



# Procedure for installing and removing ARGOS LSGW on the telescope

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### Change Record

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## 1 Scope

This document describes the procedure for installing and removing the ARGOS LGSW on its support table on telescope.

## 2 Applicable documents

No.	Title	Number & Issue
AD 1		
AD 2		

### 3 Notes

The initial condition of the installing procedure assumes that the ARGOS LGSW is stored in its flight case, deposited on top of clean room roof at 3L. This procedure ends with the LGSW clamped on its dedicated table on telescope, pushed against the mechanical references, with all cabling properly connected and air and cooling flows enabled.

The removal procedure begins when the power to the LGSW its electronic rack is turned off and it finishes with the LGSW secured into its flight case and properly stored on 3L.

### 4 Required personnel

- Procedure Supervisor
- Telescope operator.
- Crane operator.
- Two persons to perform the procedure.
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### 5 Required material

1. M6x25 socket head cap screws and washers
  2. 2x M12x35 socket head cap screws and washers
  3. 2x M12x60 socket head cap screws and washers
  4. 5mm (M6) Allen wrench
  5. 10mm (M12) Allen wrench
  6. Lifting frame
  7. LGSW flight case
  8. 4x lifting pads
  9. 4x side clamp
  10. Small clamps
  11. PC driver
  12. Sheets of optic paper
  13. Paper tape
  14. 3x PatCam thermal insulation cover
  15. PC driver thermal insulation cover
  16. Telescope Crane
  17. Crane scale
-

## 6 Equipment description

### 6.1 Lifting pads

They are 4 aluminium blocks that can be bolted to the edge of the LGSW board through M12 screws: 2x 35mm for the front ones, 2x 60mm for the rear ones. The rear pads are thicker to keep the lifting straps away from the connector panel. Each pad has on its top side 2x M6 eyebolts where the bottom lifting straps of the lifting frame are fixed.



Figura 1. Detail on one of the LGSW lifting pads when it is connected to the lifting frame.

### 6.2 LGSW lifting frame

It is an aluminium frame needed to hang the LGSW to the crane. It has a series of 8x 1m long straps: 4 are hosted on the top part of the frame and are connected to the crane hook, 4 are on the bottom part of the frame and are connected to the LGSW lifting pads. Connection ringbolts are permanently attached to the lifting straps.

When it is not used to handle the LGSW the lifting frame must be stored in the ARGOS shelves on 3L.



Figura 2. Pictures of the LGSW lifting frame taken during the DX-LGSW shipment.

### 6.3 LGSW flight case

This is the shipping / storage box for the LGSW. It is provided with 6 wheels to be easily pulled around. The box top must be handled at least by 2 people. On the box base the LGSW board base is engraved in the foam so its position is kept fixed within the box.

To avoid dust contamination as much as possible this flight case must be stored on top of clean room roof at 3L.

