



SAFETY INSTRUMENTATION

**WW650L Strut Crane
Calibration Procedure/Fault Finding Procedure**

**Hoist Rope Sensing
(With Dynamometers/Load Links/Pins
in Hoist Rope**

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WW650L Strut Crane Calibration Procedure to be read in conjunction with Operation Instructions SI 550 and Supervisor Instructions SI 551

1 Crane Preparation

1.1 During calibration certified test loads will be required for:

- a) Hook load calibration - A certified load of between 50% and 90% maximum SWL is recommended.

Note that on certain application as a result of the method used to sense the load (Deflection dynamometer) the measured signal can vary with boom angle. This is due to either the wrap angle of the rope around the measuring sheave or the effective weight of the sheave changing with the boom angle. To compensate for this additional procedures are provided. Refer to sections 11, 12, 14 and 15, for these and any additional load requirements. Consult Wylie if in doubt.

- b) Boom deflection loaded calibration - A certified load of between 80% and 95% maximum SWL for each boom at approximately 40° elevation.

- c) **WARNING:** At all times ensure that the rated load of the crane is not exceeded and that the crane positions indicated are achieved in accordance with the crane manufacturer's instructions.

1.2 Reeve the main hoist block to maximum falls.

1.3 Select the main hook duty, and maximum falls selection on the display. Refer to Sections 2.2 and 2.3 in SI 551 for more details.

1.4 Slide Switch SW3/2 on the main board in the Interface Unit, see Fig. 1, into the 'ON' position. (This enables extra values to be displayed in the bottom right display window for test purposes). A descriptive display is available of the rope direction status. It is advisable to check its correct function before proceeding. Refer to Appendix A for the list of information that may be displayed. Use INFO button functions, on the display to select the rope direction sensor message which will be showing one of the four options listed. Now hoist and lower that rope and check that the message changes appropriately.

Note that this is an optional feature using switches operated from the crane controls.

If the message does not change check the operation of the switches.

If "Hoisting" is indicated when actually lowering, and vice versa, reverse the switches.

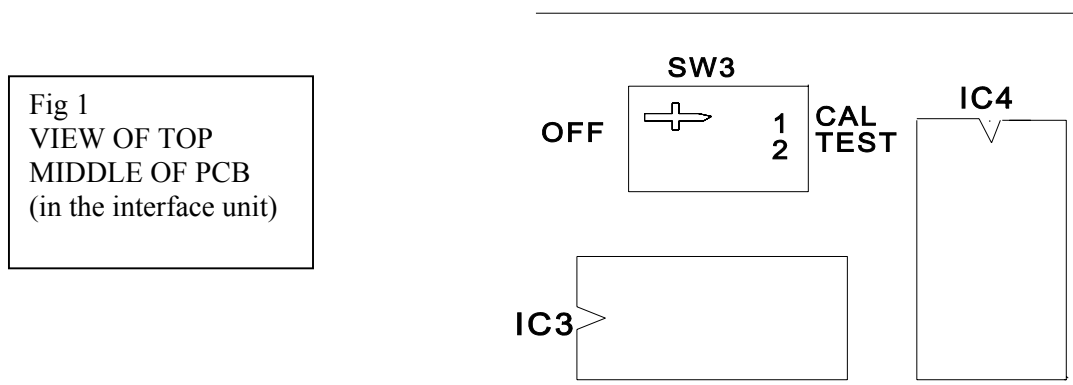
Note that SW3/2 does not need to be on for sensor calibration as described below.

1.5 Since the WW650L software is continuously being improved and updated it is necessary to check on the software version fitted to unit under calibration. This software, known as the "Operating System", is contained in IC3 on the Interface Unit PCB. Before carrying out the following procedures check the version of the Software installed. This can be established as follows:

- a) Ensure that SW3 Section 1 (Brown - see Fig 1) is in the 'OFF' position.
- b) Initiate the "Test Mode" by applying power to the WW650L while holding the ACKN button pressed.
- c) System will then show for a short time in the character display windows, "Operating System Version XXX" where "XXX" is version number.
(NB If SW3/2 had been left switched ON, the system will change to the button test described in section 30.3. To return to normal mode, move SW 3/2 to the OFF position momentarily and then on again to enable the extra information to be displayed).
- d) Note the version number for future reference since calibration procedures may differ depending on it. The higher the number the later the version. Press INFO to restore normal operation.

