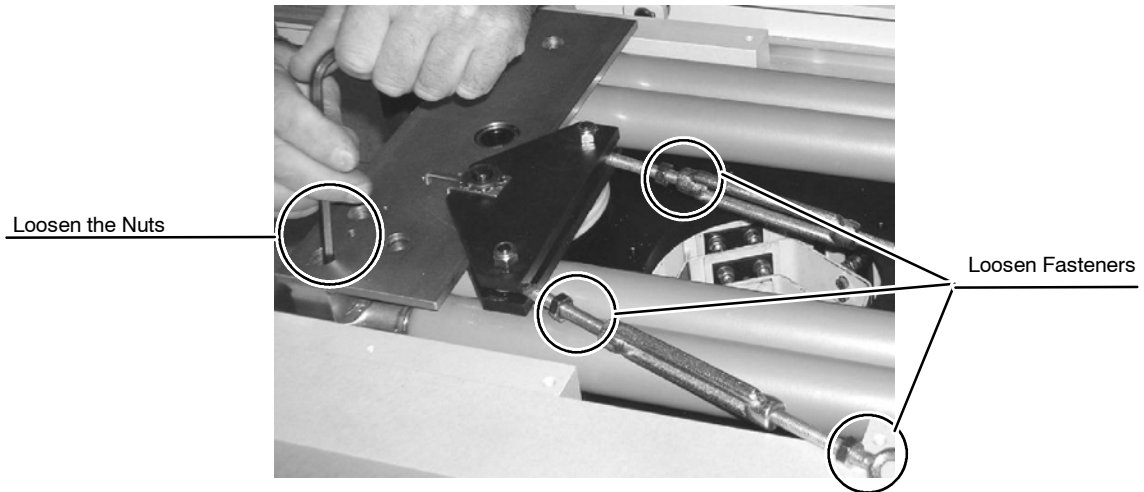
1. Switch the Ceiling Suspension OFF.
2. Remove upper covers, loosen the four central fixing screws of the Carriage Covers.
3. Remove the Gas Spring Cover.
4. Block the Telescopic Column in its higher position with the Fixing Pin, so Gas Springs get totally opened.



5. If desired, put some stick tape in the Central Pulley to fix the steel cable in its correct position.
6. Loosen the fasteners of the pulleys steel cable just enough to release the stress in the Gas Springs, 2 or 3 turns will be enough.



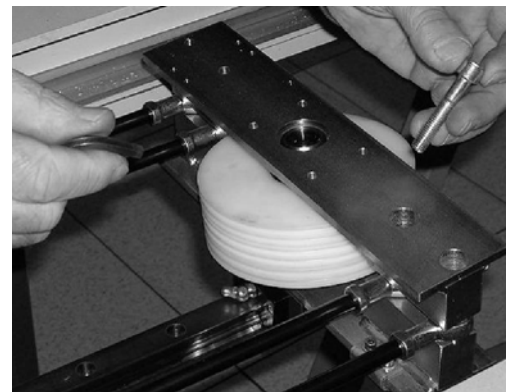
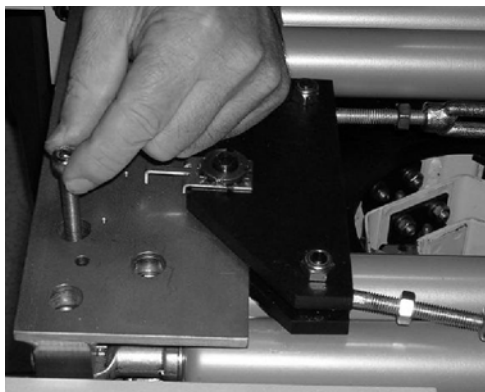
7. Loosen slightly the six nuts of the plate that supports the bottle end of the Gas Springs to get enough gap to move the spring in later steps.



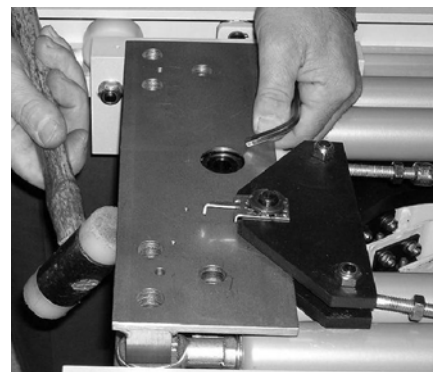
8. Loosen without removing the four nuts of the T-shaped piece that supports the rod end of the gas springs. Get a small gap to allow removing the Gas Spring.



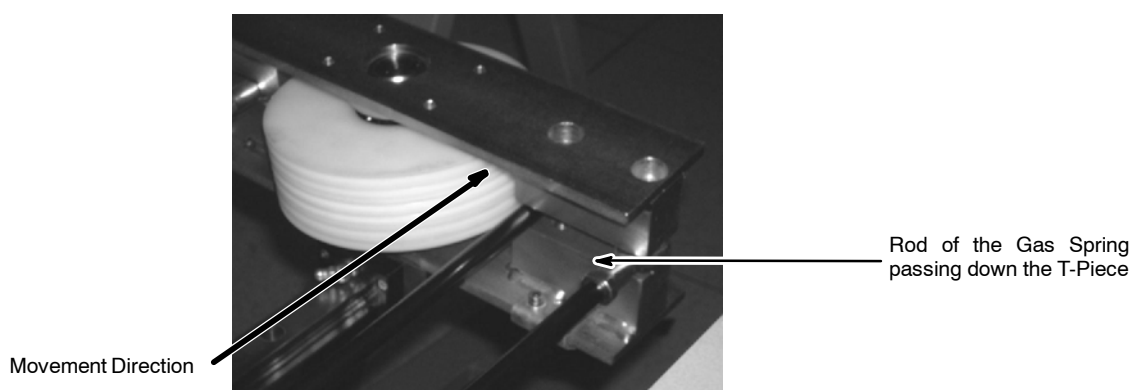
9. Remove both holding nuts of the Gas Spring.



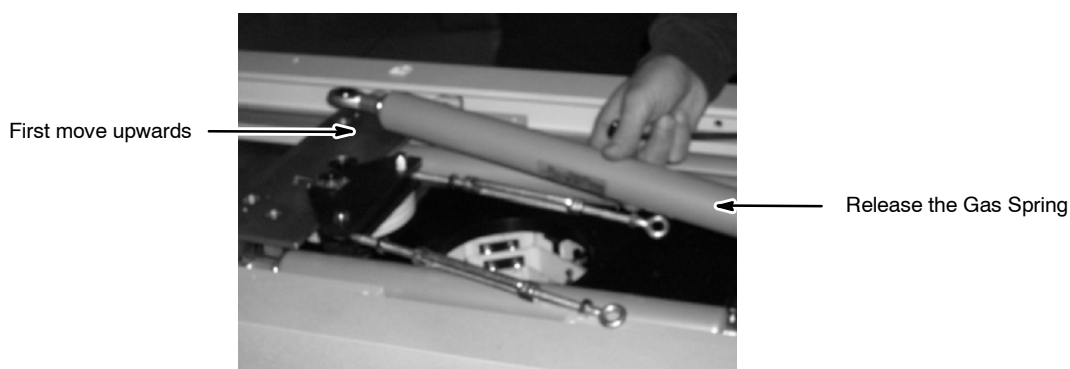
- Hit slightly upwards the T-shaped piece and the Gas Spring holding plate, use a nylon cap hammer.



- Push the rod of the Gas Spring forwards so the rod goes ahead and below the T-shaped piece in order to release the other end of the spring. Please, look out not to scratch the surface of the rod with the border of the T-shaped piece.



- Finally remove the end upwards of the Gas Springs and release the rod end by moving the spring in the direction of the plate.



- To mount a new Gas spring just follow this instructions in the opposite way. In the mounting process look out when performing steps 6. and 7. not to tighten too much the bolts (the pulleys must not be blocked).
- Proceed to Functional Checking (refer to *Section 5. Functional Checks*).

**JOB CARD 1.5: VERTICAL POTENTIOMETER REPLACEMENT PROCEDURE**

**SUBASSEMBLY:** CARRIAGE

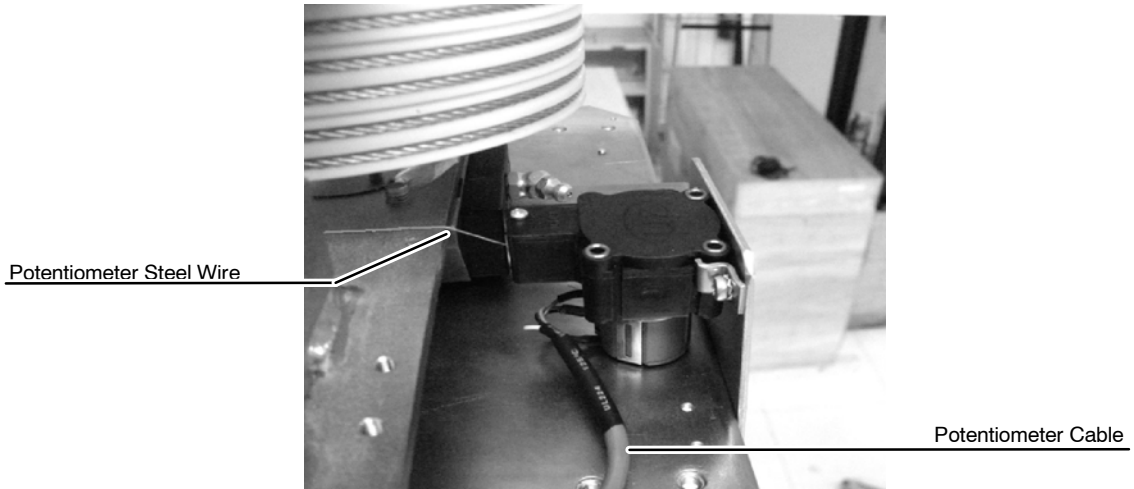
**MODEL:** Standard and Auto-tracking Ceiling Suspension

**TOOLS:** Allen Set Keys  
Scissors  
Stepladder

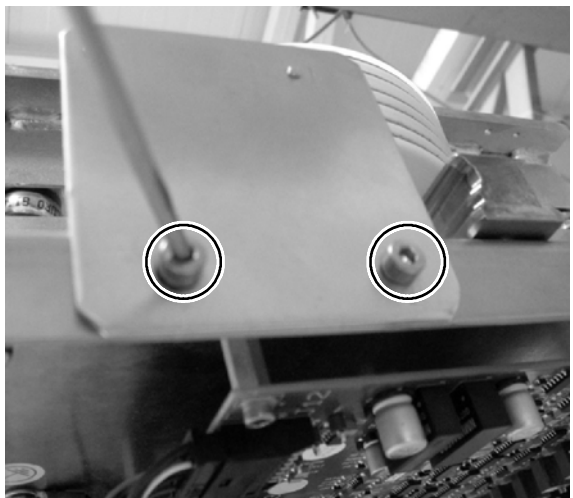
**PERSONNEL :** One Service Engineer

**PROCEDURE**

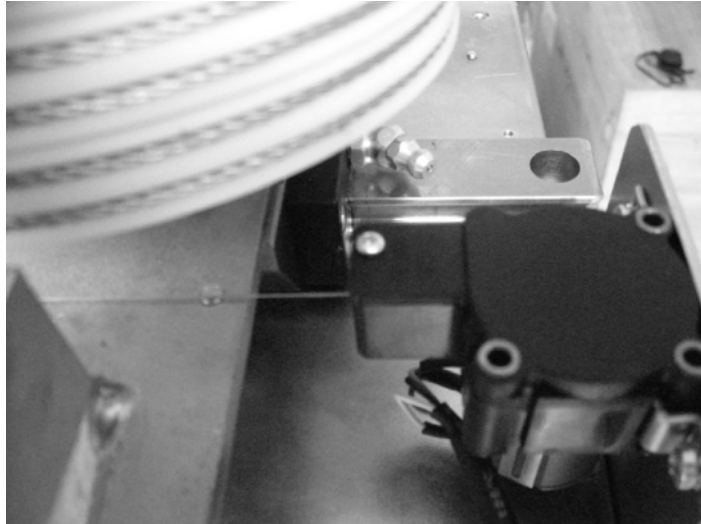
1. Switch the Ceiling Suspension OFF.
2. Remove upper covers, loosen the four central fixing screws of the Carriage Covers.
3. Disconnect the potentiometer cable.



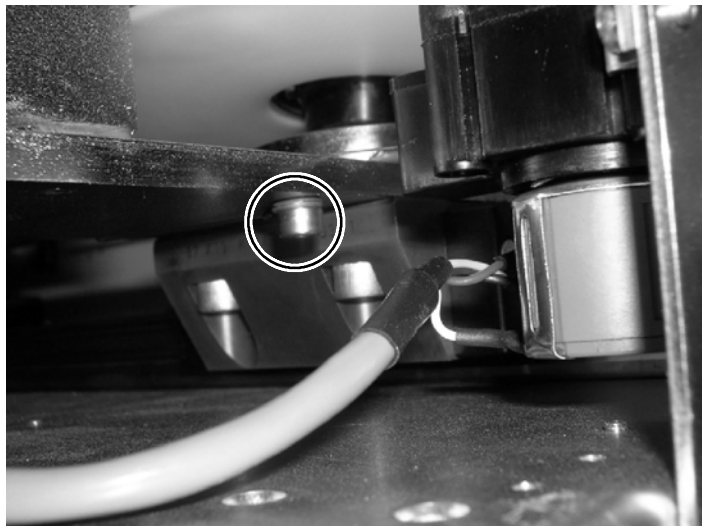
4. Loosen both fixing screws.



5. Cut the cable which connects the Vertical Potentiometer to the bridge and remove it.



6. Remove completely the Vertical Potentiometer assembly.
7. For mounting proceed in the opposite way as indicated in previous steps.
8. Pay attention that the Steel wire is always parallel to the Carriage Base Plate, fix it with the screw and after turning the Bridge plate.

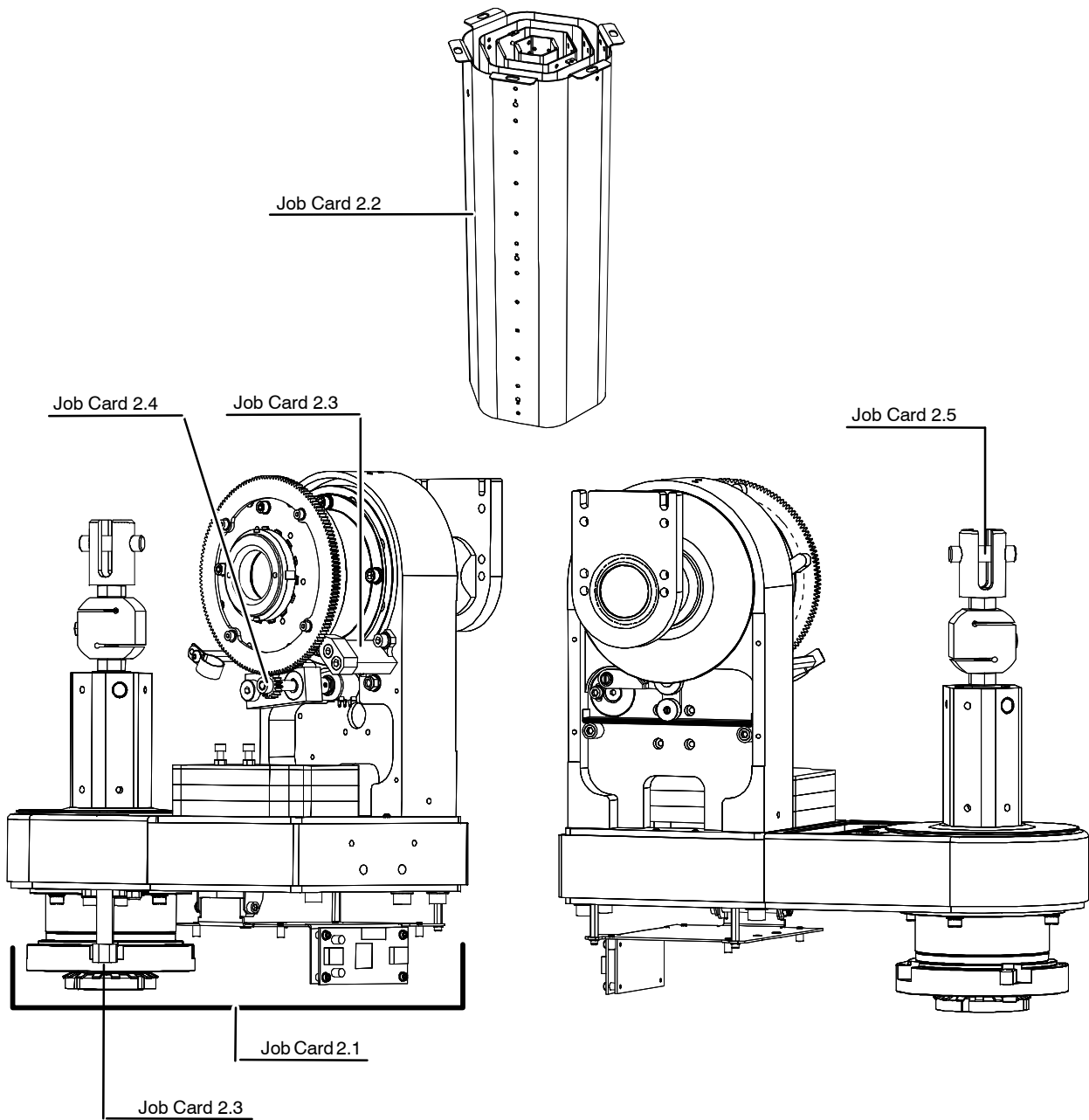


9. Adjust the Vertical SID (*refer to Section 5.3.2. Vertical SID Display Adjustment*).
10. Proceed to Functional Checking (*refer to Section 5. Functional Checks*).

### 9.4 COLUMN & L-BLOCK SERVICE PROCEDURES

Indicated below with Job Card number the location of each renewal part to be replace.

**Illustration 9-3**  
**Ceiling Suspension's Column & L-Block Job Cards**



**JOB CARD 2.1: ALPHA/BETA ASSEMBLY REPLACEMENT PROCEDURE**

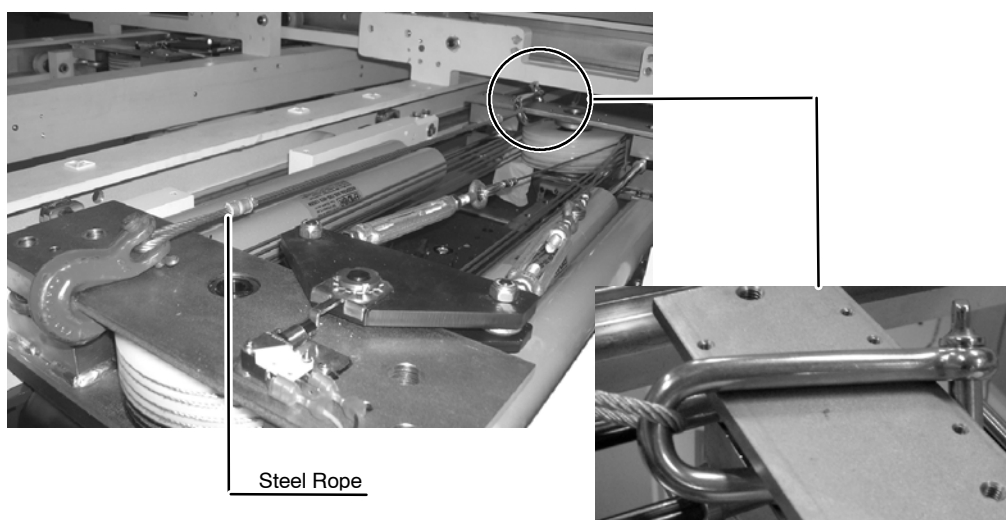
<b>SUBASSEMBLY:</b>	TELESCOPIC COLUMN & L-BLOCK
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Stepladders Nylon cap hammer Wrench Set Steel Blocking Rope Telescopic Column Fixing Pin Optional Lifting Tool or threaded rods
<b>PERSONNEL :</b>	Two Service Engineers

**PROCEDURE**

1. Switch the Ceiling Suspension OFF.
2. Totally remove the Carriage Covers.
3. Remove the Gas Springs Cover.
4. Remove L-Block Covers.
5. Get the Telescopic Column down to its lower position, as it is necessary to remove the L-Block with the Console, tube and collimator safely.

**MECHANICAL LOCKING WITH THE STEEL BLOCKING ROPE IS MANDATORY.**

6. Install the Steel Blocking Rope in the Carriage. The Telescopic Column must be extended to install easily the Steel Blocking Rope, which must not be completely stretched.

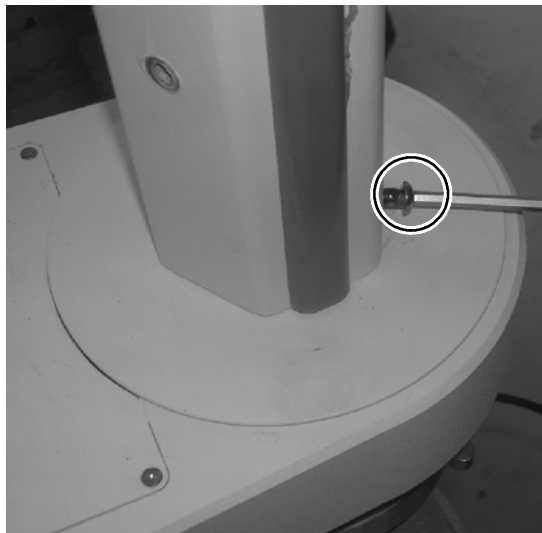


7. Move the Column upwards and slightly until the Steel Rope gets completely stretched and the Telescopic Column gets blocked.
8. To identify properly the position of each cable, put a stuck of crepe paper on each track of the cable which is not going to be removed yet.



**PROCEED TO IDENTIFY CORRECTLY THE POSITION OF THE STEEL CABLES, AS IT IS TOTALLY OBLIGATORY TO KEEP INSTALLED EACH CABLE IN THEIR CORRECT TRACK, SO THEIR POSITIONS DO NOT GET MIXED.**

9. Disconnect all the Hoses from the Ceiling Suspension. refer to *Section 2.14 External Hose Installation* to check the installation procedure.
10. Disassemble the Ceiling Suspension Console, Collimator, DAP Device and X-ray Tube Support and place them in a secure place. Refer to *Section 1. Installation* and next sections:
  - Disassemble the Ceiling Suspension Console. Refer to *Section 2.13 Control Console Installation*.
  - Disassemble the Collimator. Refer to *Section 2.12.1 Collimator Installation*.
  - Disassemble the X-ray tube Support. Refer to *Section 2.11 Tube Support & X-ray Tube Installation*.
11. Loosen completely the Telescopic Column bottom screws, which fix the Column Covers to the L-Block.



12. Raise the column covers and block them in their higher position with the Fixing Pin.



13. Remove the Gage Pin to free the Steel Rope.



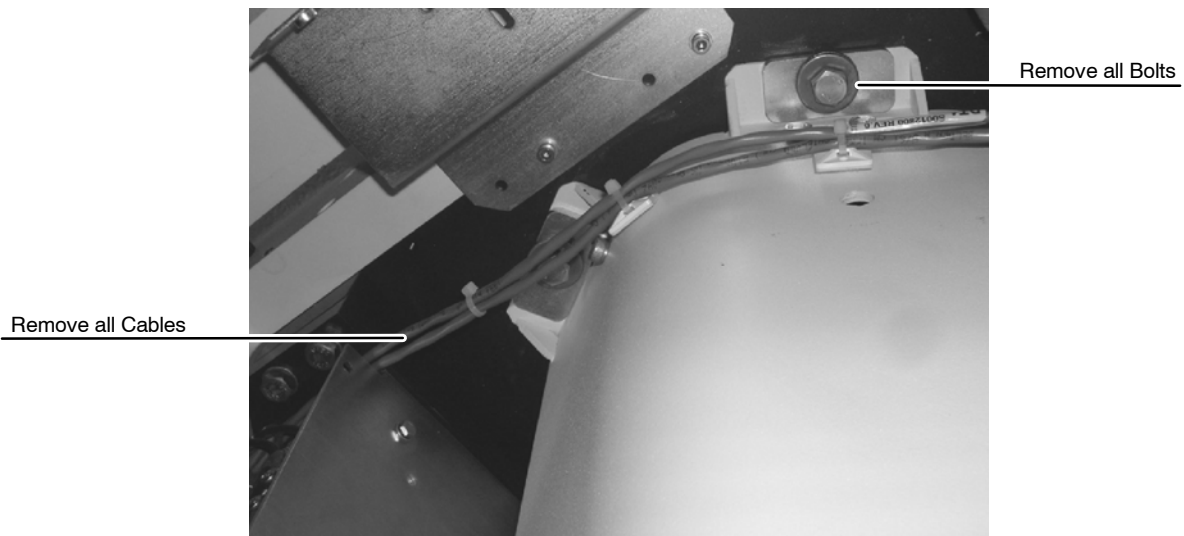
14. Remove the L-Block.
15. Proceed in the opposite way to install the new L-Block.
16. Proceed to functional checking, refer to *Section 5. Functional Checks*.

### JOB CARD 2.2: TELESCOPIC COLUMN REPLACEMENT PROCEDURE

<b>SUBASSEMBLY:</b>	TELESCOPIC COLUMN & L-BLOCK
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Stepladders Nylon cap hammer Wrench Set Steel Blocking Rope Telescopic Column Fixing Pin Optional Lifting Tool or threaded rods
<b>PERSONNEL :</b>	Two Service Engineers

#### PROCEDURE

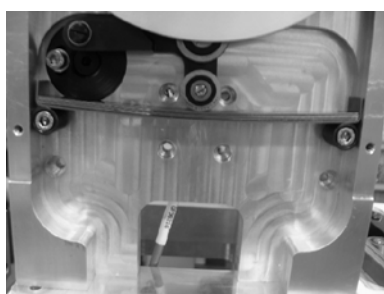
1. Remove the L-Block (*refer to JOB CARD 2.1*).
2. Remove all the sticks and cables from the Column.
3. Dismount the telescopic column:
  - Loosen the top bolts that fix the column to the Carriage.



- Remove the Column with care due to the heavy weight. A lifting tool can be optionally used.
  - If desired, use threaded rods to get the Telescopic column down safely.
4. Proceed in the opposite way to install the new column.
  5. Proceed to functional checking, refer to *Section 5. Functional Checks*.

<b>JOB CARD 2.3:</b>	<b>ALPHA/BETA MECHANICAL DETENTS REPLACEMENT PROCEDURE</b>
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<b>SUBASSEMBLY:</b>	TELESCOPIC COLUMN & L-BLOCK
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Allen Keys set
<b>PERSONNEL :</b>	One Service Engineer

**PROCEDURE**

Alpha Detent



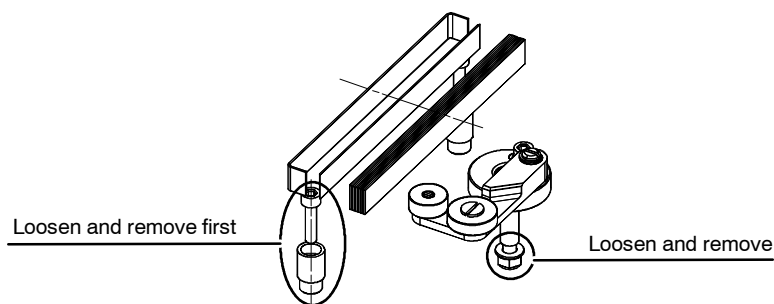
Beta Detent

1. The Ceiling Suspension must be switched ON.
2. Place the Ceiling Suspension Console at 0° in both axes, Beta and Alpha.

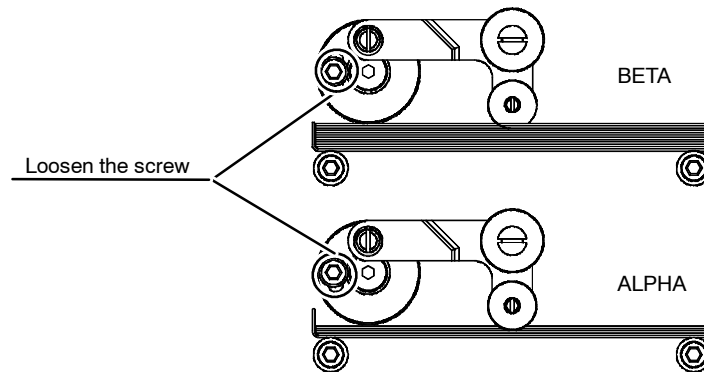
**WARNING**

**IT IS MANDATORY TO GET THE CEILING SUSPENSION AT 0° IN BOTH AXES, ALPHA AND BETA, SO ONCE THE NEW DETENTS ARE INSTALLED, IT WILL NOT BE NECESSARY TO ADJUST THEM. THEY ARE INSTALLED AT 0° POSITION.**

3. Remove the Detent Covers. In the case of the Alpha Detent, it will be necessary to remove the Alpha Covers.
4. Remove first all the sheets of the Detent. Loosen completely both fixing screws and remove the Rails.
5. Loosen and remove the bottom Washer of the Eccentric Detent.

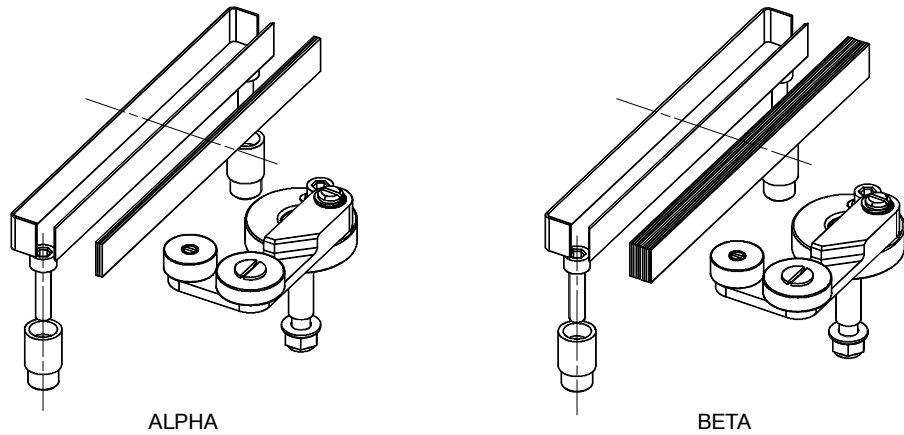


6. Loosen and remove the upper screw, which fixes the Eccentric Detent.

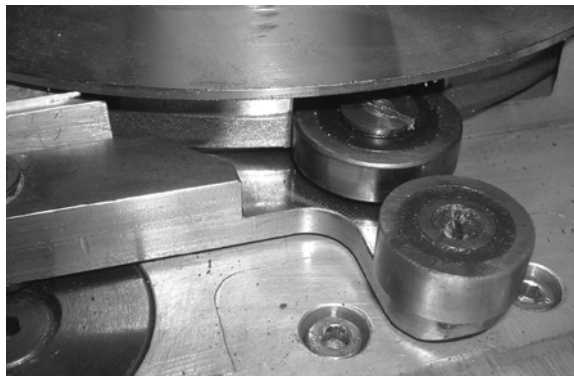


7. Remove the Eccentric Detent.

8. Install the new Detent.



9. First install the Eccentric detent. Check that the Rolling Guide fits into the housing.



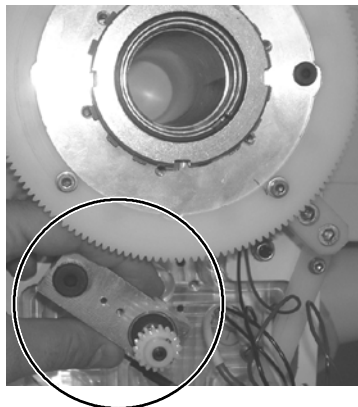
10. Tighten the upper screw.
11. Tighten the Bottom washer Once the position is the correct one, tighten totally the washer.
12. Proceed to Functional Checking, refer to *Section 5. Functional Checks*.

**JOB CARD 2.4: ALPHA/BETA POTENTIOMETERS REPLACEMENT PROCEDURE**

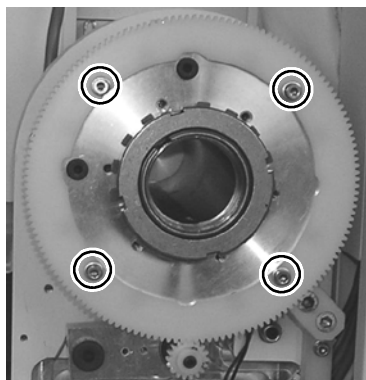
<b>SUBASSEMBLY:</b>	TELESCOPIC COLUMN & L-BLOCK
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Allen Keys set
<b>PERSONNEL :</b>	One Service Engineer

**PROCEDURE**

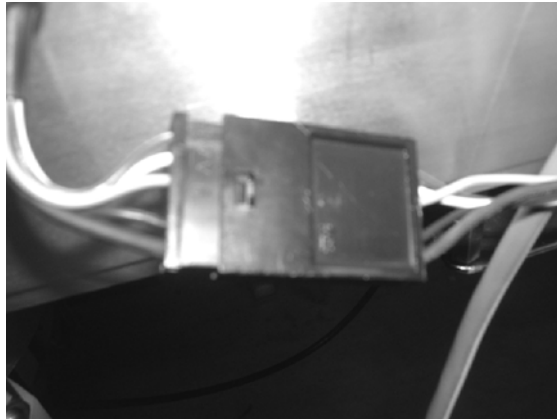
1. Switch the Ceiling Suspension OFF.
2. Before proceeding with the Potentiometer Gear disassembly, it is recommendable to locate the Ceiling Suspension in its very center of every axis, but specially mandatory with the Angulation. Check the previously configured travels.
3. Get the Alpha/Beta Covers out.
4. Remove the Potentiometer Pinion from the Potentiometer Gear. It is recommendable not to get it damaged when the Gear is disassembled.



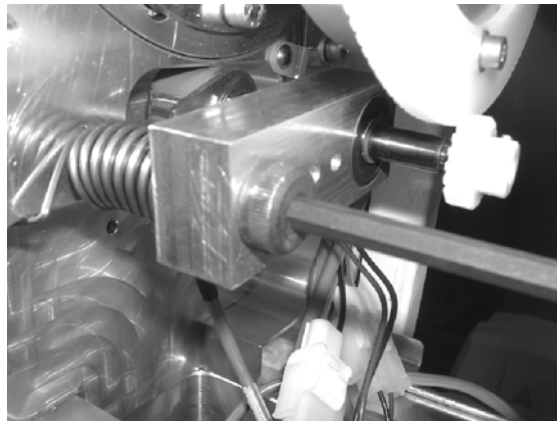
5. Loosen the four screws which fix the Potentiometer Gear to the Brake.



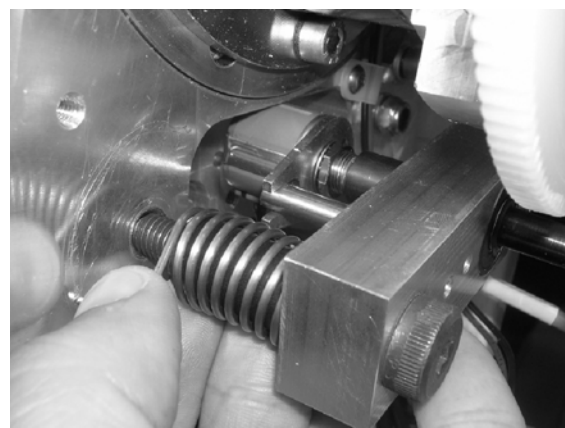
6. Disconnect the Potentiometer.



7. Loosen the Head Shoulder Screw with an Allen #5.



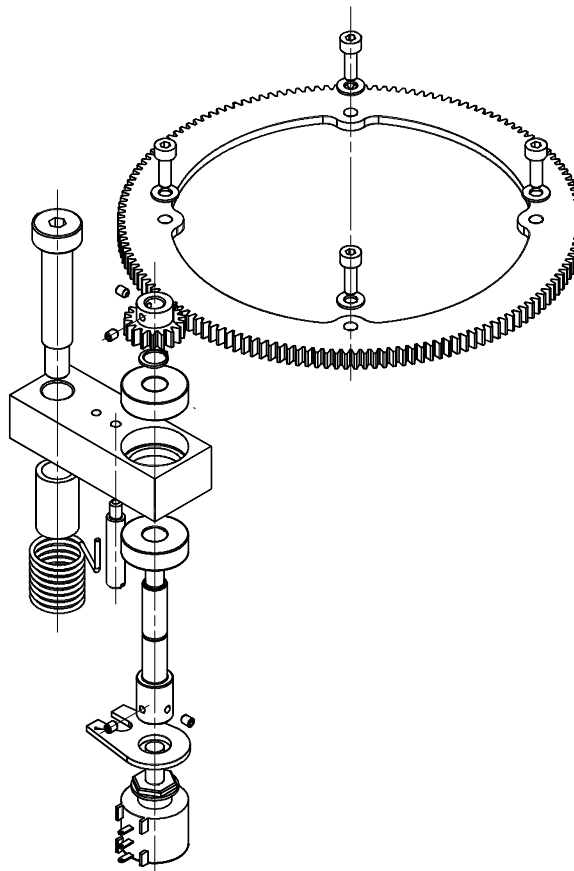
8. Remove the Potentiometer Support from its housing and, with it, the Potentiometer. Install the new Potentiometer, just fit it into the housing and tighten the Head Shoulder Screw.



9. Remember that it is necessary to adjust the new potentiometer, so set it to 5 turns of 10.
10. Install the new Potentiometer's Gear, fit it with the Pinion of the Potentiometer.



11. Install the Covers.
12. Proceed to functional checking as indicated in *Section 5. Functional Checks*.



**JOB CARD 2.5: GAGE REPLACEMENT PROCEDURE**

**SUBASSEMBLY:** TELESCOPIC COLUMN & L-BLOCK

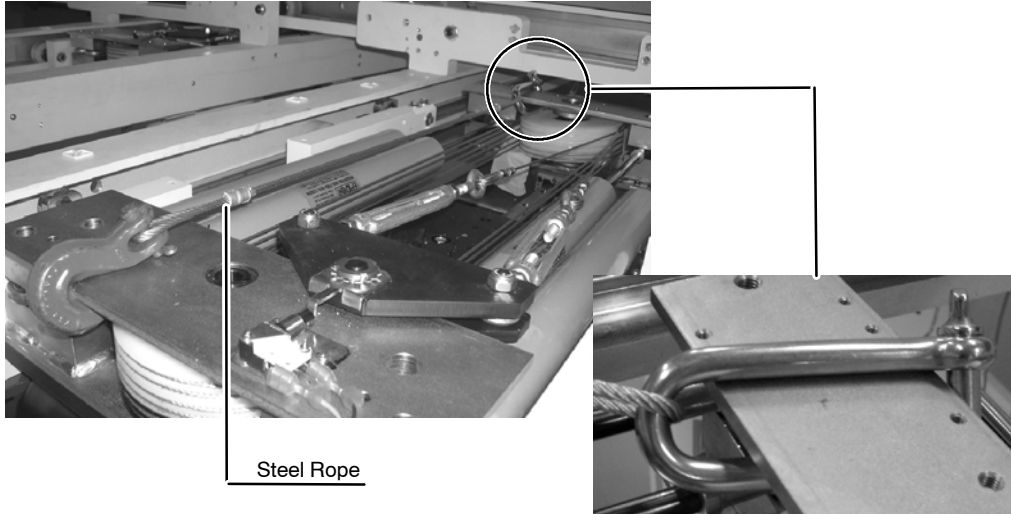
**MODEL:** Standard and Auto-tracking Ceiling Suspension

**TOOLS:** Allen Keys set  
Steel Blocking Rope, provided with this renewal part  
Telescopic Column Fixing Pin

**PERSONNEL :** Two Service Engineers

**PROCEDURE**

1. Switch the Ceiling Suspension OFF.
2. Totally remove the Carriage Covers.
3. Remove the Gas Springs Cover.
4. Remove L-Block Covers.
5. Get the Telescopic Column down to its lower position.
6. Install the Steel Blocking Rope in the Carriage. The Telescopic Column must be extended to install easily the Steel Blocking Rope, which must not be completely stretched.



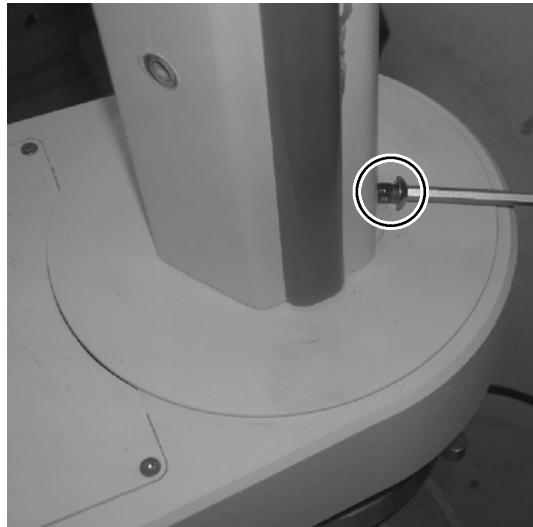
7. Move the Column upwards and slightly until the Steel Rope gets completely stretched and the Telescopic Column gets blocked.



**MECHANICAL LOCKING WITH THE STEEL BLOCKING ROPE IS MANDATORY.**

8. Disconnect all the Hoses from the Ceiling Suspension.

9. Disassemble the Ceiling Suspension Console, Collimator, DAP Device and X-ray Tube Support and place them in a secure place. Refer to *Section 1. Installation* and next sections:
  - Disassemble the Ceiling Suspension Console. Refer to *Section 2.13 Control Console Installation*.
  - Disassemble the Collimator. Refer to *Section 2.12.1 Collimator Installation*.
  - Disassemble the X-ray tube Support. Refer to *Section 2.11 Tube Support & X-ray Tube Installation*.
10. Loosen completely the Telescopic Column bottom screws, which fix the Column Covers to the L-Block.



11. Raise the column covers and block them in their higher position with the Fixing Pin.



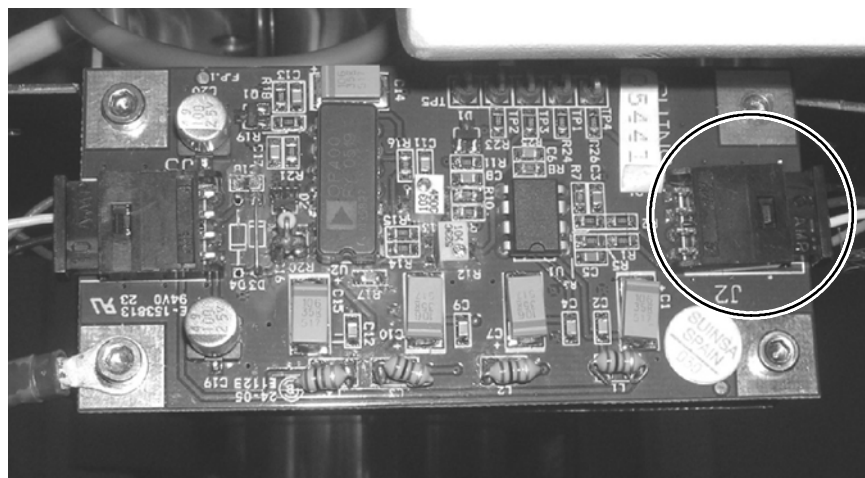


**PROCEED TO IDENTIFY CORRECTLY THE POSITION OF THE STEEL CABLES, AS IT IS TOTALLY OBLIGATORY TO KEEP INSTALLED EACH CABLE IN THEIR CORRECT TRACK, SO THEIR POSITIONS DO NOT GET MIXED.**

12. Remove the Gage Pin to free the Steel Rope.

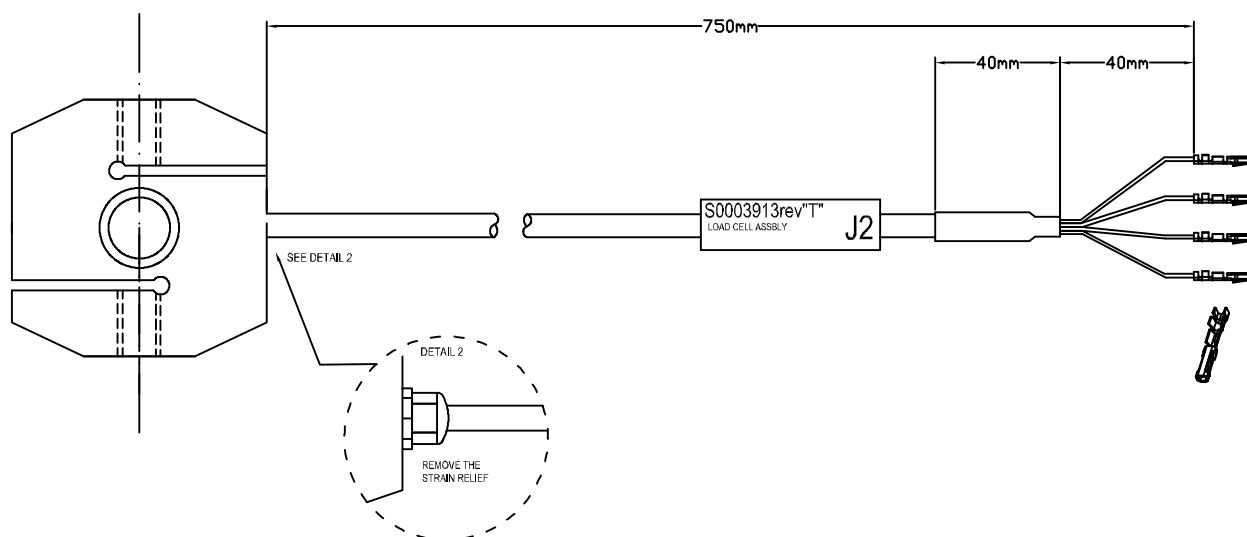


13. Disconnect the Load Cell.

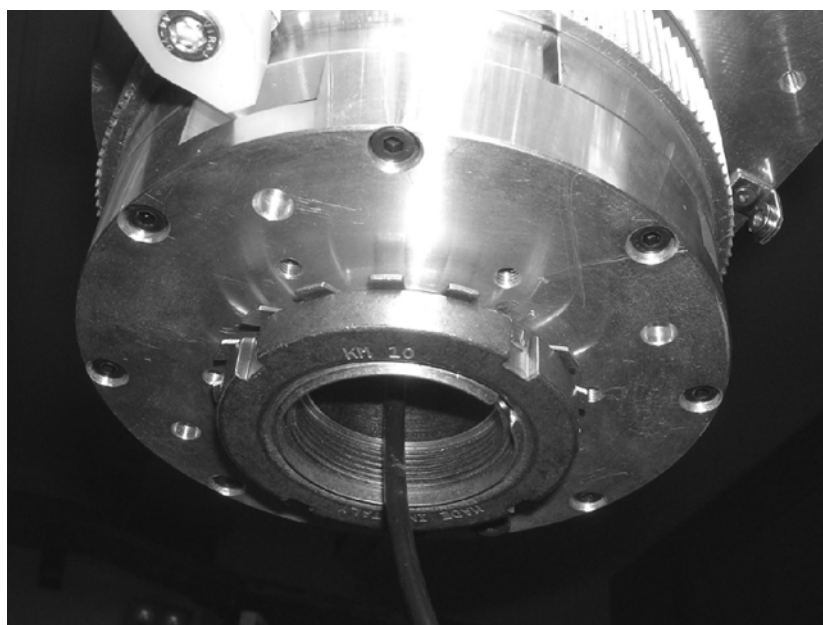


14. Remove the Connector.

15. Remove the old Load Cell Cable.
16. Remove the old Load Cell.
17. Install the new Load Cell.



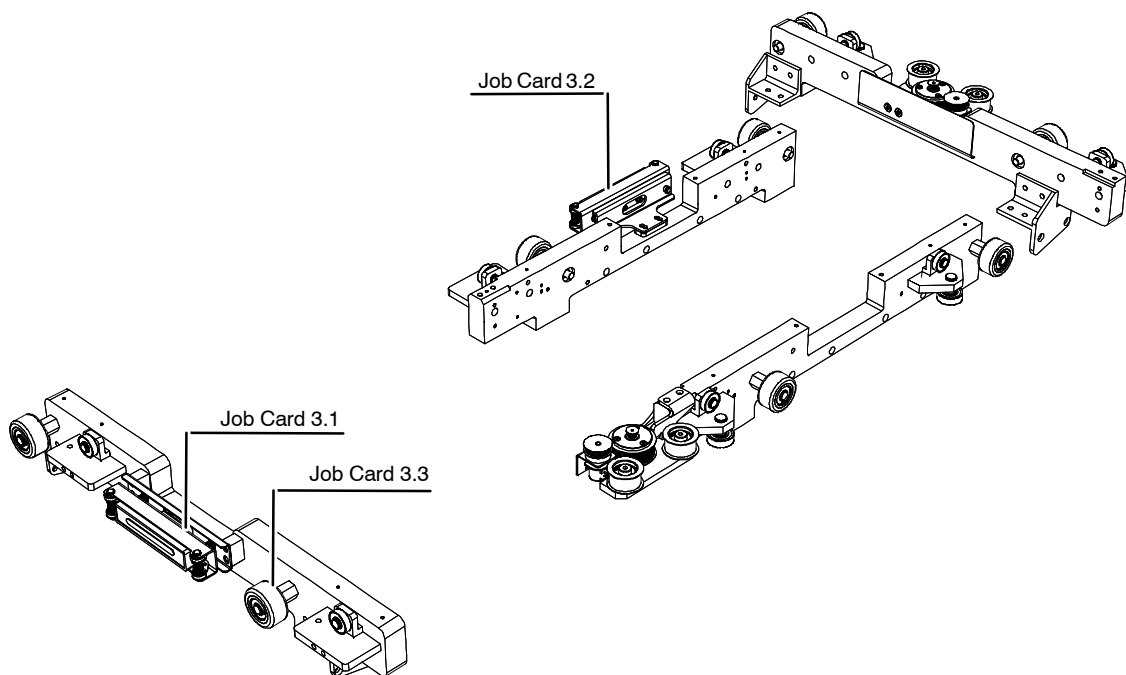
18. Introduce the Load Cell Cable through the Beta Gear. Take care the cable does not get damaged.
19. Install the new connector.



