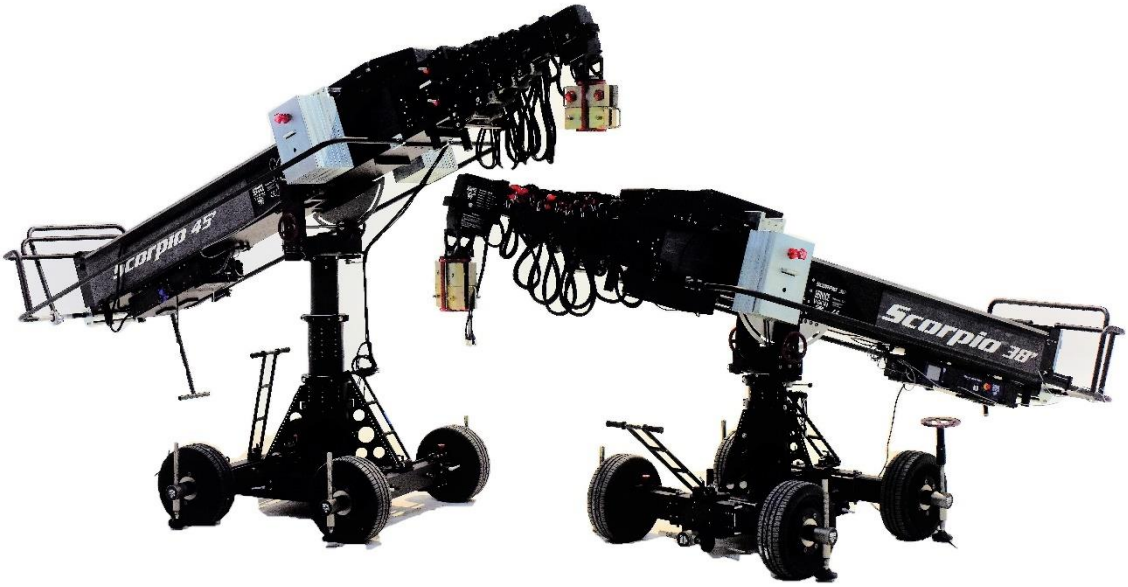
Servicevision Bis S.L.

Scorpio 38’ - 45’

User’s manual v1.02



0 INDEX

1 TECHNICAL INFORMATION

1.1 BASIC INFORMATION

The Scorpio cranes are a 4 telescopic sections cranes with a dynamic counterweight system to compensate the balance weight during motion. They are capable to perform smooth movements in high and slow speed with reduced noise of the telescopic arm movement.

It is possible to mount any kind of head up to 70kg including camera package in the underslung position. There is also the possibility to mount the leveling head in the over slung position to get more lens high with 35kg of maximum payload for the head and the camera package in this configuration.

The range of movement in the Tilt axis (55º up from the horizontal position and 43º down from the horizontal position) allows the Scorpio cranes to get an amazing high lens in a small footprint which makes it perfect for any situation.

The dollies are prepared for mounting gripping bars to push the crane along 1m dolly tracks or use the pneumatic wheels from the base that pivot over the center tires making it easy to relocate the crane around the set. On the Scorpio 38’ model the dolly can also be collapsed in order to introduce the crane through narrow spaces or mount it in 62 cm tracks.

The column is made with telescopic motorized sections controlled from the hand command of the crane. This allows to lift the column fast and smoothly without the need of any extra tool than the crane itself.

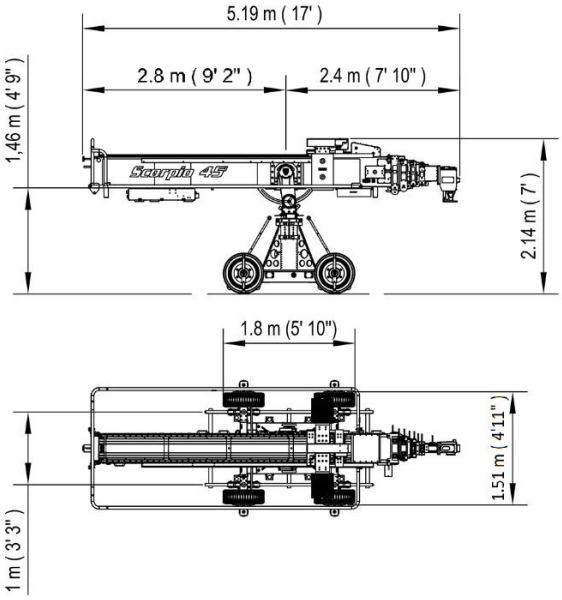
The features incorporated in the electronic box such as Arc Compensation, the possibility to program limits on the movement of the arm or the possibility to record movements and play them back as many times as needed with high precision makes this crane the best option for repetitive moments scenarios or to get those shots that require a hard level of coordination between different members of the crew.

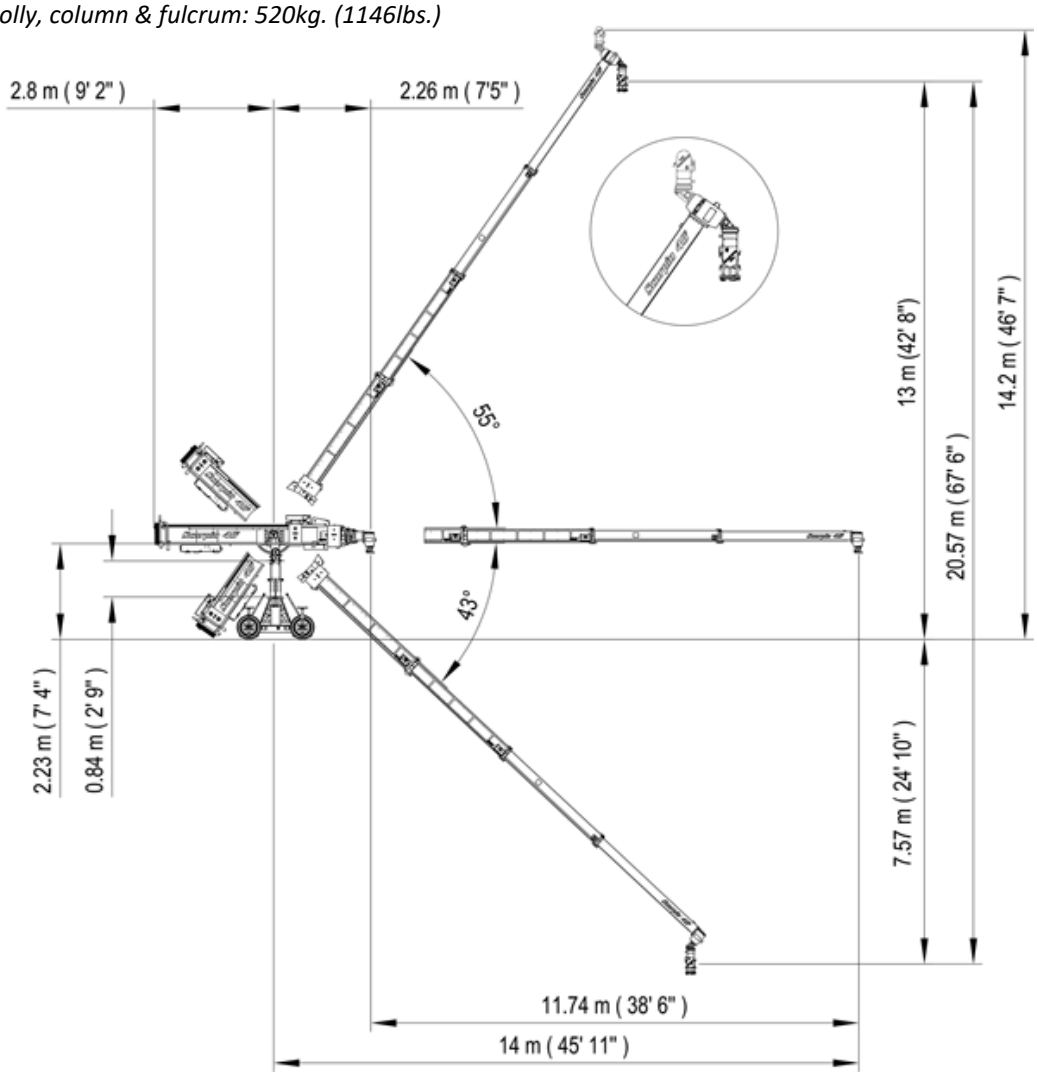
The new external display allows to operate from both sides of the crane while being able to see all the information data displayed on the screen (arm range, height of the optic, pan, and tilt degrees…).

The Scorpio cranes match perfectly with any Scorpio Head. This combination of head and crane can work together allowing the user to perform new features such as back pan or the *tracking feature*: the possibility to set one point in space and lock the head in that point while the arm moves around.

1.2 TECHNICAL SPECIFICATIONS 45'

Max length:	*14m (45'11'')*
Min. length:	*2,26m (7'5'')*
Back length of the arm:	*2,8m (9'2'')*
Telescopic Range:	*11,74m (38'6'')*
Max. optic height:	*14,2m (46'7'')*
Telescopic column range:	*0,84m (2'9'')*
Payload in Underslung:	*70kg (154lbs)*
Payload in Over slung:	*35kg (77lbs)*
Power requirements:	*AC 220 v/ 32 A*
	AC 110 v/ 32 A
Output power for head:	*DC 30 v/ 20 A*
Output power for monitor:	*DC 12 v/ 3 A*
Speed of the arm:	*2,6 m/s*
Weight of the crane empty:	*1486kg. (3276lbs.)*
Max. Weight when loaded:	*2473,1kg. (5452lbs.)*
Weight of the arm (empty):	*691kg. (1523.3lbs.)*
Weight of the dolly, column & fulcrum:	*520kg. (1146lbs.)*

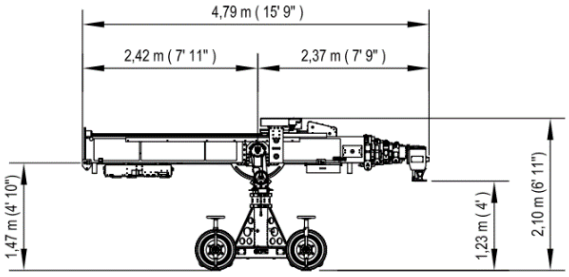


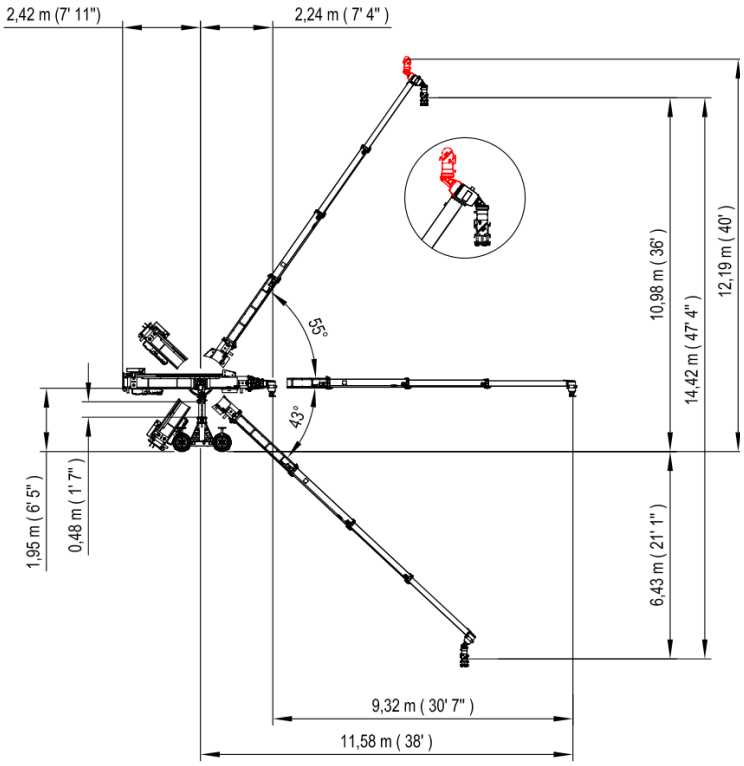


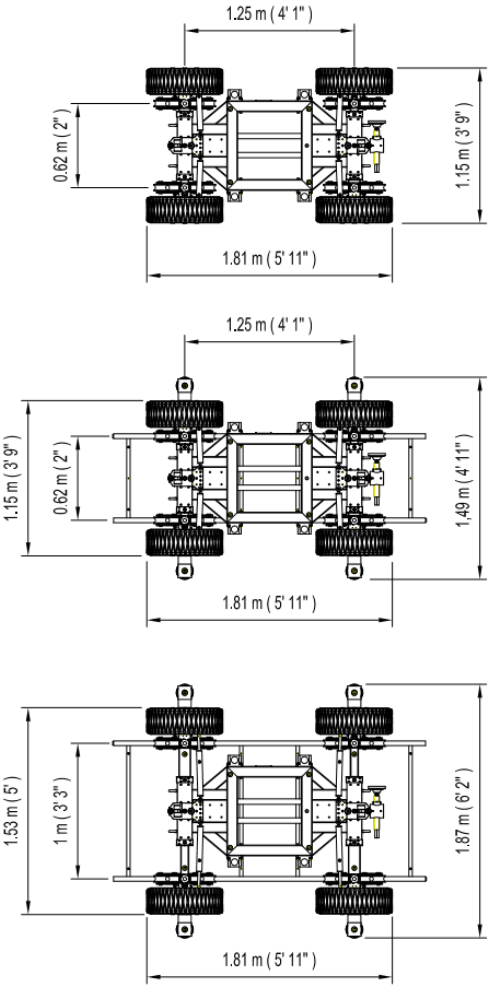
1.3 TECHNICAL SPECIFICATIONS 38'

Max length:	*11,58m (38')*
Min. length:	*2,24m (7'4'')*
Back length of the arm:	*2,42m (7'11'')*
Telescopic Range:	*9,32m (30'7'')*
Max. optic height:	*12,19m (40')*
Telescopic column range:	*0,48m (1'7'')*
Payload in Underslung:	*70kg (154lbs)*
Payload in Over slung:	*35kg (77lbs)*
Power requirements:	*AC 220 v/ 16 A*
	AC 110 v/ 16 A
Output power for head:	*DC 30 v/ 20 A*
Output power for monitor:	*DC 12 v/ 3 A*
Speed of the arm:	*2,6 m/s*
Weight of the crane empty:	*1316 kg. (2900lbs.)*
Max. Weight when loaded:	*2123kg. (4680lbs.)*
Weight of the arm (empty):	*533kg. (1175lbs.)*

Weight of the dolly, column & fulcrum: 503kg. (1109lbs.)

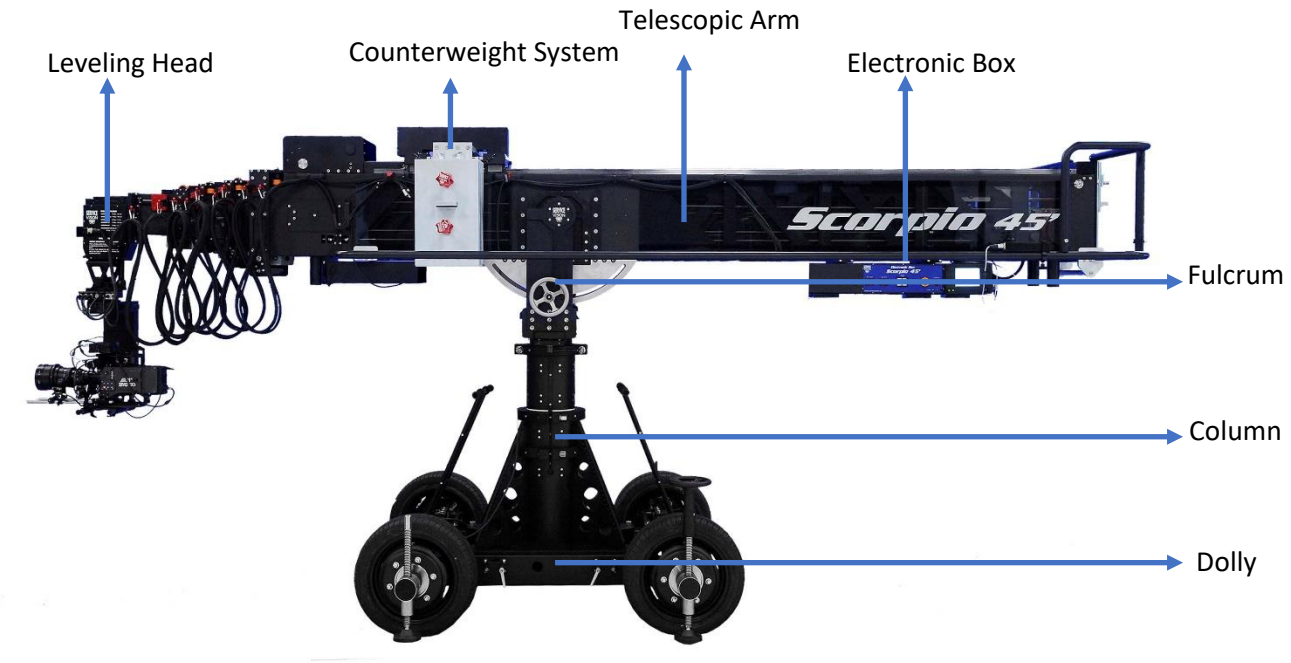






2 PARTS AND COMPONENTS DESCRIPTION

This is a general view of the components of the SCORPIO telescopic cranes:



02.00 Parts of the crane

The dolly is the part that locates the crane in the position where it will be operated, either with the travelling wheels or the dolly wheels.

The Column holds the arm and can be extended or retracted automatically to the desired high of the arm to perform different movements depending on the needs of the user.

The fulcrum is where the arm pivots in the pan and tilt. The information from the movement of the arm is gathered from here.

The Telescopic arm can be extended or retracted in order to reach different positions for the remote head. It has a counterweight support to keep it balanced in any position.

The Electronic box is the main brain of the crane. All the electronic components are located in the Electronic box and the Leveling Head.

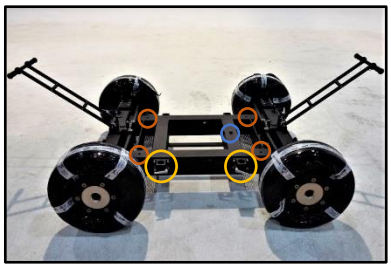
The Leveling Head holds the level automatically when the telescopic arm moves up and down.

Beside the crane, there are some accessories that are needed in order to operate the crane and to do regular maintenance of the crane. In the following chapters there will be a brief description of every component of the crane and the adjustments that can be done by the user.

2.1 DOLLY

2.1.1 45' DOLLY BASE

The dolly is the base of the crane, it can be pushed with 48mm or 50mm Aluminum pipes attached into the supports by tightening the white knobs in the supports for pushing bars. These supports can also be used as a storage point for the Leveling Jacks of the dolly. There are 8 supports for pushing bars.

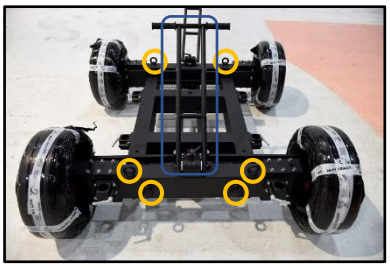


02.01 Dolly 45' completely assembled

A - Supports for pushing bars

B - Guiding pin for the column

C - Threads for the column



02.02 Dolly frontal view

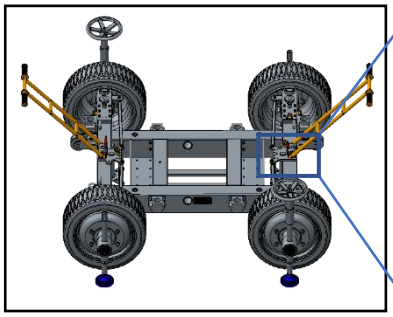
A – Rings for straps

B – Steering handle

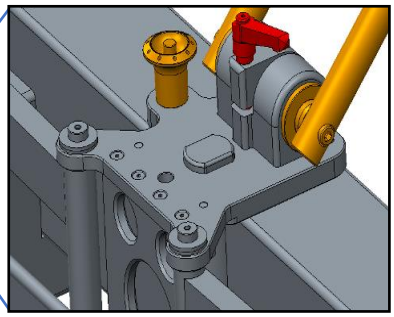
The threads in the dolly and the guiding pin are used to attach the column to the dolly. In the *chapter 9 Documentation* there is a drawing with the dimensions of this attachment.

There are 8 strap rings to hold the arm. This strap rings are just to hold the arm from the dolly, DO NOT lift the whole crane from here.

The Scorpio 45' has a dolly with 2 independent steering handles and pneumatic wheels that allow the movement of the crane through tight corners. The steering handles can be locked introducing the locking pin (*D12x25mm*) in the locking position.



02.03 Steering Handles in gold color



02.04 Detail of the steering handle

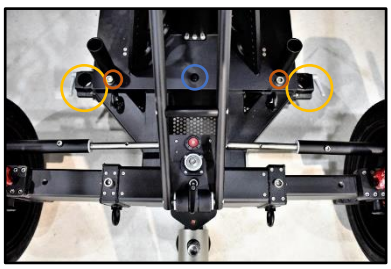
A – Friction knob

B – Locking pin for steering handle

2.1.2 38' DOLLY BASE

The dolly in the 38' model is slightly different than the 45'. It has 4 supports to attach 48mm or 50mm pushing bars and two independent steering handles to maneuver the crane. The steering handles can be locked introducing the locking pin (*D12x25mm*) in the locking position.

The threads in the dolly and the guiding pin are used to attach the column to the dolly. In the *chapter 9 Documentation* there is a drawing with the dimensions of this attachment.

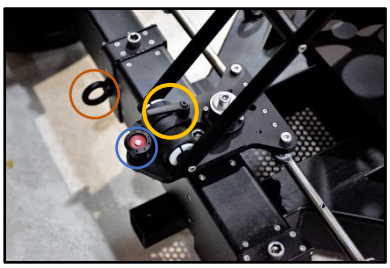


02.05 Dolly parts

A - Supports for pushing bars

B - Guiding pin for the column

C - Screws for the column



02.06 Detail of the steering handle

A – Friction knob

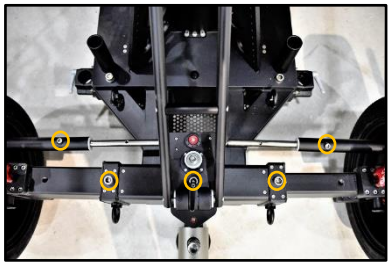
B – Locking pin position for steering handle

C – Rings for straps

There are 8 strap rings to hold the arm. These CANNOT be used to lift the crane from here.

The SCORPIO 38’ has a collapsible dolly. It can be readjusted to fit 62cm tracks and 1m tracks.

02.07 Dolly leveling jack introduced



02.08 Screws to remove to collapse

To do so, block the direction of one side, and attach the squared leveling jack in that side of the dolly to lift the base on that side. Use the steering wheel for leveling jacks *(Ref. 7639)* to lift it.

Once the dolly is supported by the Jack and the other 2 wheels, remove the 3 screws from the dolly and the 2 screws of the wheel’s pantograph (*marked in fig. 02.08).* With all the screws loosen, push from both sides in order to introduce one arm into the other. Once they are aligned in the closed position, mount all the screws again and repeat the operation in the other side of the dolly.

02.08b Steering Handles in gold color

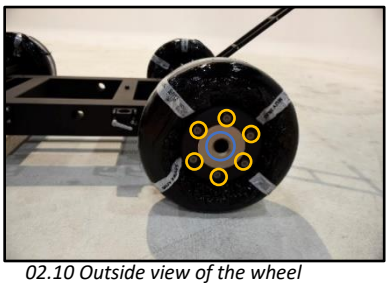
It might be possible that the locking bolt for the locking screw on the collapsible arms for the dolly (*fig.02.08b)* falls down once the screws from *fig.02.08* are removed. This part is used to lock the arm in the extended position of the arms, in the collapsed position it can be removed and stored away. To introduce it, slide it from the bottom part of the arm with the threads for the screw facing the upper part of the arm, then attach the screw while holding this part until it stops spinning and it’s locked.

02.09 38’ Dolly with column in both positions

	Scorpio 38’ *62cm track*	**Scorpio 38’** *1m track*	**Scorpio 45’** *1m track*
Length	1800 mm / 5’10’’	1800 mm / 5’10’’	1800 mm / 5’10’’
Width w/out Leveling Jacks	1150 mm / 3’9’’	1530 mm / 5’	1512 mm / 4’11’’
Width w/ Leveling Jacks	1490 mm / 4’11’	1870 mm / 6’2’’	1840 mm / 6.03 ft.
Height w/out Leveling Jacks	560 mm / 1.10 ft.	560 mm / 1.10 ft.	560 mm / 1.10 ft.
Weight	297 kg. / 654 lb.	297 kg. / 654 lb.	264 kg. / 582 lb.

2.1.3 DOLLY WHEELS

The Wheels are mounted into the dollies with 6 screws from the outside of the wheel (*DIN 7991 M14x30mm*). The holes inside the wheel axes are prepared to introduce the leveling jack.



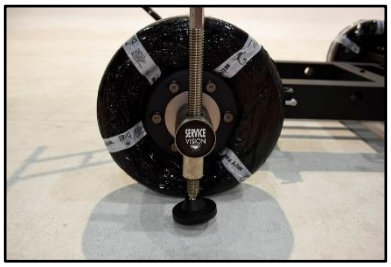
02.10 Outside view of the wheel
A – Screws for the wheel
B – Shaft of the wheel

Specifications for the wheels:

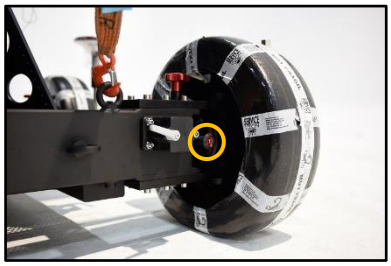
- Inflated with air at max pressure of: 51PSI/305kPa. (3.5Bar).
- Reference code from Servicevision. 2-7631

02.11 Leveling Jack (Ref. 7638)

There are 4 leveling Jacks, one for each wheel. In order to move the crane around they can be removed to reduce the width of the base. To operate the crane, the 4 of them need to be touching the ground and they are used to level the base. If the crane is mounted in tracks (*see track wheels*), one of the leveling jacks can be mounted and act as a brake when it touches the ground.



02.12 Leveling Jack assembled



02.13 Inside of the wheel
A – Locking pin for Leveling Jacks

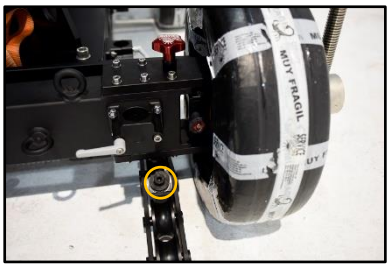
The leveling jacks are locked from inside the wheel with a different locking pin (*D16x80mm*).

To mount the leveling jacks, introduce them through the hole inside the shaft of the wheel.

Once the Leveling Jack is completely introduced, Insert the locking pin to lock its position. Now bring the shoe down using the steering wheel to move the threads of the leveling jack until the shoe touches the ground.

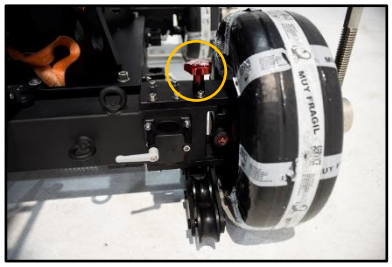
2.1.4 TRACK WHEELS

The SCORPIO 45'dolly can be used in standard 1 m tracks. The SCORPIO 38' dolly can be used either in 1m tracks or 62cm tracks. To do this the track wheels needs to be mounted into the dolly as shown in this chapter:



02.14 Track Wheel disassembled

A – Pin from the track wheels



02.15 Track Wheel assembled

A – Knob for locking the track wheels

To fix or remove the tracking wheels they need to be introduced under the chassis of the dolly, next to the pneumatic wheels with the positioner pin *(fig. 02.09*).

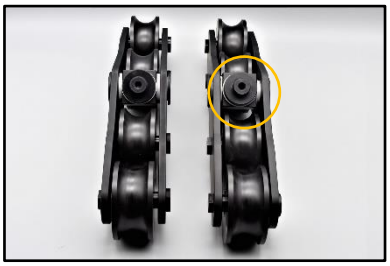
Once the pin is introduced it can be lock screwing the red knob on top of it. In case it is needed, this red knob can be removed by pulling it out and unscrewing it at the same time.

Once the track wheels are assembled, the crane can be introduced into the tracks using a 1m ramp as minimum length. Only straight tracks can be used for the crane.

In case the user wants to stop the dolly in any position, introduce the leveling jack in the shaft of the wheel and bring the shoe down to use it as a brake.

Note: Ensure that the track is leveled before mounting the crane on it.

Notice before assembling the track wheels that there are 2 of them with a movable axis side to side. This is to correct the minor differences between both sides of the track. To make this system work properly, mount the same kind of track wheels at the same dolly's side.



02.16 Different track wheels (Ref. 7632)

A – Movable axis

Important note: When using the travelling wheels, DO NOT leave the crane mounted in tracks overnight, the track wheels may get flat if they are long periods of time in the same position.

2.2 COLUMN

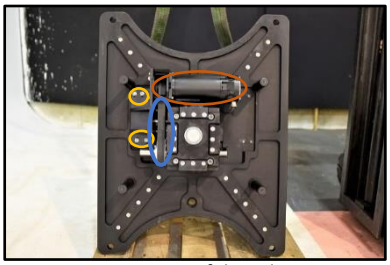
The SCORPIO cranes´ arm is supported by a telescopic column. This column can be lifted or retracted automatically with the Hand Command of the crane depending on the operator's need. The column of the SCORPIO 45' is made up of three sections: A main column fix and two telescopic sections inside of it. The SCORPIO 38' has only two sections: One fix and one telescopic.

02.17 Column dismounted from the dolly

A – Holes for the screws into the dolly
B – Legs for supporting the column

The column is attached to the dolly using 4 screws (*DIN912 M20x50mm*) in the platform. There is a guiding hole in the base of the column to align the column with the pin in the dolly.

In case the column is not mounted in the dolly, it can rest in the 4 legs located under it without damaging the mechanism for the motor of the column.

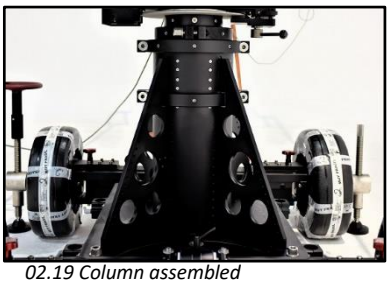


02.18 Bottom view of the column

A – Tightening screws for the belt
B – Motor of the column
C – Belt for lift the column

At the bottom of the column there is a motor attached to a gearbox through a belt. When the motor moves, the belt transmits this movement into the gearbox that moves the endless screw inside the column and pulls the telescopic sections up or down. To tight this belt, the 4 screws from the picture can be loosen and the block of the motor can be displaced to apply the proper tension to the belt. To replace the belt, lose it until there is no tension on it and the belt can be pulled out.

- Commercial reference for Column motor belt: 5M 665



02.19 Column assembled

Once the column is assembled into the dolly with the column screws it can be lifted manually or with the Hand Command. Notice that all the triangular sides of the column are threaded at *M10* to attach any support that the customer needs without interfering in the proper function of the crane.

Also notice that the connector for the column motor is accessible from one side of the column.

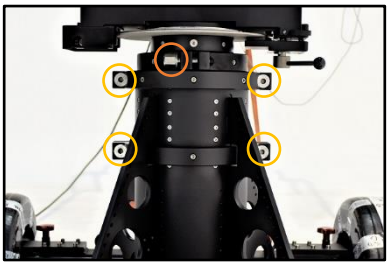
Note: To see the diagrams for the columns, go to Chapter Documentation.

2.2.1 LIFTING THE COLUMN USING THE HAND COMMAND

To lift the column using the hand command the crane needs to be **ON**. Once the crane is on, wait until the dynamic counterweight system calibrates automatically. Then move the arm to one extreme of it in order to detect the magnetic limit of that extreme (*the right procedure is explained in the chapter 3.2 Starting the crane*).

02.20 Counterweights in the center pos.

Once the main screen is showed, move the counterweight carriage to the center of the fulcrum using the Hand Command to telescope the arm. It is important to keep the weight of the crane as close as possible to the center.

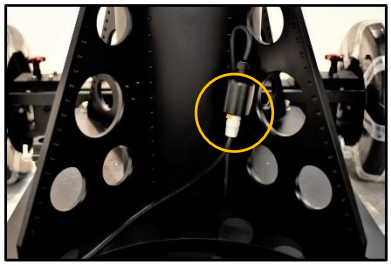


02.21 Screws from the sections

A – Screws for the middle section

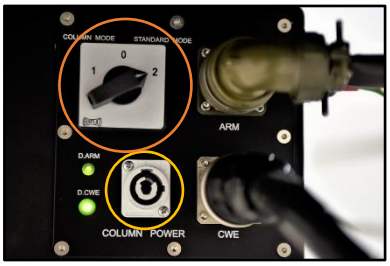
B – Screws for the inner section

Each section can be raised independently by losing the screws on the sides of the column sections (*fig.02.21*). There are 4 screws for the middle section and 2 for the inner one. Loose them from the nut (*DIN6330 M20*) using the socket wrench provided with the crane. Always lift the middle section first and, in case more high is required, lift the inside one.



02.22 Column connector

The connector for the column motor is in one side of the column. Connect the column cable into the column connector and into the electronic box by sliding it in and twisting it to lock it in place.

