SERIES 2LHS+ QUICK START GUIDE

SCREEN LAYOUT

Screen layout		
1	Foreman Key switch	Machine Controllers Switch (Foreman's key switch) allows or denies access to the user settings and service menus. Used when there are slew and height limits in use to avoid accidental changes by the operator.
2	Display	Touchscreen colour display which provides user information and control of the system.
3	Overload warning LED	**RED LED** illuminates to show when the machine is in an overload condition.
4	Rated Capacity warning LED	**AMBER LED** illuminates to show when the machine is approaching the rated capacity and overload condition.
5	System power Comms OK	**GREEN LED** flashes continuously to indicate power and system operation.
6	Light Sensor	Automatically dims or brightens the screen, depending on lighting conditions.

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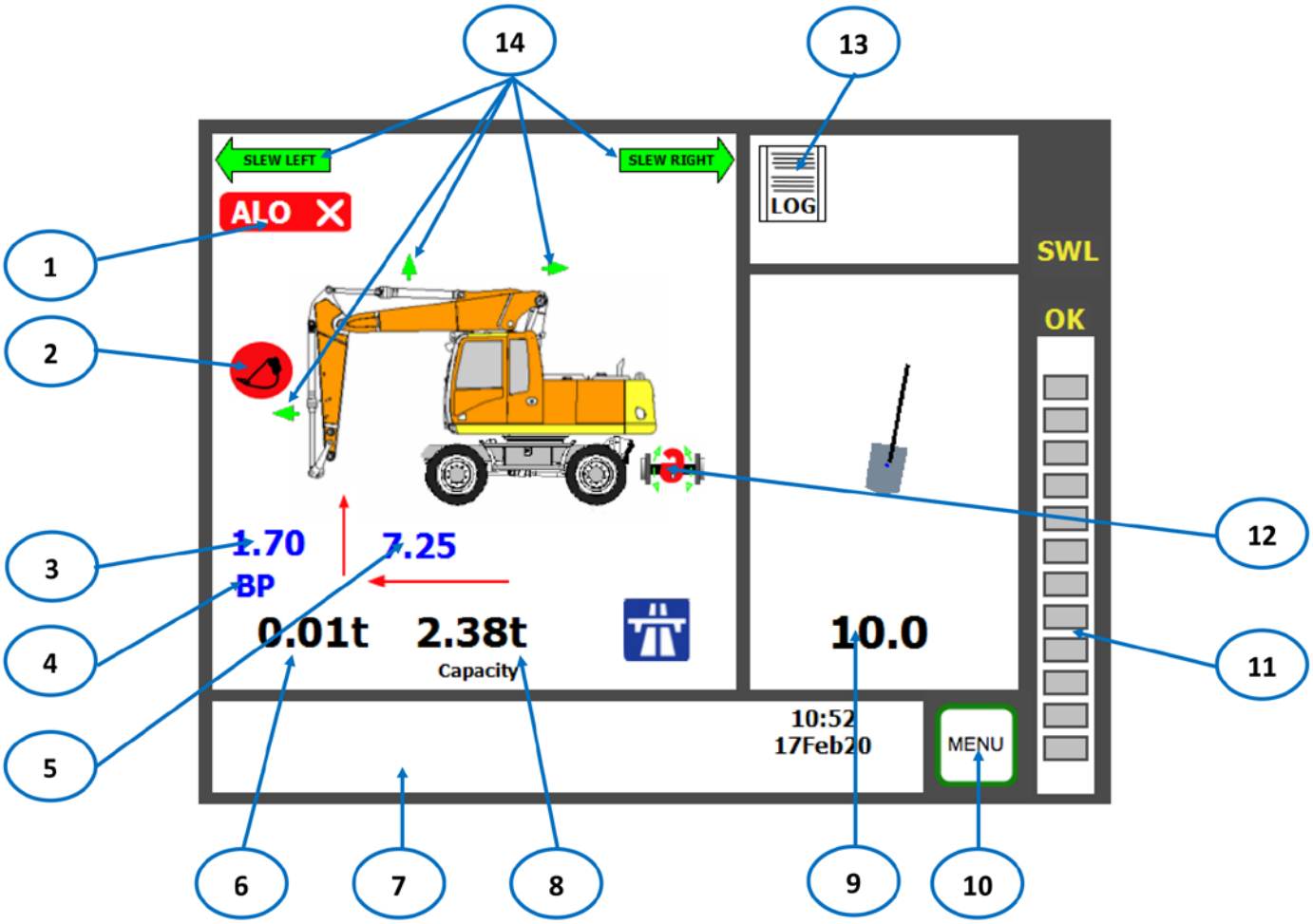
GKD

SCREEN LAYOUT continued...



Screen layout		
1	ALO Symbol	Series 2LHS+ SpaceGuard Systems that are certified to work Adjacent Line Open will show the symbol "**ALO √**", Series 2LHS+ systems that are not certified to work Adjacent Line Open, or approved systems without operational slew limits or virtual walls, will show "**ALO X**".
2	Dig Mode	If the system is in dig mode this icon shows green and the motion cuts and alarms on overload are disabled, the blue beacon is not illuminated.
3	Height	Height of lift point from ground level (road mode) or rail head (rail mode).
4	Active Lift Point	The current active lift point is shown here. Possible options are **BP** (Bucket Pin), **ALP** (Auxiliary Lift Point), **QH** (Quick hitch), or **TLJ** (demountable Tele-jib). If nothing shown here then only one lifting point is enabled (Bucket Pin).
5	Radius	Radius of current lift point from the slew centre of the machine.
6	Load	Displays the current load on hook. This will include any attachments and the quick hitch.
7	Status Bar	This area shows machine information, error messages and current date and time.
8	Rated Capacity	**Note:** when an * appears against this number, it will indicate that either the machine is in hydraulic limit or the rating displayed is the maximum based on the hydraulic limitations of the machine.
9	Slew	Shows the current slew angle in degrees. 0° is typically over the oscillating axle.
10	Menu button	Allows access to user and service functions. **Note:** if the machine controllers key switch is off then the system will not allow access to service menus or limit functions.