2 Sensor Calibration

2.1 With power on move SW3/1 (CAL) into the ON position:



The character display window now reads "Calibration Mode DUTY or TEST to select"

3 Boom angle zero

Carefully level the boom with a long spirit level on the top of the base section. Press DUTY or

TEST buttons until display shows "Boom Inclinometer Zero Press ACKN to select#7".

- 3.1 Press ACKN button. Display reverts to as in normal operating mode, but with the angle display flashing. Repeatedly press DUTY or TEST buttons until the angle display reads zero. If the Boom for some reason could not be lowered to zero then measure its angle as accurately as possible and press buttons to display this angle.
- 3.2 When correct press ACKN button. Display shows "Accepted".

4 Boom angle span

Press DUTY or TEST buttons until display shows "Boom Inclinometer span Press ACKN to select".

- 4.1 Press ACKN button. Display shows "Set angle=70.0° DUTY-TEST set. ACKN-ok". If the boom can be raised to 70° then press ACKN button. If not press DUTY or TEST to change the set angle to that maximum obtainable. When correct press ACKN button.
- 4.2 Display shows "Press button ACKN when at radius of: XX.Xft", where XX.X is the setting radius. Carefully position the hook, unladen, at the setting radius then press ACKN button.
- 4.3 Display shows "Accepted".

Note that if procedures 11, 12, 14 or 15 are to be implemented the following procedures 5 to 10 must be carried out at a constant boom angle. This would normally be near maximum angle.

5 Hoist load zero

- 5.1 Obtain no tension in the main hoist ropes by resting the hook block on the ground. Note that if the block is not to be part of the load (i.e. Net load hook tare calibration - see Sections 23 and 24) the block weight will be tared out at that stage.
- 5.2 Press DUTY or TEST button until display shows "Main Hoist Zero Press ACKN to select". Press ACKN button. Display reads normally except that the load display flashes. Repeatedly press DUTY or TEST buttons to increase or decrease the indicated reading to zero.

Lift the hook block from the ground and stop. Press DUTY or TEST button to increase or decrease the reading to indicate the block weight. If only zero is obtainable proceed immediately to Section 6.

- 5.3 Repeat the above procedure to ensure that the setting is satisfactory.
- 5.4 When block reading is correct press ACKN button. Display will show "Accepted".

Note that error messages may be displayed at this point instead of "Accepted" if the sensor signal is not in range. These are:

- 5.4.1 "SENSOR UNDER RANGE!". Input signal is too negative. This could be due to a large negative offset on the sensor or a fault with an external amplifier.
- 5.4.2 "SENSOR OVER RANGE!". Input signal is too great. This could be due to some tension still remaining in the hoist system or a large offset from the sensor. An open circuit condition, an external amplifier, or main PCB fault could also be the problem.

6 Hoist Load Span

WARNING: At all times ensure that the rated load of the crane is not exceeded.

NOTE: Before beginning the calibration, check that all sheaves are free to rotate and are not binding under load. The WW650L is able to compensate for a wide range of frictional conditions, including the case of a sheave whose bearings are near the end of their life. However, if a WW650L is calibrated with defective bearings, the frictional effects are likely to continue to change by a large amount and consequently might rapidly move out of calibration.

- 6.1 Ensure a duty is selected that uses the Main Hoist and contains rated loads at least 50% of the Maximum lifting capacity of the crane.
- 6.2 Press DUTY or TEST button until display shows “Main Hoist Span Press ACKN to select”. Press ACKN button. (If Main is not used on currently selected duty the message "Wrong Hoist. Restart!" will result. In this case switch OFF SW3/1 and select the correct duty). Now repeat 6.1 from beginning. Display will now show "Hoist and stop then press ACKN".
- 6.3 Hoist a known test load a few inches and stop and then press ACKN. Display reads normally except that the load display flashes.
- 6.4 Press DUTY or TEST button to increase or decrease the indicated load reading. (The load reading should include the block at this stage. The block weight can be tared out later using calibration procedures 23 and 24).
- 6.5 Hoist the load again and stop. If required press DUTY or TEST button to obtain correct reading.
- 6.6 Check and repeat 6.3 as necessary.
- 6.7 When load reading is correct press ACKN button. Display will show "Accepted".

Note that error messages may be displayed. These are:

- 6.7.1 "SENSR.UNDERANGE!" - This check is only active if the INFO button is pressed. This could occur for a number of reasons and is basically due to a low signal.
 - a) Incorrect setting of SW1 (SW1/1-3 for PD1, SW1/4-6 for PD2) gain setting. Check the settings shown on the "Customer Connection" diagram.
 - b) Wiring or connector fault.

c) Faulty external amplifier or main PCB.

d) Insufficient line pull.