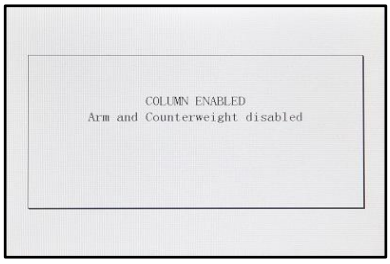


02.23 Column connector electronic box

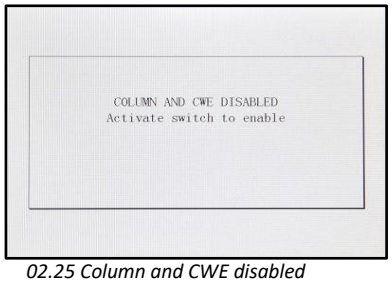
A – Column connector

B – Selector for the column

Once the cable is connected and the main screen is showed on the display, change the selector (*fig. 02.23*) from the standard mode to the column mode. The display will show that column mode is activated (*fig. 02.24*). Then use the cursor from the Hand Command to lift or lower the column.



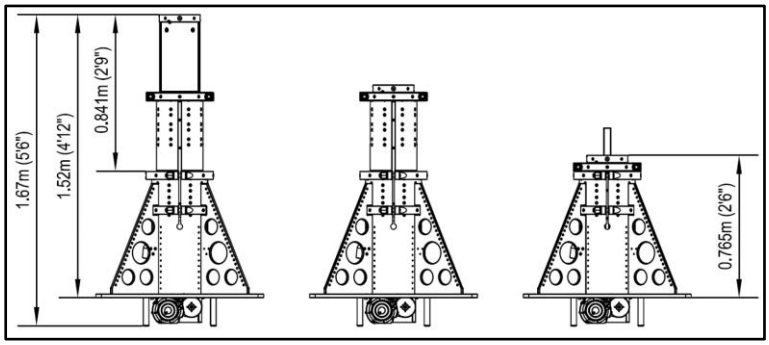
02.24 Column enabled



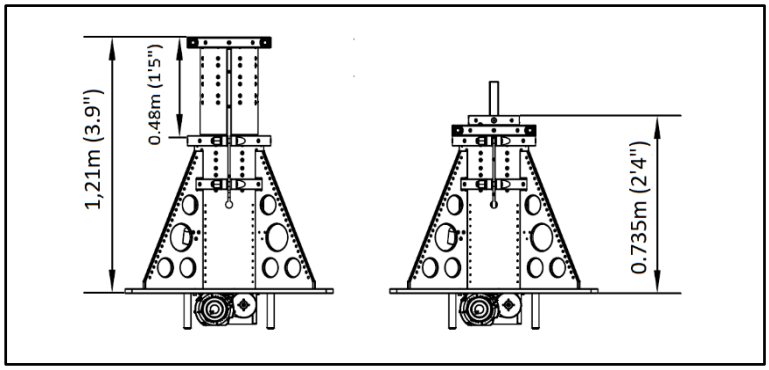
02.25 Column and CWE disabled

In case the selector is in the middle position, column and counterweights will be disabled and it will not be possible to move them until the selector position changes again.

The column of the 45 'can be raised up to 84cm / 2'9'' using both sections, the column of the 38', 48cm / 1'5".



02.26 Measurements from the column on the 45'



02.26b Measurements from the column on the 38'

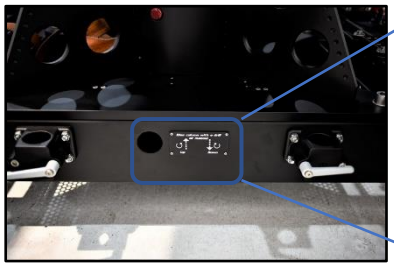
02.27 Mark of the column

There is a white mark in the limit of each column section so the operator can visually see when the limit has been reached and stop telescoping the column out. Once the desired high is achieved, remember to lock all the screws of the column again by tighten both sides equally. (*check the note at the end of the page*)

2.2.2LIFTING THE COLUMN MANUALLY

Once the column is attached to the dolly there is the possibility to access to the gearbox through the side of the dolly with the 30mm socket tool, the 2 extenders from the tool kit and the rachet wrench. It is better to use a drill with the drill adaptor from the accessories. The drill machine needs to be minimum from 1.5kW of power to be able to lift the column fully loaded.

Move the Counterweights in the middle position as seen on the previous chapter (*fig. 02.20*). Now loose the screws from the column to be lifted (*fig. 02.21*). and use the access in the dolly to introduce the socket tool and move as labeled to lift or retract the column.



02.28 Access to the column

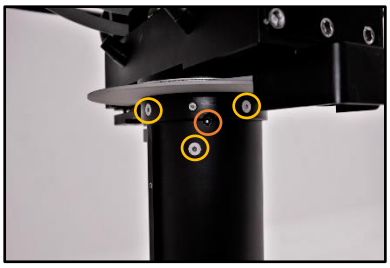
02.29 Detail of the label

Remember to stop lifting once the white mark is showed. Once lifted at the desired high, tight the screws of the column equally from both sides.

Note: Before lifting the column, balance the arm with the CW carriage in the center of the column, remove the arm straps, fix pan and tilt brakes and ensure the column bolts are loose.

2.3 FULCRUM

The SCORPIO cranes' arm is supported on the Column by the Fulcrum. The way that the fulcrum is attached to the column is with 8 screws (*Ref. DIN7991 M10x30mm*) from the column to the fulcrum. To see all of them, the inside column needs to be lifted at least 10cm.



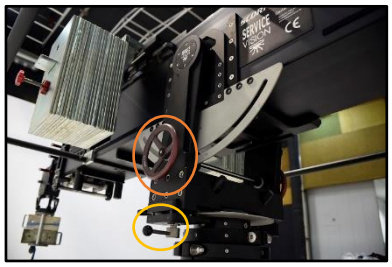
2.30 Screws for the fulcrum
A – Screws for the fulcrum
B – Friction screw for pan

There is an extra screw used to apply friction to the swing movement of the crane. To have access to it, align it with the hole in the column side when assembly.

Note: To see a diagram of the dimensions for the fulcrum's attachment to the column, go to chapter Documentation.

2.3.1 MECHANICAL COMPONENTS OF THE FULCRUM

2.31 Left side of the fulcrum
A – Friction screws for tilt
B – Guiding pin for the arm
C – Screws for the arm



2.32 Brakes of the crane
A – Pan brake
B – Tilt brake

02.33 Knob for Pan brake

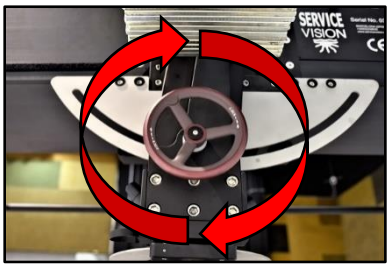
The fulcrum is the element of the crane that allows the arm to perform movements in the panoramic axis and the tilt axis using different bearings.

The main mechanical components in the fulcrum for the user are the Pan and Tilt brakes and the fluid screws.

The fluid screws adjust the friction of the movement independently for pan or tilt axis. To adjust the pan fluid, use the screw in the attachment for the column: the more tight, the more friction (*fig. 2.30*). To adjust the tilt fluid there are 2 set screws in the left side of the fulcrum: the more tight, the more friction (*fig.2.31*). There is also a guiding pin in the left side of the telescopic arm that makes that the arm only fits in one way into the fulcrum.

The brakes of the crane are located in the fulcrum. The pan is only accessible from the left side of the crane. The tilt brake can be activated from both sides of the crane. Both brakes are not blockers: when they are used, the crane is just hold in place by friction pads and it can be moved if the force applied to move it is stronger than the friction of the pads. If the crane needs to be blocked, use straps to lock it.

The pan brake is activated with the knob handle located in the left side of the fulcrum. It is a brake pad system and is tightened by moving the handle clockwise looking it from the bottom. The handle can be pulled down to disengage it and engage it again in another position to be able to apply more tension if needed.



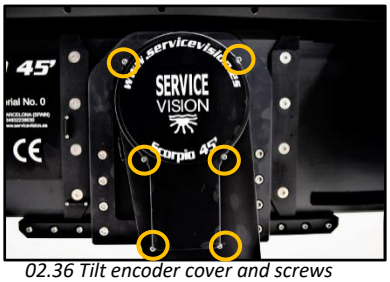
02.34 Tilt brake left side tight direction

The tilt brake can be activated from both sides of the crane by moving the brake wheel as labeled. To tight it from the left side needs to be turned clockwise, from the right side, counterclockwise. It is also a brake pad system that holds the crane in place by friction.

Note: Remark that both brakes are not blockers, when they are used, the crane is just hold in place by friction and it can be moved if the force applied to move it is stronger than this friction.

2.3.2 ENCODERS IN THE FULCRUM


02.35 Pan encoder (Ref. 7615)



02.36 Tilt encoder cover and screws

02.37 Tilt encoder (Ref. 7616) exposed


02.38 Cover for the fulcrum

Both Pan and Tilt movements are measured by encoders which are connected via a belt to the Fulcrum. When the crane is moved in any of Pan or Tilt axes, the encoders receive this information and send the gathered information to the electronic box by cable.

The Pan encoder is in the right side of the fulcrum and the color of the connector for this encoder is grey. The pan belt is tight using the encoder itself as a tensor. There are 4 slotted holes in the encoder itself to slide it in or out and apply more or less tension.

The tilt encoder is located also in the right side of the fulcrum. The color of the encoder connector is blue and to have access to the encoder belt the cover needs to be removed by unscrewing 6 screws.

Once there is access to the belt, it can be tight also using the 4 slotted holes in the encoder. Just loose the screws holding the encoder and slide it in or out to apply more tension.

To replace the tilt encoder belt, completely remove the tilt encoder by losing the 4 screws that hold it and it will be possible to remove the belt easily.

To have access to the Pan encoder belt different parts needs to be dismounted from the fulcrum. The first thing to be dismounted is the encoder by removing the 4 screws that hold it in place (*fig. 02.35*). Then the Pan brake needs to be dismounted by unscrewing the knob completely and removing the 2 screws aside the knob (*fig. 02.33*).

Once the pan encoder and the pan brake are disassembled, the arm needs to be dismounted from the fulcrum by losing the 12 screws (*6 per side shown in the fig. 02.31*) and pulling it out. Then remove the protection cover in the middle of the fulcrum (*fig. 02.38*). From here there will be access to the 8 screws that holds the structure to the main pan bushing and by removing the fulcrum, it will be possible to access to the belt to change the pan encoder belt.

Both encoders give the same signal and have the same pinout and for troubleshooting they can be swapped to check if the signal in the electronic box is received. The cables for the encoder also have the same pinout. The differences are the gear pitch and the color code of the connector.

02.39 Encoders from the crane

02.40 Screws to detach the fulcrum

- Commercial reference for Tilt encoder belt: T2.5 600
- Commercial Reference for Pan encoder belt: T5 990

Note: Tilt encoder is needed to correct the level in the leveling head, using the arc compensation feature and all the functions that require knowledge of the tilt position of the crane.

Note2: Pan encoder is needed to use the arc compensation feature and all the functions that require knowledge of the pan position of the crane.

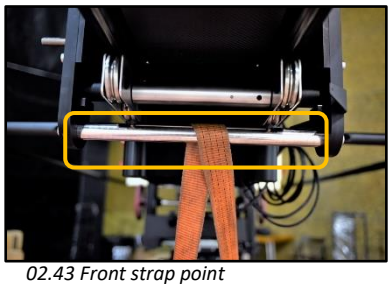
2.4 TELESCOPIC ARM

The arm of the crane is made up of different sections that extends or retracts automatically controlled by an operator with the Hand Command. In this chapter we will focus on the arm itself, the mechanics in it and how to strap it safely.

02.41 Left side screws for the arm

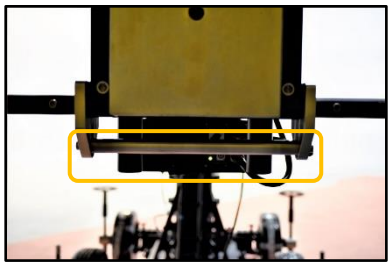
02.42 Right side screws for the arm

To mount the arm into the fulcrum it needs to be lifted using two forklifts or similar devices that can lift the arm and insert it into the fulcrum using the guiding pin as a reference in order to assemble it properly. From the factory is shipped inside a box with 2 straps marking the lift point for future references.


02.43 Front strap point

When the arm is slipped into the fulcrum, the side screws (*DIN912 M10x20mm*) needs to be tightened equally in both sides of the crane, other ways there might be problems on the telescopic movement.

Once assembled, the arm must always be strapped to the dolly base rings via the adjustable ratchet straps provided with the crane. The strapping points are shown in the *fig. 2.43, 2.44, 2.45.* Notice that when the arm is empty is always heavier in the back part of the arm.


02.44 Rear strap point

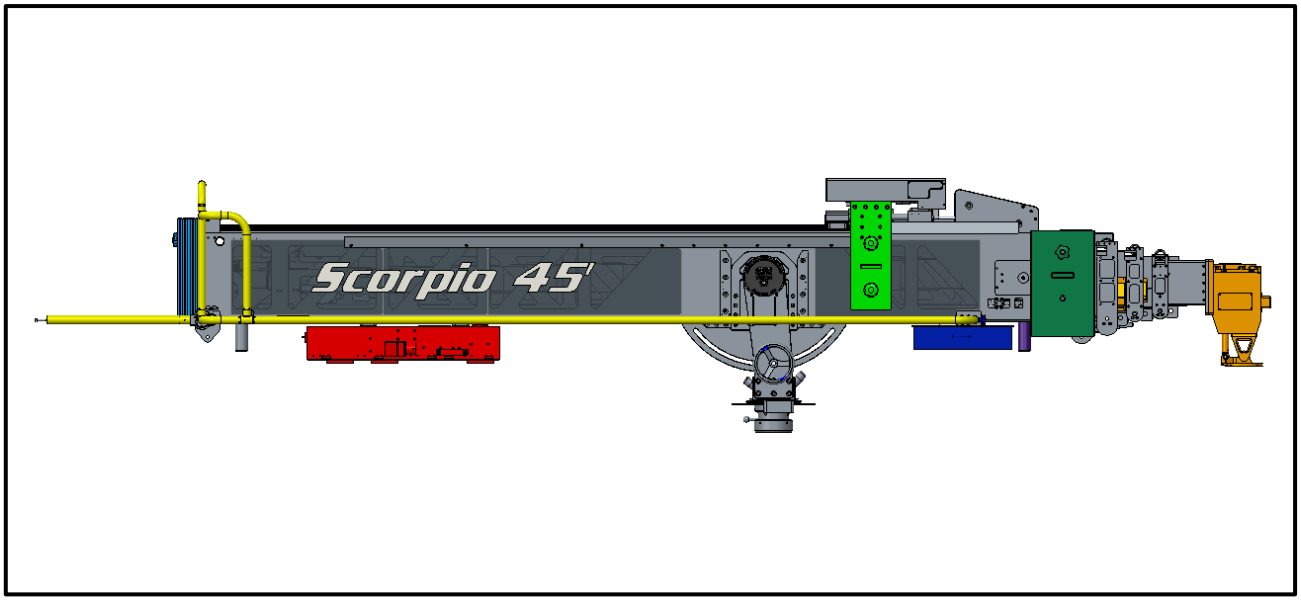
Always use two straps in the front and one in the back.

> ***Note: The ratchet straps can only be safely removed once the crane arm is completely balanced.***


02.45 Leveling Head strap to front strap point.

The strap from the leveling head is to prevent that the telescopic sections extend while it is being transported. The strap in the leveling head needs to be used as shown in *fig. 02.45* in order to do not damage the mechanism in the leveling head. Never strap it in the movable part of the leveling head.

The arm of the SCORPIO cranes is made up of a main section, fixed, and four telescopic sections. These tubes are made by extrusion from one block of aluminum and give to the crane the rigidity needed to perform movements of the camera from 2.26m/7'5'' with the arm fully closed to 14m./45'11'' in the maximum length.

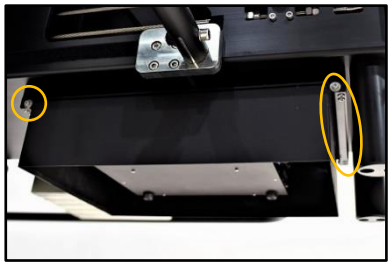


02.46 Telescopic Arm drawing

The basic components of the telescopic arm are the dynamic counterweight carriage (*flashed in light green*), the levelling head (*orange*), the electronic box (*red*) which controls the system, the power unit for the Scorpio Heads (*blue*), the protection bars (*yellow*) and the counterweight supports (*front in dark green and rear in light blue).*

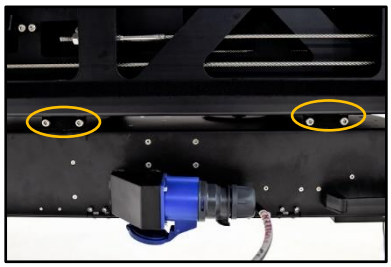
2.4.1 MAIN SECTION

The Main section is the fix part that holds the rest of the components detailed before. Underneath of it there are 4 support legs to rest the arm in case the electronic box and the power unit for the Scorpio Heads are not mounted.



02.47 Guides to support the PU

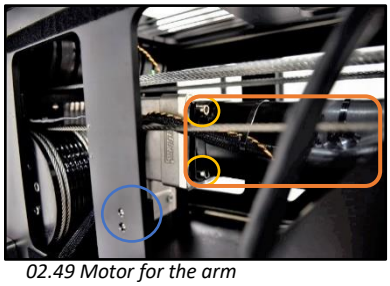
There are 2 guiding supports, in front and in the back of the crane to hold the Power Unit for Scorpio Heads and the Electronic Box from the crane. To mount the Power Unit, remove the stopper screws from the guides and slide it in with the XLR connectors facing the front of the crane.



02.48 Covers for the guides to support the EB

To mount the electronic box, remove the covers from the sliding guides (*fig. 2.48*) and slide the EB with the main AC connector in the right side of the crane. Do not do this operation alone, the Electronic Box is heavy (*over 50kg*).

2.4.1.1 INSIDE THE MAIN SECTION, MOVING THE FIRST SECTION

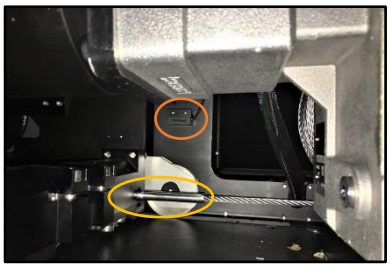


02.49 Motor for the arm

A – Screws for the motor
B – Motor for the arm
C – Magnetic limit

Inside the main section there is located the motor of the arm. This motor has an encoder attached to it to control the position of the crane. The motor is held with 4 screws into the gearbox. And this gearbox is attached to two drums, one in each side of the main section. This motor transmits the movement into a gearbox and this one makes the to two drums coil in one or other direction.

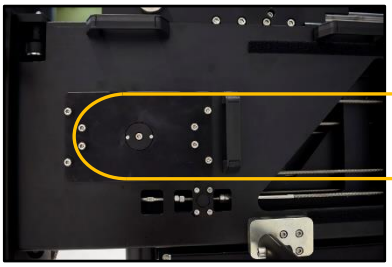
Into the drums there are two cables attached: when one is coiled, the other uncoils. These cables are rolled one faced against the other, one from the top part of the drum and the other from the bottom. The end of the bottom cable is attached into the back of the First section (*the first telescopic section*). When the drum coils the cable, the First section is pulled inside.



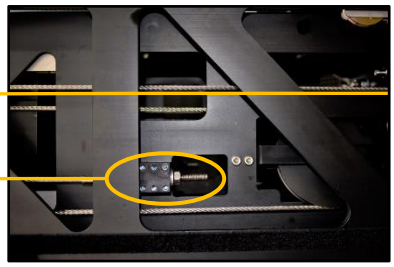
02.50 End of retracting cable

A – End of the drum cable
B – Magnetic limit

Note: All the ends of the cables have a double nut safety lock. To see how to tight the cables go to chapter 6 Maintenance.

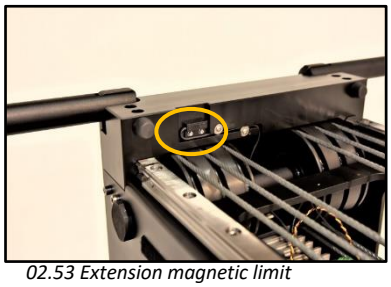


02.51 Pulley for the main cable



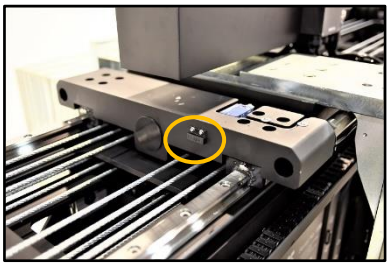
02.52 End of the extension cable

To extend the first section, the upper cable from the drum passes through a pulley attached into the main section and ends in the attachment showed in *fig. 02.52* from the First section. So, when the drum coils the cable, the first section goes out.

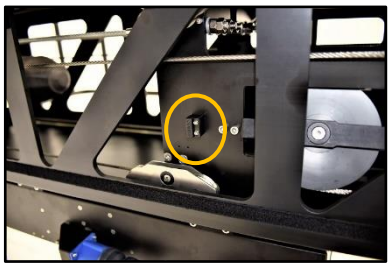


02.53 Extension magnetic limit

To know where the telescopic limits of the crane are, the SCORPIO cranes have two magnetic sensors attached into the main section. These magnetic sensors are only used when the crane is started (*see chapter 3.2 Starting the crane*). They will give to the system the reference position of the telescopic movement. Only one of these limits needs to be detected by the crane and the system will automatically know what the range of movement for the telescopic is.

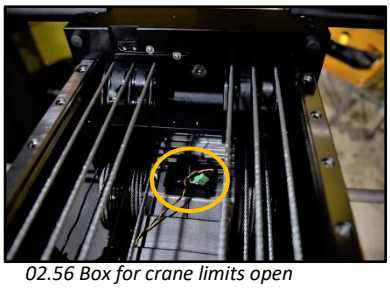


02.54 Magnet for extension limit



02.55 Magnet for retracted limit

When the First section is retracting, it approaches the magnet (*fig.02.55*) into the retracted sensor (*fig.02.50*). When the First section extends, the counterweight trolley moves back and approaches the magnet(*fig.02.54*) into the extension limit (*fig.02.53*).



02.56 Box for crane limits open

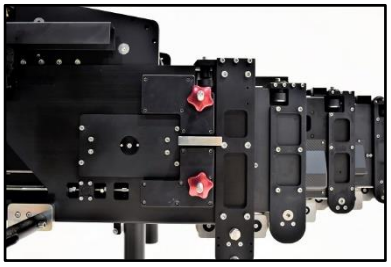
The magnetic limits are connected in one small box located on top of the gearbox. From there the cable for the limits is joined with the cable from the motor to be connected into the electronic box.

2.4.1.2 COUNTERWEIGHT SUPPORTS

There are two fix supports for counterweights in the main arm, one in the front and one in the back. These supports are used to mount counterweights on them in order to make the fix balance of the crane (*see chapter 3.2 Starting the crane).*

02.57 Rear counterweight support

The Back-Counterweight Holder is located at the back of the main tube of the Crane Arm. It consists of a platform to slide the weights in and a screw with a red locking nut that is used to fasten the different counterweights provided with the crane in order to balance it.



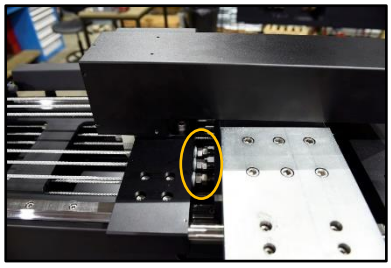
02.58 Front counterweight support

The Front-Counterweight Holder is located at the front right part of the main section. It consists of a platform to slide the weights and 2 screws with red locking nuts that are used to hold in place and fasten the different counterweights provided with the crane in order to balance it.

2.4.1.3 DYNAMIC COUNTERWEIGHT TROLLEY

02.59 Counterweight trolley

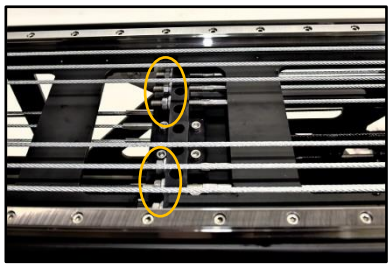
The SCORPIO 45' and the SCORPIO 38' have a movable counterweight trolley that balances the crane when the telescopic sections retract or extend. This movable counterweight is attached to the First section with 12 cables that work as a closed loop using a pulley system in the front part of the main arm and a regular pulley in the back. When the First section extends, the CW (*Counterweight carriage*) moves to the back of the crane.



02.60 CW Cables ends in CW trolley

The weight holders on the weight carriage will be used to counterbalance the telescopic crane arm while it´s moving. It consists of an inverted metallic "U" that is connected to the moving carriage on the Crane Arm. The U is fixed to the carriage with 12 screws (*DIN912 M12x40mm*). It has two "male" supports, one per side which fit into the "female" part of the counterweights.

02.61 Pulley system for front CW cables.



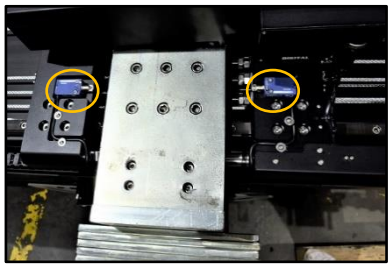
02.62 CW Cables end in the First section.

The counterweights are fastened onto the weight holders by two screws. These screws have an intermediate locking nut to be able to tighten different amounts of weights easily. These screws have two locking positions.

02.63 Telescopic Counterweights Screw and nut.

Note: The crane can never be used without all the Weight Fastening Screws and nuts securely fastened.

One on the top and one on the bottom part of the "U". Both counterweight locking screws needs to be used. The maximum number of weights can be told by the length of the male positioner on the "U". This maximum amount can never be passed.



02.64 Limits for dynamic CW system

One of the particularities of the dynamic counterweight system is that the counterweights support can move automatically inside a small range of movement to make a better balance of the telescope.

There are physical limits (*fig. 02.64)* used to detect the mechanical end of the range of movement. When the crane starts, the motor of the counterweights will move a belt attached to the gear that slides the CW support in both directions to detect these limits.

02.65 Motor for dynamic CW system

Once both limits have been detected, the motor will move the CW support in the center of the range of movement. The position of this CW support can be controlled by the system to assign different positions of the CW support to different positions of the crane length in order to get a better balance of the crane in any circumstance.

02.66 Belt and gear for the CW system

The motor for the counterweights transmits the movement using a belt. To apply tension to this belt, loose the 4 screws holding the motor and under the motor there is a set screw that can be acceded from the side. Tight this screw as needed. To remove the belt, completely lose this set screw and remove the belt. In case the user wants to move manually the position of the CW inside the trolley, use a fix wrench in the gear to move the position of the CW and disable the counterweight motor in the *Counterweight Configuration menu.*

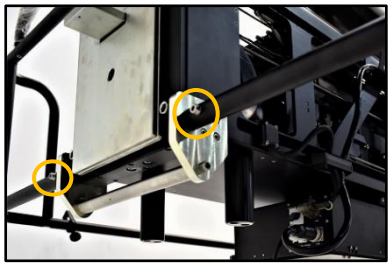
- Commercial reference for CW belt: T10 480

02.67 Connector for the CW system

All this system of motor and mechanical limits is connected to the electronic box with one single cable that comes from the trolley to the electronic box inside a chain. Either the connector, the limits and the cable are protected for vertical rain with an IP42 protection grade.

2.4.1.4 PROTECTION BARS

The protection bars mark the area of movement of the Telescopic counterweights, therefore NEVER get in between the protection bars and the crane, there is a high risk of squashing if the crane moves. These bars are also the support for the upper or lower operation bars to control the crane.



02.68 Protection bar back support

There are 2 pivots in both sides of the main arm, these pivots are used for fixing the Protection bars to the crane. In these pivots is where the screw that holds the side Protection bars are screwed (*DIN912 M10x50mm)*.

02.69 Protection bar front support

In the frontal part of the protection bars (*fig. 02.69*) there are holes in the protection bars. These holes can be used to pass power, video or different cable lines to a monitor for the crane operator. The exit hole for that monitor is in the middle of the protection bar.

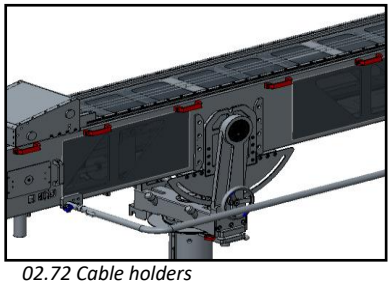
02.70 Upper operation bars

The upper operation bars are used for when the crane is tilted up, in order to control the movements of the crane in this position. They also give rigidity to the protection bars and the portable display of the electronic box can be mounted on them with the proper bracket. The upper structure is attached with 8 screws *(DIN912 M10x35mm*).

The Hand Command can be hold into the bracket in the side protection bar.

02.71 Lower operation bars

There are two kind of lower operation bars: Single or Double. Both of them are attached in the rear part of the side protection bars and they are used to control the crane when is tilted down or when the column is too high to be operated from the side bars.



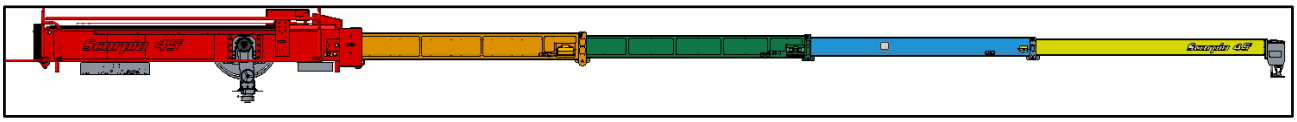
02.72 Cable holders

The last remarkable part of the main arm are the cable holders. These holders are used to pass the cables to the electronic box, the leveling head or the remote head safely strapped on them.

To dismount them, open the side cover of the holder and there will be access to the screw of it. It may be necessary in order to pass some cables with big connectors.

2.4.2 TELESCOPIC SECTIONS

The telescopic crane is made up of four telescopic aluminum tubes. Each one of them is supported in the section before it by a system of guide wheels and rails. To move each section there is a cable system that links each section with the second before it.

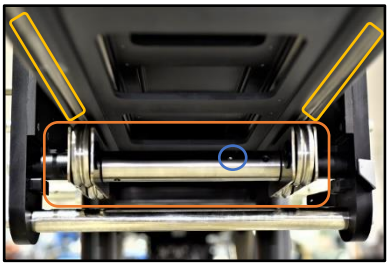


02.73 Telescopic Arm extended drawing

In the drawing, the red one is the main section which has been described in the previous chapter. The orange one is called the First section and is the only one linked to the motor. The name of the rest of the sections are Second section (*green*), Third section (*blue*) and Fourth section (*yellow*).

2.4.2.1 FIRST SECTION

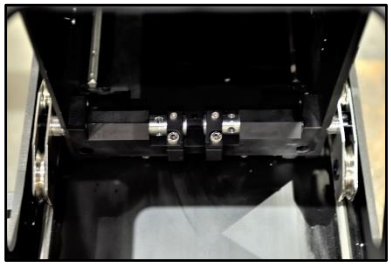
The first section is the first one to move when the motor moves. The movement of any other component of the crane is somehow linked to this section. The system used to move this section has been explained in the previous chapter.



02.74 Front wheels from the main arm
A – Rails from the First section
B –Set of eccentric wheels from the main section
C – Mark for the eccentric

The First section has 2 rails underneath along the whole section that are supported on 2 sets of metallic wheels from the front flange of the Main arm. These sets of wheels are mounted in an axis that is eccentric in the left side and there is a mark indicating which is the highest eccentric point. By losing this axis is possible to adjust the eccentric axis.

Inside the main section, there are 2 rails in the bottom to support the rear wheels from the first section. The rear wheels in the first section are metallic and eccentric. This sets of wheels can be adjusted independently by losing the flange that holds each axis with the 2 screws, and then move the axis using the holes in it.



02.75 Rear wheels in the first section

02.76 Bottom Rails for the wheels inside

The rear sets of wheels need to be adjusted with the crane completely extended. If the crane is fully extended, the pressure of these wheels is released and passed to the top rear wheels (*fig. 02.77*).

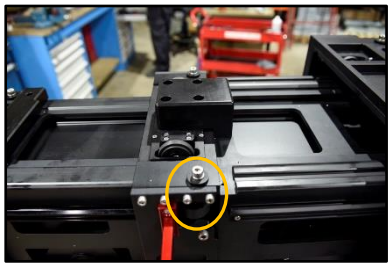
02.77 Rear top wheels in the first section

The top sets of metallic wheels run along 2 sets of rails and cannot be adjusted. These wheels ensure that, when the crane telescopes out and is heavier in the front part, is still straight and aligned. These wheels set the position for the eccentric of the rear bottom wheels.

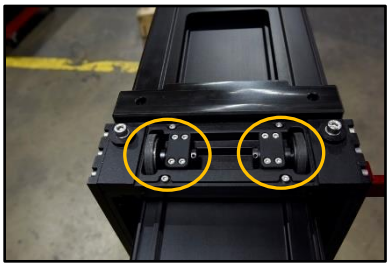
With the proper adjustment of all these wheels the section is always supported in 4 points at least.

02.78 Guiding side wheels main arm

In the front flange of the main arm there are four rubber wheels (*2 on top and one in each side*) with the purpose of guide the first section in case a sudden pan or tilt movement is made by the operator. These sets of wheels are in every flange of the Main, First, Second and Third section to guide each section in case a hard movement is performed.