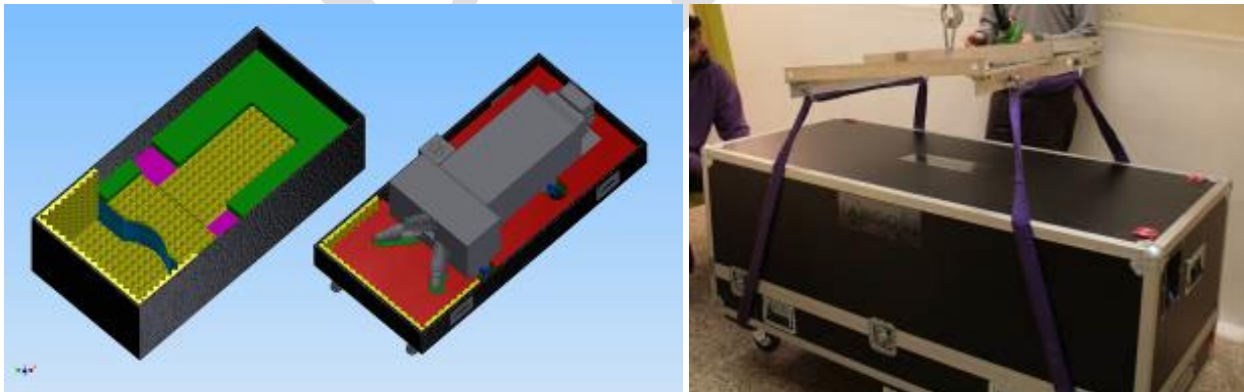


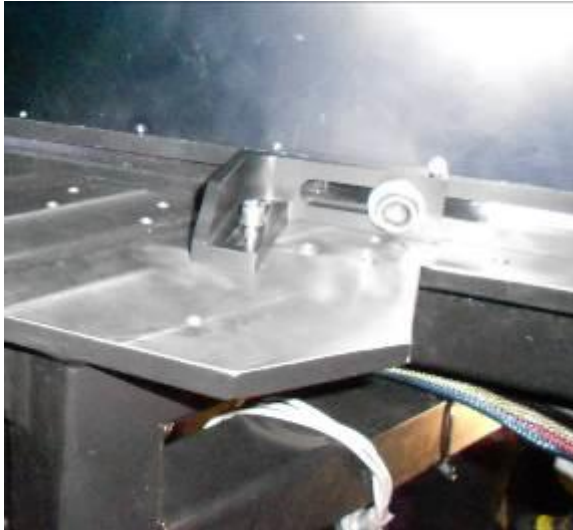
Figura 3. Drawing of the LGSW flight case (left) and picture of the full DX flight case before being shipped from Arcetri premises.

### 6.4 Side clamp

These are custom made clamps needed to secure the LGSW on the table on telescope.

When the LGSW is in operation these clamps are tightly secured to the table. When the LGSW is stored they are preserved in the ARGOS cabinet #0 on 3L.

They are fixed to the LGSW through M12x35 socket head screws, while they are fixed to the table through M6x30 socket head cap screws.



## 6.5 Small clamp

These are standard Thorlabs CL5 clamp. They are used to secure the LGSW in its table when installed on telescope.

When the LGSW is in operation these clamps are tightly secured to the table. When the LGSW is stored they are preserved in the ARGOS cabinet #0 on 3L.

They are fixed to the table through M6x30 socket head cap screws.

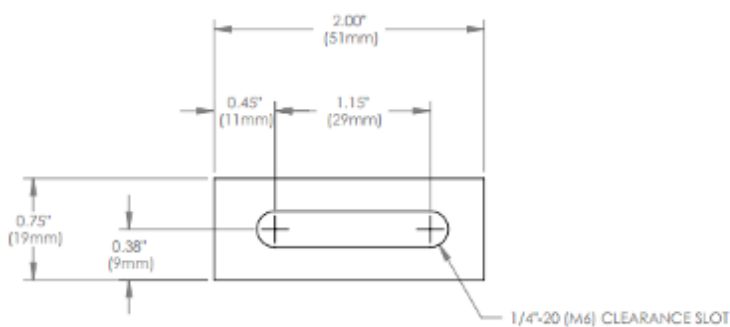


Figure 4. Sketch of the Thorlabs CL5 table clamps.

## 6.6 Pockels cell driver

This device is needed to apply the high voltage necessary to operate the ARGOS Pockels cells.

When the LGSW is in operation the driver is connected to the LGSW through its dedicated plug, and it is secured to the table through 3x small clamps. When the LGSW is stored the driver is preserved in the ARGOS cabinet #0 on 3L.





Figura 5. Pockels cell driver connected to the DX-LGSW in the lab.

## 6.7 PnCCD camera fabric cover

This is a fabric part used to protect the PnCCD camera.

When the LGSW is in operation the cover is attached to the rear of the LGSW, covering the PnCCD exposed pins and allowing to flush dry air around the camera volume. When the LGSW is stored the cover is preserved in the ARGOS cabinet #0 on 3L.



Figura 6. Image of the PnCCD fabric cover mounted on DX-LGSW.

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## 6.8 PatCams thermal insulation covers

These are three rubber covers needed to shield the Patrol cameras to avoid thermal contamination of the surrounding environment.

When the LGSW is in operation the covers are covering the 3 LGSW PatCams. When the LGSW is stored the covers are preserved in the ARGOS cabinet #0 on 3L.



## 6.9 PC driver thermal insulation cover

This is a Styrodur cover needed to shield the PC driver to avoid thermal contamination of the surrounding environment.