6.7.2 "SENSOR OVER RANGE!" - Signal is too large. Check a), b) or c) in 6.7.1. This could also be caused by too much line pull ie load too large for falls reeving.

6.8 Check and repeat Section 5 and 6 as necessary until accurate results are obtained with both the block weight (if appropriate) and test load.

7 Friction Compensation (Optional)

N.B.: Hoist load span calibration must have been carried out before attempting this procedure.

This feature is only available on the main hoist.

7.1 Press DUTY or TEST buttons in calibration mode until display reads "Main Hoist Friction Press ACKN to select". (Again as in 6.4 of the hoist load span section, if an invalid duty is selected for the hoist a warning message will result).

7.2 Press ACKN button and the display reads normally except that the load display flashes and the bottom right hand window reads "Comp = +0%".

8 Hoist dynamic

8.1 Hoist a known test load and while hoisting press DUTY or TEST buttons to increase or decrease the "Comp" figure and hence the Load display so that the load reads correctly.

8.2 When the load reading is correct press ACKN button whilst actually hoisting. Display reads "Accepted".

9 Lowering dynamic

Repeat 7.1 to 8.1 but this time lower the load. When the load is correct press ACKN button whilst actually lowering. Display reads "Accepted".

10 Static after lowering

10.1 Repeat 7.1 to 8.2 but this time press DUTY or TEST buttons when the load is stopped after lowering. When the indicated load is correct press ACKN button when actually stopped after lowering.

10.2 Check and repeat 7.1 to 10.1 as necessary to optimise the calibration.

11 Main Hoist Wrap Angle Compensation

To carry out this procedure it will be necessary to move the boom laden from maximum working angle (minimum radius) down to minimum angle (maximum radius) in ten steps. At each position the load should be not less than 70% of the SWL. This therefore may require a number of different loads to be used over the range. Note that going from maximum angle to minimum suits the use of Water Weights since the load decreases with decreasing angle.

- 11.1 In calibration mode press DUTY or TEST button until display shows “Main Hoist Wrap Comp. Press ACKN to select”. Note that the radius display window shows the boom angle in this mode. Press ACKN button. If the display shows “Wrong hoist. Restart!” then exit calibration mode and select a Main hoist duty.
- 11.2 Display shows “Boom Down to minimum angle and press ACKN”. Lower the unladen boom to the lowest working angle ie. maximum rated radius. Now press ACKN button.
- 11.3 Display shows “Boom up to maximum angle and press ACKN”. Raise the unladen boom to the highest working angle ie. minimum rated radius and then press ACKN button.
- 11.4 The display now shows as normally except that the load display flashes and the bottom right window reads “Comp = +0%”. Lift the test load at this position and press DUTY or TEST to increase or decrease the Comp figure and hence the load display so that the load reads correctly. Note that if the boom is moved from this position the Comp message will be replaced by either “Boom Up!” or “Boom Down!”. Readjust the boom angle as necessary so that the Comp display is shown. When correct press ACKN button. The message “ACCEPT” will be momentarily displayed to acknowledge calibration.
- 11.5 The message “Boom Down” will now be displayed. As before, move the boom as necessary. Readjust the suspended load if required. Use the DUTY or TEST buttons as before to adjust the load display and accept with the ACKN button.
- 11.6 Repeat 11.5 for the next 8 positions. The system will as seen indicate the appropriate Boom movement to achieve the required position to calibrate. After the final position at maximum radius, on pressing the ACKN button the display will revert to “Calibration Mode DUTY or TEST to select”.
- 11.7 This calibration is now complete. Proceed to the next section if required.

12 Main Hoist Sheave Weight Correction

To carry out this procedure it will be necessary to move the unladen boom from maximum working angle (minimum radius) down to minimum in ten steps.