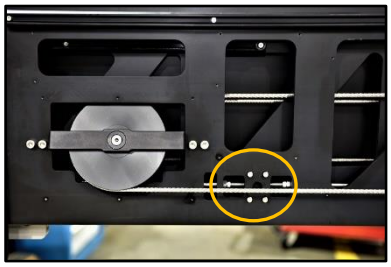


02.79 Guiding wheels first section



02.80 Top guiding wheels first section

All these wheels are eccentric and they can be adjusted by losing the bracer of the top wheels and moving the axis using the holes in it to approach it or move them away from the section. A proper adjust for these wheels is as close as possible but without touching the next section.



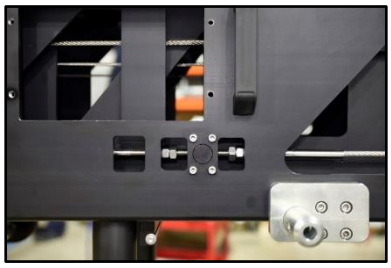
02.81 Front pulley first section
A – Link for the third section

02.82 Rear pulley first section

In the first section there is also 4 leaning pulleys, 2 in front of the section (*one per side)* and 2 in the back (*one per side).* These pulleys are part of the mechanism to move the second section, the function is detailed on the next chapter.

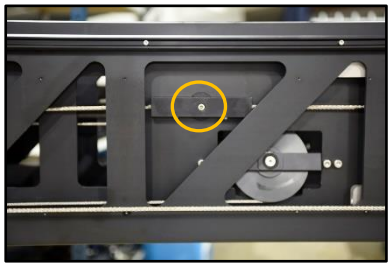
2.4.2.2 SECOND SECTION

The Second section is moved with a double cable system that links the Second section with the Main section.



02.83 Link for the second section in the main section

When the first section is pulled out, the leaning pulleys on it (*fig. 02.81-02.82*) move with it. The cables passing through those pulleys are linked at both ends of each cable in the Main section and the Second section (*fig. 02.83-02.84*). Since the Main section is fix, the link from the second section pulls from this one in the direction of the pulleys.

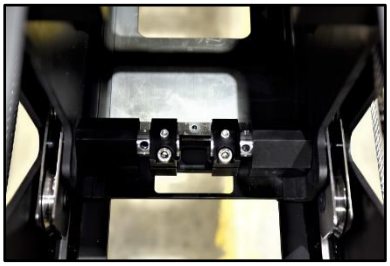


02.84 Link to move the second section

This link in both sides needs to be removed in case the user wants to disassemble the second section from the arm. To do it, unscrew the bolt and pull the link up. Once is detached, the movement of the second section is no linked with the first section anymore and can be slid using the 4 support points of the section: the 2 sets of metallic wheels from the first section and the 2 sets of inside metallic wheels from the second section.

02.85 Front wheels in the first section

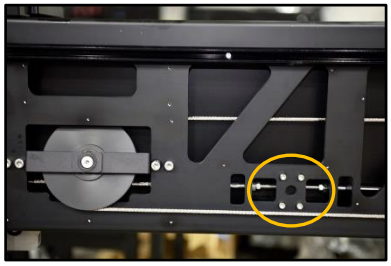
Using the same principle than the first section, the second section supports in the 2 front metallic wheels in the flange from the first section using the rails located underneath the second section. These sets of wheels are mounted in an axis that is eccentric in the left side and there is a mark indicating which is the highest eccentric point. By losing this axis is possible to adjust the eccentric axis.



02.86 Rear wheels second section

02.87 Rear top wheels second section

Inside the back part of the second section there are 4 sets of metallic wheels (2 sets in top and 2 sets in the bottom) that runs along rails from the first section and works exactly as the ones in the first section.



02.88 Front pulley second section
A –Link for the fourth section

As the first section, the second section has leaning pulleys to transmit the movement to the third section (*fig. 02.83-02.84*). And as the first or the main section it has guiding rubber wheels in the front flange to prevent oscillating movements when there are sudden movements.

2.4.2.3 THIRD SECTION

02.89 Link in the third section

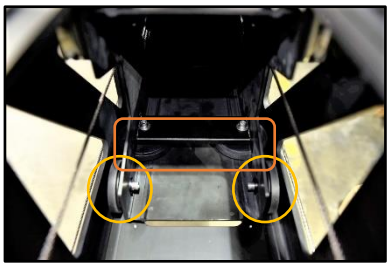
With the same mechanism as the second one, the third section is attached to the first section (*fig. 02.81-02.89*) with a closed loop of cables. When the leaning pulleys from the second section moves, the loop of cables pulls from the link in the third section. To detach the third section, remove this link and the section will be free.

02.90 Front wheels second section

As the previous sections, the third one is supported in 4 points: the sets of metallic wheels from the previous section and the rear wheels from top and bottom.

The difference between the third and the previous sections is the kind of bottom rear wheels inside the section: the previous ones where metallic sets of wheels sliding along rails and this one and the fourth have rubber wheels inside in a vertical and horizontal position (*fig. 02.91*).

Since there are no rails, the lateral rubber wheels correct the lateral movement of the section when it telescopes. The vertical wheels correct the inclination of the section as the metallic ones in the previous sections.



02.91 Rear bottom wheels third sections
A – Vertical rubber wheels
B – Lateral rubber wheels

To adjust these wheels is needed a special tool to move the eccentric axis to the proper position.

The rear top wheels are metallic and are the ones that mark the proper position of the rear rubber wheels: when the crane is fully extended and the weight of the section supports in these wheels, all the bottom rubber wheels need to be touching the second section.

02.92 Rear top wheels third section

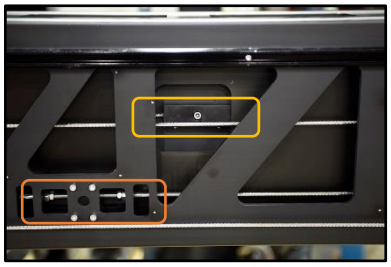
This is the last section with leaned pulleys. They connect the second section with the fourth one. It is also the last with the front flange with the top guiding wheels.

2.4.2.4 FOURTH SECTION

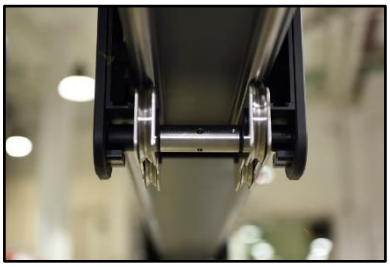
02.93 Front pulley third section

02.94 Rear pulley third section

The fourth section is the last section linked. To have access to this link there is only one position (*fig. 02.95*) and the system is the same as the previous sections: the pulleys from the previous section move and pulls this section with it. To detach the movement from this section, remove the link from it.

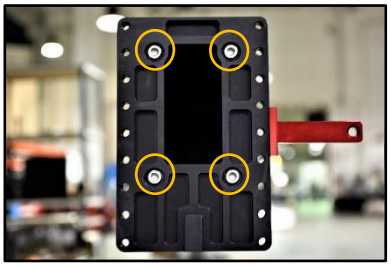


02.95 Links for the fourth section
A – Link in the fourth section
B – Link in the second section



02.96 Front wheels in the third section

It is supported in the third section front wheels and this set of wheels is eccentric as the ones in the other sections. The rear wheels from this section cannot be adjusted outside the factory because there is no room to access to them. The system of the rear wheels for this section is the same used on the third one.

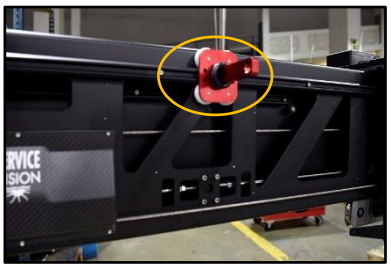


02.97 Leveling Head plate

In the end of the section there is the Leveling Head Fastening Plate. It is hold with four bolts and if the screws are loose, there is a slight play side to side to finish adjusting the lateral level at the end of the crane. This adjustment needs to be done with the base leveled and checked with the crane completely closed and open to verify that the eccentric wheels from the previous sections are properly adjusted.

Note: Any bad adjustment made in the telescopic arm can damage the crane beyond repair, ONLY QUALIFIED PERSONNEL can do the adjustment of the arm.

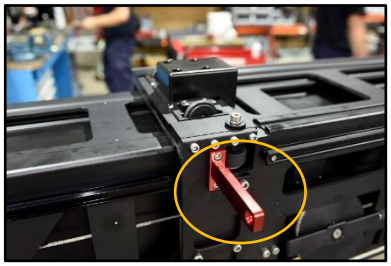
2.4.2.5 TELESCOPIC CABLE SYSTEM



02.98 Red sliding cable holder

Along the crane, there are cable holders to support the cables going into the leveling head and the remote head. There are two kind of supports: Fix and movable. The movables have rubber rings on them to minimize the noise when the crane is fully collapsed.

Each of the cable supports has a karabiner (cable holder). This allows to take off and put on the cable looms without tools and without having to break up the cable looms each time.

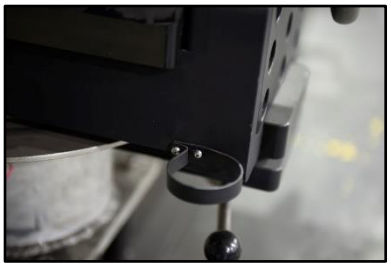


02.99 Fix red cable holder

02.100 End of the sliding rail

To remove the sliding cable holders, extend the crane until the end of the rail is visible (*fig.02.100*), remove the stopper and slide the support out. In the *chapter 6.2.11* it is explained how to adjust these sliding cable holders.

02.101 Cable pusher



02.102 Cables exit

Each section has a cable pusher to prevent that any hanging cable gets stuck in between the sections. And in the fulcrum, there is a ring to pass through it all the cables going out of the crane.

2.4.2.6 POWER&COMM FOR REMOTE HEAD

Along the crane extensions there are two looms from the main arm to the end of the fourth section. One connects the Leveling Head with the Electronic box and the other provides power for the remote head from the power unit (*P.U.*).

02.103 Power supply (Ref. 1303)

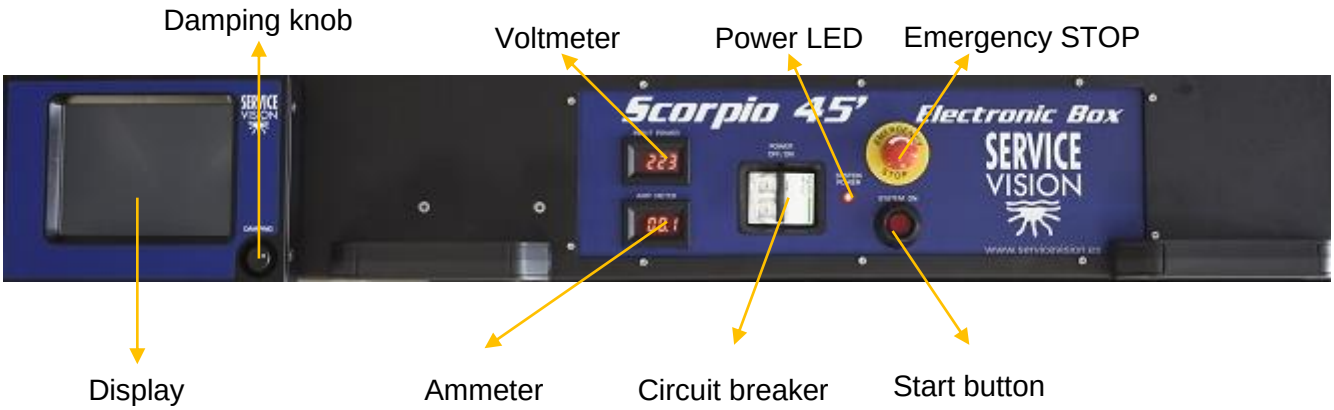
The P.U. is a 30v 20Amp power supply. It has a 20Amp fuse in front and a 7Amp fuse in the back part. It is powered from AC current coming from the electronic box and has two 3pin XLR outputs for the remote head.

Inside this loom it runs one cable for communication and a BNC line for the video signal. Both end in the base of the crane and from there they can be extended to the control and the monitor for the remote head operator.

2.5 ELECTRONIC BOX

The electronic box is in the rear bottom part of the main section. It has all the electronic components to control the position of the crane, move the motor located inside the arm and the motor for the counterweights. It has a detachable display that could be mounted in the rear operation bars.

2.5.1 OUTSIDE DESCRIPTION OF THE ELECTRONIC BOX



02.104 Electronic Box frontal view

AMMETER & VOLTIMETER: The information of the voltage arriving to the crane and the power consumption of the system will be displayed here.

AC BREAKER: This breaker protects the crane against current peaks coming to the system. If it is OFF the crane cannot be activated.

LED SYSTEM POWER: This LED lights only when the system has current and it is ready to be started.

START BUTTON: This button is used to activate the crane. Certain conditions need to be achieved in order to start the crane (*Start system protection*).

EMERGENCY STOP: This emergency stop button cuts the power from the system (*Start system protection*).

PORTABLE DISPLAY: In this display the information of the system is showed, it can be attached in the operation bars with a special bracket.

DAMPING KNOB: Potentiometer to adjust the stopping ramp of the arm when moving.

02.105 Main AC connector

In the rear part of the electronic box is the Main AC connector which provides power to all the components of the crane.

02.106 Side connectors panel

AC POWER OUT: this connector is an AC power output to the power unit for Scorpio heads.

12v/3A DC OUT: Power output for DC monitors.

LEVELING HEAD: This connector sends the tilt encoder signal, power, and communication to the leveling head.

HAND COMMAND DIGITAL: connects the crane with the hand command.

DISPLAY COMMAND: connects the portable display and the damping knob to the electronic box.

FUSE: this is a resettable fuse. In the event of the cable going to the Leveling head breaks, this fuse will disconnect the power for the leveling head and will pop out. To reset it, push it back in.

S ARM: This LED inform of the status of the SERVO board controlling the telescope motor. There are three possible status: OFF (*there is no power in the board*), RED (*the board has power but no communication with the CCU*) and GREEN (*power and communication arrive to the board*).

S CWE: This LED inform of the status of the SERVO board controlling the dynamic counterweights motor. There are three possible status: OFF (*there is no power in the board*), RED (*the board has power but no communication with the CCU*) and GREEN (*power and communication arrive to the board*).

ENCODERS: These connectors receive the information of the encoders in the crane. (*to see the position of the pan and tilt encoders go to chapter 2.3.2 Encoders in the fulcrum*). There is a third encoder input called travelling. The electronic box is prepared for receiving the position of an encoder

attached in the tracks in order to display the position of the crane along the track (*To know more about this, go to* *chapter 8 Special configurations*).

CONTROL INTERFACE: This connector communicates the Electronic box with a Scorpio Control in case there is a Scorpio Head mounted. It sends information of the position of the crane to use functions as Back Pan or Tracking *(To know more about this, go to chapter 8 Special configurations*).

ENCODERS OUT: This connector gives an output of the encoder data used in augmented reality scenarios *(To know more about this, go to chapter 8 Special configurations*).

02.107 Side connectors 2

.

COLUMN SWITCH: it allows the user to activate the column mode to lift the column with the hand command or go to the standard mode where the hand command controls the telescopic movement. There is a 0 position that disables the movement of the crane.

ARM: The motor for the telescopic movement and the magnetic limits of the crane are connected here.

D. ARM: This LED indicate the status of the Amplifier of the telescope motor. There are three possible status: OFF (*there is no power in the amplifier*), RED (*the amplifier has power but the motor is disengaged*) and GREEN (*the motor is engaged and controlled by the system*).

D. CWE: This LED indicate the status of the Amplifier of the counterweights motor. There are three possible status: OFF (*there is no power in the amplifier*), RED (*the amplifier has power but the motor is disengaged*) and GREEN (*the motor is engaged and controlled by the system*).

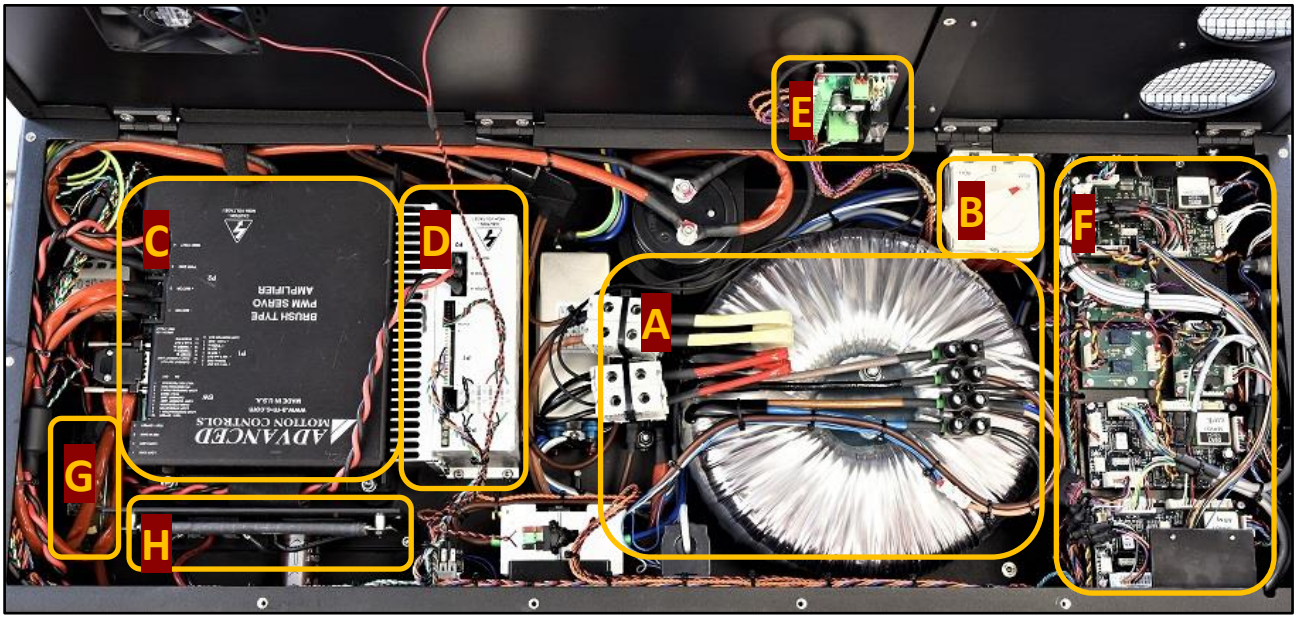
COLUMN POWER: connects the column motor to the electronic box.

CWE: The motor for the Dynamic CWE and the physical limits of this are connected here.

Note: For PINOUT references go to chapter DOCUMENTATION

2.5.2 INSIDE THE ELECTRONIC BOX

The electronic box has different electronic components and amplifiers to control the crane. In this chapter we will make a brief description of some of them.



02.108 Inside components in the EB

A. Main coil: This is the main transformer. It has 2 inputs of 110v AC and 2 outputs, the yellow cables of 90v AC to power the amplifiers and the red ones of 30v AC. To power the electronic part and the Leveling Head. It has a fuse on top of it of 3 Amp. To protect the displays of voltage and amperage.

B. Voltage selector: This switch needs to be changed depending on the input voltage of the crane. The position of 110 needs to be set when the voltage input is 110v AC. The position of 220 needs to be set if the voltage input is 220v AC.

C. Driver for the ARM: This is the driver board for the arm. It amplifies the signals from the SERVO of the arm to move the telescopic motor. It is powered by DC.

D. Driver for the CWE-Column: This is the driver board for the CWE. The output of this driver board is sent to the selector for standard-column mode and from there the power goes to each different motor. It amplifies the signals from the SERVO of the CWE to move or the CWE motor or the Column motor. It is powered by AC and it has a fuse in the connector of the driver.

E. Security system board: This board controls the safeties of the crane: If the emergency button is released, the hand command connected and the start button is pressed it will allow the system to start, other ways the crane CANNOT be started, even if the LED system power is ON. It also has a 2Amp. Fuse.

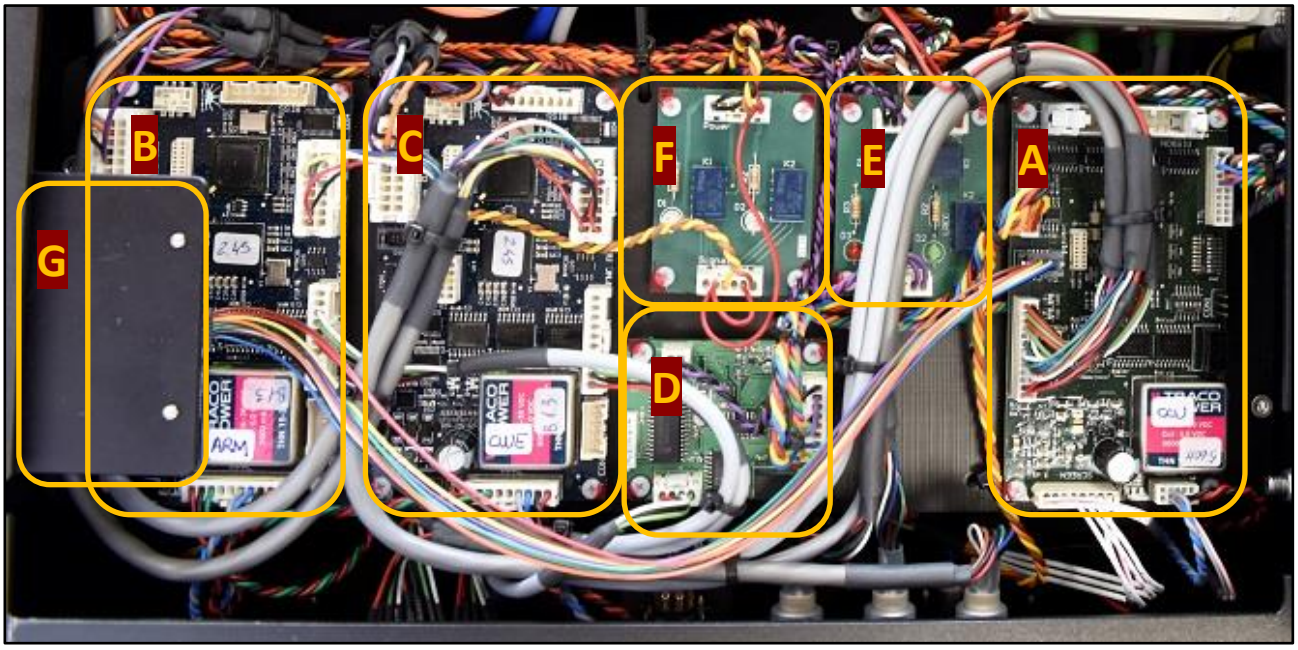
F. Electronic components: These components are detailed in the next page.

G. Fuse for the ARM: In case there is a problem with the motor cable, this Fuse will protect the Driver board. It is a 60Amp. Fuse.

H. **Shunt resistor:** This component dissipates the current generated by the motor. It has a 10Amp. Fuse in it.

> ***Note: In case one of the fuses is blown, in the chapter F.A.Q. is a list of all the fuses of the crane and the observable symptom***

2.5.3 ELECTRONIC COMPONENTS



02.109 Electronic components in the EB

A. CCU: This board is the Central Control Unit (*CCU*). It is the board that controls all the interaction with the user such as the Display or the Hand Command. It also receives the information of the encoders of the crane and control all the axis of the crane using Servo Boards.

B. Servo board for the ARM: This Servo board controls the axis of the Arm. It receives information from the CCU and sends a signal to the driver. The driver moves the motor and the encoder from the motor sends information back to the servo.

C. Servo board for the CWE: This Servo board controls the axis of the CWE/Column. It receives information from the CCU and sends a signal to the driver. The driver moves the motor and the encoder from the motor sends information back to the servo.

D. Digital board for Hand Command: This board communicates with a digital board inside the Hand Command. It translates the information from the H.C. into the CCU.

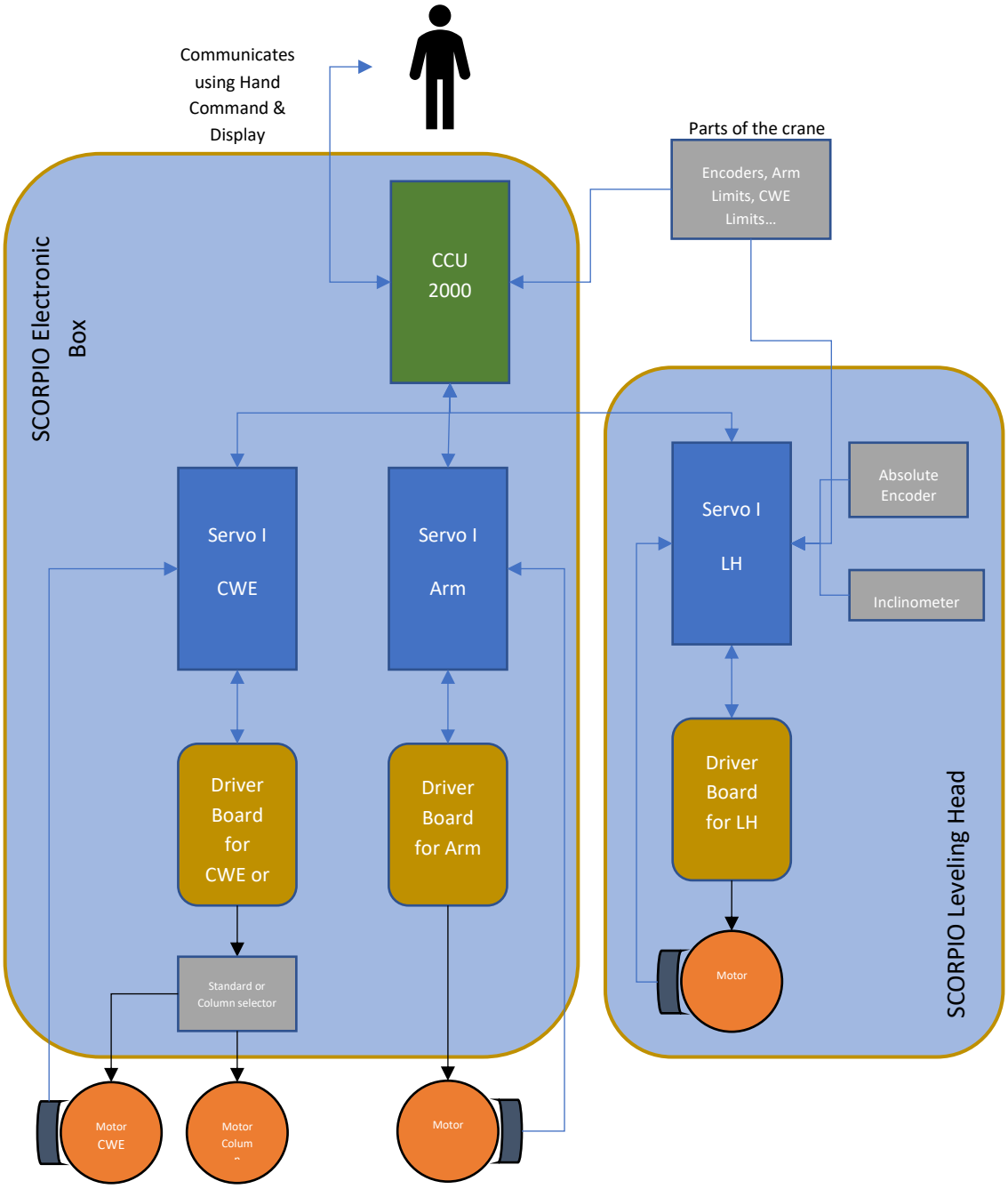
E. Relay board for ARM and H.C.: Receive the information of the Magnetic limits of the crane and translates it to the CCU. It also sends to the Security system board the information that the Hand Command is connected.

F. **Relay board for CWE:** This board Receive the information of the physical limits in the Counterweights and translate it into the driver board for the CWE.

G. SD Card Reader: This SD Card Reader is used to write memories inside an SD Card or to update software for the different boards inside the electronic box.

2.5.4 KEY CONCEPTS

All the Scorpio Systems works in the same way: The user interface with the system using different kind of peripherals (*the hand command to tell the system to move or the display to read information and set functions)*. The CCU board is the one that manages this interaction. Depending on the function that the system has to do (*which motor has to move for example*), it sends the order to the proper Servo board. This Servo board uses a driver or amplifier to move the motor assigned to it. There are encoders attached to the motors to control the position of the motor and give this information back to the Servo.



2.6 HAND COMMAND

The Hand command for the Scorpio Cranes has a digital board inside that controls the functions of the different buttons and Rockers of the Hand Command (*H.C.*) and communicates with the Electronic box using a serial communication protocol.

02.110 Hand command (Ref.7021)

02.111 Bottom view Hand Command

02.112 Top view Hand command

In case the Hand command couldn't communicate with the electronic box (either because the cable is broken or disconnected) the crane will automatically switch off and won't start until the communication with the Hand command is restored (*see chapter F.A.Q.*).

The functions of the different components of the hand command are:

STOP BUTTON: When pressed automatically switches off the crane.

LED of digital board: Indicates if the hand command is communicating with the electronic box. Red means that there is power in the hand command but no communication and green means there is power and communication with the electronic box.

ROCKER: Allows to move the motor inside the telescopic arm or the motor in the column. The T will telescope the crane out or move the column up and the W will telescope the crane inside or move the column down

GREEN BUTTON: It is the main Action button. It has different functions depending on the screen showed in the Portable display. If it is pressed while the main screen is showed it will activate or deactivate the Arc comp feature. If it is held and the rocker is pressed, the counterweights are moved. (*In the chapter 4: Control display information there are more specific functions)*.

ORANGE/BLUE BUTTON: These buttons can be configured to use different functions (*In the chapter 4.2.3.10 is explained the functions of these buttons*).

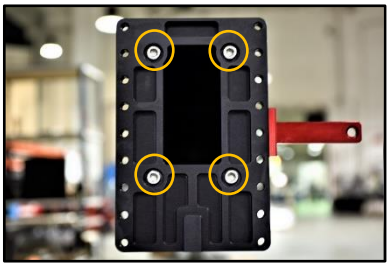
SPEED KNOB: It adjusts the speed of the rocker. It goes from 1% to 100%. If the speed is reduced under 5% the display will "very low speed"

HAND COMMAND CONNECTOR: Connects the hand command with the electronic box.

Note: For PINOUT references go to chapter DOCUMENTATION

2.7 LEVELING HEAD

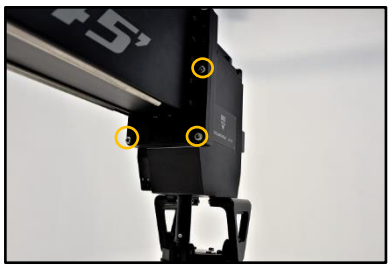
The Leveling Head (*L.H.*) is the component of the crane that holds the horizon when the crane moves up and down. It has a Mitchell mount in it to mount any kind of head with this mount.



02.113 Leveling Head plate

It is located at the end of the telescopic sections. The function of the leveling head is to hold the horizon vertically. It only corrects the level in the same direction than the arm. To adjust the lateral level, see the chapter *2.4.2.4 Fourth Section*. There is explained how to lateraly move the Leveling Head plate by loosing the screws.

To attach the leveling head into the fourth section there are 6 screws that attach the LH into the Leveling Head plate (*DIN912 M8x35mm*). There are different positions to align the LH into the fourth section.



02.114 LH screws

02.115 LH connector

The leveling head needs to be connected in order to communicate with the EB. This kind of connectors needs to be twisted clockwise from the metallic part until they are secured.

In the front part of the leveling head there are 2 components: the inclinometer box and the brake switch. The inclinometer gives information to the LH about the actual degrees of inclination respect the horizon. It only uses the inclinometer when is started. Once it finds the level it uses the encoder on the tilt of the crane to know the change of position. The brake switch is to be able to deactivate the electro brake that holds the motor in position. The normal position of this switch is ON.

02.116 LH front part (Brake and inclinometer)

02.117 LEDs in Leveling Head

To deactivate this electro brake, change the switch position to OFF and then start the crane. The LEDs of the LH will be red and the level of the Mitchell mount can be modified manually.

There are two LEDs in the Leveling Head, S and D:

S LED: This LEDs inform of the status of the SERVO board controlling the L.H. motor. There are three possible status: OFF (*there is no power in the board*), RED (*the board has power but no communication with the CCU*) and GREEN (*power and communication arrive to the board*).

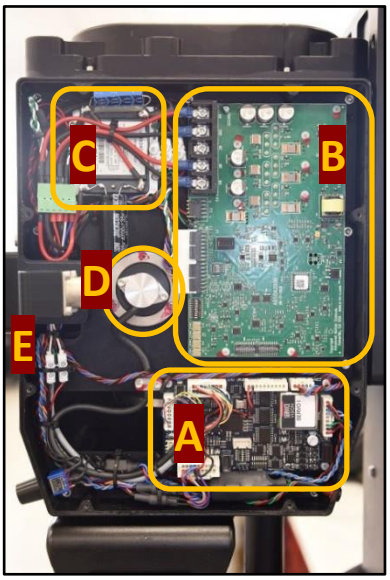
D LED: This LED indicate the status of the Amplifier of the L.H. motor. There are three possible status: OFF (*there is no power in the amplifier*), RED (*the amplifier has power but the motor is disengaged*) and GREEN (*the motor is engaged and controlled by the system*).

The Leveling Head can be mounted Underslung or Over slung. To mount it over slung, detach the LH from the crane unscrewing the 6 bolts and mount it with the Mitchell mount in the upper part of the LH. Then in the Display change the mode of the Leveling Head to Over slung (*see chapter 4.2.3.1 Leveling*).