20. Proceed to Functional Checking, refer to *Section 5. Functional Checks*.

## 9.5 RAILS SYSTEM PROCEDURES

**Illustration 9-4**  
**Rails System Job Cards**

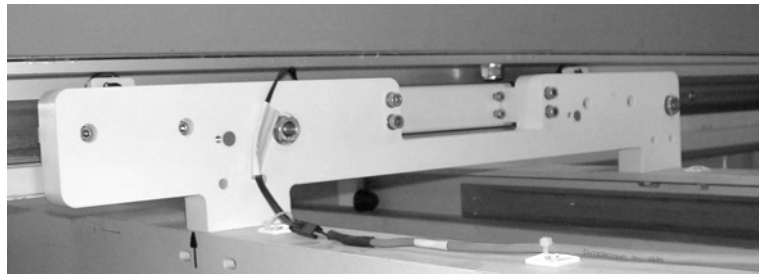


**JOB CARD 3.1: LONGITUDINAL BRAKE REPLACEMENT PROCEDURE**

<b>SUBASSEMBLY:</b>	RAILS SYSTEM
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Stepladder Allen Keys Set
<b>PERSONNEL :</b>	Total of 60 minutes, one FE required

**PROCEDURE**

1. Disconnect the Longitudinal Brake Cable from the Pulley Set Cable.



2. Unscrew the fixing to the bearings bolts of the brake.



3. Remove carefully the old brake from the longitudinal rail.
4. Proceed to the installation procedure as indicated in *Section 2.10 Longitudinal Brake Installation*.
5. Proceed to functional checking. Refer to *Section 5. Functional Checks*.

### JOB CARD 3.2: TRANSVERSE BRAKE REPLACEMENT PROCEDURE

<b>SUBASSEMBLY:</b>	RAILS SYSTEM
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Allen Keys set Stepladders
<b>PERSONNEL :</b>	One Service Engineer

#### PROCEDURE

1. Switch the Ceiling Suspension OFF.
2. Disconnect the Transverse Brake cable.
3. Loosen completely both fixing screws from the bridge.



4. Remove carefully the old Transverse Brake.



5. Follow the previous instructions backwards to install the new Transverse Brake.
6. Proceed to functional checking, refer to *Section 5. Functional Checks*.

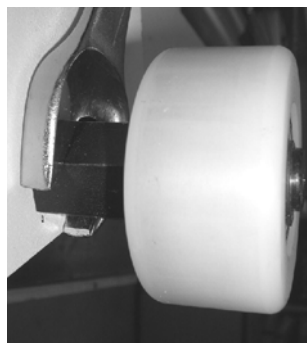
**JOB CARD 3.3: NYLON WHEEL REPLACEMENT PROCEDURE**

<b>SUBASSEMBLY:</b>	RAILS SYSTEM
<b>MODEL:</b>	Standard and Auto-tracking Ceiling Suspension
<b>TOOLS:</b>	Optional Elevation Kit or any other Lifting tool
<b>PERSONNEL :</b>	Two Service Engineers

**PROCEDURE**

***DUE TO SECURITY REASONS IT IS ABSOLUTELY NECESSARY TO LOWER THE SUSPENSION TO AVOID ANY RISK FOR SERVICEMEN AND EQUIPMENT.***

1. Switch the Ceiling Suspension OFF.
2. Disconnect the Longitudinal Potentiometer and the Longitudinal Brake.
3. Disconnect and dismount the Hose from the ceiling Suspension
4. Dismount the Collimator (*refer to Section 2.12 Collimator Installation and to its own technical documentation*).
5. Dismount the X-ray Tube Support as indicated in *Section 2.11.4 X-ray Tube Installation*. Proceed in the opposite way as indicated in this section.
6. Dismount the Longitudinal Potentiometer
7. Loosen completely the Carriage Fixation Bearings.
8. Get the Suspension down totally. The optional Elevation Kit can be used. Refer to *Section 2.7* for further information about how to use this tool).
9. Place the Ceiling Suspension in a supporting structure to maintain it save from any damage.
10. Remove the Transverse Rails from the Carriage.
11. Once it has been lifted down, proceed to loosen the Wheel axis from the bearing.



12. Follow the complete installation, calibration and functional checking procedure.

## 9.6 HOSE & CABLES PROCEDURES

### JOB CARD 4.1: POWER SUPPLY CABLE REPLACEMENT PROCEDURE

**SUBASSEMBLY:** HOSE & CABLES

**MODEL:** Standard and Auto-tracking Ceiling Suspension

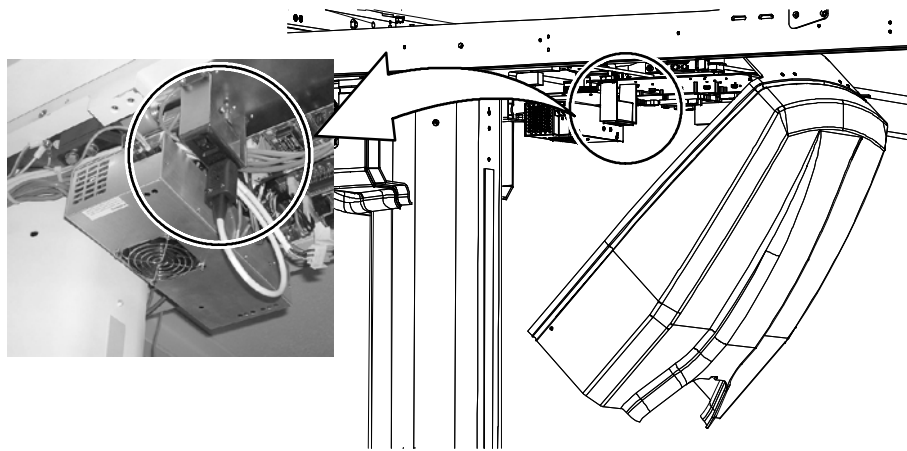
**TOOLS:** Stepladder  
Mask Tape  
Tie Wraps

**PERSONNEL :** 1 Service Engineer required

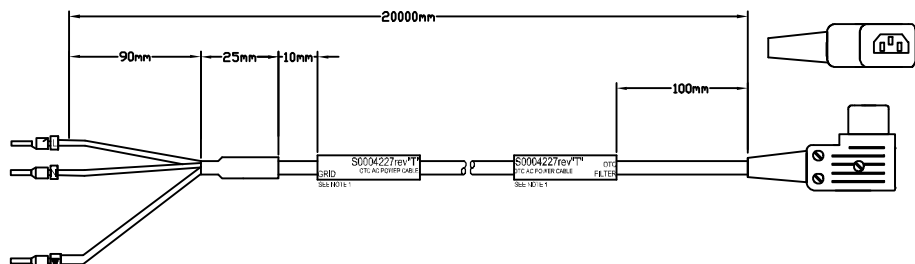
#### PROCEDURE

The Ceiling Suspension is power supplied in the Room Electrical Cabinet by the AC Power Supply Cable P/N **S0004227**, which is routed within the Hose.

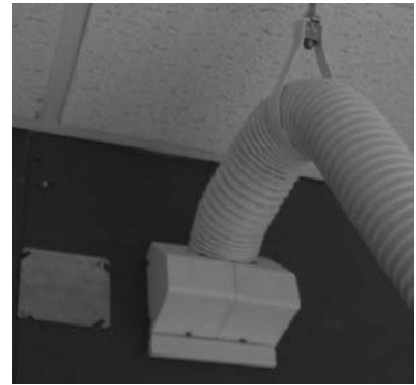
1. Open Carriage Covers
2. Disconnect the Power Line from the Fuse Holder, P/N **S0004060**.



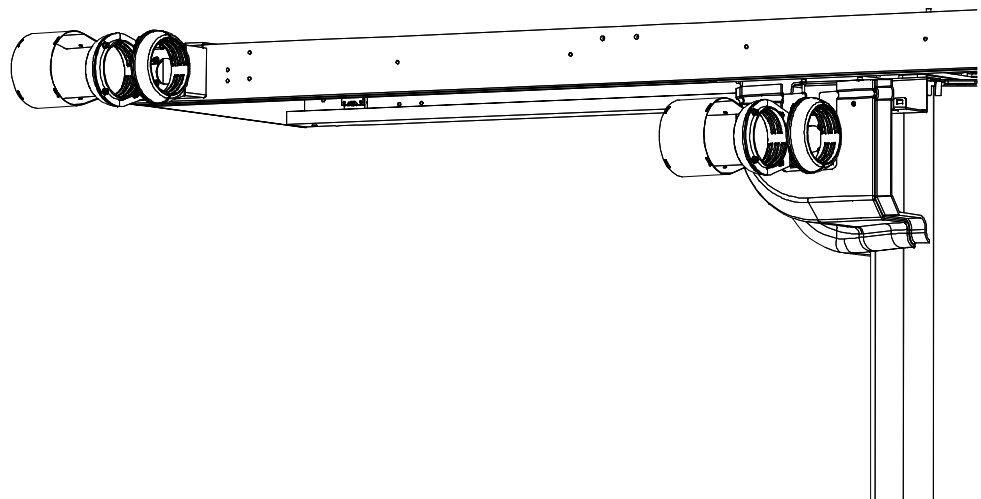
3. Disconnect the AC Power Supply Cable from the Room Electrical Cabinet.



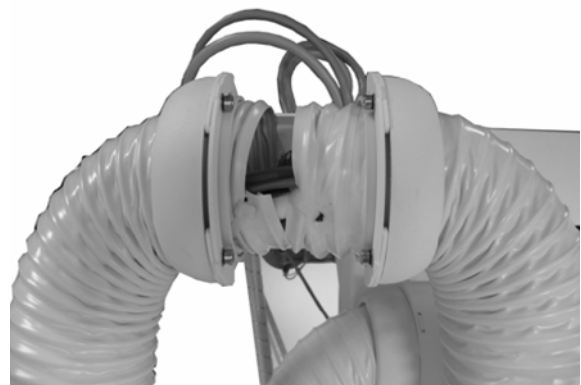
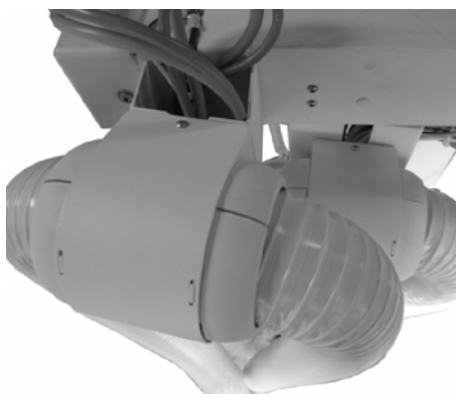
4. Open Wall Support.
5. Remove the old AC Power Supply Cable from the Cable Duct up to the Wall Support.



6. To remove the old AC Power Supply Cable and route the new one, open all the Hose fixation brackets to Transverse Rails, to Carriage. It is not necessary to remove them from the Ceiling Suspension.



7. Loosen both fixation screws of the Bracket covers and remove it.

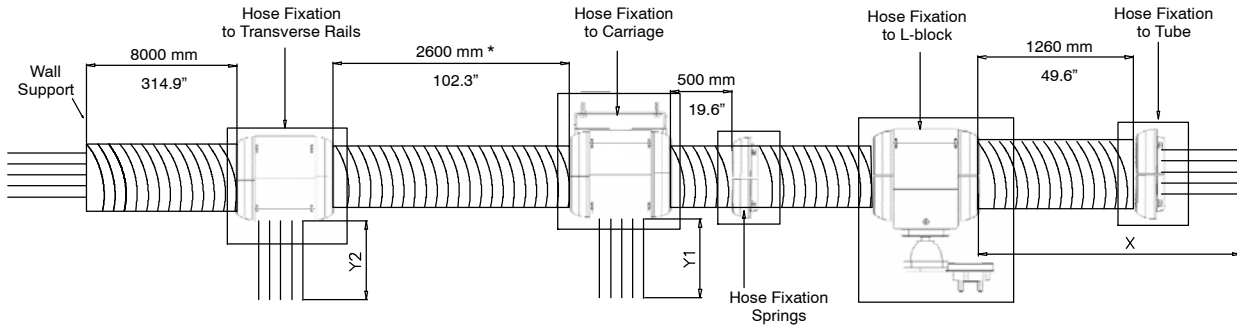


8. Cut all Tie Wraps that fix all the Cables of the Hose in the brackets.

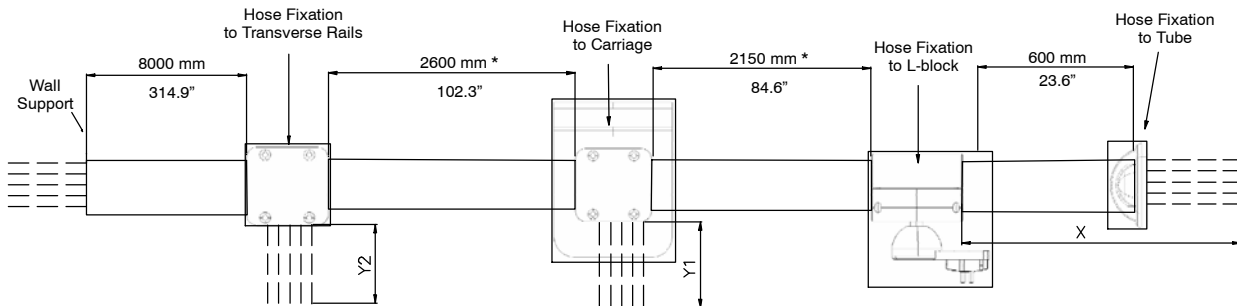


**When replacing any Cable of the Hose, it is very important to fix them properly and especially to respect the mandatory distances between the Fixation Brackets. But also to not blend them. Replace the Cable as carefully as possible.**

**TUBULAR HOSE**



**VELCRO HOSE**



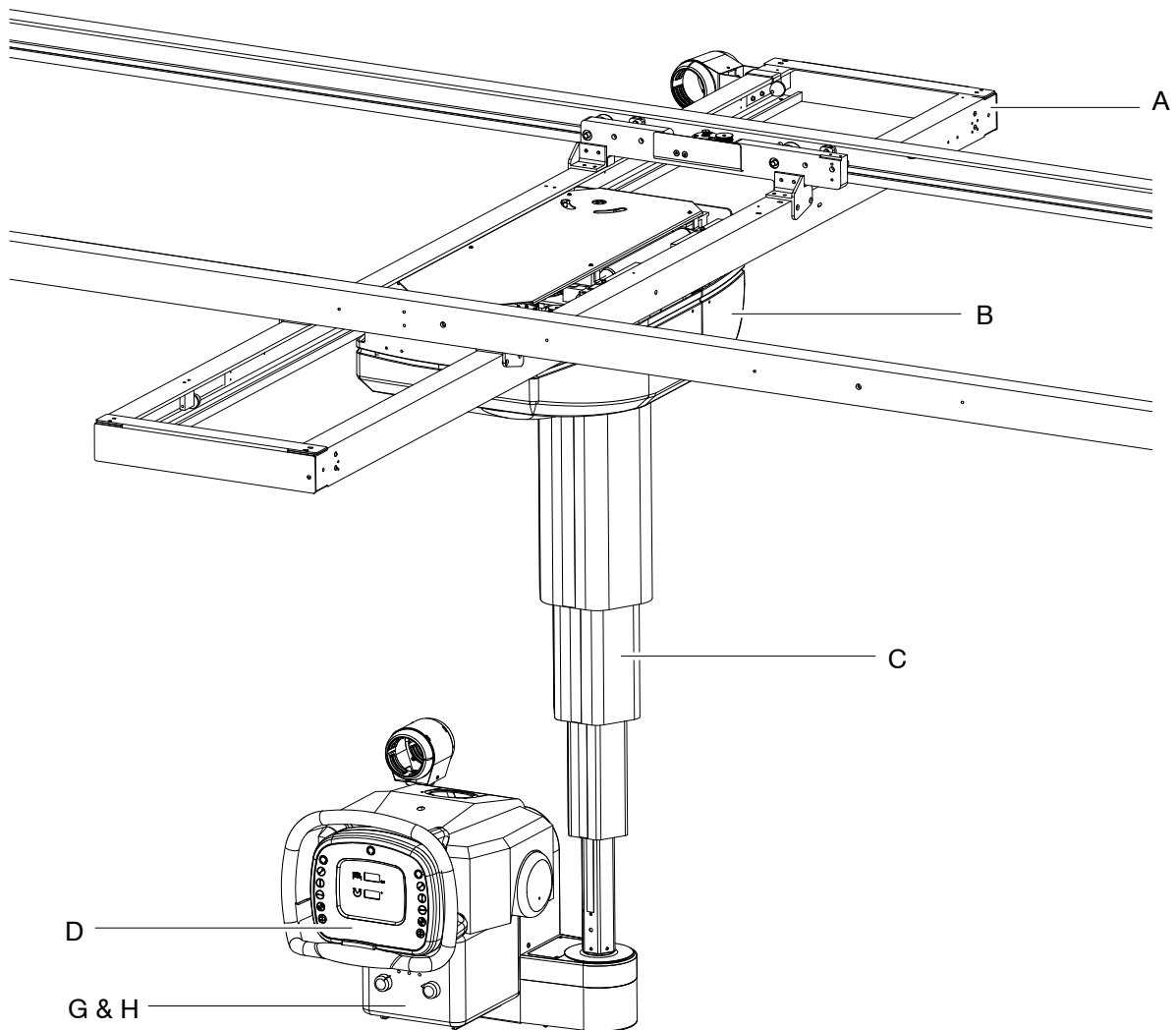
**Note**

*Remember that it is not required to remove the complete Hose from the Ceiling Suspension to replace just one Cable. Use the old cable as a guide to route the new one.*

9. Fix the new cable plug end to the external connectors of the old one, use a mask tape.
10. Carefully pull out the old cable from the Hose Fixation to Transverse Rails, at the same time the new AC Power Supply cable is routed replacing the old one. Try to route it in the same position of the replaced cable.
11. Pull the old cable from the Hose Fixation to Carriage until the new cable is completely routed and old one removed.
12. Check the distance from the Fixation to Carriage to Fuse, it must be 700 mm (27.56"). Refer to *Section 2.16 Electrical Connections and Routing*.
13. Fix the cables with new tie wraps.
14. Connect the new Power Line Cable, P/N **S0004227**. Check if the Suspension powers ON.

## SECTION 10 RENEWAL PARTS

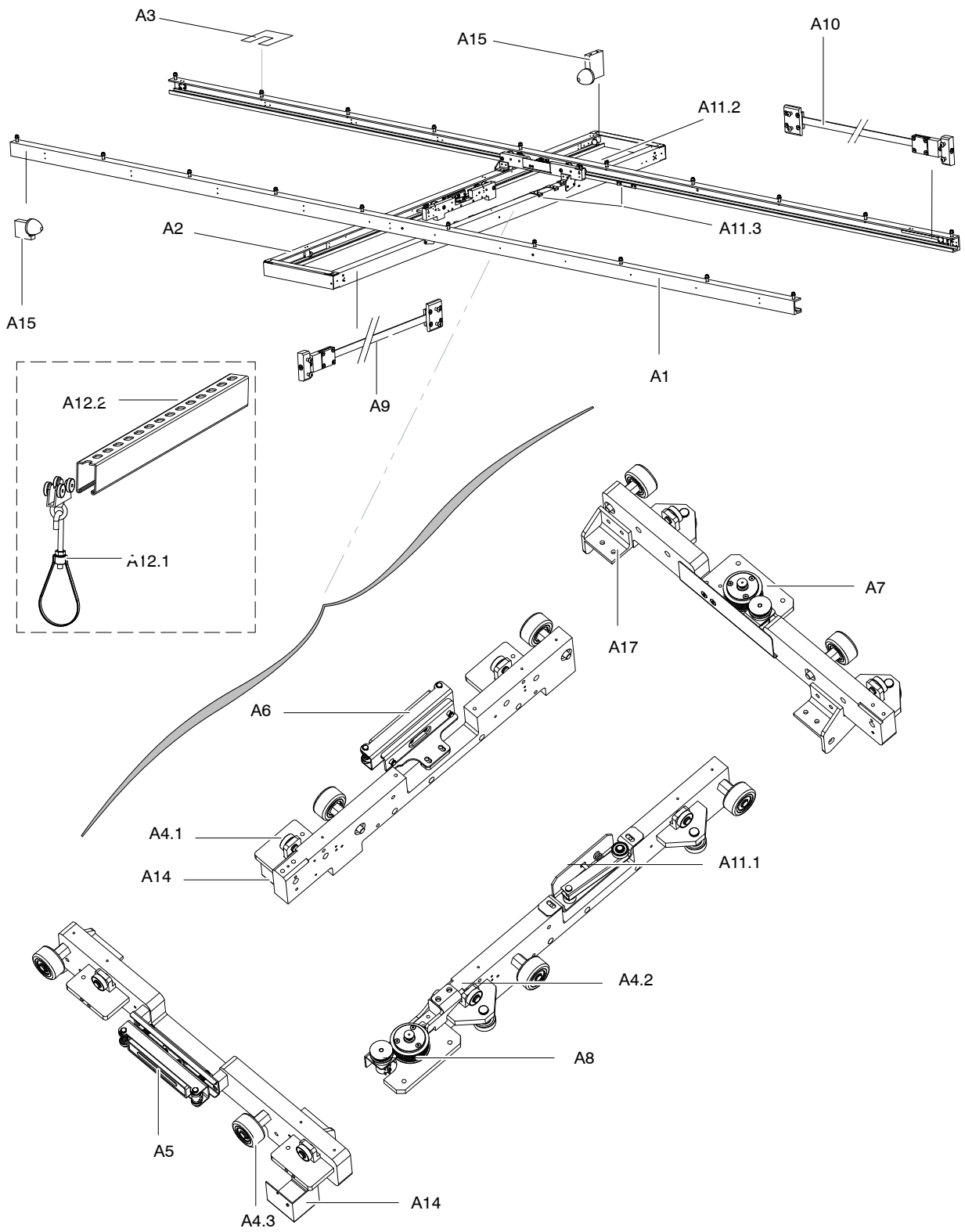
- A - RAIL SYSTEM
- B - CARRIAGE
- C - TELESCOPIC COLUMN & L-BLOCK
- D - STEERING WHEEL CONSOLE
- E - CABLES
- F - MISCELLANIOUS
- G - AUTOMATIC COLLIMATOR
- H - MANUAL COLLIMATOR



## Standard & Auto-tracking Ceiling Suspension

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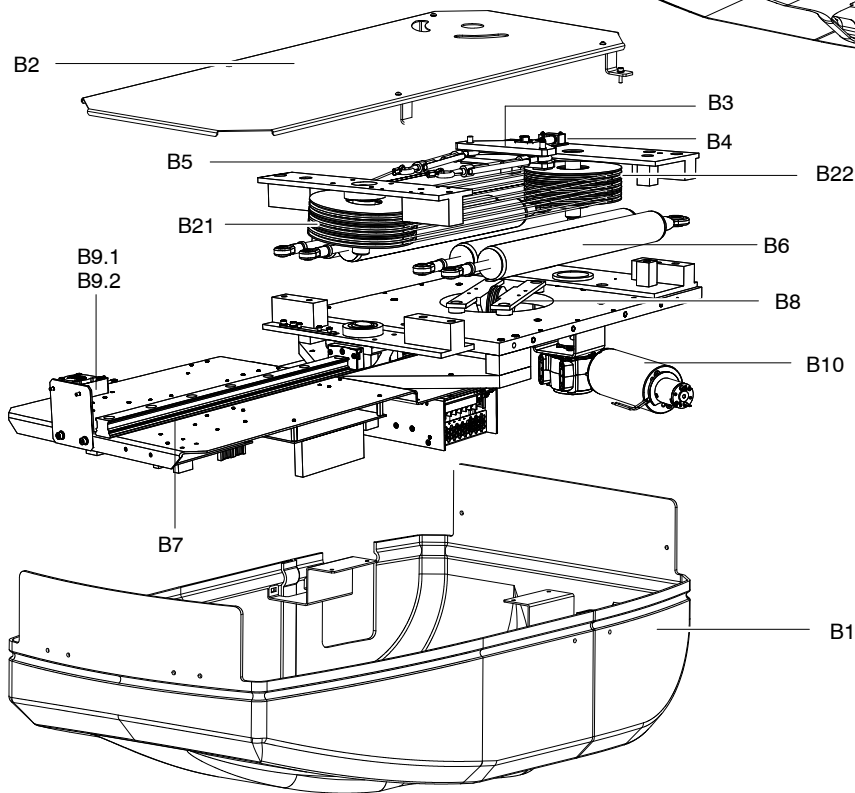
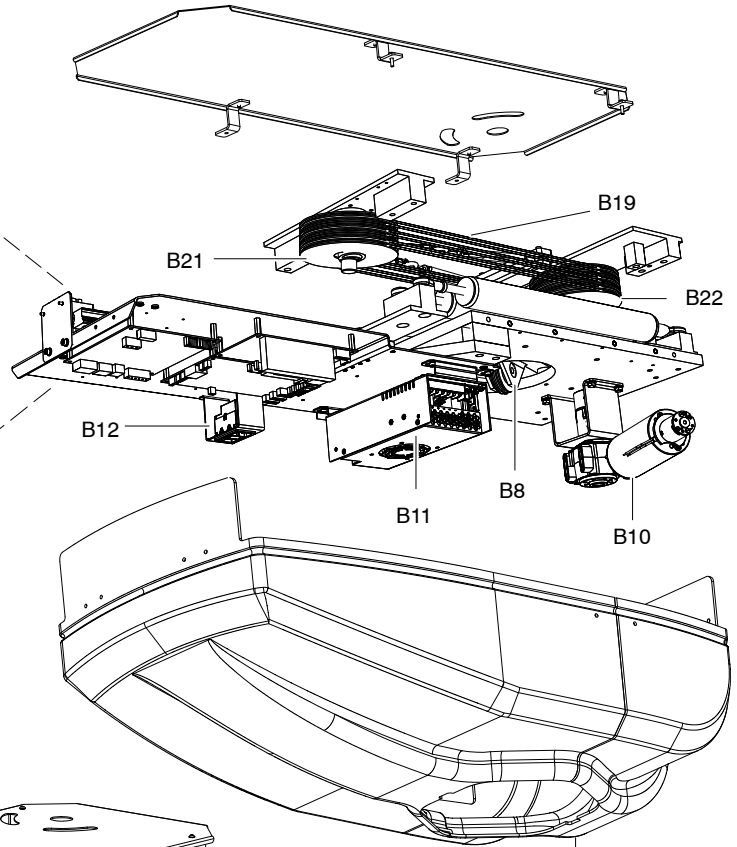
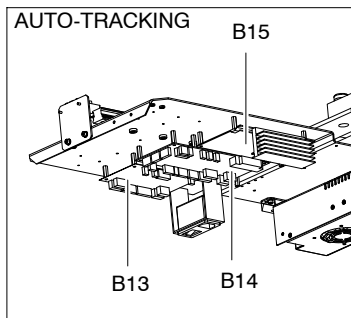
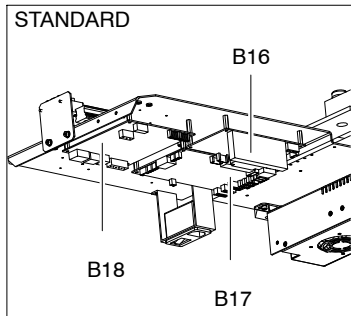
ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
<b>A</b>	<b>RAIL SYSTEM</b>			
A1	LONGITUDINAL RAILS 6000 MM	1	RS0019675	6000 mm / 236.22" Longitudinal Rail
	LONGITUDINAL RAILS 5340 MM	1	RS0019676	5340 mm / 210.22" Longitudinal Rail
	LONGITUDINAL RAILS 4679 MM	1	RS0019678	4679 mm / 184.22" Longitudinal Rail
	LONGITUDINAL RAILS 4019 MM	1	RS0019679	4019 mm / 158.22" Longitudinal Rail
	LONGITUDINAL RAILS 3358 MM	1	RS0019680	3358 mm / 132.22" Longitudinal Rail
A2	TRANSVERSE RAILS 3500 MM	1	RS0018234	3500 mm / 137.79" Transverse Rail
	TRANSVERSE RAILS 3000 MM	1	RS0004364	3000 mm / 118.11" Transverse Rail
	TRANSVERSE RAILS 2750 MM	1	RS0004365	2750 mm / 108.27" Transverse Rail
	TRANSVERSE RAILS 2500 MM	1	RS0004366	2500 mm / 98.42" Transverse Rail
	TRANSVERSE RAILS 2250 MM	1	RS0004367	2250 mm / 88.58" Transverse Rail
	TRANSVERSE RAILS 2000 MM	1	RS0004368	2000 mm / 78.74" Transverse Rail
A3	SHIMS SET	1	A527002-01	
A4	BEARING SET	2	RS0004000	It includes items A4.1, A4.2 & A4.3
A4.1	FIX BEARING GUIDE ASSY	4	RS0009431	
A4.2	ADJUST BEARING GUIDE ASSY	4	RS0009434	
A4.3	NYLON WHEEL	8	RS0017508	
A5	LONGITUDINAL BRAKE	1	RS0016937	
A6	TRANSVERSE BRAKE	1	RS0016938	
A7	POT LONGITUDINAL TRACKING	1	RS0023450	
A8	POT MANUAL TRANSVERSE	1	RS0023478	
A9	LONGITUDINAL BELT	1	RS0020135	
A10	TRANSVERSE BELT	1	RS0022488	
A11	KIT MECHANICAL DETENT FOR NOVA	1	A527005-01	Optional for Standard ceiling suspensions It includes items A11.1, A11.2 & A11.3
A11.1	LONGITUDINAL DETENT (X)	1	RS0007636	
A11.2	TRANSVERSE DETENT	1	RS0007642	
A11.3	DETENT MARK	4	RS0013552	
A12	CABLE RAIL SET FOR TUBULAR HOSE	3	RS0022010	It includes items A12.1, A12.2
A12.1	CARRIAGE FOR CABLE RAIL	1	RS0022015	
A12.2	CABLE RAIL	1	RS0022413	
A13	CENTER & SID MARKS ASSY	1	RS0016137	
A14	SAFETY PARKING SWITCH	1	RS0019143	Positioning as per configuration
A15	END STOP RAILS ASSEMBLY	1	RS0023358	
A16	LONGITUDINAL POTENTIOMETER CABLE	1	RS0004242	
A17	REINFORCEMENT BRACKET FOR ROLLING	1	A527064-01	



## Standard & Auto-tracking Ceiling Suspension

### Service Manual

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
<b>B</b>	<b>CARRIAGE</b>			
B1	UPPER COVER STANDARD	1	RS0008310	
B2	GAS SPRING COVER	1	RS0024238	
B3	CABLE BRAKE DETECTOR ASSY	1	RS0007064	
B4	DETECTOR SW CABLE BROKEN	1	RS0021596	
B5	STEEL CABLE WITH TENSOR (NEW "L" BLOCK)	1	RS0025341	
B6	SET 4 GAS SPRING 1100N	1	RS0024148	Each <b>Gas Spring Set</b> consists of four units. It is mandatory to replace all the units for the correct performance of the equipment.
	SET 4 GAS SPRING 1200/1300N	1	A527001-01	
	SET 4 GAS SPRING 1200N	1	RS0024160	
	SET 4 GAS SPRING 1100/1200N	1	RS0024161	
	SET 4 GAS SPRING 1200/1300N	1	A527001-01	
B7	GAS SPRING LINEAR GUIDE & BLOCK	1	RS0006218	
B8	CENTRAL PULLEY	1	RS0018784	
B9.1	VERTICAL POTENTIOMETER (Z)	1	RS0017586	Only for Auto-tracking Ceiling Suspension
B9.2	VERTICAL POTENTIOMETER (Z)	1	RS0019869	Only for Standard Ceiling Suspension
B10.1	VERTICAL MOTOR (Z)	1	SAT-A11153-02	Flexible Coupling Vertical Motor Only for Standard Ceiling Suspension
B10.2	VERTICAL MOTOR (Z)	1	SAT-A11153-06	Rigid Coupling Vertical Motor Only for Auto-tracking Ceiling Suspension
B11	POWER SUPPLY 24V XP SLM600PS24-CT	1	SAT-53418038	
B12	IEC INPUT FILTER & FUSE	1	RS0004060	
B13	AUTOTRACK Z POWER BOARD	1	SAT-A3705-01	Only for Auto-tracking Ceiling Suspension
B14	AUTO-TRACKING SYSTEM CONTROL	1	RS0013450	Only for Auto-tracking Ceiling Suspension
B15	PWA SERVO CONTROL TRACK	1	SAT-A3704-01	Only for Auto-tracking Ceiling Suspension
B16	LOAD CELL INTERFACE & DETENTS PWA	1	RS0019383	Only for Standard Ceiling Suspension
B17	UPGRADED SERVO POWER PWA	1	RS0019473	Only for Standard Ceiling Suspension
B18	CONTROL PWA	1	RS0019874	Only for Standard Ceiling Suspension
B19	STEEL CABLE WITH TENSOR	1	RS0025341	
B20	STEEL ROPE BLOCK	1	RS0020777	Option, Service and Installation Tool
B21	STEEL CABLE PULLEY SET MOBILE	1	A527028-01	
B22	STEEL CABLE PULLEY SET	1	RS0006221	

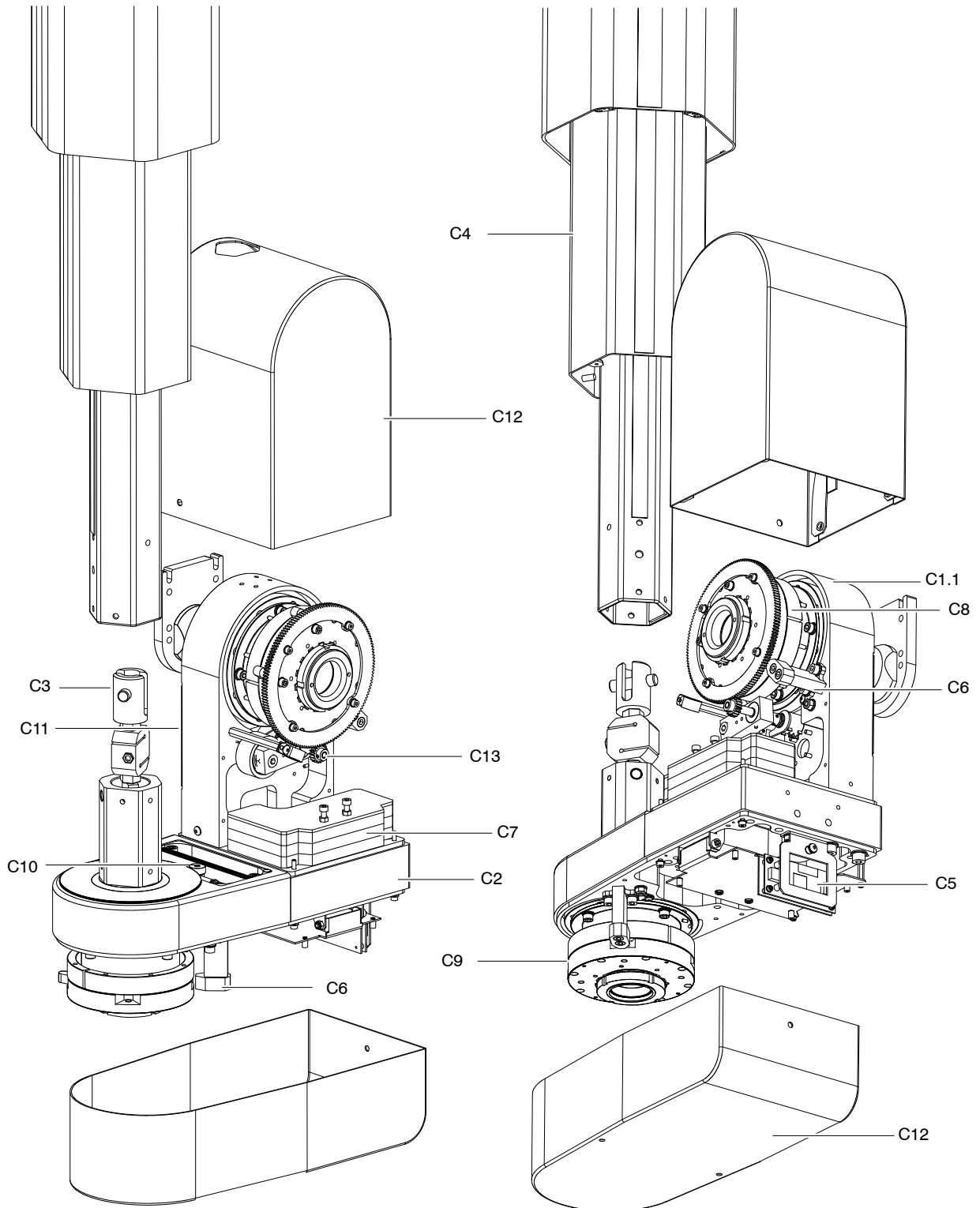


## Standard & Auto-tracking Ceiling Suspension

### Service Manual

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ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
<b>C</b>	<b>TELESCOPIC COLUMN &amp; L-BLOCK</b>			
C1	BETA FRAMEWORK FOR AT AND AT+TFT	1	A527027-01	INCLUDES C1.1
C1.1	BETA FRAMEWORK	1	RS0023173	
C2	ALPHA FRAMEWORK	1	RS0023174	
C3	LOAD CELL 300KG	1	RS0003913	
C4	TELESCOPE	1	RS0006100_LB	
C5	GAGE BOARD	1	RS0017517	
C6	ALPHA-BETA END STOP	2	RS0022801	
C7	COUNTERWEIGHTS ASSY	1	RS0023175	
C8	ALPHA BRAKE	1	RS0023176	
C9	BETA BRAKE	1	RS0023228	
C10	BETA DETENT	1	RS0023238	
C11	ALPHA DETENT	1	RS0023239	
C12	ALPHA/BETA COVERS	1	RS0024151	
C13	ALPHA POTENTIOMETER ST/AT	1	RS0024586	

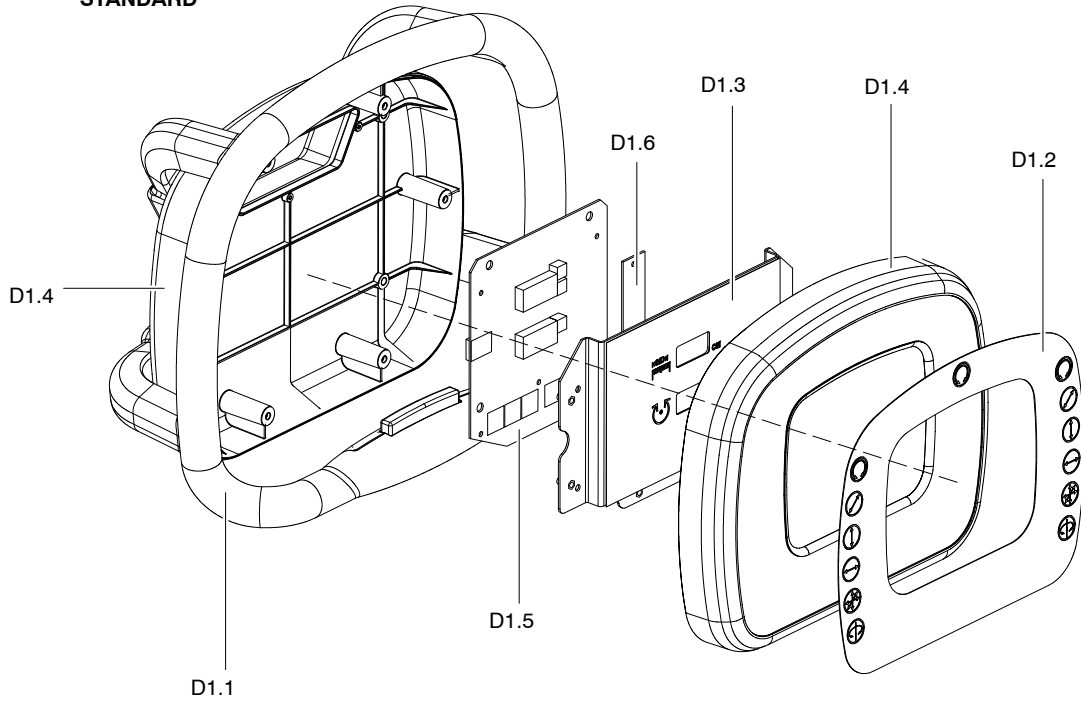


## Standard & Auto-tracking Ceiling Suspension

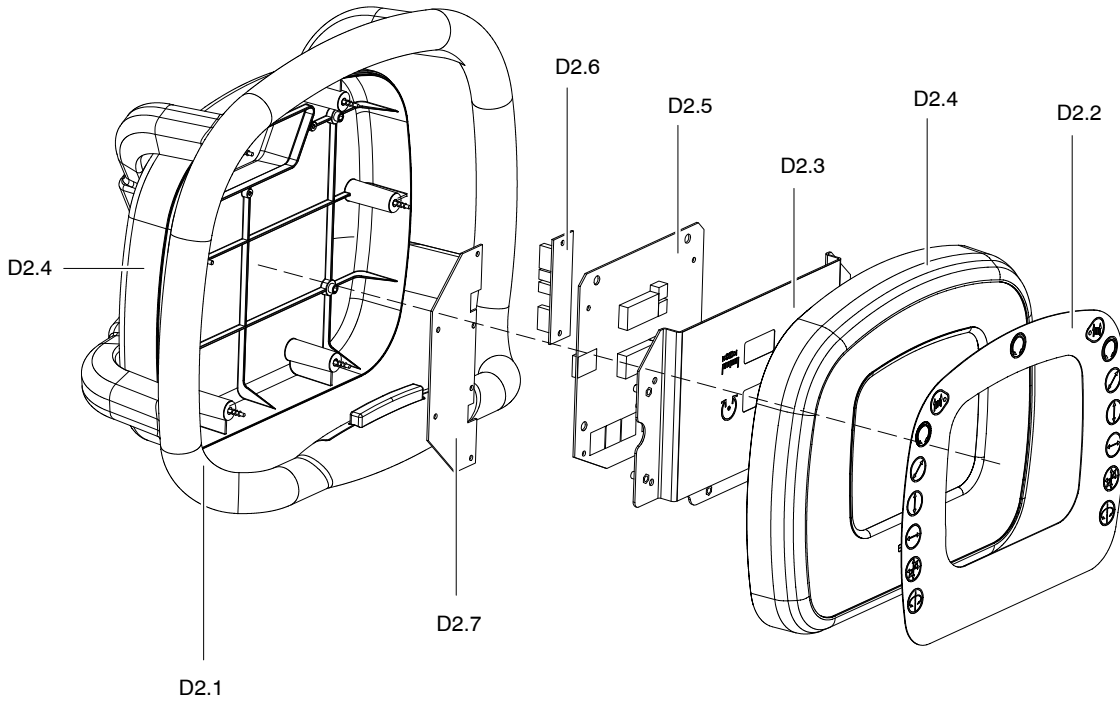
### Service Manual

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
<b>D</b>	<b>STEERING WHEEL CONSOLE</b>			
<b>D1</b>	<b>STANDARD MODEL</b>			
D1.1	NOVA CONSOLE WHEEL COLOR	1	A527008-XXX	
D1.2	NOVA CONSOLE OVERLAY	1	A527009-01	
D1.3	NOVA ST CONSOLE COMPLETE CM	1	A527013-01	
	NOVA ST CONSOLE COMPLETE INCH	1	A527014-01	
D1.4	NOVA ST CONSOLE CHASSIS CM	1	A527018-01	
	NOVA ST CONSOLE CHASSIS INCH	1	A527019-01	
D1.5	NOVA ST DISPLAY SIR/ROT PWA	1	RS0025490	
D1.6	KEYBOARD ADAPTATION PWA	1	RS0019873	
<b>D2</b>	<b>AUTO-TRACKING MODEL</b>			
D2.1	NOVA CONSOLE WHEEL COLOR	1	A527008-XXX	
D2.2	NOVA AT CONSOLE OVERLAY	1	A527017-01	
D2.3	NOVA AT CONSOLE COMPLETE INCH	1	A527015-01	
	NOVA AT CONSOLE COMPLETE CM	1	A527016-01	
D2.4	NOVA AT CONSOLE CHASSIS CM	1	A527020-01	
	NOVA AT CONSOLE CHASSIS INCH	1	A527021-01	
D2.5	NOVA AT DISPLAY SID/ROT PWA	1	RS0025453	
D2.6	PWA KEYBOARD ADAPT TRACK	1	RS0025488	
D2.7	Z MOTORIZED NOVA TRACKING KEYBOARD	1	RS0024589	

