RCI-8522 HRT and LM Systems
Operator Manual

MAN-1108 REV F

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Table 1 - Revision History

Version	Issue Date	Description
A	19/05/2010	Initial Release
B	29/03/2011	Revisions mandated by UI 3.xx and Proc 4.xx release
C	18/08/2011	Pagination revised to allow two-sided printing
D	23/11/2011	Title page format changed. Service contact details added.
E	17/08/2011	Operator ID Optional Section added
F	29/04/2014	LSI-Robway added, Revised Operator Screen Layout

1. IMPORTANT SAFETY NOTICES

Various notices may be presented in this manual to aid in understanding and operating the equipment or to protect personnel and equipment

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE: Indicates practices not related to personal injury.

WARNING:	Prior to the operation of the crane the Operator must read this manual carefully and thoroughly and shall ensure that all operational instructions and warnings are understood and complied with.

WARNING:	The RCI -8522 system may be equipped with an override key which bypasses alarms and motion limiter functions at which time the system can no longer warn of impending overload and must only be operated strictly in accordance with the crane manufacturer's setup and operation procedures. Operation of this override key is for authorised personnel only who shall be solely responsible for its use.

WARNING:	The RCI-8522 is not a substitute for good operator judgement, experience and safe crane operation. The operator is solely responsible for the safe operation of the crane. At all times, relevant codes of practice must be followed.

NOTE:	The SWL capacities in the load charts have been provided to Robway by either the crane manufacturer, owner, or Robway distributor on behalf of either the crane owner or operator. Robway dutifully represents this capacity into memory.

2. GENERAL NOTICES

2.1. COPYRIGHT NOTICE

2.2. INTENDED AUDIENCE

This manual is intended for use by field engineering, maintenance, operation and repair personnel trained by LSI-Robway Pty Ltd or familiar with LSI-Robway Pty Ltd methods and application knowledge.

2.3. PERSONNEL QUALIFICATIONS

The procedures described in this manual should be performed only by persons who have read the safety notices in this manual, have read, and understood the relevant section and who are suitably qualified and trained to perform the procedures within.

2.4. PRODUCT REVISIONS AND UPDATES

This is an uncontrolled document. Any and all information in this document is subject to change without notice.

2.5. GLOSSARY OF TERMS

ATB	Anti Two-Block
AUX	Auxiliary Lifting point, typically a lower capacity hoist-rope
GA	General Arrangement System Diagram
RC	Rated Capacity, also known as SWL
RCI	Rated Capacity Indicator
SWL	Safe Working Load

3. SCOPE OF MANUAL

This Operator Manual applies to cranes with either Main hoist only or cranes with both Main and Auxiliary hoist, in other words single winch and twin winch cranes.

As viewed by the Crane Operator the only difference between a single winch and a twin winch RCI-8522 system is in the in the ability to display Auxiliary hoist parameters.

Note that some Main hoist only systems will have multiple lift points. These are still considered Main hoist only systems with the lift points selected by duty selection

There are no differences in the operator console between load-moment systems or hoist-rope tension systems.

4. SYSTEM OVERVIEW

4.1. LOAD-MOMENT LOAD SYSTEMS

The Load-Moment system solution for Mobile Telescoping Cranes measures and uses the boom luffing force, angle, and length to calculate the actual load suspended from a lift-point. This load is then compared to the safe working loads specified by the load charts programmed in the system for a given radius or boom angle and length. Typical system components are:

- Operator Console
- Junction Box
- Boom Luffing Ram Pressure Sensors
- Boom angle sensor
- Boom length sensor
- ATB Switch
- Articulation or Slew Zone Proximity Switch

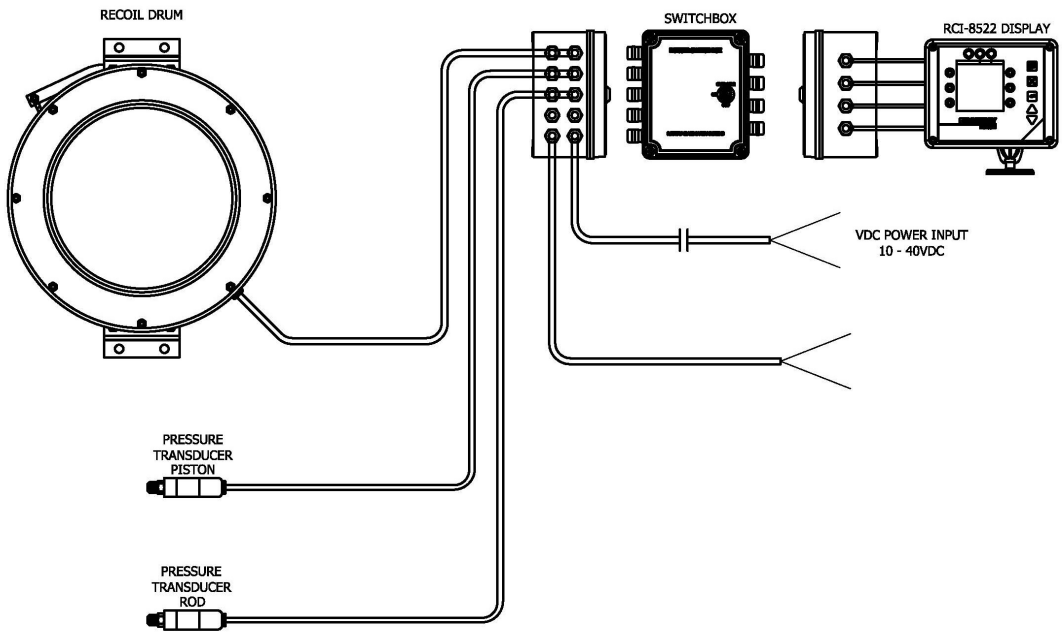


Figure 1 - Typical Mobile Telescoping Crane Load-Moment System Components

4.2. HOIST-ROPE TENSION LOAD SYSTEMS

The hoist-rope tension system solution measures and uses the hoist-rope tension, boom angle, and boom length (for telescoping boom cranes) to calculate the actual load suspended from a hook. This load is then compared to the safe working loads specified by the load charts programmed in the system for a given radius or boom angle and length. Typical system components are:

- Operator Console
- Junction Box
- Main and Auxiliary Hoist-Rope Tension Dynamometers
- Boom angle sensor
- Boom length sensor (telescoping boom cranes)
- ATB Switch
- Articulation or Slew Zone Proximity Switch