11	RCI Status Bar	This bar fills from bottom to top and provides a visual reference of the relationship between the applied load and the rated capacity. A warning will occur between **92.5%** and **97.5%** of the rated capacity. This warning is an **AMBER LED** and an audible alarm on the cab. If the applied load should exceed **104%** of the rated capacity then the **RED LED** is lit and a continuous external siren is sounded. The machine will then be inhibited to prevent further unsafe movements.
12	Axle Lock Icon	Shows the current state of the axle lock. A locked padlock indicates that the axle locked, an unlocked padlock indicates that the axles are unlocked, and an unlocked padlock with a cross through it indicates that the axles cannot be unlocked as it is unsafe to do so as it would put the machine into an overload condition.
13	Logging	This icon shows the status of the on-board data logging system. There are four states for the icon. 1. **Not shown** - logging is disabled. 2. **Logging icon** - Logging is on and an event has been recorded. 3. **Logging symbol with red cross** - Log is inoperative or card full.
14	Movement	These arrows indicate the safe direction each piece of equipment can be moved. **GREEN** indicates movement is safe. **RED** indicates movement is unsafe.

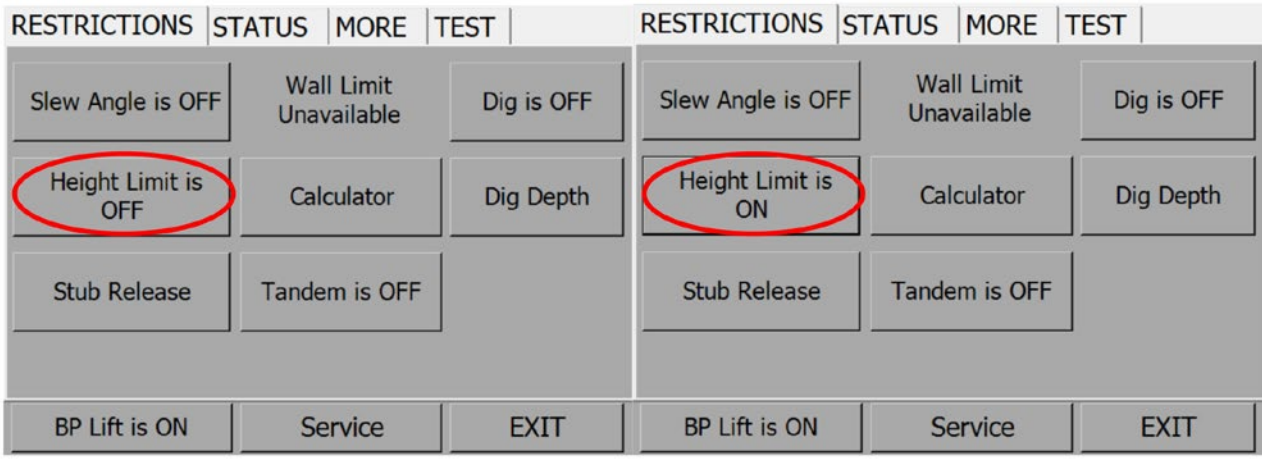
HEIGHT RESTRICTION

Height restriction is defined as the maximum height that the excavator can work at. This allows the machine to be used in restricted areas such as tunnels, stations and under overhead wires.

WARNING: THE HEIGHT RESTRICTION FUNCTION IS DESIGNED TO BE USED AT SLOW LIFT SPEEDS ONLY. USE AT SPEED MAY RESULT IN AN OVERSHOOT INTO A POTENTIALLY DANGEROUS POSITION.

The height restriction functions in the GKD Series 2LHS+ continually monitor the highest part of the machine. If the highest part of the machine should exceed the pre programmed height restriction then the appropriate motion cut signals will be activated.

The buttons in the **RESTRICTIONS** menu indicate the current status of the restriction. The two screens below show the height limit switch legend when the restriction is off and on. When set, the height limit is shown on the front screen as a red line above the machine graphic. The text in blue shows the current height of the highest part of the machine, the red height figure under the red line indicates the current active height limit.



WARNING: THE HEIGHT RESTRICTION FUNCTION IS DESIGNED TO BE USED AT SLOW LIFT SPEEDS ONLY. USE AT SPEED MAY RESULT IN AN OVERSHOOT INTO A POTENTIALLY DANGEROUS POSITION.

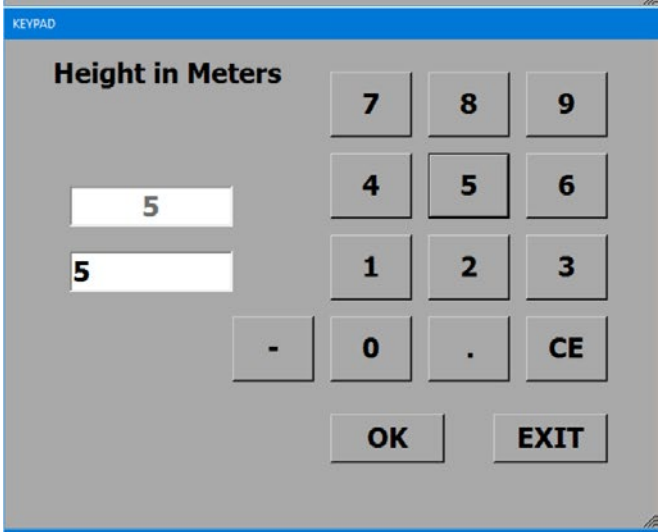
Setting a height limit

There are two methods of setting the restriction value, either by entering a height on the keyboard or by moving the machine to the required limit and capturing a position.

To enter a height press the **"Height Limit is OFF"** button to begin the height limit set procedure.

