Rangemaster

Operators Guide

This guide describes operation of the
PROLEC RANGEMASTER

Model covered :	MODEL NAME	RANGEMASTER
	INTRODUCED	FEBUARY 2011
	PART No	002145-000

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Any alterations or modifications to machine components which affect the RCI must be reported to Prolec Ltd or via the machine convertor/service agreement holder.

Prolec Ltd must be informed of any Prolec system component failure. Be it directly or via the machine convertor/ service agreement holder.

Manufacturers original instructions

1.0 System Description

1.1 Applications

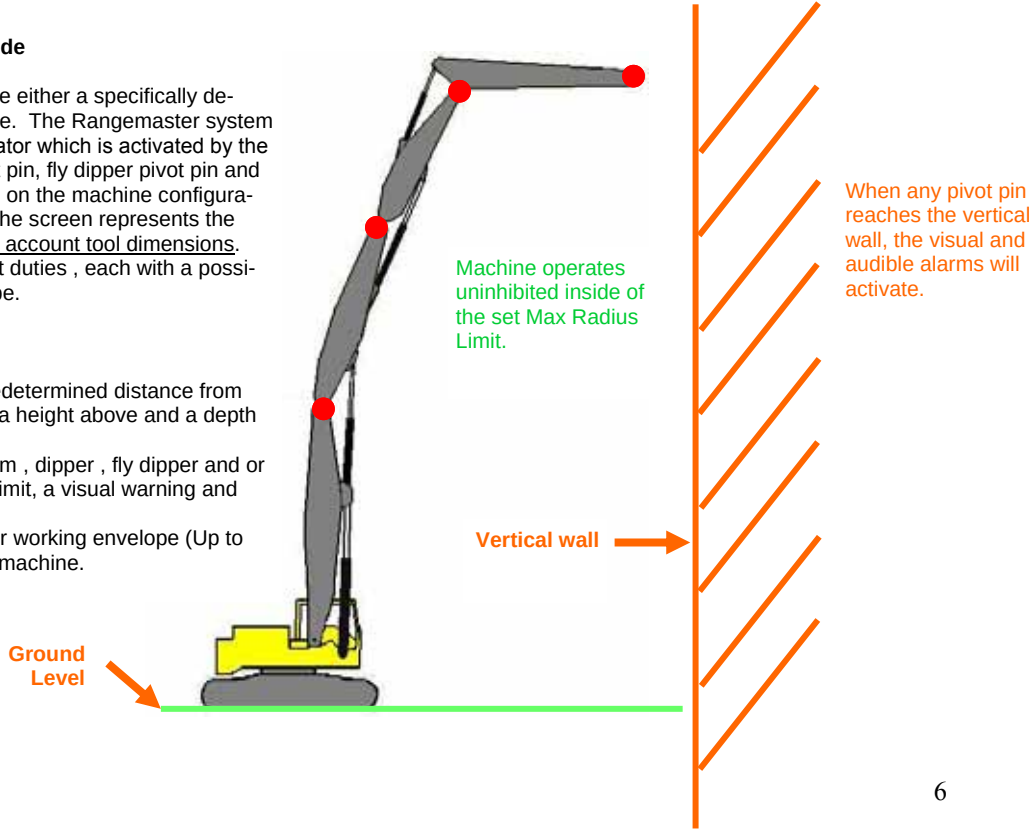
Rangemaster can be deployed to a variety of heavy plant including excavators to monitor and alarm at a given maximum radius.
The system uses a sensor on each articulation of the machine, so single boom to quadruple articulation machines can be easily equipped. Telescopic boom sections are catered for via a reeling drum sensor.
Using Rangemaster ensures both plant and operator can work safely where plant should not .

1.2 Safe Working Radius Mode

The safe working radius can be either a specifically designed vertical wall or envelope. The Rangemaster system features a 'warning only' indicator which is activated by the Exboom pivot pin, dipper pivot pin, fly dipper pivot pin and or the tool pivot pin depending on the machine configuration. The radius displayed on the screen represents the tool pin and does not take into account tool dimensions. The system cal use up to eight duties , each with a possible unique wall and or envelope.

Vertical Wall

The vertical wall is set to a predetermined distance from slew centre and can be set to a height above and a depth below ground.
If any of the pivot pins - exboom , dipper , fly dipper and or the tool pivot pin reaches the limit, a visual warning and audible alarm will sound.
Details of either the wall and or working envelope (Up to eight) should be kept with the machine.