When the LGSW is in operation the cover is surrounding the PC driver. When the LGSW is stored the cover is preserved in the ARGOS cabinet #0 on 3L.



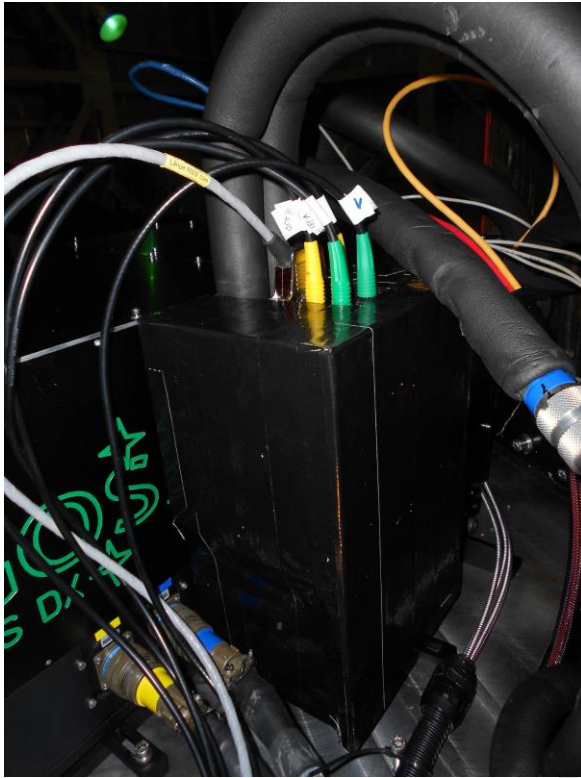



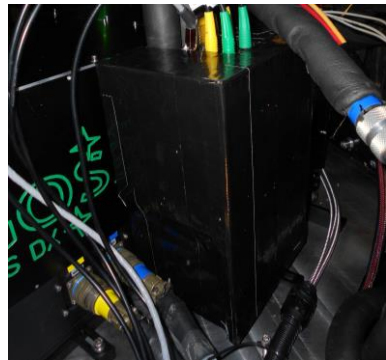



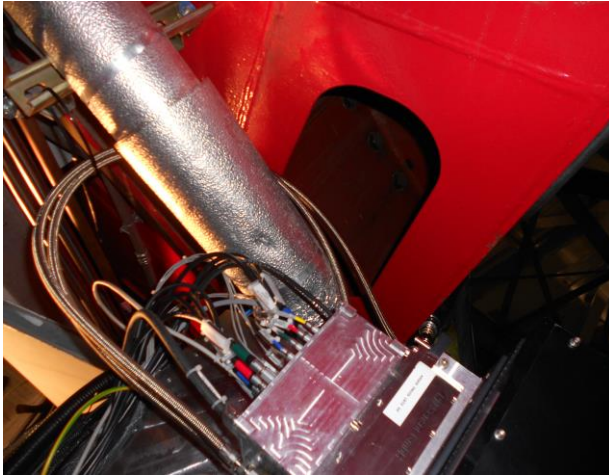


Figura 7. Image of the PC driver cover.

## 7 Installation of the ARGOS LGSW DX SX

#	Procedure	By	Time
<b>PREPARATION</b>			
1.	Bring the LGSW flight case and the lifting frame from 3L to the instrument galley LVL 6 		
2.	From ARGOS cabinet #0 take the LGSW box #1 to LVL 6 and leave it below the LGSW table, in front of the upper tree house		
3.	Deploy LUCI calibration unit		
4.	Lock LUCI rotator in the Upper Right Tree House		
5.	Move the crane to the instrument gallery on LVL 6		
6.	Open the flight case top (2 people needed)		
7.	Verify that the 4 lifting pads are tightly secured to the LGSW board and that each pad is provided with 2 eyebolts		
8.	Verify that the 2 black valves on the ingoing cooling line to the LGSW manifold is switched off		
9.	Verify that the 2 green valves of the PnCCD camera cooling on C-ring are switched off		
<b>LGSW INSTALLATION</b>			
10.	Attach the lifting frame to the crane at LVL 6 		
11.	Verify that each one of the 4 lower lifting stripes of the frame has 2 D-shackles attached		
12.	Secure each D-shackle to the correspondent eyebolt of the lifting pads:		