2.7.1 INSIDE THE LEVELING HEAD

The Leveling Head has a motor mounted in vertical that transmit the movement to an endless screw attached to the back of the Mitchell mount using a belt. When the screw turns, it lifts up or down the back part of the Mitchell mount and changes the level of it.

The components inside the leveling head are:



02.118 LH Electronic components

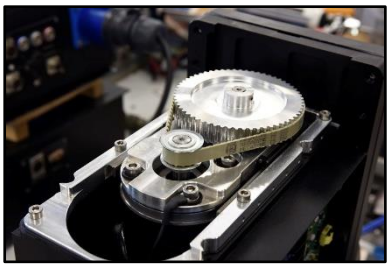
A. Servo board for the LH: This Servo board controls the axis of the LH. It receives information from the CCU, the Encoder in the tilt of the crane, the inclinometer and the absolute encoder in the LH and processes all that information to move the motor inside the L.H. in order to find the level set by the factory.

B. Driver for the L.H.: This is the driver board for the motor inside the L.H. It amplifies the signals from the SERVO of the arm to move the motor. It is powered by DC voltage.

C. Voltage regulator: It stabilizes the power arriving to the L.H. and amplifies the voltage for the driver.

D. Absolute encoder: It is adjusted by the factory with a precision of ±0.00001 º. It sends to the servo information about where is the horizon level.

E. Inclinometer (*fig. 02.116*). This sensor gives information to the servo about the actual degrees of the crane. Only it is used when the crane starts and search for level.



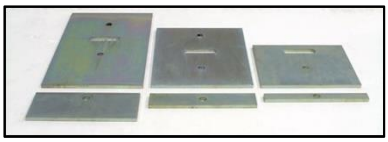
02.119 LH Top cover removed

Under the top cover there is access to the motor and the belt of the LH. To tight the belt, loose the 4 screws holding the motor and push the motor to apply tension to the belt. To remove it, lose the 4 screws and the tension of the belt will be released.

- Commercial reference for LH motor belt: T5 350

In the Underslung position the LH can handle 70kg/154lbs.
In the Over slung position 35kg/77lbs. maximum.

2.8 ACCESSORIES

Component	Ref.	Qty. 45’	Qty. 38’	Description
Set of Counterweights 	7054 7055 7056 7057 7058 7059	64 1 3 2 1 2	54 1 3 2 1 2	Counterweight 15 Kg. Counterweight 10 Kg. Counterweight 8 Kg. Counterweight 4 Kg. Counterweight 2 Kg. Counterweight 1 Kg. They are used to balance the crane.
S45’-S38’ Weights dolly 	7006	5	4	To transport the counterweights with the crane.
S45’-S38’ Security strap 	7076	3	2	The straps are used to secure the arm into the dolly for safely transport it. It is mandatory to have the crane strapped if there is no one operating it.
S38’-45’ H. command bracket 	7036	1	1	Used to hold the hand command into the protection bar
S38’-45’ Sliding counter-weight 6kg. 	7060	1	1	This weight slides along the protection bars to do the fix balance of the crane.
S38’-45’ Portable display bracket 	7701	1	1	To be attached in the operating upper handlebars to hold the portable display.
S38’-45’’ Digital hand command 	7021	1(1)	1(1)	Hand command for the crane.

S38'-45' Portable display 	7692	1	1	The Portable display allows the user to use the functions of the crane and also displays useful information for the user.
S38'-45' Portable display cables 	7693 7694	1(1) 1	1(1) 1	Short cable for portable display. Long cable for portable display.
S38'-45' Encoders 	7615 7616	1 1	1 1	Pan encoder Tilt encoder
S38'-45' Hand command cables 	7022 7023	1(1) 1	1(1) 1	Short cable for hand command (5m.) Long cable for hand command (15m.)
S38'-45' Encoder cables 	7619 7620 7621	1 1 1	1 1 1	S38'&S45' Encoder cable for pan axis (grey) S38'&S45' Encoder cable for tilt axis (blue) S38'&S45' Encoder cable for travelling (red)
S38'-S45' Column cables 	7309 7625	 1(1)	1(1)	S38' Column cable S45' Column cable (5m).
S38'-45' Leveling head cable 	7310 7623	 1(1)	1(1)	Cable to communicate the leveling head with the Electronic box.
S38'-45' Power, Comm. & Video line from Scorpio cranes to Scorpio Heads 	7308 7640	 1	1	This looms provides any Scorpio head power, communication and a video line going through the crane to the base of the dolly.

S38’-45’ AC Power cable 	7642 7622	1 1	1 1	Open end AC power cable AC power cable.
S38’-45’ AC Power cable for Power Unit. 	0193	1	1	To power the Power unit from the Electronic box.
S38’-45’ Dynamic counter-weights cable 	7304 7626	 1	1	To control the motor on the counterweight system from the E.B.
S38’ Locking bolt for collapsible arms on the dolly 	7331		2 (1)	This bolt is used to fix the collapsible arms for the dolly in the extended position
Servo I 	7658	1	1	There are different digital boards inside the Electronic box. To understand the function of each board and identify which one could have a problem see the *chapter 2.5.4 Internal Working concepts*. Also, the LEDs outside the Electronic box and the LH gives information about the status of the boards.
Kit of fuses 	0092 0093 7320 7321 7322 7323 7324 7710 7728 7727 7661	2 2 2 4 2 2	2 2 2 2 2 2 2 	7A Fuse (Power Unit input) 20A Fuse (Power Unit output) S38’ 60A Fuse S38’ Fuse shunt 10A S38’ Fuse 7A P.S AC IN S38’ Fuse 2A safety S38’ 4A Fuse S45’ 4A Fuse S45’ 2A Fuse safety S45’ Fuse shunt 10A S45’ 60A Fuse
S38’-45’ Belts 	7617 7618	1(1) 1(1)	1(1) 1(1)	Encoder belt for Pan T5 990 Encoder belt for Tilt T2.5 600

S38'-S45' Power unit (w/ cover) 	1303	1	1	The P.U. is a 30v 20Amp power supply. It has a 7Amp fuse in the back part. It is powered from AC current and has two 3pin XLR outputs to power the remote head from the crane.
	7311		1	Cover for the P.U.
	7607	1		Cover for the P.U.
S38'-45' Hardware	7318		4(4)	S38' Blocking screw on collapsible dolly M16x60mm with washer.
	7653	4(1)	4(1)	Holder pin for leveling jacks D16x80mm.
	7652	2(1)	2(1)	Holder pin for steering handle D12x25mm
	7648	24(6)	24(6)	Screw for wheel to dolly M12x40mm.
	7650	(25)	(25)	Screw for covers DIN912 M3x6mm.
	7647	16(2)	16(2)	Screw for steering bar DIN912 M8x30mm.
	7644	8(2)	8(2)	Screw and washer from sidebars to operation bars DIN912 M10x35mm.
	7643	4(2)	4(2)	Screw and washer for side protection bars DIN912 M10x50mm.
	0081	6(6)	6(6)	Screw for leveling head DIN912 M8x35mm.
	7627	6(1)	4(1)	Fixing nut and washer for column DIN6330 M20.
	7645	2	8(2)	Screw from fulcrum to column DIN7991 M10x30.
	7646	12(2)	12(2)	Screw from fulcrum to arm DIN912 M10x20mm.
	7664	12(2)	12(2)	Screw to fix CW support in CW carriage DIN912 M12x40mm.
	7633	4	4	Holding screw for traveling wheels
	7310	9	9	Carabiner for cables
	7608	4	4	CW Locking screw with aluminum knob
	7609	7	7	CW Aluminum knob
	7656	4(1)		Screw to fix column to dolly DIN912 M20x50mm.
S45'-S38' Set of tools 	0065	2	2	19mm fix combined wrench
	0066	1	1	17-19mm fix ring wrench (open)
	0067		1	18-19mm fix ring wrench (gated)
	0068	1	1	13mm fix ratchet combined wrench
	0069	1	1	13-13mm fix combined wrench
	0070	1	1	½'' Ratchet wrench
	0071	2	2	½'' x 125mm extenders
	0072	1		30mm socket
	0073	1	1	19mm socket long
	0074	1	1	Multidirectional lug wrench adapter ½
	0075	1	1	Drill adaptor
	0077	1	1	5mm T Allen key
	0078	1	1	6mm T Allen key
	0079	1	1	14mm L Allen key
	0080	1		17mm L Allen key
	2482	1	1	Allen key set
	0203	1	1	Vise grip pliers

**The quantity detailed between brackets () is counted as spare.*

***This list is based on a basic package and is susceptible to be changed on demand.*

3 SET UP THE EQUIPMENT

3.1 CHECK BEFORE FLIGHT

With the crane assembled there are some things to be checked before transporting it into the location of shooting.

The first thing to do is to ensure that the crane will have a good power source to perform. The power requirements for the crane are detailed in the technical specifications.

03.01 Selector inside EB

Since the crane can work at 110V or 220V it is important to know how this power source is going to be and adjust the selector inside the electronic box accordingly.

Once the selector has been adjusted, connect the Main power cable into the electronic box, switch the AC breaker ON, connect the Hand Command using the Hand Command cable and press the START button. The emergency button needs to be released. Now the crane can be moved slightly to verify that the movement of the crane is good.

03.02 Guides of the telescopic sections

Note: Remove the strap blocking the telescopic sections before moving the ARM

Be sure that the guides of the sections are clean and there are no frayed cables on the crane. If so, they need to be replaced.

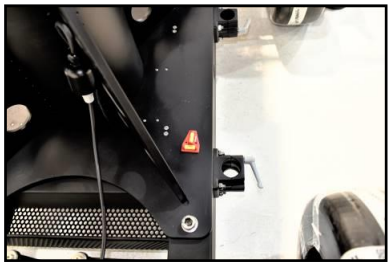
Visually verify that the leveling head corrects the level properly.

Also check the pressure of the wheels. If the wheels are flat, the crane will be hard to move. If they are low, inflate them accordingly.

Once everything is checked the crane can be strapped into the transport vehicle. The base of the crane needs to be secured into the base of the vehicle with straps. The Arm needs to be strapped into the base of the crane with two straps in the front and one in the back. The telescopic arm needs to be secured to prevent the arm to extend while transport and it needs to be strapped into the vehicle to prevent any Pan movement of the Arm. The leveling jacks needs to be touching the ground and the weight of the vehicle needs to be evenly distributed.

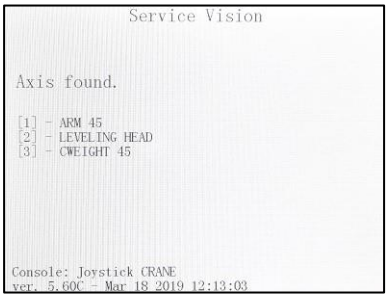
3.2 STARTING THE CRANE

Procedure to set up the equipment in location once the crane has been removed from the transport vehicle:



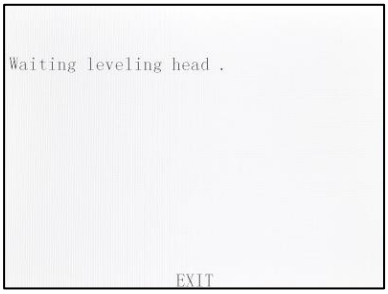
03.03 Bubble level on the base

Use the leveling jacks to level the base of the arm. The level can be checked in the fulcrum part, in 2 parallel directions or in the dolly base. Be sure to start leveling from the higher point of the base.



03.04 CCU finds all the servos

Start the system by arming the AC breaker and then pressing the START button on the electronic box. Be sure that the hand command is connected, the emergency stop is released and the system power LED is ON. The system will start.



03.05 LH Searching for level

The leveling head will find the level and the counterweight system will calibrate itself. If these events do not occur, check the *F.A.Q. chapter*.

03.06 Finding magnetic limits

Once the *Search Arm Limits* screen is displayed in the portable display, it is possible to move the crane with the hand command.

Mount the Head in the Mitchel mount and if possible, mount the whole camera package that will be used. If there is no possibility to get the full camera package with the head at this moment, there will be needed to repeat the next steps in order to balance the crane properly.

To balance the crane there are two steps. Step one is to balance the static part of the crane, as if it is a rigid crane. The second step is to balance the moving part of the crane, the telescoping arm.

03.07 Telescopic Counterweights in the center

Remove the leveling head strap and move the arm in order to leave the counterweight carriage in the middle of the Fulcrum. In this position the weights in the carriage does not affect to the balance of the crane. In this position, check which side of the crane is heavier by slightly loosing the rear strap with the tilt brake on and add weights in the back/front counterweight support to balance the crane (*fig. 2.52, fig. 2.53)*. The sliding light weight can be used to do this balance.

Note: Be sure that the tilt brake is loose to balance the crane.

Note 2: To be more accurate, remove carefully the straps holding the arm once is more or less balance.

Note 3: Remember to lock the weights with the counterweight locking screw after balancing the arm.

Once the Static Balancing has been achieved and the ratchet straps are taken off, the crane arm can be slowly extended. When the crane becomes front heavy, stop, and add weight in the counterweight carriage until the correct balance is achieved.

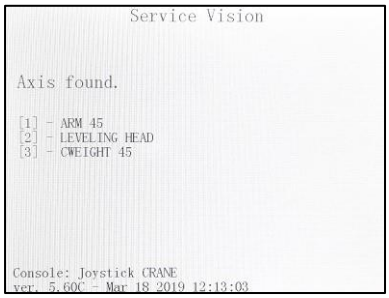
This process is repeated until the Crane Arm is at the maximum length and is balanced through its entire length. At the end when the maximum length has been reached the smaller weights are used to reach the correct balance.

Note: The Dynamic counterweight system can be used to reach 100% perfect balance by changing the position of the carriage along the movement of the crane (see chapter 4.2.3.9 CWE gen).

Now the crane is ready to use all the functions in it.

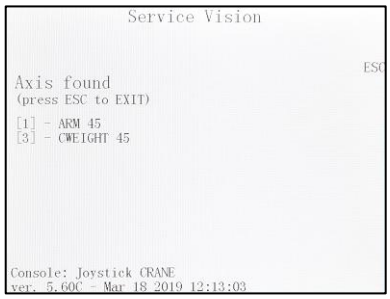
4 CONTROL DISPLAY INFORMATION

The following chapter describes the different screens showed when starting the crane:

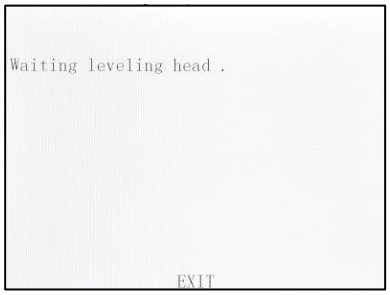


04.01 CCU finds all the servos

After pressing the START button in the electronic box and if all the securities are ready (*Hand Command, Emergency stop*.) screen 04.01 will appear. It shows to the user that the system is trying to connect with the Servos of the Arm motor, the Leveling Head and the Counterweight axes.



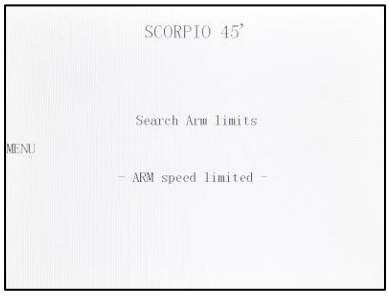
If the Central Control Unit does not find one or both of these axes, it is possible to press ESC in order to access the rest of the menus. If ESC is pressed, Matrix mode is enabled (*see chapter special modes*).



04.03 LH Searching for level

If the Central Control Unit finds all axes screen 04.03 will automatically appear and show us that the Leveling Head is searching the "0", the level set by the factory. Once the horizon has been reached, screen 04.04 will automatically appear. While the crane is switched ON, the Leveling Head will correct any change on the level

Note: Screen 04.03 is only showed if the leveling head is configured in Search level YES. (see chapter 4.2.3.1 Leveling)

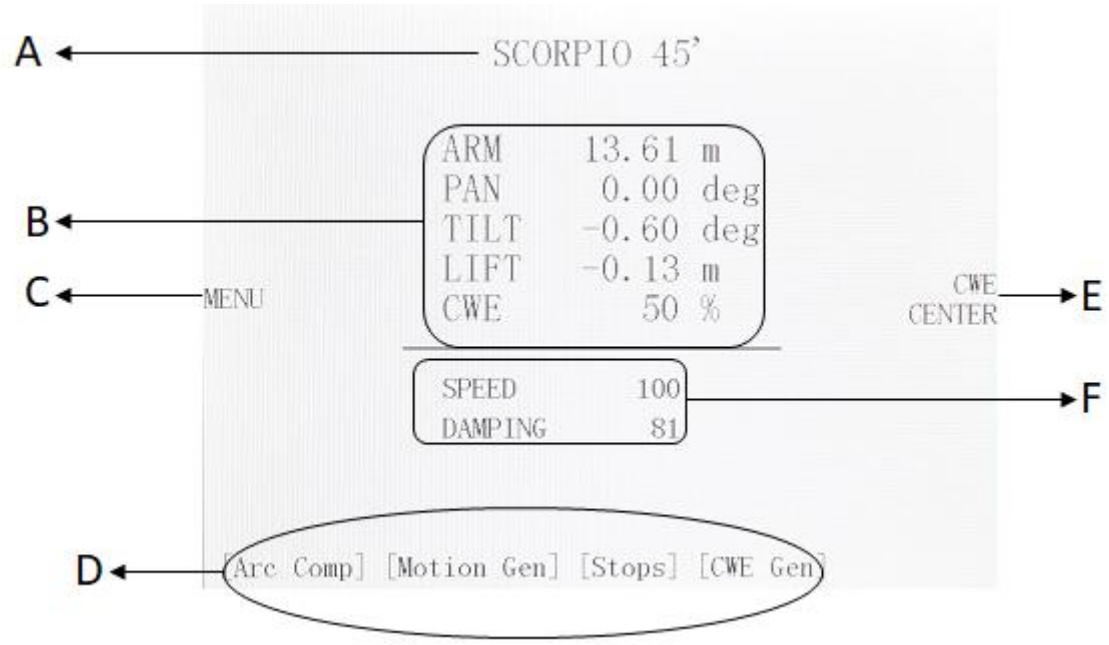


04.04 Finding magnetic limits

At this point, the crane can be moved but with limited speed and one magnetic limit must be find. The crane has a Front Limit and a Back Limit. It does not matter which one, but the system needs to know one to be able to calculate where the Arm is. The crane must be moved using the Hand Commands rocker until one magnetic limit is detected.

4.1 MAIN SCREEN

This is the Principal Menu. The different features buttons and system information appear in this screen. The following system information appears:



04.05 Main Screen

A: The type on crane being used, SCORPIO 45´

B: This is the information of the position of the crane such as:

- The length of the crane arm in meters or feet (from the center of rotation).
- The PAN axis angle respect to where the Crane Arm was when the system was switched on or from the Zero Position when a Pan Reset is done (*see 4.2.3.4 Pan reset menu*)
- The TILT axis angle respect to the horizon.
- The LIFT is the height of the camera lens (*see 4.2.3.3 Lift calibration*).
- The position of the Dynamic Counterweight System "CWE" in percentage.

C: Opens a dropdown tab with different functions and configurations for the head (*chapter 4.2 Operation menu*)

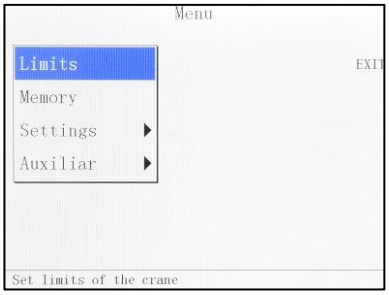
D: This are shortcuts to the main functions of the crane (*see each menu independently*). If any of these functions is activated, they will be flashing green.

E: If pressed, Moves the Dynamic Counterweight to the 50% position.

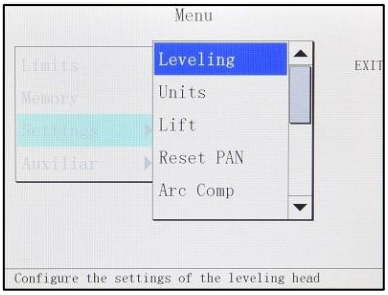
F: Displays the Arm Movement Speed from 0% –100%. If the Speed setting is below 5, "Very Slow Speed" is displayed. The Damping level goes from 0, very hard to 100, very soft. This is how soft or hard the Crane Arm slows down when stopping. This setting affects the Programmable Limits, the final Arm Limit ramps and the stop at any point the operator stops.

4.2 OPERATION MENU

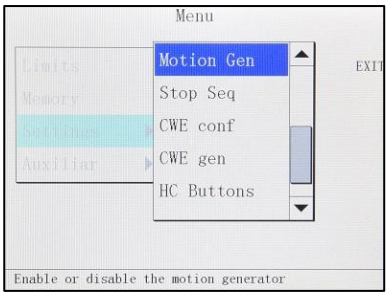
These are all the menus available through the MENU button. Each menu is described below.



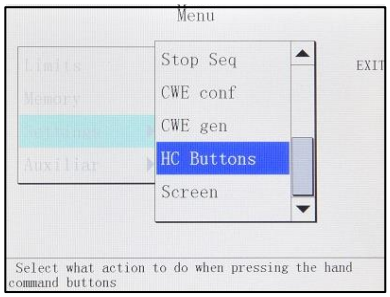
04.06 Dropdown Menu



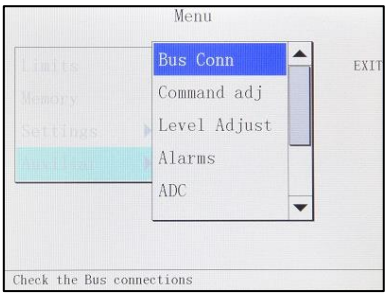
04.07 Dropdown Menu Settings 1



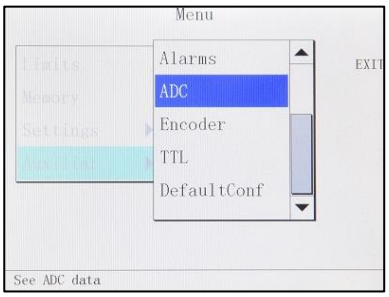
04.08 Dropdown Menu Settings 2



04.09 Dropdown Menu Settings 3

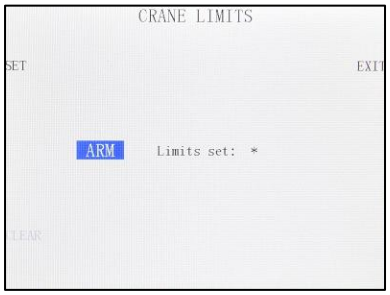


04.10 Dropdown Menu Auxiliary 1



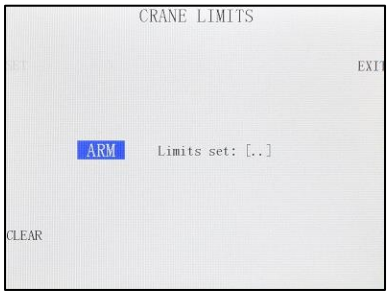
04.11 Dropdown Menu Auxiliary 2

4.2.1 LIMITS



04.12 Limits menu without limits

This menu sets limits on the movement on the crane. To use it, move the crane in one of the desired limits and press SET (*fig. 04.12*). One bracket "[", will appear indicating that the point has been saved. Now move the crane to the other desired position and press SET again. Another bracket will appear "[..] ", indicating that both limits are activated. The crane will never pass beyond those points.



04.13 Limits menu with limits activated

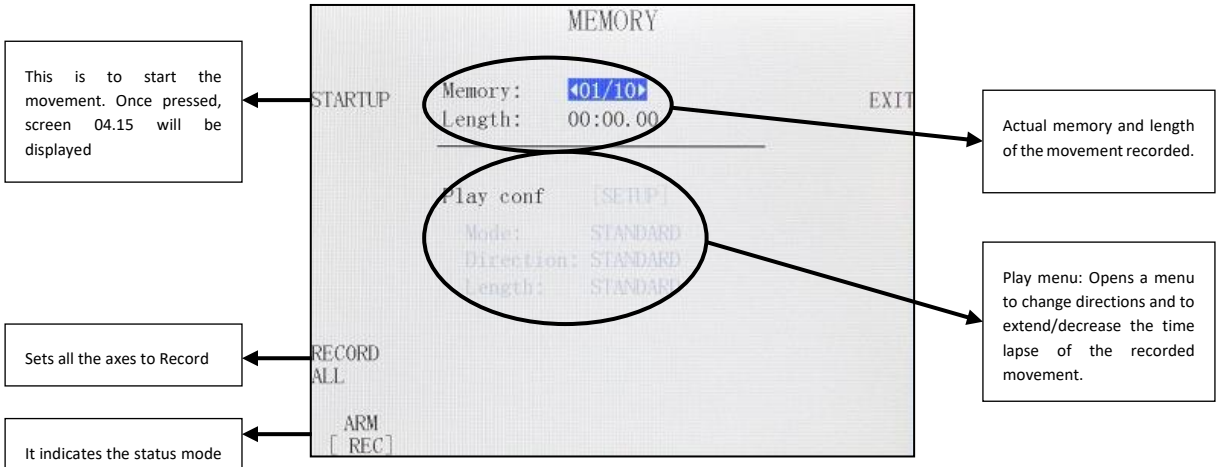
To erase those limits, press the CLEAR button and both limits will be erased.

Note: If the crane is switched off, any limit recorded will be erased.

4.2.2 MEMORIES

The Memory menu allow to record movements of the arm. The recorded movement can be reproduced and modified afterwards. It also allows to change the direction and the time lapse of the recorded movement.

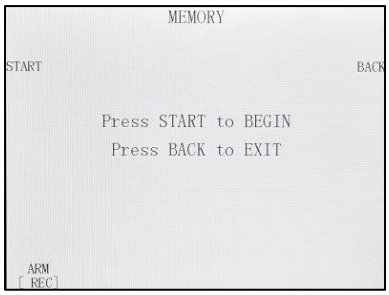
The system records the memory directly to an SD card located inside the electronic box. In case there is no SD card, the system will not allow you to go further on the memory menu.



04.14 Memory menu main screen

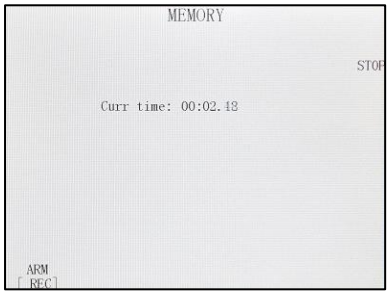
4.2.2.1 RECORD A MOVEMENT

There are 10 slots of memories. To record a movement, select which of those 10 memories will be recorded. Then, on the bottom left corner, be sure that the ARM axis is on REC. RECORD ALL button can be pressed to change all the axes states to REC.



04.15 Start recording screen

Now press STARTUP and the screen will change to fig. 04.15. While this is screen is being displayed, no movement will be recorded, allowing the user to relocate the crane at the beginning position for his movement. The START button triggers the memory and a counter will appear (*fig. 04.16*) indicating that the memory is being recorded. It can also be triggered by the GREEN button in the Hand Command.

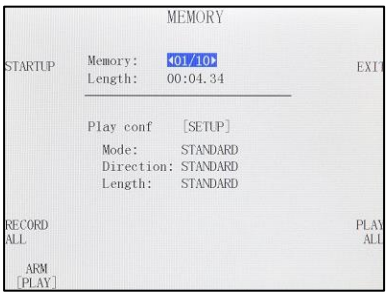


04.16 Recording memory

Once the take is finished, the STOP button finishes recording the memory.

Note: The maximum length of recording each memory can be 1 hour.

4.2.2.2 PLAYBACK A MOVEMENT



04.17 Memory recorded screen

Once there is a memory recorded, the system allows different playing configurations to play/reproduce a recorded movement.

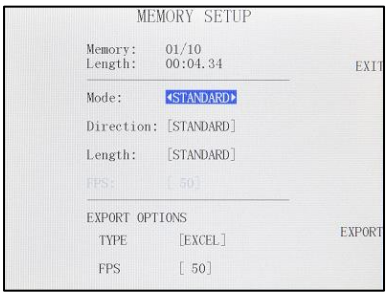
To playback a movement as it was recorded, change the status mode of the ARM axis to [PLAY] or press the PLAY ALL button to change all the axes states to play.

Then press the STARTUP button and the crane will automatically go to the beginning position of the recorded movement (this action is called HOMING). Now screen 04.15 is displayed again. Press START or the GREEN button in the Hand Command and the same movement recorded will be reproduced.

Note: The recorded movement can be stopped at any time by pressing the STOP button in the display or the GREEN button in the Hand Command while the memory is being played.

4.2.2.3 CONFIGURE AN EXISTING MOVEMENT

By pressing the [SETUP] button of an existing memory the user can access to modify that memory.



04.18 SETUP of a memory

MODE:

- Standard: Regular playback mode.
- Stop Motion: It allows to playback the memory frame by frame. The FPS option sets how many FPS the user wants.

DIRECTION:

- Normal: Regular playback mode.
- Reverse: The playback starts in the end of the movement and ends in the beginning position of the recorded movement.

LENGTH:

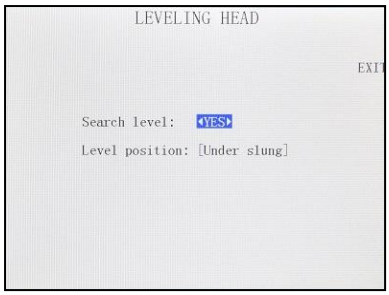
This is the length of the movement; it can be multiplied by 2 as many times as needed to make it slower.

EXPORT OPTIONS: with the EXPORT button a file is generated in the SD card. In this submenu it is possible to choose the type of file (ASCII or EXCEL) and how many FPS will have the exported file.

Note: the memories will remain in the SD card once recorded even if the crane is switched off. The file in the SD card can be used in a different crane of the same model to reproduce the same movement.

4.2.3 SETTINGS MENU

4.2.3.1 LEVELING



04.19 Leveling Head Menu

02.110 LH front part (Brake and inclinometer)

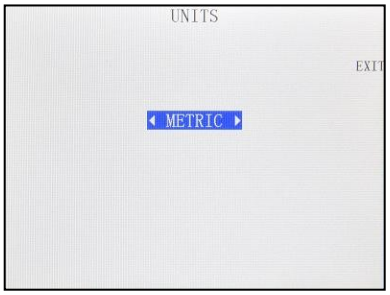
In this screen is possible to choose if the leveling head needs to search the level when the crane starts (Search level YES) or if we want to set the level manually.

To set the level manually, put the Search level option in NO, then restart the crane with the brake on the leveling head OFF (*fig.02.110)*. Once the crane is restarted with the switch OFF, it will be waiting for the leveling head. Manually move the Mitchel base from the Leveling Head to the desired level and change the brake to ON again. That will be the level maintained by the LH when the arm goes up or down.

In case we change the position of the leveling head from Underslung to Over slung it is needed to change the Level position in this menu in order to make the leveling head correct in the proper direction.

Note: Any change made in this screen requires the system to be restarted to take effect.

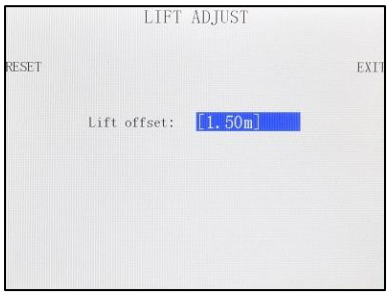
4.2.3.2 UNITS



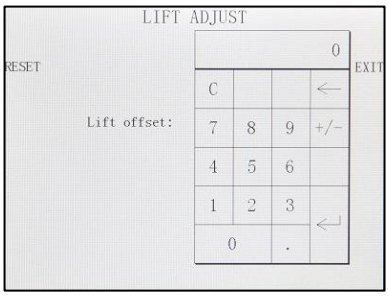
04.20 Units Menu

In this menu is possible to select how the distance information is displayed: Metric system or Imperial system.

4.2.3.3 LIFT



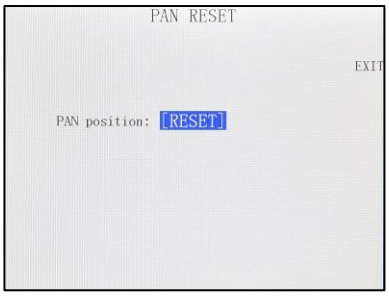
04.21 Lift Adjust menu



04.22 Lift adjust panel

To introduce a lift offset, with the crane still measure the lens height. Introduce that distance using the keypad and when the crane moves it will calculate the height change of the lens and it will display in the main screen.

4.2.3.4 RESET PAN



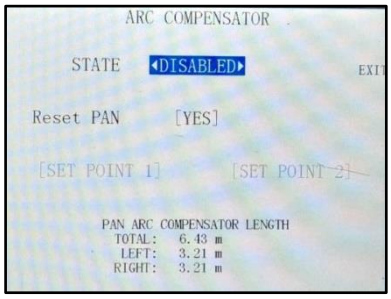
04.23 Pan Reset menu

The reset pan feature is used to set the 0º in the actual position of the crane. If the 0 position of the crane is not done, the position that the crane has when the system was started will be taken as the 0 position.

Note: The 0 position of the Pan axis is used for different features such as Arc Comp, Motion Gen, or the Integration with the Scorpio Heads. Please physically mark the 0 position before using these features.

Note 2: If the crane is Integrated with the Scorpio Heads for a tracking movement, the change of the 0 position of the crane will affect to the position of the Scorpio Head.

4.2.3.5 ARC COMPENSATION



04.24 Arc compensator menu

The Arc Compensator feature can be activated by pressing the GREEN button in the Hand Command, by pressing the [Arc Comp] button in the main screen or by changing the STATE in this screen (*fig. 04.24*).