The system will now ask you to confirm that you wish to enter the height via the keyboard.

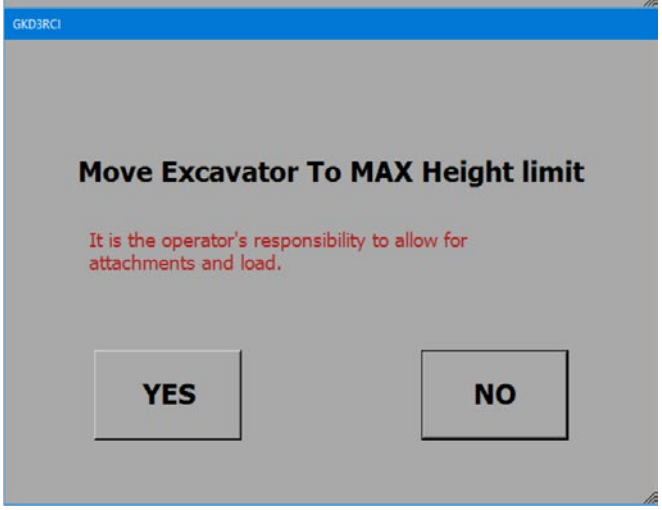
Select **"YES"** to enter the height in meters via the keyboard. Otherwise select **"NO"** to capture the machine position.



If **"NO"** is selected, the system will prompt you to move the machine to the maximum height. Move the machine booms to the maximum height that is allowed.

Select **"YES"** to set the restriction. The height limit will be set based on the highest point of the machine equipment.

You may exit from this screen without setting a height restriction by selecting the **"NO"** button.

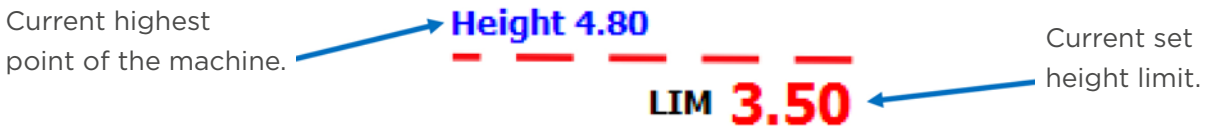


HEIGHT RESTRICTION continued...

Once a height limit has been set, when the machine reaches the set limit the hydraulic lift circuits will automatically be restricted.

The main display will show the active height limit in red below the current machine height display, which is shown in blue . When the programmed maximum height is reached then machine movement will be restricted. Any motion cuts that are inhibited will be shown in red on the depiction of the machine on the screen.

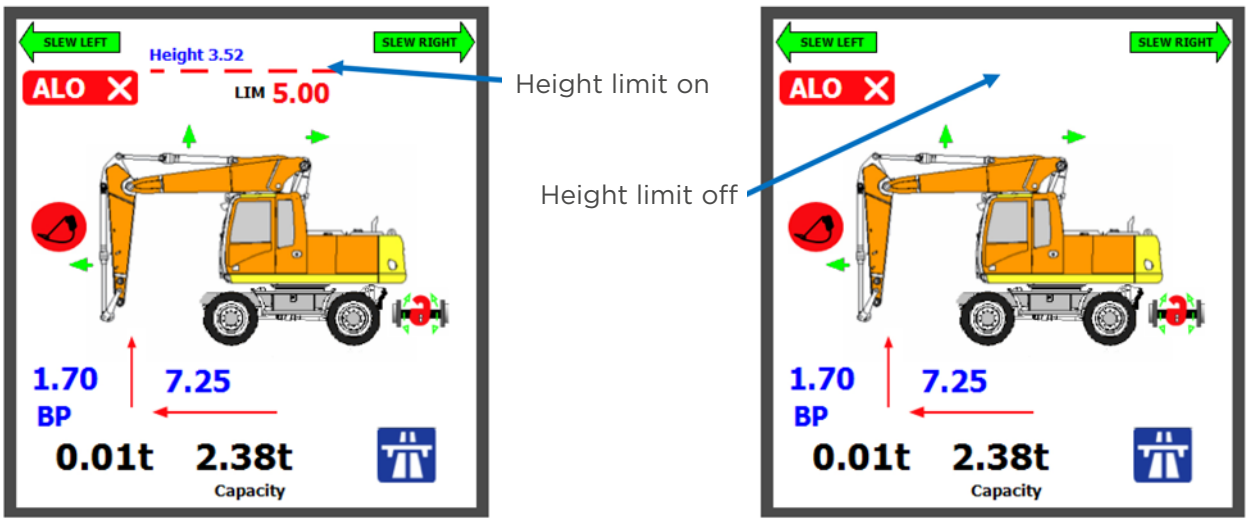
NOTE: THE HEIGHT RESTRICTION IS MEASURED FROM THE HIGHEST POINT OF THE MACHINE WHICH IN MANY CASES WILL BE HIGHER THAN THE BUCKET PIN HEIGHT. THE RCI MONITORS THE TOP OF THE FORE BOOM, THE TOP OF THE DIPPER BOOM, AND THE END OF THE DIPPER BOOM. ON MONO BOOM MACHINES, THE RCI WILL ALSO MONITOR THE TOP OF THE "BEND" ALONG THE MAIN BOOM.



Turning the height limit off

To remove the height restriction press the **MENU** button and select the **"Height Limit is ON"** button.

The limit will be reset and the button status will show **"Height Limit is OFF"**. The main operator screen will show no height limit set, as indicated by the examples below.



Logging of Height Limits

The enabling, disabling and exceedance (breach) of height limits is logged in the event logger within the display. This will also include the date and time of the event.