			
13	Lift the LGSW from the flight case and fly it over the telescope to the support table		
14	Once the LGSW weight is completely supported by the table unload the lifting device		
15	Disconnect the D-shackles from the eyebolts and fly away the lifting frame to the front of the instrument gallery on LVL 6		
16	Using a 10mm Allen wrench loose the 4x M12 screws holding the lifting pads		
17	<p>Replace the lifting pads with the side clamps, match the vertical slot of the side clamp on the proper M6 hole and tight the M12 screw. Then secure each side clamp to the table with an M6 screw.</p> 		
18	Store the lifting pads in the LGSW box		
19	Secure the 4x side clamps to the table using M6x25 socket head cap screws (provided with washers) using a 5mm Allen wrench		
20	<p>Install the small CL5 clamps all around the LGSW board:</p> <ul style="list-style-type: none"> <li>• 3x clamps on the camera board edge</li> <li>• 4x clamps on the PatCam board edge</li> <li>• 5x clamps on the long edge, facing the primary</li> <li>• 4x clamps on the long edge, facing the LUCI cable wrap</li> </ul>		



			
UNIT SETUP ON TELESCOPE			
21	Take the the Pockels cell driver from the LGSW box and connect it on the LGSW pushing it against the connectors panel facing the LUCI cable wrap		
22	Secure the Pockels cell driver to the table using 2x small clamps and M6x25 socket head cap screws (provided with washers)		
23	Take the Pockels cells driver thermal cover from the LGSW box and install it on the driver itself		
24	 <p>Connect the cooling pipes to the LGSW manifold below the table to:</p> <ul style="list-style-type: none"> <li>• PatCams</li> <li>• PC driver</li> </ul> 		
25	Connect the cooling pipes from PnCCD camera to the circuit on C-ring		

				
26	<p>Connect one short end of the the dry air pipe to the quick connector on the LGSW connectors panel:</p> 			
27	<p>Connect the 3x power lines and Ethernet cables that are secured below the table to the rear side of the GE1360 cameras of the PatCams matching the blue-yellow-red color code:</p>			



				
28				
29	<p>Connect the HV and 4 BNC cables to the PC driver, properly matching the names between BNCs and driver plugs:</p>			



			
30	<p>Connect the 2 cables provided with Amphenol connectors to the NSA motors derivation box on the LGSW connector side matching the blue-yellow color code:</p> 		
31	<p>Screw the Ethernet cable with black head connector on the LGSW connectors panel:</p> 		
32	<p>Connect the 3 sets of LEMO and BNC connectors of the PI mirrors, the blue-yellow-red color code and naming (axis1, axis2, pzt1, pzt2, pzt100V) must be matched:</p>		



33	<p>Connect the power line for the internal THOR:</p>		
34	<p>Connect the 3 optical fibers for the internal calibration unit, matching the blue-yellow-red color code:</p>		
35	<p>Connect the PnCCD cable bundles to the camera plugs matching the names and colors:</p>		



					
36.	<p>Connect the grounding to the PnCCD camera head</p> 				
37	<p>Secure the second short end of the dry air pipe to the PnCCD camera cable bundle</p>				
38	<p>Fix the fabric cover for the PnCCD camera to the rear of the LGSW enclosure using the velcum and then clamp the bottom part to the small clamps that hold the LGSW board</p> 				
39	<p>Close the cover zipper and tight the stripe on the PnCCD cable bundle:</p>				

			
40	<p>Remove the optic paper taped to the PatCams entrance:</p> 		
<b>UNIT START UP</b>			
41	Open the black valves on the cooling line to LGSW manifold		
42	Open the green valves on the C-ring for the PnCCD camera cooling		
43	Unlock the LUCI rotator in the DX upper threehouse		
44	Park LUCI calibration unit		
<b>PARTS STORAGE</b>			
45	Store the lifting frame and the flight case on the ARGOS shelves at 3L		
46	Store the LGSW box #1 in the ARGOS cabinet #0 at 3U		