STANDARD



AUTOTRACKING

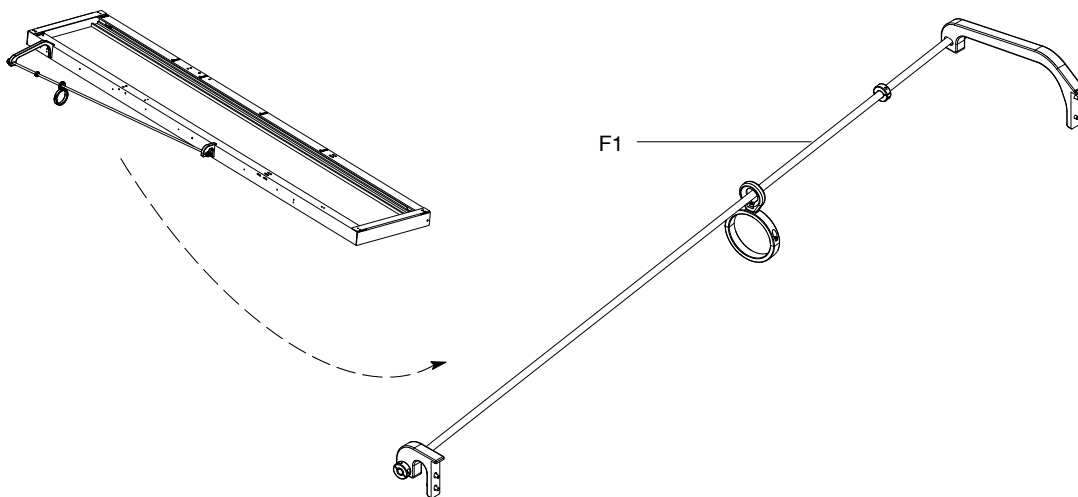


## Standard & Auto-tracking Ceiling Suspension

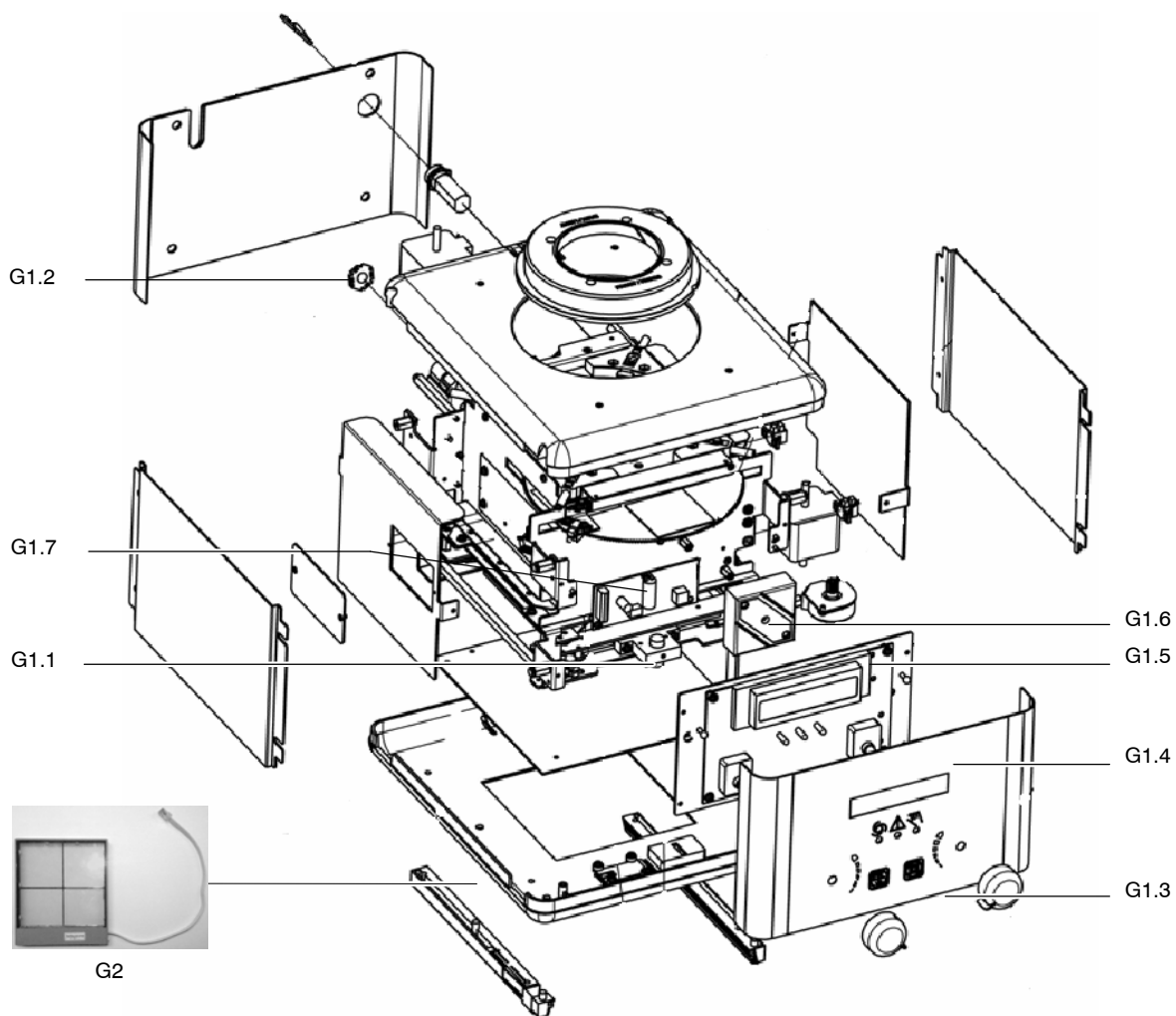
### Service Manual

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
<b>E</b>	<b>CABLES</b>			
E1	MANUAL HOSE CABLES SET	1	RS0024163	
E2	AUTO-TRACKING HOSE CABLES SET	1	RS0024164	
E3	SPARE NOVA CABLE POWER LINE	1	RS0004227	
E4	RS232 COLLIM DATA HUESTIS CABLE 20M	1	RS0021937	

ITEM	DESCRIPTION	QTY	REFERENCE	REMARKS
<b>F</b>	<b>MISCELLANEOUS</b>			
F1	TRANSVERSE HOSE CLAMP SLIDE ASSEMBLY	1	SAT-A11138-01	Option
F2	"L" CABLES SUPPORT FOR TUBULAR HOSE	1	RS0024171	
F3	SAFETY PARKING SWITCH	1	RS0019143	
F4	TUBULAR HOSE W/ROTATION TUNNEL ALPHA	1	RS0024136	
F5	SPARE HOSE WALL SUPPORT	1	RS0004845	
F6	SPARE NOVA HOSE CABLE	1	RS0009504-XX	XX= 5 FOR LENGTH 5M XX= 10 FOR LENGTH 10M XX= 15 FOR LENGTH 15M XX= 20 FOR LENGTH 20M



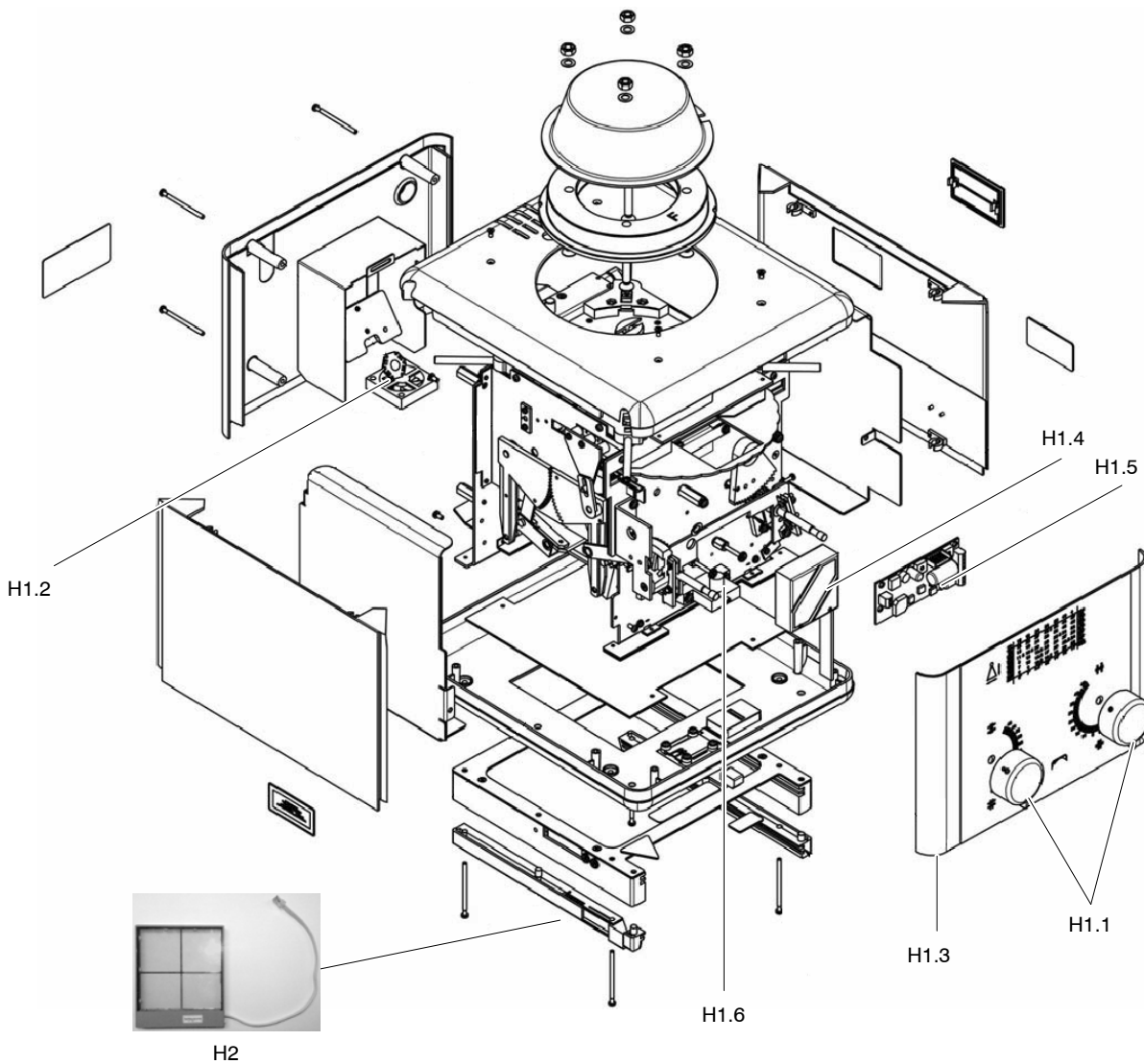
ITEM	DESCRIPTION	P/N	QTY.	REMARKS
<b>G</b>	<b>AUTOMATIC COLLIMATOR</b>			
G1	AUTOMATIC COLLIMATOR	SAT-6693-XX	1	XX= 35 with DAP XX= 41 laser and Bus Can XX= 42 with laser, Bus Can and Filter XX= 43 with DAP and motorized Filter
G1.1	LASER	A525147-01	1	
G1.2	POWER LED	A525343-01	1	
G1.3	KNOB	A525158-01	1	
G1.4	FRONT PANEL	A525149-01	1	For collimator 6693-35 and 6693-41
G1.5	RSR 008 PCB	A525145-01	1	
G1.6	RETRACTABLE TAPE	A525150-01	1	
G1.7	TIMER	A525159-01	1	
G2	DAP ION CHAMBER HS 120-131 CAN	SAT-6695-55	1	



# Standard & Auto-tracking Ceiling Suspension

## Service Manual

ITEM	DESCRIPTION	REFERENCE	QTY	REMARKS
<b>H</b>	<b>MANUAL COLLIMATOR</b>			
H1	MANUAL COLLIMATOR	SAT-6693-XX	1	XX= 04L with LED XX= 04LUSA with LED (FDA) XX= 09LFUSA with Setting Filter & Laser (FDA) XX= 09LUSA with Laser
H1.1	KNOB	A525023-01	1	
H1.2	POWER LED	A525343-01	1	
H1.3	FRONT PANEL	A525322-01	1	
H1.4	RETRACTABLE TAPE	A525320-01	1	
H1.5	TIMER	A525159-01	1	
H1.6	LASER	A525147-01	1	
H2	DAP ION CHAMBER	SAT-6695-55	1	Optional



## SECTION 11 SCHEMATICS

Note 

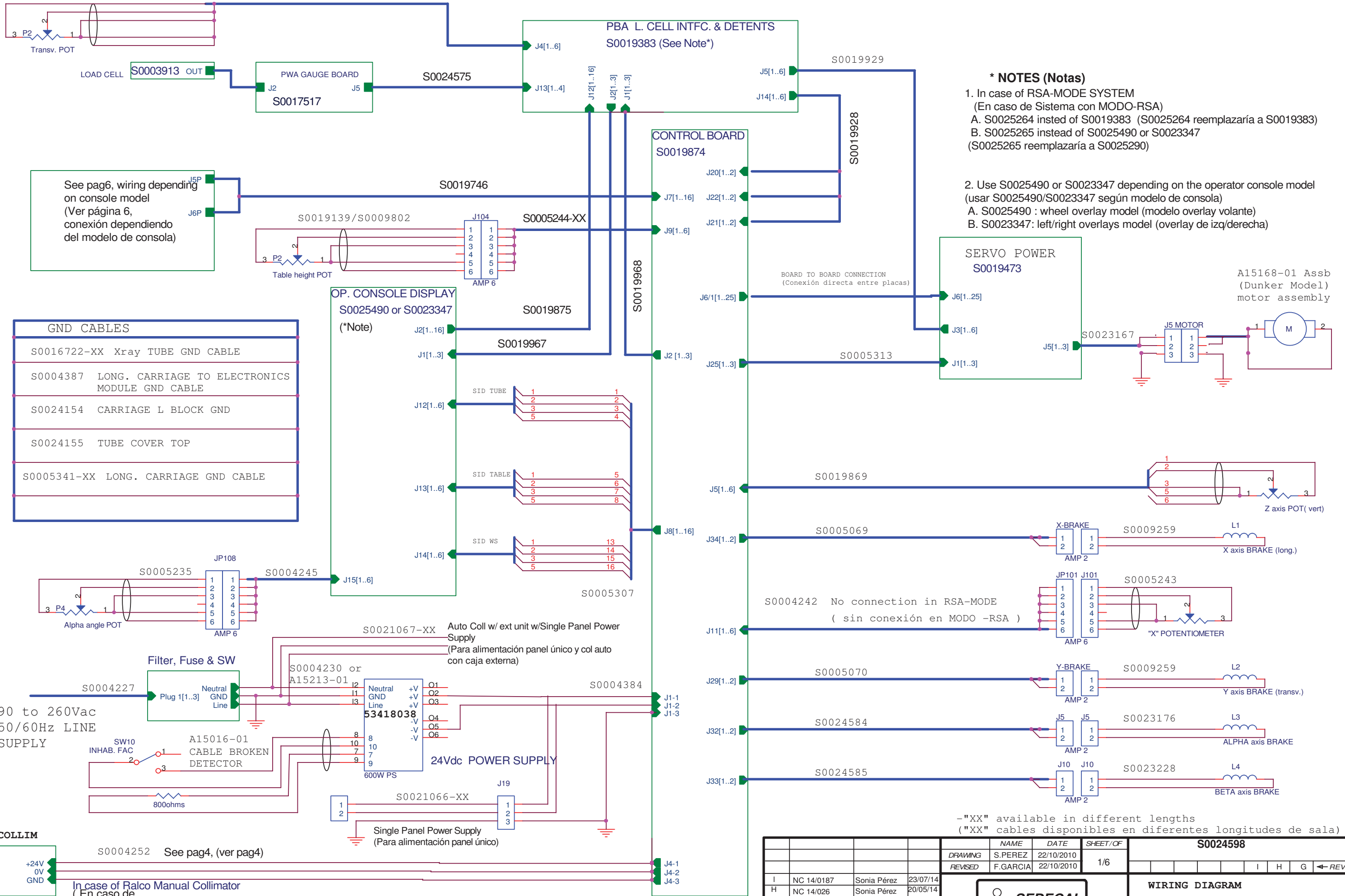
Remember that the indicated revision in the next Schematics refers to the SCH document specific revision, not to the PWA revision which is indicated on the board. In the case of doubt, consult first the table below, where they are indicated the PWA and the corresponding SCH revisions. For wirings and connections it is indicated just the SCH revision.

P/N	PWA	SCH	DESCRIPTION
<b>WIRING DIAGRAMS</b>			
S0024598	-	I	STANDARD CEILING SUSPENSION WIRING DIAGRAM
S0024170	-	O	AUTO-TRACKING CEILING SUSPENSION WIRING DIAGRAM
<b>COMMON PWA</b>			
S0017517	B	B	GAGE PWA
S0019357	1	--	OMNI-SWITCH WITH CABLE PWA
<b>STANDARD CEILING SUSPENSION</b>			
S0019383	2	2	LOAD CELL INTERFACE AND DETENTS
S0019473	A	A	UPGRADED SERVO POWER PWA
S0019873	0	0	KEYBOARD ADAPTATION PWA
S0019874	1	1	CONTROL PWA
S0025490	C	C	SID & ROTATION DISPLAY ST-SENSING PWA
<b>AUTO-TRACKING CEILING SUSPENSION</b>			
A3704-01	B	B	AUTO-TRACK Z SERVO CONTROL PWA FOR DUNKER RIGID
A3705-01	B	B	AUTO-TRACK Z SERVO POWER PWA FOR DUNKER RIGID
S0013450	1	1	SYSTEM CONTROL PWA
S0024589	B	B	Z MOTORIZED NOVA TRACKING KEYBOARD
S0025453	A	A	DISPLAY & SID ROTATION TRACKING PWA
S0025488	A	A	AUTO-TRACKING KEYBOARD ADAPTATION PWA

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# GENERAL INTERCONNECTION

S0019850 No connection in RSA-MODE  
( sin conexión en MODO -RSA )



- \* NOTES (Notas)**
- In case of RSA-MODE SYSTEM (En caso de Sistema con MODO-RSA)
    - A. S0025264 instead of S0019383 (S0025264 reemplazaría a S0019383)
    - B. S0025265 instead of S0025490 or S0023347 (S0025265 reemplazaría a S0025290)
  - Use S0025490 or S0023347 depending on the operator console model (usar S0025490/S0023347 según modelo de consola)
    - A. S0025490 : wheel overlay model (modelo overlay volante)
    - B. S0023347: left/right overlays model (overlay de izq/derecha)

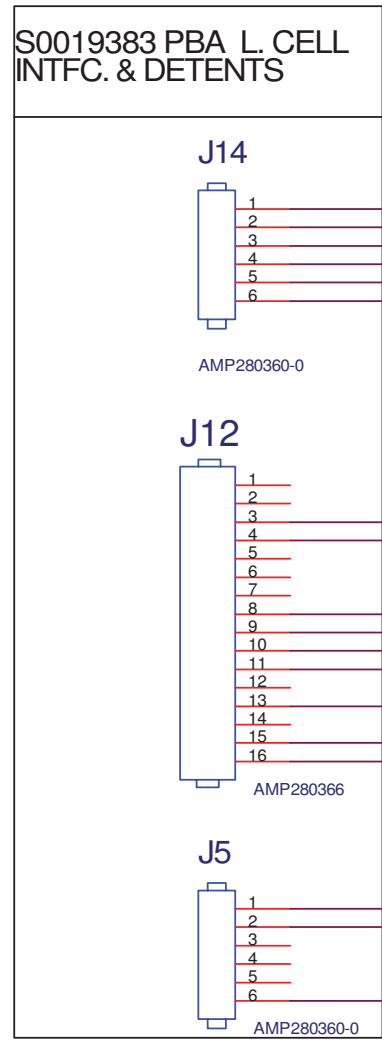
**GND CABLES**

S0016722-XX	Xray TUBE GND CABLE
S0004387	LONG. CARRIAGE TO ELECTRONICS MODULE GND CABLE
S0024154	CARRIAGE L BLOCK GND
S0024155	TUBE COVER TOP
S0005341-XX	LONG. CARRIAGE GND CABLE

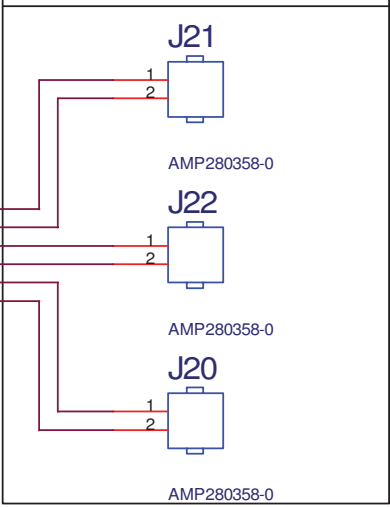
- "XX" available in different lengths  
("XX" cables disponibles en diferentes longitudes de sala)

REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET/OF	S0024598			
				DRAWING	S.PEREZ	22/10/2010				
				REVISED	F.GARCIA	22/10/2010				
I	NC 14/0187	Sonia Pérez	23/07/14							
H	NC 14/026	Sonia Pérez	20/05/14							
G	NC 14/039	Sonia Pérez	14/05/14							
							<b>WIRING DIAGRAM</b> <b>OTC STANDARD</b>			

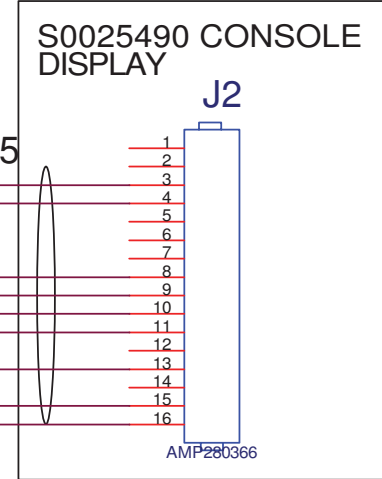
(S0025264 in case of RSA-MODE)



**S0019874 PBA CONTROL BOARD**



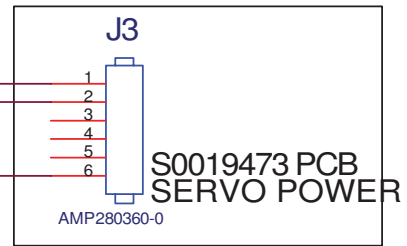
(S0025265 in case of RSA-MODE)



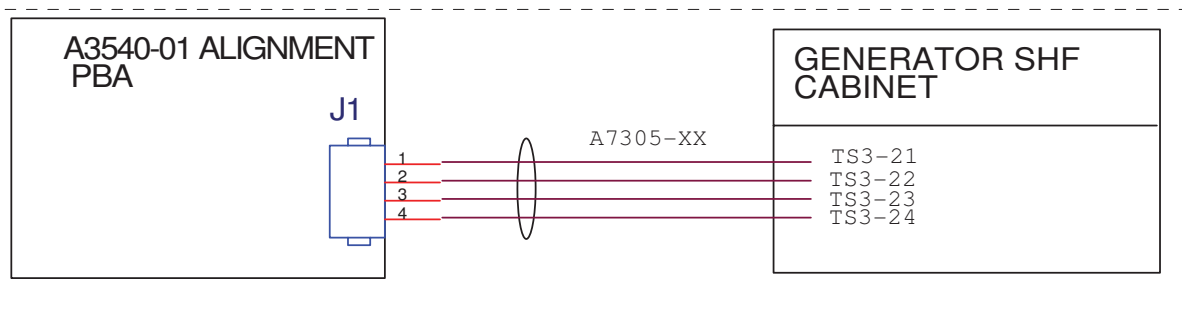
S0019875

S0019928

S0019929

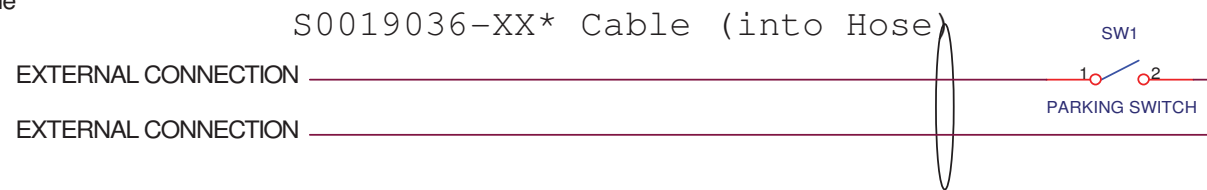


IN CASE OF FAILSAFE OPTION

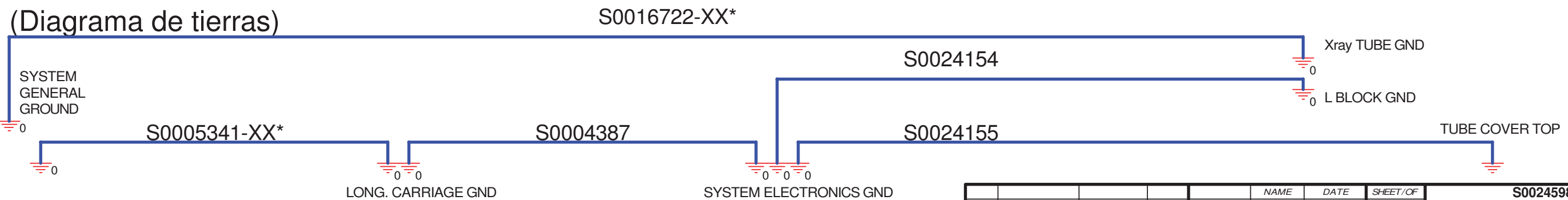


### IN CASE OF PARKING SWITCH KIT

That connection can be done in the RF remote table or another device. See service note SN1139



### EARTH WIRING (Diagrama de tierras)



(\*)Note:  
 -"XX" available in different lengths  
 ("XX" cables disponibles en diferentes longitudes de sala)

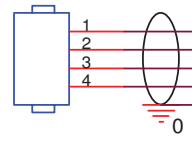
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				REVISED	F.GARCIA	22/10/2010						
I	NC 14/0187	Sonia Pérez	23/07/14					<b>SEDECAL</b> WIRING DIAGRAM OTC STANDARD				
H	NC 14/026	Sonia Pérez	20/05/14									
G	NC 14/039	Sonia Pérez	14/05/14									

S0019383 PBA L. CELL INTFC. & DETENTS

(S0025264 in case of RSA-MODE/Reemplazar por S0025264 en caso de sistema en modo RSA)

S0017517 PBA GAUGE

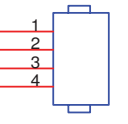
J13



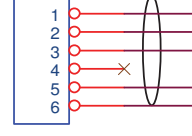
S0024575



J5



J4



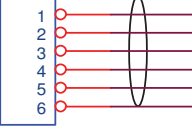
S0019850 No connection in RSA-MODE (No conectado en Modo RSA)



"Y" POTENTIOMETER

S0019874 PBA CONTROL BOARD

J11

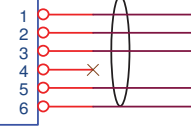


S0004242



JP101

J101

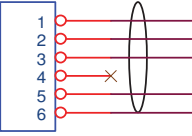


S0005243 No connection in RSA-MODE (No conectado en Modo RSA)



"X" POTENTIOMETER

J5

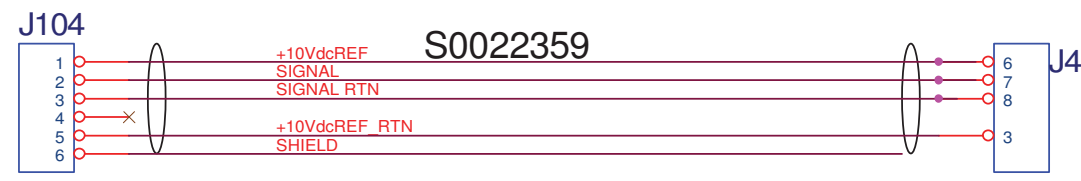


S0019869

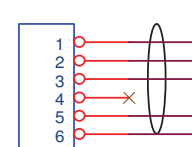


"Z" POTENTIOMETER

SUPPLIED WITH S0022359 TABLE COMPATIBILITY KIT (Suministrado en caso de kit de compatibilidad solicitado con p/n S0022359)



J104 \*



SUPPLIED WITH S0019000 TABLE COMPATIBILITY KIT (Suministrado en caso de kit de compatibilidad solicitado con p/n S0019000)

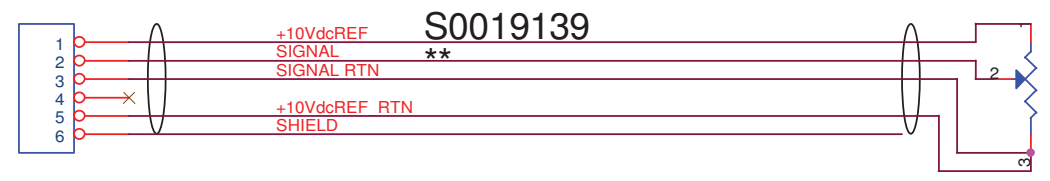
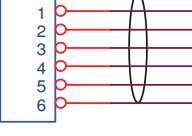


TABLE HIGHT POTENTIOMETER

\*\* Labeled cable with J28 (cable marcado como J28)

J9

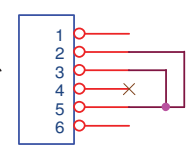


S0005244-XX\*



J104

S0009802 JUMPER



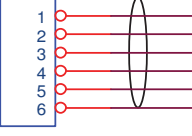
PLACE JUMPER ON J104 IF NON ELEVATING TABLE IS USED (Conectar jumper en caso de uso de mesa no elevadora)

S0025490 or S0023347 CONSOLE DISPLAY PBA

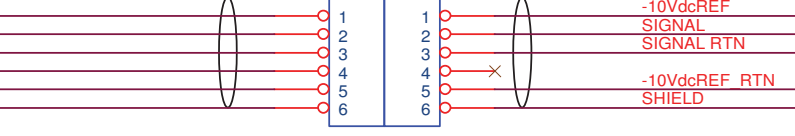
(S0025265 in case of RSA-MODE)

See note on pag1 (ver nota en pag1)

J15

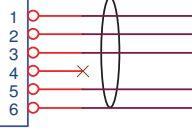


S0004245



JP108

J108



"ALPHA" POTENTIOMETER

S0005235



(\*)Note:  
- "XX" available in different lengths ("XX" cables disponibles en diferentes longitudes de sala)

				NAME	DATE	SHEET/OF	S0024598				
				DRAWING	S.PEREZ	22/10/2010	3/6				
				REVISED	F.GARCIA	22/10/2010					← REV
I	NC 14/0187	Sonia Pérez	23/07/14								
H	NC 14/026	Sonia Pérez	20/05/14								
G	NC 14/039	Sonia Pérez	14/05/14								
REV	DESCRIPTION	ISSUED BY	DATE								



WIRING DIAGRAM  
OTC STANDARD

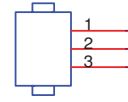
S0025490 or S0023347  
CONSOLE DISPLAY PBA

(S0025265 in case of RSA-MODE/  
reemplazar por S0025265 en caso de sistema con Modo RSA)

S0019874 PBA CONTROL  
BOARD

See note on pag1  
(ver nota en pag1)

J1

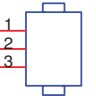


MOLEX 3069/3

S0004373

+24V3  
0V3  
GND

J2



AMP 1-480303-0

COLLIM

IN CASE OF COLLIM W/LIGHT W/HANDW  
OPTION

( En caso de  
Colimador Ralco modelo manual)

S0004252

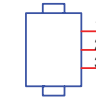
A15169-XX

GENERATOR SHF  
CABINET

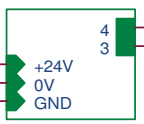
TS3-22  
TS3-24

In case of Ralco Manual Collimator\_1

J2



AMP 1-480303-0



J12

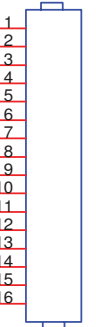


AMP280360-0

S0005307

-10VdcREF  
SIGNAL  
SIGNAL RTN  
-10VdcREF RTN  
+10VdcREF  
SIGNAL  
SIGNAL RTN  
+10VdcREF RTN

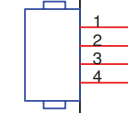
J8



AMP280366

A3540-01 ALIGNMENT  
PBA

J1



J13



AMP280360-0

J14

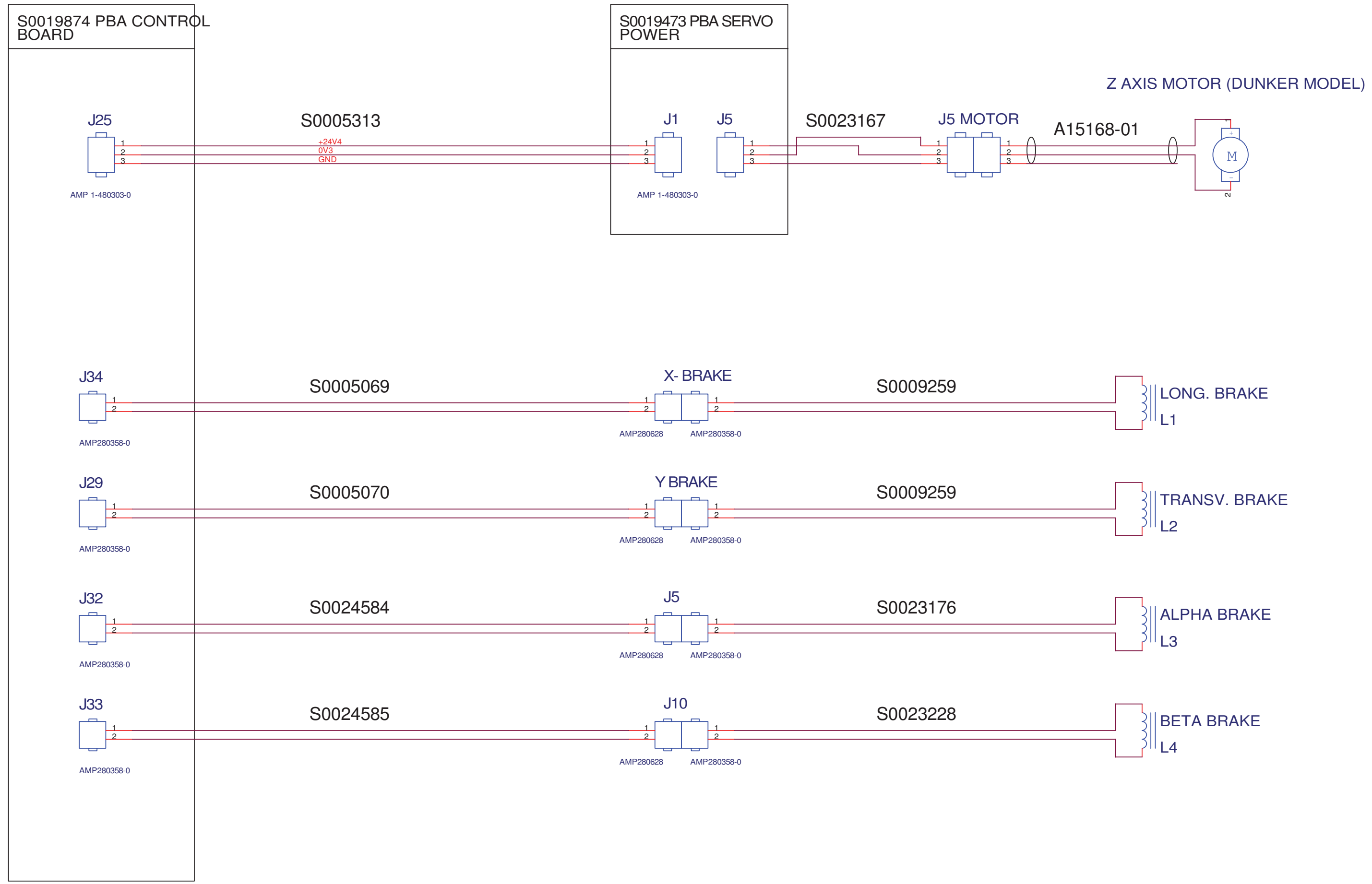


AMP280360-0

- "XX" available in different lengths  
("XX" cables disponibles en  
diferentes longitudes de sala)

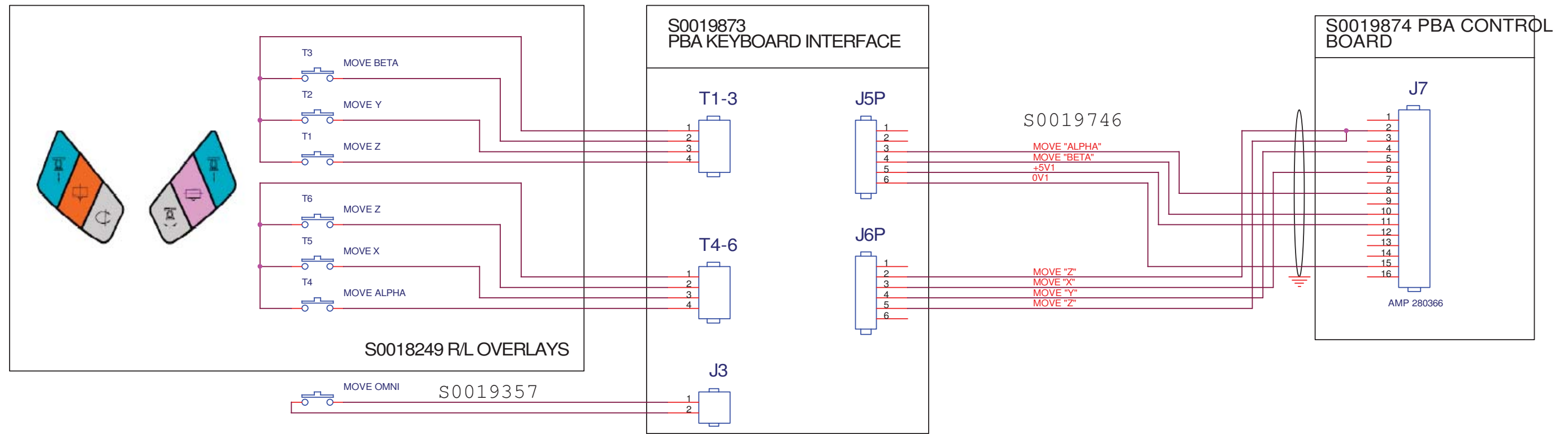
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DRAWING				S.PEREZ	22/10/2010	4/6					
REVISED				F.GARCIA	22/10/2010						
I	NC 14/0187	Sonia Pérez	23/07/14	SEDECAL				WIRING DIAGRAM OTC STANDARD			
H	NC 14/026	Sonia Pérez	20/05/14								
G	NC 14/039	Sonia Pérez	14/05/14								
REV	DESCRIPTION	ISSUED BY	DATE								

Z AXIS MOTOR (DUNKER MODEL)

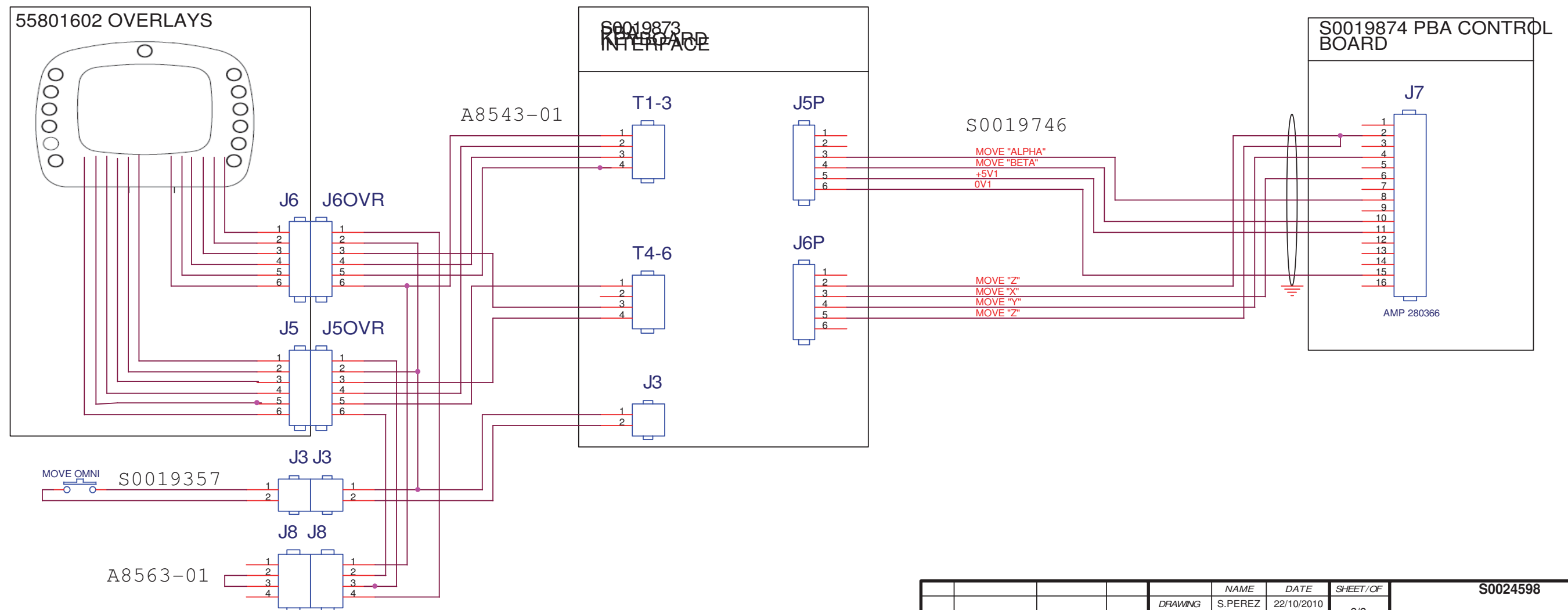


				DRAWING	NAME	DATE	SHEET/OF	S0024598							
				REVISED	F.GARCIA	22/10/2010	5/6					I	H	G	← REV
I	NC 14/0187	Sonia Pérez	23/07/14									WIRING DIAGRAM OTC STANDARD			
H	NC 14/026	Sonia Pérez	20/05/14												
G	NC 14/039	Sonia Pérez	14/05/14												
REV	DESCRIPTION	ISSUED BY	DATE												

# CONSOLE WITH R/L OVERLAYS (Modelo con teclados izquierda/derecha)



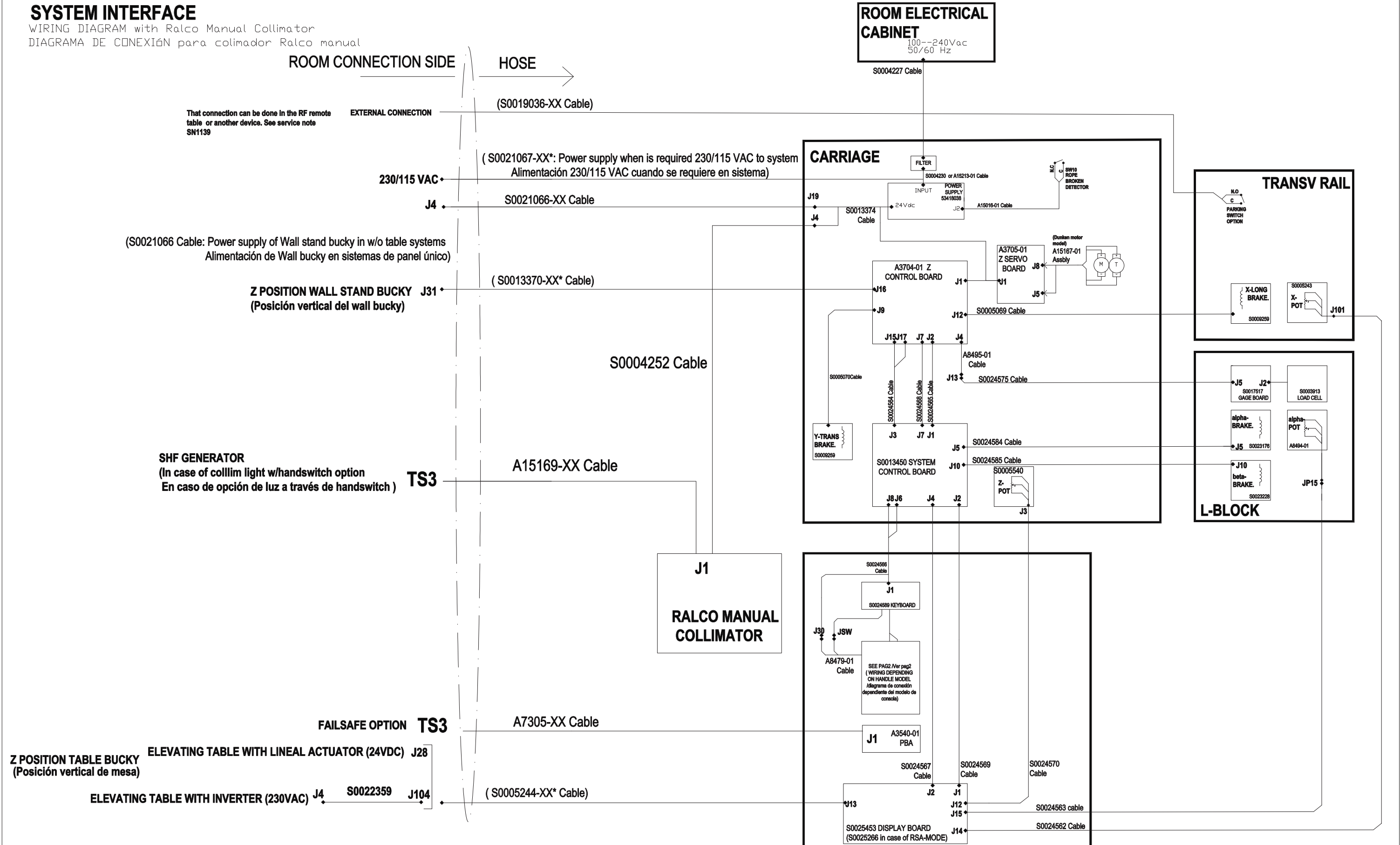
# CONSOLE WITH WHEEL OVERLAY (Modelo con teclado único de volante)



				DRAWING	NAME	DATE	SHEET / OF	S0024598							
				REVISED	F.GARCIA	22/10/2010	6/6					I	H	G	← REV
I	NC 14/0187	Sonia Pérez	23/07/14												
H	NC 14/026	Sonia Pérez	20/05/14												
G	NC 14/039	Sonia Pérez	14/05/14												
REV	DESCRIPTION	ISSUED BY	DATE	SEDECAL				WIRING DIAGRAM OTC STANDARD							

# SYSTEM INTERFACE

WIRING DIAGRAM with Ralco Manual Collimator  
 DIAGRAMA DE CONEXIÓN para colimador Ralco manual



That connection can be done in the RF remote table or another device. See service note SN1139

(S0021066 Cable: Power supply of Wall stand bucky in w/o table systems  
 Alimentación de Wall bucky en sistemas de panel único)

SHF GENERATOR  
 (In case of collim light w/handswitch option  
 En caso de opción de luz a través de handswitch)

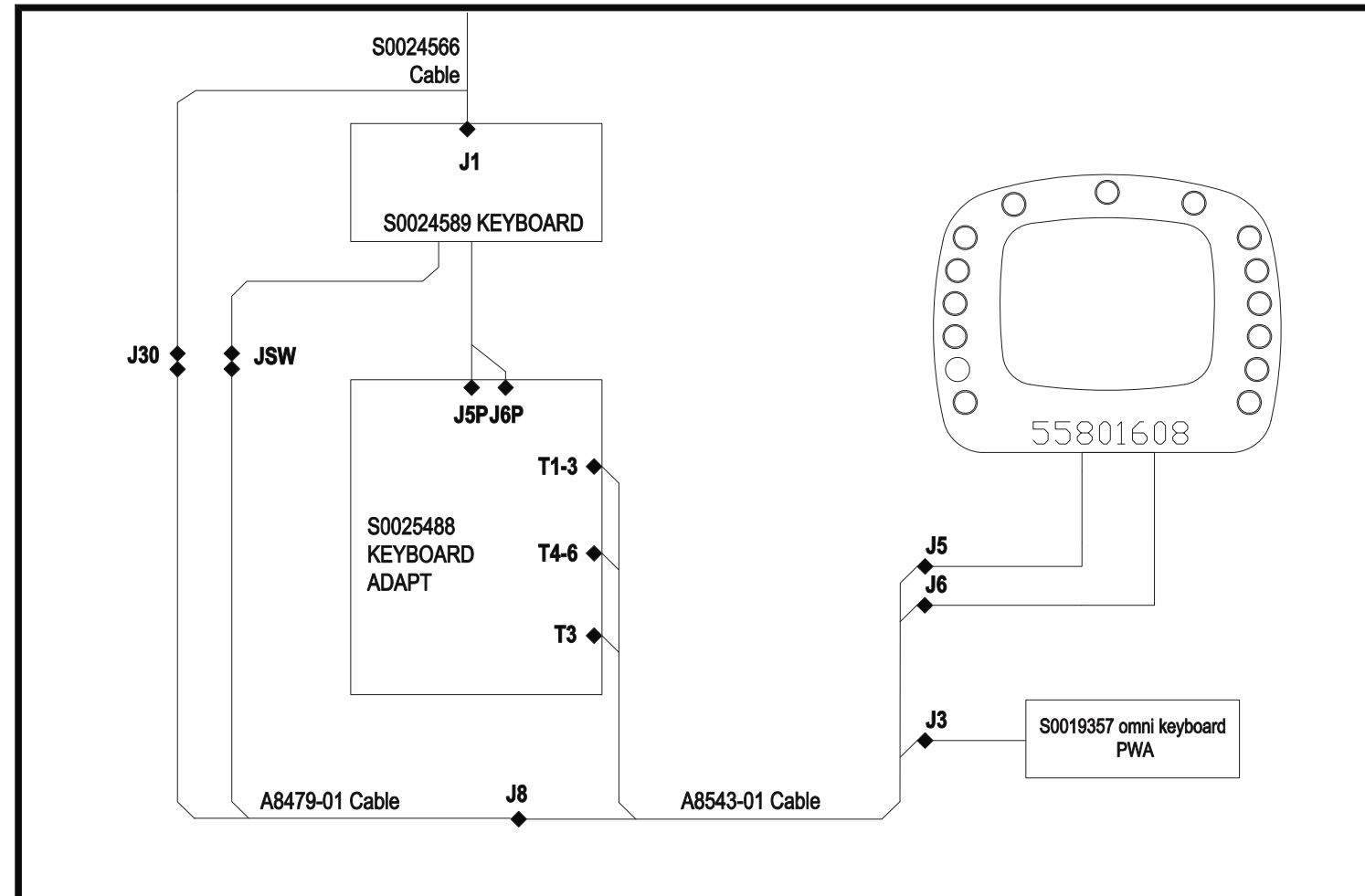
Z POSITION TABLE BUCKY (Posición vertical de mesa)  
 ELEVATING TABLE WITH LINEAL ACTUATOR (24VDC) J28