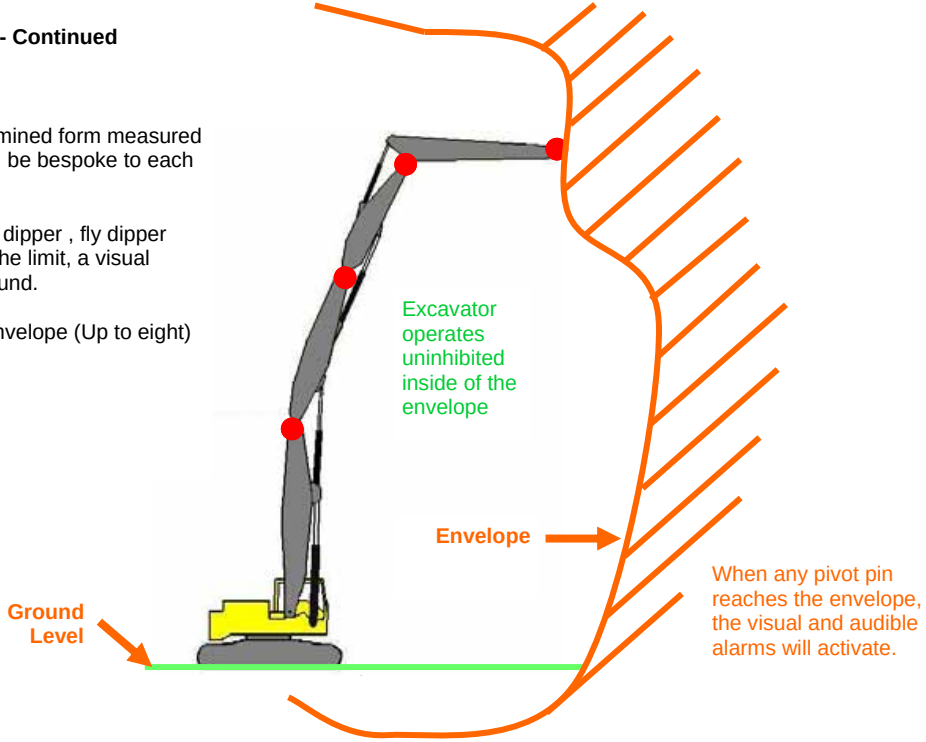
1.2 Safe Working Radius Mode - Continued

Envelope

The envelope is set to a predetermined form measured from the boom pivot pin which will be bespoke to each machine.

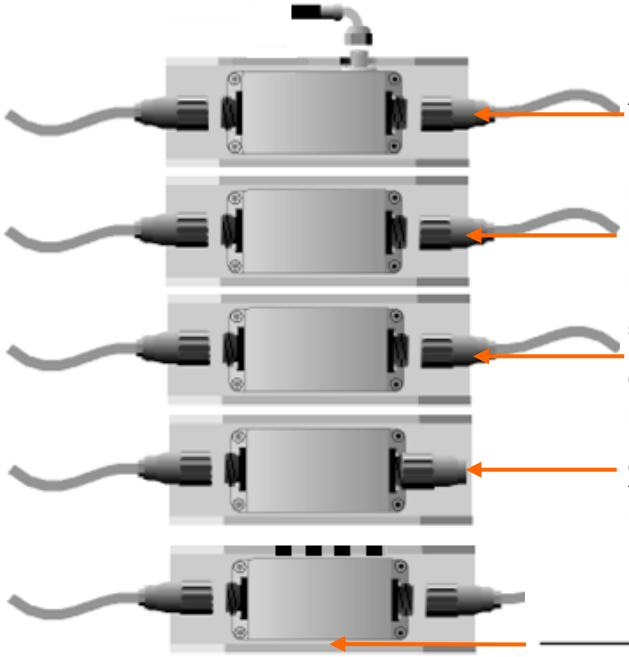
If any of the pivot pins - exboom , dipper , fly dipper and or the tool pivot pin reaches the limit, a visual warning and audible alarm will sound.

Details of either the wall and or envelope (Up to eight) should be kept with the machine.



2.0 System Components
2.1 System Component Descriptions

Cab mounted combined Computer/LCD display unit. Rear mounting plate carries sockets for connection to DC power and CAN.