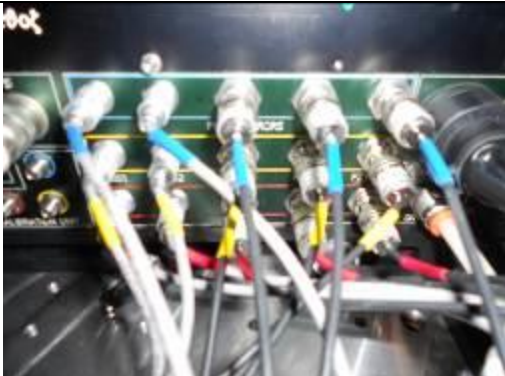
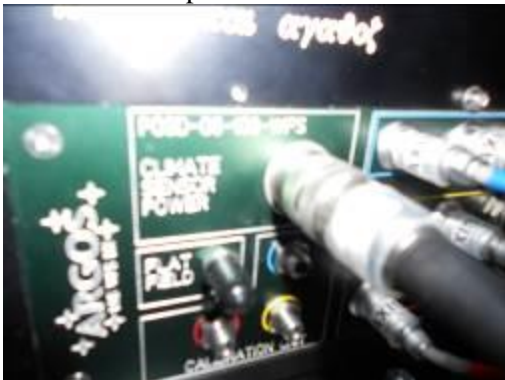


## 8 Removal of the ARGOS LGSW DX SX


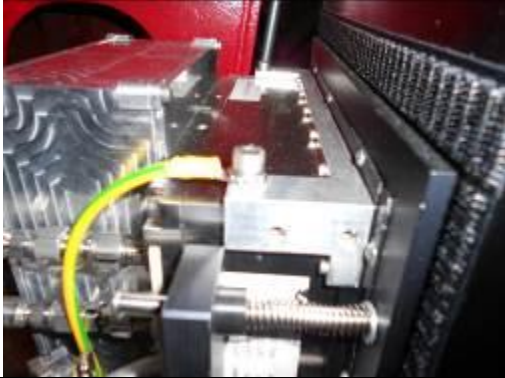
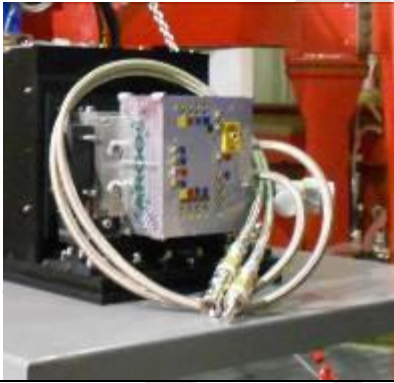
#	Procedure	By	Time
<b>PREPARATION</b>			
47.	Take the lifting frame and LGSW flight case from the ARGOS shelves at 3L and bring them to LVL 6		
48.	Take the lifting pads and the LGSW box #1 in the ARGOS cabinet #0 at 3U and bring it to LVL 6, close to the Upper Tree House, below the LGSW table.		
49.	Deploy LUCI calibration unit		
50.	Lock LUCI rotator in the Upper Right Tree House		
51.	Switch off ARGOS LGSW rack and cooling		
52.	Bring the crane on front of the instrument gallery at LVL 6 and hang the LGSW lifting frame to it		
53.	Roll the LGSW flight case (or a wheeled table) of front of the instrument gallery on LVL 6		
<b>LGSW DISCONNECTION</b>			
54.	Close the 2 black cooling valves of the manifold below the LGSW table (inlet first) 		
55.	Close the 2 green cooling valves of the PnCCD on the C-Ring (inlet first) and disconnect the 2 Rectus quick connectors 		
56.	Disconnect the Stucchi quick connectors on the Pockels cells and Patrol cameras cooling:		

	<ul style="list-style-type: none"> <li>• 3x are directly attached to the manifold below the table</li> <li>• 1x is secured behind the Pockels cells driver, once unplugged secure the part attached to the manifold below the LGSW table</li> </ul>		
			
57.	<p>Remove the 3x thermal shieldings from the Patrol cameras cutting the cable ties and store it in the LGSW box #1</p> 		
58.	<p>Disconnect the Ethernet and the power cables from the three Patrol cameras, secure the 2 cable bundles below the table</p>		
59.	<p>Disconnect the 4 BNC and the HVC cables from the Pockels cells driver</p>		