SLEW RESTRICTION

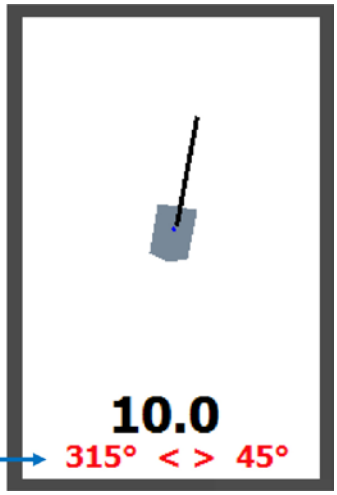
There are two modes of slew restriction:

- **Angular** restricts the slewing of the machine between two user determined angles.
- **Virtual wall** restriction allows the machine to operate to a limit determined by a virtual wall placed parallel to the rails.

WARNING: THE SLEW RESTRICTION FUNCTIONS ARE DESIGNED TO BE USED AT SLOW SLEW SPEEDS ONLY. USE AT SPEED MAY RESULT IN AN OVERSHOOT INTO A POTENTIALLY DANGEROUS POSITION.

The buttons in the user settings menu indicate the current function of the button. Therefore, when the system is active then the button will say **"Slew Angle is ON"** and requires a button press to switch it off. In addition the slew restriction status is shown on the front screen as part of the slew position graphic, as depicted in the graphic on the right.

Angular slew limits shown next to the slew angle on the main operator screen.



Entering of slew limits

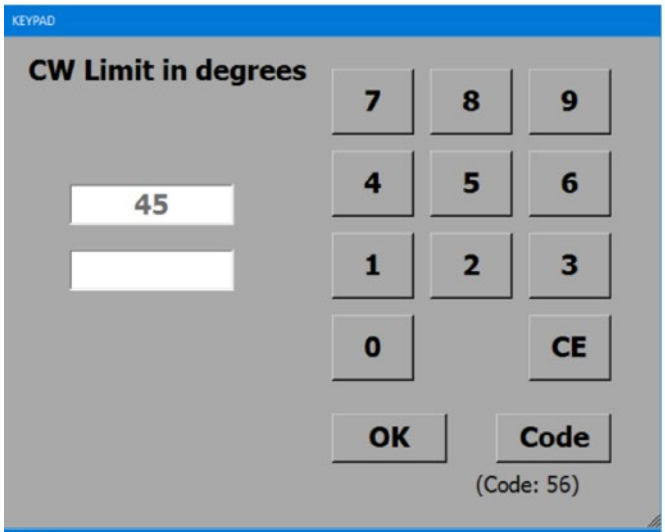
Press **MENU** and select **"Slew Angle is OFF"**.

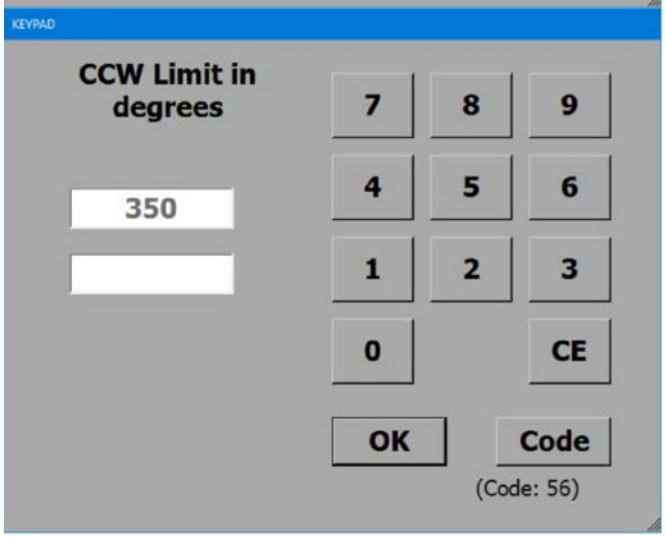
When asked if you wish to enter slew Limits, select **"YES"**.

Using the keypad enter the clockwise maximum angle. Press the **"OK"** button.

Then enter the counter clockwise maximum angle.

Press the **"OK"** button.





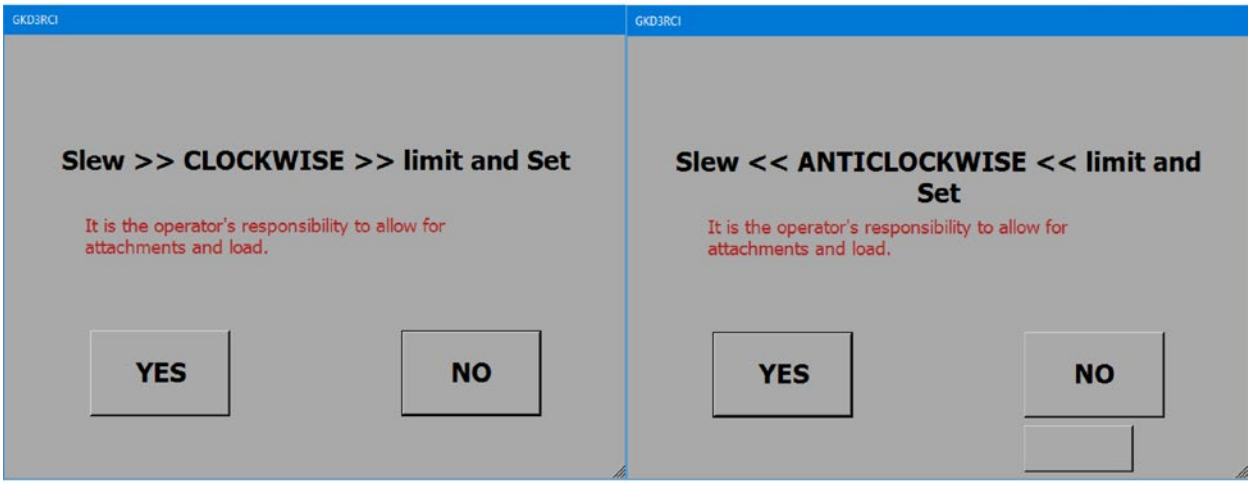
The button on the restrictions page will now show **"Slew Angle is ON"** and the main operator display will change to indicate angular slew limits.