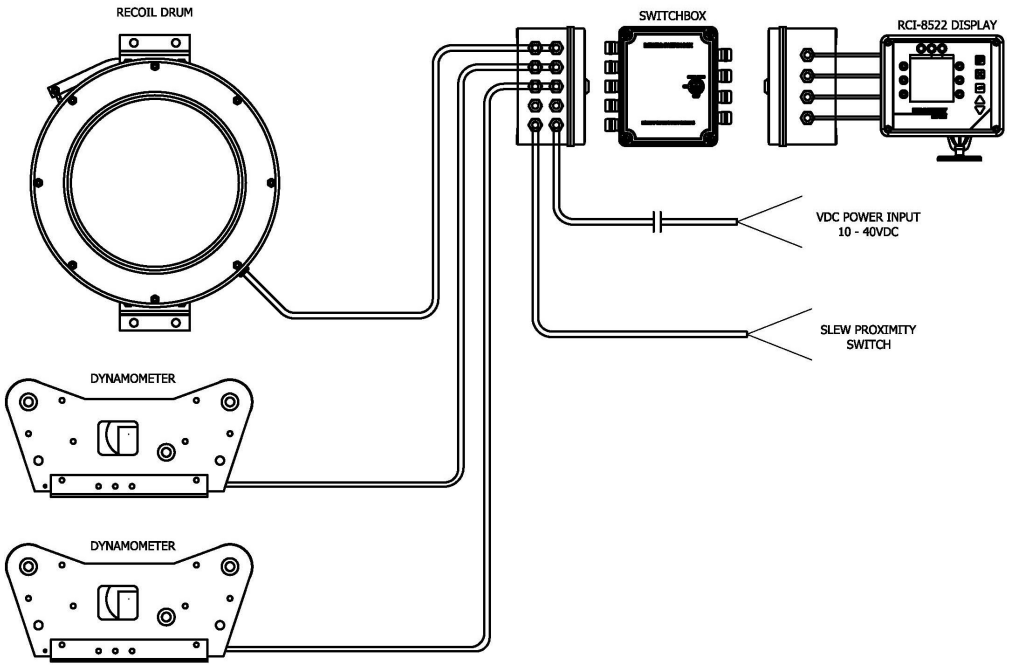


Figure 2 - Typical Mobile Telescoping Crane Hoist-Rope Tension System Components

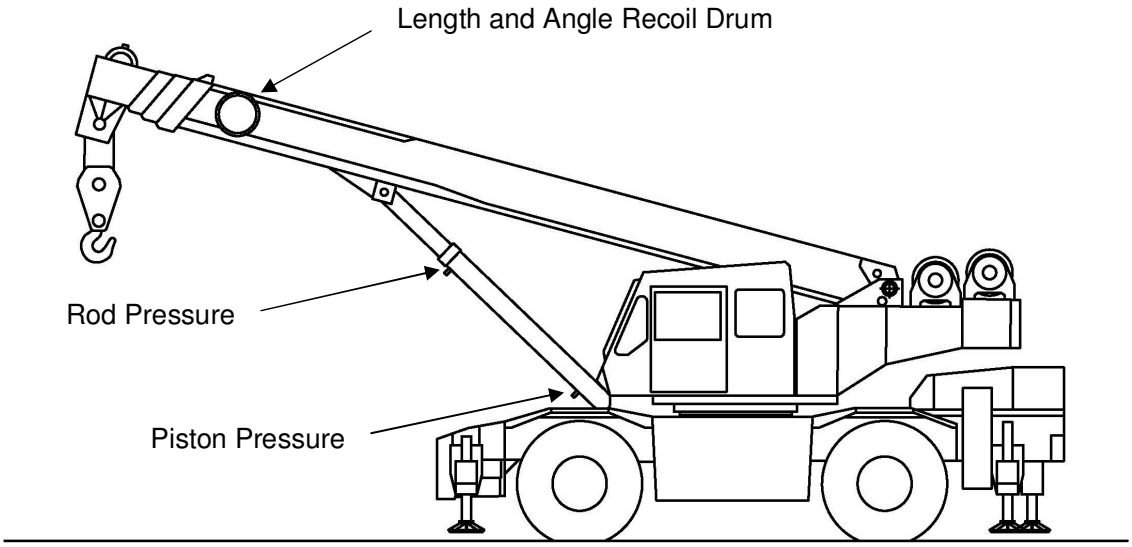


Figure 3 - Load-Moment System Components

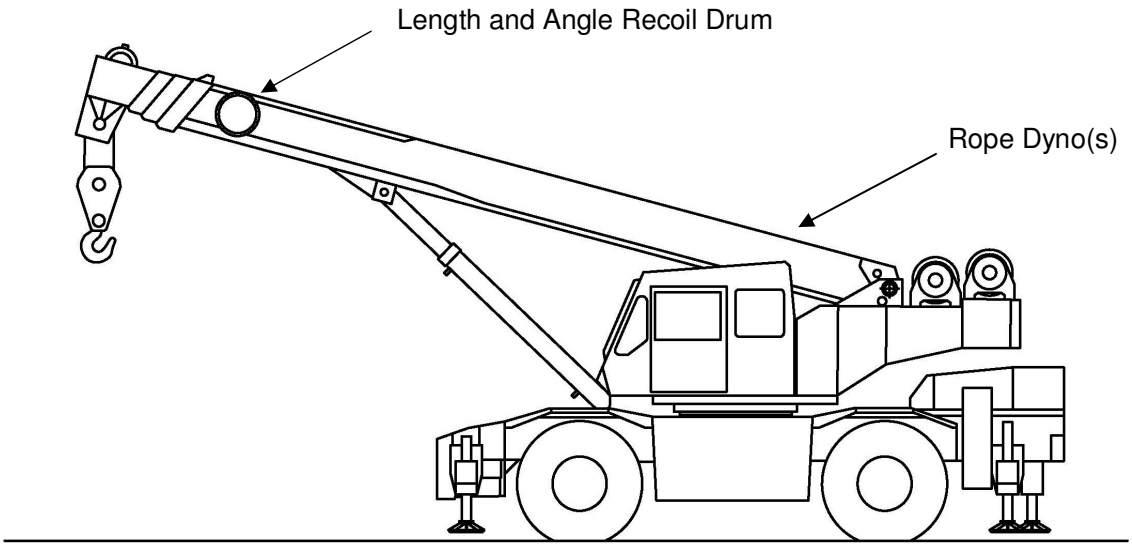


Figure 4 - Hoist-Rope Tension System Components

4.3. MAIN OPERATOR SCREEN

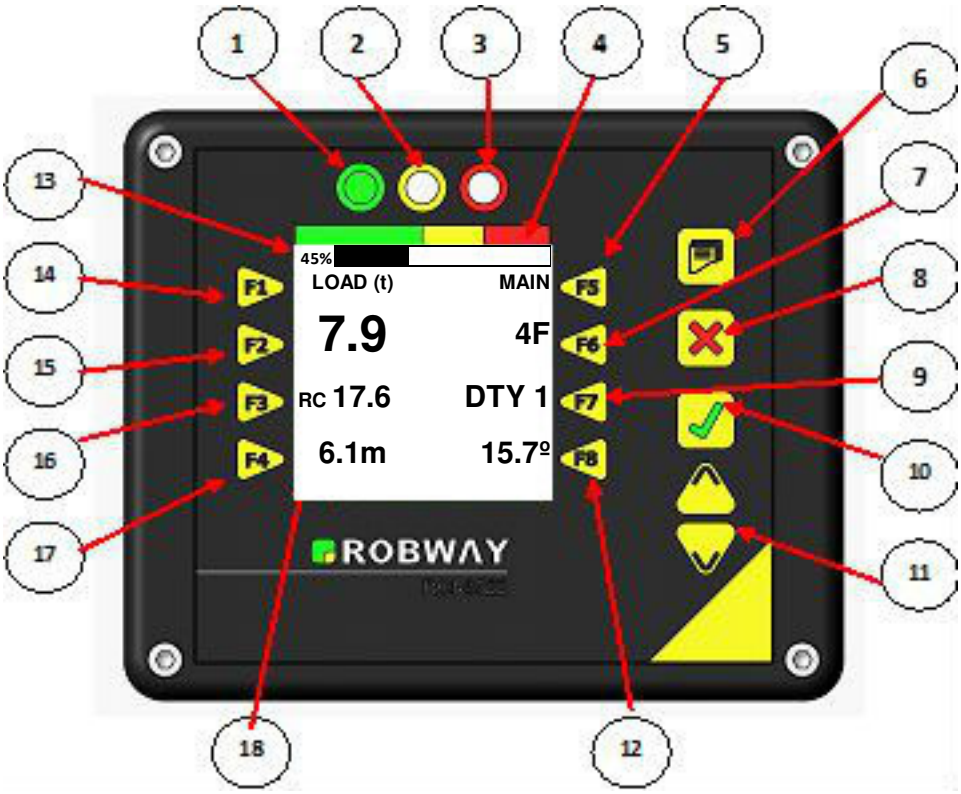


Table 2 – Main Operator Screen Function Key Description

F1>	Select Load vs Tare		Select Main vs Aux	**<F5**
F2>	Select Load vs Tare		Change No. of Falls	**<F6**
F3>	NA		Change Duty	**<F7**
F4>	NA		NA	**<F8**

1. GREEN, SWL <85%
2. YELLOW, 85% < SWL < 100%
3. RED, SWL > 100%
4. SWL Bar Graph Zones
5. F5 Select Main vs Aux
6. Enter Calibration Menus
7. F6 change Falls
8. Cancel Entry
9. F7 Change Duty
10. Enter or Acknowledge
11. Value Edit Up & Down Scroll
12. F8 (unused)
13. SWL Bar graph Indicator
14. F1 View Load or Tare
15. F2 View Load or Tare
16. F3 (unused)
17. F4 (unused)
18. System Status Bar
19. Value Edit Up & Down Scroll

Note: Actual SWL Percentages may vary by application

4.4. ALTERNATE DETAILED OPERATOR SCREEN

An alternate detailed Operator screen may be accessed by pressing the DOWN arrow.

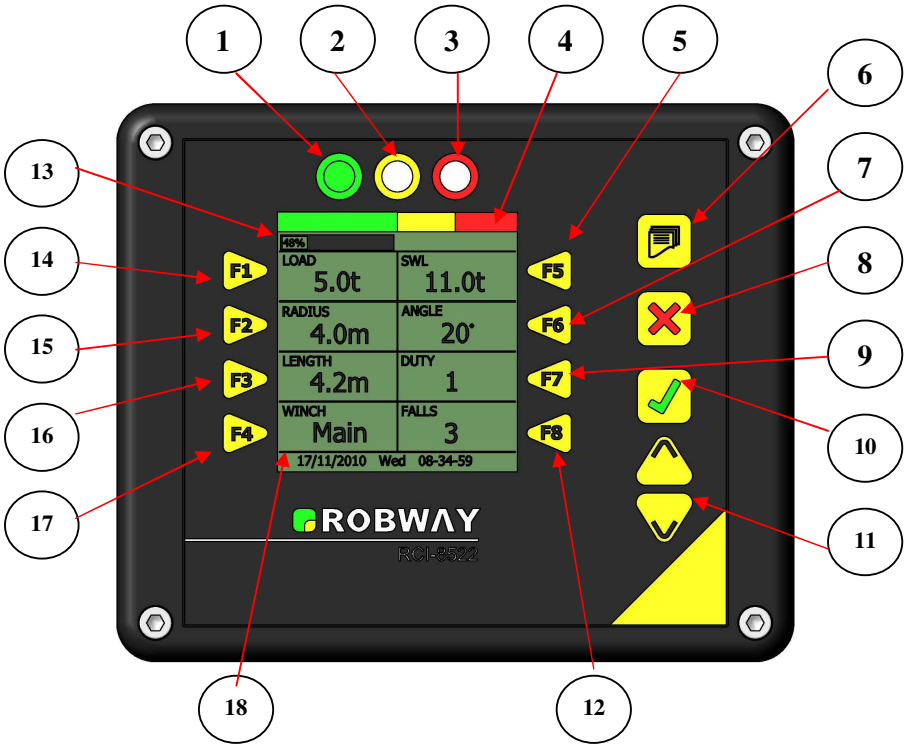


Table 3 – Alternate Operator Screen Function Key Description

F1>	Select Load vs Tare		n/a	**<F5**
F2>	n/a		Select Boom vs Jib Angle	**<F6**
F3>	Select Total vs Jib Length		Change Duty	**<F7**
F4>	Select Main vs Aux		Change Falls	**<F8**

1. GREEN, SWL <85%
2. YELLOW, 85% < SWL < 100%
3. RED, SWL > 100%
4. SWL Bar Graph Zones
5. F5 (unused)
6. Enter Calibration Menus
7. F6 Toggle Boom vs Jib Angle
8. Cancel Entry
9. F7 Change Duty
19. Value Edit Up & Down Scroll

10. Enter or Acknowledge
11. Value Edit Up & Down Scroll
12. F8 Change No. of Falls
13. SWL Bar graph Indicator
14. F1 View Load or Tare
15. F2 (unused)
16. F3 View Total or Jib Length
17. F4 Select Main or Aux Hoist
18. System Status Bar

Note: Actual SWL Percentages may vary by application

4.5. DISPLAY KEYPAD