This feature compensates for the arc generated when both the Pan and/or Tilt are moved. The compensation is automatic, works in any arm position and does not affect the normal operation of the arm. The arm will telescope by itself correcting the arc generated by the Pan and/or Tilt movement but the user can still control it. There might be a small error due to the mechanics tolerances.

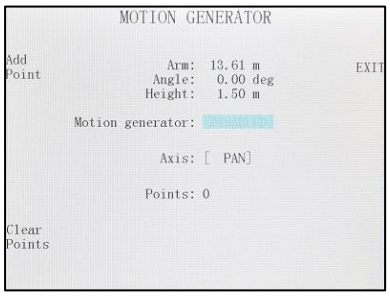
The Tilt compensation will always be vertical, but the Pan compensation is respecting the 0º position in PAN axis. If the Reset PAN of this menu is in [YES], every time the Arc Comp feature is activated it will reset the 0º position in the PAN axis of the arm and it will set it in the actual position of the crane. It is also possible to set this 0º PAN position using two points: Move the arm to one end of the desired horizontal correction and set point 1. Move the arm to the other end of the desired horizontal correction and set point 2. The system will change the 0º PAN position in order to correct on the line marked by those two points. The Pan arc compensation length will be displayed on this screen to inform the user where is the end of the pan compensation. The maximum correction for Pan is +-80 degrees from 0º position.

Note: This feature cannot be used with the Motion Generator feature.

Note 2: There are limitations on the use of this feature. If the operator swings the arm too fast, the motor may not be fast enough to follow the arm.

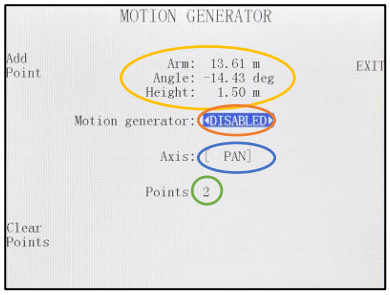
Note 3: If the Pan 0ºposition is set using two points, the reset PAN must be in NO, other ways every time it is activated the PAN 0º position will be reset and changed.

4.2.3.6 MOTION GENERATOR



04.25 Motion generator without points

The Motion Generator feature allows the user to set some key frames of the extension of the arm respect to the degrees of one of the axes Pan OR Tilt. This means that while the user swings the crane in one axis (Pan or Tilt) the crane will automatically retract or extend in order to pass through this extension points in the desired degrees.



04.26 Motion generator with points

A – Information of the actual position

B –State of the Motion gen

C – Working axis

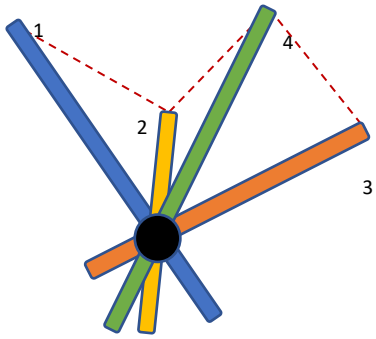
D – Number of points recorded

To start using it, select the working axis (*PAN or TILT*). The Pan or Tilt encoder is the one who will generate the arm movement. If the Pan axis is selected, set the Tilt in the horizontal position and brake the Tilt axis. If working in the Tilt axis, lock the position of the Pan axis using the Pan brake.

Once the axis has been selected, move the extension of the arm in one desired keyframe for a certain degree and press the Add Point button. Now change the degrees in that axis and adjust a new extension for the arm to set another point.

Repeat this procedure to save as many points as desired.

Once all the points are recorded, enable the Motion Gen. Now the extension of the arm is automatically moved by the system while the crane is being moved in order to pass through the key points. The operator cannot control the arm while the Motion generator is engaged.



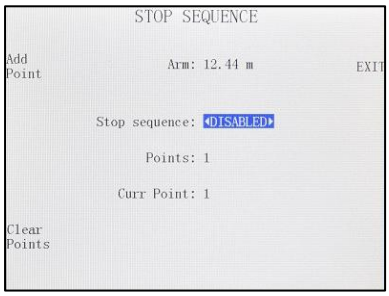
04.26b Movement of the motion gen

Note: The minimum degrees between points is 5 degrees. If the point introduced has less difference with the previous, it will not be recorded.

Note 2: The motion generator works respect the zero position. See reset pan for more information.

Note 3: The order of the points does not affect the movement of the crane. In fig. 04.26b there are 4 points in the pan axis and the line that the arm will follow to reach those points.

4.2.3.7 STOP SEQUENCE



04.27 Stop Sequence menu

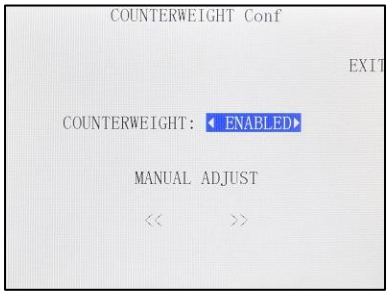
This feature can be used to set different stop points for the telescopic movement.

To start using it, extend the crane to the first stopping point and press the Add Point button. Now is possible to enable the stop sequence.

Move the arm to another extension point if desired and press Add Point again. This process can be repeated as many times as needed.

Once all the desired stops are added, Enable the Stop sequence feature and the Current point will be set in 1. Now if the crane is extended or retracted it will stop in the current point of the extension. To change to the next point, press the GREEN button on the hand command or press the next point button in the Stop sequence screen. The order of the points set is the order that the system will follow.

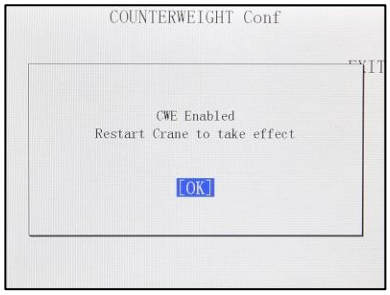
4.2.3.8 CWE CONF



04.28 Conterweight config screen

In this menu is possible to manually adjust the position of the dynamic counterweight system (with the arrows) or deactivate it by disabling it.

If it is disabled, when the crane starts the counterweights will not calibrate and will not be able to move.



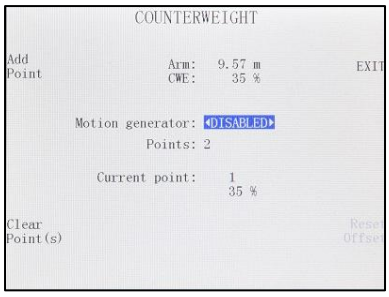
04.29 Conterweight Enable screen

In case it is disabled, and the user wants to activate it, it will be required to restart the crane so the counterweight system can calibrate itself.

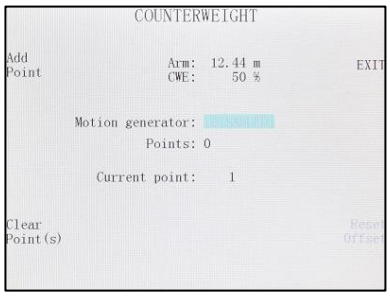
Once it is enabled the counterweights can be moved with the hand unit.

4.2.3.9 CWE GENERATOR

With the counterweight generator is possible to change the position of the counterweight carriage depending on the extension of the arm. This function helps to balance the arm during all the extension of the crane.



04.30 Counterweight generator screen



04.31 CWE Generator screen empty

To start using it, move the arm to the maximum extension and, in this position, move the counterweight carriage using the rocker of the Hand Command while the GREEN button is being hold.

Once the counterweight is in the desired position for this extension of the arm, press the Add Point button.

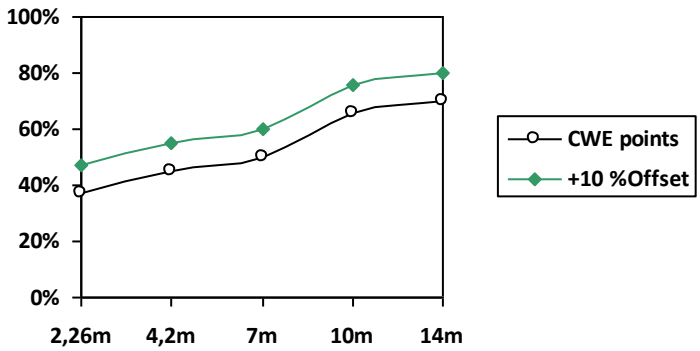
From this point, start retracting the arm and as soon as the balance of the arm is not good, move again the counterweight carriage and Add another Point.

Keep adding points along the range of the arm. Normally with 4-5 points is enough. Once all the points have been recorded. Enable the counterweight generator and the carriage will move automatically as the arm extends or retracts.

In case one point is not recorded properly can be erased by getting close to the point and pressing Clear Point while the system is disabled.

More points can be added in between once the rest has been recorded.

An Offset can be added to all the points once the system is on by moving the carriage with the cursor and the GREEN button. The points will be the same but all of them will be displaced.



04.32 5 CWE Points in the length of the crane with an offset of 10%

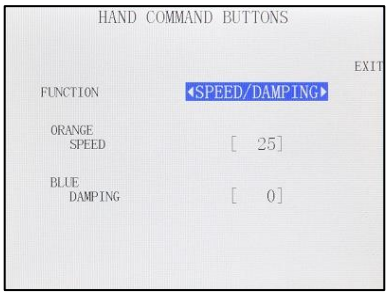
4.2.3.10 HAND COMMAND (H.C.) BUTTONS

The GREEN button is the main action button, below is detailed the different functions of this button depending on the screen shown in the display.

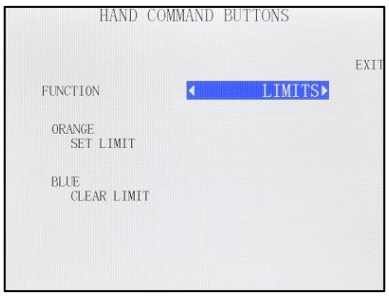
GREEN button functions on the screens if:	***Main menu screen***	***Memories screen***	***CWE Gen screen***	***Motion Gen screen***	***Stop sequence screen***
Short pressed	*ON/OFF the Arc compensator**	*Start/Stop memories*	*Add new point*	*Add new point*	*Add new point*
Press & Hold	*While holding the button, the rocker will move the counterweights in any screen*				

**If the Stop Sequence mode is Enabled, the short press increases current stop point number*

The ORANGE & BLUE buttons can be configured in different modes as shown:



04.33 Hand command Speed/Damping



04.34 Hand command Limits

SPEED/DAMPING MODE: Configures the ORANGE button to set a Speed value and the BLUE button to set a Damping value when they are pressed. If any of these buttons are pressed, in the main screen the speed and the damping will change to these presets and a purple background will be displayed.

If the buttons are pressed & hold, the preset of this screen will be set as long as the button is being hold.

LIMITS: Configures the ORANGE button to Set a limit at the current point when pressed. Once one limit is set, it is still not decided if is the extended or the retracted limit. When the crane is moved from that point, the type of limit is defined and another limit can be set. The LED (if present) or the brackets around the word "Limits" can be seen in the main screen once they are set.

The BLUE button clears the nearest limit when pressed.

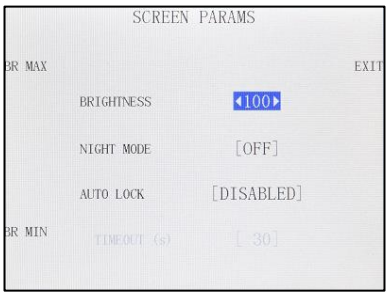
REST OF THE MODES: The rest of modes changes the function of the orange button on the main screen accordingly to the next table:

ORANGE button functions on the screens if:	***Main menu screen***	***CWE Gen screen***	***Motion Gen screen***	***Stop sequence screen***
CWE GEN MODE	*ON/OFF CWE GEN*	*ON/OFF CWE GEN*	*ON/OFF MOTION GEN*	*ON/OFF STOP SEQ.*
MOTION GEN MODE	*ON/OFF MOTION GEN*	*ON/OFF CWE GEN*	*ON/OFF MOTION GEN*	*ON/OFF STOP SEQ*
STOPS MODE	*ON/OFF STOP SEQ*	*ON/OFF CWE GEN*	*ON/OFF MOTION GEN*	*ON/OFF STOP SEQ*

**In all cases it is expected to short press the button*

*** The BLUE button in all cases will show the main screen when it is pressed*

4.2.3.11 SCREEN



04.35 Screen menu

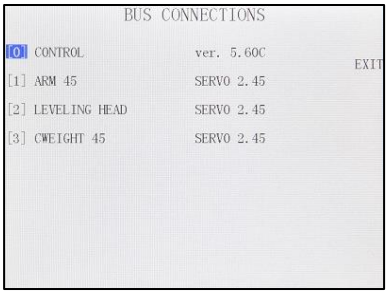
04.36 Night mode ON

Changes the brightness from the display. Also is possible to enable the night mode (black screen with less backlight) or set an auto lock for the screen, a function that after a timeout locks the screen to prevent miss clicking on it. If the screen is locked, on the bottom right corner will inform the user that the screen is locked.

To unlock the screen press in any point of the display and the system will ask if the user wants to unlock the screen.

4.2.4 AUXILIARY

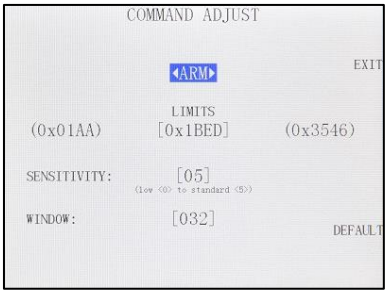
4.2.4.1 BUS CONNECTIONS



04.37 Bus connections

In this menu everything connected to the communication line will be displayed. Also, it is possible to see the Software version for each axis and, if the number of an axis is pressed, a screen will display more information referred to that axis.

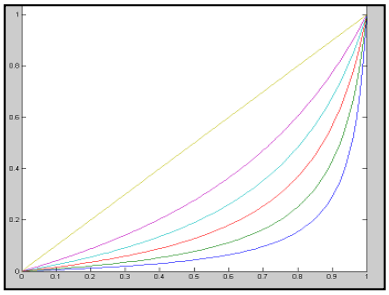
4.2.4.2 COMMAND ADJUST



04.38 Command Adjust screen

It calibrates the cursor of the Hand Command. To calibrate it, press the limits numbers in the middle of the screen (*fig.04.38*).

Move the cursor to both limits and then press OK. Now the range of movement of the cursor is introduced to the system. This needs to be done in case the crane moves faster in one direction than the other.



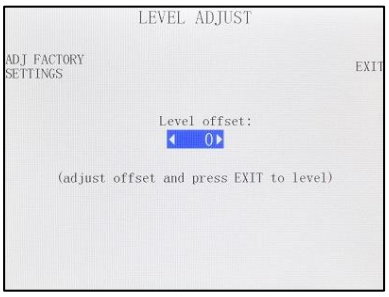
04.39 Relations of sensitivity

The SENSITIVITY parameter changes the relation between the cursor from the Hand Command and the speed of the crane. It goes from a lineal relation (5) to an exponential relation by reducing this parameter until 0 (fig.42.42b). The more is reduced, the more exponential the relation.

WINDOW is the range of the potentiometer where it can be moved and the system will not make any movement on the crane.

Note: **The DEFAULT button sets back the factory settings.**

4.2.4.3 LEVEL ADJUST

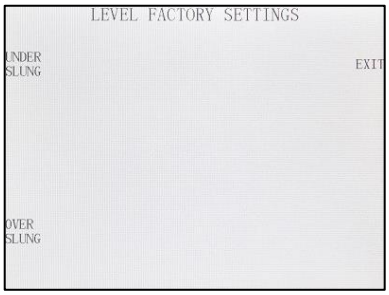


04.40 Level Adjust screen

In case the leveling head does not correct well (always off by the same degrees in the same direction), An offset can be added to the leveling head in order to compensate that difference.

To add the offset, change the value of the Level offset and press EXIT to see the changes.

Note: Level search must be in YES to see the correction.

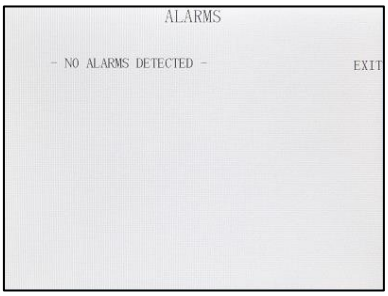


04.41 Adjust Factory settings

In case the offset is increased by more than 200, there is the possibility to set a new 0 for the level set by the absolute encoder in the ADJ FACTORY SETTINGS menu.

To do the factory level adjust, the crane needs to be leveled and with the safety straps fixing it in the horizontal position. Once in that position, if the leveling head is hanging under slung press the under slung button. If the leveling head is in the over slung position, press the over slung button.

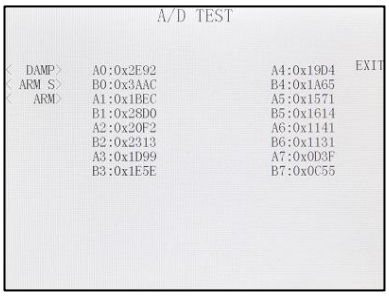
4.2.4.4 ALARMS



04.42 Alarms

The SCORPIO 45’ recognizes a series of different alarms. In case the temperature of the motor is too high or the limits for the CWE are disconnected will be displayed in this screen.

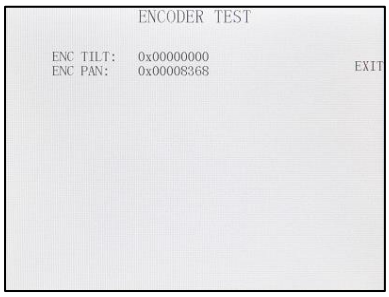
4.2.4.5 ADC TEST



04.43 ADC Test

Displays the readings for the Analog/Digital converters. This screen is for troubleshooting, in case one potentiometer does not work, here is possible to see if the CCU have a reading for that potentiometer.

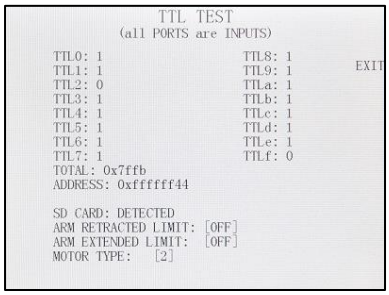
4.2.4.6 ENCODERS



04.44 Encoders

Displays the readings of the encoders connected to the CCU. In case the encoder signal does not change when the controller is moved, there is a problem with that controller.

4.2.4.7 TTL

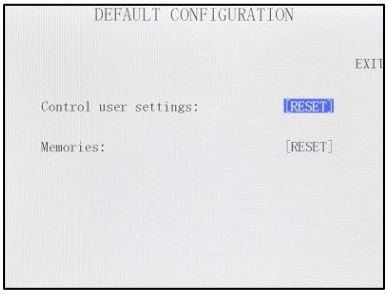


04.45 TTL Readings

Displays the digital inputs (buttons, selectors…). In case one button is pressed or one controller is connected a change in this screen will be seen.

Also shows if one the magnetic limits is detecting or if the SD card is connected.

4.2.4.8 DEFAULT CONFIGURATION



04.46 Default Config

In this is screen is possible to reset the memories and set the user settings (CWE points, L. Head configuration…) back to the factory settings.

5 SECURITIES & RECOMMENDATIONS

Before delivering any product made by Servicevision, the product is completely assembled to detect and ensure there will be no problem in the assembly process once it has been delivered to the final customer and to verify the functioning of the systems.

All the parts and components designed by Servicevision (free of toxic, dangerous or hazard materials), has eliminated any sharp edges, avoiding the possibility of cutting.

5.1 BASIC SAFETY INFORMATION

There are several points to consider in order to operate the Scorpio cranes without any risk or danger:

- Crane technicians and operators must have received the proper formation through the training given by Servicevision.
- Scorpio crane operators must wear the individual protection: helmet, protection working boot and protection gloves.
- It is MANDATORY having perfectly balanced and the counterweights locked and secured BEFORE operating the Scorpio cranes.
- DO NEVER use the Scorpio cranes under weather conditions such as electrical storms since the system might be a spotlight for electrical discharge.
- DO NOT manipulate the Scorpio cranes while there is power into the system.
- NO person can be inside the arm turn radius. In case of the presence of spectators or public, a delimited area will be defined visually, and a verbal security announcement must be given, warning about the existing hazard.
- The Scorpio cranes MUST BE COMPLETETLY DISCONNECTED and with the three security straps on in case there is no operator or technician in the area.
- Consider that being a predominantly metallic element, there is a risk of burns if heat sources in proximity, such as high-power illumination spotlights or other similar devices.

It is essential to have the arm correctly counter balanced for the correct using of the Scorpio cranes. Otherwise the movement of the arm will be uncontrollable by the operator, with the real danger of seriously injuring the personnel working or near the arm.

5.2 MALFUNCTION RISKS

Next there is a list of events related to the crane and the possible danger associated to the malfunction of each part. In the event any of the following occurs, contact Servicevision for the procedure to follow.

Event on the crane	Risk associated
Working with the crane unbalanced	There is a risk of not being able to control the movement of the crane. Balance the crane before operating it.
One broken/damaged steel side cable	If one of all the side cables brakes, there is no risk or danger. The cables must be replaced for the optimum arm behavior.
All the cables from one section break	There will be no control of the section and the sections behind it, it will be detached from the system and therefore uncontrollable. The crane cannot work until the cables have been replaced.
The main section cables moving the first section break	In this case the telescopic arm will not move. Replace the cable to use the crane again.
One broken/damaged steel CWE cable	If one cable is broken there is no risk or danger. The cable must be replaced for the optimum arm behavior.
All the cables from the CWE break	If the crane is in the horizontal position no risk will happen. If the crane is tilted, even slightly, the CWE trolley will move freely and the balance of the crane will be lost. The crane cannot work until the cables have been replaced.
Moving the telescopic arm with something blocking it	There is a risk to burn the motor or damage some mechanical component. Remove anything blocking the telescopic section before operating the crane.
One guiding wheel breaks or is too tight	The rail can be damage and the movement of the crane is not smooth. Replace/readjust the wheel.
Upper bars or rear side bars broken/damaged	If one or several bars brake, there are no specific risks or danger. It must be replaced for the optimum arm behavior.
The dynamic CWE belt breaks	It might be possible that the counterweights move freely along the range. Replace the belt or it could happen sudden changes on the balance of the crane while operation.
The main motor/gearbox is broken	There are no risks associated to this event but the crane cannot work, it will be blocked in the position it has when the event occurs.
Pan or Tilt brake loose	The crane will be moved freely by the wind and it can hit anything in the surroundings.
Electronic box breaks	The crane will stop but there are no risks associated. Replace the electronic Box to operate the crane again.
Leveling Head breaks	There will be no correction of the horizon.
Working in Electrical storm conditions (lighting and thunderstorms)	There is the risk of serious injury and death by electrocution or burns for the operators/technicians or any personnel near the crane.
Wind Speed	The consequences of ignoring the maximum wind speeds permitted to operate each Scorpio crane will lead into overturning/capsize. With a REAL RISK of injuring crew and personnel around the camera car.

5.3 POTENTIAL DANGERS FOR THE USER

There are mechanical dangers to behold, but if the crane is manipulated with all protections, equipment covers and instructions received under both the user's manual and the training given by Servicevision's authorized trainee, it should be no danger.

Noteworthy, the operators must always know the performance limits of the machine, thus watching that no person entering the physical space of operation. In locations where there is presence of public, it also must perform a hazard warning verbally or implement a security fence to prevent any approach.

Operators will also be responsible for monitoring during the operation; no person may come into contact with the crane:

- All protection covers must be mounted for operation.
- The protection bars need to be mounted ALL THE TIME, only for doing certain maintenances they can be removed.
- Table of potential mechanical hazards associated in case the instructions are not followed is shown below.

5.3.1.1 MECHANICAL HAZARDS:

These are the mechanical hazards that may arise in the case that the conditions and explanations given by Servicevision training personnel are not followed.

Mechanical Hazards	Associated to the Scorpio cranes
Flattening/Crushing	Yes
Shearing	Yes
Cutting & Sectioning	Yes
Hitch	Yes
Dragging & Entrapment	Yes
Impact	Yes
Piercing & Puncture	No
Friction or Abrasion	Yes
Pressurized fluid injection	No

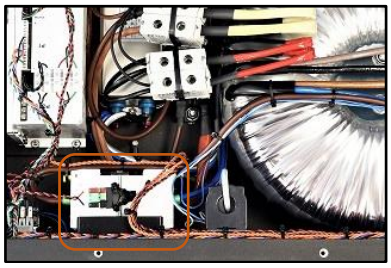
5.3.1.2 ELECTRICAL HAZARDS:

There is a risk of electrical hazard in case the following instructions are not followed:

- Take caution when connecting the power, electrical hazard.
- Do not use cables without an earth ground connected to the system.

5.4 PROTECTION SYSTEMS

5.4.1 PROTECTION AGAINST OVERLOADS



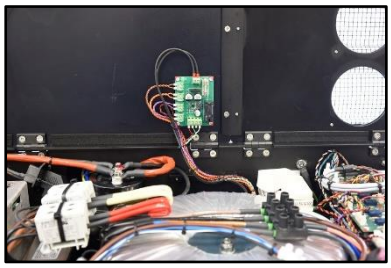
05.01 Circuit breaker

The Scorpio cranes have a cutting element against electrical overloads; the circuit breaker is located at the power input. It is a protection against electrical overload (and shortcuts) 32 A caliber and curve C.

5.4.2 ENCODER PROTECTION SYSTEM

In what entails to the arm movement, there is a protection system that will disconnect the motor if the system detects a malfunction. In the event something is hit the system will display an alarm in the main screen in case the system detects any inconsistent information regarding the position of the crane.

5.4.3 SECURITY CIRCUIT BOARD



05.02 Security circuit board

There is a board inside the electronic box that controls all the components to start the crane such as: The start button, the red emergency button, and the hand command. If any of the three components is not ready the crane will not be able to start.

5.4.4 PROTECTION BARS AND COVERS

The protection bars mark the area of movement of the Telescopic counterweights, therefore NEVER get in between the protection bars and the crane, there is a high risk of squashing if the crane moves.

The covers protect any moving component inside the telescopic arm therefore NEVER can be removed while the crane is moving, there is a high risk of squashing if the crane moves.

5.5 SYSTEM SHUTDOWN

05.03 Emergency stop

In case of necessity, there is an emergency stop button in the Electronic box and a red button in the hand command. This emergency stop buttons will shut down all the system immediately.

These safety features cannot be reprogrammed by the user; security routines **CANNOT** be modified.

05.04 Hand command stop button

> ***Note: If the system shuts down while the arm is expanding or retracting, the inertia of the arm will make that the arm continues with the movement until it stops by friction.***

6 MAINTENANCE & SERVICE

The Scorpio crane must be inspected periodically since the delivery date. The inspections must be done by qualified personnel.

Each inspection will determinate the conditions of the equipment, and the parts or components that need repair or replacement.

In case the user is not doing these inspections or is not following the recommendations of the technical personnel of Servicevision, Servicevision will not be responsible of any damage generate by the crane.

6.1 MAINTENANCE REQUIREMENTS

Any maintenance must be done only by personnel trained by Servicevision. Servicevision will provide the certificate as Maintenance technician.

The Maintenance technician will decide how often and the works to do depending on the shooting conditions on the previous shooting and the reports received from the operators and the technicians on location.

6.2 GENERAL MAINTENANCE

For a proper and correct maintenance, the Scorpio crane must always be revised before and after every shooting. The parts to be checked or changed will be under the maintenance technician judgement. As well as the parts to be cleaned or lubricated since the conditions under the crane has been exposed in the previous days can be different every time. The table below is only to be used as a reference, depending on the shooting conditions the components to be check may change.

Before every shooting there are some parts to be checked or cleaned described in the *chapter 3 Set up the equipment*. Those checks need to be done before every shooting.

Note: Before any arm manipulation, the crane must be disconnected from the power source and, unless it is specified, strapped into the base.

Note: Remember that if the crane is started with the sections being locked by a strap or a bar, the motor might get damaged or burned.

Part to be checked	Weekly	Monthly	Every 3 months	Every 6 months	Every year	Every 2 year
Crane operation	Inspect	-	-	-t	-	-
Air pressure on the dolly wheels	Inspect	Refill	-	-	-	-
Outside telescopic rails and rollers	Clean	-	Clean and Grease	-	-	-
Inside telescopic rails and rollers	Inspect	-	-	Clean and Grease	-	-
Counterweights square bearings	Inspect	Clean	-	Clean and Grease	-	-
Counterweight cables	Inspect	-	Inspect and Tight	Inspect and grease	-	Replace
First section cables	Inspect	-	Inspect and Tight	Inspect and grease	-	-
Brushes of the main motor	-	-	-	Open and Clean	-	-
Electronic connectors	Inspect	-	-	Inspect and Clean	-	-
Different belts of the crane	Inspect	-	-	-	Inspect and Tight	-
Cable trolleys	Inspect	-	-	Inspect and Tight		

This table is only a reference, it is under the maintenance technician's judgement to check the different parts of the crane. It will also depend on how many times the crane work during this period of time.

The situations where the crane had been exposed to humid/wet environments such as rain, high humidity areas, rain effect shootings, shooting near water areas such rivers or sea, etc. requires following the next steps:

- General drying of all the components of the crane. Open the carbon fiber covers to be able to reach the inside parts of the arm.
- Cleaning of all the mechanical components for the telescopic arm using a degreaser and a rag, mainly the wheel guides, the steel wheels, and any other component subject to friction.
- In case of salty environments such as beaches or long periods near the sea, all the procedure must be done deeply and previously washed with fresh water the non-electrical components.
- Lubricate the aluminum wheels in case the existing lubricant is dirty or inexistent.
- Open the covers for the electronic box and the leveling head to let dry the possible moisture inside these components.
- Clean the electronic connectors with contact cleaner, let it dry before connecting the crane.

The situation in which the crane was exposed to environments with suspended particles, such as deserts, beaches, mountainous areas or places with special effects (paper, glitter, environmental smoke, etc...), the procedure and the steps to follow are:

- Expulsion/blowing all the particles with compressed air after opening all the covers.
- Cleaning of all the mechanical components, mainly the areas of contact between wheels and the guides with degreaser.
- In case of salty environments such as beaches or long periods near the sea, all the procedure must be done deeply and previously washed with fresh water.
- Lubricate the aluminum wheels in case the existing lubricant is dirty or inexistent.

Normal shooting situation involving crashes, emergency full stops, sudden side tackles, etc. requires the following steps:

- Check that the contacts between guides and wheels are in good condition without particles that might interfere with the correct functioning of the arm.
- Check the steel cables of the crane to see if they are in good conditions, with the proper tension and without frayed parts.
- Check the tension of the screws tightening the different parts of the crane: dolly-column, column-fulcrum, fulcrum-arm, arm-leveling head, and arm-electronic box.
- Remove the carbon fiber covers and visually inspect the guides are in good condition (without any broken wheels, with hits or any damage in the guides) clean of any particles that might interfere with the correct functioning of the crane.

6.2.1 CRANE OPERATION

To inspect the crane operation consists in start the crane and balance it as in a normal shooting condition. To do this follow the *chapter 3 Set up the equipment*. In that chapter is detailed everything the operator needs to check before starting the crane.

6.2.2 AIR PRESSURE ON THE DOLLY WHEELS

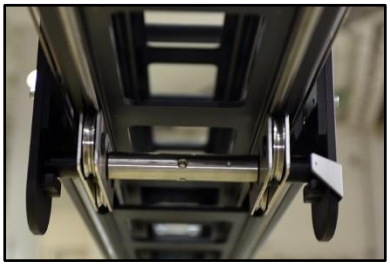
06.01 Cap for the inner tube of the wheel

The wheels of the crane are inflated with air at max pressure of: 51PSI/305kPa. (3.5Bar).

To inflate the wheels, remove the cap of the inner tube of the wheel and apply air pressure using an air compressor and a manometer to know how much pressure is inside the inner tube. Repeat the process for all the wheels of the crane.

If there is not enough pressure on the wheels the crane will get harder to move.

6.2.3 OUTSIDE TELESCOPIC RAILS AND ROLLERS

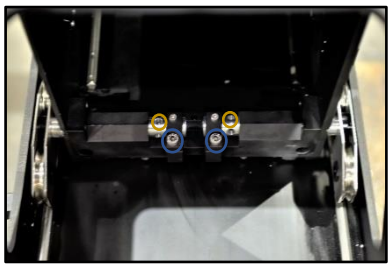


06.02 Front wheels first section

The outside telescopic rails and rollers are along all the telescopic sections of the crane. To clean them, extend the crane completely and use a rag with degreaser applied on it to clean all the rails. Use the same rag to clean the rollers that move with these rails.

Once the rail is clean, apply just a little bit of lubricant for motorcycles chains in a rag and pass it along the whole rails. If too much is applied it will attract dust and small particles, is better to keep it dry than too much oily.

6.2.4 INSIDE TELESCOPIC RAILS AND ROLLERS



06.03 Rear wheels in the first section
A – Screws to lose to adjusts the eccentric
B – Holes to move the eccentric

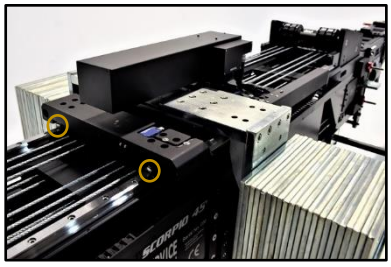
Inside every section there are rollers and rails to move the telescopic sections. To clean them, open all the covers of the crane in order to have access to these rails and then apply degreaser in a rag and clean all the dirty grease along the rails.

