

**OPERATOR DISPLAY GUIDE**

**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**

Touch screen 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**

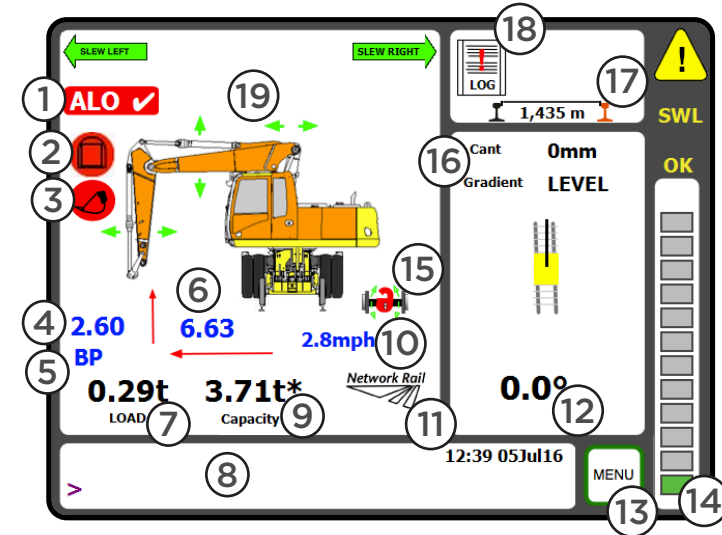
**AMBER LED** illuminates to show when the machine is approaching the rated capacity and overload condition.

**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.



**1. ALO Symbol**

Series 3 SpaceGuard Systems that are certified to work Adjacent Line Open will show the symbol “ALO ✓”, Series 3 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. In-gauge**

Shows green when the machine is within gauge to travel. Will also show red when a slew limit is exceeded or a height limit is exceeded.

**3. 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.

**4. Height**

Height of lift point from ground level (road mode) or rail head (rail mode).

## 5. 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 enable (Bucket Pin).

## 6. Radius

Radius of current lift point from the slew centre of the machine.

## 7. Load

Displays the current load on hook. This will include any attachments and the quick hitch.

## 8. Status Bar

This area shows machine information, error messages and current date and time.

## 9. Rated Capacity

Shows the maximum permitted load for the current height an radius.

**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.

## 10. Speed

Shows the current speed of the machine in MPH.

## 11. Duty Indicator

This symbol will indicate whether the Series 3 is switched to Rail duties, Road duties or **LUL** (London Underground) duties.

## 12. Slew

Shows the current slew angle in degrees. 0° is typically over the oscillating axle.

## 13. 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.

## 14. Series 3 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.

## 15. 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.

## 16. Cant/Gradient

Shows the current cant and gradient of the machine (rail duties only). Cant will show as positive (right hand rail high at 0° of slew) or negative (right hand rail low at 0° of slew), and gradient will show as positive (facing up gradient) or negative (facing down gradient).

## 17. Rail Gauge

Indicates the current rail gauge on use. This is set during the system installation by the converter.

## 18. Logging

This icon shows the status of the onboard data logging system. There are four states for the icon. **1) Not shown** - logging is disabled. **2) Logging icon** - no events recorded but Logging On. **3) Exclamation mark** - Logging is on and an event has been recorded. **4) Logging symbol with red cross** - Log is inoperative or card full.

## 19. Movement

These arrows indicate the safe direction each piece of equipment can be moved. **GREEN** indicates movement is safe. **RED** indicates movement is unsafe.

### DAILY CHECKS

Before starting work, visually inspect the Series 3 sensors and wiring for damage, ensure that the Series 3 system is in good working order and that the values for height, radius, slew position and load shown on the Series 3 are valid. Please refer to the User manual for daily check requirements.

### SYSTEM START - UP

The Series 3 system should automatically start up when the ignition is turned on. Initially a green LED on the front panel will blink on and off to indicate that the system is booting up, and then the screen will power up. Once started up, the internal buzzer will sound continuously until the operator acknowledges the system by pressing the “**OK**” button. The operator will then need to input his 8 digit PTS number. Where the operator has a 6 digit Sentinel card number, it is suggested that two zeros are typed in first, followed by the 6 digit Sentinel number. The system will then go to the working screen shown on page 5.