			
60.	Remove the Pockels cells driver thermal shielding and store it in the LGSW box #1		
61.	Remove the 2 small CL5 clamps that hold the Pockels cells driver on the table, disconnect it from the LGSW side pulling it toward the edge of the table. Store all the material it in the LGSW box #1		
62.	Disconnect the 2 Amphenol connectors of the Mocon cables		
			
63.	Disconnect the Ethernet cable of the Internal THOR unit and the dry air pipe		
			
64.	Disconnect the 3 sets of PI cables. Each set is composed by 2 LEMO connectors and 3 BNCs. Secure them aside the LGSW table.		

			
65.	<p>Disconnect the power line for the Internal THOR unit and the 3 fibers.</p> 		
66.	<p>Secure all the side cables on the edge of the LGSW table</p>		
67.	<p>Remove the 2 clamps on the rear of the LGSW board that are holding the PnCCD camera fabric cover</p> 		
68.	<p>Open the zip and remove the PnCCD camera fabric cover</p> 		

69.	<p>Disconnect all the PnCCD camera cables and secure them on the tail of the table</p> 		
70.	<p>Remove the grounding from the PnCCD camera head</p> 		
71.	<p>Secure the PnCCD camera cooling pipes on the 2 sides of the camera mount using cable ties</p> 		
<b>LGSW REMOVAL</b>			
72.	<p>Remove all the small CL5 clamps around the LGSW board and store them in the LGSW box, with bolts and washers.</p>		

			
73.	<p>Remove the 4x side clamps and store them on the LGSW box together with their screws and washers</p> 		
74.	<p>Install the 4x lifting pads</p>		
75.	<p>Crane the lifting frame on top of the LGSW, taking care of avoiding collisions with the red beams of the instrument gallery and swing arms end stops on top of the C-ring structure</p>		
76.	<p>Secure the lifting frame to the eyebolts on the 4 LGSW lifting pads</p> 		
77.	<p>Put the lifting straps in tension and push the LGSW out of the table profile, on top of M1</p>		
78.	<p>Crane the LGSW over the flight case (or the wheeled table)</p>		

				
79.	Unload the lifting frame straps and release the lifting frame from the LGSW			
LGSW STORAGE				
80.	Protect the 3 LGSW entrance windows with optical paper fixing it with paper tape			
				
81.	Close the flight case top			
82.	Roll the flight case on 3L together with the lifting frame where the ARGOS storage shelves are			
83.	Bring the LGSW box on 3U and store it in the ARGOS cabinet #0			
84.	Park LUCI calibration unit and unlock roator in the URTH			



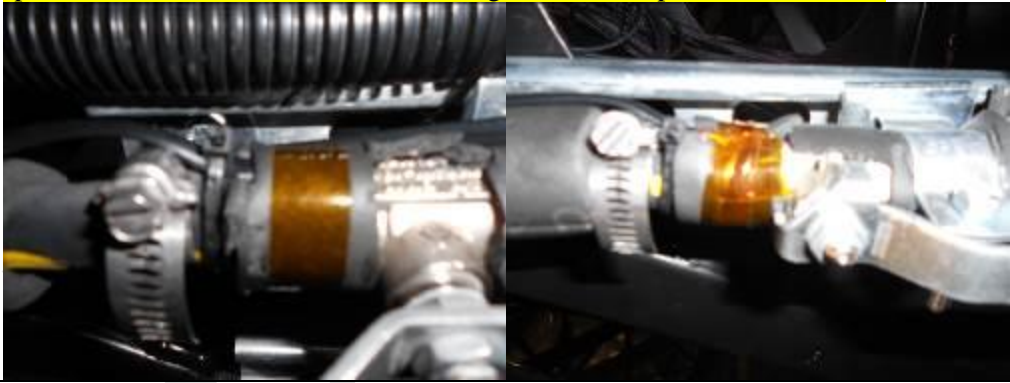
## 9 Removal of the ARGOS LGSW table DX SX

### REQUISITES




- LGSW must have been removed from the table and properly stored
- To allow the table repositioning 2 pins must be inserted between the table and the rotator gallery before the removal procedure starts