Once the rails are clean, use a brush to apply a small amount of regular grease along the top rails and the bottom rails.

06.04 Rear top wheels in the first section

In case there is a noise when the weights of the telescopic sections pivot, the bottom rear wheels can be adjusted to minimize this noise. To do it, Loose the screws holding the axis of the roller and use a small Allen key to pivot the axis into the proper position. These rollers need to be movable by hand when the crane is fully extended.

6.2.5 COUNTERWEIGHTS SQUARE BEARINGS

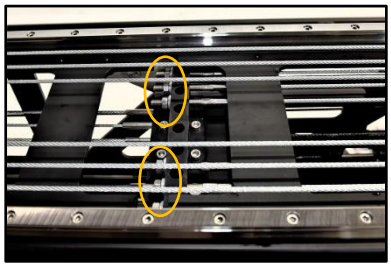


06.05 Bearing greasing points

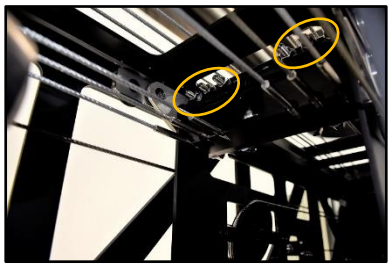
There are 4 square bearings holding the counterweights support. Each of these bearings have 2 greasing points, one on each side of it. These bearings grease by themselves and will expel the excess of grease on them. The excess of grease needs to be cleaned using a rag to prevent that the dust or other particles interfere with the proper function of these bearings.

To grease them, use a greasing gun filled with regular grease. Grease them until they start expelling the excess of grease.

6.2.6 COUNTERWEIGHT CABLES



06.06 Cables end in the First section



06.07 Cables end in the First section

There are 12 counterweight cables holding the counterweight trolley. Each of these cables have 2 ends: one in the counterweight trolley and the other one in the first section. To tight these cables always put the crane in the horizontal position and extend it until there is access to the top cables in the first section (*fig. 06.06)*.

Remove the locknut using the fix wrench provided with crane and tight them from the part of the first section using a vice grip to hold the cable and a wrench to move the nut. Apply tension to all the cables equally in order to not change the position of the counterweights respect the first section.

Once the cables are tight, check <u>both</u> magnetic limits of the crane to verify that the position of the counterweight trolley have not change.

06.08 Pulley system for front CW cables

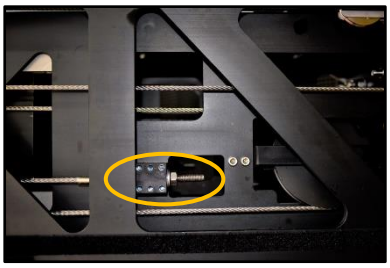
Note: To tight the CW cables the protection bars MUST BE REMOVED in order to prevent any entrapment.

To grease the cables of the counterweights, open the cover of the front pulley system for the CW and apply motorcycles chain lubricant with a spray while the crane is moving.

06.09 Pulley system for back CW cables

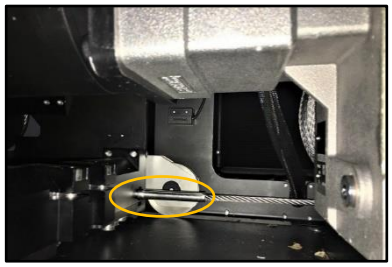
To lubricate the back cables, spray the lubricant in the rear pulley while the crane is moving. Not too much lubricant needs to be applied, just enough to prevent too much friction between the pulleys and the cables.

6.2.7 FIRST SECTION CABLES



06.10 End of the extension cable

The first section cables need to be tight if there is too much bouncing on them when telescoping in and out. To do it, remove the locknut using the fix wrench provided with crane and tight them from the part of the first section using a vice grip to hold the cable and a wrench to move the nut. Apply tension on both sides equally in order to keep both cables working together.



06.11 End of retracting cable

In case the other end is fully tight, repeat the same process to the retracting cable. Apply tension on both sides equally in order to keep both cables working together.

06.12 Drums for the arm

To lubricate the first section cables, spray motorcycles lubricant in the drums while the crane is moving. Not too much lubricant needs to be applied, just enough to prevent too much friction between the pulleys and the cables.

6.2.8 BRUSHES OF THE MOTOR

06.13 Motor for the arm

The brushes of the motor are from carbon and they get wasted with the use. To clean them, remove them from the motor one by one and clean the excess of carbon dust on them. To clean the collector, use compressed air while moving the crane slowly and the carbon inside will be cleaned.

06.14 Brush of the motor

To have access to the brushes, loose the covers holding them into the motor.

6.2.9 ELECTRONIC CONNECTORS

All the connectors are susceptible to get some moisture if the working environment is humid. To clean them, disconnect the cable and spray some contact cleaner, let the contact cleaner dry before connecting the crane again.

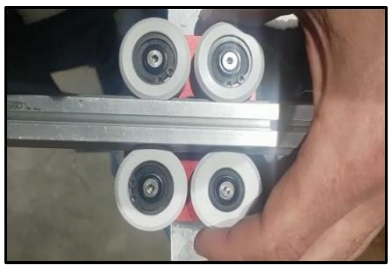
6.2.10 BELTS OF THE CRANE

There are 5 belts in the crane. It is explained how to tight them or replace in the following chapters:

Belt	Chapter	Commercial reference
Column motor belt	*Chapter 2.2*	5M 665
Dynamic CW motor belt	*Chapter 2.4.1.3*	T10 480
PAN/TILT Encoder belt	*Chapter 2.3.2*	T5 990 / T2.5 600
Leveling Head belt	*Chapter 2.7.1*	T5 350

The belts moving motors needs to be tight enough so there is no mechanical play between the gears and the belt. The belts reading the encoders needs to be tight enough to do not skip teeth when moving.

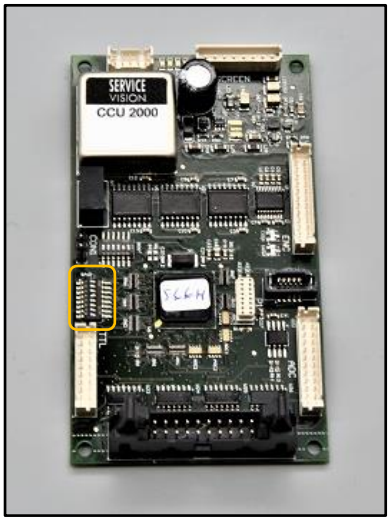
6.2.11 CABLE TROLLEYS



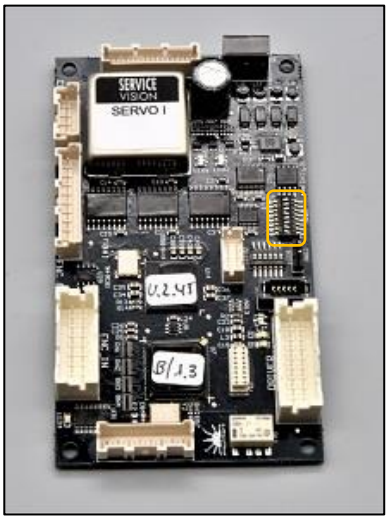
06.15 Adjusting the cable trolleys

With the weight of the cables, the white wheels of the cable trolleys get wasted and they can even touch the telescopic section when they move causing noise. To tight them, remove the trolley from the crane by extending it completely and removing the stopper at the end of the rail and lose the 4 screws holding the wheels. Then use the guide provided by Servicevision to press the wheels against the guide and tight the screws. Mount it back in and verify that the tension of the wheels is correct.

6.3 ELECTRONIC BOARDS



06.16 CCU2000 I DIP switch



06.17 SERVO I DIP switch

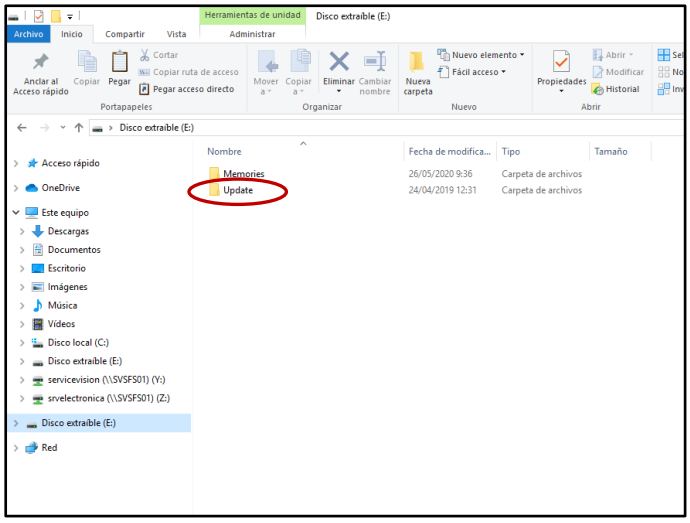
There are 2 kind of electronic boards inside of the crane: the SERVO and the CCU. They look very similar but they make different functions. The CCU controls the user interface and the SERVO controls motors. To replace them, remove all the connectors from the board, unscrew the plastic screws holding the board and remove them from the system. Notice that every board have a DIP switch on it. Be sure to copy the DIP switch of the board BEFORE removing the damaged board.

In the *chapter Documentation* there is information of the possible DIP switch configurations for the SERVO and the CCU. There is one SERVO inside the electronic box and one SERVO inside the leveling head. There is only one CCU board placed inside the electronic box.

There are two driver boards inside the electronic box to control the motor of the arm and the motor for the CWE/Column. There is another driver in the leveling head. To change any driver, remove the screws holding the driver in place and then disconnect the connectors from the driver and connect them exactly in the same pins on the new driver. The driver for the leveling head can be acceded by removing the labeled cover from the leveling head. The drivers need to be adjusted for every motor. In the *chapter 6.5 Driver adjustment* it is explained how to adjust them.

6.4 LOADING SOFTWARE TO THE SERVO/CCU

In the electronic box there is a slot for SD Cards. The SD Card reader is normally connected to the CCU but there is one connector in the SERVOs also to connect the SD Card reader. To LOAD software in the boards the software needs to be inside an SD Card. Servicevision will send to the users a new software every time it is developed. This software will be a file called *"XXXX.bin".*



06.18 Folder called UPDATE inside the root of the SD CARD

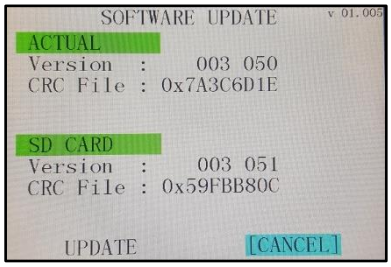
Copy the software file (*.bin) inside the UPDATE folder. The access path should be:

X:\UPDATE*.bin. (*X is the name of the SD CARD in the computer).*

Once the file is in the folder called update (***only one file in the folder***), introduce the SD card into the loader and connect it to the board to be updated.

6.4.1 CCU SOFTWARE UPDATE

The CCU controls all the functions that the head/crane can perform. There are two different kind of software for the CCU depending if it is inside a crane or in a control for the head. To identify them, on the name of the file there is an H or a C depending on this ("*CCU_C.v05.68xxxxx.bin" for example*).



06.19 CCU2000 UPDATE screen

With the software for the CCU inside the SD Card and the SD Card reader connected into the CCU, start the crane. The system will identify the new software and it will use the display to ask if the user wants to complete the update.

Once the software has been updated remove the software from the SD Card.

Note: It is needed a portable display to do a software update in the CCU.

6.4.2 SERVO I SOFTWARE UPDATE

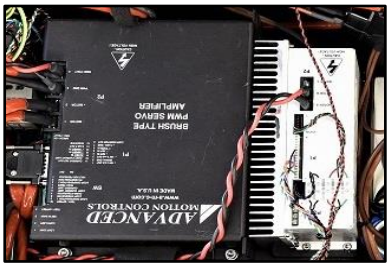
The servo controls the movement of the motor connected to it. It is not common to update it but it can be done with the SD card reader connected into the SD card connector.

06.20 Bus connections

With the software for the SERVO inside the SD Card, connect the SD card reader to the SERVO. Once it is connected, start the crane. The Servo Board will make a LED sequence inside. Once the Outside LED of the SERVO flashes fix RED, the new software would have been UPDATED and the system may start booting as normally. To ensure that the new software is loaded, verify it in the menu→auxiliary→Bus connections.

6.5 DRIVER ADJUSTMENT

Before doing any adjustment of any driver we need to be sure that the hand command is correctly adjusted (*Chapter 4.2.4.2*).

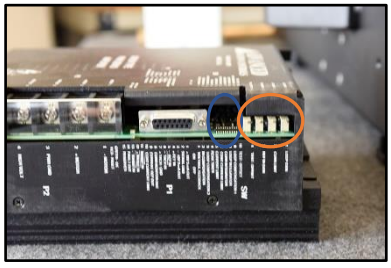


06.21 Drivers in the electronic box

Any spare driver will be pre-adjusted at factory but since every motor is different it may need a final adjustment once replaced. In the Electronic Box for the Scorpio 45/38 there are two different drivers, the Arm Driver, and the CWE/Column driver.

6.5.1 ARM DRIVER

There is a DIP SWITCH near the connectors of the driver, ensure the new driver has the same address. The correct DIP SWITCH address for the driver of the arm is: Switches 3/4/5 and 8 in ON position, rest in OFF position.



06.22 ARM driver

A – DIP SWITCH
B – Potentiometers

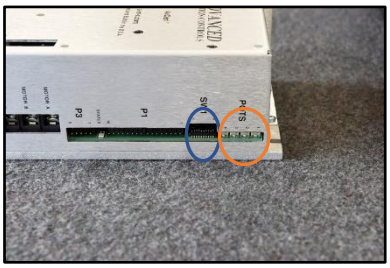
Once this is verified, start the crane, and find the magnetic limits of the crane. When the main screen is shown, the driver can be adjusted.

There are 4 potentiometers in the connectors side. These potentiometers adjust different parameters of the behavior of the motor and there is no mechanical limit on the numbers of turns they can do.

- Potentiometer 1 Loop Gain: Turn the potentiometer number 1 CLOCKWISE until hearing a "coupling" noise from the motor. From this point, turn counterclockwise now until the "buzz" noise stops. And from this exact point, keep turning counterclockwise for 2,5 turns more and stop.
- Potentiometer 2 Current Limit: Always needs to be giving the maximum current. Turn the potentiometer number 2 CLOCKWISE until hearing a "click" noise or during 14 full turns CLOCKWISE to reach its maximum.
- Potentiometer 3 Ref in Gain / SPEED: Turn potentiometer number 3 CLOCKWISE until hearing a "click", from this point, turn COUNTERCLOCKWISE for 3.5 turns. There is one test it can be performed to see if this potentiometer is properly adjusted: Move the crane to one end and move it from there at 100% Speed and 0% Damping. When the crane reaches the middle of the movement, release the hand from the rocker. The crane needs to stop at that exact time. If it is delayed, turn CLOCKWISE this potentiometer. If it is too stiff, turn it COUNTERCLOCKWISE.
- Potentiometer 4 Test/offset: This potentiometer adjusts the offset or zero of the motor. It does not need to be adjusted; it is preset by the factory.

6.5.2 CWE DRIVER

Note this driver in controlling two different motors, the motor of the Dynamic Counterweights System (CWE) and the motor of the column. Therefore, we will adjust potentiometer 1, 2 for the motor of the CWE only, the potentiometer 3 for speed will be for the motor of the column and potentiometer number 4 does not need to be adjusted since it’s preset by the factory.



06.23 CWE/Column driver

A – DIP SWITCH
B – Potentiometers

The correct DIP SWITCH address for the motor driver of the arm and for the motor driver of the CWE and COLUMN is the same: Switches 3/4/5 and 8 in ON position, rest in OFF position.

Be sure the new driver has the same address before replacing it.

Once the new driver is connected, start the crane, and find the magnetic limits of the crane. When the main screen is shown, the driver can be adjusted.

- Potentiometer 1 Loop Gain: Turn the potentiometer number 1 CLOCKWISE until hearing a “buzz” noise. Turn COUNTERCLOCKWISE now until the “buzz” noise stops. And from this exact point, keep turning COUNTERCLOCKWISE for 3 turns more and stop. Leave it like this.
- Potentiometer 2 Current Limit: We want this always giving the maximum current. Turn the potentiometer number 2 CLOCKWISE until hearing a “click” noise or during 14 full turns CLOCKWISE to reach its maximum.
- Potentiometer 3 Ref in Gain / SPEED: Change the mode selector to COLUMN MODE on the commuter on the electronics to set the crane to work on the column motor. We set speed of the column motor ONLY, we do not adjust speed on the motor of the Dynamic Counterweight System.
  Using a multimeter at 200VCC check the COLUMN/STANDARD MODE commuter. Place the red/positive cable to the pin number 2 (in some crane it might be number 3) and the black/negative cable to pin number 6 of the commuter (in some crane it might be number 7 instead of 6) *see chapter 10 Documentation to find the driver output.*
  Now set the speed potentiometer of the hand command to Maximum speed.
  While pushing the rocker in one direction on the hand command, turn clockwise or counterclockwise to adjust it to +-125VCC.
  The values of 125VCC are guideline value, so it might be 124 or 126VCC, what is important is that both values have to be the same (W in negative and T in positive). We want equal speed when rising and when lowering down the telescopic column.
- Potentiometer 4 OFFSET: Since this driver is controlling two different motors, we cannot adjust this parameter. The offset parameter for the motors will be adjusted from factory.

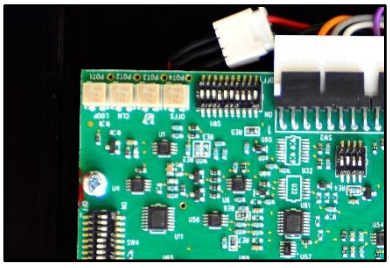
6.5.3 LEVELING HEAD DRIVER

There are different DIP switches on the PCB board, verify the configuration of those DIP switches with the following table for the LH driver:

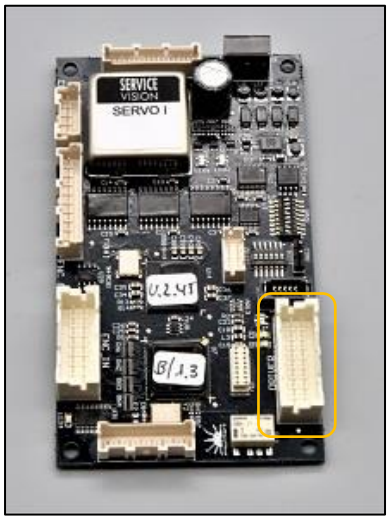
SW1	2,3,4,7 ON	1,5,6,8,9,10 OFF
SW2	1,2,3 ON	4 OFF
SW3	1,2,3,4,5,6,7,8,9 ON	10 OFF
SW4	-	1,2,3,4,5,6,7,8,9,10 OFF

Once this is verified, start the crane, and find the magnetic limits of the crane. When the main screen is shown, the driver can be adjusted.

There are 4 potentiometers in the connectors side. These potentiometers adjust different parameters of the behavior of the motor and there is no mechanical limit on the numbers of turns they can do.



06.24 Driver potentiometers



06.25 SERVO I Driver connector

- Potentiometer 1 Loop Gain: Turn the potentiometer number 1 CLOCKWISE until hearing a "coupling" noise from the motor. From this point, turn counterclockwise now until the "buzz" noise stops. And from this exact point, keep turning counterclockwise for 1,5 turns more and stop. Try to be as accurate as possible.
- Potentiometer 2 Current Limit: Always needs to be giving the maximum current. Turn the potentiometer number 2 CLOCKWISE until hearing a "click" noise or during 15 full turns CLOCKWISE to reach its maximum.
- Potentiometer 3 Ref in Gain / SPEED: To adjust the speed it is mandatory to DISENGAGE the motor of the crane. Switch off the Electronic Box and remove the belt for the leveling head as seen in *Chapter 2.7.1 Inside the leveling head*. Then change the SERVO I Switch SAd1 direction to MOTOR FREEWHEEL (1,2,3,4 ON) (*check documentation chapter*). Switch on the Electronic Box again and turn the potentiometer clockwise 15 times then turn counterclockwise slowly until the noise of the motor changes. Power off the Electronic Box and set the SERVO DIP switch 1 as it was (2,3,5 ON).

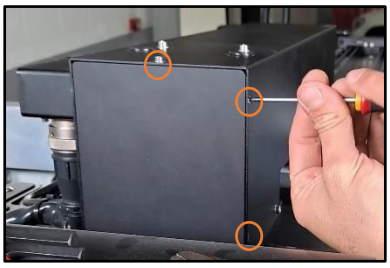
WARNING: in this mode, when the system is powered on, the motor will run freewheel!

Ensure the mechanics are disengaged before doing any adjustment

- Potentiometer 4 Offset: With the crane started and the mechanics disengaged, remove the DRIVER connector in the Servo I board, checking if there is any movement in the motor. If so, turn the potentiometer clockwise or counterclockwise until the movement disappears. Connect the DRIVER connector of the Servo I board again and engage the motor to the mechanics again with the belt.

6.6 REMOVE THE CW MOTOR

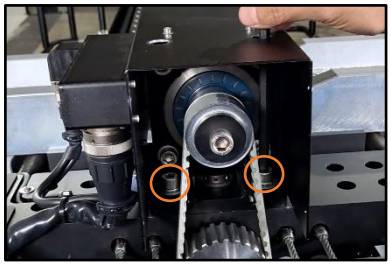
The latest version of the Scorpio 38’ and the Scorpio 45’ offer the possibility to detach the counterweight motor to reduce the height of the cranes under 2.10m *(6’11”).*



06.26 Screws from the front cover

To do this operation, it is necessary to open the front cover of the counterweights motor block by removing the 4 Philips screws on the sides of the cover and the Allen screw on the top cover.

With the cover removed, the two front screws holding the motor block can be completely removed using an Allen key from the holes on top of the motor cover (*fig. 06.27).*



06.27 Motor block screws

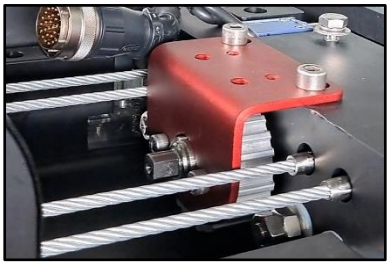
With the screws removed, proceed to disconnect the limits cable and the main CW cable using and adjustable plier. Leave this cables in a position where they do not suffer harm.

Proceed to loosen the two rear screws holding the motor block until there is enough room to tilt the motor block and easily remove the CW belt without changing the tension of this belt.

06.28 Rear screws from the CW motor block

To assemble the CW motor again use the same process: tilt the motor block until the belt can easily be attached and then tight all the screws and connect the cables again.

It is important to notice that if there is nothing holding the gear of the dynamic counterweights, they may move during the tilt motion of the arm. To prevent this, mount the red part shown in *fig. 06.29* to lock the position of the endless screw on the CW.



06.29 CWE/Column driver

First move manually the CW trolley to the desired locking position and then attach the red part into the gear and the counterweight trolley to prevent any motion of the endless screw.

7 F.A.Q. / COMMON PROBLEMS

7.1 POSSIBLE PROBLEMS RELATED TO THE LH

If the leveling Head does not work properly, it could be for different reasons as follow:

Symptom	Procedure to follow
The Leveling Head does not communicate with the electronic box when the crane starts	-Check if the brake of the LH is ON. -Check if the FUSE for the LH is released. -Verify that the cable is connected and there is power into the LH -Change the LH cable. -Contact Servicevision
The Leveling Head finds the level when the system starts but is not a good level	It could be possible that one of the sensors incorporated in the leveling head loses the reference position. It is possible to add an offset to the leveling head to correct this effect. Go to *MENU→AUXILIARY→LEVEL ADJUST*. In this screen is possible to add an OFFSET to correct the level (*see the chapter 4.2.4.3 Level Adjust*).
The leveling head finds a different level every time the crane is started	One of the components of the Leveling Head is damaged. Use the Leveling Head in manual mode and contact Servicevision for repair it. (*see chapter 4.2.3.1 Leveling to use the manual mode)*
The leveling Head finds the level when the system starts but does not correct properly the movement of the crane	The Leveling Head is not configured properly, it needs to be changed from Over slung to Underslung. *(see chapter 4.2.3.1 Leveling to use the manual mode)*
The leveling Head finds the level properly but does not correct the movement of the crane	If the leveling head finds the level properly, the problem is not in the leveling head. The information to correct the movement of the crane come from the *Tilt encoder* located in the fulcrum (*chapter 2.3 Fulcrum*). It could be that the information from the Tilt encoder does not reach the leveling head for some reason. -Check if the encoder information reaches the Electronic Box (*the degrees for tilt may change*). If there is no change in the E.B., change the tilt encoder cable. -Change the LH cable. -Contact Servicevision

7.2 POSSIBLE PROBLEMS RELATED TO THE ELECTRONICS

The most common problems related to the Arm are:

Symptom	Procedure to follow
There is no Alarm, but the Arm does not move	-Check the speed of the Hand Command. -Check if there are limits sets on the movement of the Arm. -Check if there is something blocking the movement of the Arm.
There is no light in the screen	-Check the cable for the display -Contact Servicevision
The system does not start	-Check if all the securities are connected (*Hand Command, Emergency stop, start button)*. -Change the cable for the Hand Command.
The crane only moves in one direction	-Check if there is something blocking the movement of the crane -Check in the TTL screen to see if the crane detects one of the magnetic limits. If so, that magnetic limit is broken, either the cable is broken/disconnected, or the sensor is broken -Contact Servicevision
In the display appears "Motor burnt or motor cable disconnected"	-Check if the motor of the cable is connected. -Check if the magnetic limits of the crane are arriving into the electronic box (*both LEDs of the Relay board are ON)*
There is a bad movement of the crane at 100% speed	-Check if there is enough power arriving to the crane.
The crane arm drift by itself	-Restart the crane -Calibrate the potentiometer from the Hand Command (*chapter Command adjust 4.2.4.2*)
The counterweight motor does not move	-Check if there is an ALARM in the main screen. If so, check if the counterweight chain is connected. -Verify that the counterweights chain is properly connected. - Verify that both counterweights' limits are not pressed at the same time (*by a branch or other things for example).* -Contact Servicevision
The telescopic arm moves faster in one direction than another	-Calibrate the potentiometer from the Hand Command (*chapter Command adjust 4.2.4.2*)

7.3 POSSIBLE PROBLEMS RELATED TO THE COLUMN

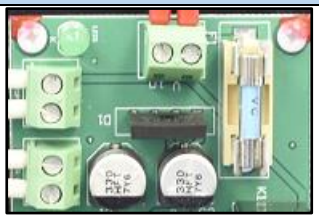
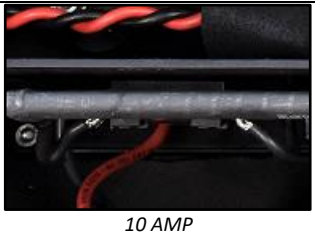
Symptom	Procedure to follow
The column does not move manually	-Check if the screws of the column are loose.
The column does not move with the Hand Command	-Check if the screws of the column are loose. -Check if the column cable is connected. -Change the column cable. -Check the belt for the motor. -Check if there is an alarm in the display. -Contact Servicevision

7.4 POSSIBLE PROBLEMS RELATED TO THE COUNTERWEIGHTS

Symptom	Procedure to follow
The counterweights make noise in a point of the arm	-Check if the counterweight generator is activated and if so, check if there are 2 points really close to each other with a high difference of % on the counterweights.
The counterweights do not move	-Check if the counterweights are enabled -Check if the cable is connected. -Contact Servicevision.
There is an alarm "CWE LIMITS ALARM"	-Both counterweight limits are detecting at the same time. -Check if there is something stuck on the counterweights trolley -Check if the counterweight cable is properly connected. -Contact Servicevision for further troubleshooting.

7.5 FUSES IN THE ELECTRONIC BOX

It could be that one of the fuses inside the electronic box is broken. The way to know which fuse is blown is the next one:

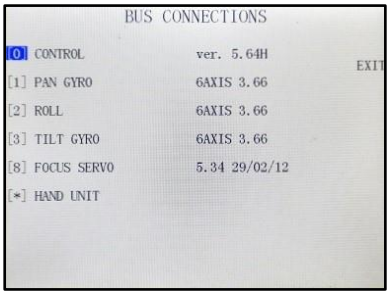
Symptom	Fuse	Description
The system does not start	 *2 AMP*	This fuse is located in the security system board. It protects all the securities of the system (HC, Start button and Emergency stop).
The system starts but there is no light on the Ammeter or Voltmeter	 *3 AMP*	This fuse is connected to the main coil. It protects the Ammeter, Voltmeter, and the system power LED
When the rocker in the Hand Command sends signal, the crane stops working and the motor does not move	 *60 AMP*	This fuse is connected to the input of the ARM driver. If the fuse is blown the LED for the driver will not start because there is no power in the driver.
The dynamic counterweight system does not work. The column neither.	 *16AMP*	There is a fuse build inside the connector for the driver of the CWE/Column. If the fuse is blown, the LED for the driver will not start because there is no power in the driver.
The Leveling Head has no power		This fuse protects the leveling head in case the leveling head cable is broken.
When the crane stops, it does not stop smoothly	 *10 AMP*	This is a fuse in the SHUNT AMP. It protects the SHUNT resistance of the ARM driver.

8 SPECIAL CONFIGURATIONS

8.1 INTERFACE WITH SCORPIO HEADS

In the Electronic Box there is one connector that connects the crane with the control of the Scorpio Head. By doing this the system can perform special features such as Motion Generator or Back Pan.

8.1.1 SET UP CONDITIONS



08.01 Bus connection screen in SSHV

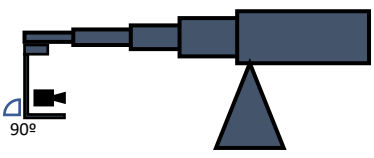
These functions are available with any regular Scorpio Head (Classic/Mini/Mini EZ or Micro) that has a SERVO F , SERVO I board (*or a newer version*) and a control with the CCU2000 (*Handwheels, Joystick, Pan bar*…) with a software version newer than 5.87H. The CCU2000 controls are easily identified because the control has **white screen touch panel**. To identify the SERVO versions of the HEAD it can be done by connecting the remote head to the control and opening the *MENU→Auxiliary→Bus connections.* There is a list of the SERVOs connected to the control. If the name of one of the axes is HEAD SERVO, it will not be possible to set up this function (*the boards inside the head needs to be upgraded).* The stabilized heads *(Stab, Stab V)* can also use this functions only if the Stab mode is disabled.

Regarding the crane, any crane *(S10'/S17'/S23'L/S23'/S30'+7'/S38' and S45')* can perform this feature if the electronic on the crane are updated to CCU2000 (*there is a **white screen touch panel***) and the software version of the crane is newer than 5.80C*.*

8.1.2 SET UP

08.02 Connectors to be linked

08.03 Control interface cable



08.04 Head pointing to the crane in the horizontal position to set the ZERO POSITION

To start connecting the Head and the Crane, the control interface cable (*fig. 08.03*) can be used to send the communication line from the control interface connector from the EB to the FIZ Command connector in the back of the control of the Scorpio Head.

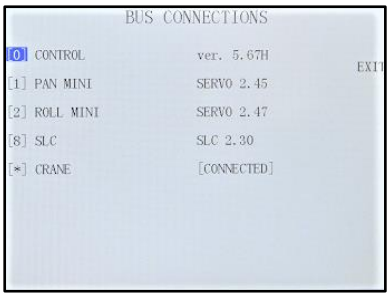
A standard communication cable from Servicevision *(6pin XLR)* can be used to extend the link from the control interface connector of the crane to the Control interface cable.

Once the cables are connected the crane and the head can be started.

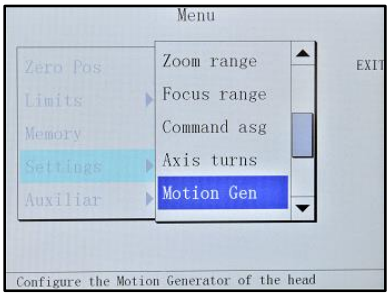
Note: In case the user wants to use the Motion Generator mode, the ZERO POSITION of the head needs to be set with the remote head looking to the crane in the horizontal position (center the camera in the pan axis for better performance).

All the following functions are based on that Zero position.

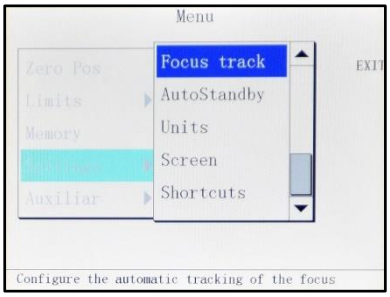
The only function that does not require the Zero position is the Back-Pan function.



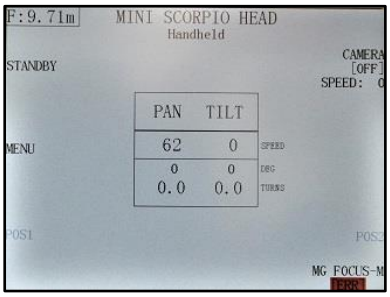
08.05 Bus connections in head control



08.06 Motion Gen in settings



08.06b Focus track in settings



08.07 Crane not detected ERROR

Once the crane has been started, it has found the physical limits and the main screen in the display of the crane is shown, the communication between the crane and the head is engaged. It can be checked in the MENU→*Auxiliary*→*Bus connections* from the head control. In this screen it can be seen the [*] CRANE identified by the head control and the status [CONNECTED].

Note: The crane needs to be engaged all the time to use the Control interface (not compatible with the standby mode).