### FOREMAN KEY

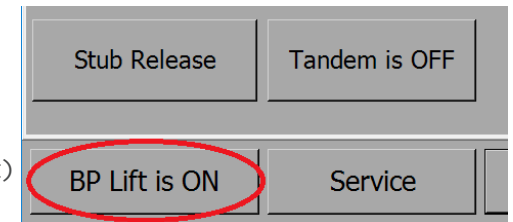
The Series 3 display incorporates a foreman key switch to the right of the display. When this key switch is in the “**Locked**” position, most of the buttons behind the [**MENU**] button will be greyed out and unavailable. To make them available, turn the foreman key switch to the “unlocked” position.

## LIFT POINT SELECTION

Where multiple lift points are available, the lift point being used should be selected from the options programmed into the Series 3. The active lift point is shown on the main screen under the Height value (see item 5 on page 5). To change the active lift point, press the [**MENU**] button, and cycle through the available calibrated lift points using the bottom left button.

Possible options are:

- **BP** (Bucket Pin)
- **ALP1** (Auxiliary Lift Point)
- **ALP2** (Second Auxiliary Lift Point)
- **QH** (Quick Hitch)
- **TLJB** (demountable tele jib)



Only those options enabled within the software will be available. Selecting the incorrect lift point will not compromise the safety of the system, but height, radius and load values may be inaccurate.

### LIFTING A LOAD

As a load is lifted, the Load on Hook value as displayed on the screen (**item 7 on page 5**) will show the weight of the load suspended from the hook. This load is compared to the Rated Capacity (**item 9 on page 5**), the calculated value that the machine is allowed to lift before an “**overload**” event occurs, and the status bar (**item 14 on page 5**) will fill proportional to the % of the Rated Capacity currently being used. As the machine changes position in terms of height, radius, cant, gradient or slew angle, the Rated

Capacity is continuously recalculated. Axle lock status and Road, Rail or LUL duty changes will also affect the Rated Capacity value.

## OVERLOAD

As the Series 3 detects that the Load on Hook value is approaching the Rated Capacity, the **AMBER LED** on the side of the Series 3 display will light up and the internal buzzer will sound. As the Load on Hook value reaches the full Rated Capacity value, the Series 3 will register an Overload state, which is signalled by the **RED LED** being lit and the external tipping alarm sounding. At the same time, any hydraulic service which will take the machine further into overload will be cut, and the Series 3 screen will change the colour of the arrows representing available hydraulic services from green to red for any service that has been motion cut. Any hydraulic service that will result in the load moving to a safer position will still be allowed, and the arrows on screen representing these services will stay green to signify that the services are still available.

## AXLE LOCK

The machine's Rated Capacity will generally be lower with the oscillating axle unlocked than when it is locked. When working with a locked axle (static lift) and a lift and carry duty is required, the axle must be unlocked. The Series 3 will monitor the Rated Capacity for both locked and unlocked duties, and if unlocking the axle will put the machine into overload, the axle unlock signal will be interrupted by the Series 3 and the axle will not be allowed to unlock. The axle lock symbol on screen will change to an unlocked padlock with a red X through it, and the axle will remain locked until the load is moved to a position where the Series 3 will not be in overload with the axle unlocked. At that point, the axle unlock interrupt will be released and the axle will be allowed to unlock

## TRAVEL INHIBIT

The Series 3 will inhibit travel under the following conditions:

- When the machine is in an overload state
- When the axle is locked
- When a height limit has been reached
- When the air pressure is detected as being low (air brakes)

## DIG MODE

When the machine is not being used as a crane, it may be permitted for the system to operate in DIG mode. In DIG mode all overload warnings and motion cut on overload is turned **OFF**, and no protection against overload will be present. The blue light on the roof will be turned off, and where red / white indicator lamps are present the white lamp will switch **OFF** and the red lamp will switch **ON**. The data log will record the use of DIG mode. In order to use DIG mode, the foreman key switch must be in the **unlocked** position.

To engage DIG mode, press the **[MENU]** button, and press the **[DIG IS OFF]** button. DIG mode will then be turned on. The main screen will indicate that DIG mode is engaged by turning the DIG mode indicator to green (**item 3 on page 5**), a yellow circle with an alarm symbol with a cross will be shown next to the logging symbol top right of the screen and **LOGGING DIG MODE** will flash in the status bar (**item 8 on page 5**).