AS7 boom angle and pressure sensor. This sensor is usually mounted on the OFFSIDE of the boom.

Exboom /Arm angle sensor (AS7 Bucket sensor). This sensor is usually mounted on the OFFSIDE of the equipment. Fitted to all machines, one connector has a special 'Terminator' plug when used on mono boom machines.

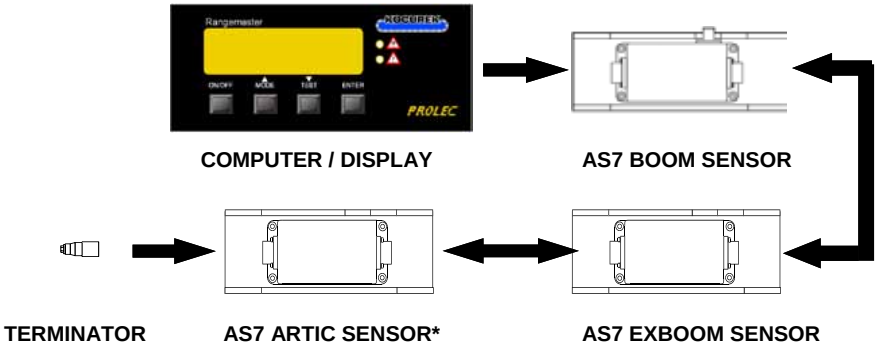
[OPTIONAL] AS7 Artic angle sensor usually mounted on the NEARSIDE of the arm near the pivot pin. One connector has a special 'Terminator' plug fitted on triple machines. This is required for correct system operation. Not fitted to mono or quadruple machines.

[OPTIONAL] AS7 arm angle sensor usually mounted on the NEARSIDE of the flying dipper near the pivot pin. One connector has a special 'Terminator' plug fitted. This is required for correct system operation. Not fitted to mono or triple machines.

[OPTIONAL] Reeling drum with interface this unit is fitted to telescopic boom machines only.

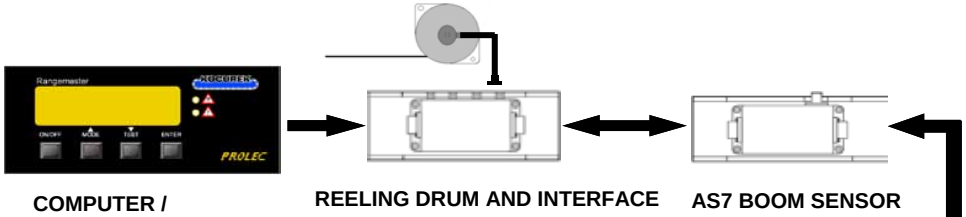
2.2 Mono boom and triple articulation machines

The Rangemaster uses CAN2.0B communication technology. A single cable run connects all the system components. Power from an ignition switched source is connected to the LCD/Computer. All the cables have 6-way screw type connectors. These have a common pin-out, and are polarised, allowing any cable to be plugged into any device or sensor without causing damage.

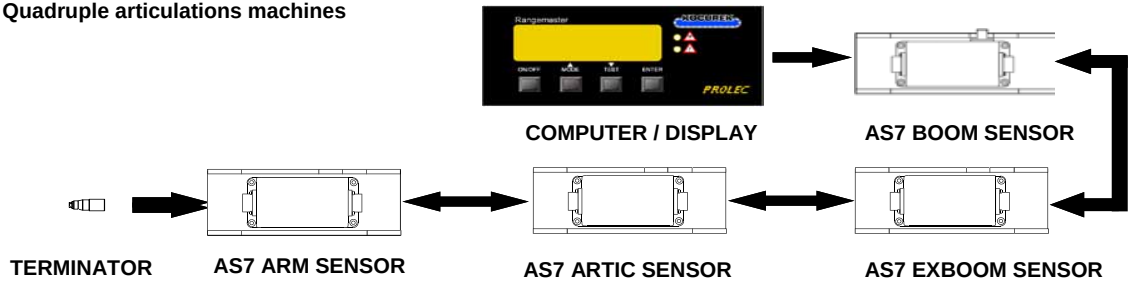


***Triple articulation machines only**

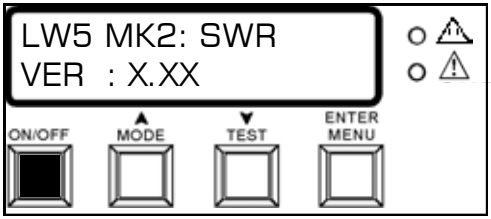
2.3 Mono Boom and Triple articulation with single boom telescopic section