- 12.1 In calibration mode press DUTY or TEST button until display shows “Main Sheave Weight. Press ACKN to select”. Press ACKN button. If the display shows “Wrong hoist. Restart!” then exit calibration mode and select Main hoist duty.
- 12.2 Display shows “Boom Down to minimum angle and press ACKN”. Lower the unladen boom to the lowest working angle ie. maximum rated radius and then press ACKN button. Note that the radius display window shows the boom angle in this mode.
- 12.3 Display shows “Boom up to maximum angle and press ACKN”. Raise the unladen boom to the highest working angle ie. minimum rated radius and then press ACKN button.
- 12.4 The display now shows as normally (i.e radius is now displayed and not boom angle) except that the load display flashes and the bottom right window reads “Shv = 0kg”. Hoist the hook block at this position a few centimetres and stop. Press DUTY or TEST to increase or decrease the “Shv” figure and hence the load display so that the hook block weight reads correctly. Note that if the boom is moved from this position the “Shv” message will be replaced by either “Boom Up!” or “Boom Down!”. Readjust the boom angle as necessary so that the “Shv” display is shown. When correct press ACKN button. The message “ACCEPT” will be momentarily displayed to acknowledge calibration.
- 12.5 The message “Boom Down” will now be displayed. Boom down until the display shows “shv=0kg”, stop derricking and repeat the procedure as in 12.4. That is, use the DUTY or TEST buttons to adjust the “shv” value and to display the correct hook block weight in the load display, and accept with the ACKN button.
- 12.6 Repeat 12.5 for the next 8 positions. The system will as seen indicate the appropriate Boom movement to achieve the required position to calibrate. At the final position at maximum radius after pressing the ACKN button the display will revert to “Calibration Mode DUTY or TEST to select”.
- 12.7 This calibration is now complete. Proceed to the next section if required.

13 Auxiliary Hoist Zero and Span

Repeat section 5 selecting “Aux Hoist Zero” and section 6 selecting “Aux Hoist Span”. There is no friction compensation for Auxiliary.

14 Auxiliary Hoist Wrap Angle Compensation

14.1 Proceed as indicated in section 11 but this time select “Aux Hoist WrapComp”. If the SWL is constant from minimum to maximum radius then a single load can be used at least 50% of this value.

15 Auxiliary Hoist Sheave Weight Correction

15.1 Proceed as indicated in section 12 but this time select “AuxSheaveWeight”.

16 Boom Deflection

16.1 This calibration to be carried out on each individual boom length.(if appropriate)

16.2 A test load of not less than 80 to 95% of the rated capacity at a boom angle of approximately 40° is required in each case.

16.3 Press DUTY or TEST button until the display reads "Boom Deflection Press ACKN to select".

16.4 Press ACKN button and follow the displayed instructions. The message "Correct angle! Press ACKN to continue" will be displayed when the boom is at approximately 40°. If boom cannot safely be lowered to this angle, boom down to the lowest safe angle and press INFO button to override this limit.

16.5 Move the boom appropriately until the above message is displayed, then press ACKN button. The display will then read normally except that the radius display flashes and the bottom right hand window reads "Ang = 0.0°".

16.6 Lift the appropriate test load with the boom in this position and carefully measure the radius with a tape; then press DUTY or TEST button to change the "Ang =" reading so that the radius indicates correctly.

16.7 When correct press ACKN button. Repeat for other boom lengths if applicable.

IMPORTANT

For the radius to indicate correctly on each boom, i.e. duty number, a value of "Ang =" must be entered. Therefore, if a particular boom length cannot be fitted, or is not available at the time of calibration, the default value of "Ang = 0.0°" must be entered. This can be done by carrying out procedure 12.1 - 12.5 with any boom length fitted provided the correct duty number is selected.

Exit calibration mode by sliding switch SW3/1 to the 'OFF' position, see Fig 1 on page 3.

The Calibration is now complete and tests should be made to verify the systems performance by lifting a range of loads over the cranes duty chart.

These checks should include load tests with the hoist reeved on the maximum and minimum number of falls and radius checks over the cranes' working range.

17 Cardinal Points

This calibration is to adjust the analogue pointer linearity which is slightly affected by the Display Unit position. It should only be carried out after this unit has been securely fixed in its final position.

17.1 In calibration mode press DUTY or TEST buttons to select “Set Cardinal Points Press ACKN to select”

17.2 Press ACKN button. At this point if a Remote Display is fitted and has been activated (see Supervisor Manual) a choice will be displayed as to which display is required to be set.

PRESS TEST for MAIN
Disp. or INFO for REMOTE

Press the TEST button to set the Main display or INFO to set the Remote display. Note that the pointer will only be active on the display selected, although the buttons will work on both.

17.3 Display reads “Set point X% DUTY or TEST to select” where X% is scale point to be set. Pressing the DUTY button repeatedly increments the % figure in 10% steps and correspondingly moves the pointer up the scale through the 10% cardinal positions. Note also that TEST decrements the pointer.