This section describes the Operator Console functionality and the associated LED indicators.

Menu functions specific to system installation, Calibration, and Service are covered separately in the RCI-8522 Installation and Service Manual.

4.5.1. Function Buttons (F1 - F8)

The function of buttons F1 to F8 vary depending upon what screen is displayed. The function of each button will correspond to the adjacent item on the LCD.

4.5.2. MENU ( ) Button

The MENU button is used to access the Calibration and Service menus and requires a service pin code to be entered correctly.

4.5.3. ENTER / OK (√) Button

The ENTER or OK button is used to 'accept' the currently displayed message, option or value on the LCD.

4.5.4. QUIT / CANCEL (X) Button

The QUIT or CANCEL button is used to escape (move back one menu option) without any change recorded. The button is also used to mute the alarm for a short duration when the alarm is activated.

4.5.5. UP (▲) Button

The UP button is used both to navigate through menu options or to edit an existing value within a menu item. When editing a value the UP button scrolls from 0 to 9 repeatedly until either ENTER, QUIT, or DOWN is pressed.

4.5.6. DOWN (▼) Button

The DOWN button is used to navigate through menu options or to edit an existing value within a menu item. When editing a value the DOWN button moves the cursor from left to right until either the ENTER or QUIT is pressed. Note that once the cursor gets to the end of a line it will then go back to the beginning in a circular fashion.

4.5.7. Mute Alarm (Button

The MUTE ALARM button is used to

4.6. AUDIBLE ALARM

When the crane is approaching an overload condition the audible alarm will sound intermittently with the rate increasing as the SWL is approached.

When the crane is overloaded the alarm will sound continuously. The alarm may be muted for 15 seconds by pressing the CANCEL button. The alarm will resume after 15 seconds. The alarm will resume immediately if the error condition changes.. The CANCEL button may be pressed repeatedly.