ELEVATING TABLE WITH INVERTER (230VAC) J4 S0022359 J104

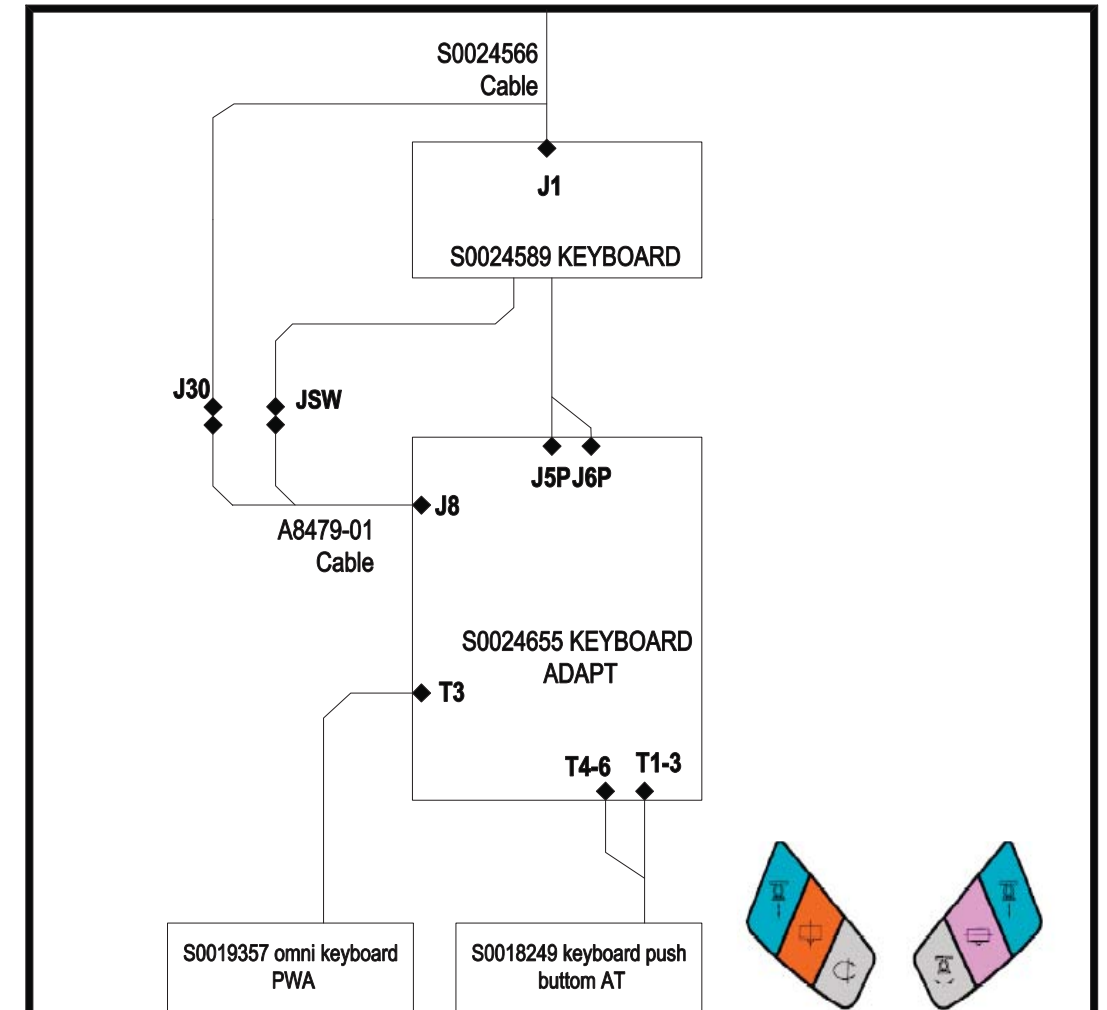
FAILSAFE OPTION TS3

-XX\* Available in diferents lenghts  
 (-XX\* Cables disponible en diferentes longitudes)

REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / DF	S0024170_SCH				
□	NC 14/0480	SONIA PEREZ	18-11-2014	DRAWING	SONIA PEREZ	24-11-2010	1/2				
N	NC 14/0187	SONIA PEREZ	24-07-2014	REVISED	F.GARCIA	24-11-2010					
L	NC 14/026	SONIA PEREZ	20-05-2014								
K	NC 14/039	SONIA PEREZ	04-04-2014								
REV	DESCRIPTION	ISSUED BY	DATE	SEDECAL		AUTOTRACKING DTC W/SENSING WIRING DIAGRAM (Ralco Collim)					



**CONSOLE WITH WHEEL OVERLAY (Modelo teclado único tipo volante)  
(with AT pushbutton included / botón AT incorporado)**

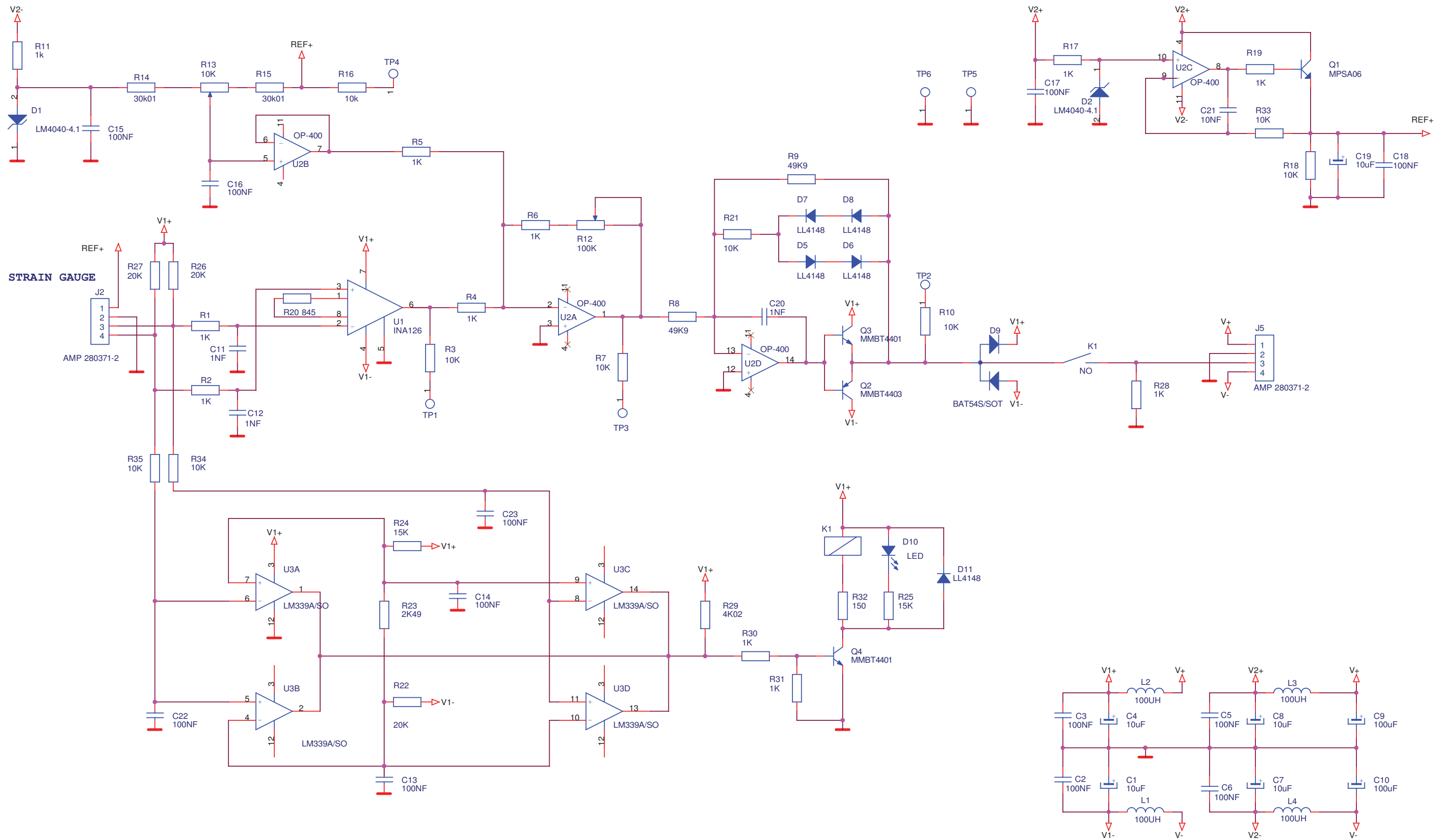


**CONSOLE WITH R/L OVERLAYS  
(Modelo teclados de izquierda / derecha)**

CONSOLE WIRING DIAGRAMS DEPENDING ON HANDLE MODEL  
<DIAGRAMAS DE CONEXIÓN DEPENDIENTES DEL MODELO DE CONSOLA>

-XX\* Available in diferents lenghts  
(-XX\* Cables disponible en diferentes longitudes)

REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	S0024170_SCH						
□	NC 14/0400	SONIA PEREZ	18-11-2014	DRAWING	SONIA PEREZ	24-11-2010	2 / 2		□	N	L	K	←
N	NC 14/0187	SONIA PEREZ	24-07-2014	REVISED	F.GARCIA	24-11-2010							
L	NC 14/026	SONIA PEREZ	20-05-2014										
K	NC 14/039	SONIA PEREZ	04-04-2014										
				SEDECAL			AUTOTRACKING OTC W/SENSING WIRING DIAGRAM (Ralco Collim)						



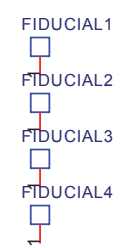
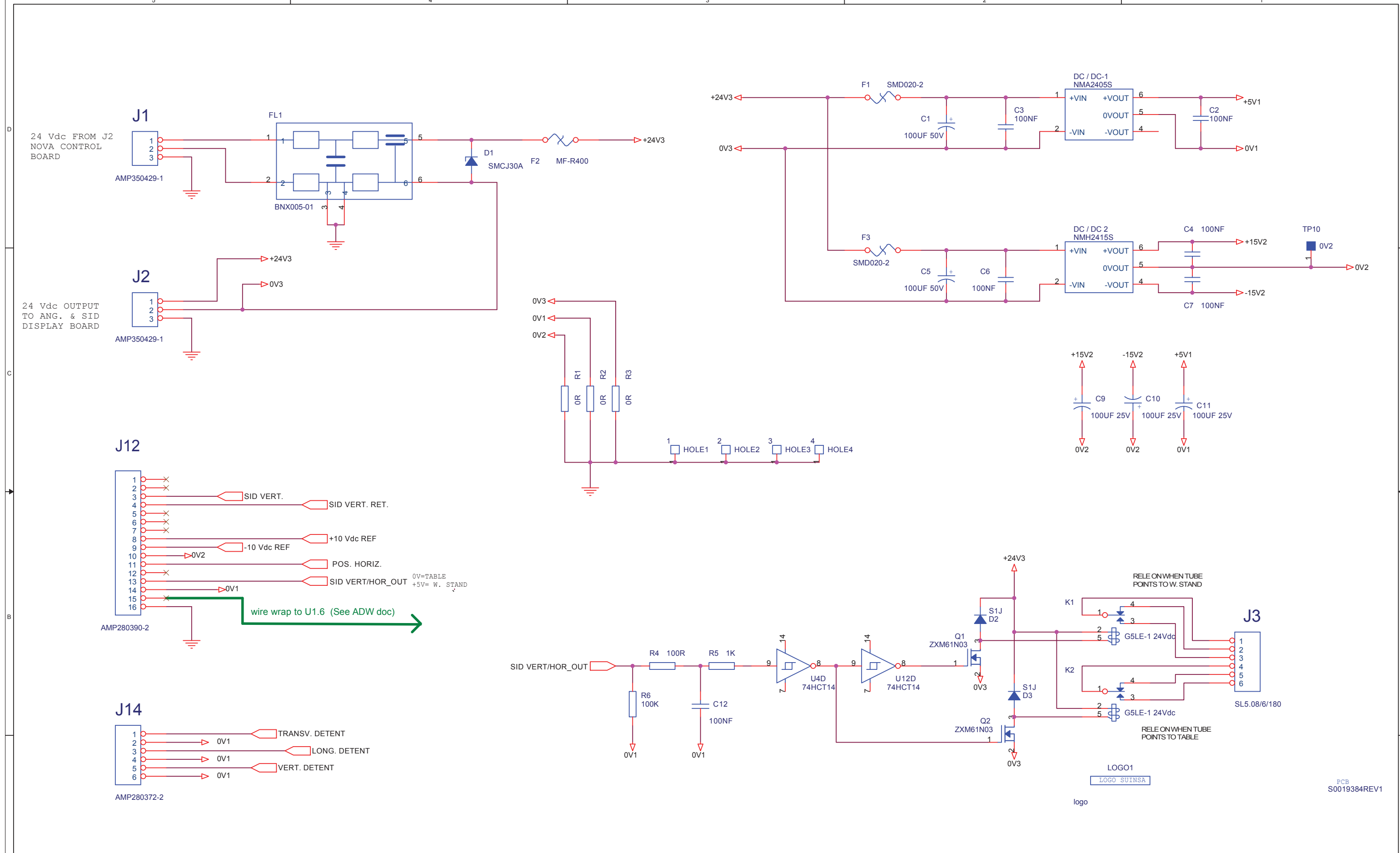
PCB S0008739 Rev.4

				DRAWING	NAME	DATE	SHEET/OF	S0017517			
				REVISED	S. Pérez	13/01/09	1/1				
B	NC 13302	R. Hermosilla	17/09/13								
A		R. Hermosilla	26/05/13								
1	11673	S. Pérez	13/01/09								
REV	DESCRIPTION	ISSUEDBY	DATE								



AUTOMATIC NOVA TOMO GAUGE BOARD

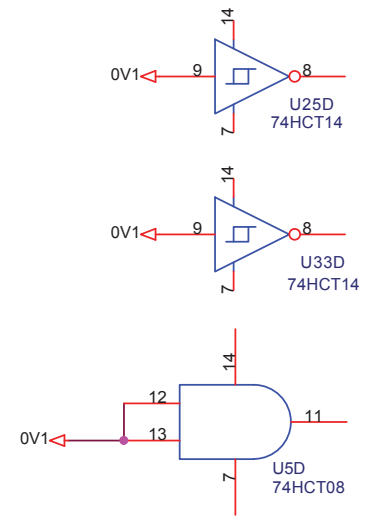
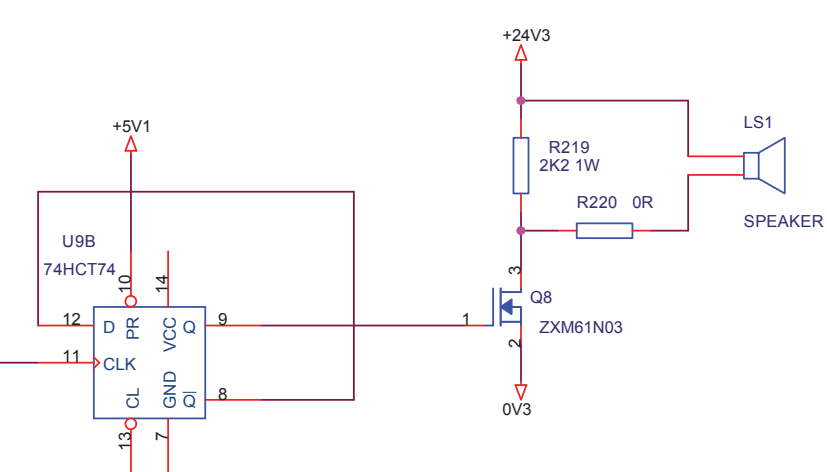
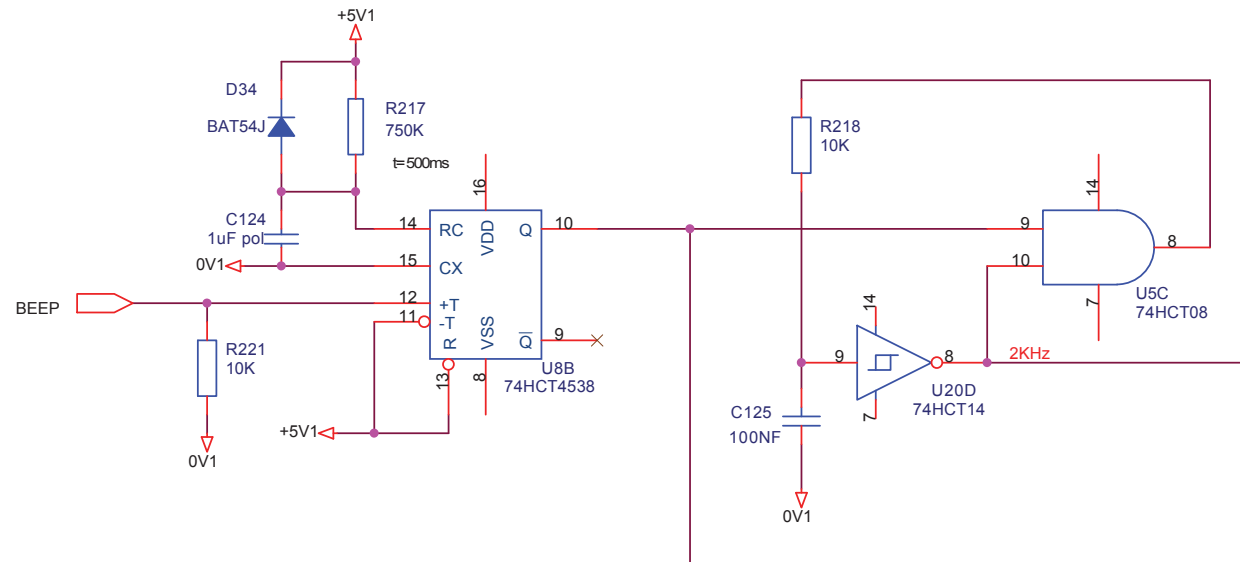
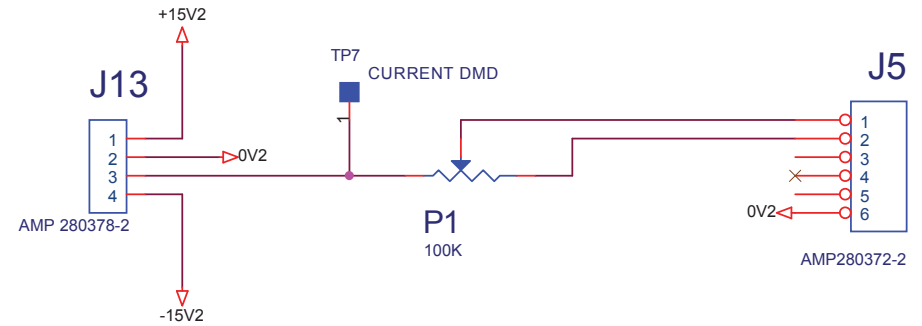
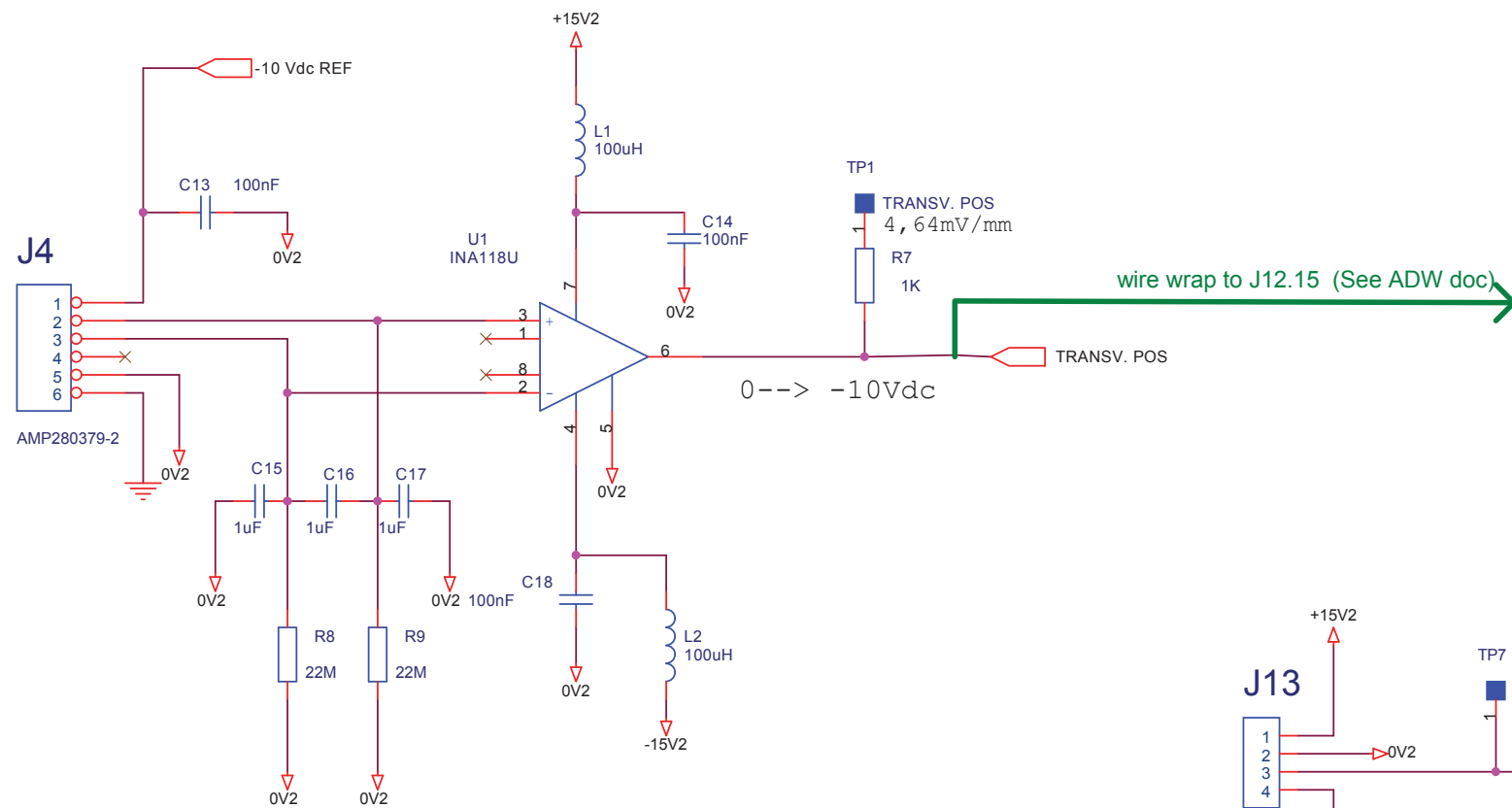




				NAME	DATE	SHEET / OF	S0019383				
				DRAWING	S.PEREZ	02/11/2010	1/7				
				REVISED	F.GARCIA	02/11/2010					
2	NC 11607	Sonia Pérez	2/11/2010	SEDECAL				LOAD CELL INTFC+DETENTS (RSA-MODE)			
1	NC 11151	J.Gallego	21/01/2008								
0	New	J.Gallego	20/12/2007								
REV	DESCRIPTION	ISSUED BY	DATE								

PCB  
S0019384REV1

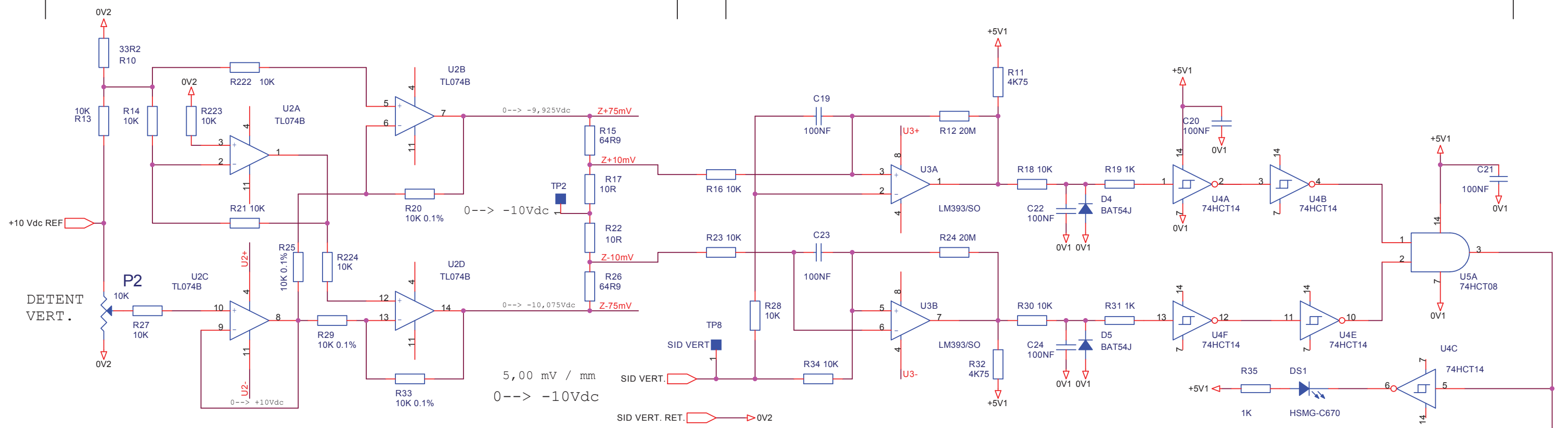
TRANSV. TUBE POSITION  
RATIO = 4,64 mV/mm



				NAME	DATE	SHEET / OF	S0019383					
				DRAWING	S.PEREZ	02/11/2010	2/7					
				REVISED	F.GARCIA	02/11/2010			2	1	0	←REV
2	NC 11607	Sonia Pérez	2/11/2010	SEDECAL				LOAD CELL INTFC+DETENTS (RSA-MODE)				
1	NC 11151	J.Gallego	21/01/2008									
0	New	J.Gallego	20/12/2007									
REV	DESCRIPTION	ISSUED BY	DATE									

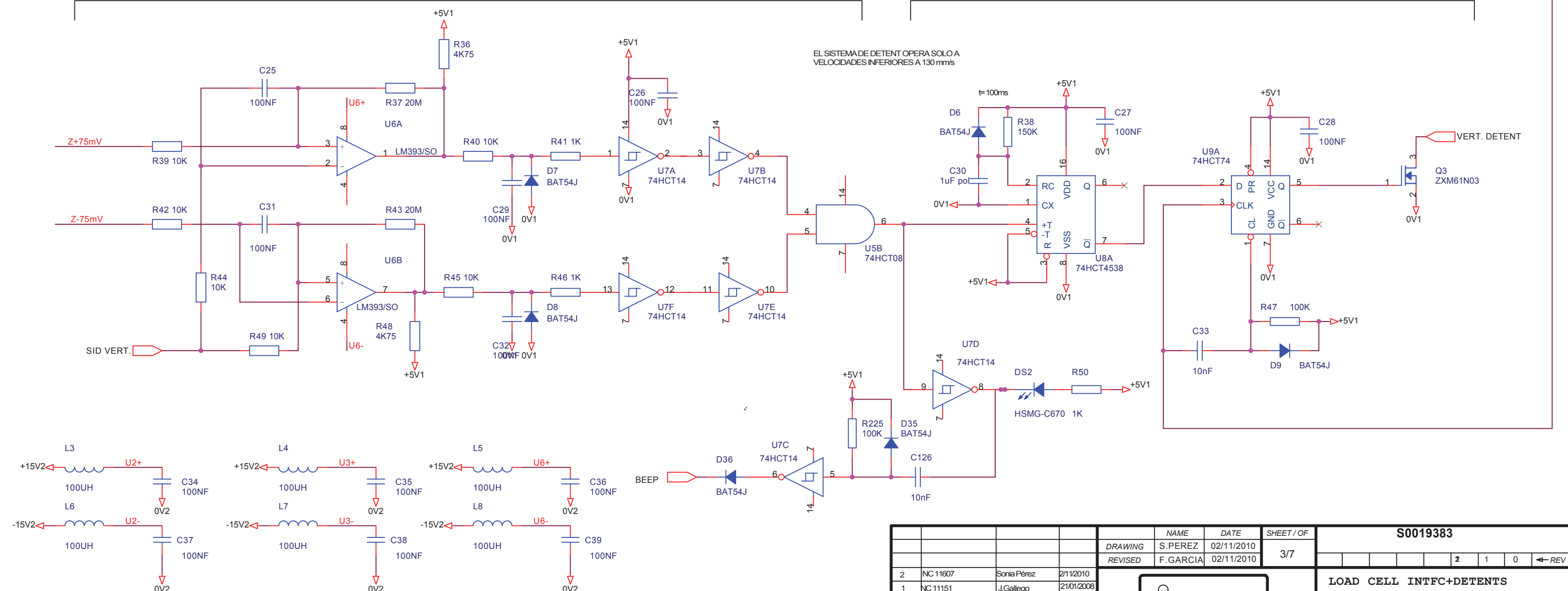
REFERENCE GENERATOR

DETENT WINDOW



PRE - DETENT WINDOW

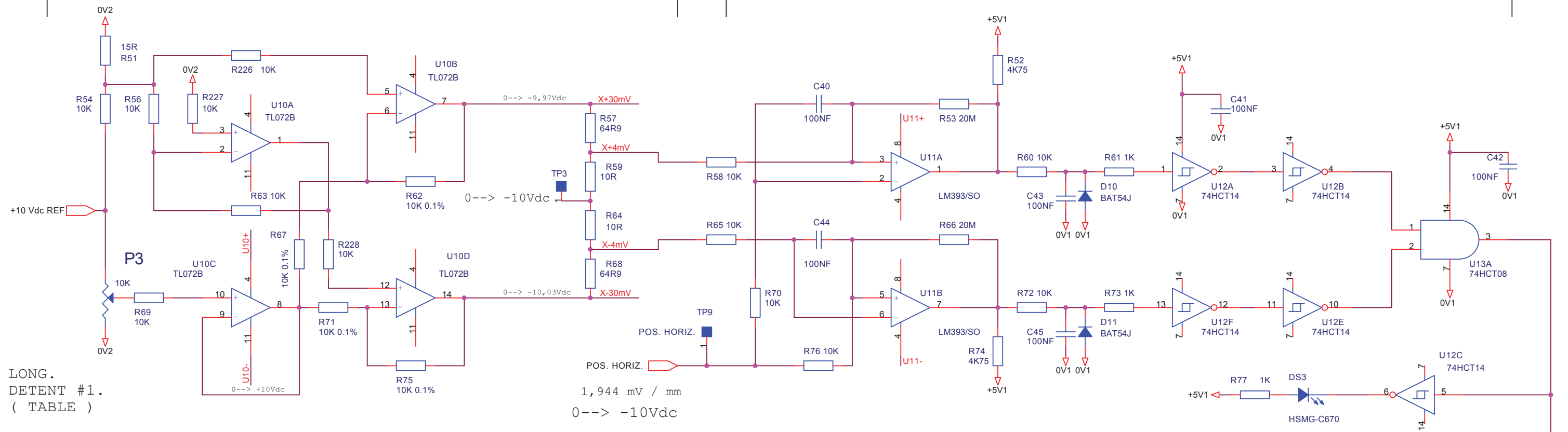
TIMER



REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	S0019383				
2	NC 11607	Sonia Pérez	2/11/2010	DRAWING	S.PEREZ	02/11/2010	3/7	2	1	0	←REV
1	NC 11151	J.Gallego	21/01/2008	REVISED	F.GARCIA	02/11/2010					
0	New	J.Gallego	20/12/2007								
							<b>SEDECAL</b>		<b>LOAD CELL INTFC+DETENTS (RSA-MODE)</b>		

REFERENCE GENERATOR

DETENT WINDOW



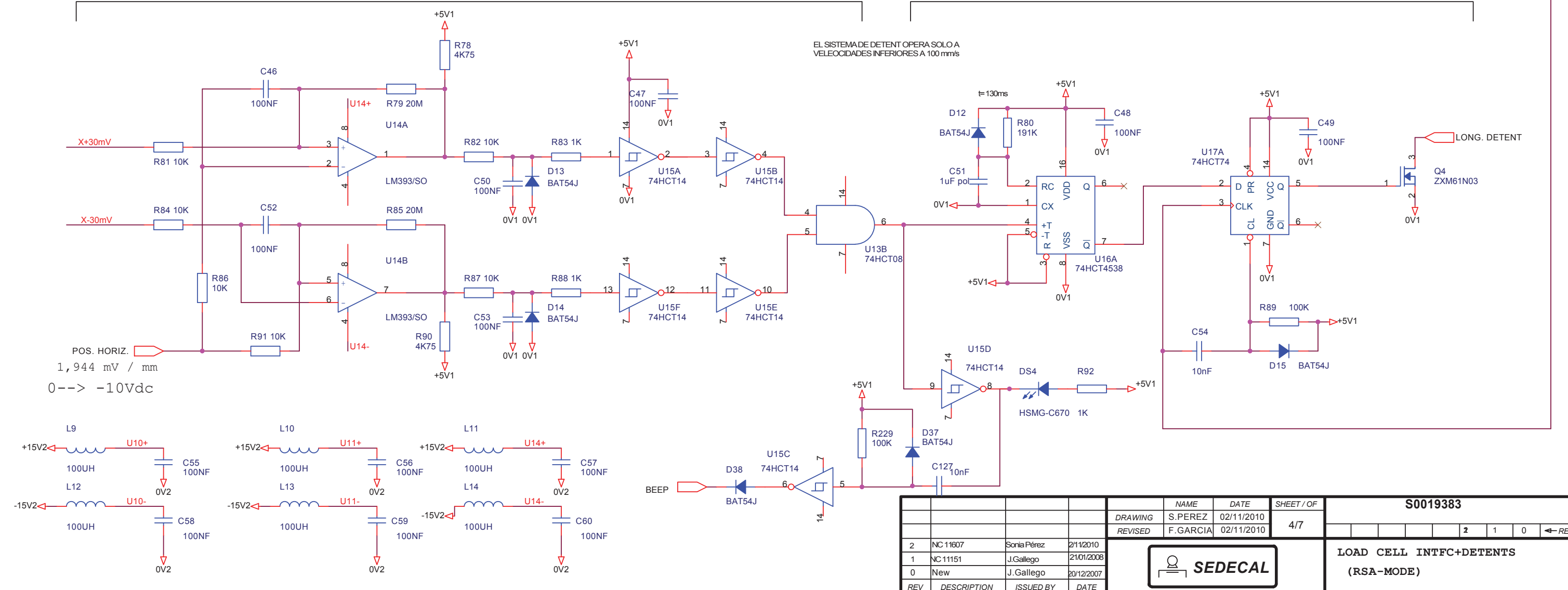
LONG.  
DETENT #1.  
( TABLE )

1,944 mV / mm  
0--> -10Vdc

PRE - DETENT WINDOW

TIMER

EL SISTEMA DE DETENT OPERA SOLO A VELOCIDADES INFERIORES A 100 mm/s



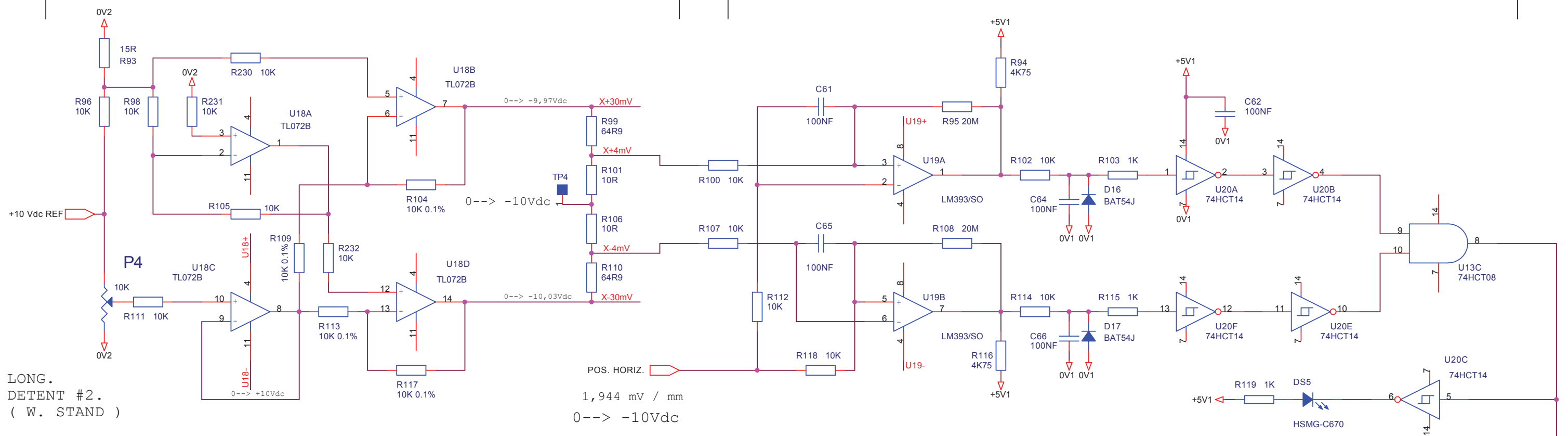
1,944 mV / mm  
0--> -10Vdc

				NAME	DATE	SHEET / OF	S0019383			
				DRAWING	S.PEREZ	02/11/2010				
				REVISED	F.GARCIA	02/11/2010				
2	NC 11607	Sonia Pérez	2/11/2010							
1	NC 11151	J.Gallego	21/01/2008							
0	New	J.Gallego	20/12/2007							
REV	DESCRIPTION	ISSUED BY	DATE							

**LOAD CELL INTFC+DETENTS**  
(RSA-MODE)

REFERENCE GENERATOR

DETENT WINDOW

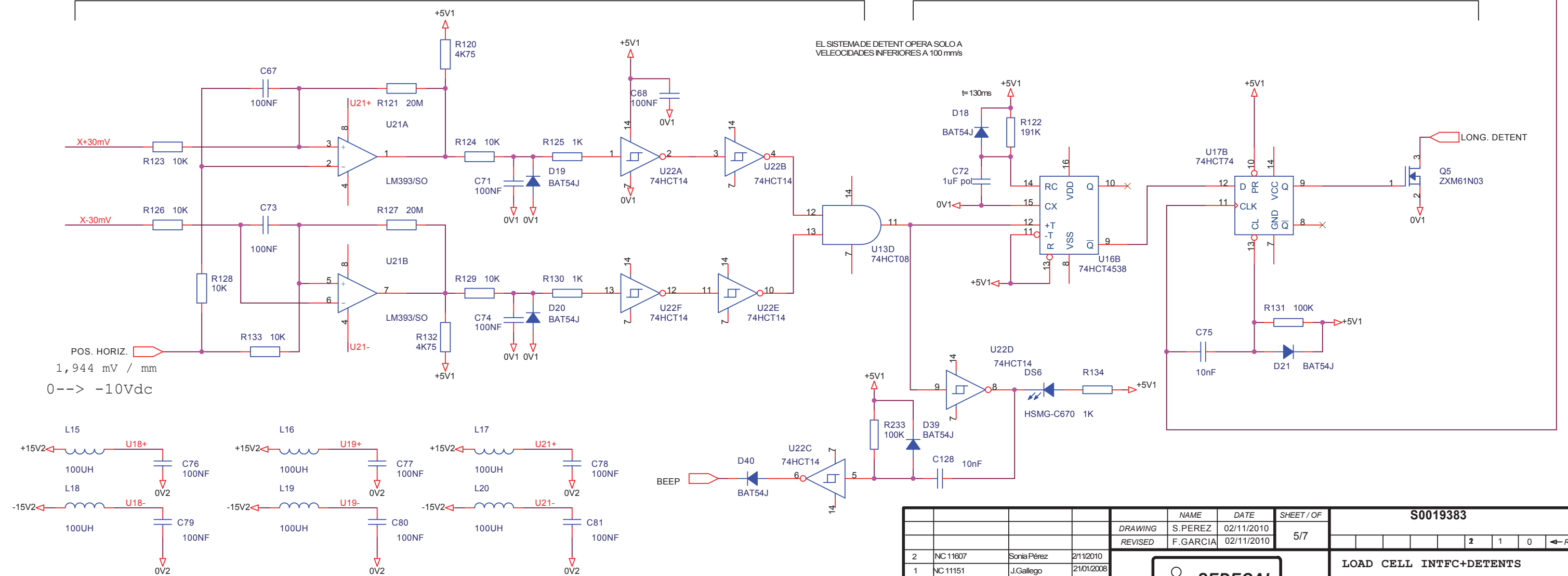


LONG.  
DETENT #2.  
( W. STAND )

POS. HORIZ.  
1,944 mV / mm  
0--> -10Vdc

PRE - DETENT WINDOW

TIMER



EL SISTEMA DE DETENT OPERA SOLO A VELOCIDADES INFERIORES A 100 mm/s

POS. HORIZ.  
1,944 mV / mm  
0--> -10Vdc

LONG. DETENT

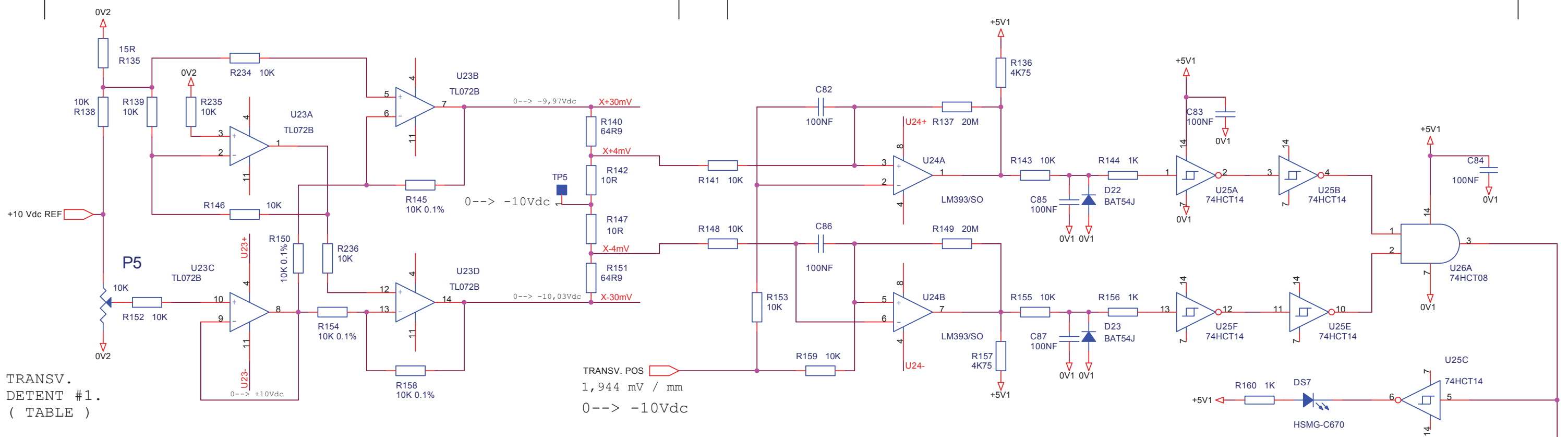
				NAME	DATE	SHEET / OF	S0019383				
				DRAWING	S.PEREZ	02/11/2010					
				REVISED	F.GARCIA	02/11/2010	5/7				
2	NC 11607	Sonia Pérez	2/11/2010								
1	NC 11151	J.Gallego	21/01/2008								
0	New	J.Gallego	20/12/2007								
REV	DESCRIPTION	ISSUED BY	DATE								



LOAD CELL INTFC+DETENTS  
(RSA-MODE)