17.4 Starting at the 0% and continuing with other points up the scale to 120% carry out the following:-

17.4.1 Press ACKN at desired point.

17.4.2 Display shows “Set point X%(YY) DUTY-TEST set.ACKN-ok”. Use the DUTY and TEST buttons to move the pointer to correct position for X%. Note that the (YY) figure will change also.

17.4.3 When correct press ACKN button.

17.4.4 Select the next point using the DUTY and TEST buttons.

17.5 Exit calibration mode.

18 Event Recorder Initialisation

Warning: This procedure deletes current event logger data.

This procedure should be carried out after calibration and is as follows:

- 18.1 Enter calibration mode.
- 18.2 Press DUTY or TEST button to select "Clear Event Logger? Press ACKN to select".
- 18.3 Press ACKN button. The message "Are you sure. ACKN-YES. INFO-NO" will be displayed. Press ACKN button again if you wish to proceed. Note, as previously stated, this procedure deletes existing data. The system should respond by displaying "Event Logger Cleared OK".
- 18.4 Exit calibration mode.
- 18.5 Check that all event counters have been initialised to zero by performing the next section.

19 Event Recorder Examination

19.1 With the system turned off, hold INFO button pressed and at the same time turn the power on. This will enable you to see how many lifts have occurred within each defined band of maximum percentage Safe Working Load.

19.2 After the initialisation sequence the button can be released and the character display will show:

Lifts > 20% = x

Lifts > 30% = y

Where x is the number of lifts since initialisation with a maximum percentage Safe Working Load between 20% and 30%, and y is the number of lifts with a maximum SWL between 30% and 40%.

19.3 Pressing the DUTY button repeatedly will scroll the display up showing the number of lifts for 40% up to 90%, and Approach, Overload and Cut. Alternately the TEST button will scroll the display down.

19.4 Press ACKN button to restore normal operation.

20 Changing of Indicated Length/Load Units

Six display options are available as listed in the table below where some useful equivalent weights are also shown.

SELECTED UNITS	DISPLAYED MNEMONIC	EQUIVALENT WEIGHTS
Metric Tonnes and Metres	Te&m	1 Tonne = 1000Kgs
Kilograms and Metres	Kgs&m	-
Imperial Tons and Feet	T&ft	1 Ton = 2240lbs
US Tons and Feet	usT&ft	1 US Ton = 2000lbs
Pounds and Feet	lbs&ft	-
1000's Pounds and Feet	Klbs&ft	-

The “Displayed Mnemonic” is displayed in normal mode right justified in the lower line of the alpha-numeric display window.

- 20.1 Enter "Calibration Mode" as described in Section 2.1.
- 20.2 Press DUTY or TEST button to display "Display Units Select". Press ACKN button.
- 20.3 Press DUTY or TEST button to select required units and then press ACKN button.
- 20.4 Display shows "Accepted". Exit calibration.

21 Option to Show Display Units

This option enables the weight and length units to be displayed on the alphanumeric LCD display.

- 21.1 Enter Calibration Mode as described in Section 2.1.
- 21.2 Press DUTY or TEST button to display “Show Display Units?” Press ACKN to select.
- 21.3 Display shows “ACKN to Enable or DUTY to Disable”. Press ACKN button to enable this feature or DUTY button to disable. Only disable the feature if units are shown on facia panel adjacent to the appropriate 7 segment displays.
- 21.4 Display shows “Accepted”. Exit calibration.

Note that displayed units option can be changed as described in section 20.

22. Setting Slack Line Relay Limit

This option is available for both Main and Aux. but operates a single relay (see Customer Connection diagram).

- 22.1 Select the hoist to be set.
- 22.2 Enter Calibration Mode as described in Section 2.1.
- 22.3 Press DUTY or TEST button to display “Set Slack Line Limit” Press ACKN button.
- 22.4 Display shows “Set Value = xxx kgs.DUTY-TEST Set.ACKN-OK” where xxx is current setting. Press DUTY button to increase or TEST button to decrease value to that desired. Press ACKN button when correct.
- 22.5 Display shows “Accepted”. Exit calibration.
- 22.6 Select other hoist and repeat.

23 Setting Main Hook Tare Value

This allows the Main Hook/Block to be tared out so that with no load suspended the display will read approximately zero.

- 23.1 Enter Calibration Mode as described in Section 2.1.
- 23.2 Press DUTY or TEST button to display “Set Main Hook Tare”. Press ACKN button.
- 23.3 Display shows “Set Value = xxx kgs.DUTY-TEST set.ACKN-OK.” where xxx is current setting. Press DUTY button to increase or TEST button to decrease value to that desired. Press ACKN button when correct.
- 23.4 Display shows “Accepted”. Exit calibration.