The limits are shown below the slew angle. (see graphic at top of this page).

If the preset angles are exceeded then the appropriate slew motion cut is applied, and the slew motion cut icons on the operator display change colour to RED to show the slew service is cut.

Capture of Slew Limits

When asked if you wish to enter slew limits, select **"NO"**. You will then be asked to slew to the desired clockwise slew limit. Slew the machine to required position and press **"YES"**. Then slew the machine to the desired counter clockwise slew limit and press **"YES"**.



Turning the slew restriction off

To turn off the slew restriction select **MENU** and press the **"Slew angle is ON"** button.

The system will ask for confirmation that slew limits are to be turned off, confirm by pressing **"YES"** and the slew limits will be turned off. The slew Limits button will now show **"Slew angle is OFF"** and no slew limits will be active.

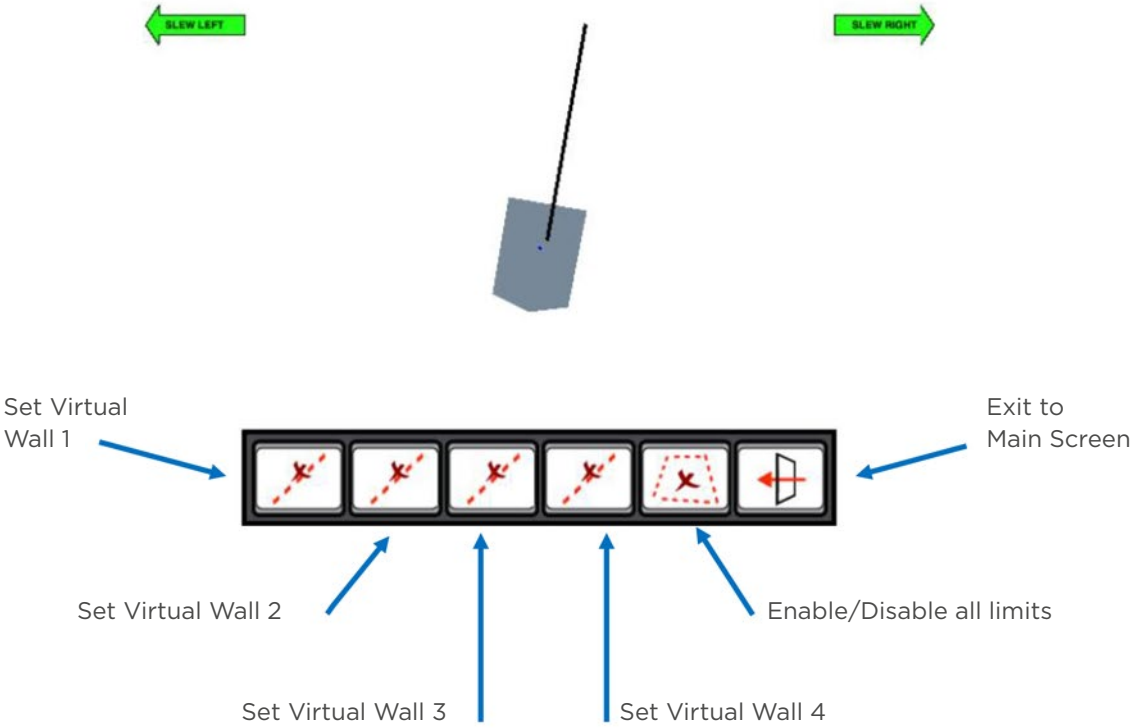
Logging of slew limits

The enabling, disabling and exceedance (breach) of slew limits is logged in the event logger within the display. This will also include the date and time of the event.

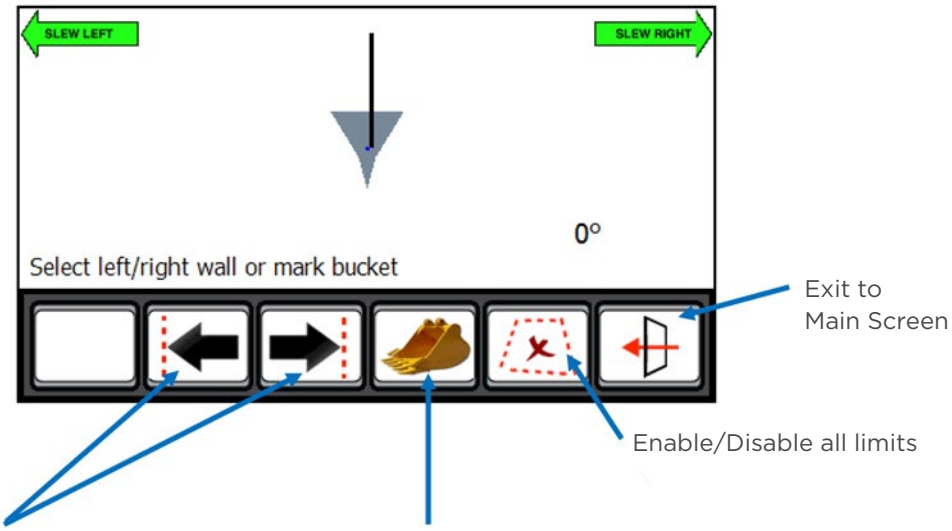
VIRTUAL WALLS

It is possible to set a left parallel wall, a right parallel wall or up to 4 multi-point walls.

Select **MENU** and press the **"Virtual Wall Off"** button. The screen shown below appears.



Pressing on any of the **"Set Virtual Wall"** buttons will display the following screen:



Set a left or right virtual wall which will be parallel with the tracks or wheels of the machine.

This is entered as a distance, in metres, from the centre of the machine.

Set a virtual wall by moving the bucket or tool to 2 different points near the machine. The system will then connect these points with a 'virtual wall' which will then become the limit.