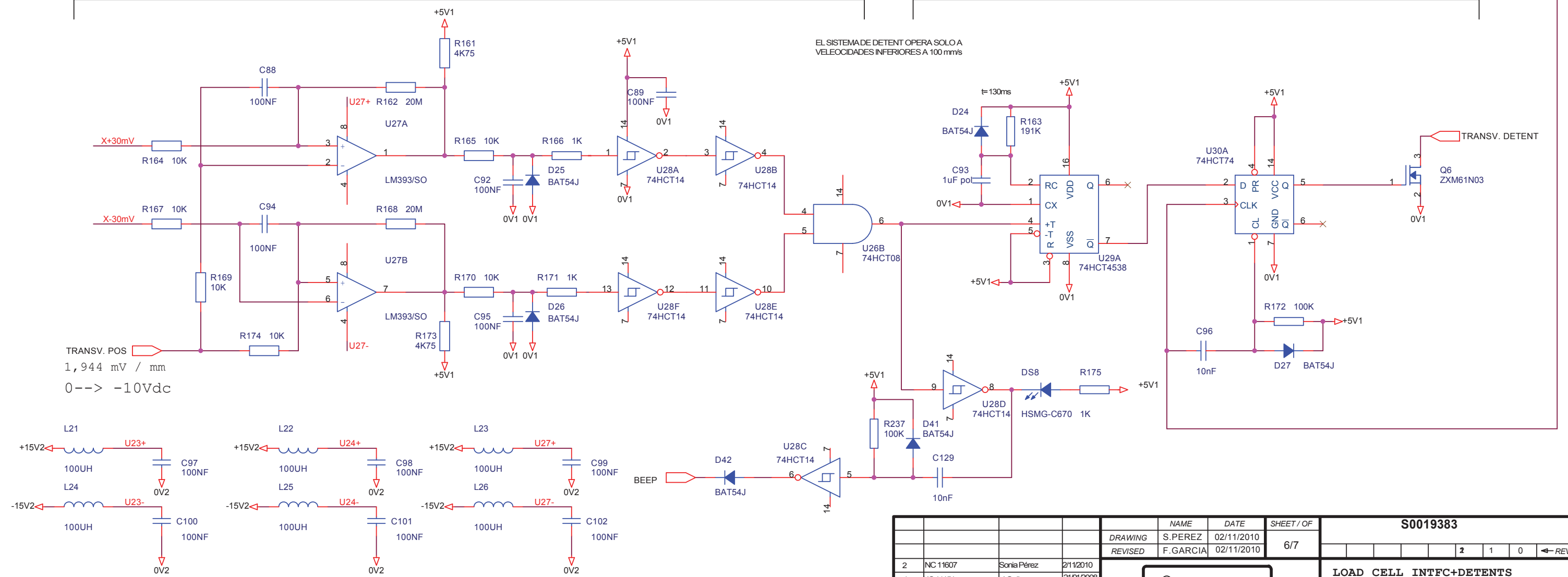
REFERENCE GENERATOR

DETENT WINDOW



PRE - DETENT WINDOW

TIMER

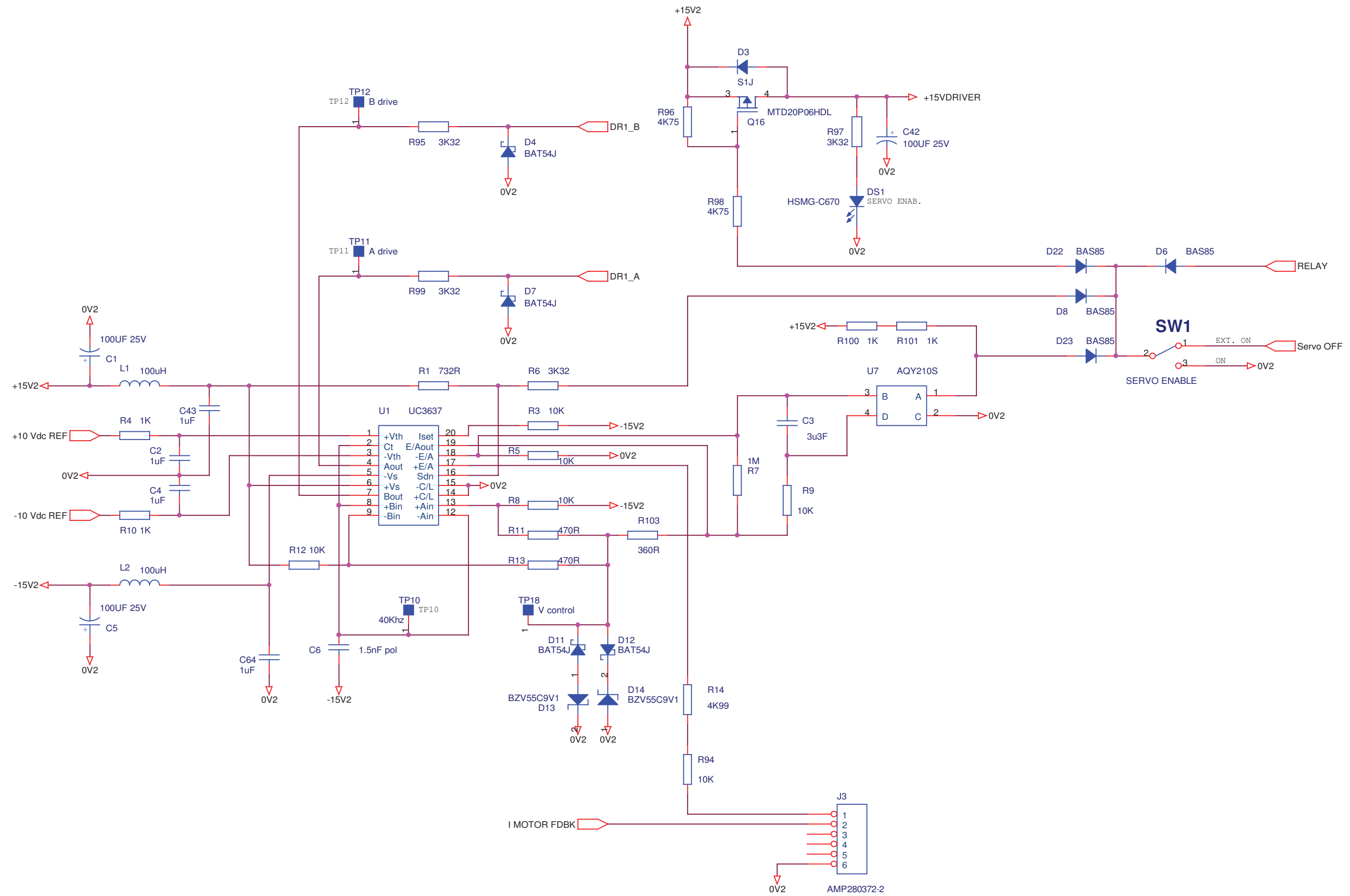


				NAME	DATE	SHEET / OF	S0019383			
				DRAWING	S.PEREZ	02/11/2010				
				REVISED	F.GARCIA	02/11/2010	6/7			
2	NC 11607	Sonia Pérez	2/11/2010							
1	NC 11151	J.Gallego	21/01/2008							
0	New	J.Gallego	20/12/2007							
REV	DESCRIPTION	ISSUED BY	DATE							

**SEDECAL**

**LOAD CELL INTFC+DETENTS  
(RSA-MODE)**

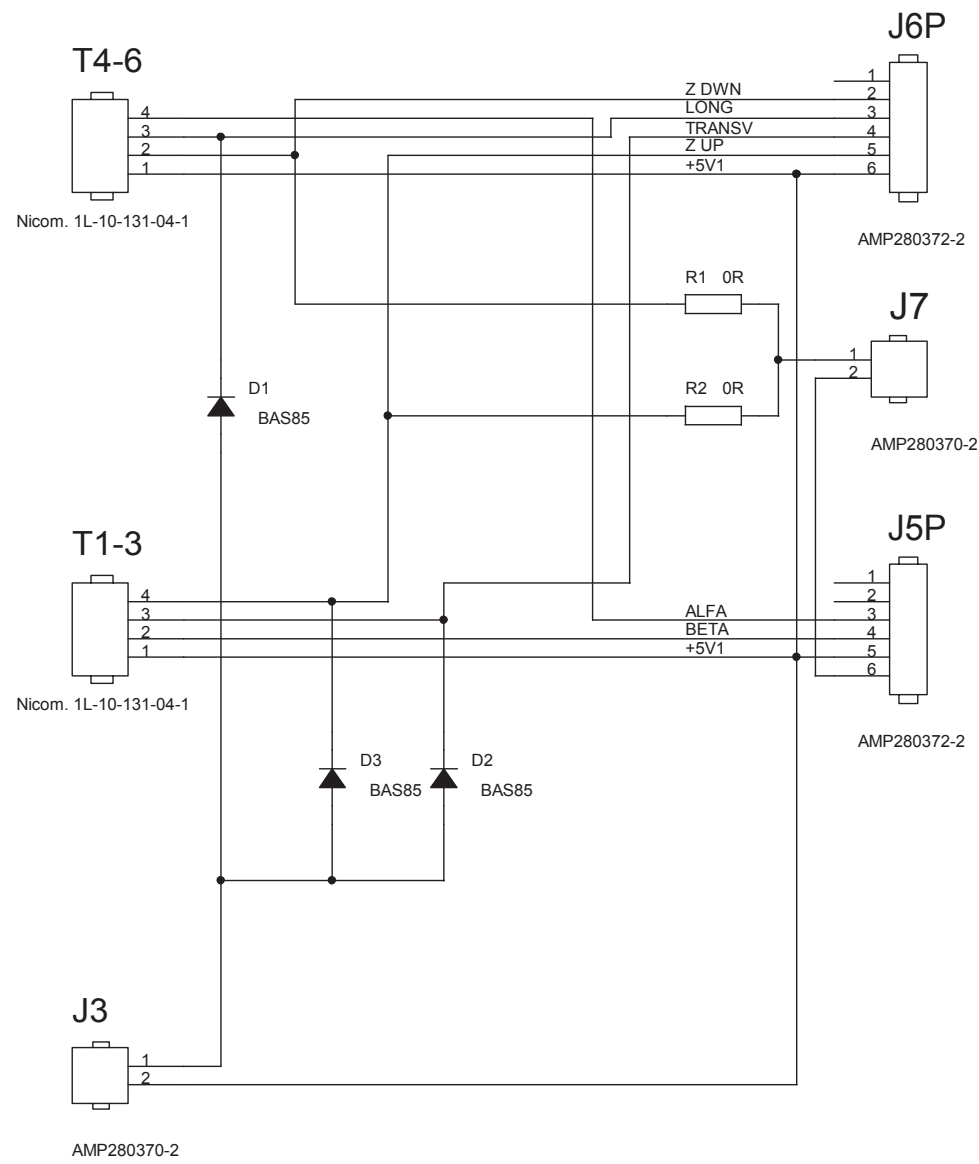




				NAME	DATE	SHEET / OF	PBA S0019473_A_SCH PCB S0019713			
DRAWING				S.Perez	27/02/2009	1/3				
REVISED				F. Garcia	27/02/2009					
				<b>SEDECAL</b>		<b>UPGRADED SERVO POWER BOARD</b>				
A	NC 15211 NE 22015	J.Clemente	21.07/2015							
REV	DESCRIPTION	ISSUED BY	DATE							

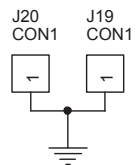






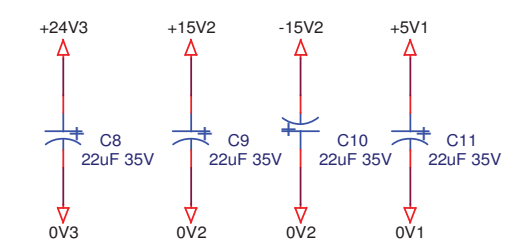
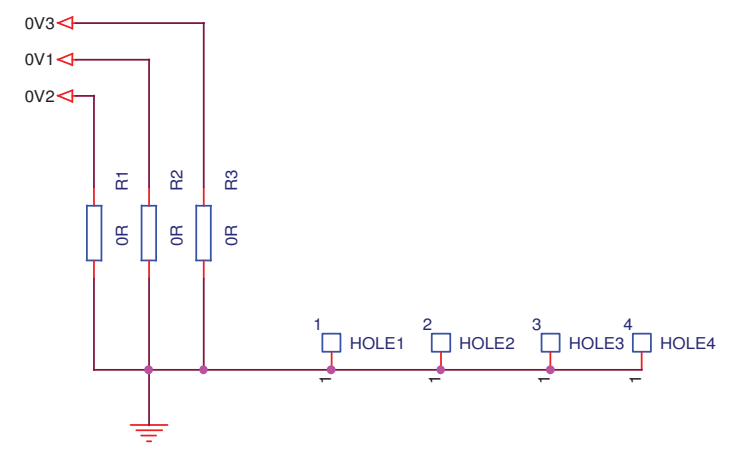
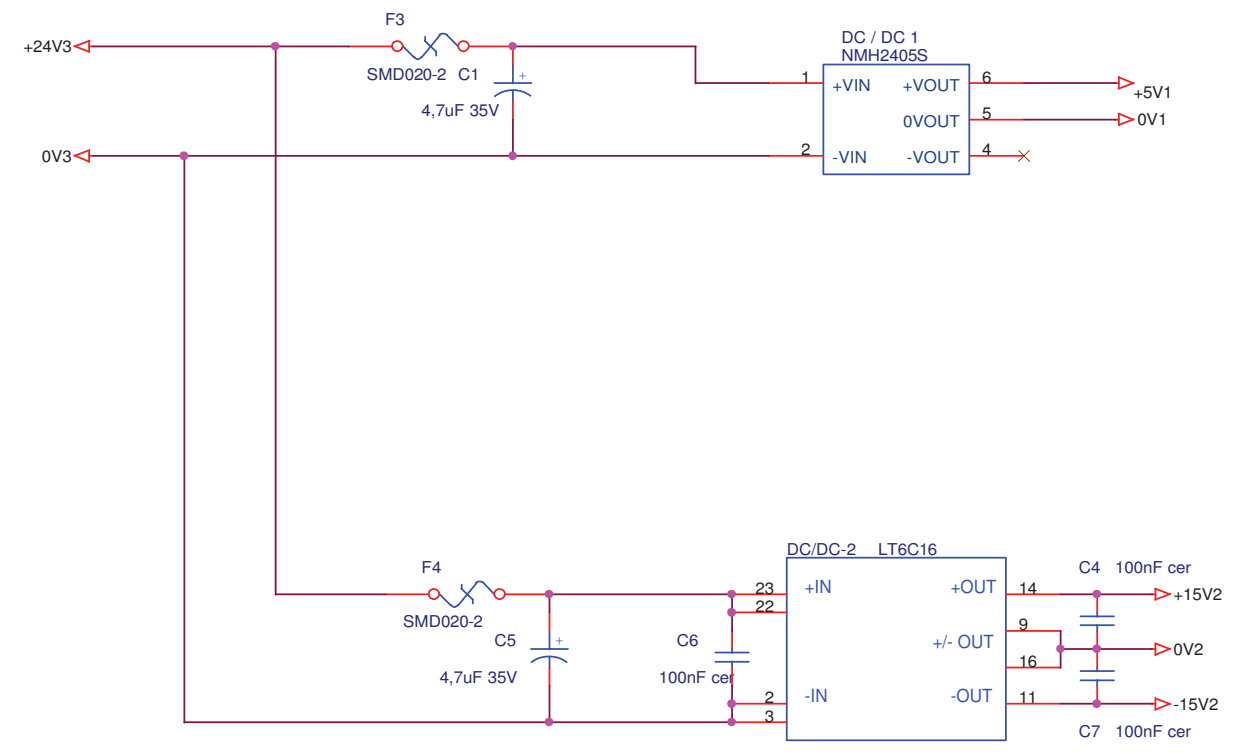
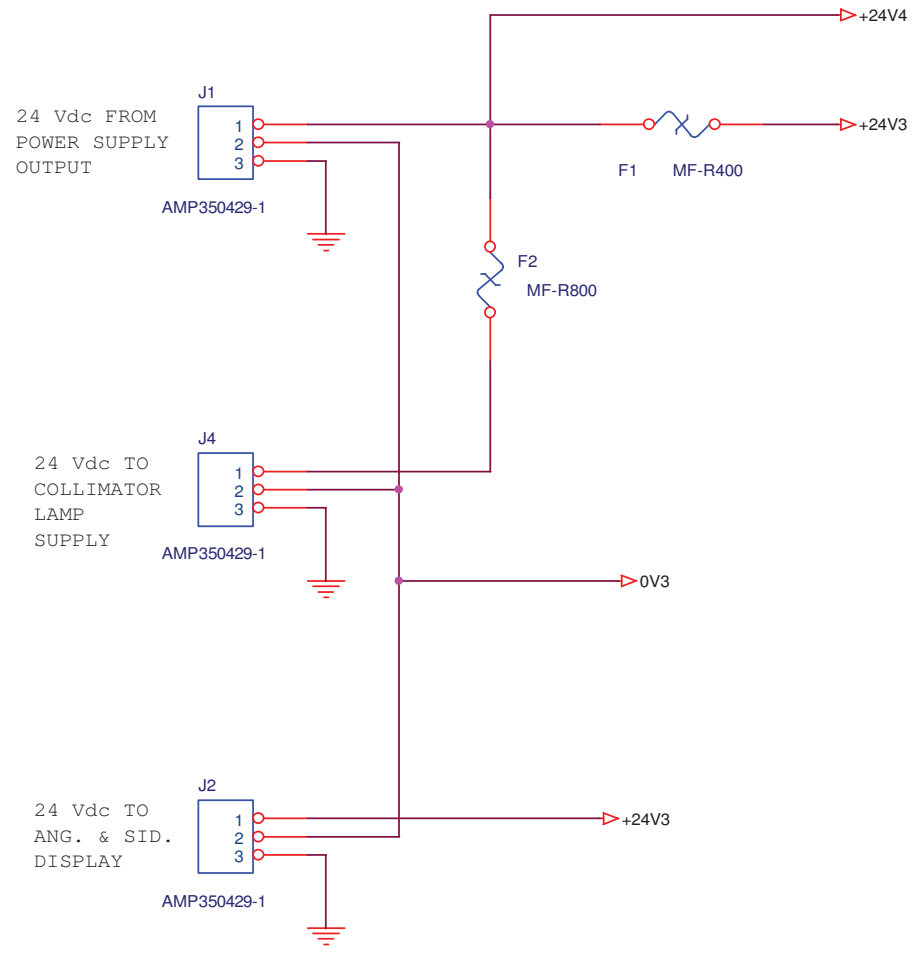
LOGO1  
LOGO SUINSA

logo

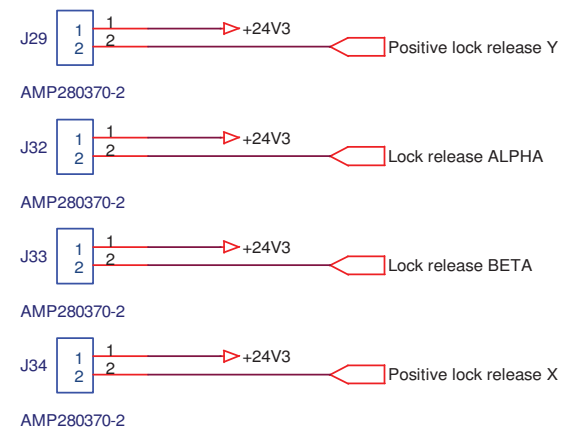
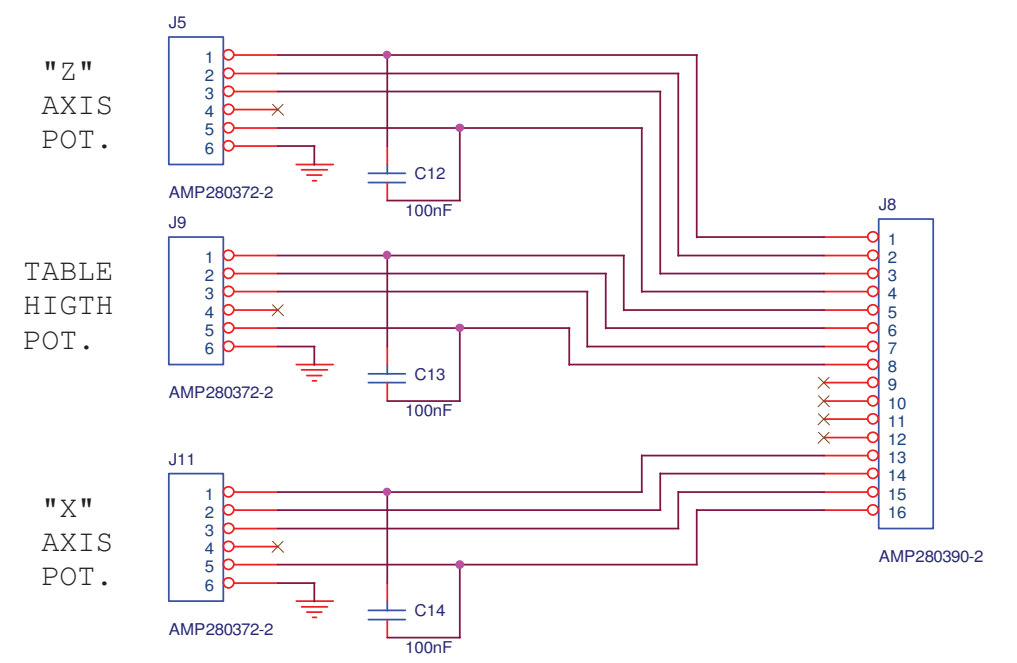
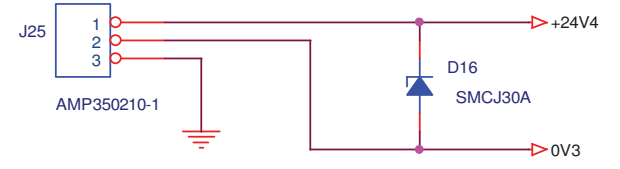
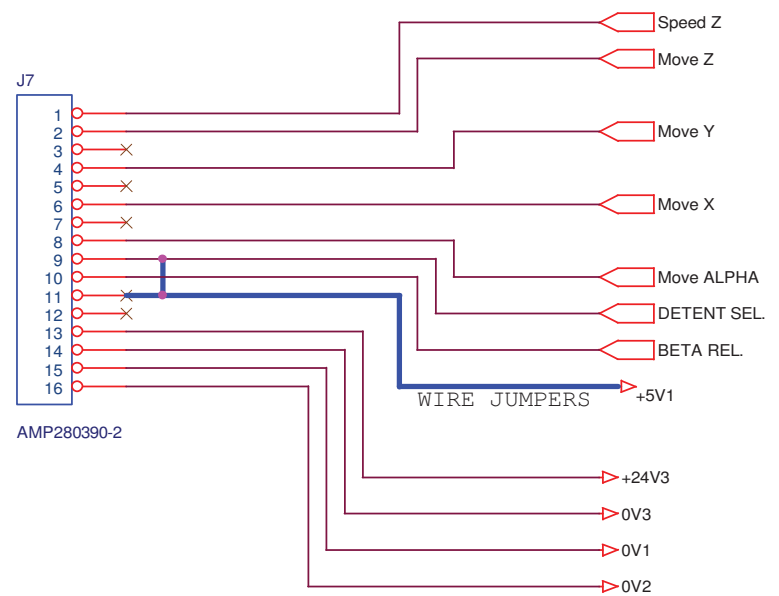
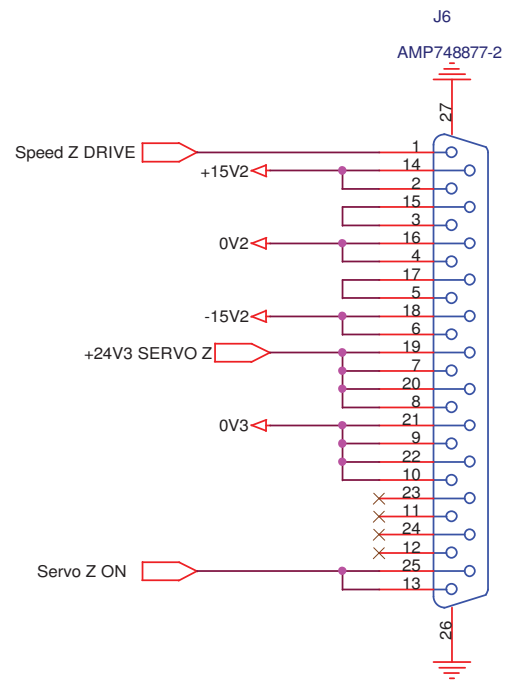


PCB  
S0019944REV0

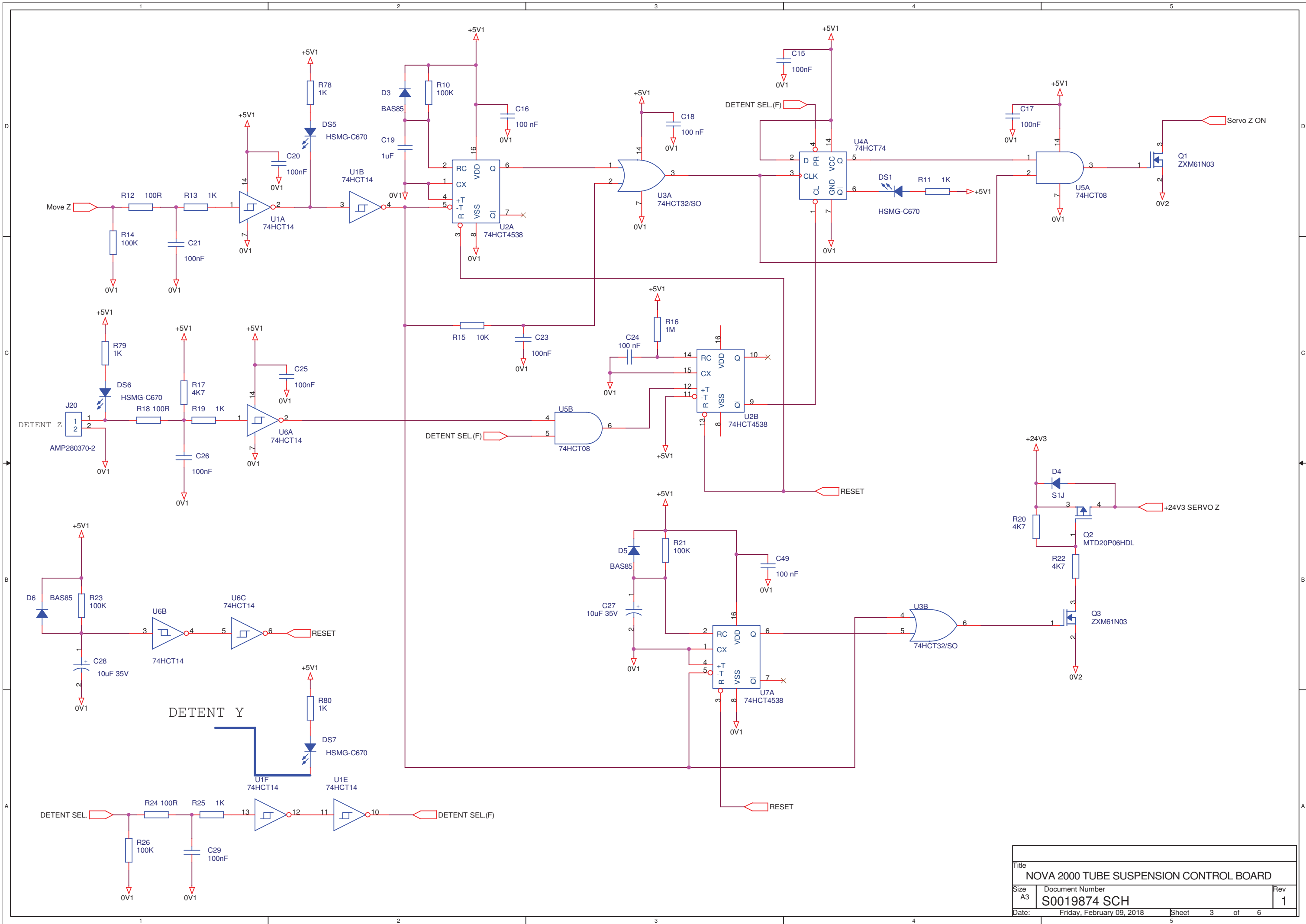
Title		
PBA ADAPTACION TECLADOS NOVA 2000		
Size	Document Number	Rev
A3	S0019873SCH	0
Date:	Monday, November 12, 2007	Sheet 1 of 1



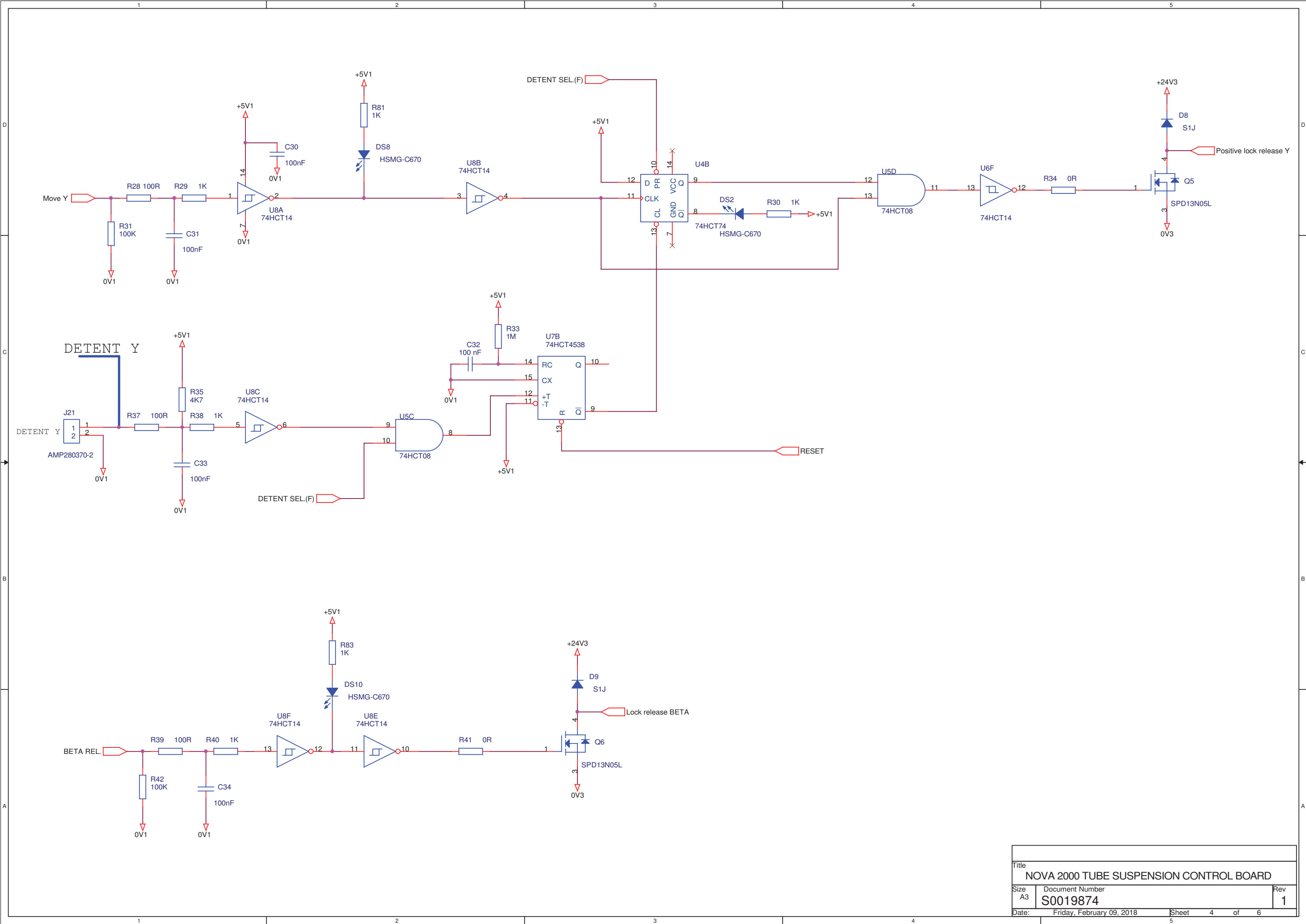
Title			
NOVA 2000 TUBE SUSPENSION CONTROL BOARD			
Size	Document Number	Rev	
A3	S0019874 SCH	1	
Date:	Friday, February 09, 2018	Sheet	1 of 6



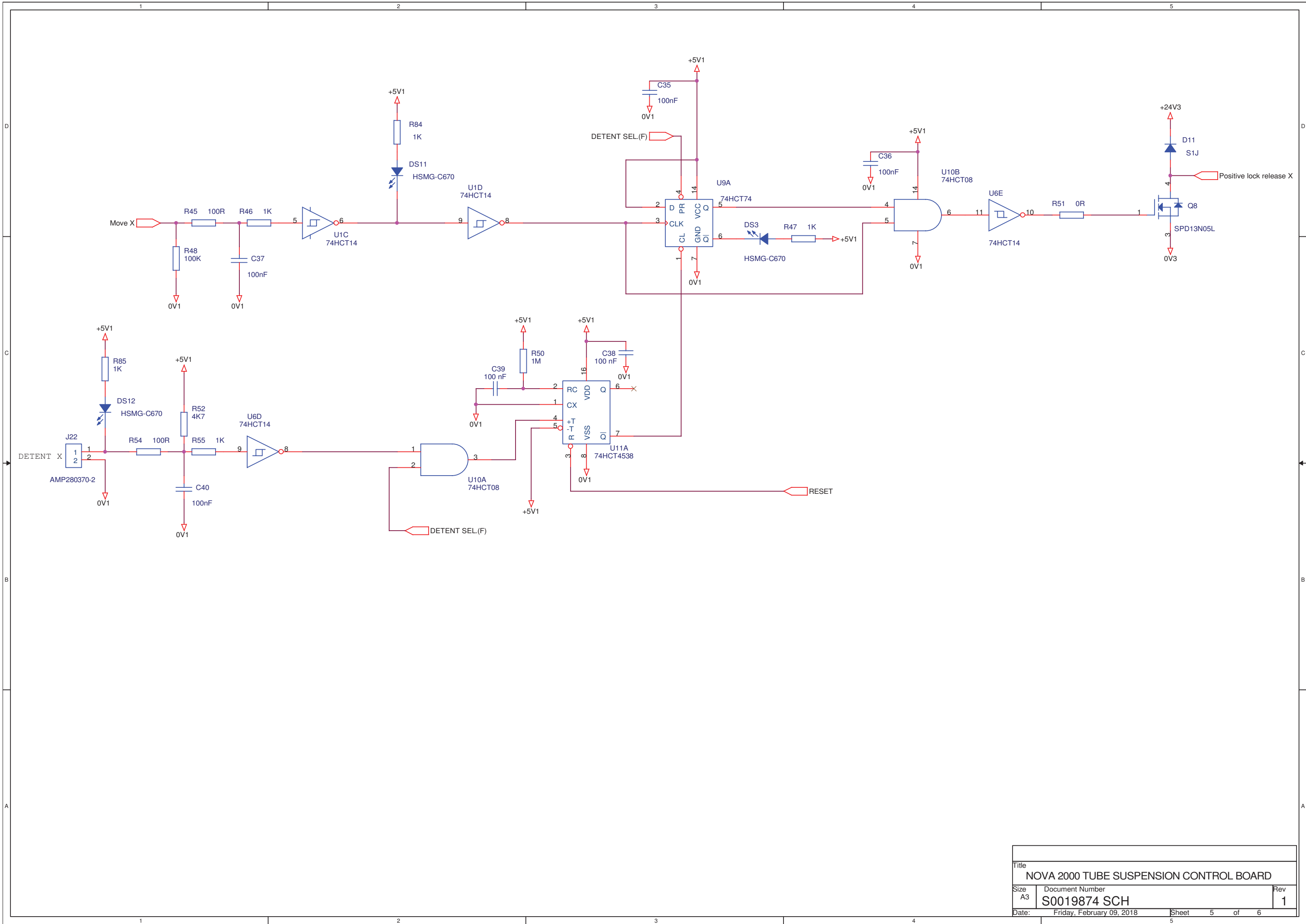
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Size	Document Number		Rev		
A3	S0019874 SCH		1		
Date:	Friday, February 09, 2018	Sheet	2	of	6



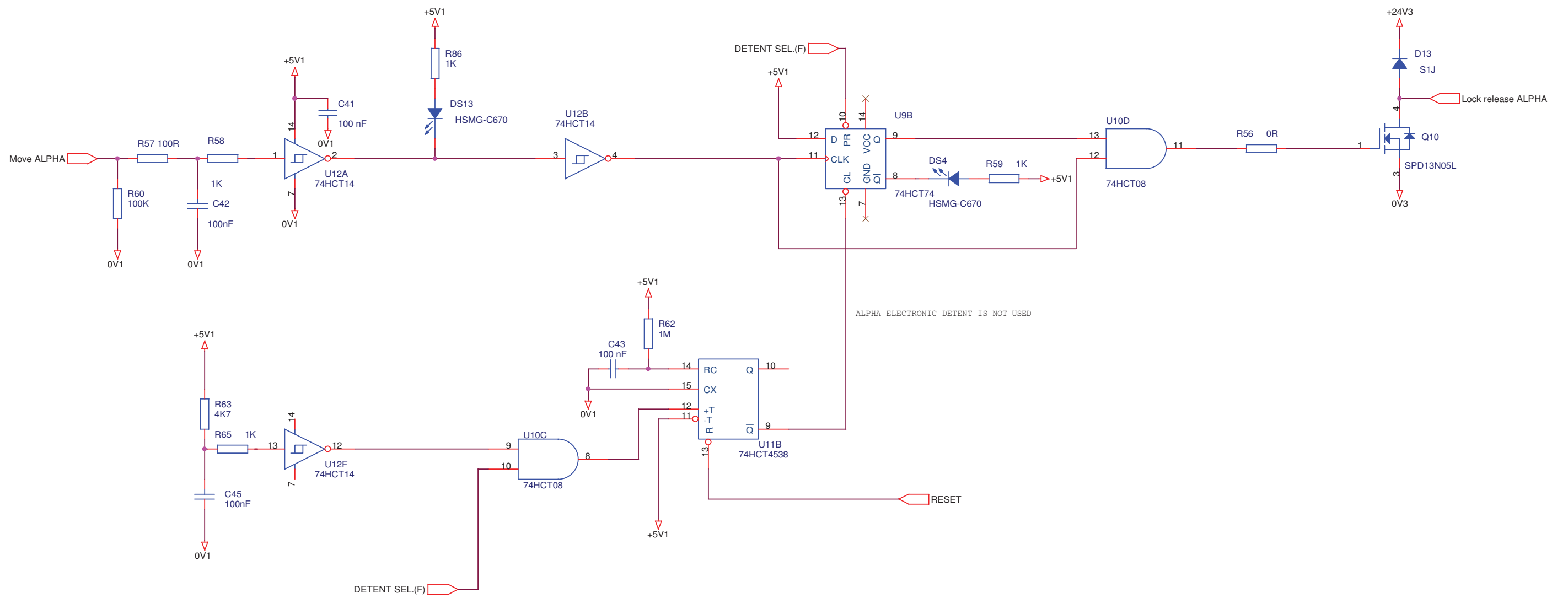
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Size	Document Number	Rev
A3	S0019874 SCH	1
Date:	Friday, February 09, 2018	Sheet 3 of 6



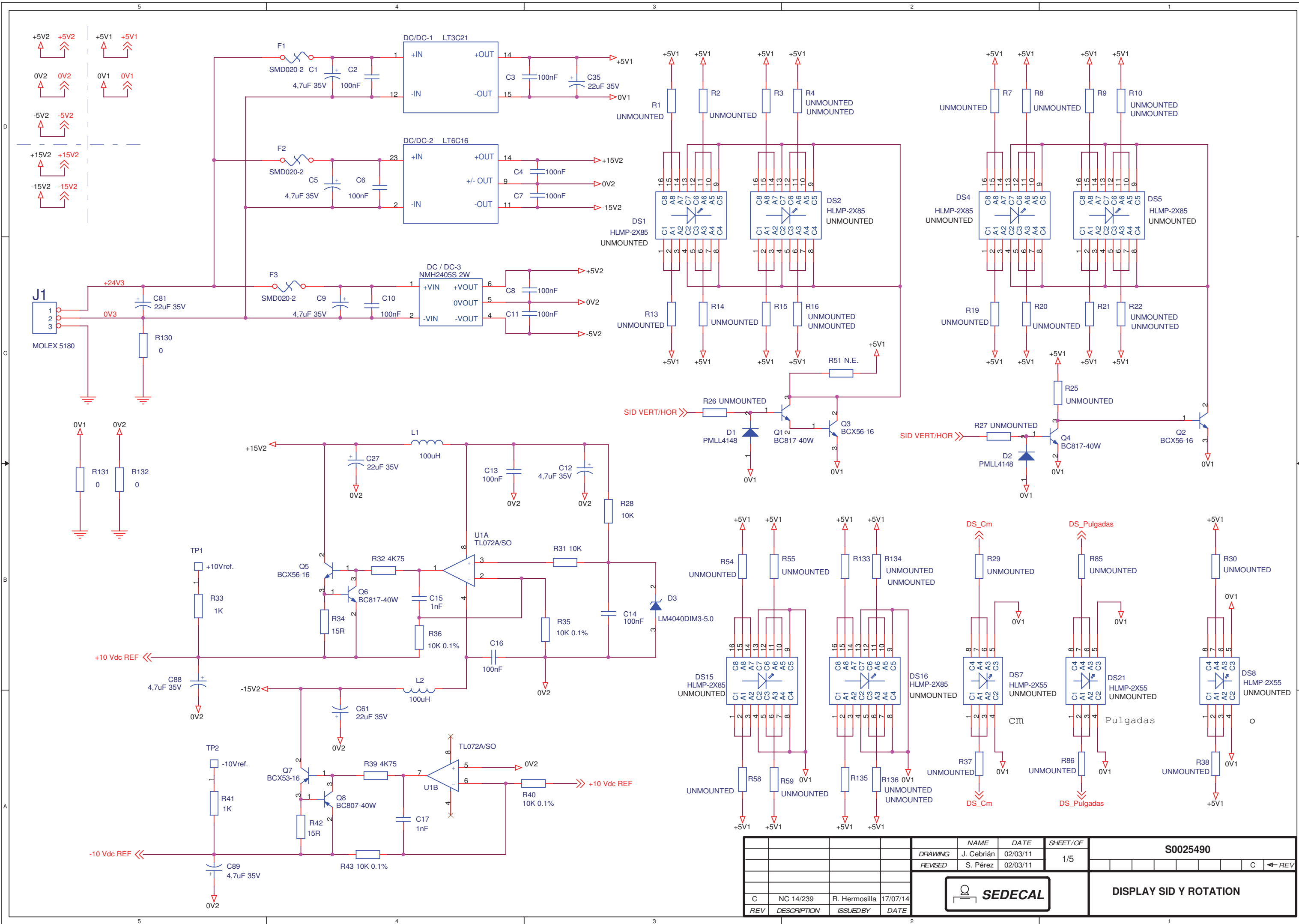
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Size	Document Number	Rev
A3	S0019874	1
Date:	Friday, February 09, 2018	Sheet 4 of 6
		5



Title		
NOVA 2000 TUBE SUSPENSION CONTROL BOARD		
Size	Document Number	Rev
A3	S0019874 SCH	1
Date:	Friday, February 09, 2018	Sheet 5 of 6



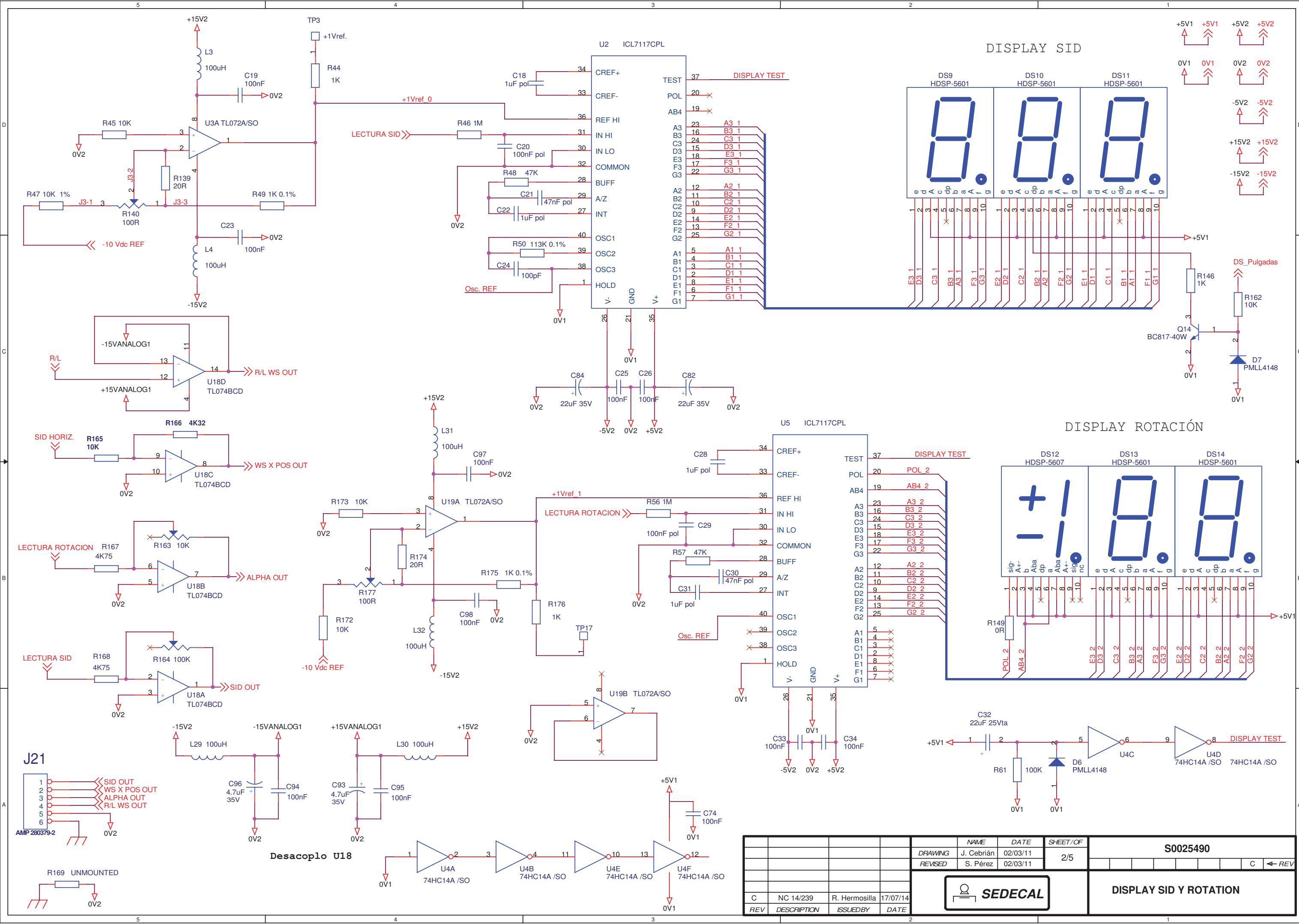
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NOVA 2000 TUBE SUSPENSION CONTROL BOARD		
Size	Document Number	Rev
A3	S0019874 SCH	1
Date:	Friday, February 09, 2018	Sheet 6 of 6



				NAME	DATE	SHEET/OF	S0025490		
DRAWING				J. Cebrián	02/03/11	1/5			
REVISED				S. Pérez	02/03/11				
C	NC 14/239	R. Hermosilla	17/07/14						
REV	DESCRIPTION	ISSUEDBY	DATE						



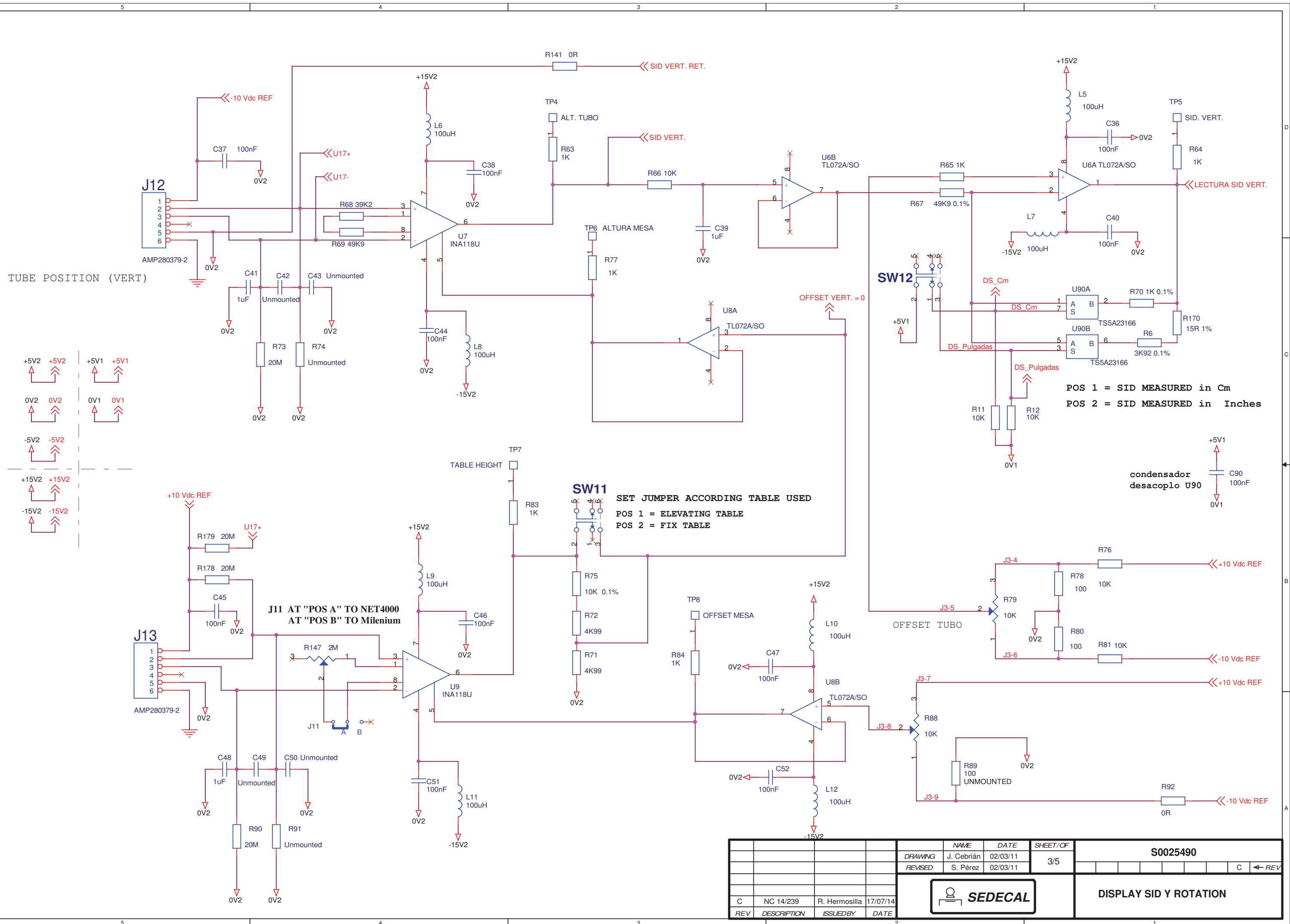
DISPLAY SID Y ROTATION



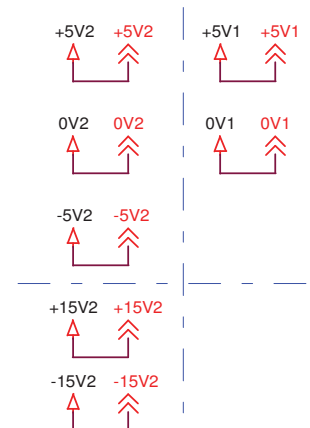
DISPLAY SID

DISPLAY ROTACIÓN

REV	DESCRIPTION	ISSUEDBY	DATE	NAME	DATE	SHEET/OF	S0025490	
				J. Cebrián	02/03/11	2/5		
				S. Pérez	02/03/11			
C	NC 14/239	R. Hermosilla	17/07/14				C ← REV	
							<b>DISPLAY SID Y ROTATION</b>	