4.7. SYSTEM STATUS BAR

When the crane is operated within safe working limits the time and date will be displayed. If there is a system fault or overload condition detected one or more error messages will be displayed. This information is invaluable for troubleshooting or to understand why motion limiting functions are active.

5. SYSTEM STARTUP

5.1. RCI STARTUP

During the power-up stages the RCI goes through a sequence of internal diagnostics and operator confirmations to guarantee appropriate system setup prior to crane operation.

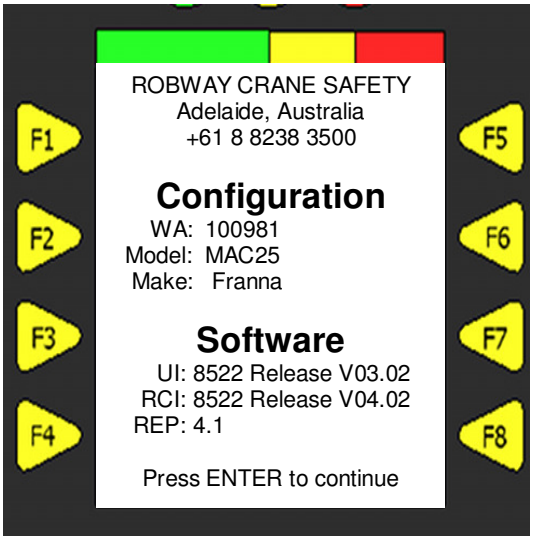
The system will automatically turn on when the crane is started, however crane operation will be prevented until the system version, configuration, duty, and number of falls is confirmed.

5.1.1. Startup Screen

During the power-up stages the RCI goes through a sequence of operator confirmations to guarantee appropriate system setup prior to crane operation.

At this point, if the crane make and model differ from the actual crane then the crane must not be operated until the issue is resolved.

Press √ to continue

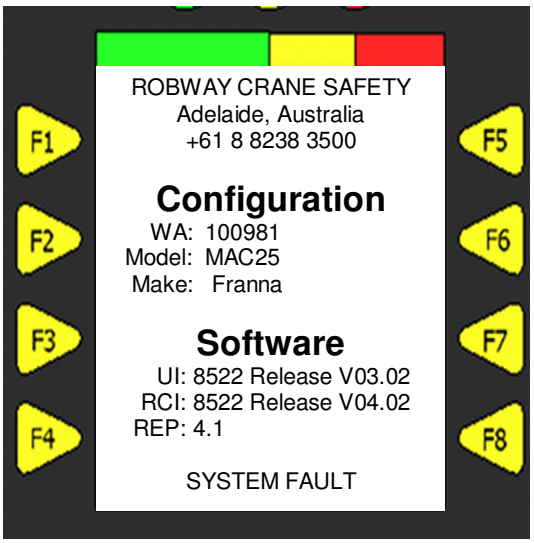


5.1.2. Startup Diagnostics Error Messages

If the RCI detects a system fault during the startup diagnostics an error message will appear on the screen.

The crane may not be operated at this time and a service call must be placed.

See Section 7.2 for a list of error messages and their meaning.



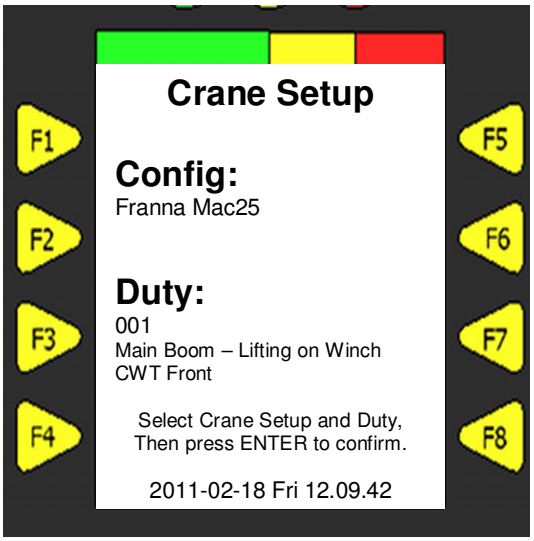
5.2. CONFIRM OR CHANGE DUTY

The screen will display the current crane configuration and duty. If no change to Configuration is required press the √ button to advance to the Duty Selection.

If no change is required to the Duty Selection press the √ button.

The RCI will then automatically progress to the next screen.

NOTE: During System startup pressing the **X** button will not advance the Operator to the operational screens. Settings must be acknowledged by pressing the √ button.



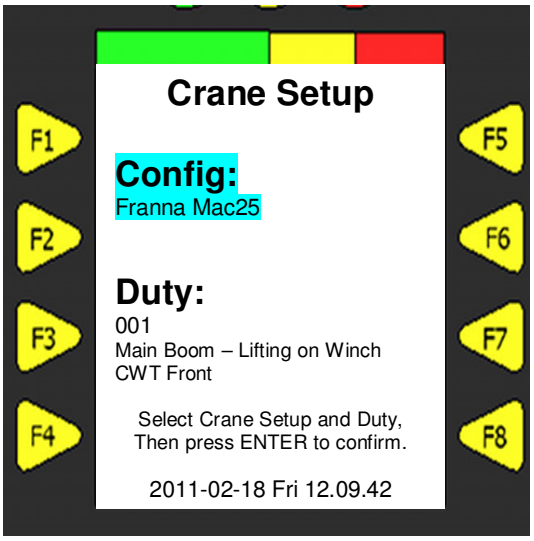
5.2.1. Change Configuration

To change the configuration use the ▲ or ▼ buttons to scroll through the configuration options.

When the required configuration setting is displayed, press the √ button to accept the new configuration.

At this point the RCI will restart and load new duty selections.

The Operator must then start at the beginning of the acknowledgement screens.



5.2.2. Change Duty

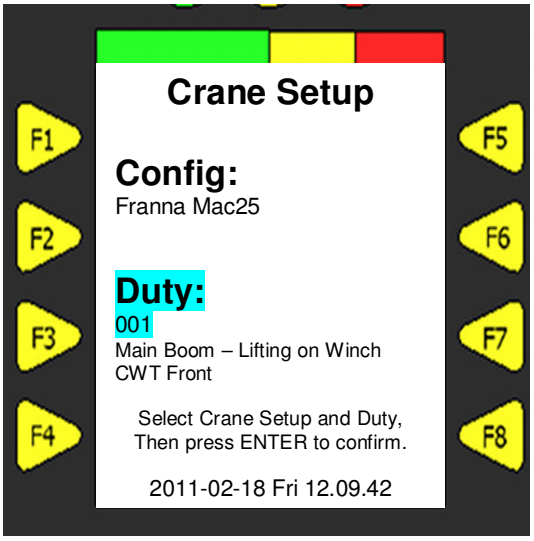
To change the duty use the ▲ or ▼ buttons to scroll through the Duty options. The Duty description will change with the duty number.

When the required duty is displayed, press the √ button to accept new duty selection.