2.4 Quadruple articulations machines



3.0 System Operation



3.1 Power On

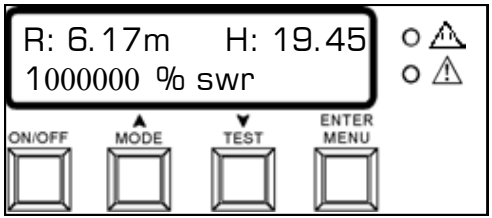
Rangemaster will only operate when it is switched on.

To activate the Rangemaster press the ON button. The System title and software version will be momentarily displayed while performing an initialisation procedure. This will take two to three seconds, during which time all sensors and auxiliary components are checked for correct operation. If all checks are successfully completed, operation will resume as normal. If problems are detected during initialisation a relevant warning message will be issued.

Systems can be configured to automatically power on with the ignition.

Refer to section 9.0 for further information on error conditions

3.2 Safe Working Radius

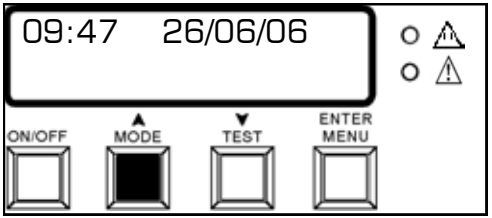


Once the system has completed the initialisation procedure, the safe working radius screen will be displayed.

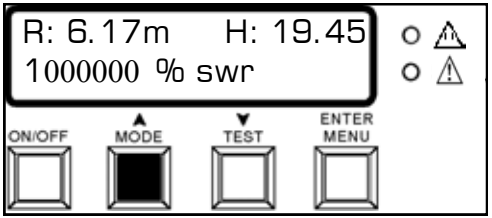
3.3 Mode Sequence

Pressing the MODE button will cycle the Rangemaster through the TWO available operational modes as shown below. With the system in Time and date mode, safe working radius and its associated alarms will not be operational. This mode will time out after 5 seconds returning to the safe working radius mode. See section 7.0 to adjust the time and date.

TIME/DATE MODE

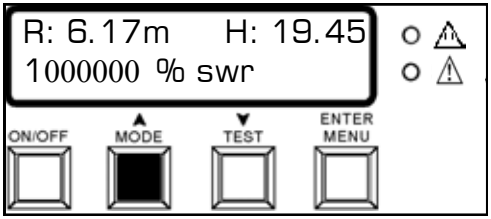


SAFE WORKING RADIUS

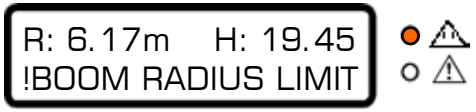


4.0 Safe working radius mode

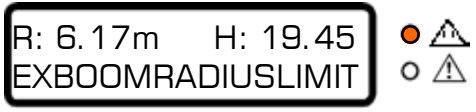
SAFE WORKING RADIUS



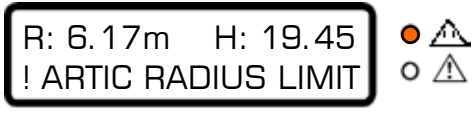
In the safe working radius mode, the tool pivot pin height and radius are displayed. The duty number is displayed in the bottom left corner. The graph represents the distance of the nearest pivot pin to the vertical wall or envelope.
In this mode several warning messages can be displayed depending on the machine setup (See section 2.0 for further information).



If the end of the boom breeches the limit '! BOOM RADIUS LIMIT' will be displayed, the internal alarm will sound and the RED LED will be illuminated.

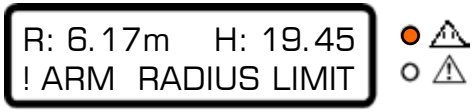


If the end of the exboom breeches the limit '! EXBOOM RADIUS LIMIT' will be displayed, the internal alarm will sound and the RED LED will be illuminated.



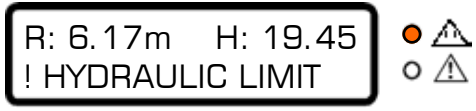
If the end of artic breeches the limit '! ARTIC RADIUS LIMIT' will be displayed, the internal alarm will sound and the RED LED will be illuminated.