TUBE POSITION (VERT)



J11 AT "POS A" TO NET4000  
AT "POS B" TO Milenium

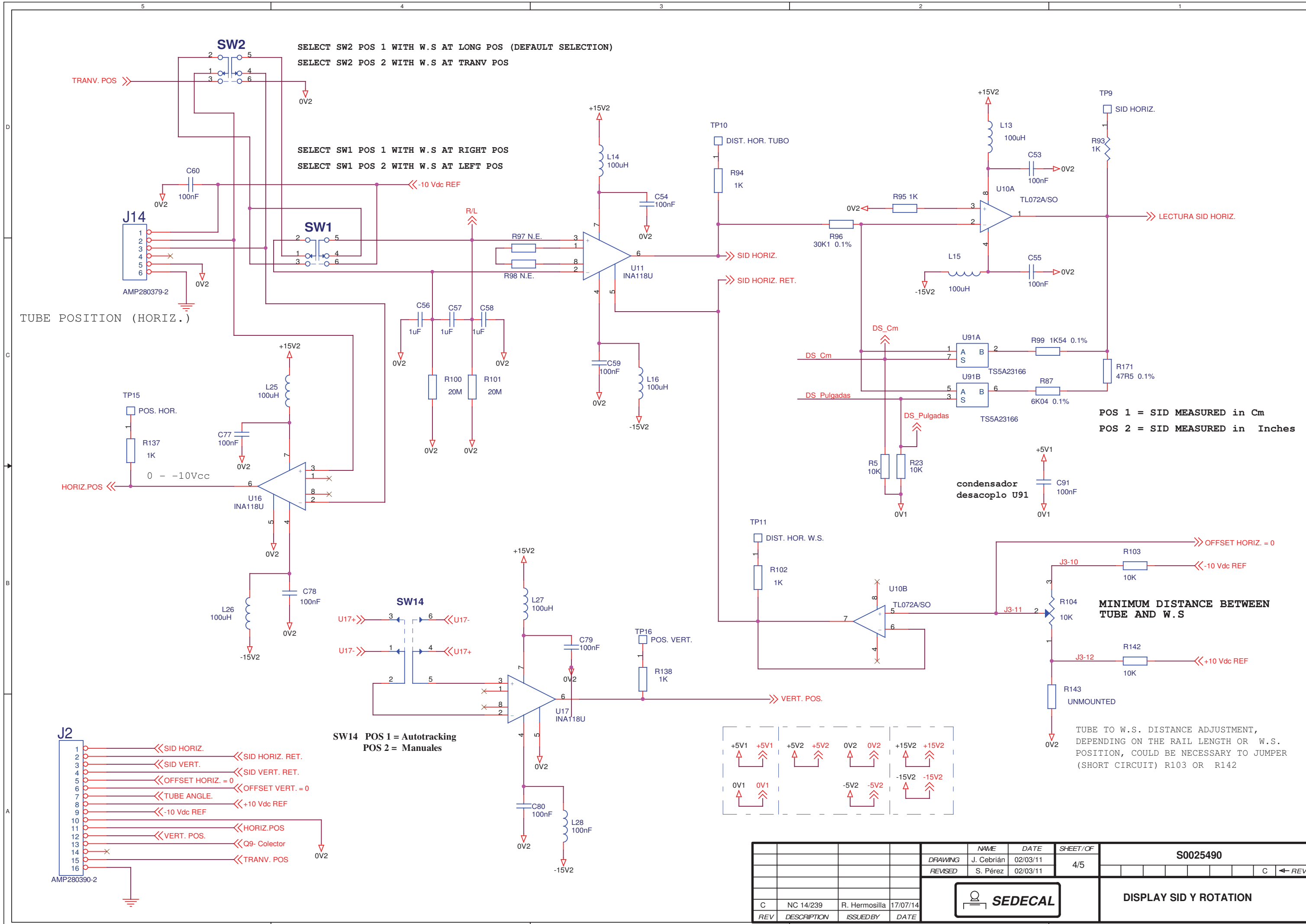
SW1 SET JUMPER ACCORDING TABLE USED  
POS 1 = ELEVATING TABLE  
POS 2 = FIX TABLE

POS 1 = SID MEASURED in Cm  
POS 2 = SID MEASURED in Inches

condensador desacoplo U90

		NAME	DATE	SHEET/OF	S0025490	
DRAWING		J. Cebrián	02/03/11	3/5		
REVISED		S. Pérez	02/03/11			
C	NC 14/239	R. Hermosilla	17/07/14			
REV	DESCRIPTION	ISSUEDBY	DATE			

**DISPLAY SID Y ROTATION**



SELECT SW2 POS 1 WITH W.S AT LONG POS (DEFAULT SELECTION)  
 SELECT SW2 POS 2 WITH W.S AT TRANV POS

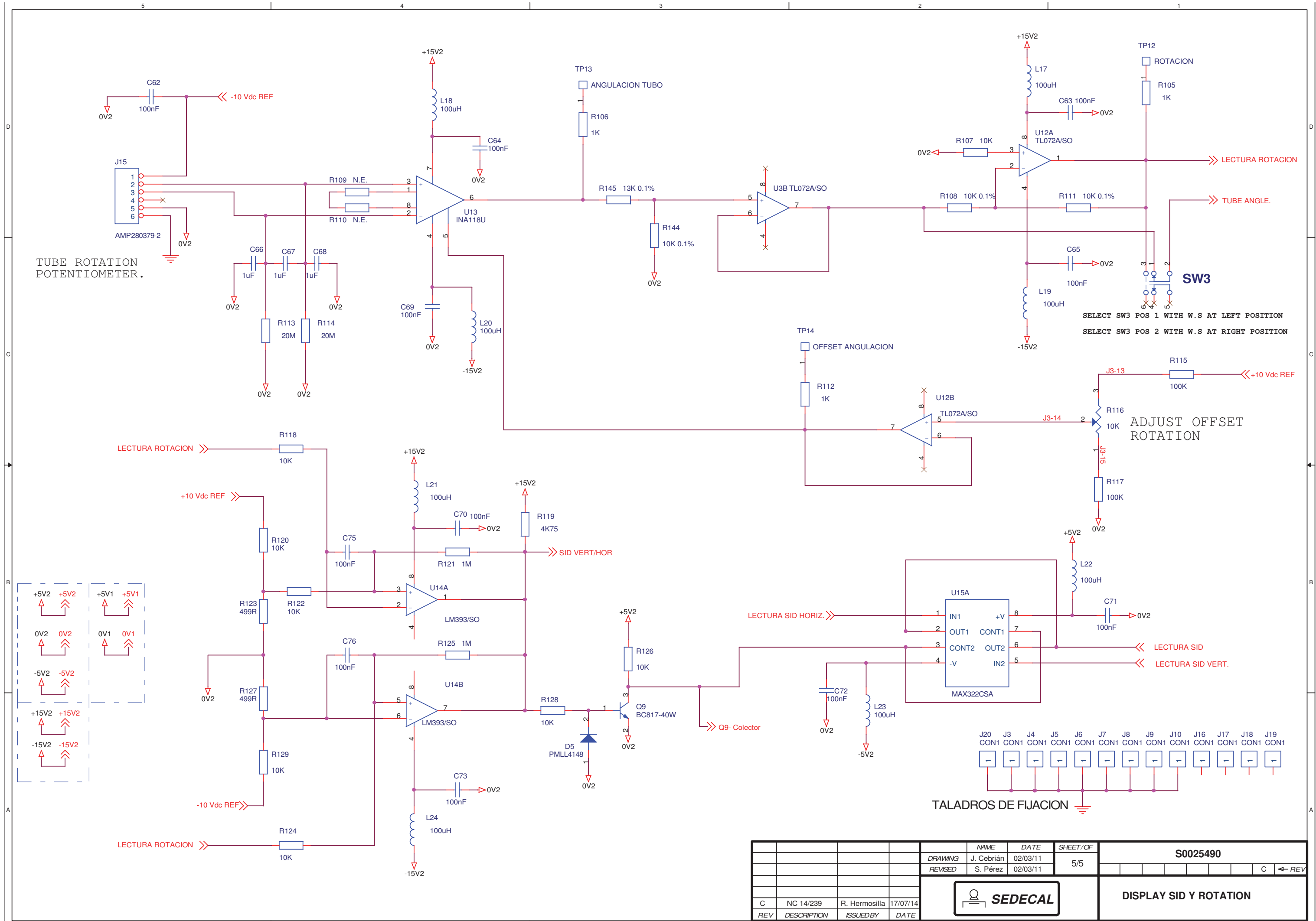
SELECT SW1 POS 1 WITH W.S AT RIGHT POS  
 SELECT SW1 POS 2 WITH W.S AT LEFT POS

POS 1 = SID MEASURED in Cm  
 POS 2 = SID MEASURED in Inches

MINIMUM DISTANCE BETWEEN  
 TUBE AND W.S

TUBE TO W.S. DISTANCE ADJUSTMENT,  
 DEPENDING ON THE RAIL LENGTH OR W.S.  
 POSITION, COULD BE NECESSARY TO JUMPER  
 (SHORT CIRCUIT) R103 OR R142

REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	S0025490					
				DRAWING	J. Cebrián	02/03/11	4/5					
				REVISED	S. Pérez	02/03/11						
C	NC 14/239	R. Hermosilla	17/07/14								<b>DISPLAY SID Y ROTATION</b>	
REV												



TUBE ROTATION POTENTIOMETER.

LECTURA ROTACION >>>

+10 Vdc REF >>>

-10 Vdc REF >>>

LECTURA ROTACION >>>

SID VERT/HOR >>>

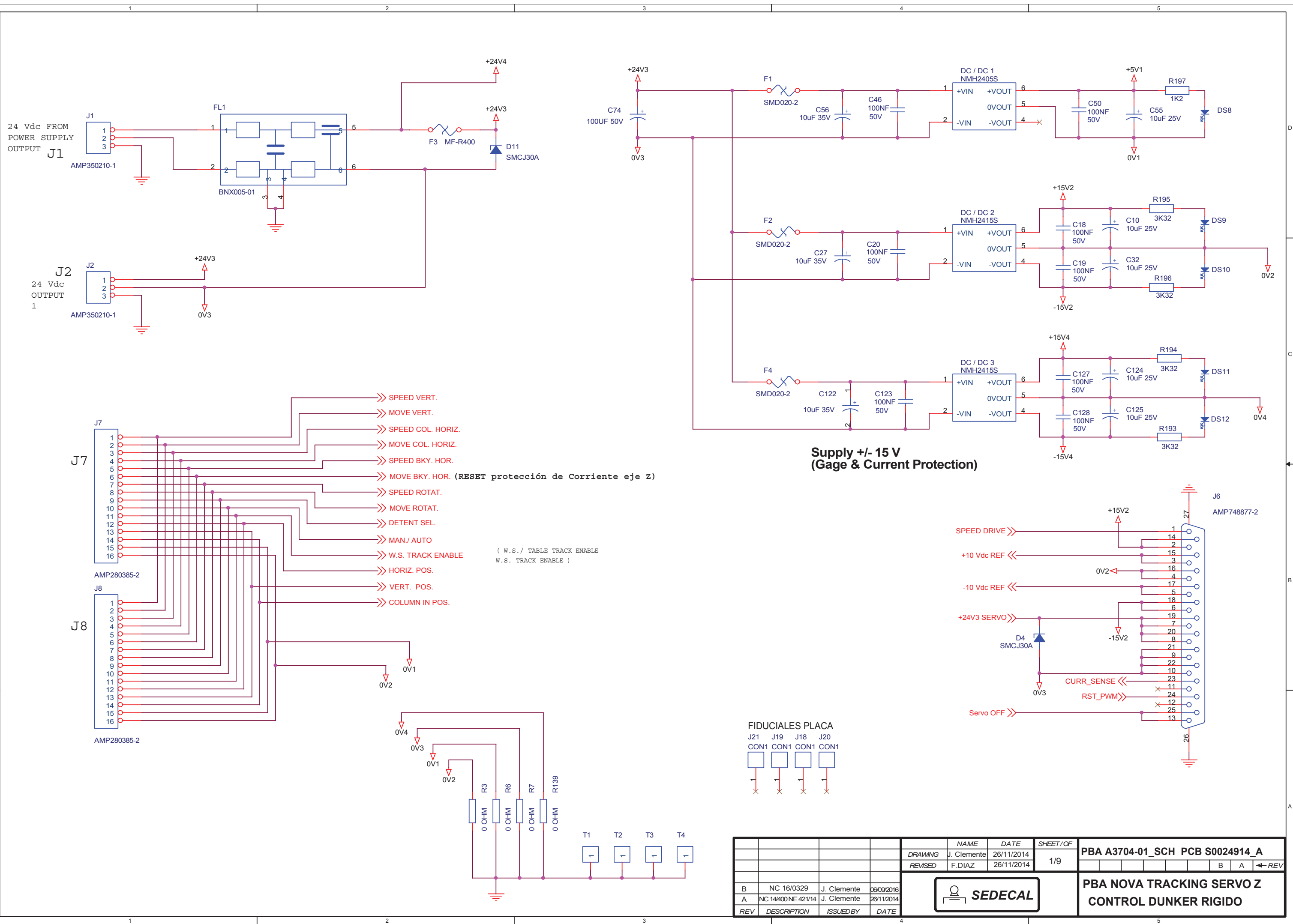
LECTURA SID HORIZ >>>

ADJUST OFFSET ROTATION

SELECT SW3 POS 1 WITH W.S AT LEFT POSITION  
SELECT SW3 POS 2 WITH W.S AT RIGHT POSITION

TALADROS DE FIJACION

REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	S0025490		
				DRAWING	J. Cebrán	02/03/11	5/5		
				REVISED	S. Pérez	02/03/11			
C	NC 14/239	R. Hermosilla	17/07/14				SEDECAL		
							DISPLAY SID Y ROTATION		

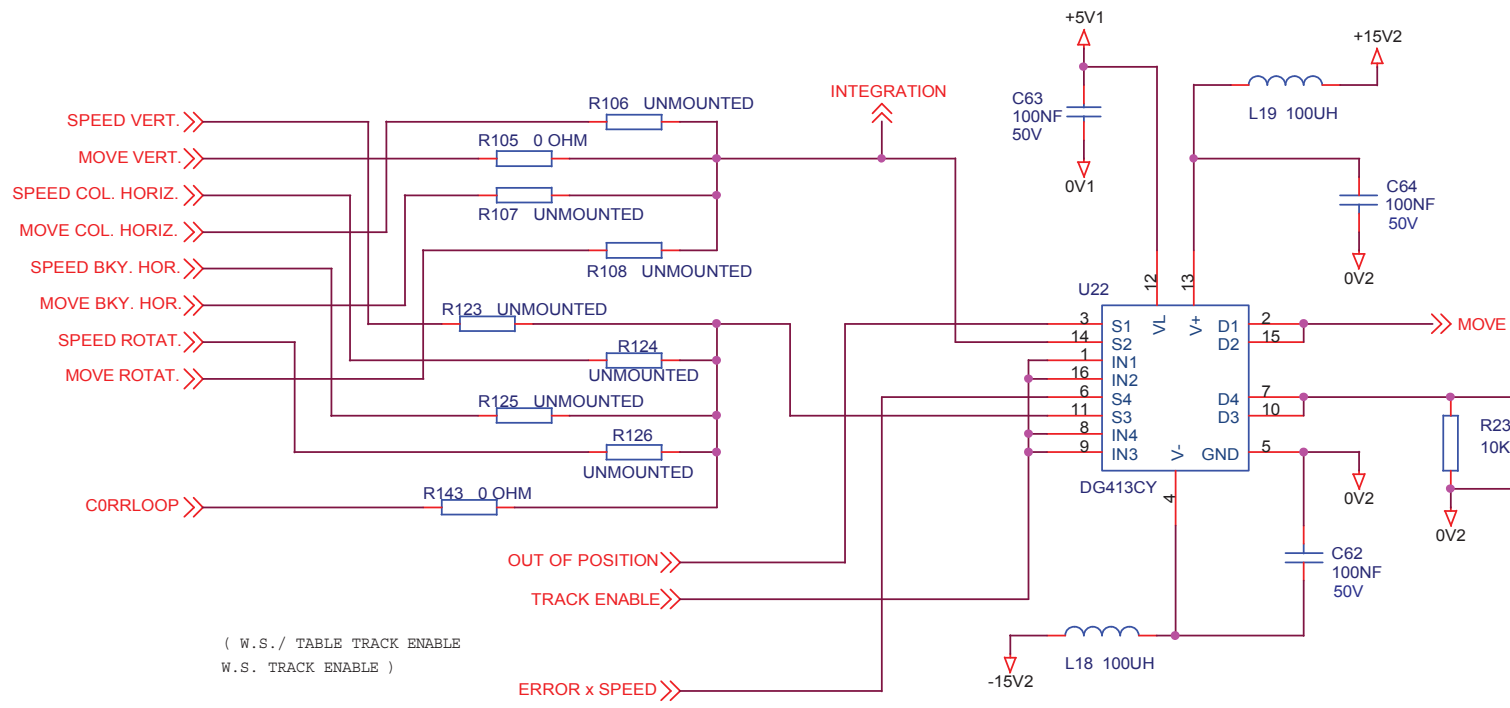


**Supply +/- 15 V  
(Gage & Current Protection)**

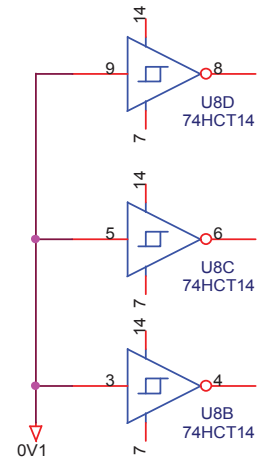
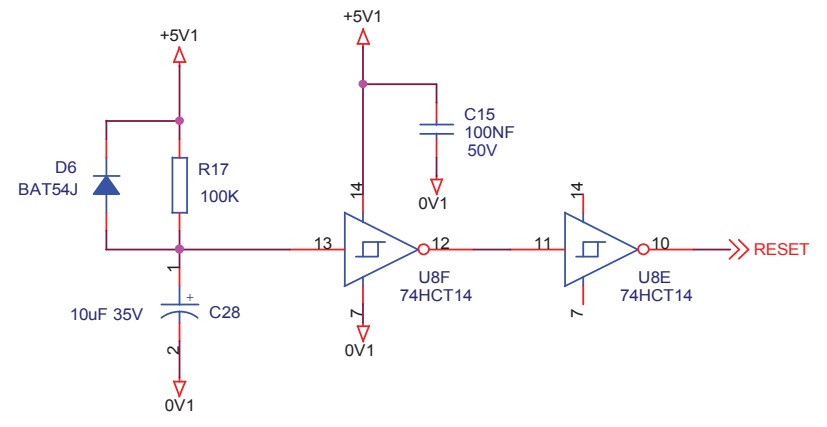
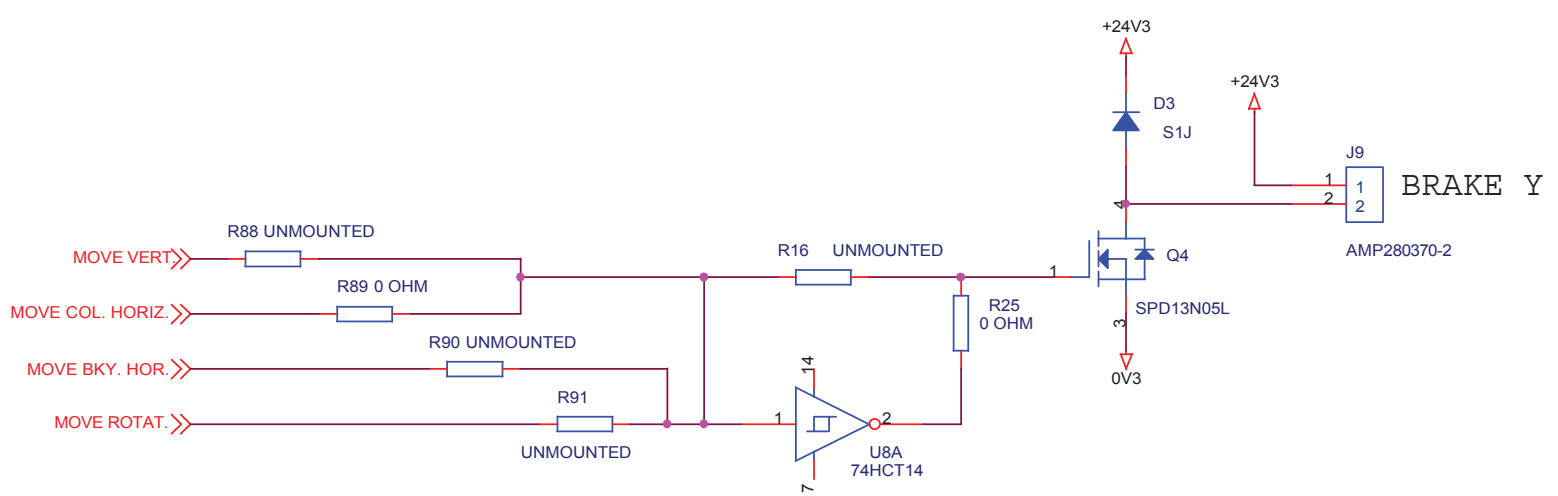
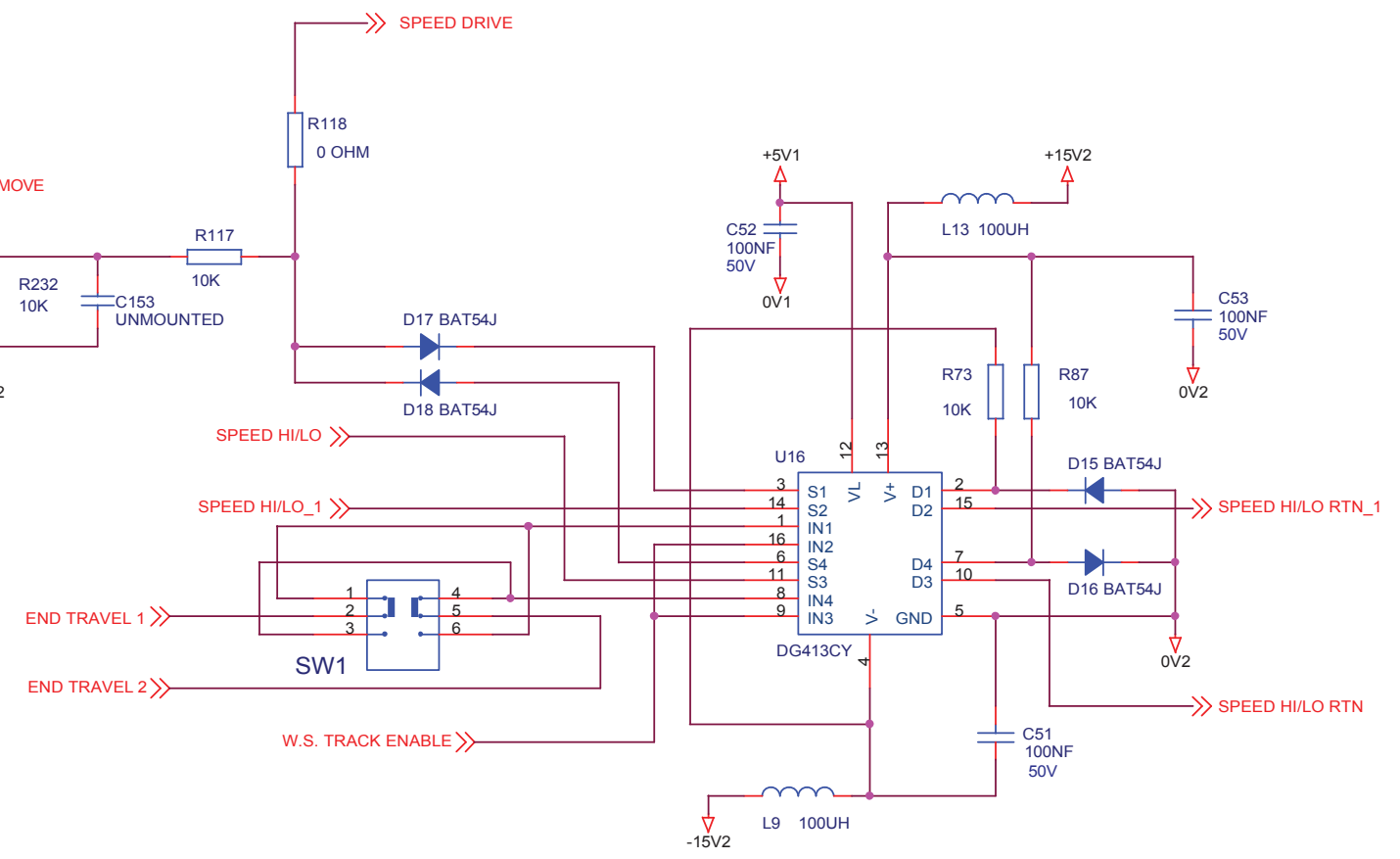
( W.S./ TABLE TRACK ENABLE  
W.S. TRACK ENABLE )

FIDUCIALES PLACA  
J21 J19 J18 J20  
CON1 CON1 CON1 CON1

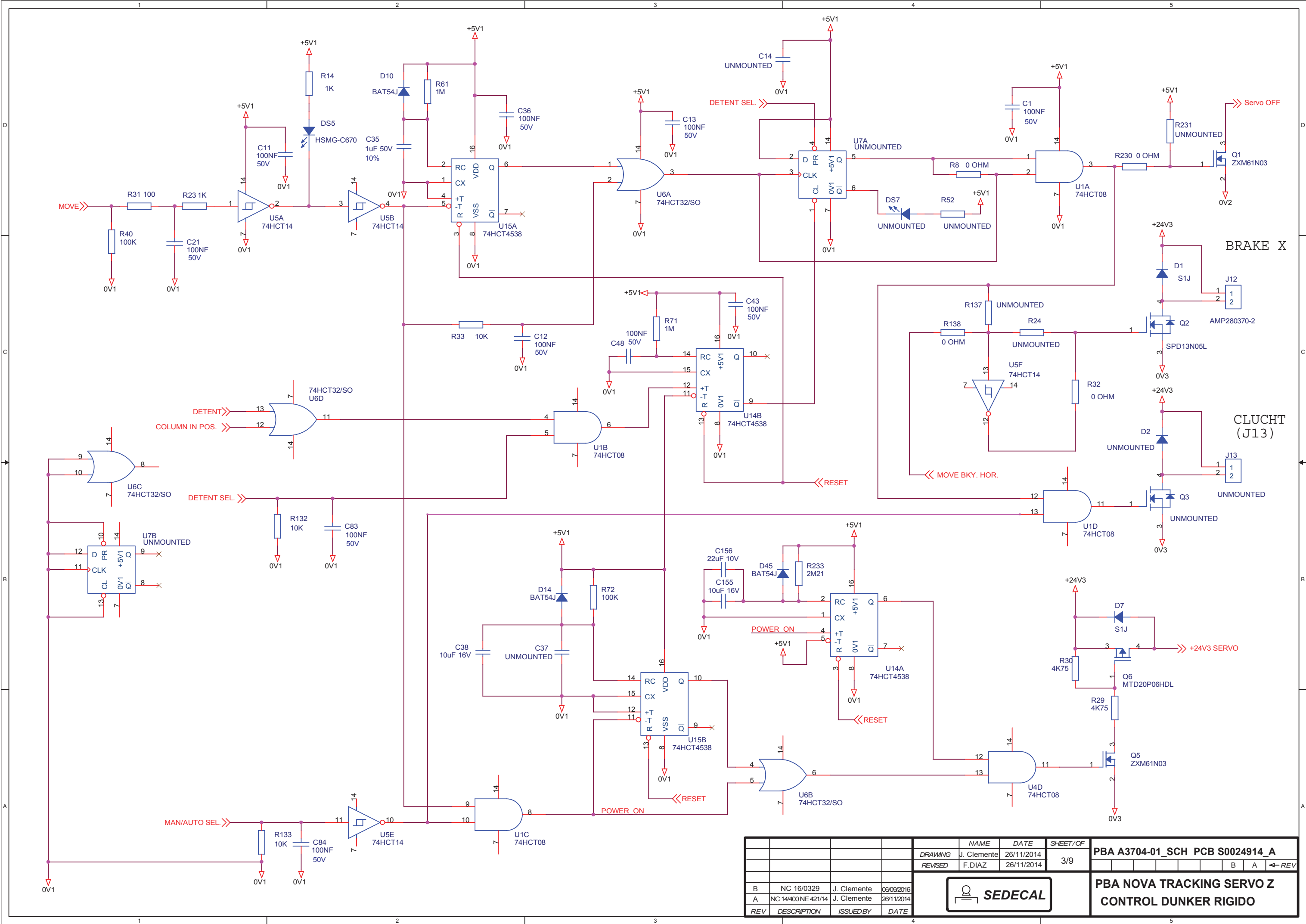
REV	DESCRIPTION	ISSUED BY	DATE	DRAWING	NAME	DATE	SHEET / OF	PBA A3704-01_SCH PCB S0024914_A				
B	NC 16/0329	J. Clemente	08/09/2016		J. Clemente	26/11/2014	1/9					
A	NC 14/400 NE 421/14	J. Clemente	26/11/2014	REVISED	F. DIAZ	26/11/2014						
								<b>PBA NOVA TRACKING SERVO Z CONTROL DUNKER RIGIDO</b>				



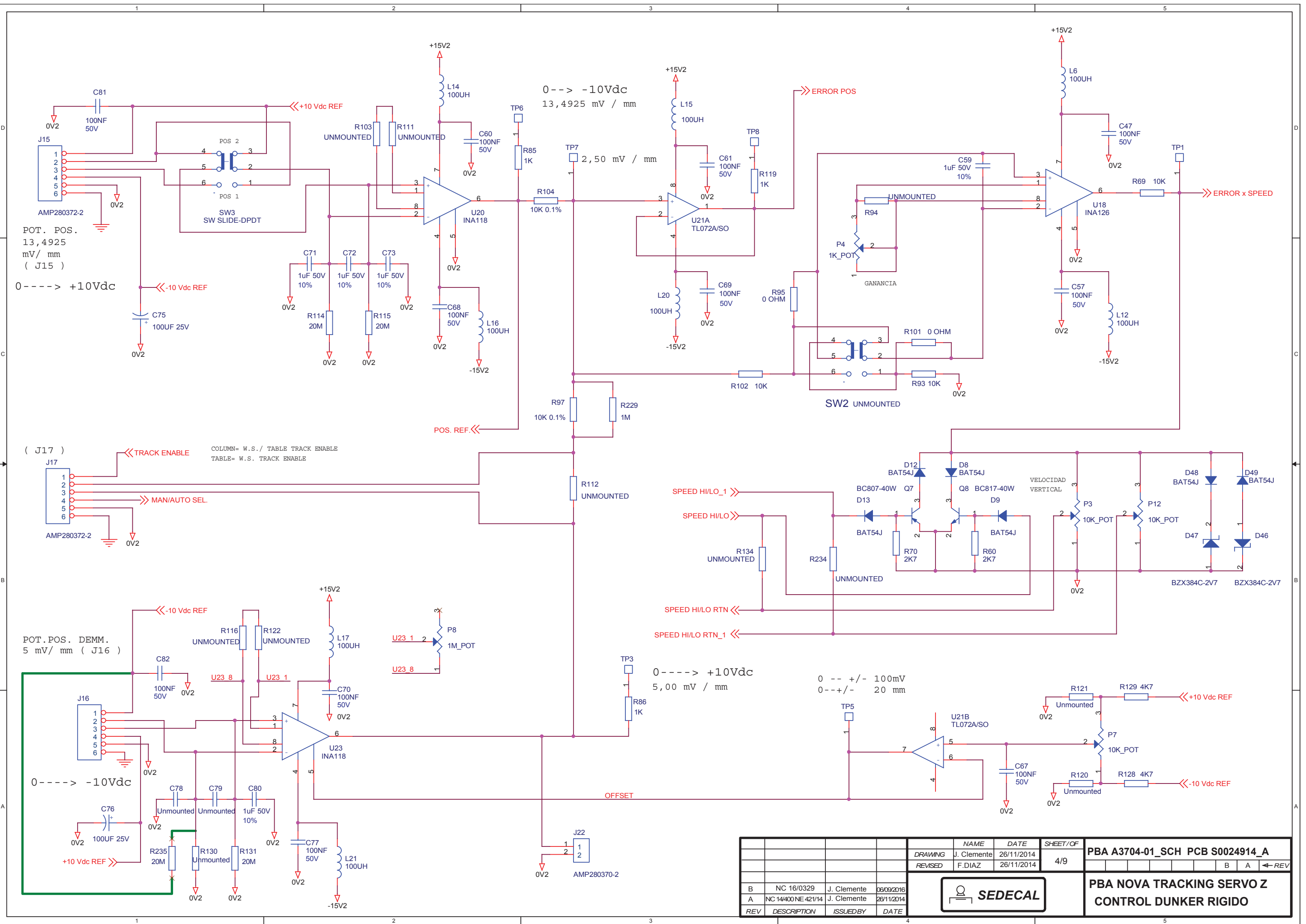
'1' -----> S1 & S4 = 0N  
 '0' -----> S2 & S3 = 0N



REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET/OF	PBA A3704-01_SCH PCB S0024914_A		
B	NC 16/0329	J. Clemente	08/09/2016	J. Clemente	26/11/2014	2/9	B A ← REV		
A	NC 14/400 NE 421/14	J. Clemente	26/11/2014	F. DIAZ	26/11/2014		PBA NOVA TRACKING SERVO Z CONTROL DUNKER RIGIDO		
							SEDECAL		



REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET/OF	PBA A3704-01_SCH PCB S0024914_A			
				DRAWING	J. Clemente	26/11/2014	3/9			
				REVISED	F. DIAZ	26/11/2014				
B	NC 16/0329	J. Clemente	08/09/2016							
A	NC 14/400 NE 421/14	J. Clemente	28/11/2014							
<b>PBA NOVA TRACKING SERVO Z CONTROL DUNKER RIGIDO</b>										



0 ---> -10Vdc  
13,4925 mV / mm

POT. POS.  
13,4925  
mV / mm  
( J15 )

0 ----> +10Vdc

( J17 ) TRACK ENABLE  
COLUMN = W.S. / TABLE TRACK ENABLE  
TABLE = W.S. TRACK ENABLE

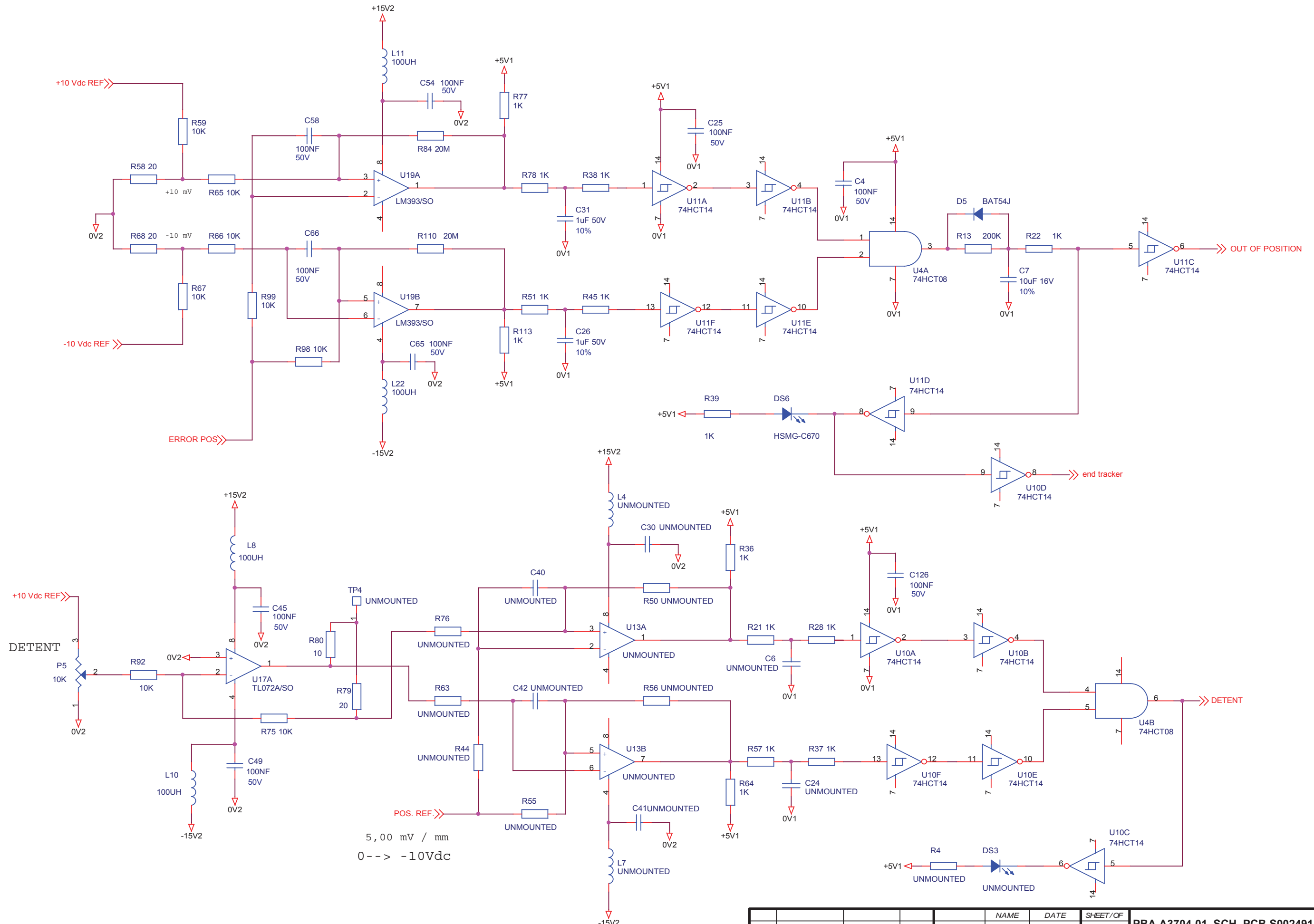
POT.POS. DEMM.  
5 mV / mm ( J16 )

0 ----> -10Vdc

0 ----> +10Vdc  
5,00 mV / mm

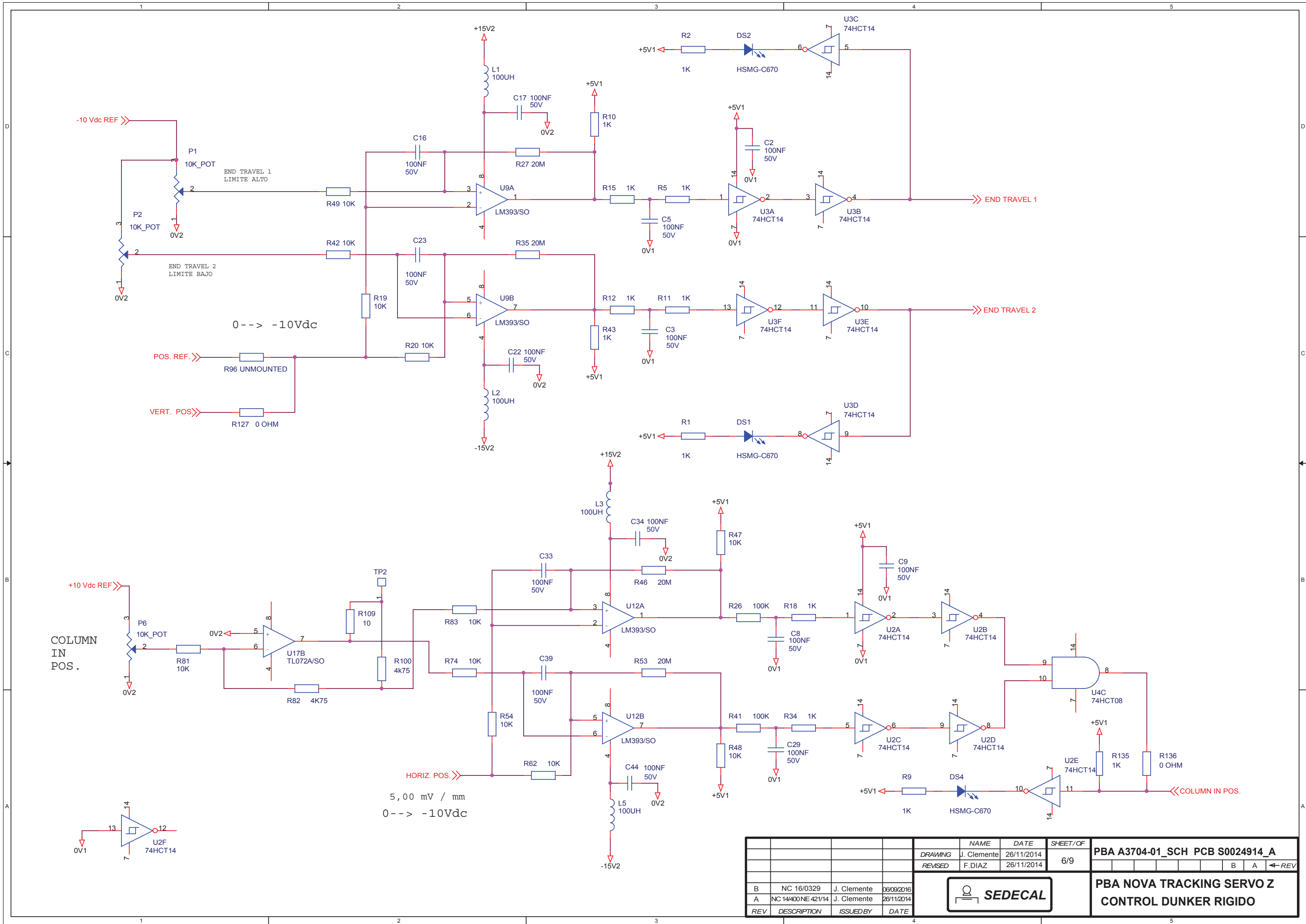
0 -- +/- 100mV  
0 -- +/- 20 mm

REV	DESCRIPTION	ISSUEDBY	DATE	NAME	DATE	SHEET/OF	PBA A3704-01_SCH PCB S0024914_A			
				J. Clemente	26/11/2014	4/9				
				F. DIAZ	26/11/2014					
B	NC 16/0329	J. Clemente	08/09/2016							<b>PBA NOVA TRACKING SERVO Z CONTROL DUNKER RIGIDO</b>
A	NC 14/400 NE 421/14	J. Clemente	26/11/2014							



5,00 mV / mm  
0 ---> -10Vdc

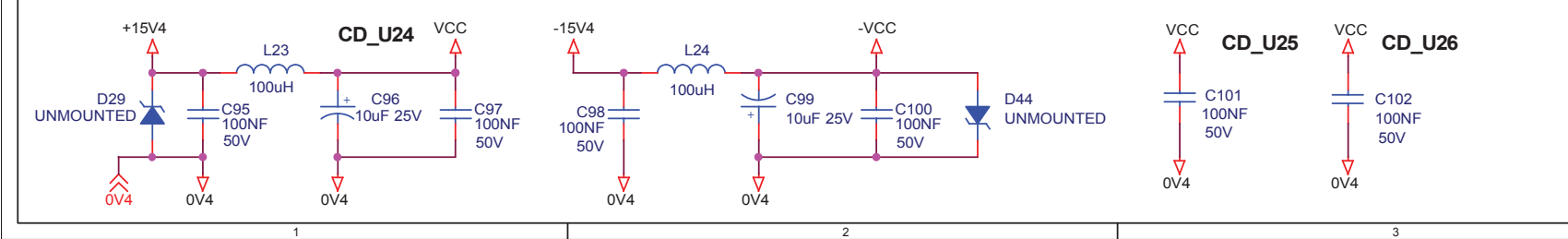
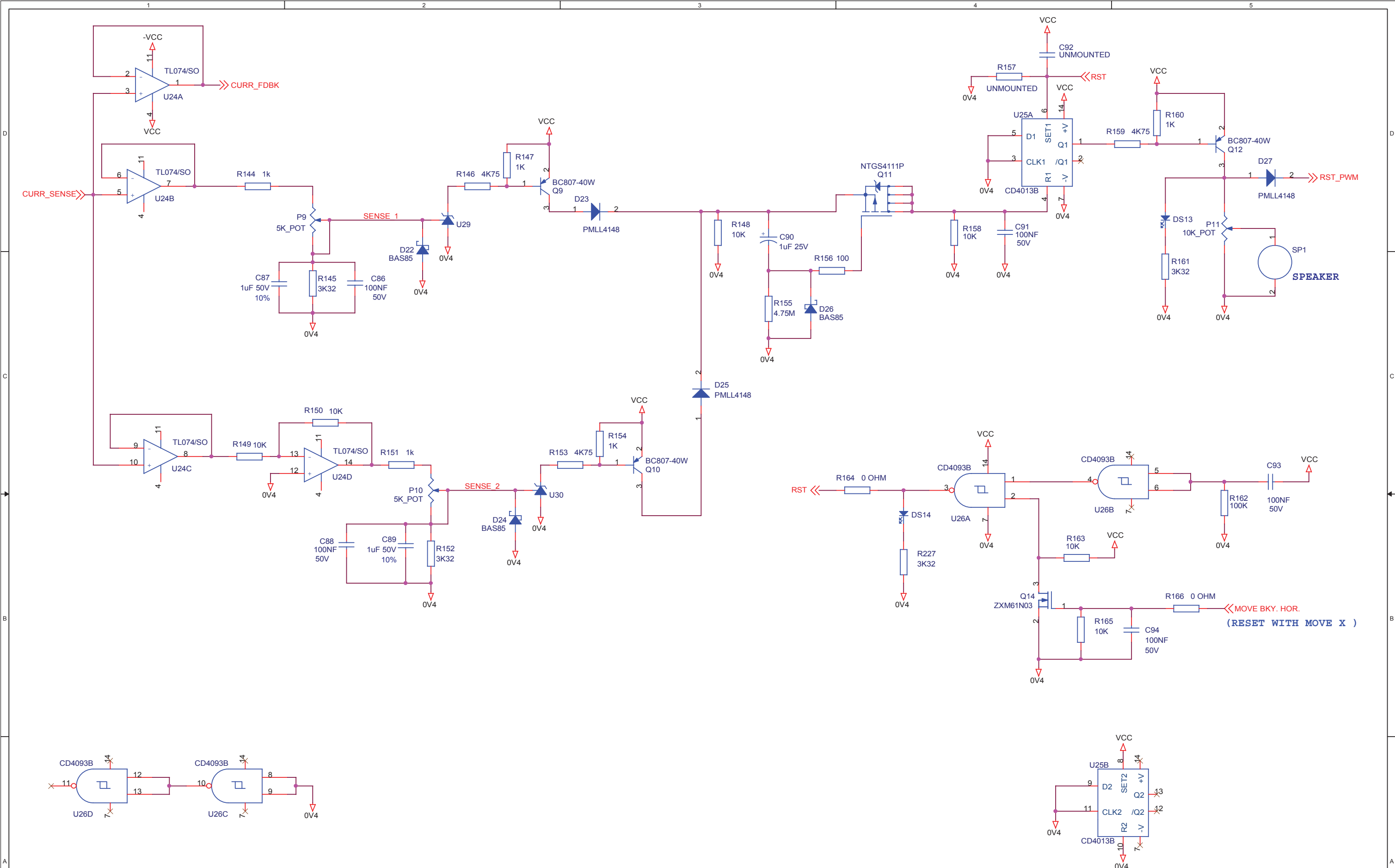
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				J. Clemente	26/11/2014	5/9			
				F. DIAZ	26/11/2014				
B	NC 16/0329	J. Clemente	06/09/2016						
A	NC 14400 NE 421/14	J. Clemente	26/11/2014						
							<b>PBA NOVA TRACKING SERVO Z CONTROL DUNKER RIGIDO</b>		