To turn DIG mode off and return to LIFT mode, press the **[MENU]** button and then press the **[DIG RAIL MODE]** button at the top right of the screen.

## BACKWARD STABILITY

The Series 3 system will monitor the state of the machine to prevent the machine falling over backwards when working on a cant. With a reduced

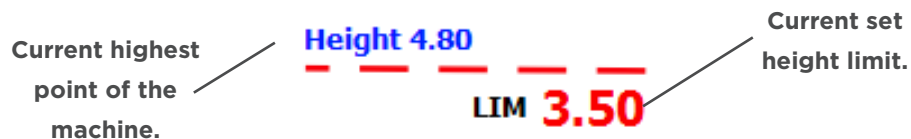
load on the hook and when working on a cant of more than 50mm with the turret facing up the cant, the Series 3 may restrict the movement of the stub boom back. When the maximum boom angle is achieved in a potentially backwardly unstable condition the stub boom lift function will be motion cut and a “**backward stability**” message will be shown. If the boom is far enough back to trigger a backwardly unstable condition and the machine is slewed towards a potentially backwardly unstable condition, the “**backward stability**” message will be shown and the slew function will be cut to prevent the machine reaching a backwardly unstable position. To rotate the turret further, lower the stub boom until the message disappears and slew function is restored.

## HEIGHT LIMITS

In order to set a height limit, the foreman key switch must be in the **unlocked** position. To set a height limit, press the [MENU] button and then press the [HEIGHT LIMIT is off] button. The system will ask if you wish to Enter a height limit. To enter a height limit (in meters) press [YES]. To capture a height limit from the excavator current boom position, press [NO] and you will be prompted to move the excavator to the desired height limit and press [YES]. A height limit will be set that corresponds with the highest point of the excavator at the moment it was set. Once set, the Series 3 will monitor all booms against the set height limit, and will motion cut any hydraulic service that will cause a boom to move through a set height limit. Services that cause machine movement away from the height limit will always be allowed.

To turn off a set height limit press [MENU] and the [HEIGHT LIMIT IS ON]. The height limit will be turned off.

When a height limit is set, you will see the following on the operator main screen.

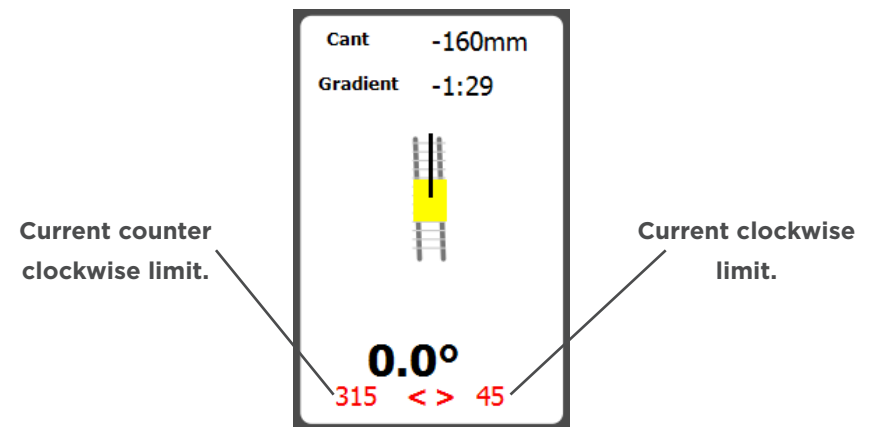


## ANGULAR SLEW LIMITS

In order to set a slew limit, the foreman key switch must be in the **unlocked** position. To set angular slew limits, press the [MENU] button and then press the [Slew Angle is off] button. The system will ask if you wish to enter slew limits. To enter slew limits (in degrees) press [YES]. To capture slew limits using the excavator turret position, press [NO] and you will be prompted to move the excavator to the desired clockwise limit position and press [YES], and then to the desired counter clockwise position and press [YES] again. Slew limits will be set as captured from the turret position relative to the undercarriage. Once set, the Series 3 will monitor turret position against the set limits, and will motion cut the appropriate hydraulic slew services the limit is reached. Slew away from the set slew limit will always be allowed.