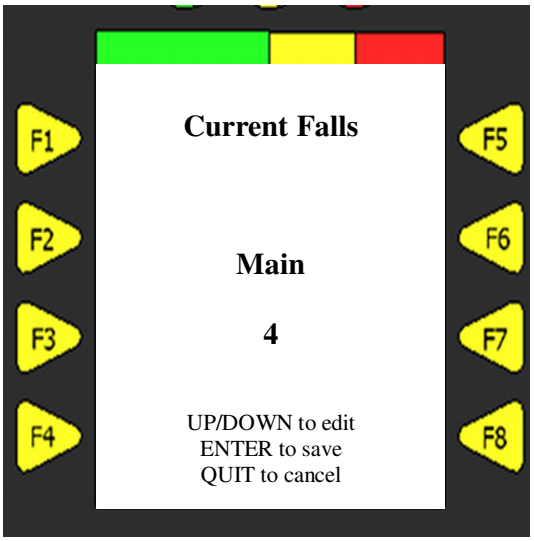
The RCI will then automatically progress to the next screen.

If a selected duty is not calibrated the following is displayed and crane operation prevented.

"Error:\\Not calibrated"



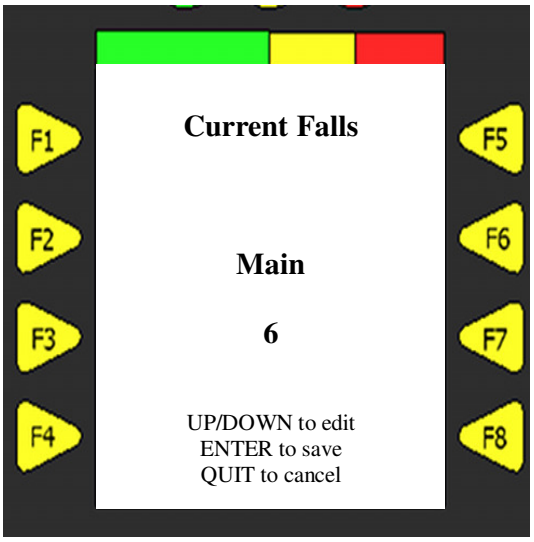
5.3. CONFIRM NUMBER OF FALLS



The screen will display the current number of falls (parts of line). If no change is required press the √ button to advance to next screen.

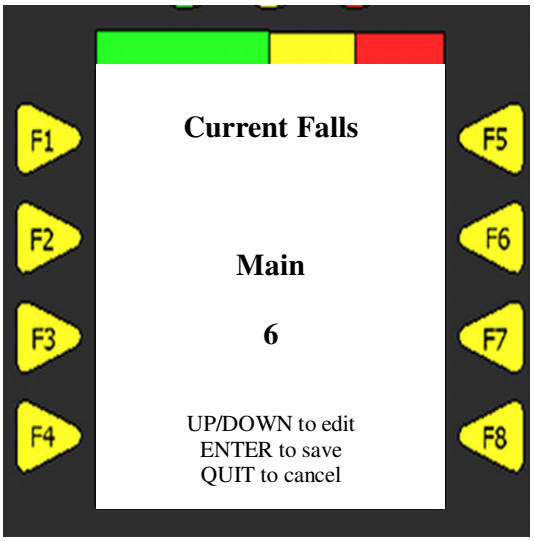
NOTE: During System startup pressing the **X** button will not advance the Operator to the operational screens. Settings must be acknowledged by pressing the √ button.

5.3.1. Change Number of Falls



If a change is required to the number of falls use the ▼ button to select the digit to be changed and the ▲ button to change the digit.

5.3.2. Enter Number of Falls



When the desired number is displayed press the √ button to accept the new number of falls.

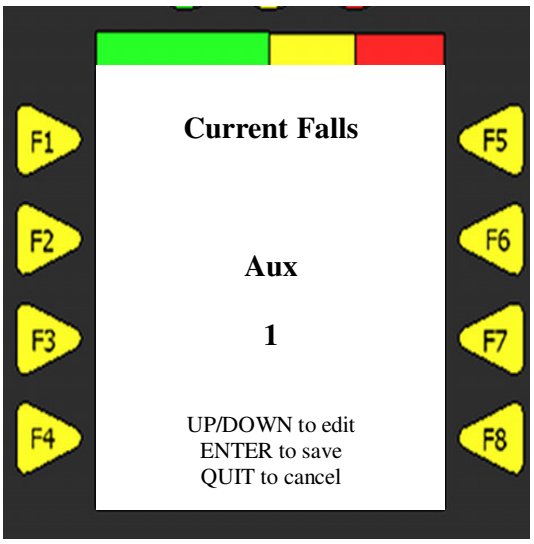
The RCI will automatically advance to the next screen.

5.4. CONFIRM NUMBER OF FALLS (AUX HOIST SYSTEMS)

The screen will display the current number of falls (parts of line).

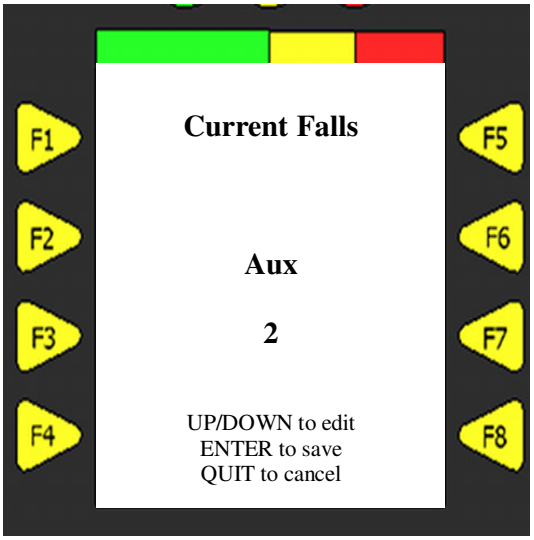
If no change is required press the √ button to advance to the next screen.

NOTE: During System startup pressing the **X** button will not advance the Operator to the operational screens. Settings must be acknowledged by pressing the √ button.



5.4.1. Change Number of Falls (Aux hoist systems)

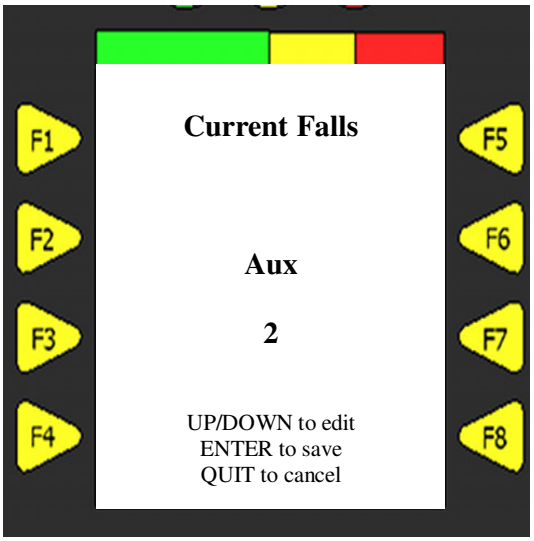
If a change is required to the number of falls use the ▼ button to select the next digit to be changed and the ▲ button to change the digit.



5.4.2. Enter Number of Falls (Aux hoist systems)

When the required number is displayed, press the √ button to accept the new number of falls.

The RCI will then progress to the operational crane screen.



6. CRANE OPERATION

Once the initial confirmation screens are acknowledged and there are no faults detected, the operator screen will appear and all crane operations are allowed.