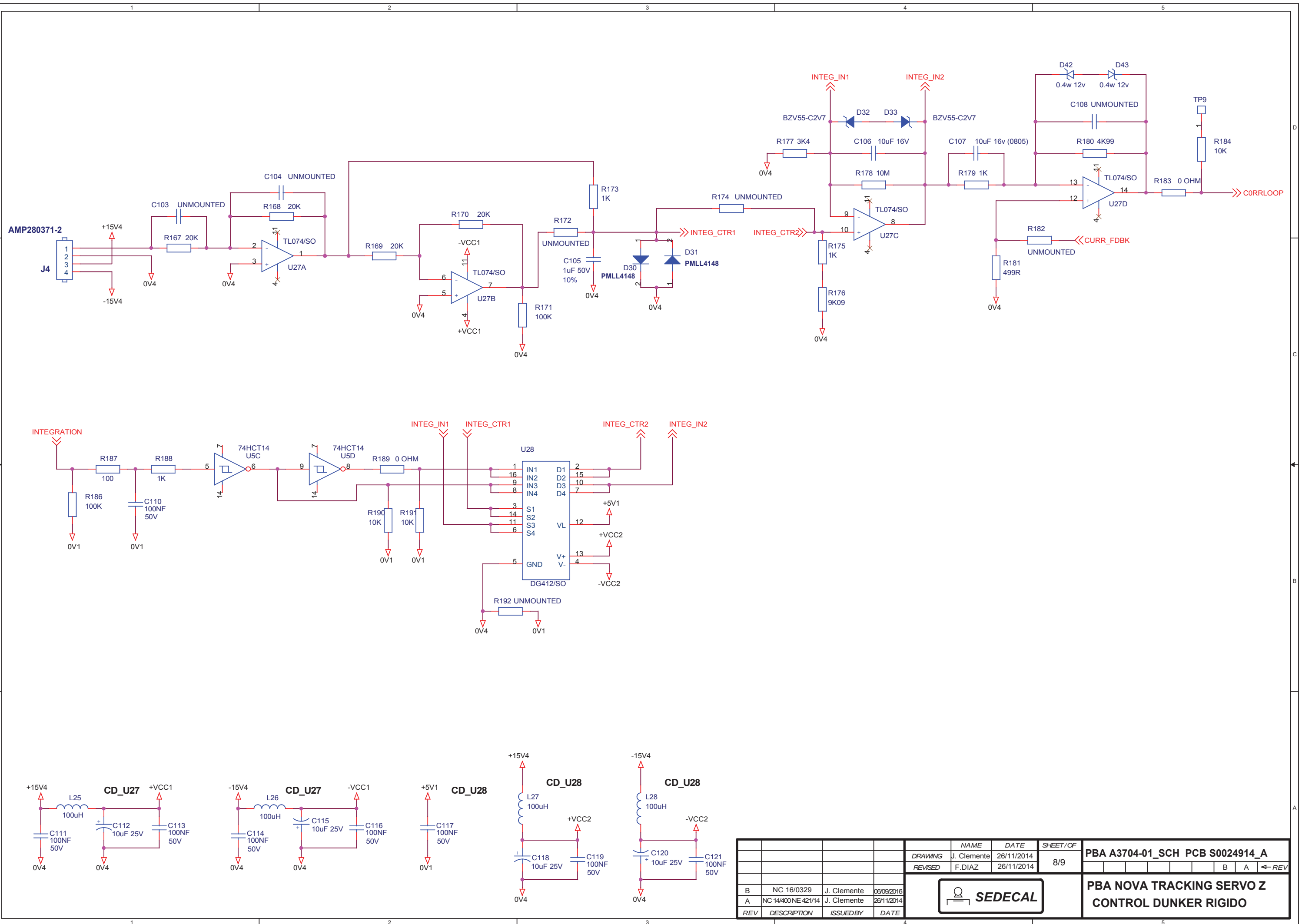
5,00 mV / mm  
0 --> -10Vdc

REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	PBA A3704-01_SCH PCB S0024914_A		
B	NC 16/0329	J. Clemente	06/09/2016	J. Clemente	26/11/2014	6/9	B A ← REV		
A	NC 14/400NE 421/14	J. Clemente	26/11/2014	F. DIAZ	26/11/2014		PBA NOVA TRACKING SERVO Z CONTROL DUNKER RIGIDO		





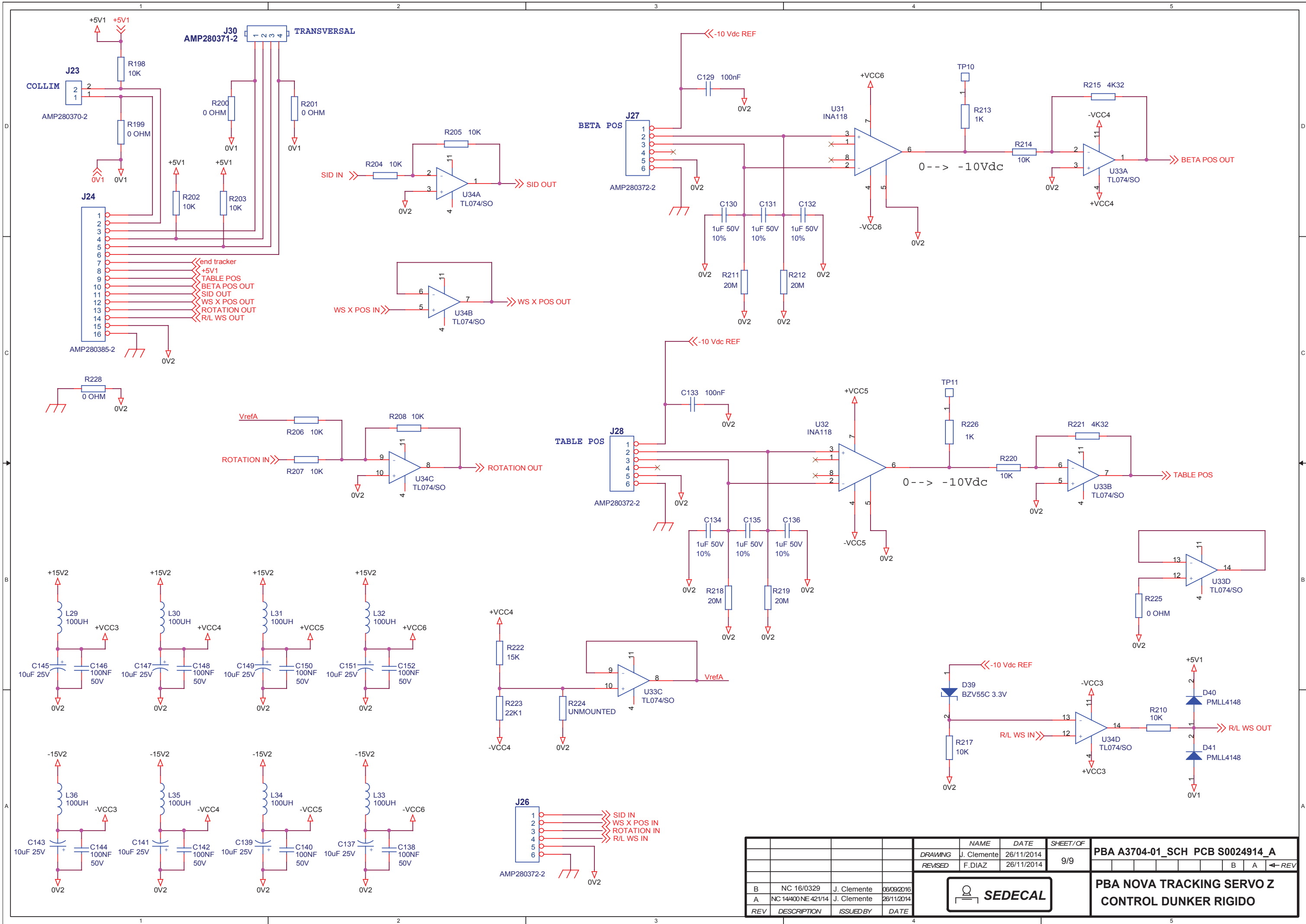
REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET/OF	PBA A3704-01_SCH PCB S0024914_A				
B	NC 16/0329	J. Clemente	06/09/2016	J. Clemente	26/11/2014	7/9					
A	NC 14400 NE 421/14	J. Clemente	26/11/2014	F. DIAZ	26/11/2014						
REV	DESCRIPTION	ISSUED BY	DATE					PBA NOVA TRACKING SERVO Z CONTROL DUNKER RIGIDO			



REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	PBA A3704-01_SCH PCB S0024914_A				
B	NC 16/0329	J. Clemente	06/09/2016	J. Clemente	26/11/2014	8/9					
A	NC 14/400NE 421/14	J. Clemente	26/11/2014	F. DIAZ	26/11/2014						
											← REV



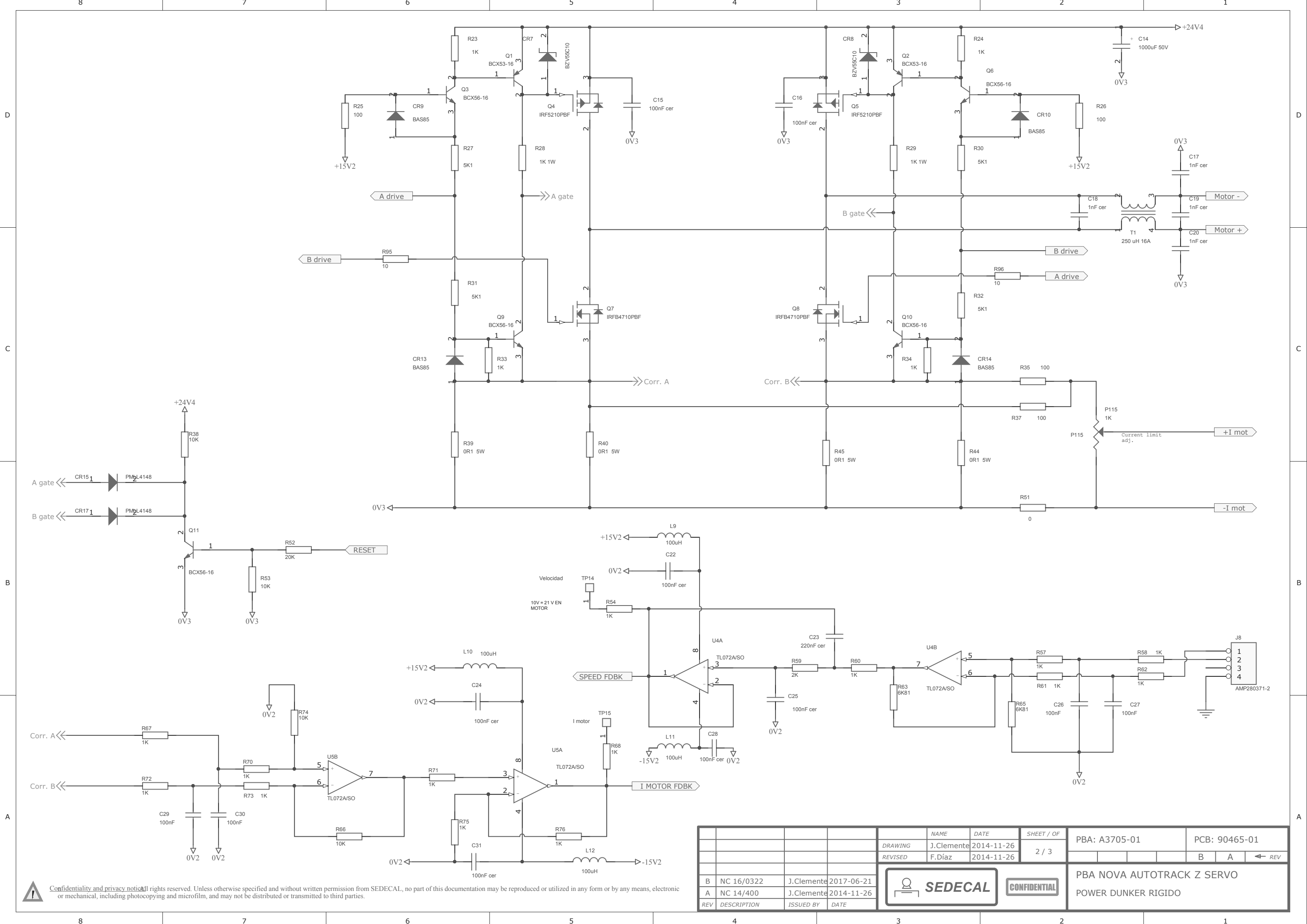
**PBA NOVA TRACKING SERVO Z  
CONTROL DUNKER RIGIDO**



				NAME	DATE	SHEET/OF	PBA A3704-01_SCH PCB S0024914_A		
DRAWING				J. Clemente	26/11/2014	9/9	B A ←REV		
REVISED				F. DIAZ	26/11/2014				
B	NC 16/0329	J. Clemente	06/09/2016	<div style="display: flex; align-items: center; justify-content: center;"> <b>SEDECAL</b> </div>					
A	NC 14/400 NE 421/14	J. Clemente	26/11/2014						
REV	DESCRIPTION	ISSUED BY	DATE						

**PBA NOVA TRACKING SERVO Z  
CONTROL DUNKER RIGIDO**



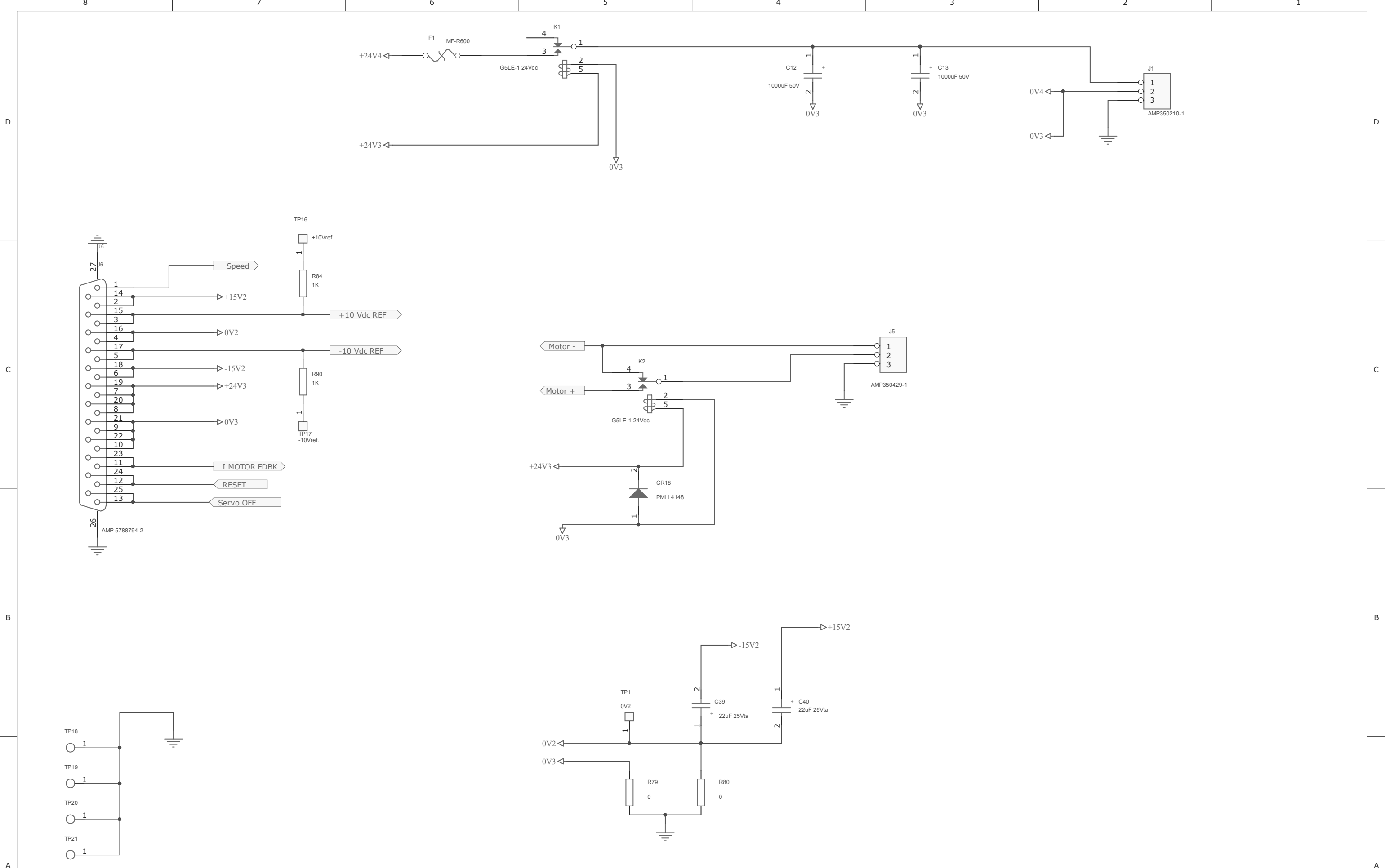


REV	DESCRIPTION	ISSUED BY	DATE	DRAWING	NAME	DATE	SHEET / OF	PBA: A3705-01	PCB: 90465-01
B	NC 16/0322	J.Clemente	2017-06-21				2 / 3		
A	NC 14/400	J.Clemente	2014-11-26						



PBA NOVA AUTOTRACK Z SERVO  
POWER DUNKER RIGIDO

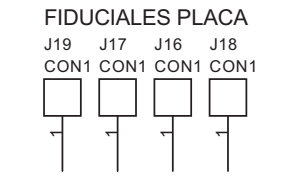
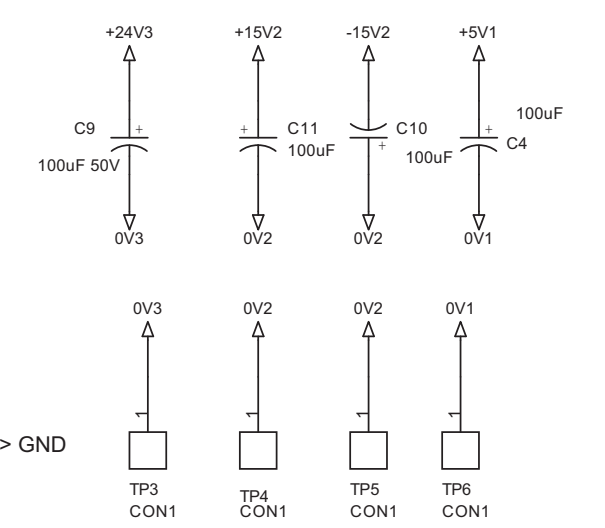
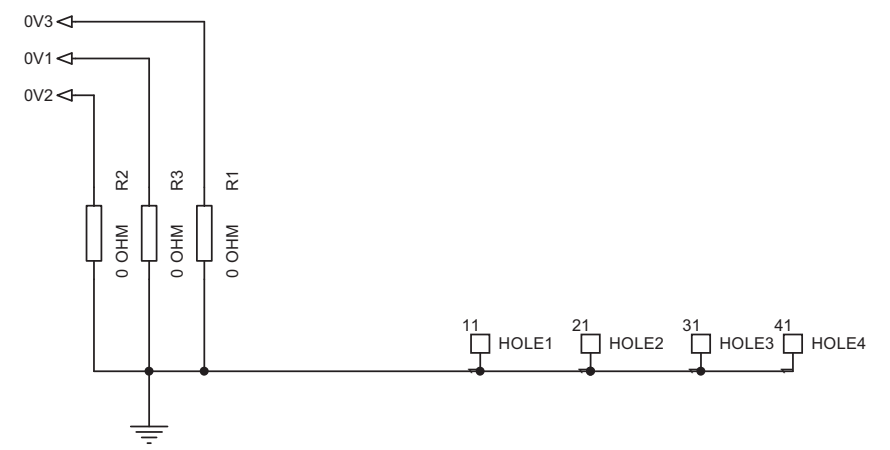
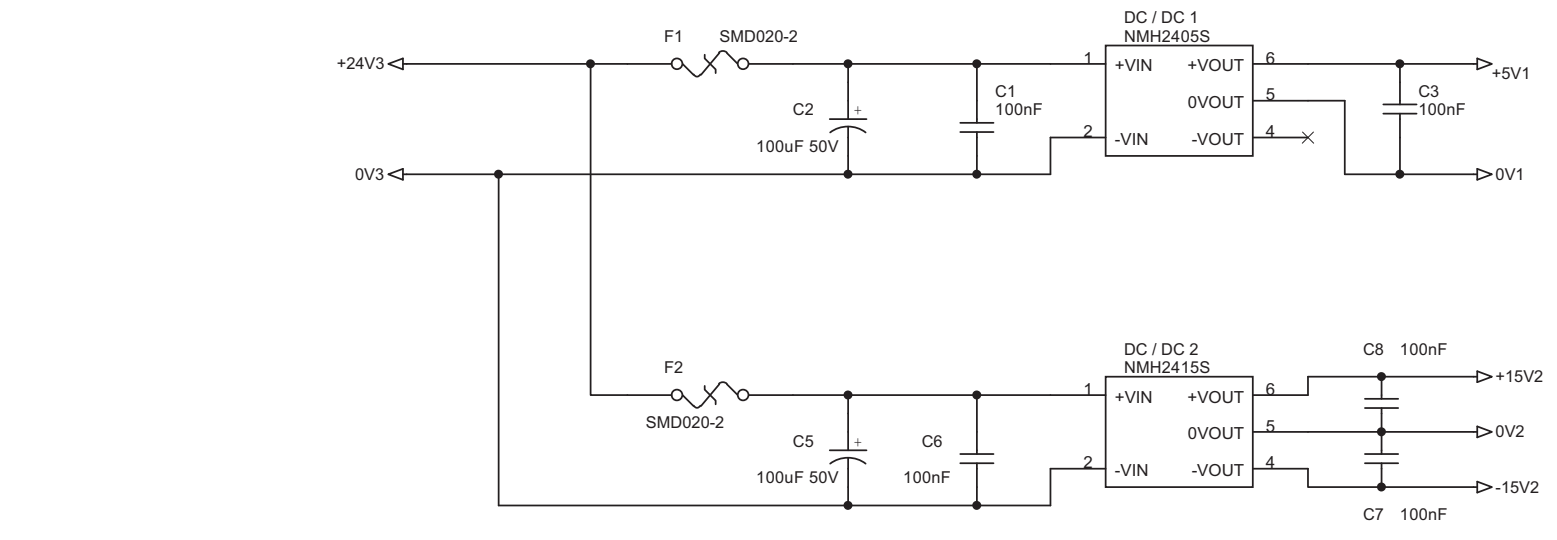
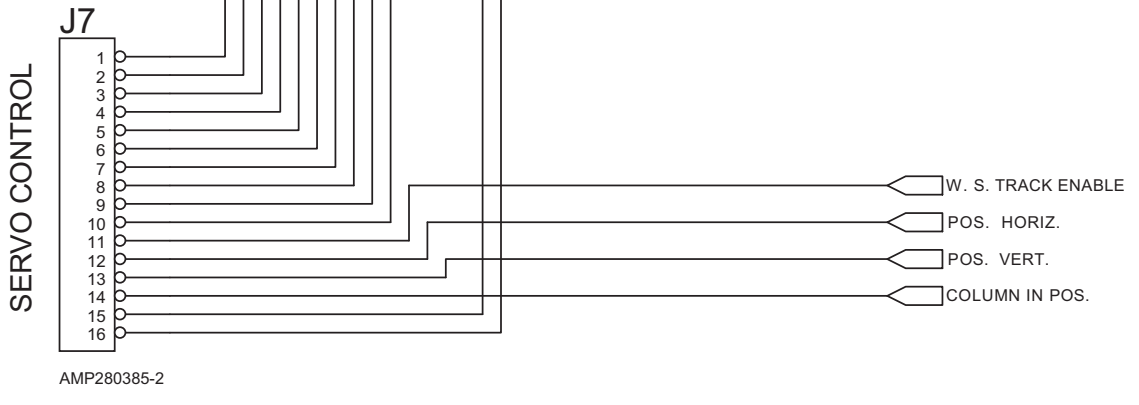
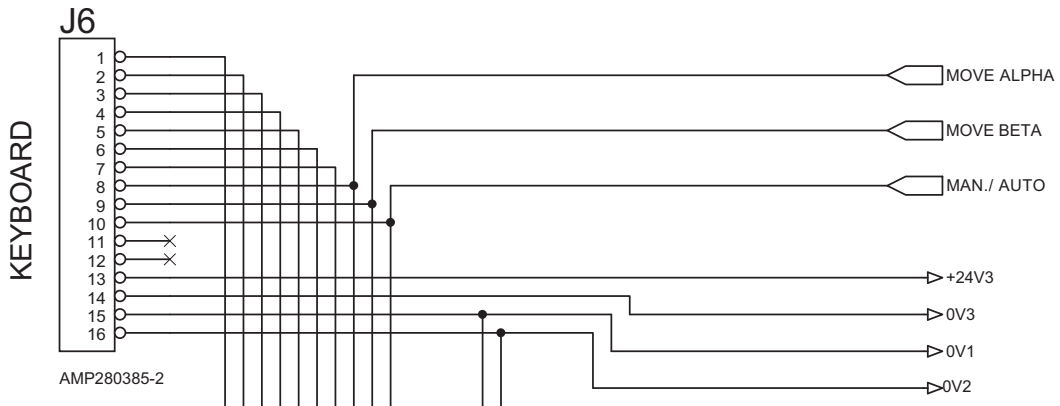
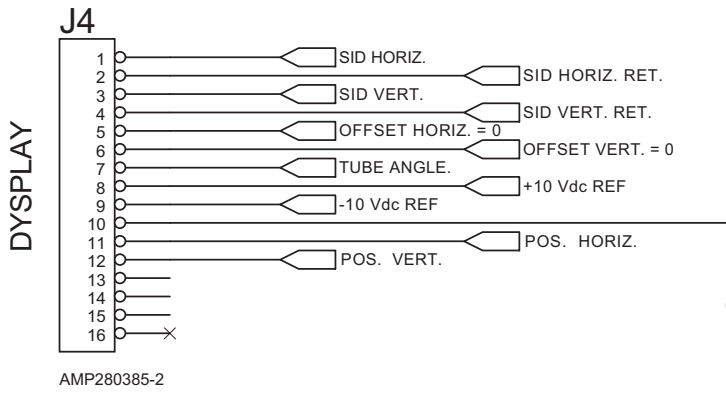
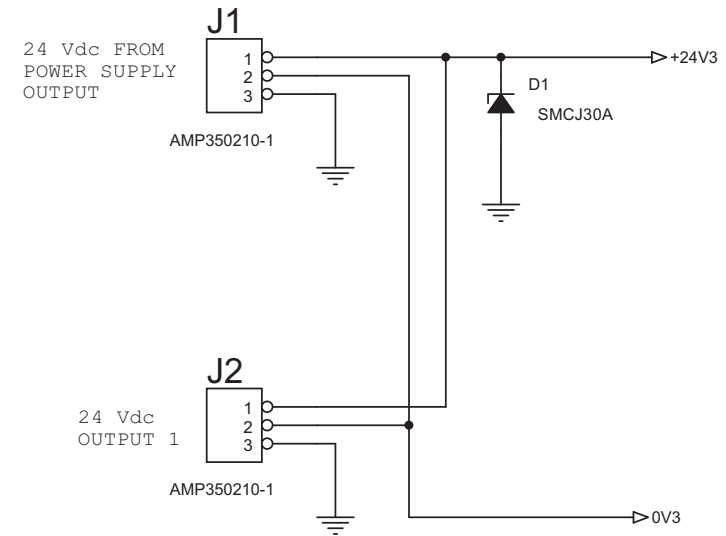
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REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	PBA: A3705-01	PCB: 90465-01
B	NC 16/0322	J.Clemente	2017-06-21	J.Clemente	2014-11-26	3 / 3		B A ← REV
A	NC 14/400	J.Clemente	2014-11-26	F.Díaz	2014-11-26			
							PBA NOVA AUTOTRACK Z SERVO POWER DUNKER RIGIDO	

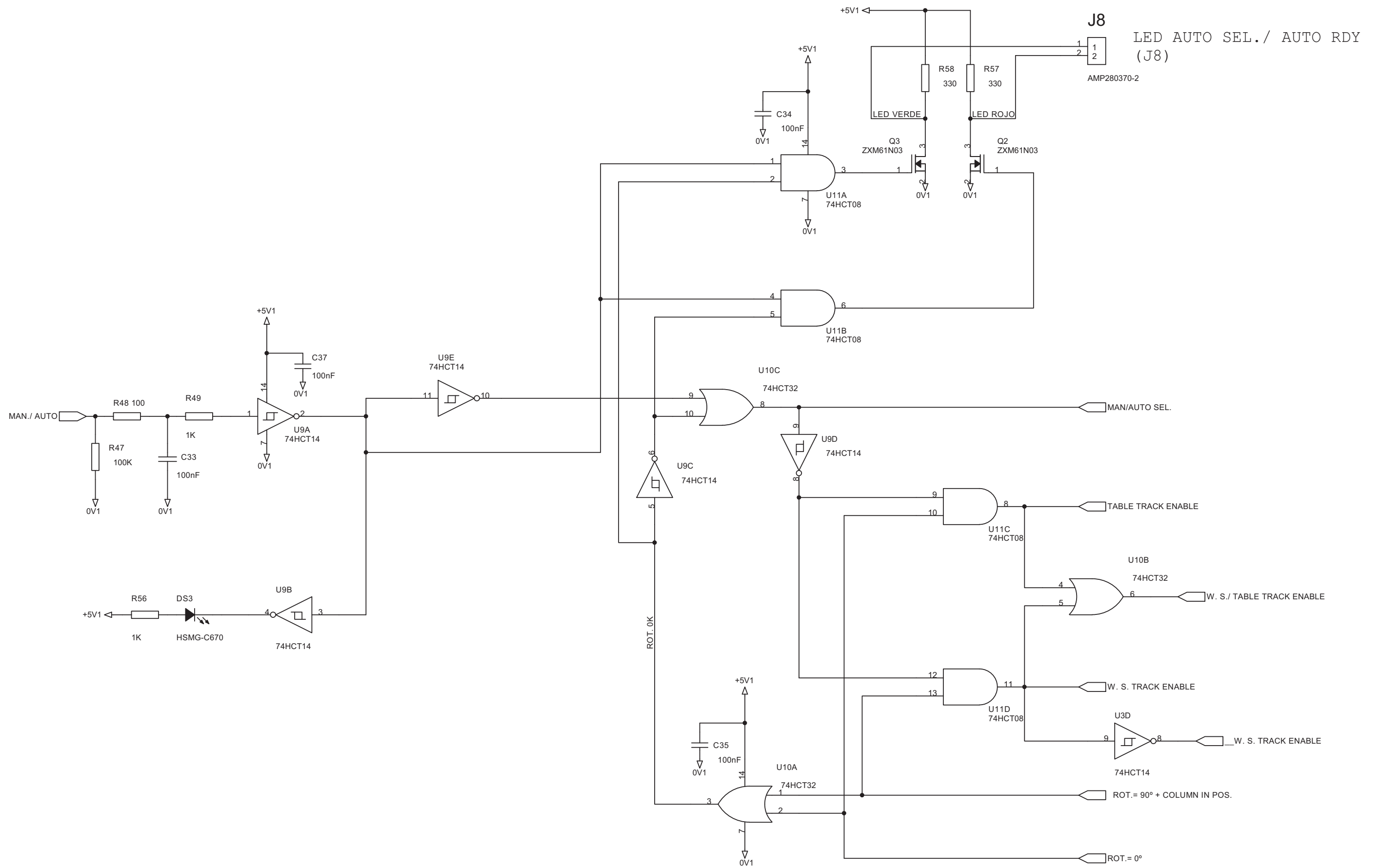
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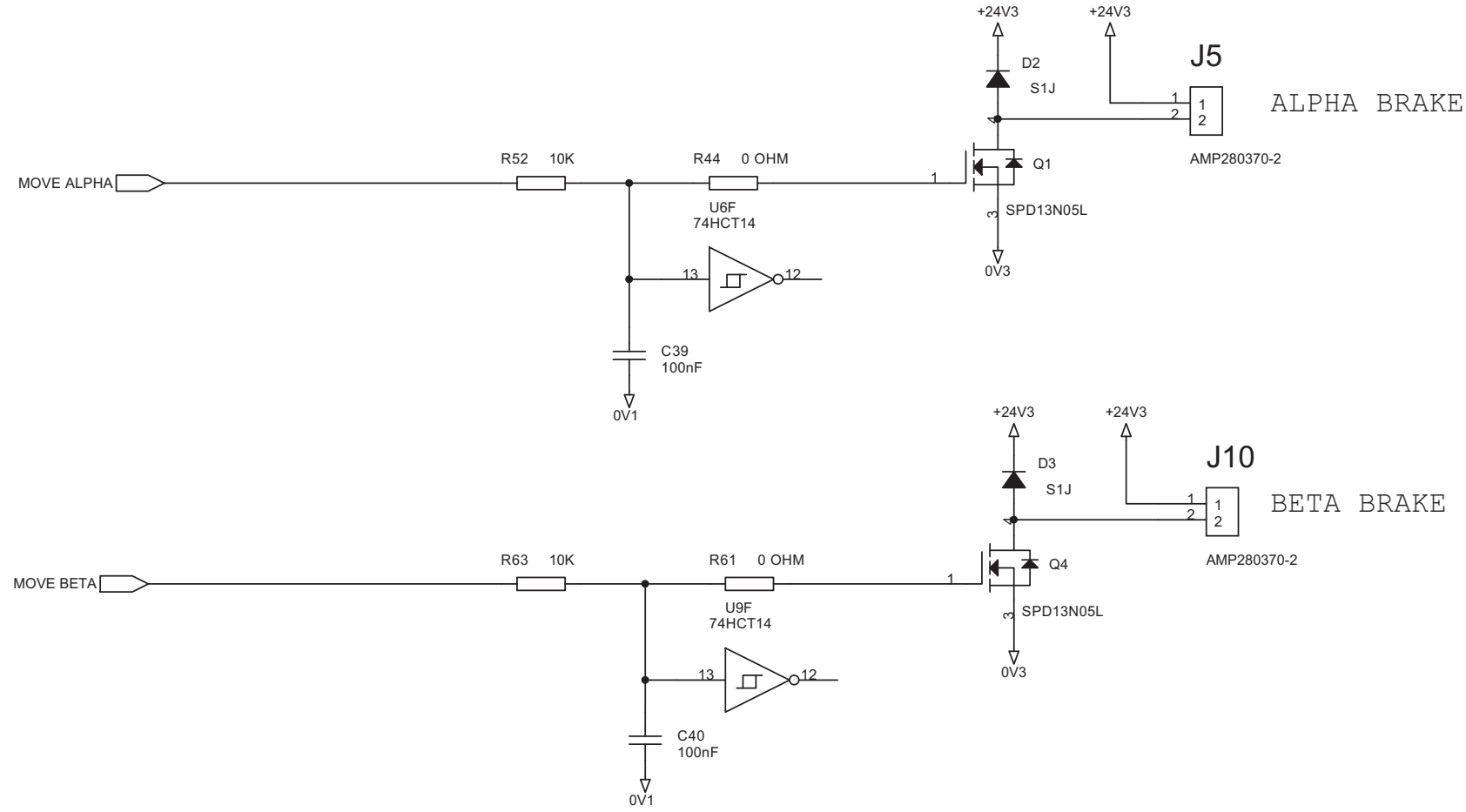
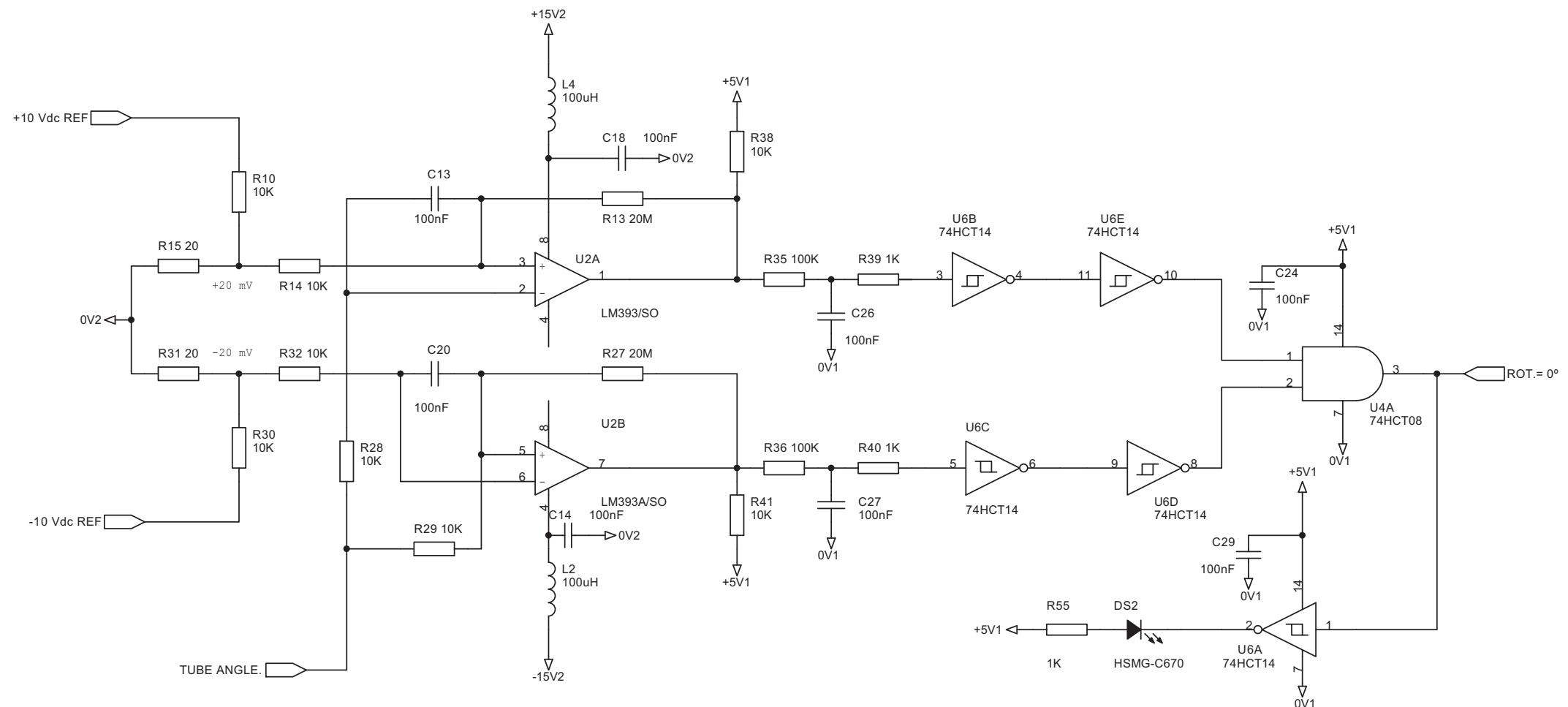


PCB  
S0007381REV2

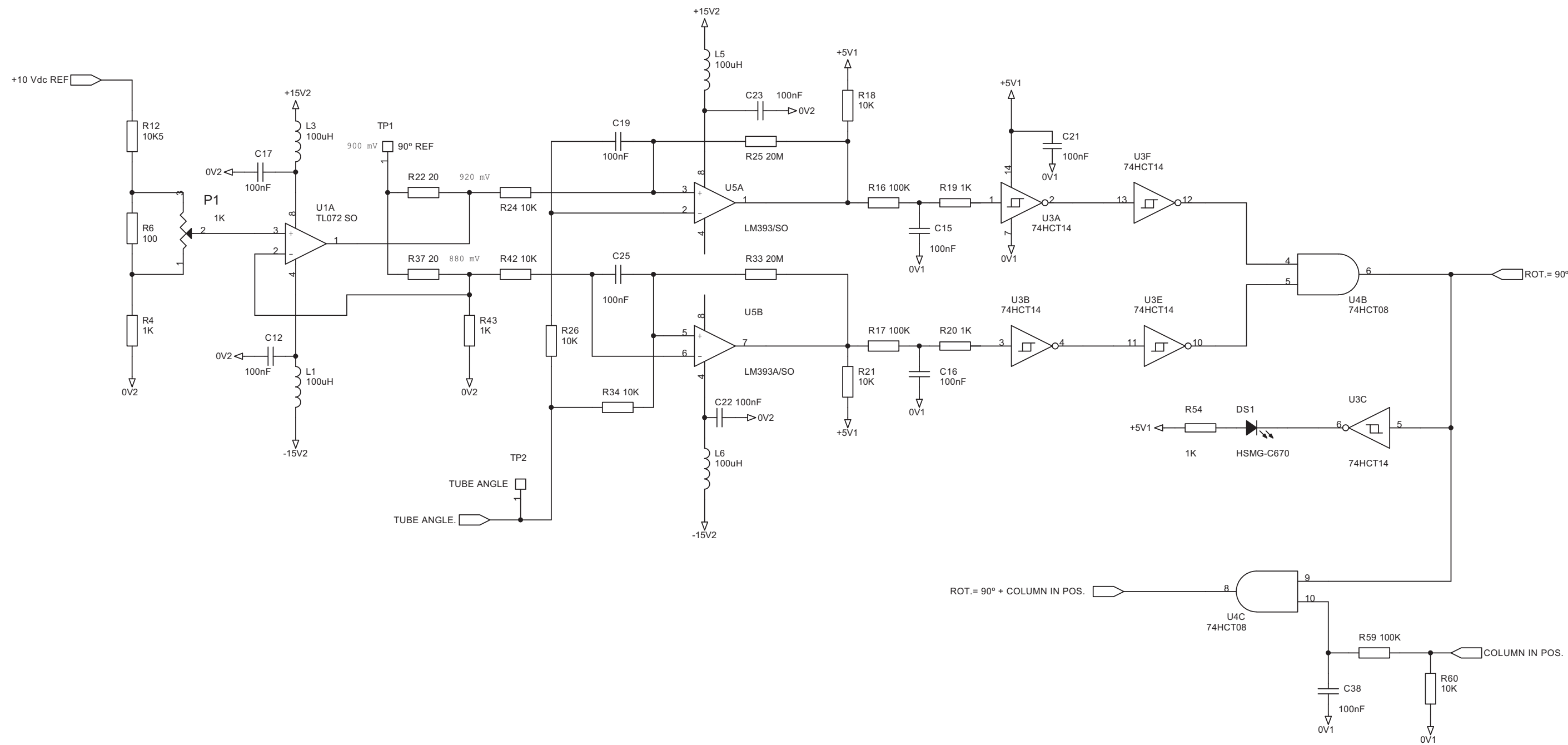
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Size <b>A3</b>	Document Number <b>PBA S0013450REV1 (PCB S007381REV2)</b>	Rev <b>1</b>
Date: Tuesday, January 27, 2009	Sheet 1	of 5



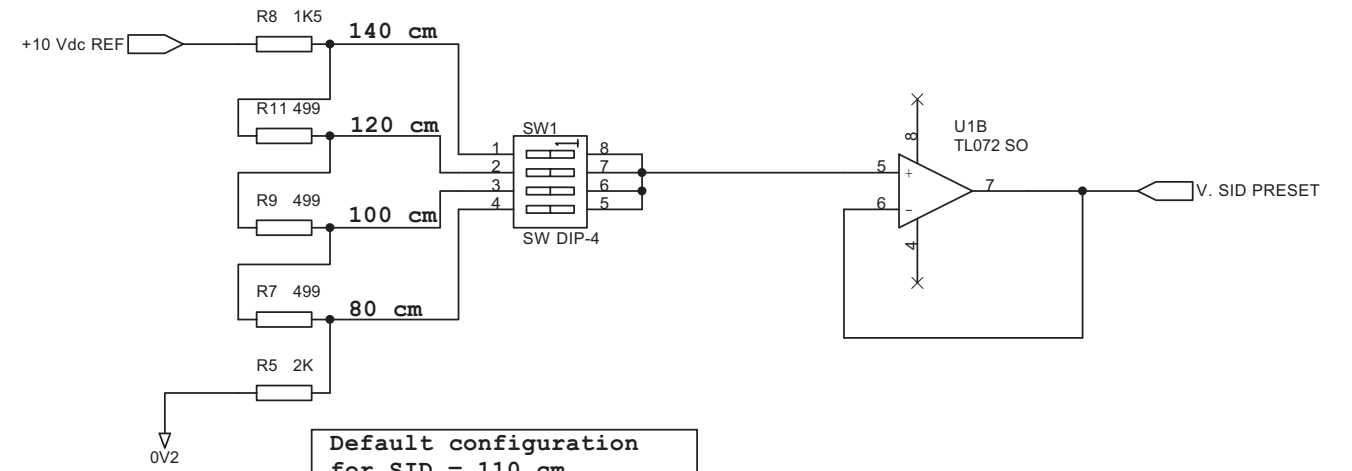
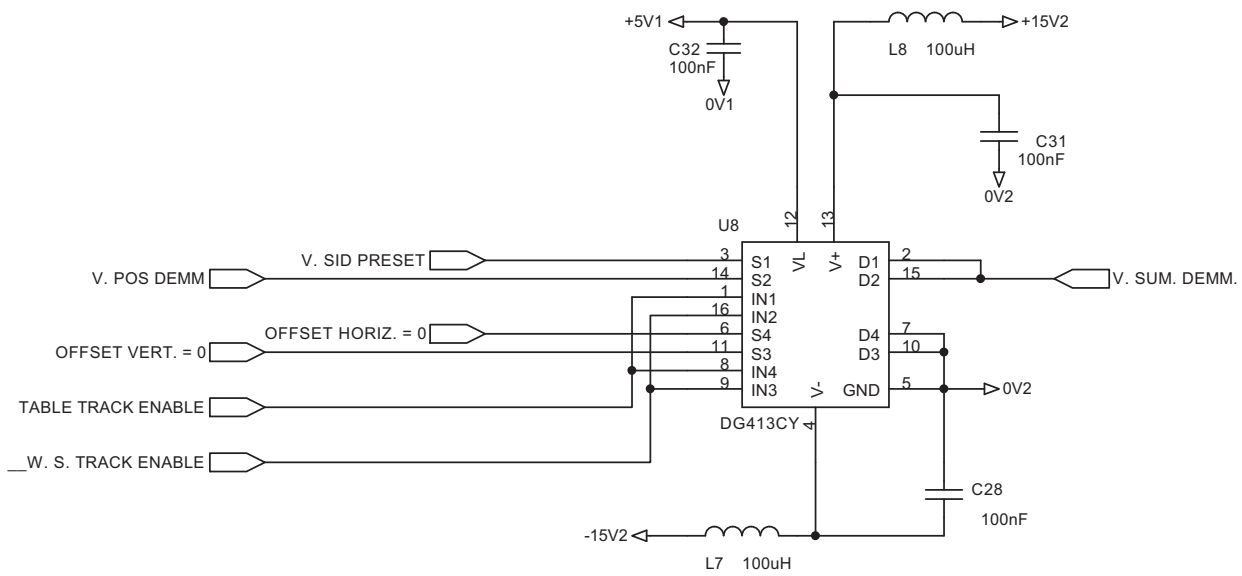
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<b>NOVA SYSTEM CONTROL</b>		
Size	Document Number	Rev
<b>A3</b>	<b>PBA S0013450REV1 (PCB S007381REV2)</b>	<b>1</b>
Date:	Tuesday, January 27, 2009	Sheet 2 of 5