4.0 Safe working radius mode - continued

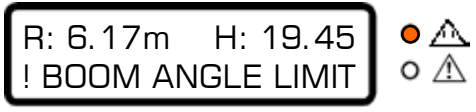


If the end of the arm breeches the limit '! ARM RADIUS LIMIT' will be displayed, the internal alarm will sound and the RED LED will be illuminated.

Low Pressure
If the pressure within the boom lift rams falls below 5bar'! LOW PRESSURE' will be displayed, the internal alarm will sound and the RED LED will be illuminated.
The low pressure warning can indicate either a system state, or a system error. This normally occurs if the machine equipment is either rested on, or powered into the ground. If this message occurs at any other time then there is likely to be a problem with the pressure transducer, and service should be sought.



Hydraulic limit
The hydraulic limit message can indicate either that the current pressure measured in the boom lift rams is in excess of 87% of MRV (Main Relief Valve) pressure, or there is a failure in the system pressure transducer. The internal alarm will sound and the RED LED will be illuminated. The MRV should be heard to be 'blowing'. If this message appears at any other time then there is likely to be a problem with the pressure transducer, and service should be sought.



If the boom moves below a pre set angle '! BOOM ANGLE LIMIT' will be displayed, the internal alarm will sound and the RED LED will be illuminated.

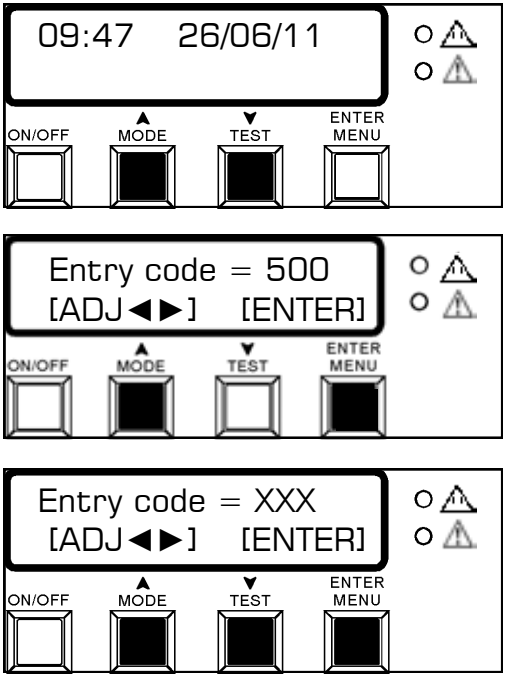
5.0 Duty Selection

Multiple duties will be available if enabled at calibration.
Multiple duties allow for different equipment to be fitted (See section 2.0) and or different vertical walls and or envelopes (See section1.2) allowing removable extensions and secondary equipment can be easily taken into account.

The system can automatically change duty if enabled at calibration.

All screens will time out back to the SWR screen at any point if left idle for more than 15 seconds. With the system in duty selection mode, safe working radius and its associated alarms will not be operational.

Note: the pass code is purposely not shown.

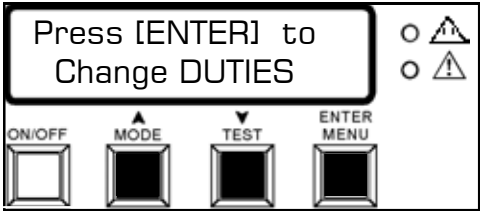


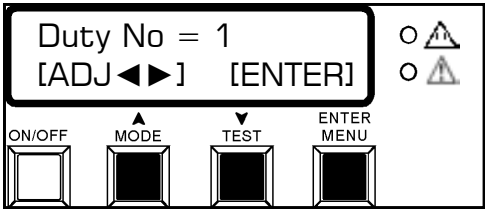
PRESS MODE and TEST together

PRESS MODE and TEST to scroll to the passcode

PRESS ENTER to confirm passcode

5.0 Duty Selection Mode – continued

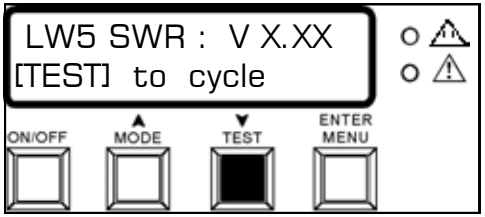




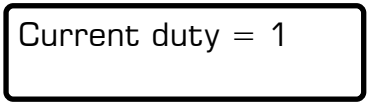
Press ENTER to access the duty change function. Use the MODE and TEST keys to select the required duty number. There is a maximum of 8 possible duty selections. Press ENTER to confirm the selection. After duty changes are made, test equipment to ensure correct operation.
The duty number is displayed in the bottom left corner of the SWR screen or use the test function to check current duty and current equipment lengths, see section 6.0.