WARNING:	The RCI is NOT a fully automatic system. In order for the RCI to provide overload warnings and limiter outputs the Crane Operator is responsible for the following: 1) The correct Configuration and Duty MUST be selected 2) The correct number of falls MUST be entered 3) The correct winch MUST be selected Failure to correctly enter these details can lead to a hazardous condition.

The main features of the operator screen are described here. Each parameter displayed has a function key located next to it. Pressing these function keys will either toggle the parameter displayed or allow editing of an existing parameter. The available parameters are determined by crane type and crane configuration.

6.1. CRANES WITH MAIN HOIST ONLY

6.1.1. The SWL % Bar Graph

The Bar Graph is located at the top of the LCD. The Green-Amber-Red is imprinted in the decal. The bar graph provides an analogue indication of the load to the Safe Working Load as a percentage.

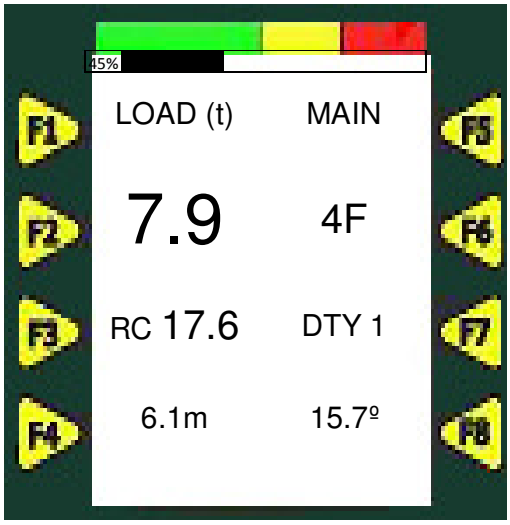
The green zone typically represents 0% to 85%, amber zone 85% to 100%. The red zone 100 to 110% of rated capacity (SWL). The motion limit relay de-energises at 100% thus preventing certain crane operations.

These % values can be varied to suit local requirements if necessary.

Press **F1** to toggle between actual load and Tare load.

Press **F7** to select new configuration or duty.

Press **F8** to change the number of falls.

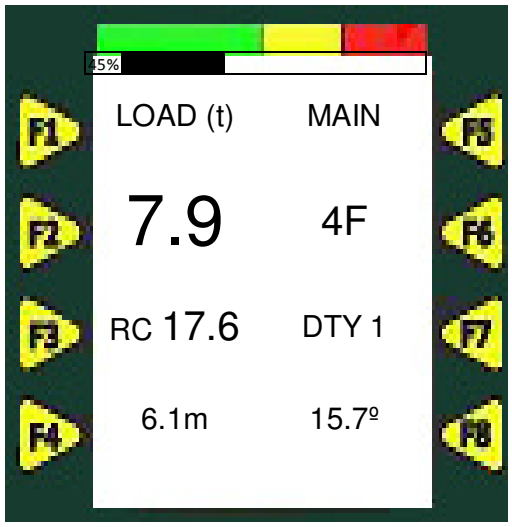


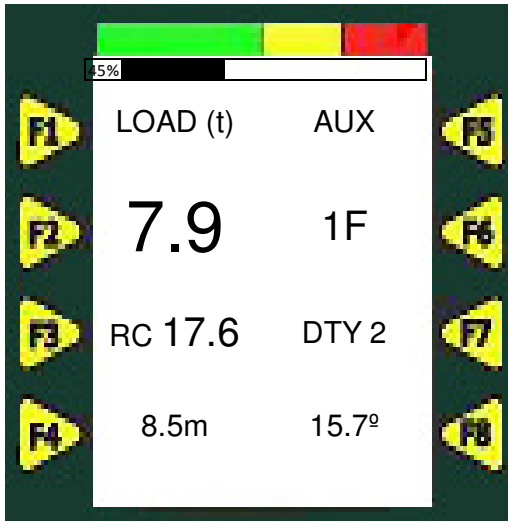
6.2. CRANES WITH MAIN AND AUXILIARY HOIST

6.2.1. Twin Winch Screens

The RCI has the capability of displaying both Main Hoist Parameters or Auxiliary Hoist Parameters.

This is accomplished by pressing the button next to the corresponding parameter to be viewed.





Press **F1** to toggle between actual load and Tare load.

Press **F2** to toggle between Main Hoist radius and Auxiliary Hoist radius.

Press **F3** to toggle between Boom Length and Total length.

Press **F4** to toggle between Main Hoist load parameters and Aux Hoist load parameters.

Press **F6** to toggle between Boom angle and Jib angle.

Press **F7** to select new configuration or duty.

Press **F8** to change the number of falls for winch selected.

6.3. CRANE OPERATION

The RCI system provides the operator with real-time data for the following parameters:

- Load
- Safe Working Load (Working Load Limit)
- Percentage of Safe Working Load
- Main Hoist Radius / Auxiliary Hoist Radius
- Boom Angle / Jib Angle
- Boom Length / Total Length
- Main or Auxiliary Hoist Selected
- Number of Falls
- Crane Configuration and Duty
- Overload Condition
- Two-Blocking Condition
- System Fault Condition

Certain operational parameters may be changed by the Crane Operator such as:

- Crane Configuration
- Crane Duty
- Main Hoist or Auxiliary Hoist Operation
- Main and/or Auxiliary Hoist Number of Falls
- Load or Tared Load

The Crane Operator does not have access to service and calibration menus. These features are password protected and should only be accessed by qualified personnel.

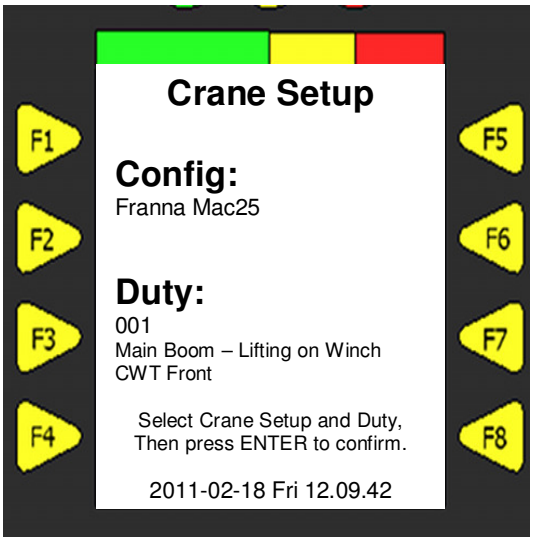
6.4. AUDIBLE WARNING ALARM

The RCI audible Warning Alarm has four states.

Table 4 – Audible Alarm States

ALARM STATE	DESCRIPTION
Alarm Off	Crane operated within safe limits.
Alarm Intermittent, varying rate	Load between 85% and 100% SWL Frequency increases as 100% SWL is approached
Alarm On	Overload Condition
Alarm repetitive beep.	System is being over-ridden by override keyswitch. Motion Limiting functions disabled. Crane can be operated in unsafe manner.

6.5. CHANGE CONFIGURATION / DUTY



Pressing **F7** will display the current crane configuration and duty.