WARNING: IT IS THE RESPONSIBILITY OF THE DRIVER TO MAKE SURE THAT ANY LIMIT SET IS OUTSIDE ANY WHEELS, STABILISERS OR ATTACHMENT THAT MAY BE FITTED TO THE MACHINE WHICH COULD CAUSE IT TO BE IN A DANGEROUS POSITION. THE SIZE OF THE LOAD SUSPENDED FROM THE BUCKET PIN OR LIFTING POINT SHOULD ALSO BE CONSIDERED WHEN SETTING A WALL.

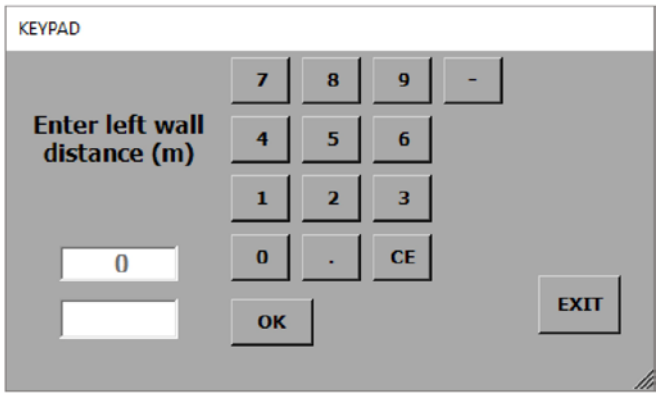
Setting a virtual wall by entering a distance

Press on the **"Set Virtual Wall 1"** button.

Then press on the **"Left Wall"** button.

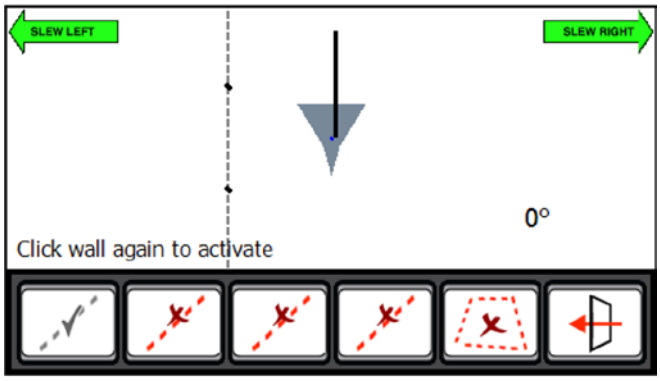
A keypad will open for you to enter the distance to the left wall, in metres.

Enter the distance and press ok.

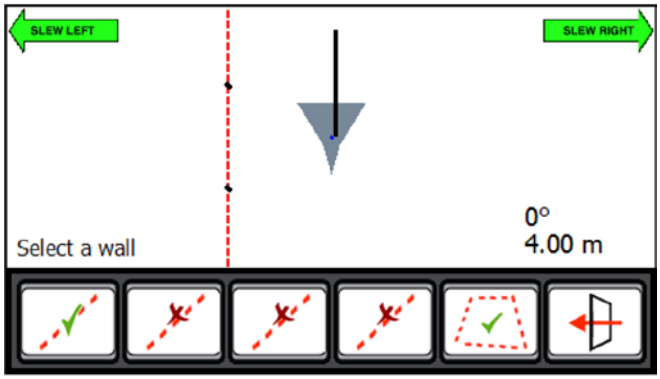


The screen should now change back to one similar to that pictured to the right.

The **"Set Virtual Wall 1"** button will now be greyed out. Pressing on this button will activate the virtual wall and the button will change to indicate that the virtual wall is not active.



The screen pictured to the right, shows a virtual wall set and active.

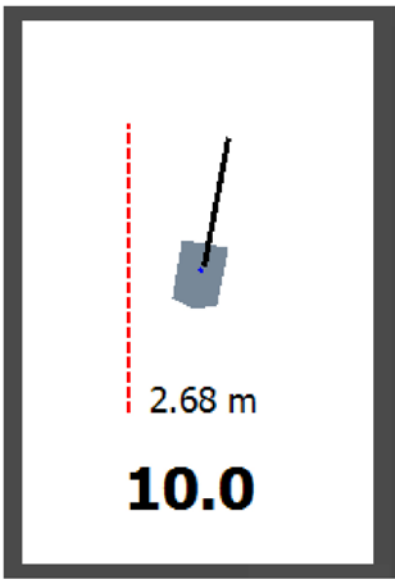


The screen pictured to the right, shows the main operator screen once the virtual wall has been set and activated.

The top right corner of the display will show where the virtual wall is in relation to the machine. It will also show the distance to the virtual wall from the machine.

As the machine slews, its position and distance to the wall will be updated automatically.

When the machine reaches the virtual wall, all relevant machine motions will be prevented from breaching the wall. This includes Boom and Dipper motions.

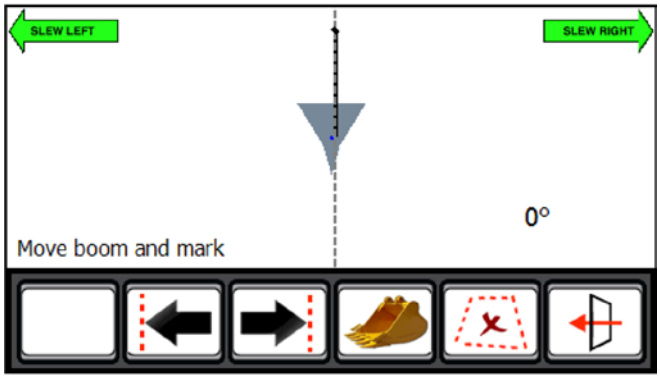


7.2 Setting a virtual wall using the bucket

Move the machine and position the bucket where the first point of the wall is required.