To turn off a set slew limit press [MENU] and then [SLEW ANGLE IS ON]. The slew limits will be turned off.

When a slew limit is set, you will see the following on the operator main screen.



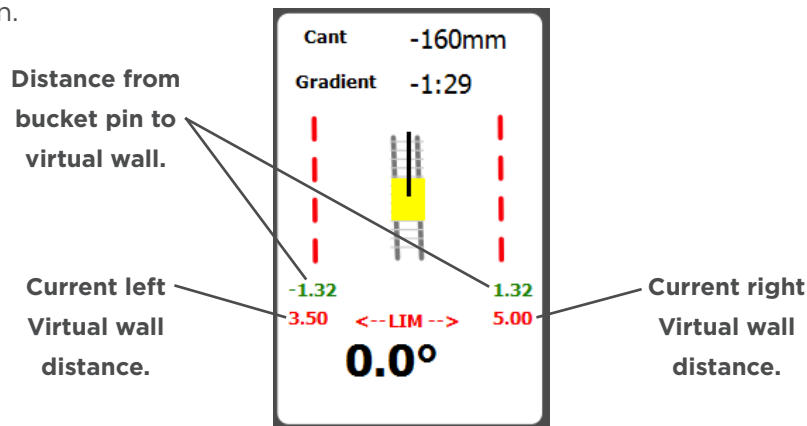
## VIRTUAL WALLS

In order to set a slew virtual wall, the foreman key switch must be in the **unlocked** position.

To set a virtual wall, press the **[MENU]** button and then **[VIRTUAL WALLS OFF]**. To set the LEFT wall distance, press **[LEFT]**. To enter the value for the left wall, in meters from the machine centre, select **[YES]**. Alternatively, to capture the wall distance from the bucket pin position press **[NO]**, move slew left of 0° of slew and position the bucket pin at the desired left limit and press **[YES]**. The right wall is set in the same way, but slewed to the right of 0° of slew to capture the wall position. Select either **LEFT**, **RIGHT** or **BOTH** to activate the virtual wall/s as required.

To turn the virtual walls off, press the **[MENU]** button and then **[VIRTUAL WALLS ON]**, select **CANCEL**. Virtual walls will then be turned OFF.

When a slew limit is set, you will see the following on the operator main screen.



## TANDEM LIFT DUTY

In order to use Tandem Lift, the foreman key switch must be in the **unlocked** position. When using the machine as one of a pair of machines lifting a load together, the Tandem Lift mode must be engaged. The effect of the Tandem Lift mode is to reduce the lift capacity of the machine to provide an additional safety margin before an overturn

occurs, as dictated by Network Rail Tandem Lift guidelines. To engage Tandem Lift mode, press **[MENU]** and then **[Tandem is off]**. Tandem Lift mode will be engaged, the machine's lift capacity will be recalculated in line with Tandem Lift regulations, and on machines certified to RIS1530 rev4 and above the blue Series 3 indicator lamp on the cab will blink on and off at 2 second intervals.

To turn Tandem Lift mode OFF press **[MENU]** and then **[Tandem is ON]**. Tandem Lift mode will be turned off and the machine lift capacity will return to standard lift duties.

## SPACEGUARD AND SAFETY MISMATCH

If a SpaceGuard equipped Series 3 system detects a mismatch between the primary angle / slew sensors and the Safety angle / slew sensors, a Safety Mismatch warning is displayed. The mismatch is often related to the slew count sensors, and slewing the machine back over the reset sensor at 0° of slew may well clear the fault. If not, inspect the angle sensors for possible mechanical damage. If a fault still exists, an engineer visit may be required.

## TROUBLESHOOTING

The Series 3 system continuously monitors the system components for correct operation. In the event that a problem is detected with the system, the lift capacity is reduced to 700kg and an error message is displayed next to the **[MENU]** button indicating the nature of the error detected. In the event that more than one error is present, only the top line error is indicated. Pressing the **[MENU]** button and selecting the **[MORE]** tab will bring up a list of all detected errors on the system.

Below is a link to the GKD Knowledge base where you can find definitions of all the error codes for the Series 3 System including SpaceGuard.

[helpdesk.gkdtechnik.com/kb](https://helpdesk.gkdtechnik.com/kb)