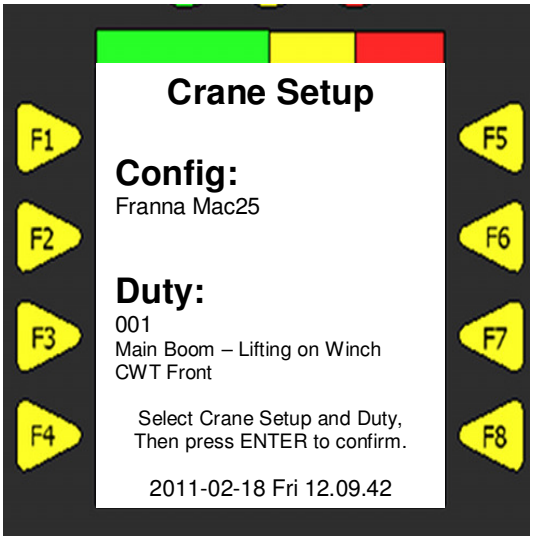
If no change to Configuration is required press the √ or **X** button to advance to the Duty Selection Screen.

If no change is required to the Duty Selection press the √ or **X** button.

The RCI will then automatically progress to the next screen.

NOTE: It is not possible to change Configuration or Duty with Load suspended.

6.5.1. Change Configuration



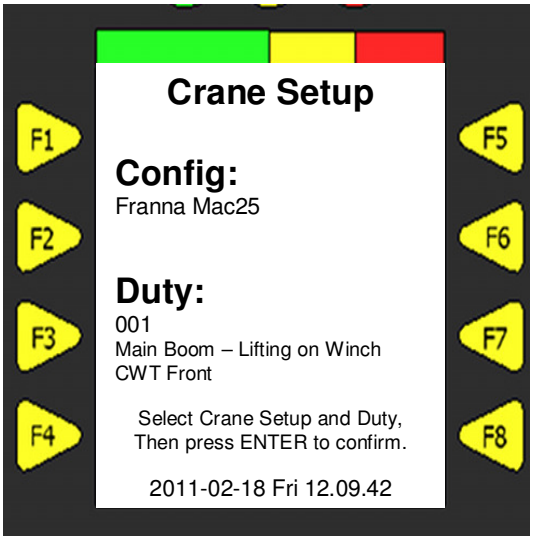
If a change is required to the configuration use the ▲ or ▼ buttons to scroll through the configuration options.

When the required configuration setting is displayed, press the √ button to accept the new configuration.

At this point the RCI will restart and load new duty selections.

The Operator must then start at the beginning of the acknowledgement screens.

6.5.2. Change Duty



If no change to the configuration is required, press the √ button to advance to the Duty Selection.

Use the ▲ or ▼ buttons to scroll through the Duty options. The Duty description will change with the duty number.

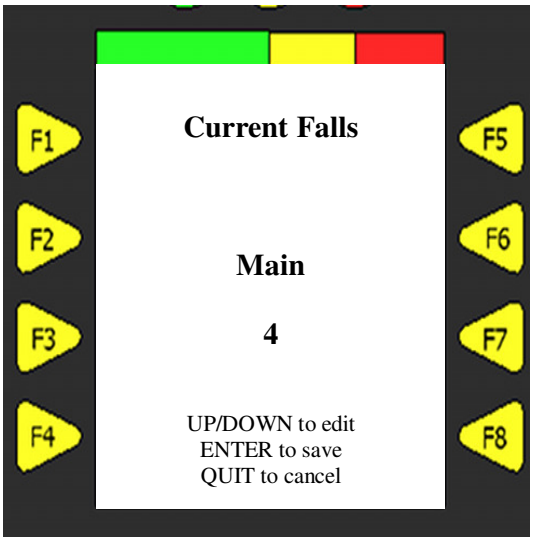
When the required duty is displayed, press the √ button to accept new duty selection.

The RCI will then return to the Operational Screen.

6.6. CHANGE NUMBER OF FALLS

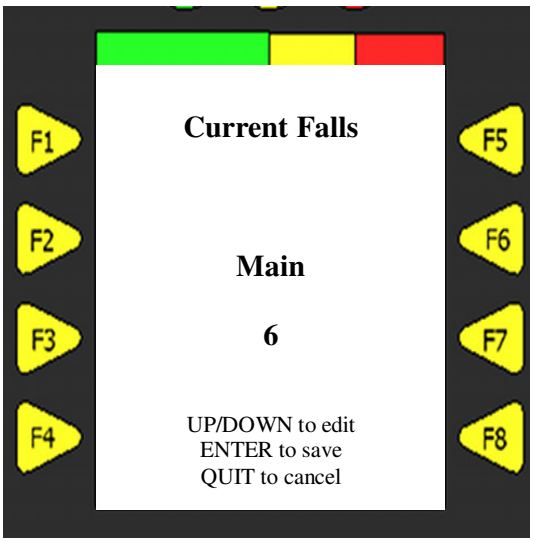
The screen will display the current number of falls (parts of line).

NOTE: For Main and Auxiliary hoist systems the Falls to be edited will be the same as the winch selected.



6.6.1. Change Number of Falls

If a change is required to the number of falls use the ▼ button to select the digit to be changed and the ▲ button to change the digit.

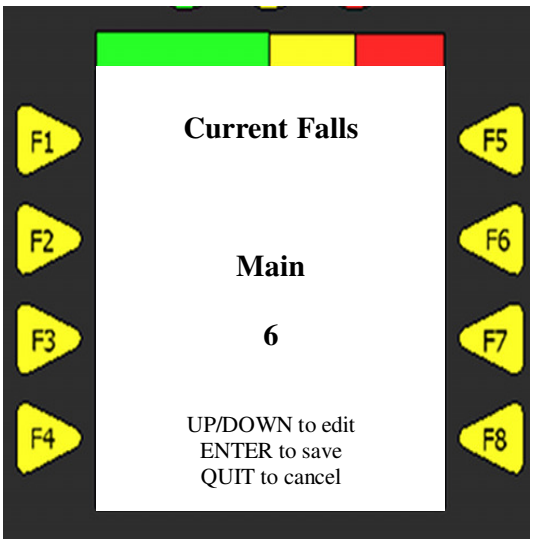


6.6.2. Enter Number of Falls

When the desired number is displayed, press the √ button to accept new number of falls.

Press **X** to cancel.

The RCI will automatically return to the Operational Screen.



6.7. TARE LOAD

Press the F1 button and the "Tare" will replace the "Load". The value displayed will initially be 0.0t.

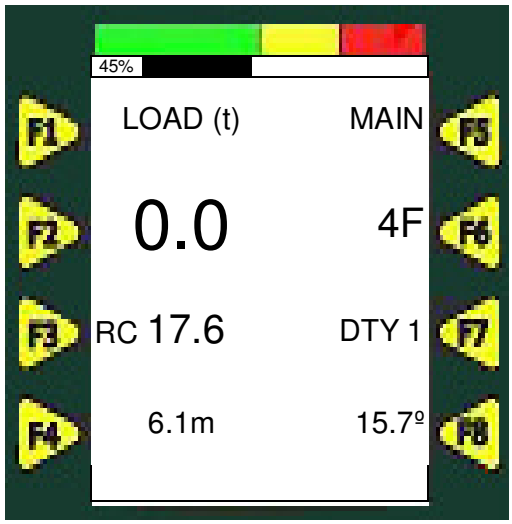
To disable the tare function, press the **F1** button.