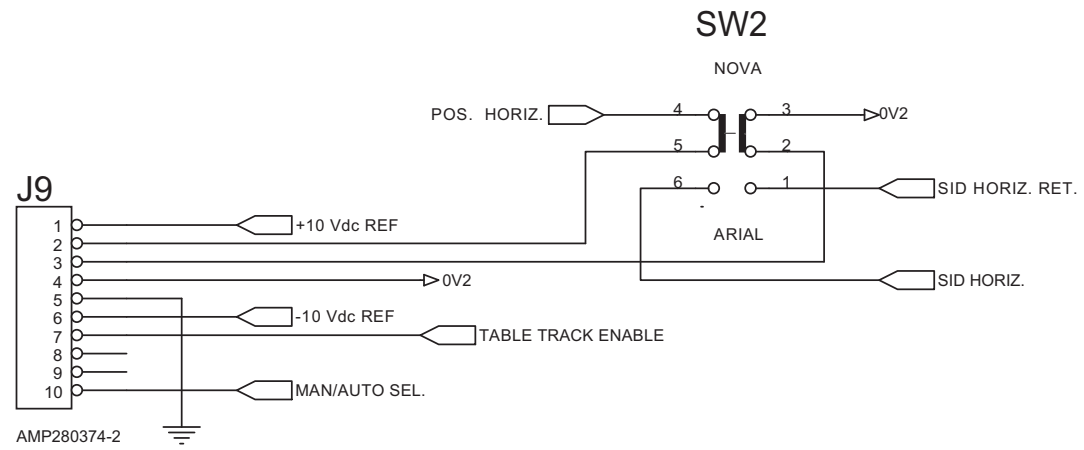
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Size	Document Number	Rev
<b>A3</b>	<b>PBA S0013450REV1 (PCB S007381REV2)</b>	<b>1</b>
Date:	Tuesday, January 27, 2009	Sheet 3 of 5



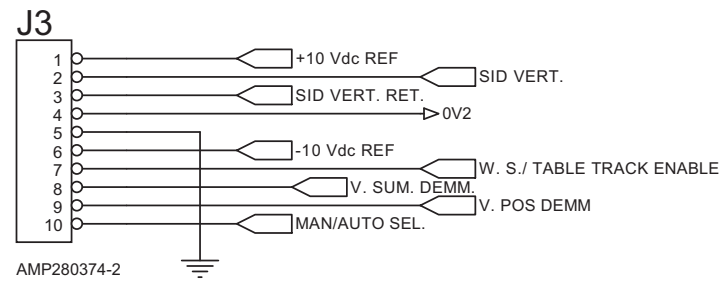
Title		
<b>NOVA SYSTEM CONTROL</b>		
Size	Document Number	Rev
<b>A3</b>	<b>PBA S0013450REV1 (PCB S007381REV2)</b>	<b>1</b>
Date:	Tuesday, January 27, 2009	Sheet 4 of 5



Default configuration  
for SID = 110 cm  
1. OFF  
2. ON  
3. ON  
4. OFF



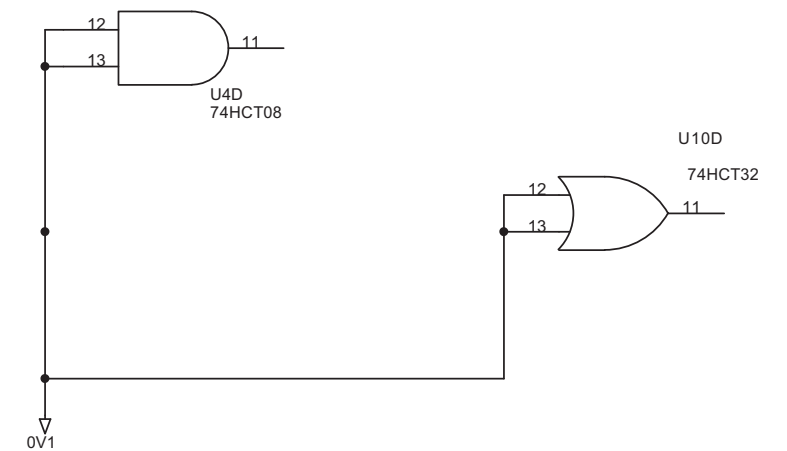
TABLE

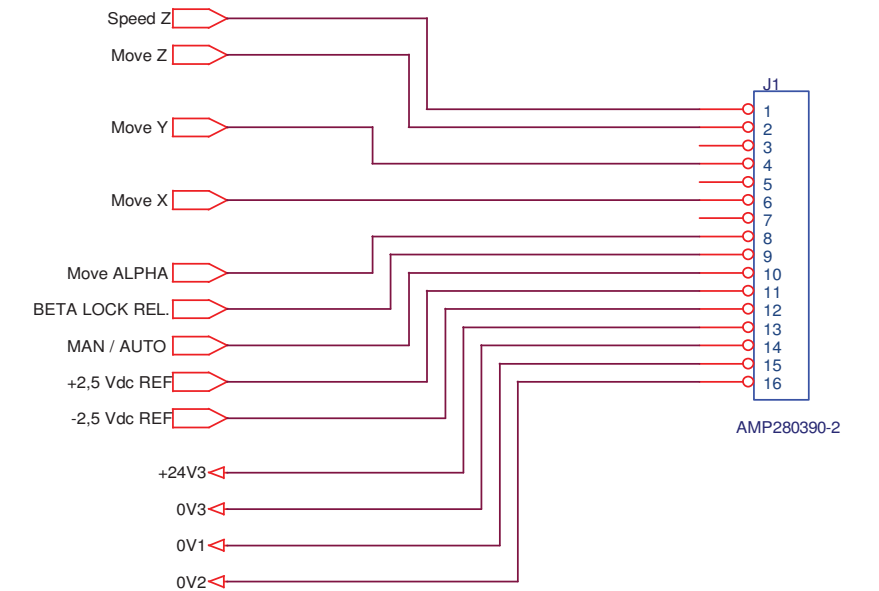
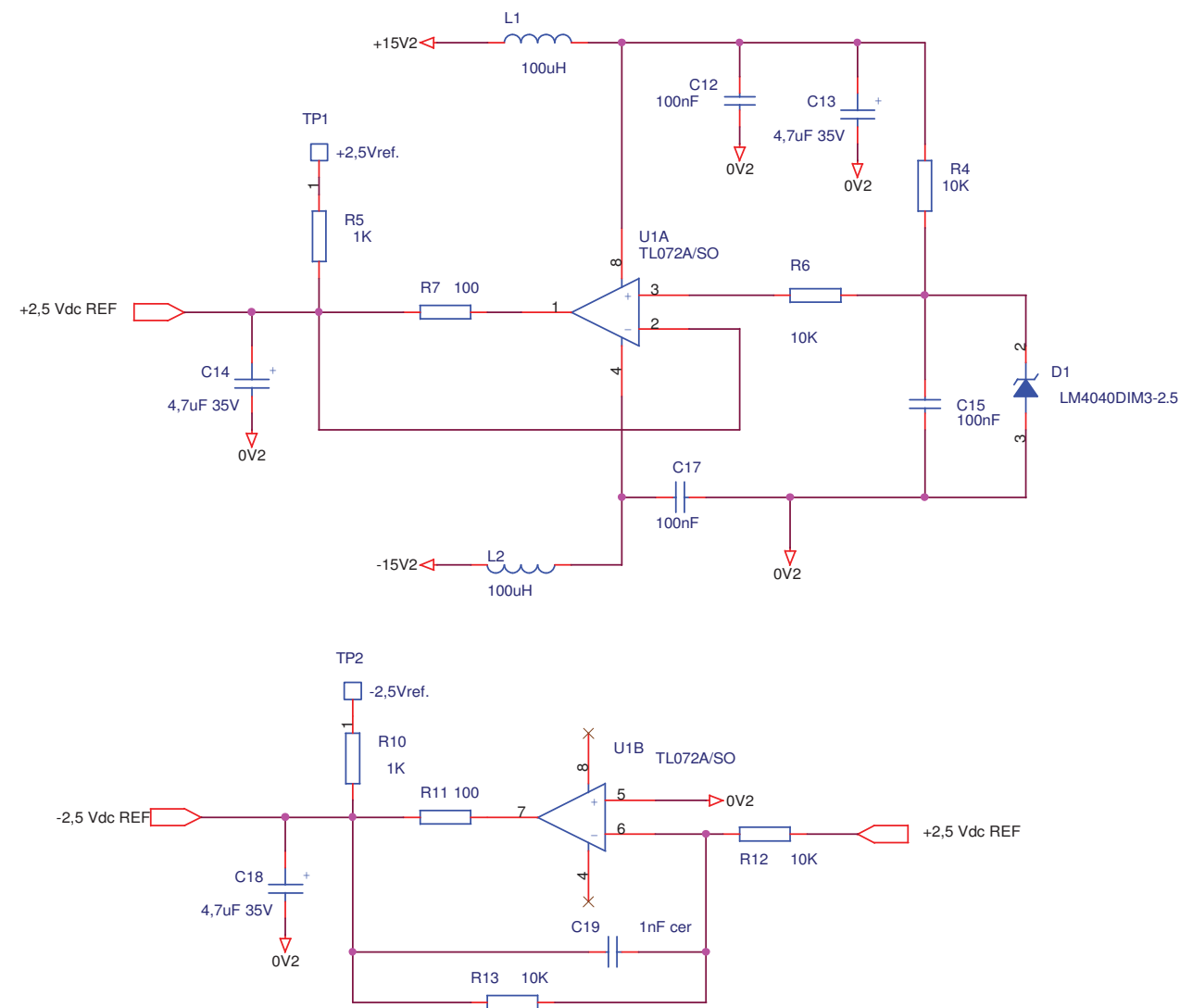
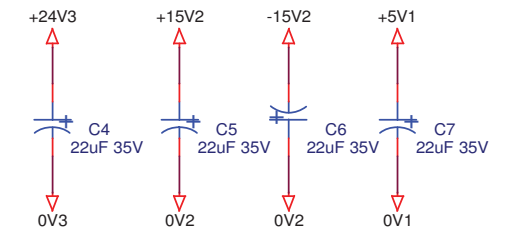
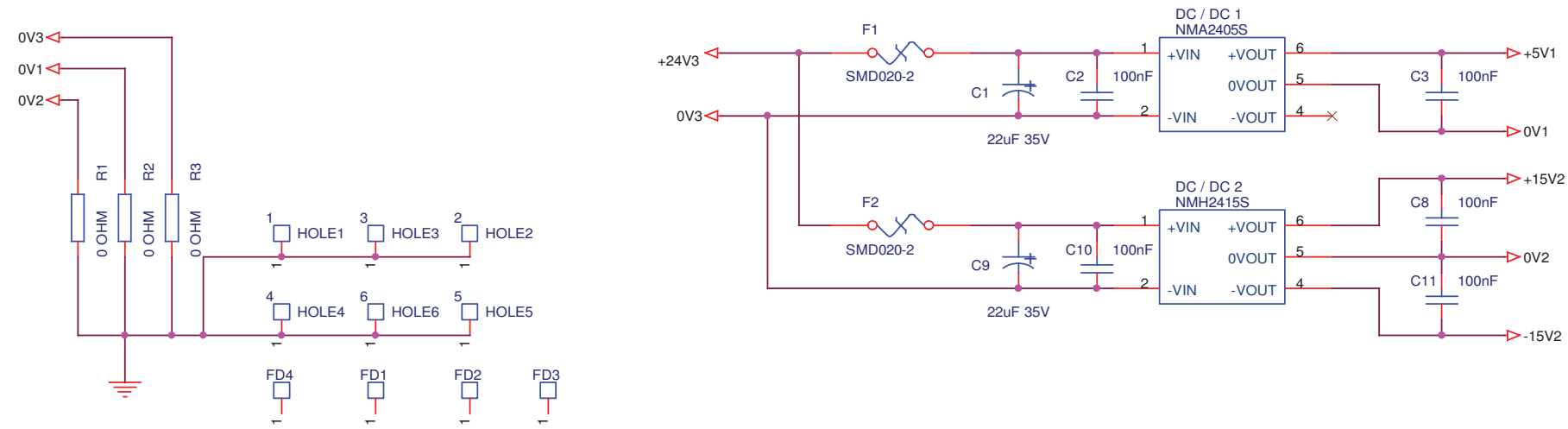


COLUMN ( NOVA )

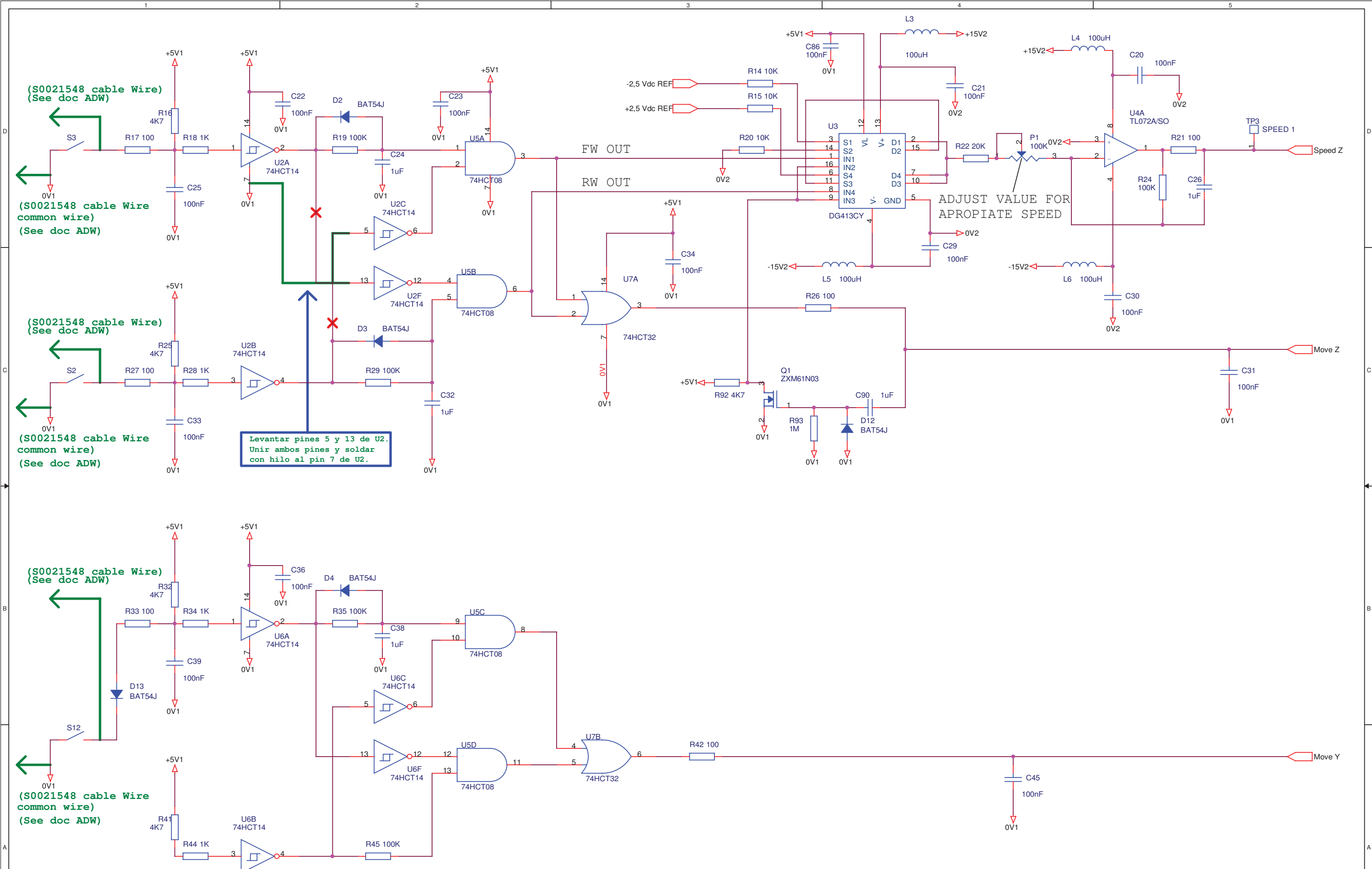
U8 STATUS TABLE

MODE	S1	S2	S3	S4
TABLE MAN.	<del>ON</del>	<del>ON</del>	OFF	OFF
W. STAND MAN.	<del>ON</del>	<del>ON</del>	OFF	OFF
TABLE AUTO	ON	OFF	OFF	ON
W. STAND AUTO	OFF	ON	ON	OFF





REV	DESCRIPTION	ISSUED BY	DATE	NAME	DATE	SHEET / OF	S0024589						
				DRAWING	J. Cebrián	10/02/2010	1/4						
				REVISED	S. Pérez	10/02/2010					B	A	← REV
B	NC 17/0284	J.Clemente	27/06/17	<b>SEDECAL</b>		<b>Z MOTORIZED NOVA TRACKING KEYBOARD</b>							
A	09/384	J.Cebrián	02/10										
REV	DESCRIPTION	ISSUED BY	DATE										



(S0021548 cable Wire)  
(See doc ADW)

(S0021548 cable Wire)  
common wire)  
(See doc ADW)

(S0021548 cable Wire)  
(See doc ADW)

(S0021548 cable Wire)  
common wire)  
(See doc ADW)

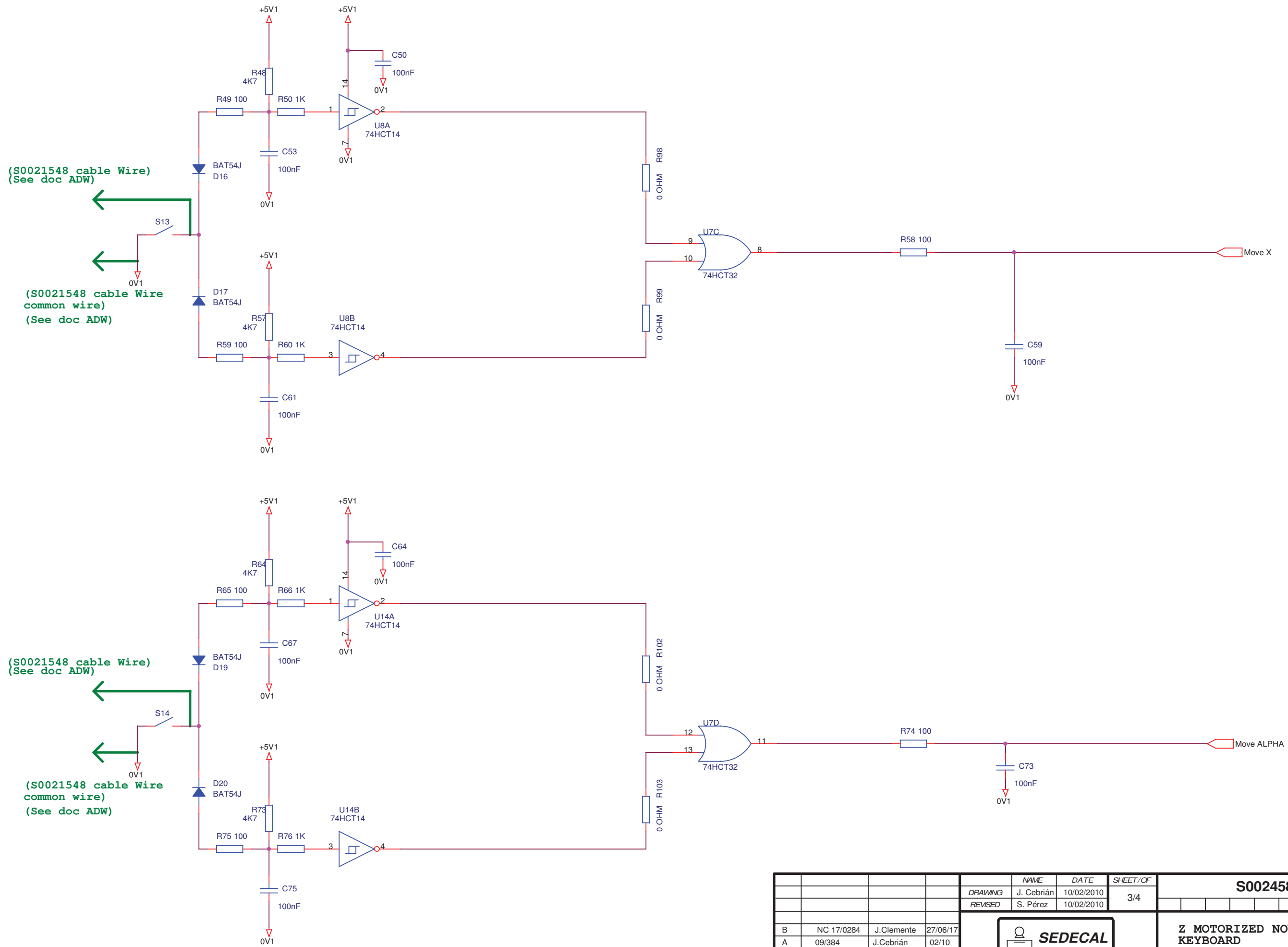
(S0021548 cable Wire)  
(See doc ADW)

(S0021548 cable Wire)  
common wire)  
(See doc ADW)

Levantarse pines 5 y 13 de U2.  
Unir ambos pines y soldar  
con hilo al pin 7 de U2.

ADJUST VALUE FOR  
APROPIATE SPEED

				NAME	DATE	SHEET/OF	S0024589			
DRAWING				J. Cebrián	10/02/2010	2/4				
REVISED				S. Pérez	10/02/2010					
B	NC 17/0284	J.Clemente	27/06/17							Z MOTORIZED NOVA TRACKING KEYBOARD
A	09/384	J.Cebrián	02/10							
REV	DESCRIPTION	ISSUEDBY	DATE							



(S0021548 cable Wire)  
(See doc ADW)

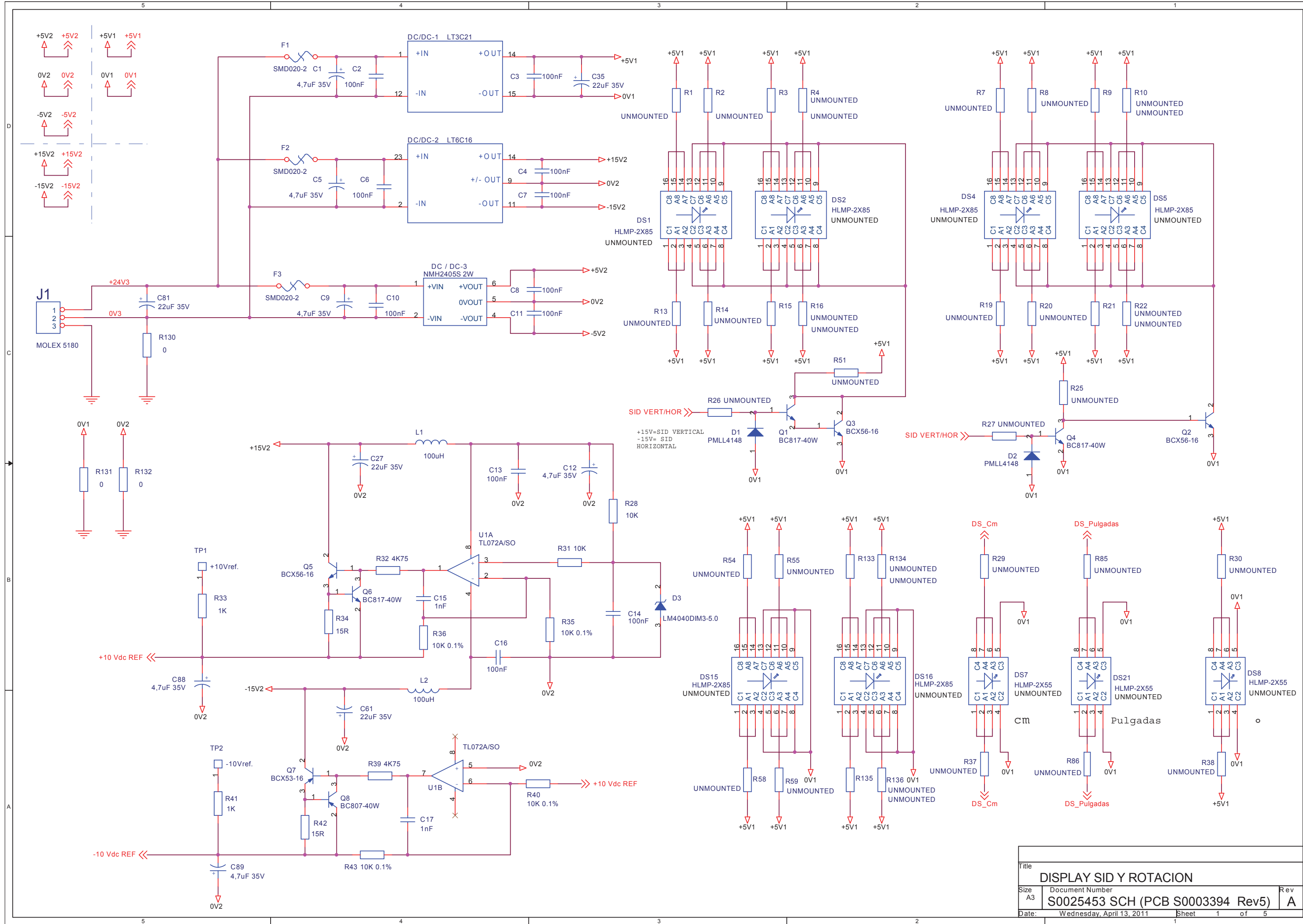
(S0021548 cable Wire  
common wire)  
(See doc ADW)

(S0021548 cable Wire)  
(See doc ADW)

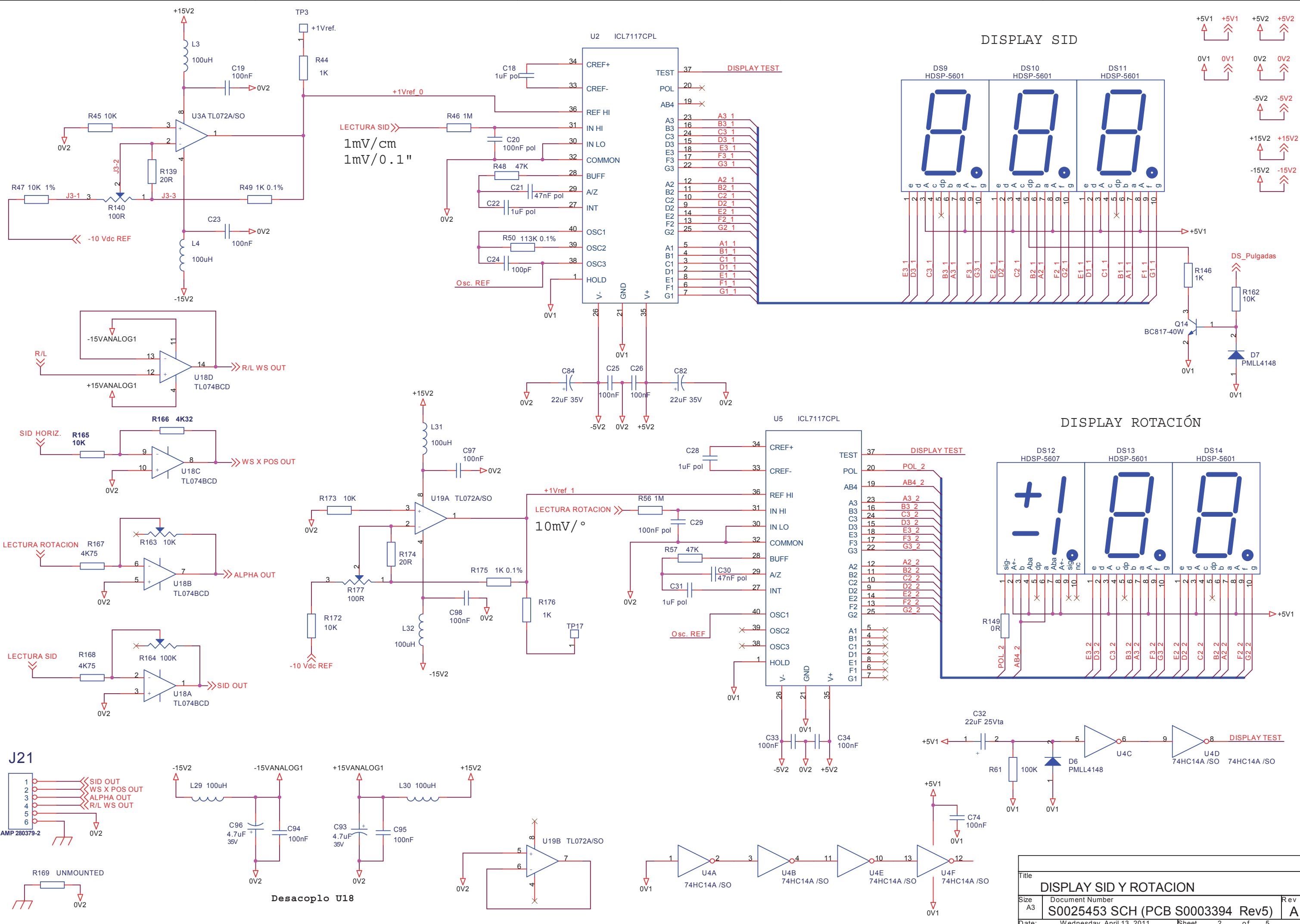
(S0021548 cable Wire  
common wire)  
(See doc ADW)

REV	DESCRIPTION	ISSUED BY	DATE	DRAWING	NAME	DATE	SHEET / OF	S0024589						
				REVISED	S. Pérez	10/02/2010	3/4					B	A	← REV
B	NC 17/0284	J.Clemente	27/06/17									<b>Z MOTORIZED NOVA TRACKING KEYBOARD</b>		
A	09/384	J.Cebrián	02/10											





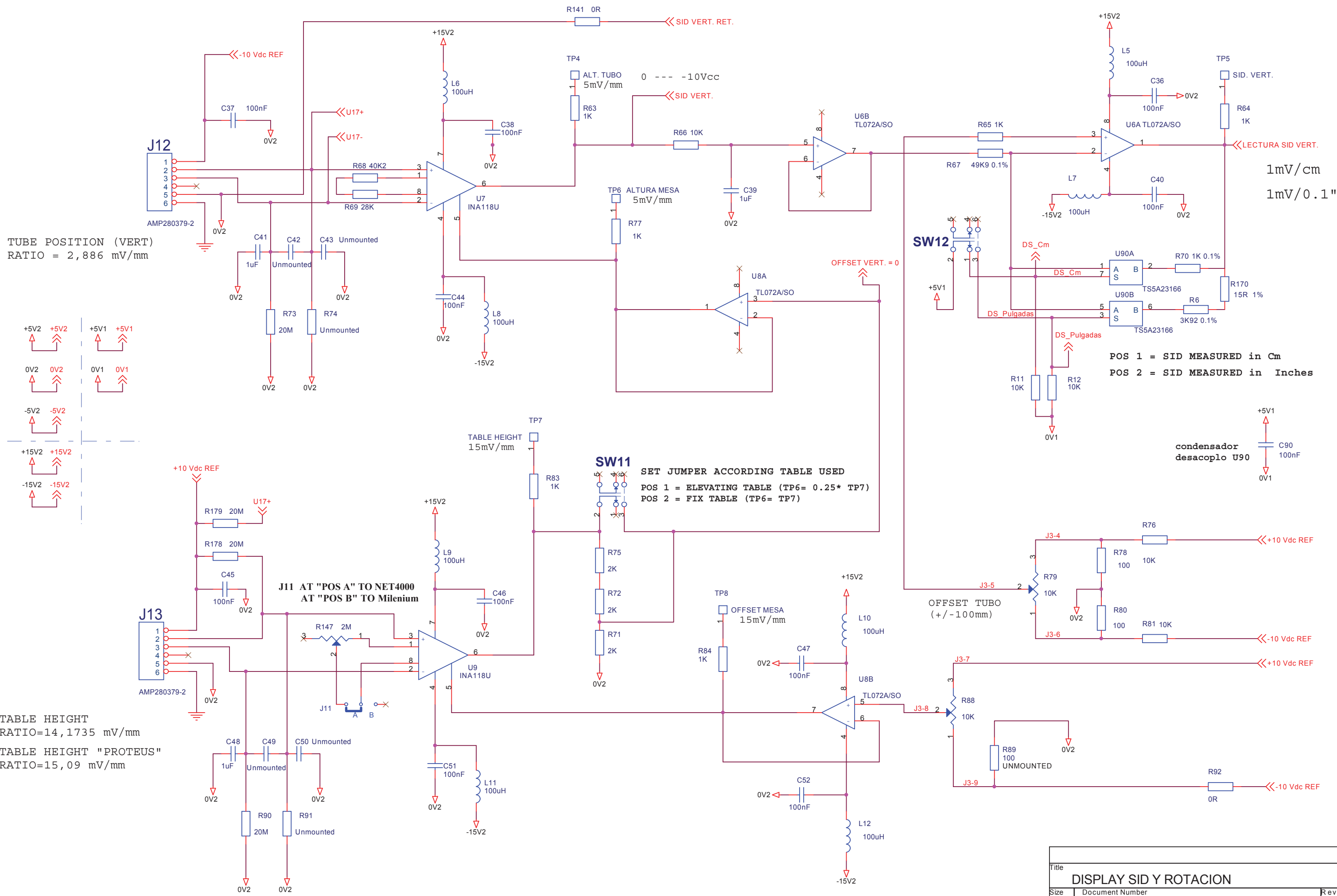
Title		
DISPLAY SID Y ROTACION		
Size	Document Number	Rev
A3	S0025453 SCH (PCB S0003394 Rev5)	A
Date:	Wednesday, April 13, 2011	Sheet 1 of 5



DISPLAY SID

DISPLAY ROTACIÓN

Title		
DISPLAY SID Y ROTACION		
Size	Document Number	Rev
A3	S0025453 SCH (PCB S0003394 Rev5)	A
Date:	Wednesday, April 13, 2011	Sheet 2 of 5



TUBE POSITION (VERT)  
RATIO = 2,886 mV/mm

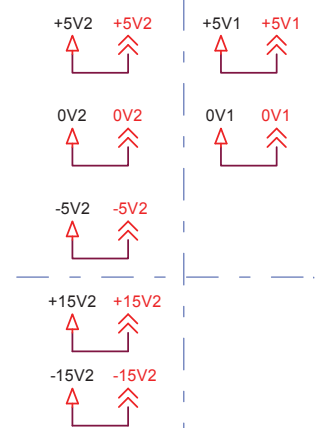


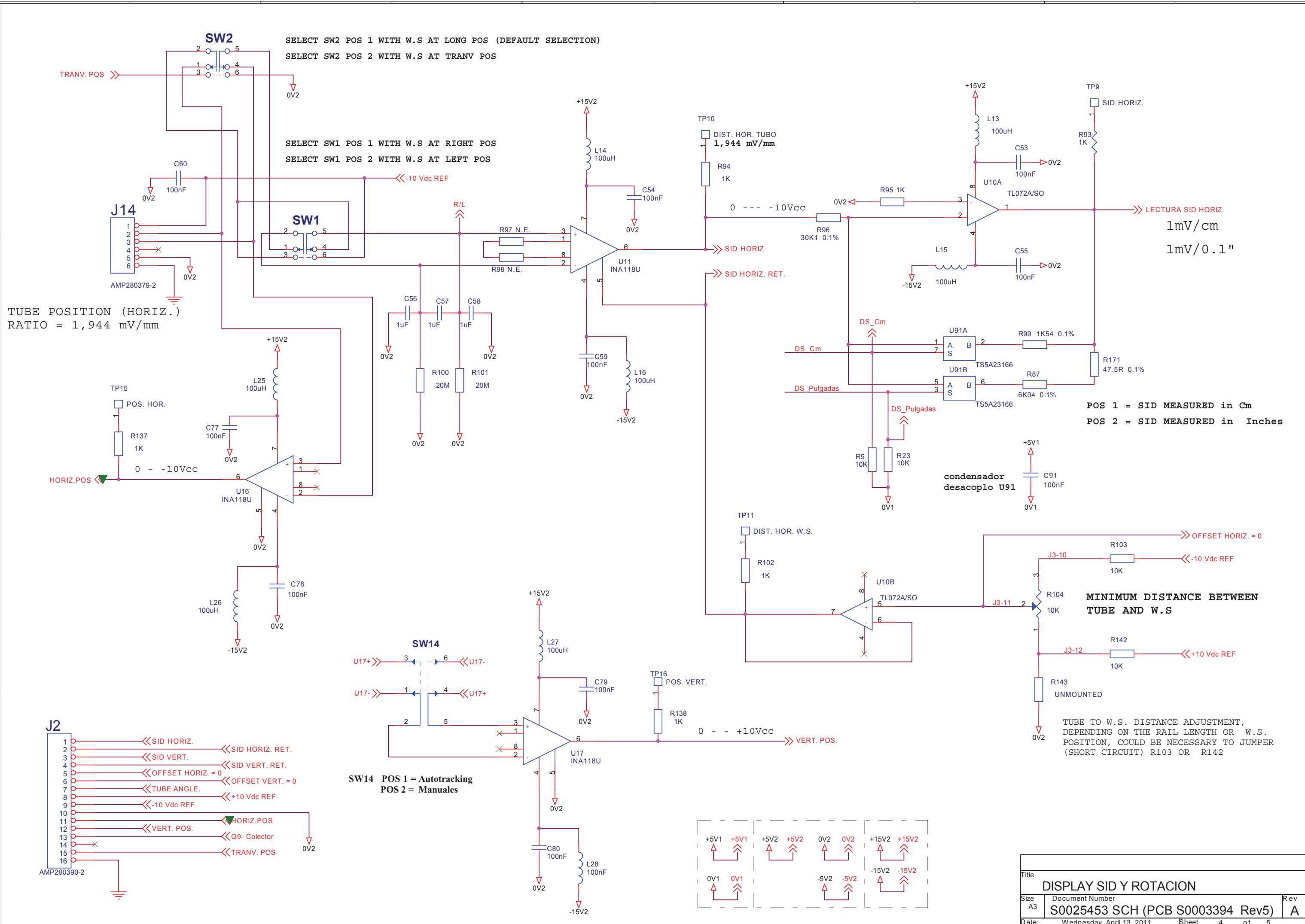
TABLE HEIGHT  
RATIO=14,1735 mV/mm  
TABLE HEIGHT "PROTEUS"  
RATIO=15,09 mV/mm

**SW11**  
SET JUMPER ACCORDING TABLE USED  
POS 1 = ELEVATING TABLE (TP6= 0.25\* TP7)  
POS 2 = FIX TABLE (TP6= TP7)

POS 1 = SID MEASURED in Cm  
POS 2 = SID MEASURED in Inches

condensador desacoplo U90

Title		
DISPLAY SID Y ROTACION		
Size	Document Number	Rev
A3	S0025453 SCH (PCB S0003394 Rev5)	A
Date:	Wednesday, April 13, 2011	Sheet 3 of 5



TUBE POSITION (HORIZ.)  
RATIO = 1,944 mV/mm

SELECT SW2 POS 1 WITH W.S AT LONG POS (DEFAULT SELECTION)  
SELECT SW2 POS 2 WITH W.S AT TRANV POS

SELECT SW1 POS 1 WITH W.S AT RIGHT POS  
SELECT SW1 POS 2 WITH W.S AT LEFT POS

SW14 POS 1 = Autotracking  
POS 2 = Manuales

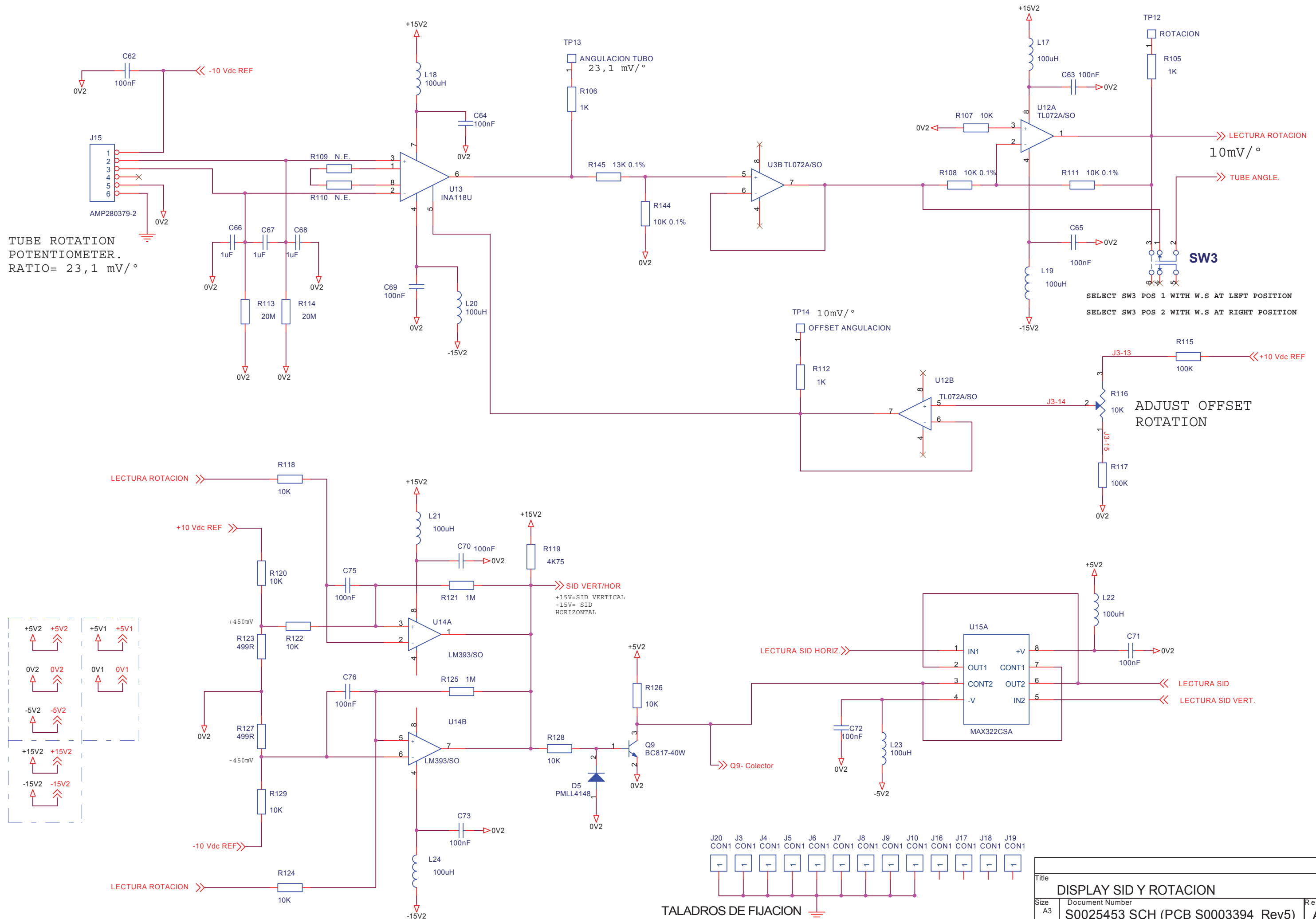
POS 1 = SID MEASURED in Cm  
POS 2 = SID MEASURED in Inches

MINIMUM DISTANCE BETWEEN  
TUBE AND W.S

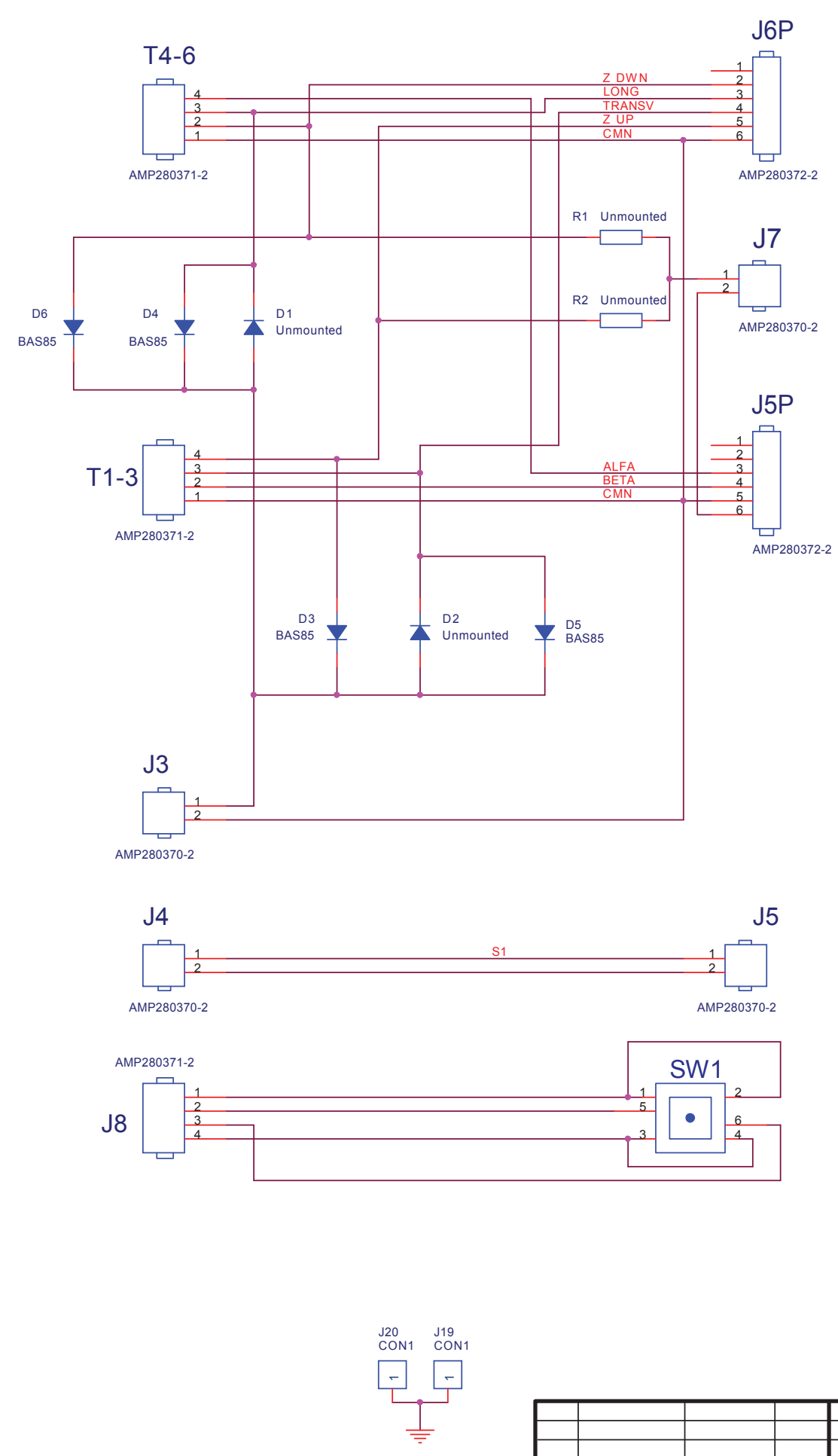
TUBE TO W.S. DISTANCE ADJUSTMENT,  
DEPENDING ON THE RAIL LENGTH OR W.S.  
POSITION, COULD BE NECESSARY TO JUMPER  
(SHORT CIRCUIT) R103 OR R142

Title		
DISPLAY SID Y ROTACION		
Size	Document Number	Rev
A3	S0025453 SCH (PCB S0003394 Rev5)	A
Date:	Wednesday, April 13, 2011	Sheet 4 of 5

TUBE ROTATION  
POTENTIOMETER.  
RATIO= 23,1 mV/°



Title		
DISPLAY SID Y ROTACION		
Size	Document Number	Rev
A3	S0025453 SCH (PCB S0003394 Rev5)	A
Date:	Wednesday, April 13, 2011	Sheet 5 of 5



				NAME	DATE	SHEET / OF	<b>PBA S0025488 (PCB S0024656)</b>				
				DRAWING	J. Cebrián	11/04/2011	1/1				
				REVISED	F. Diaz	11/04/2011			A ← REV		
						<b>ADAPTACION TECLADOS AUTOTRACKING CON GALGA</b>					
A	11/071	J.Cebrián	04/11								
REV	DESCRIPTION	ISSUED BY	DATE								