6.0 System Test

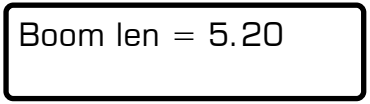
The Rangemaster has a comprehensive built-in test function that allows the operator to check all aspects of the system and its set-up. This function can be accessed at any time from the Time & Date mode by pressing the TEST button. Once this mode is accessed, pressing TEST will cycle the options available and pressing MODE will cancel the function and return to the safe working radius mode. All screens will time out back to the SWR screen at any point if left idle for more than 5 seconds. With the system in Time and date mode, safe working radius and its associated alarms will not be operational.



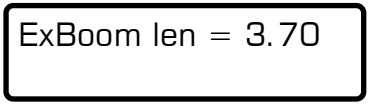
The initial test display is shown here. All information is displayed on the upper line. The lower line contains a scrolling message that says '[TEST] to cycle [MODE] to exit'. This will be present throughout the test procedure.



Current duty number
This displays the currently selected duty.



Boom length
This is the length of the boom from the boom pivot pin to exboom pivot pin, and is given in metres.

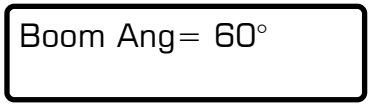


Exboom length
This is the length of the exboom from the exboom pivot pin to tool pivot pin on monoboom machine or to the artic pivot pin on triple or quadruple machines, and is given in metres.

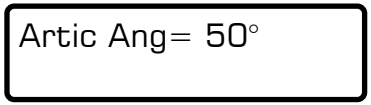
6.0 System Test - continued

Artic len = 2.50	**Artic length** This is the length of the artic from the exboom pivot pin to tool pivot pin on triple machines or to the arm pivot pin on quadruple machines, and is given in metres.
Arm len = 3.00	**Arm length** This is the length of the arm from the arm pivot pin to tool pivot pin on quadruple machines, and is given in metres.
Alarm ON check	**External alarm check** This test will activate the external alarm if fitted.
Buzzer ON check	**Internal alarm check** This test will activate the internal alarm which is mounted on the rear of the display housing.
Amber LED check	**Amber LED alarm check** This test will activate the lower amber LED on the display front.
Red LED check	**Red LED alarm check** This test will activate the upper red LED on the display front.

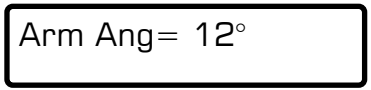
6.0 System Test – continued



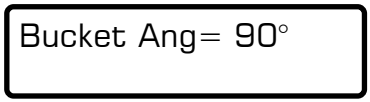
Boom angle check
This test displays the current boom angle on all machines, or the first boom section angle on triple machines. The angle given is for the imaginary line connecting the two pivot pins. As the boom moves up the value should increase: as the boom moves down the value should decrease. When the two pins are in the same horizontal plane, the value should be zero.



Artic angle check
This test displays the current dipper angle on triple and quadruple machines. The angle given is for the imaginary line connecting the two pivot pins. As the section moves in the value should increase: as the dipper moves out the value should decrease. When the two pins are in same horizontal plane, the value should be zero. This option will not appear on monoboom machines.



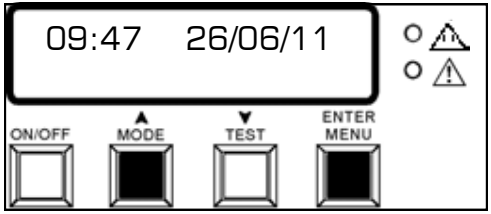
Arm angle check
This test displays the current fly dipper angle on quadruple machines. The angle given is for the imaginary line connecting the two pivot pins. As the fly dipper moves in the value should increase: as the fly dipper moves out the value should decrease. When the two pins are in same horizontal plane, the value should be zero. This option will not appear on monoboom or triple machines.