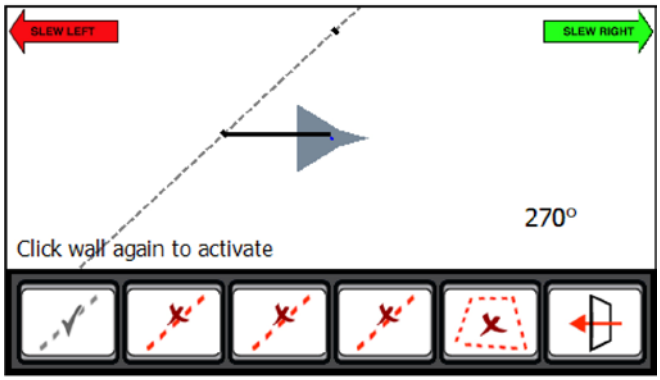
Press on the **“Bucket”** button.

The system will log this point as the first point of the virtual wall.



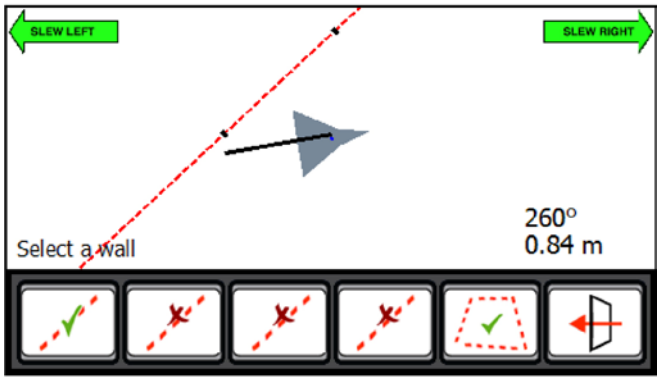
Slew the machine to move the bucket to the second position. As the machine moves, you will see the screen update and create a virtual wall between the first point and where the bucket is.

Once you have positioned the machine at the second point, press the **“Bucket”** button again. This will log the second point of the virtual wall.



The **“Set Virtual Wall 1”** button will now be greyed out. Pressing on this button will activate the virtual wall and the button will change to indicate that the virtual wall is not active.

This method is the same for Virtual Walls 2, 3 & 4.

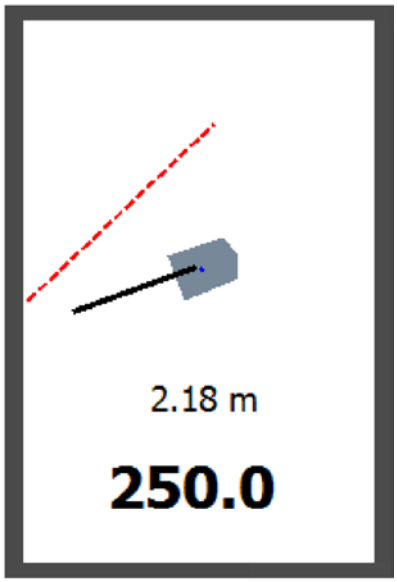


The screen pictured to the right, shows the main operator screen once the virtual wall has been set and activated.

The top right corner of the display will show where the virtual wall is in relation to the machine. It will also show the distance to the virtual wall from the machine.

As the machine slews, its position and distance to the wall will be updated automatically.

When the machine reaches the virtual wall, all relevant machine motions will be prevented from breaching the wall. This includes Boom and Dipper motions.



DIG MODE

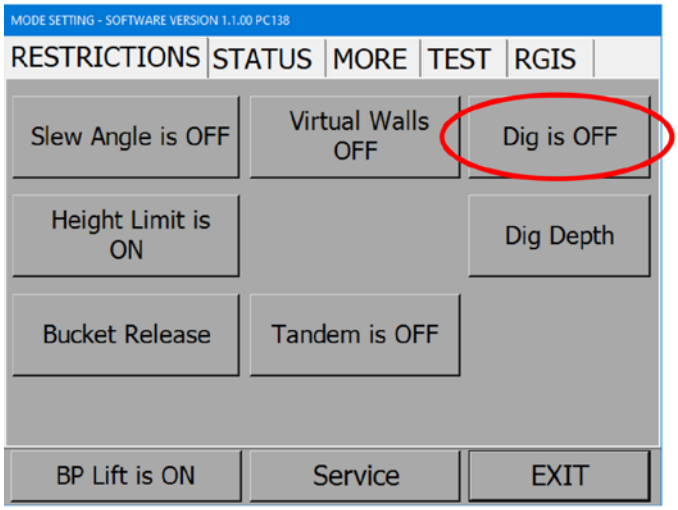
The system has a function to allow the machine to be used for digging. Whist the system is in Digging Mode, it is inoperative as an RCI and external alarms and beacons are disabled.

There is no protection against overloading or tipping.

Use of this mode is recorded in the Data Logger.

You cannot enter Dig Mode if there is more than 500kgs Load On Hook present.

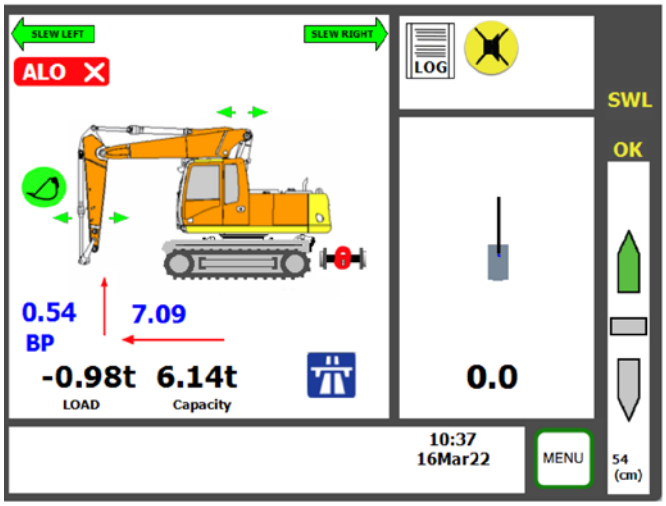
To access this mode, press on **Menu** then the **Dig if Off** button (shown here).