### MATERIAL NEEDED

- 3x M16 eyebolts
- Telescope Crane
- LGSW box #1
- 5mm, 8mm Allen wrenches



#	Procedure	By	Time
PREPARATION			
1.	Verify that the ARGOS cooling is powered off		
2.	Verify that the LUCI calibration unit is deployed		
3.	Verify that the LUCI rotator is locked		
4.	Verify that the black valves of the LGSW cooling manifold are closed		
5.	Bring LGSW box #1 on the bottom of the LGSW table in front of the Upper Tree House (if properly stored it can be found in the ARGOS cabinet #0 at 3U)		
6.	Remove the 2 THOR sensor probes from the cooling manifold inlet and outlet <b>WARNING:</b> these probes are very delicate and should be handled with care. Keep special attention to not break the soldering between the probe and its cable.		
			
7.	Remove the 2 THOR sensor probes below the LGSW table plane <b>WARNING:</b> these probes are very delicate and should be handled with care. Keep special attention to not break the soldering between the probe and its cable.		




			
<p>8.</p>	<p>Remove the THOR sensor attached to the table side, over the manifold <b>WARNING:</b> these probes are very delicate and should be handled with care. Keep special attention to not break the soldering between the probe and its cable.</p> 		
<p>9.</p>	<p>Remove the THOR sensor from the Pockel cell driver and Patrol cameras outlet cooling lines <b>WARNING:</b> these probes are very delicate and should be handled with care. Keep special attention to not break the soldering between the probe and its cable.</p> 		
<p>10.</p>	<p>Secure together the 7 THOR sensor probes and protect them with bubble plastic before removing them from the table</p>		

			
<p>11.</p>	<p>Free the THOR sensors cable from the cable ties and remove it from below the table. Secure them in the LGSW cable tray.</p> 		
<p>12.</p>	<p>Free the Patrol Cameras Ethernet and power cables from the cable ties and extract them from the bottom of the table. Secure them in the LGSW cable tray.</p>		

			
<p>13.</p>	<p>Disconnect the dichroic cables and the LUCI interlock from the connector box below the dichroic mount</p> 		
<p>14.</p>	<p>Free and remove the dichroic cables and the LUCI interlock cable from below the LGSW table and secure it in the LGSW cable tray</p>		

			
<p>15.</p>	<p>Free and remove the LGSW cables that are secured on the side of the table and secure it in the LGSW cable tray:</p> <ul style="list-style-type: none"> <li>• 4x BNC cables and an HV cables for the Pockels cell driver</li> <li>• 2x Mocon cables</li> <li>• Ethernet and power cable for the Internal THOR</li> <li>• 3x sets of PI cables (each one made by 2 strain gauge cables with LEMO connectors and 3 coaxial cables with BNC connectors)</li> <li>• 3x optical fibers</li> </ul>		
<p>16.</p>	<p>Remove the dry air T junction that is bolted on the edge of the table and store it in the LGSW box and secure it to the C-ring</p> 		



17.	Free and remove the blue air pipe from the tail of the table and secure it in the LGSW cable tray		
18.	Remove the grounding cable from the tail of the table and secure it in the LGSW cable tray		
19.	Remove the 2 hose clamps from the LGSW manifold on side of the table <b>WARNING:</b> since the pipes can be in over pressure glycol can spill out of the pipes, so it is better to hold a bucket below the manifold and protect the surrounding material with absorbing tissue		
			
20.	Clog the 2 hoses with a plug		
21.	Extract the cooling pipes from below the table and secure them below the LGSW cable tray		
			
<b>LGSW TABLE REMOVAL</b>			
22.	Screw the 3x M16 eyebolts on the table plane as shown below		
			
23.	Move the telescope crane over the table and attach it to the eyebolts		
24.	Tension the lifting straps		
25.	Remove the 16 M12 screws using a 10mm Allen wrench		



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26.	Crane out the table over M1 up to the front of the instrument gallery at LVL 6		
27.	Unload the table on top of a cart		
28.	Unlock the LUCI rotator		
29.	Park the LUCI calibration unit		
LGSW TABLE STORAGE			
30.	Roll the cart to 3L where the ARGOS storage shelves are		
31.	Store the LGSW box #1 on the ARGOS cabinet #0 at 3U		

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