Example:

if the original load value is 2.2t and **F1** is pressed the load indicator displays 0.0.

If the load then increases from 0.0t to 3.0t and the **F1** button is pressed again, the load indicator will display 5.2t.

NOTE: Motion-limit and audible/visual alarms are always activated at total load, NOT at tared load.



6.8. TURNING OFF THE RCI

The RCI automatically powers off when the crane is shut down.

7. OVERLOAD AND ERROR CONDITIONS

7.1. RCI OVERRIDE FUNCTION

An override (by-pass) key-switch is located in the Switch Box. While override is activated the system will not de-energise the crane motion-cut relay or sound the audible alarm. A repetitive 'beep' will continue as a reminder that override is activated. The override message "OVR" is displayed on the lower part of the operator display and is accompanied by the audible alarm pulsing at a slow rate while activated.

WARNING:	The override keyswitch must be used with caution. While activated the system will NOT prevent dangerous crane operation or sound the audible alarm. A repetitive 'beep' will continue as a reminder while in override state. The override keyswitch must only be used by authorized personnel. While in Override the safe crane operation is the responsibility of the authorized person activating Override.

7.2. ERROR MESSAGES

When any errors are detected "Error Messages" will be generated as text on the bottom section of the display The display will show multiple error messages by alternately cycling through each error (some error conditions will result in multiple errors messages). Note that the RCI will not normally allow crane operation while error conditions are present.

Once an error message has been activated, it will continue to be displayed until the error is resolved.

Once resolved the bottom of the display will return to the date and time.

Table 5 – RCI Error Messages

Error Message	Description	Action
MCUT	Motion-Cut limiter is active	Boom down is prevented Tele out is prevented Hoist-up is prevented
OVERLOAD	The load on the hook exceeds the safe working load	MCUT outputs activated
ATB	Two-blocking condition is present.	Hoist-up is prevented.
OVR	Override keyswitch is ON	RCI will **NOT** prevent dangerous operation
ERR-ANG	Angle is out of range	Boom up or Boom down is prevented depending upon whether high or low angle limit is exceeded.
ERR-LEN	Length is out of range	Motion cut (MCUT) outputs activated
ERR-RAD	Radius is out of range	Boom up or Boom down is prevented depending upon whether minimum or maximum radius limit is exceeded.
ERR-HGT	Height is out of range	(not applicable)
ERR-SLEW	Slew is out of range	(not applicable)
ERR-SNSR-n	Sensor fault detected on sensor channel n	Crane cannot be operated. All limiter outputs in motion-cut. Service call required.
LM-Missing	The RCI calibration file is missing	Crane cannot be operated. All limiter outputs in motion-cut.
LM-UNCALIB	The configuration and duty selected are not calibrated.	Crane cannot be operated. All limiter outputs in motion-cut. Configuration and duty must be calibrated before crane can be operated.
ERR-RCI	The RCI has an internal fault	Crane cannot be operated. All limiter outputs in motion-cut.
LOG-FULL	Internal data log is full	Contact Supervisor.
SYS-VOLTAGE	Internal voltage error.	All limiter outputs activated
SYS-RELAY	Output relay readback malfunction	All limiter outputs activated

Table 6 – RCI System Messages

Error Message	Description	Action
No display repository!\\Restart...	Can be caused by no SD card or if the User Interface outpaces the controller function.	Verify correct SD card installed and acknowledge the message.
Comms error:\\client timeout	May be caused by a transient condition.	Service call if message does not go away.
Error:\\No SD card	SD Card not installed.	Verify correct SD card installed and restart system.
Error:\\Not calibrated	Selected duty has not been calibrated.	Service Call

Table 7 – RCI Critical System Fault Messages

Error Message	Action
RCI is in SAFE state	Service Call Required
Comms error:\\no client	Service Call Required
Error:\\Controller inaccessible	Service Call Required
Error:\\Internal problem	Service Call Required
No startup repository	Service Call Required
No data repository	Service Call Required
Error:\\No load chart	Service Call Required
Error:\\File missing or read/write error	Service Call Required
Error:\\No LM data	Service Call Required
Comms error:\\invalid server response	Service Call Required
Comms error:\\server abort	Service Call Required

7.3. MOTION LIMITER OUTPUTS

The RCI has several possible limiter outputs. There are two safety-relays and up to 8 additional limiter outputs depending upon application.

Limiter Output	State	Condition
Relay	Energised = Closed	Crane within Safe Operating limits
Relay	De-energised = Open	Crane outside Safe Operating Limits
Digital I/O	Shunt to ground	Crane within Safe Operating limits
Digital I/O	Floating Output	Crane outside Safe Operating Limits

7.3.1. Typical Limiter Outputs (May vary by application)

Table 8 – Limiter Outputs

Motion-Cut	Opens when the Lifted Load exceeds 100% of SWL, a system fault is detected, or other dangerous condition. Normally used to prevent Boom-Up or Tele Out motions.
Hoist Up Limit	Opens when ATB fault detected. Prevents hoisting up if an ATB fault or other dangerous condition is sensed.
Boom Up Limit	Opens when high boom angle limit reached. Prevents booming up in the event of maximum boom angle.

8. SERVICE AND MAINTENANCE

Other than overload conditions, any indicated system errors require service by a qualified Robway Service Technician. Please contact your Authorised Robway Dealer or Robway Service directly for assistance.

LSI-Robway Service Center:

LSI-ROBWAY PTY LTD
ATTN: SERVICE
32 WEST THEBARTON ROAD
THEBARTON, SA 5031
AUSTRALIA
+61 8 8238 3500
service@robway.com.au

Your Authorised Dealer:

8.1. REPORTING SERVICE ISSUES

When reporting service issues it is imperative to give the Robway qualified Service Technician the following information:

Table 9 – RCI System Information

Information	Description	Can be found at	Notes
WA Number	Software Job Number	RCI Startup Screen Operator Manual, Appendix A	
Model	Crane Model No.	RCI Startup Screen	
Make	Crane Manufacturer	RCI Startup Screen	
UI Release	User Interface Version	RCI Startup Screen	
RCI Release	Controller Version	RCI Startup Screen	
REP Release	Configuration Version	RCI Startup Screen	

Please record as much of this information as possible and have it available when placing a service call.

8.2. SUPPLY OVERVOLTAGE PROTECTION

The RCI is immune to fast power supply overvoltage transients, however in the case of extreme crane power system faults the RCI has an internal protection mechanism which may cause a power supply fuse to blow. This will happen if the crane supply exceeds 36 volts for an extended period of time which can happen if the crane battery is disconnected while being charged (or otherwise heavy load).

The RCI has two power fuses; an inline fuse in the junction box and also an internal slow-blow fuse. Generally speaking the junction box fuse will blow before the internal fuse. Both of these fuses are serviceable items. DO NOT replace fuses with a higher current rating as this can lead to irrepairable damage to the RCI electronics in the future.

Table 10 – System Fuses

Location	Type	Manufacturer	Part number
Junction Box	3 amp, Automotive Blade Type	Littlefuse	297003
Internal	1.5 amp slow-blow, 5x20 mm	Bussman	BK/GMD-1.5-R

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