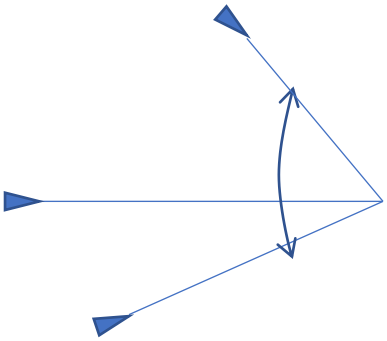
When the communication between the head and the crane is established, the Motion Gen menu is available in the MENU→*Settings*→*Motion Gen.*

The focus tracking function also appears now in MENU→ *Settings*→ *Focus track*.

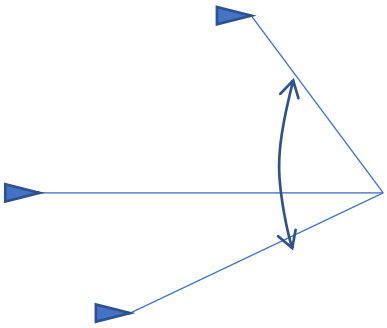
It is recommended to set a shortcut of these menus in the main screen to have a quick access in case any adjustment needs to be done. It will also warn the user in case the crane gets disconnected displaying an error message in the main screen (*fig. 08.07)*.

8.1.3 BACK-PAN

In a normal operation mode, the remote head holds always the same position respect the crane. This means that if the arm of the crane swings left or right, the remote head will change the perspective of the camera by the same number of degrees that the crane in order to maintain the same position respect the crane (*fig. 08.08*).

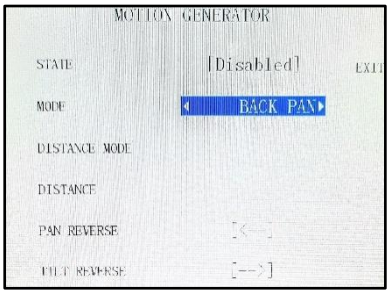


08.08 Camera point of view in different positions of the arm



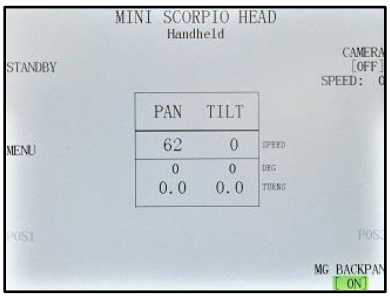
08.09 Camera point of view in different positions of the arm w/ Back-Pan ON

The Back-Pan function makes the head to hold the same infinity point even if the crane swings left or right (*fig. 08.09*). It will only work in the Pan axis to correct the swing of the crane.



08.10 Back Pan mode in Motion Gen.

To activate this function, select it in the MODE tab of the *Motion Generator* menu by pressing on the sides of the name and change the state from Disabled to Enabled by the same way.



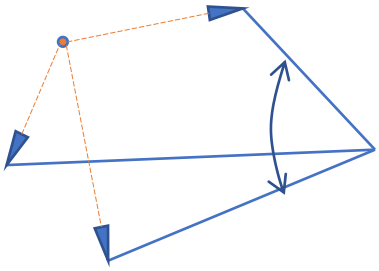
08.11 Shortcut of B. pan in main screen

In case that the remote head does not correct in the proper direction, change the tab for PAN REVERSE. This tab is to change the direction of correction depending on the model of the head or in case the head is mounted Over slung.

If a shortcut is created, in the main screen it will be possible to activate or deactivate it once it has been configured just by pressing on the shortcut.

8.1.4 TRACKING MODE

The Scorpio systems have fully encoded information regarding the position of the crane and the head in space. From a reference point called *Zero Position*, the system knows how many degrees the crane or the remote head has changed in every axis. This is why it's important to set the *Zero position* of the remote head and the crane always the same: with the camera facing the column of the crane in the horizonal position (*see chapter 8.1.2 Set up*).

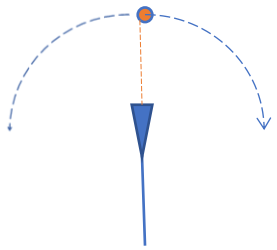


08.12 Different position of the crane with the remote head tracking the same point.

With that information, the *Motion Generator* allows the system to generate one tracking point in the space and to keep the camera looking to that point even if the crane change the position of the camera in the space (*fig. 08.12)*.

The only thing that the system needs to know is where to generate the tracking point. The way to do this is by giving to the system the distance from the center of the remote head to the point to be tracked.

Note: This function is not a Motion Control, there are some tolerances to consider when using this function. In order to minimize these deviations, introduce the minimum distance as possible to the point to be tracked (approach the camera to the target). The minimum distance is 0.20m (7.8 inches)

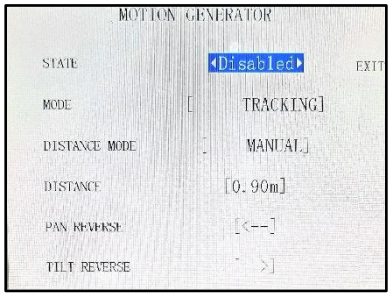


08.13 Moving the tracking point when Panning on the remote head

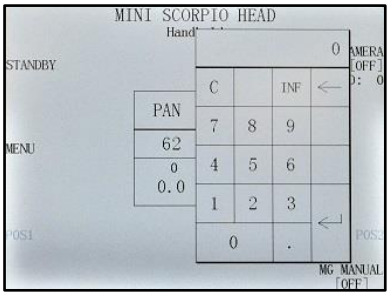
It is important to notice that there will always be possible to move the remote head from the control. The only difference is that instead of moving the axes of the head, the user will be moving the tracking point in the space depending on the distance to the tracking point. This can be used to readjust the point where the shot requires.

Depending on how the distance to the tracking point is introduced to the system, there are three different modes: *Manual, Focus M.*, and *Focus*. To use the *Focus M*. and the *Focus* modes a *Scorpio Focus* or a *Servo Lens Control* needs to be connected to the system, otherwise they will not be displayed.

MANUAL DISTANCE



08.14 Manual mode in Motion Gen.



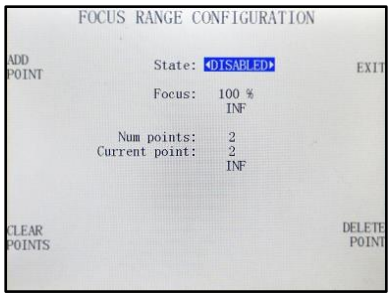
08.15 Keypad to introduce distance

When the manual mode is selected, we can introduce a distance to set the tracking point. If the number between the brackets in the DISTANCE MODE tab is pressed, a keypad will be opened to introduce the distance from where the camera is to the target. Measure this distance from the center of the head. The minimum distance is always 0.20cm *(7.8 inches)*.

There is also the possibility to reverse the pan and the tilt in case the head is mounted over slung and the corrections in those axes are in the wrong direction. If there is a shortcut to the M.G., just by pressing the shortcut the keypad will be opened to introduce the distance.

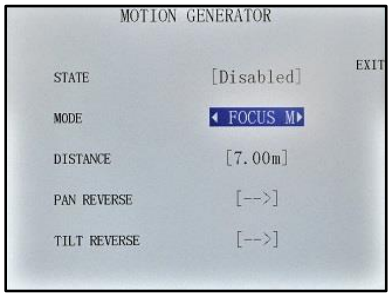
DISTANCE BY FOCUS M

If there is a Scorpio Focus connected to the system, it is possible to introduce lens points in the system in the *MENU→Settings→Focus Range (fig. 08.16)*. This is mandatory to use the Focus M or the Focus functions.

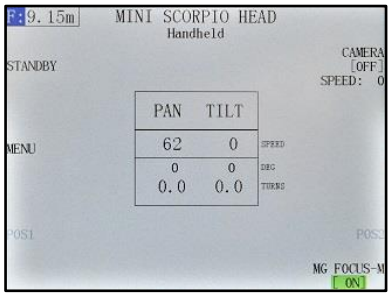


08.16 Focus Range screen

In this menu is it possible to copy the lens focal scale into the system in order to be displayed in the main screen. To do so, move the focus motor until one of the focal marks on the lens. In this mark press the ADD POINT button. A keypad will appear to introduce the focal distance mark (using the enter button). Now repeat the same process with the rest of the marks on the lens. Once all the marks are introduced and the state is ENABLED, in the main screen will be displayed the current focal length and this can be used to introduce the distance to the Motion Generator.



08.17 Focus M mode in Motion Gen.



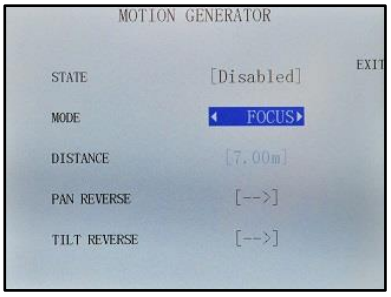
08.18 Focus M enabled main screen

When the Focus M MODE is selected, the distance of the initial tracking point will be determined by the current focal length when the system is ENABLED.

If there is a shortcut to the M.G., is possible to generate a new point at the current focal distance by pressing the blue F at the left-upper corner of the screen.

DISTANCE BY FOCUS

To use the Focus function, a Scorpio Focus needs to be connected to the system and the focal lengths needs to be previously introduced (*as in the Focus M mode*).



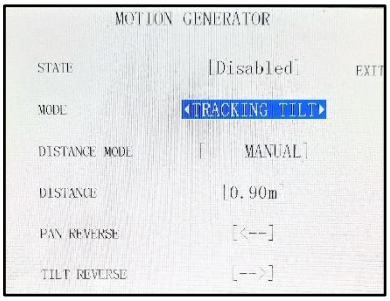
08.19 Focus mode in Motion Gen.

Once the Lens data is visible in the main screen, select the FOCUS mode in the Motion Generator menu. Now the distance of the point changes with the focal distance in real time as the focus puller moves the lens.

Note: When using the Motion Generator, it is important to respect the same Zero position for the head and the crane ALL THE TIME. Functions as the Arc compensator needs to be used without Reset pan feature due to the Zero position of the crane will change.

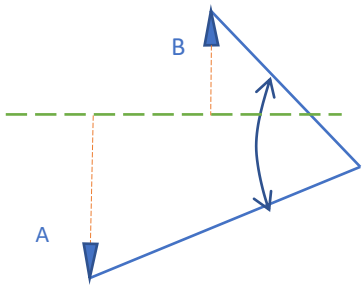
8.1.5 TRACKING TILT

This mode has been added in order to perform a circular movement around a line and allow the tilt axis to move upside down in one side of that line.



08.20 Tracking tilt

To use this function, point the head perpendicular to the imaginary line where you want to perform the circular movement and introduce the distance to that imaginary line using the different DISTANCE MODES seen in the previous chapter (*Manual, Focus M or Focus)*. Once it is activated, any movement done by the crane will be corrected by the head to keep the camera pointing to that imaginary line. If the crane is moved to the opposite side of the line, the camera will be facing upside down.



08.21 Different position of the crane with the remote head tracking the same line.
A – Camera facing the line
B – Camera facing the line upside down
C – Imaginary line
D – Distance to the imaginary line

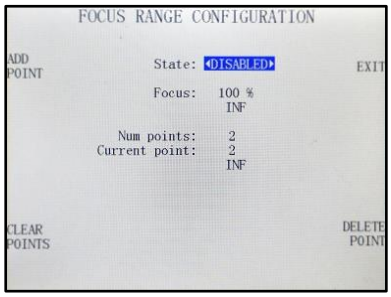
As seen in the diagram, the camera starts in the position A and the distance from the point A to the imaginary line is introduced into the system. Once it is activated, the system will recalculate the distance to the imaginary line in any position of the crane and, in case the crane moves to the other side of the imaginary line (*point B*), it will be facing that line in the upside down position.

This mode can be used together with the arc compensation feature of the crane to perform a perpendicular movement of the crane respect the imaginary line and track the same point of that line.

Note: All the restrictions applied to the tracking mode, also applies in the tracking tilt mode, such as respect the Zero position of the head and the crane all the time that the function is enabled or the minimal distance to the line of 0.20cm (7.8inches).

8.1.6 FOCUS TRACKING

The focus tracking is a function that keeps the focal distance at the same point regardless the movement of the crane. The different modes are: *TRACK CRANE, CINETAPE and CINETAPE M.*

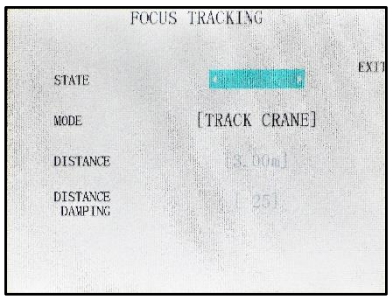


08.16b Focus Range screen

To use any of these functions a Scorpio Focus must be connected to the system by wire and the lens marks must be pre-introduced into the system. To introduce the lens points into the control for the head go to *MENU→Settings→Focus Range (fig. 08.16b)*. Move the focus motor until one of the focal marks on the lens. In this mark press the ADD POINT button. A keypad will appear to introduce the focal distance mark (using the enter button). Now repeat the same process with the rest of the marks on the lens. Once all the marks are introduced and the state is ENABLED, in the main screen will be displayed the current focal length on the top left corner.

Note: The focus puller can always override any of these functions to readjust the focal distance to the target. The minimal focal distance to track is 0.50m (19 inches).

TRACK CRANE

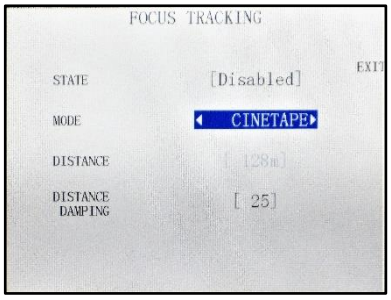


08.22 Track crane menu

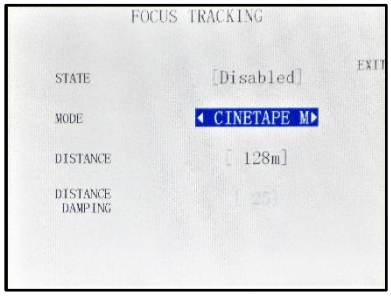
The track crane requires the motion generator feature to be enabled only in the manual distance mode *(chapter 8.1.3*).

Once the motion generator is enabled and the point has been generated, it is possible to enable the track crane and the focal distance will be automatically adjusted to the same tracking point of the crane.

CINETAPE & CINETAPE M



08.23 Cinetape mode



08.24 Cinetape M mode

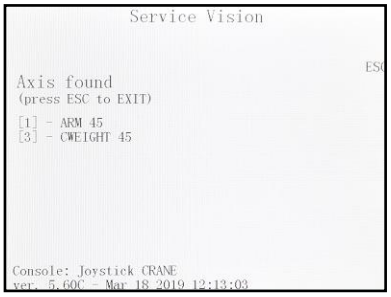
The Cinetape and the Cinetape M modes require to have a cinetape connected to the Scorpio Focus. When the CINETAPE mode is ENABLED, this mode will use the current distance reading of the cinetape to set the focal distance at that distance all the time. Since the reading of the cinetape can vary in high values depending on the proximity of the objects, there is the possibility to add damping to the movement of the focus motor in this screen.

The Cinetape M mode will use the distance reading of the cinetape to set the point ONLY when it is enabled. If the distance reading changes after the mode has been enabled, the system will not change the focal distance to the new reading.

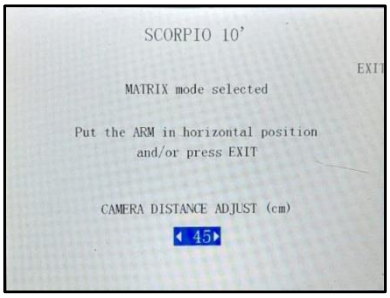
Note: The focus tracking functions are only available with software version newer than 5.87H for the HEAD CONTROL and newer than 5.80C for CRANE

8.2 MATRIX MODE

The Matrix mode is a special mode to be used with any head that can be nose mounted to the crane.



08.25 Leveling Head not detected.



08.26 Matrix mode selected.

To enter in this working mode the Scorpio crane needs to be mounted without the leveling head and the Remote Head nose mounted instead. The system will not communicate with the leveling head (*fig 08.25*) when is started. To activate the mode, press the ESC button and the *fig 08.26* will appear. This mode is available to allow the system to do proper calculations (for example in functions as the Arc compensator...) counting the size of the remote head. It is necessary to measure the distance from the camera center to the end of the crane (*without counting the leveling head*) and introduce it to the system (*it can be in centimeters or inches)*.

Press EXIT when the crane is in the horizontal position, then work as in normal mode.

8.3 RECORD MEMORIES CRANE-HEAD

There is an accessory to synchronize the memories of the crane and the head in order to start them at the exact same time.

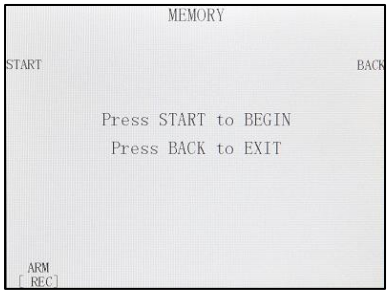
08.27 Analog & Digital Hand command

To use this device, it is mandatory to know if the crane has been updated with a digital hand command. It is easy to identify it because the digital hand command is labeled as *digital hand command* and it has an LED on it and three buttons.

Depending on which hand command the crane has, the trigger for the memories will be analogic or digital.

The control for the Scorpio Head does not need to be updated, just take in consideration that the trigger will be connected in the connector for the *JDR Roll.*

8.3.1 SET UP CONDITIONS



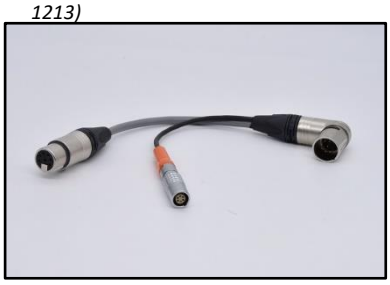
08.28 Start recording screen

The first thing to do is connect the memory trigger as shown on the respective diagrams depending on if the hand command is analog or digital.

Both controls (*crane & head control*) must have a screen display connected in order to have access to the memory menu. Once the axes to be recorded are set, press the *STARTUP* button on the screen and the *fig. 08.28* will be displayed. Ensure that both controls have this screen displayed before pressing the start button.

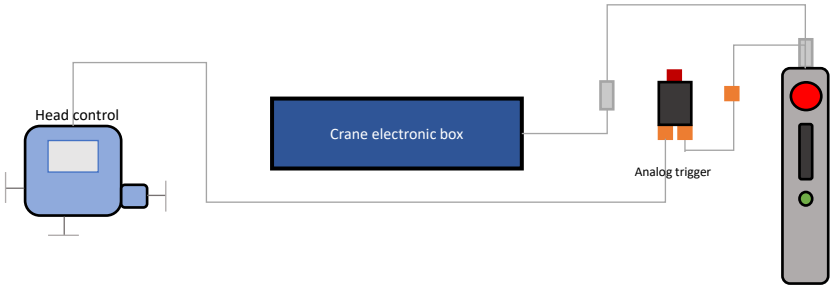
8.3.2 ANALOG TRIGGER

08.29 Analog trigger memory (Ref. 1213)



08.30 Adaptor for analog trigger (Ref. 7082)

08.31 Lemo 6pin male to male cable



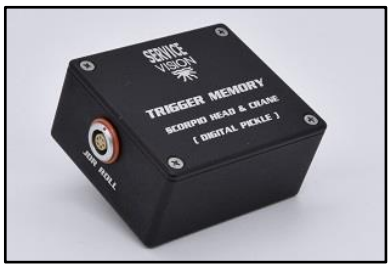
To start the memories of the head and the crane at the same time with the analog hand command, the adaptor cable (*Ref. 7082*) needs to be connected to the hand command. The 7pin female goes to the hand command, the male can be extended with regular hand command cables to the electronic box of the crane.

The Lemo 6 pin female needs to be extended with a male to male cable (*Fig. 08.31*) into the analog trigger box. From the trigger box, another male to male Lemo cable needs to be connected into the head control in the *JDR Roll* connector in the back of the control.

With everything connected and the *8.3.1 Set up conditions* fulfilled, press the red button of the trigger and both memories will start at the same time.

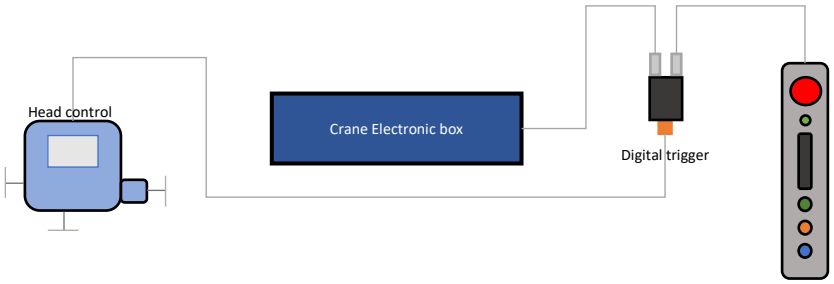
To play them back at the same time, use the same procedure but instead of REC in the memory menu, set the axes in PLAY.

8.3.3 DIGITAL TRIGGER



08.32 Digital trigger memory (Ref. 7114)

08.33 Digital trigger memory 7pin connectors side



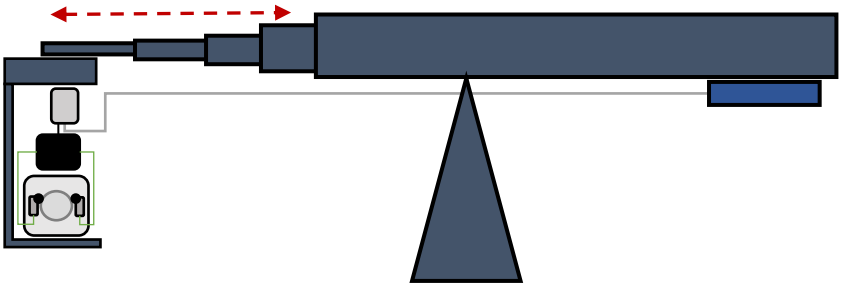
To start the memories with the digital trigger memory the hand command needs to be connected to the trigger with a regular hand command cable. From the 7pin male panel connector of the digital trigger memory another regular hand command cable needs to be connected to the crane electronic box. The Lemo 6 pin female from the trigger box needs to be connected to the *JDR Roll* connector in the back of the control with an extension cable (*fig. 08.31*).

With everything connected and the *8.3.1 Set up conditions* fulfilled, press the green button of the hand command and both memories will start at the same time. To play them back at the same time, use the same procedure but instead of REC in the memory menu, set the axes in PLAY.

8.4 M.G. WITH SCORPIO FOCUS

Using the encoder output of the crane, it is possible to send the encoder signal of the telescopic arm into the M.G. connector of the Scorpio Focus to record focal and zoom points depending on the extension of the arm.

08.34 Encoder signal converter



08.35 Encoder cable from E.B.

08.36 Encoder cable to the M.G. connector

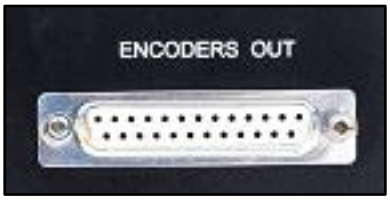
To connect the encoder from the arm into the M.G. of the Scorpio Motor driver box it is necessary to adapt the encoder signal using the encoder signal converter (*fig. 08.34*). With the Encoder cable from the E.B. send the signal into the converter and from the converter into the M.G. connector of the motor driver box using the 4 pin Lemo cable.

Once everything is connected, link the motor driver box with the Scorpio focus hand command by cable or by radio and activate the motion generation feature.

When the extension of the arm changes, the motor driver box will detect that change and will allow the user to record points depending on the extension of the arm.

8.5 AUGMENTED REALLITY

Servicevision products are equipped with encoder output connectors. From those connectors it is possible to read the number of pulses and with the encoder resolution and the gear factors provided in the documentation chapter of the manuals it is possible to have an accurate reading of the movement of the cranes and heads.

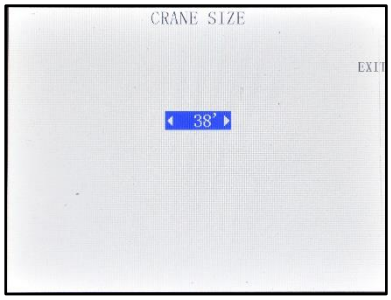


08.37 Encoder out connector from the

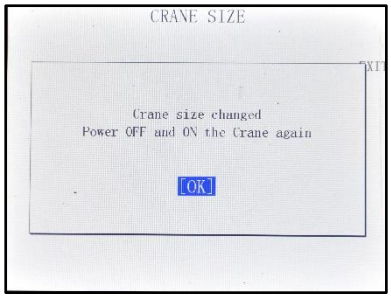
This information can be used in real time to generate graphics in the virtual set using different software providers.

08.38 Encoder out from an EZ head

8.6 LIMIT THE MOVEMENT OF THE 45’ TO 38’



08.38 Crane size selection.



08.39 Confirmation of size selection.

It is possible to electronically limit the movement of a 45’ to adjust its size to 38’. To use this mode, go to MENU→AUXILIAR→BUS CONNECTIONS, and in this screen press the bottom right corner for 5 seconds. The screen 08.38 will be shown and it is possible to adjust the size of the crane between 38’ & 45’. To activate the changes, the crane must be restarted, and the size of the crane will be adjusted.

9 DOCUMENTATION

9.1 PINOUTS

Connectors in the Electronic Box:

AC Power out for P.U. (BURNDY 4 pins female panel UT100-104 ST)

1 220/110 V PHASE (Blue)
2 NC
3 220/110V NEUTRAL (Yellow)

12V/3A DC OUT (NEUTRIK 4 pins female panel NC4 FP1)

1 GROUND (Black)
2 NC
3 NC

Cable levelling Head (BRUNDY 8 pins female panel UTGO 128S)

1 VCC +28V (Red)
2 GROUND (Black)
3 TILT ENC B1+ OUT (Green)
4 TILT ENC B1 - OUT (Blue)
5 485 - (Grey)
6 485 + (Blue)
7 TILT ENC A1- OUT (White)

Hand command digital (NEUTRIK 7pins female panel NC7FP1)

1 VCC +5V (Red)
2 GND (Black)
3 485 N (White)
4 485 P (Green)
5
6

Display Command (NEUTRICK 8 pins female panel ORP8F)

1 VCC +5V (Red)
2 GND (Black)
3 BUSY (Purple)
4 DOUT (Grey)
5 DIN (Blue)
6 VCC +12V (Orange)
7 GND (Brown)

Encoder travelling red (LEMO 10 pin female panel EGG -2B.310.CYM)

1 VCC (Red)
2 GROUND (Black)
3 ENC A+ (Green)
4 ENC A- (Blue)
5 ENC B+ (White)
6 ENC B- (Brown)
7 NC
8 NC
9 NC
10 NC

Encoder pan grey (LEMO 10 pin female panel EGG -2B.310.CYM)

1 VCC (Red)
2 GROUND (Black)
3 ENC A+ (Green)
4 ENC A- (Blue)
5 ENC B+ (White)
6 ENC B- (Brown)
7 NC
8 NC
9 NC
10 NC

Encoder tilt blue (LEMO 10 pin female panel EGG -2B.310.CYM)

1 VCC (Red)
2 GROUND (Black)
3 ENC A+ (Green)
4 ENC A- (Blue)
5 ENC B+ (White)
6 ENC B- (Brown)
7 NC
8 NC
9 NC
10 NC

Connector control interface (NEUTRICK 6 pins female panel N66FD_LX)

1
2
3
4
5 485 (Grey)

Encoders OUT (DB connector 25 female DB-25S-A191-A1977)

1 NC
2 NC
3 NC
4 NC
5 NC
6 NC
7 NC
8 NC
9 NC
10 A+ ARM (Green)
11 A- ARM (Blue)
12 B+ ARM (White)
13 B- ARM (Brown)
14 A+ PAN CRANE (Red)
15 A- PAN CRANE (Black)
16 B+ PAN CRANE (Yellow)
17 B- PAN CRANE (Orange)
18 A+ TILT CRANE (Green)
19 A- TILT CRANE (Blue)
20 B+ TILT CRANE (White)
21 B- TILT CRANE (Brown)
22 A+ TRACK CRANE (Green)
23 A- TRACK CRANE (Blue)
24 B+ TRACK CRANE (White)
25 B- TRACK CRANE (Brown)
26 NC
27 NC

9.2 WEIGHTS OF THE CRANES

COMMONLY USED WEIGHTS:

	SCORPIO 45'	SCORPIO 38'
Crane assembled (truck load)	1486,2 kg. / 3276.5 lbs.	1316,2kg. / 2901 lbs.
Max. Weight of the crane (Max payload)	2473,1 kg. / 5452 lbs.	2123,1kg. / 4680.6 lbs.
Column + Fulcrum + Dolly (4 wheels & 2 steering handle)	520kg. / 1146 lbs.	503kg. / 1109 lbs.
Empty arm	691kg. / 1523.3 lbs.	533kg. / 1175 lbs.

DETAILED WEIGHTS OF THE CRANE:

	SCORPIO 45'	SCORPIO 38'
Empty arm	691kg. / 1523.3 lbs.	533kg. / 1175 lbs.
Counterweights support	80kg. / 176.3 lbs.	84kg. / 185.1 lbs.
Leveling head	15kg. / 33 lbs.	15kg. / 33 lbs.
Power unit	7kg. / 15.4 lbs.	7kg. / 15.4 lbs.
Leveling head cable & Scorpio head cable	11kg. / 24.2 lbs.	10kg. / 22 lbs.
Rest of cables & hand unit	3kg. / 6.6 lbs.	3kg. / 6.6 lbs.
Electronic box	54kg. / 119 lbs.	54kg. / 119 lbs.
Protection bars & upper operation bars	29kg. / 63.9 lbs.	25kg. / 55.1 lbs.
Rear operation bars (lower operation bars)	7,5kg. / 16.5 lbs.	7,5kg. / 16.5 lbs.
Fulcrum	108kg. / 238 lbs.	93kg. / 205 lbs.
Column	148kg. / 326.2 lbs.	113kg. / 249.1 lbs.
Empty dolly (chassis)	186kg. / 410 lbs.	219kg. / 482.8 lbs.
Leveling jack on dolly 38'	-	6kg. / 13.2 lbs.
Straps	7,5kg. / 16.5 lbs.	7,5kg. / 16.5 lbs.
Locking screws for weights (per side)	1,6kg. / 3.5 lbs.	1,6kg. / 3.5 lbs.
Wheels (x1)	18kg. / 39.6 lbs.	18kg. / 39.6 lbs.
Leveling Jacks for wheels (x1)	9kg. / 19.8 lbs.	9kg. / 19.8 lbs.
Travelling wheels (x1)	4kg. / 8.8 lbs.	4kg. / 8.8 lbs.
Steering wheel for leveling jack (x1)	3kg. / 6.6 lbs.	3kg. / 6.6 lbs.
Steering handle (x1)	3kg. / 6.6 lbs.	3kg. / 6.6 lbs.