Press on the Dig Depth button to set the required depth, with a negative number being under ground level.

When in Dig Mode, the operator screen will change to represent image shown to the right.

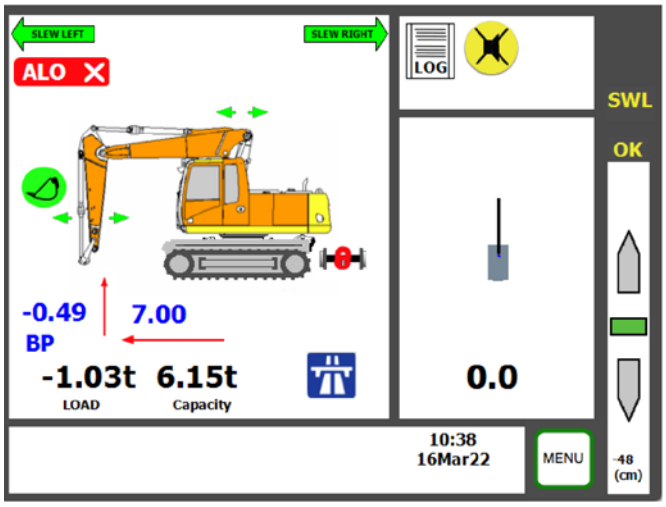
There is an icon to show that the Alarms have been disabled (in the yellow circle) and the Lifting Bar Graph has been replaced by the Dig Depth indicator.



Whilst in Dig Mode, the height of the Bucket Pin is used to see if the depth is on target.

If the Bucket Pin is above the target level then the Green upwards arrow will be lit (see middle picture).

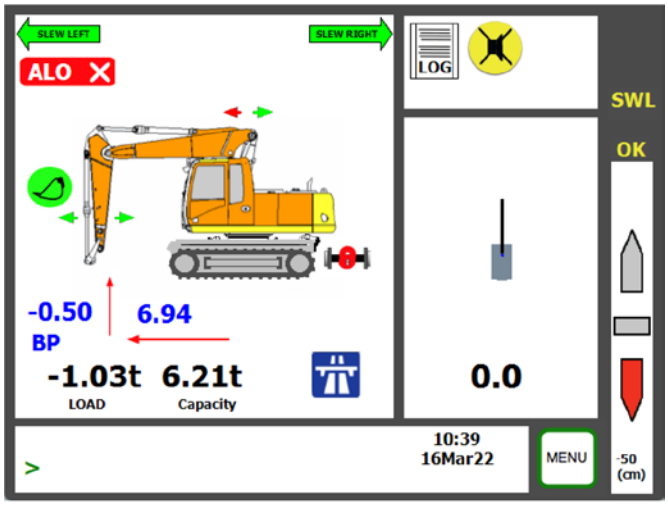
If the Bucket Pin is at the target level, then the horizontal symbol will be green (see bottom picture).



If the Bucket Pin goes below the target level, then the down arrow will be red (see adjacent picture) and the Boom Down motion will be cut to prevent digging down any further.

If the machine is fitted with a Hydraulically Adjustable Boom (sometimes referred to as a Luffer) then the down movement of this section will also be cut.

To exit Dig Mode, press on **Menu** then the **Dig Mode On** button.



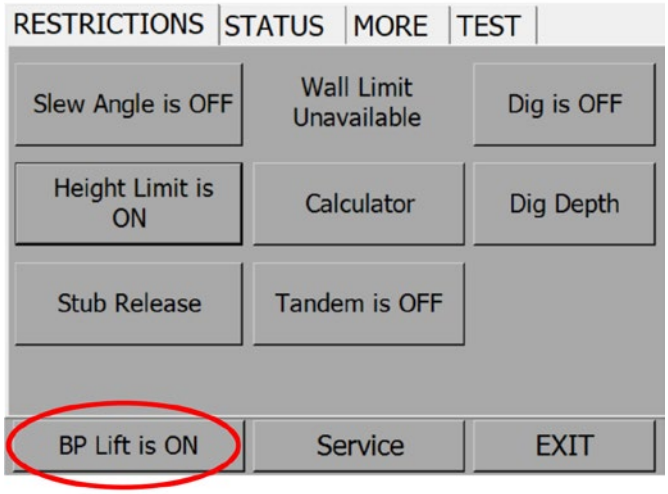
Lift Point Selection

Series 2LHS+ supports multiple lift points. If multiple lift points have been set up, from the **"Restrictions"** page, press the bottom left button to cycle through the available lift points.

Available options may include:

- **BP** (Bucket Pin)
- **ALP1** (Auxiliary Lift Point)
- **ALP2** (second Auxiliary Lift Point)
- **QH** (Quick hitch) assumes the Quick hitch is Horizontal for purpose of Height and Radius display
- **TLJB** (Tele jib)

The lift point in use is indicated on the RCI main screen (item 5 on page 8) just above the load on hook value.



REMOTE KILL SWITCH

The Remote Kill Switch, once enabled, will cut all hydraulic movement of the machine, when the button on the key fob is pressed. The hydraulics will remain cut until the button is pressed again..

When the system is operational and the button is pressed, the following splash screen appears on the Operator Screen:

Even if the Operator press the 'Accept' button, motion is still cut until the key fob button is pressed again.

If the Remote Kill Switch fails for any reason, or becomes disconnected, then it will show the **E159 Remote Kill Switch Fault** error.

While this message is shown, the capacity of the machine is reduced to 0.7t and all motions will be cut until the fault is resolved.

ERROR CODES AND ERROR DIAGNOSIS GUIDE

The system diagnostics continually monitor all of the system components for correct operation. If there is a problem, the system will show an error message on the display and if appropriate sound the alarm.

Below is a link to the GKD Knowledge base where you can find definitions of all the error codes for the Series 2LHS+ System including SpaceGuard.

helpdesk.gkdtechnik.com/kb

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www.gkdtechnologies.com

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