Exboom angle check
This test displays the current exboom angle all machines. The angle given is for the imaginary line connecting the two pivot pins. As the section moves out the value should decrease: as the section moves in the value should increase. When the two pins are in same vertical plane, the value should be 90.

Calibration time and date
The final test option displays the calibration time and date. This value is updated when the passcode protected Calibration menu is accessed.

7.0 Setting the Clock



To access the clock setting function, the Rangemaster must be in the Time & Date mode. Press the MODE and ENTER buttons together, the display will now enter the clock set function as described below.

As each parameter is offered, use the UP and DOWN keys to adjust the displayed number to the correct value, and press ENTER to confirm. At the end of the procedure control will return to the normal Time & Date mode.

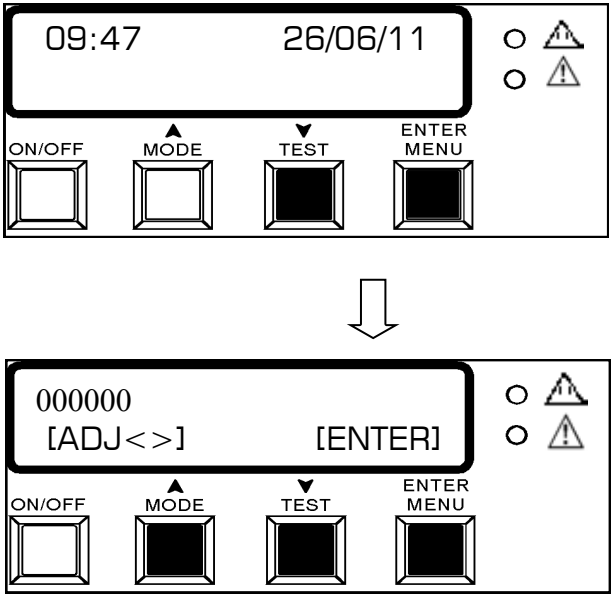
Hours = 9 [ADJ<>] [ENTER]	HOURS range = 0 to 23
Minutes = 34 [ADJ<>] [ENTER]	MINUTES range = 0 to 59
Date = 26 [ADJ<>] [ENTER]	DATE range = 1 to 31 (Note : it is possible to set a date beyond the maximum—for example 31 February. If this is attempted the system will set itself to the next valid date and month).
Month = 6 [ADJ<>] [ENTER]	MONTH range = 1 to 12 (1 = January, 12 = December)
Year = 08 [ADJ<>] [ENTER]	YEAR range = 00 to 99 (00 = 2000)

8.0 Setting Screen Contrast

To access the contract function, the Rangemaster must be in the Time & Date mode. Press the MODE and TEST buttons together. The display will now enter the contrast function.

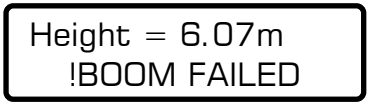
Use the UP/DOWN buttons to adjust. Press ENTER to save the desired contrast.

With the system in setting screen contrast mode, safe working radius and its associated alarms will not be operational

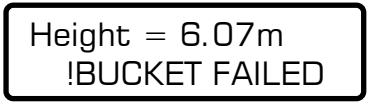


9.0 Error Conditions

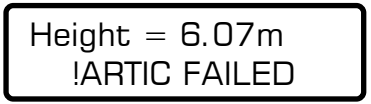
Rangemaster software constantly checks for the presence of all attached sensors and if they are not detected then the display indicates the problem component. This will indicate if the sensor is missing, damaged, or that there is a fault with interconnecting CAN bus cable. If an error condition is displayed halt any operation, seek service immediately and do not continue operation until the fault has been remedied. The failure message is shown on the lower line of the current active display. If more than one sensor fails then the Fail messages will scroll.



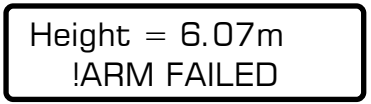
Boom sensor not detected.



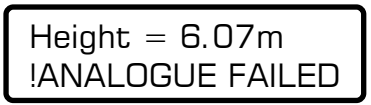
Exboom sensor not detected.



Artic sensor not detected.



Arm sensor not detected.



Analogue Reeling Drum sensor not detected.

10.0 Daily Checks

Visual Check To be carried out Daily

- Exposed proximity switches for slew monitor and slew reference switches (If fitted)- check for damage
- Sensors and sensor cabling - check for damage
- Connectors - check for damage
- Display - check for damage and any operational abnormalities

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