TRANSPORT WEIGHTS:

Package	Format	Size	Weight
S45 Arm	Plywood crate	502x90x102cm	998kgs
S45 Dolly	Plywood crate	173x165x95cm	748kgs
S45 Column/Fulcrum	Plywood crate	188x85x105cm	435kgs
S45 Weights + dollies	Pallet	130x90x50cm	590 kg
S45 Weights + dollies	Pallet	130x90x80cm	562 kg

**The size and the weight of this packages are based on a standard S45'. It may change based on the customer order.*

Package	Format	Size	Weight
S38 Arm	Plywood crate	490x80x93cm	800kgs
S38 Dolly	Plywood crate	173x165x95cm	748kgs
S38 Column/Fulcrum	Plywood crate	188x85x105cm	332kgs
S38 Weights + dollies	Pallet	130x90x50cm	562 kg
S38 Weights + dollies	Pallet	130x90x50cm	562 kg

**The size and the weight of this packages are based on a standard S38'. It may change based on the customer order.*

9.3 OTHER DOCUMENTATION

ENCODER OUTPUT RESOLUTION & PINOUT FOR S45’

Encoder A/B phase: 90º Z output: not available

TILT & PAN: Encoder Resolution: 19000 points Gear factors: 202:12

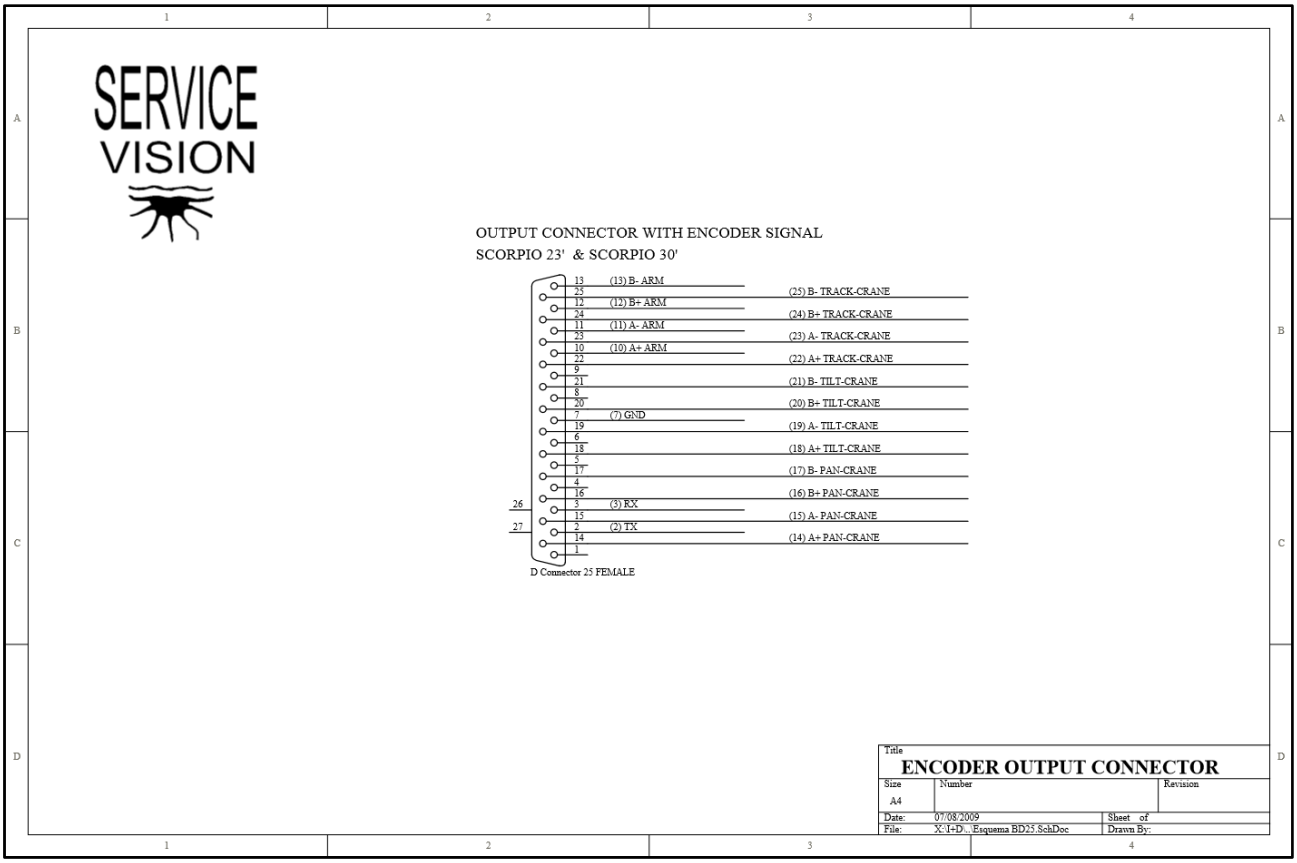
Encoder output resolution: (202 / 12) x 19000 = **319833.3333 points/turn** or **888.4259 points/deg**

ARM: Encoder resolution: 1000 points

Motor turns: 131 Length: 11050 mm

Encoder output resolution: (131 / 11050) x 1000 = **11.8552 points/mm**

> ***Note: This is the point resolution. If the reading is by flank it needs to be multiplied by 4. If the reading is by level needs to be multiplied by 2.***



ENCODER OUTPUT RESOLUTION & PINOUT FOR S38’

Encoder A/B phase: 90º Z output: not available

TILT & PAN: Encoder Resolution: 19000 points Gear factors: 158:15

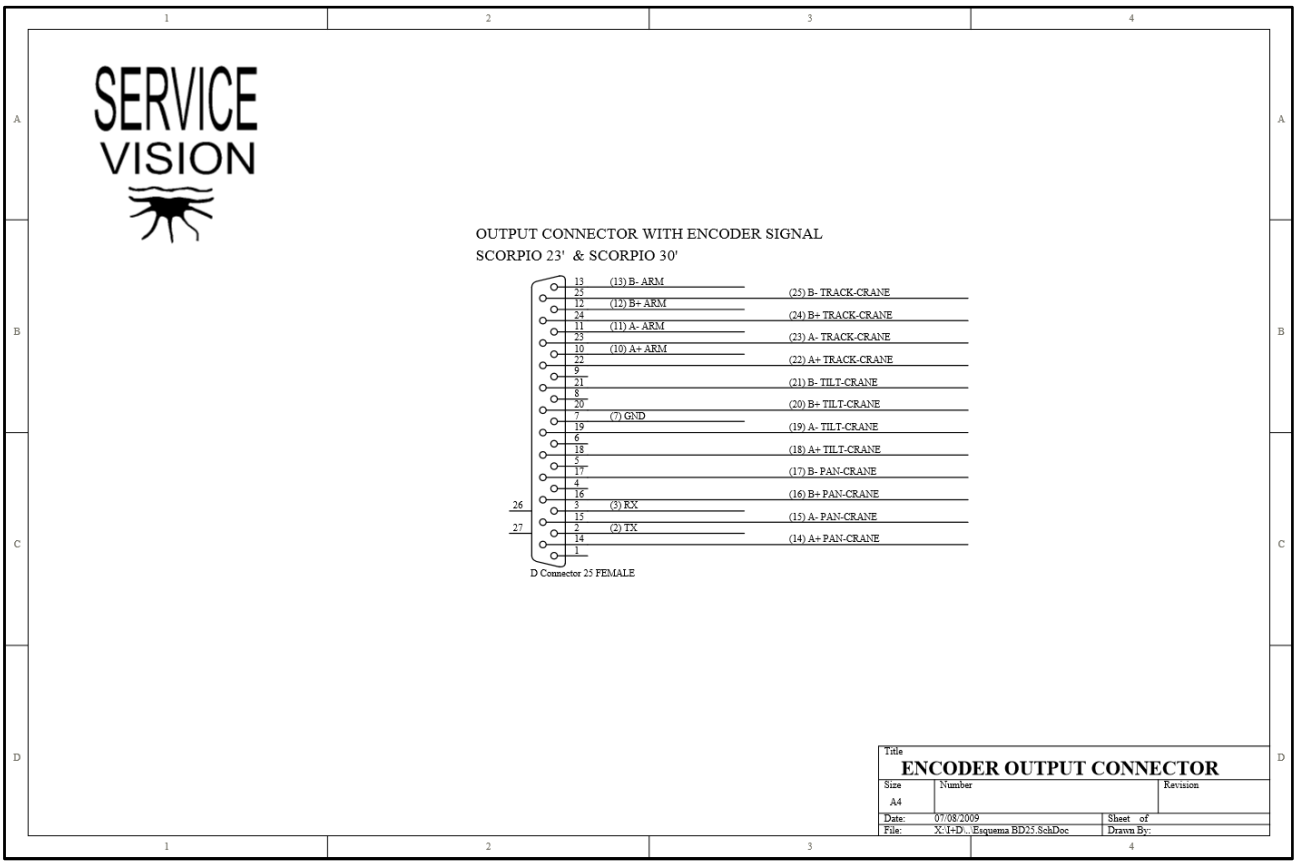
Encoder output resolution: (158 / 15) x 19000 = **200133.3333 points/turn** or **555.9259 points/deg**

ARM: Encoder resolution: 1000 points

Motor turns: 108.5 Length: 9400 mm

Encoder output resolution: (108,5 / 9400) x 1000 = **11.5425 points/mm**

> ***Note: This is the point resolution. If the reading is by flank it needs to be multiplied by 4. If the reading is by level needs to be multiplied by 2.***



CCU/SERVO DIP SWITCH CONFIGURATIONS

SERVO 9.00 (SERVO_I) BOARD DIP CONFIGURATION

BOOT

SWITCH	1	2	3	4	5	6	7	8
BOOT	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

SAd1

SWITCH	1	2	3	4	5	6	7	8
LEVELING	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LEVELING GM	OFF	**ON**	**ON**	OFF	**ON**	OFF	OFF	OFF
ARM 10'	**ON**	**ON**	**ON**	OFF	**ON**	OFF	OFF	OFF
ARM 17'	**ON**	**ON**	OFF	OFF	OFF	**ON**	OFF	OFF
ARM 20'	**ON**	OFF	OFF	OFF	OFF	**ON**	OFF	OFF
ARM 23' LT	OFF	OFF	**ON**	OFF	OFF	**ON**	OFF	OFF
ARM 23'	OFF	OFF	**ON**	**ON**	OFF	OFF	OFF	OFF
ARM 30'	OFF	OFF	OFF	**ON**	OFF	OFF	OFF	OFF
ARM 38'	OFF	OFF	OFF	OFF	OFF	**ON**	OFF	OFF
ARM 45'	**ON**	**ON**	OFF	OFF	**ON**	OFF	OFF	OFF
PAN CLASSIC	**ON**	OFF	OFF	OFF	OFF	OFF	OFF	OFF
TILT CLASSIC	**ON**	**ON**	OFF	OFF	OFF	OFF	OFF	OFF
ROLL CLASSIC	OFF	**ON**	OFF	OFF	OFF	OFF	OFF	OFF
PAN MINI	**ON**	OFF	OFF	**ON**	OFF	OFF	OFF	OFF
TILT MINI	**ON**	**ON**	OFF	**ON**	OFF	OFF	OFF	OFF
ROLL MINI	OFF	**ON**	OFF	**ON**	OFF	OFF	OFF	OFF
ROLL CONT	OFF	OFF	OFF	**ON**	**ON**	OFF	OFF	OFF
CWE	OFF	**ON**	**ON**	OFF	OFF	OFF	OFF	OFF
CWE (LIMITS)	OFF	OFF	**ON**	**ON**	**ON**	OFF	OFF	OFF
CWE 45'	OFF	OFF	**ON**	OFF	**ON**	OFF	OFF	OFF
CWE 45' (LIMITS)	**ON**	OFF	**ON**	**ON**	**ON**	OFF	OFF	OFF
MICRO HEAD	**ON**	OFF	**ON**	OFF	OFF	OFF	OFF	OFF
DOLLY	**ON**	OFF	**ON**	**ON**	OFF	OFF	OFF	OFF
DOLLY(AUTO)	OFF	**ON**	OFF	OFF	OFF	**ON**	OFF	OFF
TOWER	OFF	**ON**	**ON**	**ON**	OFF	OFF	OFF	OFF
SCORPIO ARM	OFF	OFF	**ON**	OFF	OFF	OFF	OFF	OFF
MINI HEAD EZ	OFF	**ON**	OFF	OFF	**ON**	OFF	OFF	OFF
MINI HEAD EZ (TILTDETECT)	**ON**	OFF	**ON**	OFF	**ON**	OFF	OFF	OFF
SCORPIO ARM GYRO PAN	OFF	OFF	OFF	OFF	**ON**	OFF	OFF	OFF
SCORPIO ARM GYRO TILT	**ON**	OFF	OFF	OFF	**ON**	OFF	OFF	OFF
MOTOR FREEWHEEL	**ON**	**ON**	**ON**	**ON**	OFF	OFF	OFF	OFF

CCU C2000 BOARD DIP CONFIGURATION

SAD1

SWITCH	1	2	3	4	5	6	7	8
JOYSTICK 2.I	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
JOYSTICK 2	**ON**	OFF	OFF	OFF	OFF	OFF	OFF	OFF
JOYSTICK 4.I	OFF	OFF	OFF	**ON**	OFF	OFF	OFF	OFF
JOYSTICK 4.F	OFF	**ON**	**ON**	OFF	OFF	OFF	OFF	OFF
JOYSTICK 5.FI.2	OFF	**ON**	OFF	OFF	OFF	OFF	OFF	OFF
HANDWHEELS	**ON**	**ON**	**ON**	OFF	OFF	OFF	OFF	OFF
HANDWHEELS EZ	**ON**	**ON**	OFF	OFF	OFF	OFF	OFF	OFF
JDR	**ON**	OFF	OFF	**ON**	OFF	OFF	OFF	OFF
HANDHELD	**ON**	**ON**	OFF	**ON**	OFF	OFF	OFF	OFF
CRANE(23,30,45)	OFF	OFF	**ON**	OFF	OFF	*BOX*	*MOT*	*ENC*
CRANE 10'	OFF	**ON**	OFF	**ON**	OFF	*BOX*	OFF	OFF
CRANE 17'-23'	OFF	OFF	**ON**	**ON**	OFF	*BOX*	OFF	OFF

- SCORPIO CRANE:
  → **SWITCH 8** – ENCODER TYPE (*ENC*)
  OFF: ENCODER **E2**
  ON: ENCODER **E1**

→ **SWITCH 7** – MOTOR TYPE (*MOT*)

	SCORPIO 30	SCORPIO 45
OFF	MOTOR **MINI** (HI-SPEED)	MOTOR **1**
ON	MOTOR **NORMAL**	MOTOR **2**

→ **SWITCH 6** – *ELECTRONIC BOX TYPE (BOX)*

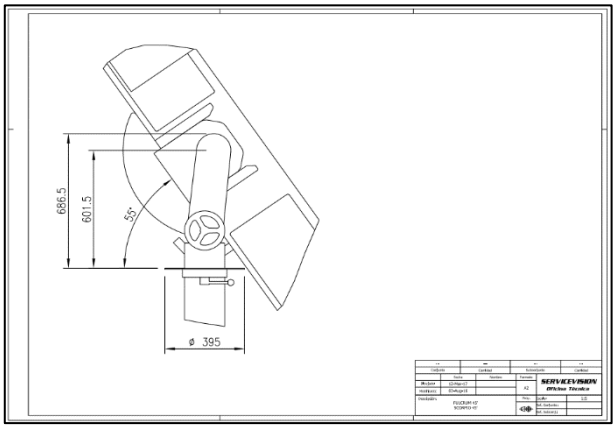
	SCORPIO 45	SCORPIO 10
OFF	BOX **STANDARD**	**V1**
ON	**BOX 4K (HI-SPEED)**	**V2**

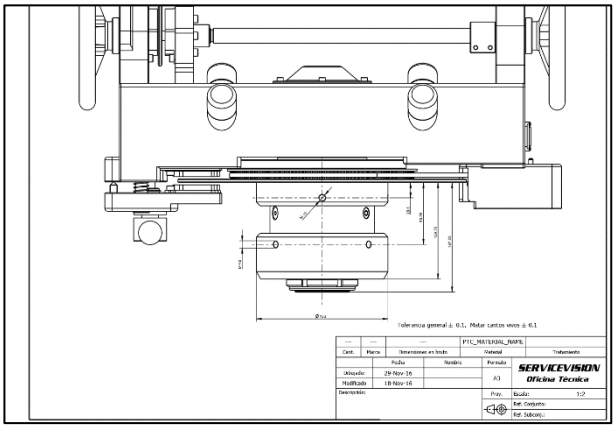
BOOT

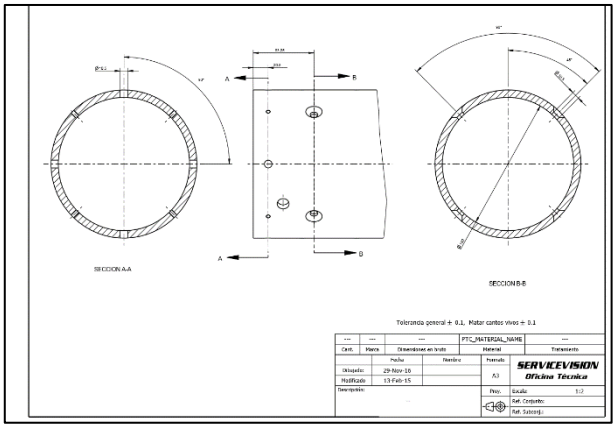
SWITCH	1	2	3	4	5	6
	ON	**ON**	**ON**	**ON**	OFF	**ON**

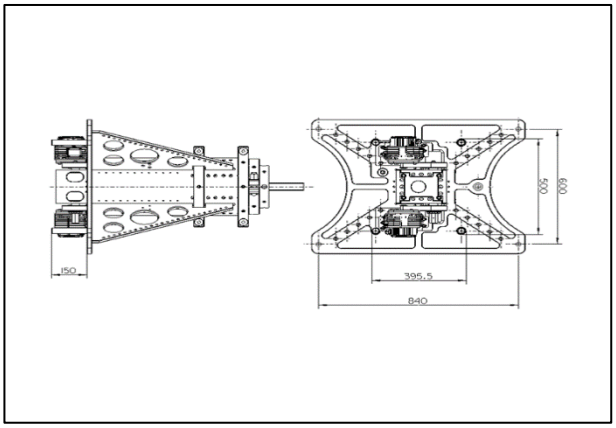
**DIP switch configuration at date 05/10/2020*

DRAWINGS


686.5
601.5
55°
ø 395




SECCION A-A
SECCION B-B
Tolerancia general ± 0.1. Matar cantos vivos ± 0.1


150
395.5
840

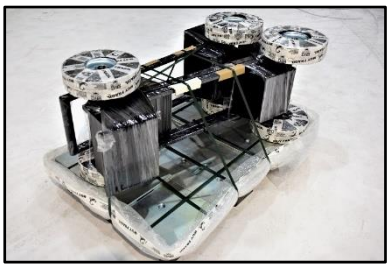
10 CRANE ASSEMBLY & TRANSPORT PROCESS

Before starting the assembly of the SCORPIO 45' or the SCORPIO 38' it is important to identify all the transport plywood crates and know what is inside each one, thereby it will be more practical and intuitive.

10.1 DESCRIPTION OF THE PLYWOOD CRATES

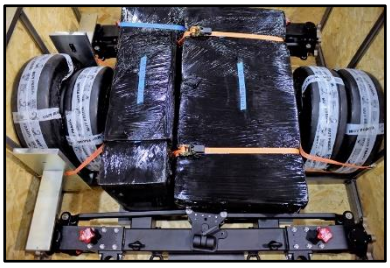
The SCORPIO 38'/45' are send in five lumps: three plywood crates and two pallets. Inside the crates there are the parts of the crane and in the pallets are the counterweights and the counterweight dollies.

10.01 From left to right: Column crate, Dolly crate and Arm crate



10.02 CW + CW dollies pallet

In the longest crate there is the main arm, and the side protection bars. The smallest one *(left on fig. 10.01)* has the column and the fulcrum and in the squared crate there is the dolly and the different accessories provided with the crane. It is important to notice the position of the parts of the crane in case it is needed to fit the components inside the crate again. Notice also that the plywood crate covers are marked to identify the position of the cover.



10.03 Dolly box

Inside the dolly crate there are different boxes including accessories such as the electronic box, the leveling head and different boxes including hardware, cables, and spares. Those boxes need to be removed in order to have access to the dolly.

10.04 Column box

The column crate includes only the column and the fulcrum and there is only one way to fit them inside.

10.05 Rear strap from the arm

10.06 Front strap from the arm

The arm is provided with two straps indicating the lifting points to remove the arm from the crate safely.

10.2 ASSEMBLY OF THE SCORPIO 38’-45’

It will be necessary to have lifting devices *(such as forklifts or winches)* that can lift the weight of the crane. The set of tools provided with the crane can be used to attach the different parts of the crane.

FIRST STEP: DOLLY

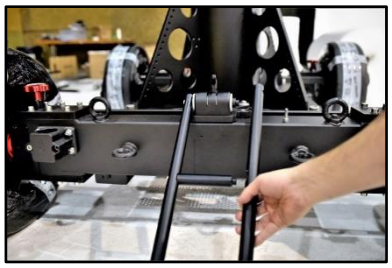
10.07 Dolly in the crate

10.08 Remove the dolly from the crate

The first thing to do is open the dolly crate and empty all the accessories cases until there is access to the dolly at the bottom of the crate. Use a forklift to remove it from the crate using straps from the O rings.

10.09 Assemble the wheels

With the Dolly still hanging from the support points, attach the four wheels using the screws provided with the equipment. Apple boxes can be used instead of the forklift to attach the wheels.

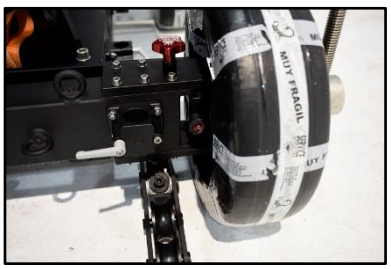


10.10 Assemble the steering handle

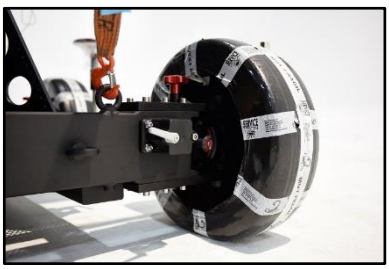
The steering handles should be introduced now by unscrewing one side of the bar in order to introduce it in the support as shown in the *fig. 10.10*. It will be easier if the bar is completely removed, even from the handle.

10.11 Knobs for pushing bars

The knobs for the pushing bars can be mounted now. Screw the knobs and leave them loose to introduce the pushing bars on the supports. If the pushing bars does not fit, loose slightly the Allen screw on the side of the knob.



10.12 Track Wheel dismounted



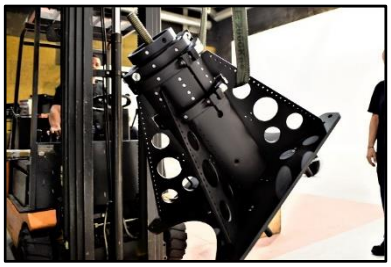
10.13 Pin inside of the wheel

To fix or remove the tracking wheels they need to be introduced under the chassis of the dolly, next to the pneumatic wheels with the positioner pin and tighten with the red knob. The leveling Jacks are introduced through the hole inside the shaft of the wheels and secured with a pin in the dolly.

Now the dolly is ready to assemble the column and the fulcrum.

SECOND STEP: COLUMN AND FULCRUM

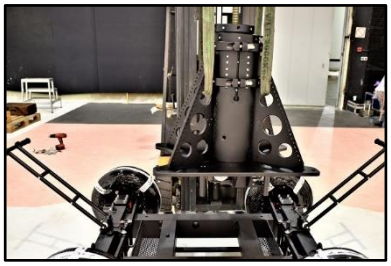
Once the dolly is ready, the column can be introduced. Notice that there is one guiding pin in the base of the dolly to mark the position of the column.



10.14 Lifting point for the column

To take the column out of the crate use a strap as shown in the *fig. 10.14.* Notice that lifting the column from this point it will slightly tilt, guide gently the column using the hands to take it out of the crate.

Once it is out, let it rest in the four legs or use two apple boxes to change the straps in order to lift it straight and introduce it into the dolly.



10.15 Introduce column into the dolly

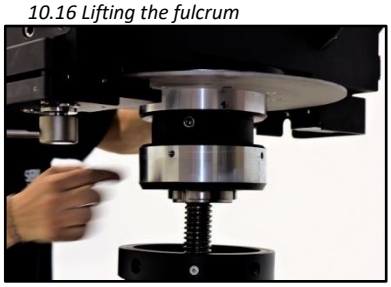
To introduce the column into the dolly, use the guiding pin in the dolly to align it to the column and gently bring it down until the four screws on the corners of the column can be tighten.

From this point, lift the inner column manually as showed in *chapter 2.2 column* until there is access to the screw holes to attach the fulcrum into the column. Remember to loosen the bracers holding the inner columns.

10.16 Lifting the fulcrum

To lift the fulcrum, block the tilt brake to prevent the fulcrum to spin while lifting it. Pass the straps under the base as shown in the *fig. 10.16*.

Introduce the fulcrum in the column noticing that there is one hole in order to have access to the pan fluid screw. Align the fluid screw with the hole (*loose the pan brake in order to spin it)* and introduce it.

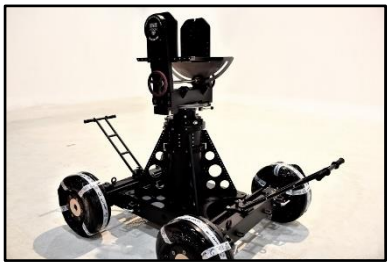


10.17 Pan fluid set screw

Once it is introduced, tight the Allen screws gently until all of them are introduced and then start tightening them in cross until all of them are firm.

The dolly and the column should look like *fig. 10.19* and now is ready to assemble the arm.

10.18 Tight the fulcrum to the column



10.19 Dolly, column, and fulcrum

THIRD STEP: THE ARM

For the installation of the arm, it is very important to lift it from the two points marked with the green straps provided with the crane. The best option is to use two forklifts to ensure that each strap lift the arm making a U instead of a triangle. If the straps support points are too close, the arm may be exposed to deformation forces that can lead to malfunction once the crane is assembled.

10.20 Lifting the arm

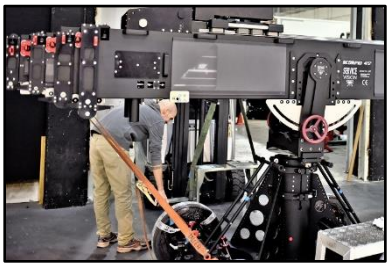
Once the arm is out of the plywood crate, unwrap the middle part to slide it into the fulcrum as shown on *fig. 10.20*.

Notice that there is a set screw in one side of the arm to mark the position of the arm inside the fulcrum *(marked in yellow in fig. 10.20)*.

Slide the arm inside the fulcrum until the front strap gets loose. Ensure that the tilt brake is loose and then tight the side screws gently until all of them are introduced. Once they are all in, start tightening them in cross until all of them are firm as seen in *chapter 2.4 Telescopic arm*. Tight both sides equally to prevent the arm to be too close to one side of the fulcrum.

10.21 Alternative lift of the arm

Note: Once the arm is tight to the fulcrum and BEFORE removing the forklifts, use a ratchet strap to tight the arm to the dolly since it will be too back heavy and it may fall back.



10.22 Front strap holding the arm

FOURTH STEP: COUNTERWEIGHTS SUPPORT

To introduce the counterweights support, lift it with the forklift and prepare it as shown in the *fig. 10.23.* From this point, just roll the crane backwards until it can slide between the counterweights motor and the support where it will lay. Once in the position, remove the strap and tight it with the twelve screws for it.

10.23 Lifting the counterweights sup.

FIFTH STEP: ELECTRONIC BOX AND POWER UNIT

10.24 Sliding the electronic box

The Electronic box and the power unit for the Scorpio heads are introduced by sliding them respectively in the back and the front of the arm. Just remove the stopper screws and slide them in as shown in the pictures.

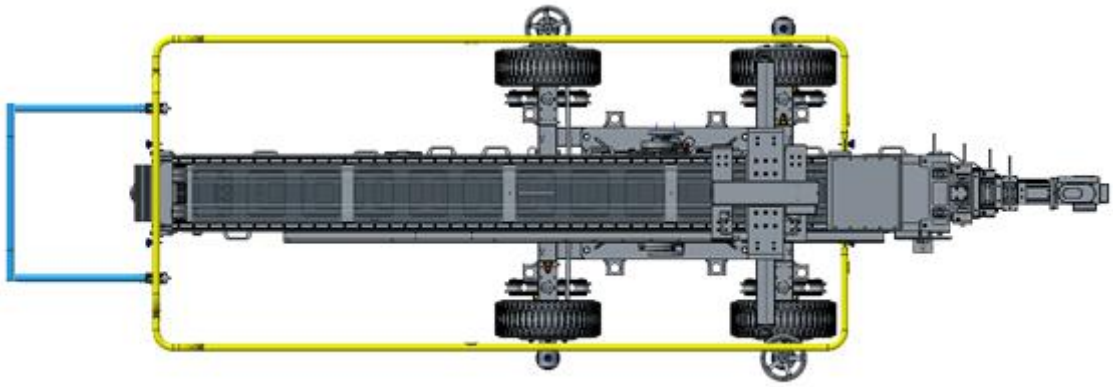
Notice that the electronic box is heavy and it is recommended to lift it between two people.

10.25 Power unit being assembled

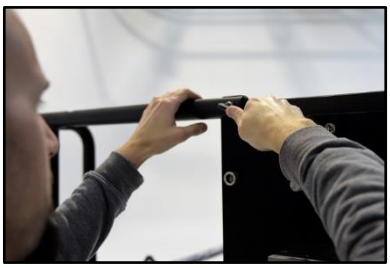
Once assembled, mount again the stoppers to prevent them to fall during transport or operation.

SIXTH STEP: PROTECTION BARS

The protection bars (*marked as yellow in the picture*) are assembled into four pivots in both sides of the crane and they are tight with Allen screws to hold them in place.



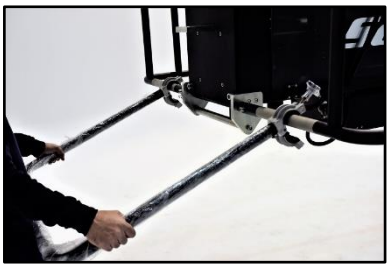
10.26 Upper structure assembly



10.27 Upper structure assembly 2

Before introducing them, the bracket for the hand command needs to be slide inside the main operation bar (*left or right)* since once the bar is attached, the bracket cannot be introduced.

With the sidebars mounted, proceed to assemble the upper operation bars. Attach all the Allen screws slightly until all of them are set. Then tight them completely once the whole structure is assembled.



10.28 Lower operation bars

10.29 Slide the HC bracket before attaching the side bars

To assembly the lower operation bars open the knob until the bracer opens. Then attach the bracer in the rear part of the protection bars and close the bracer with the knob and tight. To apply friction, tight more the knob.

SEVENTH STEP: ASSEMBLY THE LEVELING HEAD

10.30 Attach LH

10.31 Tight LH screws

To assembly the Leveling head slide it into the desired high at the end of the arm and tight the six Allen screws to hold the Leveling head in place.

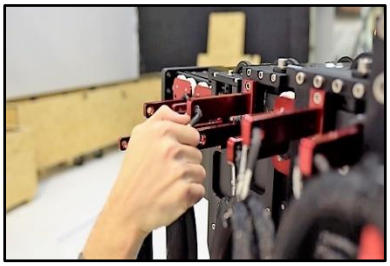
EIGHTH STEP: CABLE CONNECTIONS

Once all the parts of the crane are assembled, is time to connect them with the different cables provided. All the cables are color coded, or they only fit in one place. Here next will be some pictures of the different connections of the crane.

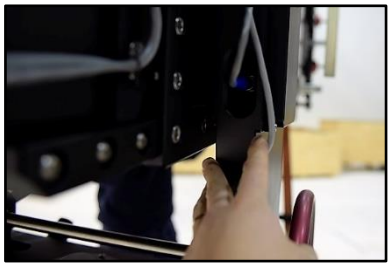
Noteworthy that there are also pictures of how to run cables along the arm using the cable holders. These cable holders need to be attached from the side of the red support, it is the only way to mount them in and out.

10.32 Connect LH

10.33 Detail of the last red support



10.34 Position to introduce the holders



10.35 Connection of the tilt encoder

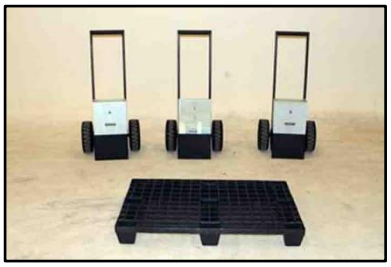
10.36 Connecting the EB side 1

10.37 Connecting the EB side 2

In the event it is needed to mount an extra cable (*BNC, Fiber cable…)*, the arm needs to be extended to reach the magnetic limit of extension. With the arm fully extended at that position, attach the extra cables to the cables already mounted and move the arm in and out to verify the optimal behavior of the cable loom.

Here next are pictures of the crane fully assembled and the counterweight dollies with the weights on them.

10.38 Crane assembled



10.39 Counterweight dollies

10.3 TRUCK TRANSPORT & LOCATION POSITIONING

The Scorpio 38’/45’ cranes can be transported to different locations using a truck. It is recommended to load it in the truck with the back of the crane facing the front of the truck. To ensure that the crane is safely secured to the truck it has to be strapped from several points as detailed next:

Fixing points to the truck box	
Front and rear straps between dolly and truck 	These straps prevent the crane to move front or back. Ensure to only strap the outer column while pressing the L shaped corners against the column.
Side straps between arm and truck  	These straps prevent the arm to turn respect the dolly. Ensure to strap them using the front or rear fix bars under the main arm to the sides of the truck box.
Leveling jacks touching the ground 	It is recommended to bring the leveling jack’s shoes to the box base to give more stability to the crane.
Straps holding the arm of the crane (do not remove while loading or unloading)	
Front straps between arm and dolly  	These straps prevent the arm of the crane to tilt up. Use the front fix bar under the main arm to secure it to the dolly.
Rear strap between arm and dolly  	This strap prevents the arm of the crane to tilt down. Use the rear fix bar under the main arm to secure it to the dolly (*This strap can be safely loosened if the crane is empty to prevent it to hit the truck box when using a lift gate)*.
Front strap securing arm extension 	This strap prevents the telescopic sections to telescope out. Use the strap from the front fix bar under the main arm through the side support points of the leveling head.

The straps holding the arm of the crane are to secure the crane itself, therefore those straps only have to be removed when balancing the crane (*see chapter 3.2 Starting the crane).*

LIFTING THE CRANE FULLY ASSEMBLED

10.xx Lifting the crane.

Some shooting locations are hard to accede just rolling the crane in and require lifting the whole crane without tearing it apart. If it is necessary to lift the crane, use straps or span sets able to lift the weight of the crane and pass them under the chassis of the dolly to a higher support point (*fig.10.xx)*. To do this operation it is better to do it without remote head and with the arm fully closed and more or less balanced (*to balance it in this position, remove the electronic box and add weights in the front counterweight support point until it is full).*

11. MARKS OF THE EQUIPMENT

In the crane there are different labels indicating serial number, max. weights over and underslung and the model of crane.

CE MARK

The Scorpio 45’ has been certified in conformity with the rules imposed by directive CEE/98/37 of June 22, 1998 and its amendments like that by any other law of supplier attests that it conformed to the procedure imposed by Directive CEE/98/37 to certify the conformity of the material to these safety regulations and hygiene.

SERVICEVISION S.L.	
MODEL	SCORPIO 45’
SERIAL NUMBER	XXXXX
FABRICATION YEAR	20XX
ELECTRICAL TENSION	110~220 V
MAXIMUM AUTORITHED MASS	2360,5 Kg.
MAXIMUM PAYLOAD UNDERSLUNG	70 Kg.
MAXIMUM PAYLOAD OVERSLUNG	30 Kg.