24 Setting Aux. Hook Tare Value

This allows the Aux. Hook/Block to be tared out so that with no load suspended the display will read approximately zero.

- 24.1 Enter Calibration Mode as described in Section 2.1.
- 24.2 Press DUTY or TEST button to display “Set Aux Hook Tare” Press ACKN button.
- 24.3 Display shows “Set value = xxx kgs.DUTY-TEST set.ACKN-OK.” where xxx is current setting. Press DUTY button to increase or TEST button to decrease value to that desired. Press ACKN button when correct.
- 24.4 Display shows “Accepted”. Exit calibration.

25. Setting Minimum Radius Relay Limit

This option allows a limit value to be set inside which a relay will operate. (See Customer Connection diagram).

- 25.1 Enter Calibration Mode as described in Section 2.1.
- 25.2 Press DUTY or TEST button to display “Set Min Radius Limit”. Press ACKN button.
- 25.3 Display shows “Set value = xxx m.DUTY-TEST Set.ACKN-OK.” where xxx is current setting. Press DUTY button to increase or TEST button to decrease value to that desired. Press ACKN button when correct.
- 25.4 Display shows “Accepted”. Exit calibration.

26. Setting Maximum Radius Relay Limit

This option allows a limit value to be set outside which a relay will operate (see Customer Connection diagram).

- 26.1 Enter Calibration Mode as described in Section 2.1.
- 26.2 Press DUTY or TEST button to display “Set Max Radius Limit”. Press ACKN button.
- 26.3 Display shows “Set value = xxx m.DUTY-TEST set.ACKN-OK.” where xxx is current setting. Press DUTY button to increase or TEST button to decrease value to that desired. Press ACKN button when correct.
- 26.4 Display shows “Accepted”. Exit calibration.

27. Setting the Cut Alarm Percentage

This allows the percentage of SWL that Cut operates i.e. RL3 to be adjusted to a different value to that pre-programmed.

- 27.1 Enter Calibration Mode as described in Section 2.1.
- 27.2 Press DUTY or TEST button to display “Set CUT Percentage”. Press ACKN button.
- 27.3 Display shows “Are you sure? ACKN-YES.INFO-NO”. The display prompts since this value is critical to the operation of the system. If OK press ACKN. If not press INFO and the system will use the currently set value.
- 27.4 Display shows “Set value = xxx.x%.DUTY-TEST set.ACKN-OK.” where xxx is current percentage setting. Press DUTY button to increase or TEST button to decrease value to that desired. Press ACKN button when correct.
- 27.5 Display shows “Accepted”. Exit calibration.

28. Setting the Cut Alarm Hysteresis Level

This allows the cut relay RL3 to turn off at a lower SWL percentage than turn on.

28.1 Enter Calibration Mode as described in Section 2.1.

28.2 Press DUTY or TEST button to display “Set CUT Hysteresis”. Press ACKN button.

28.3 Display shows “Set value = xxx.x% DUTY-TEST set.ACKN-OK.” where xxx.x is current percentage setting. Press DUTY button to increase or TEST button to decrease value to that desired. Press ACKN button when correct.

Note that the xxx.x% figure is the percentage of SWL that the load has to reduce by before the cut turns off.

28.4 Display shows “Accepted”. Exit calibration.

29 Selecting display messages Language Option

Two language options are available at present. These are English and Spanish.

- 29.1 Enter Calibration Mode as described in Section 2.1.
- 29.2 Press DUTY or TEST button to display “Select Language” (“Selec Idioma” in Spanish). Press ACKN button.
- 29.3 Display shows “English DUTY-TEST set.ACKN-OK” OR “ESPAÑOL Mod, ACKN-OK” depending on currently selected language.

Press DUTY or TEST button to select option required. Press ACKN when correct.
- 29.4 Display shows “Accepted” or “Aceptado”. Exit calibration.

30 System Malfunction

30.1 Fault Finding Table

Refer initially to the fault-finding Table shown below. Further details of the normal voltages and currents around the WW650L are given in Section 17.2. Error messages are shown on the internal display. Built-in tests are given in section 17.3.

Symptom	Possible Cause	Action
WW650L not functioning.	No AC Power No 24VDC Internal Fuse Blown (main PCB FS1 or DIN terminal) Internal Connection damaged/ loose	Check supply voltage to system. Check internal power supply Check Fuses and replace with correct rating fuse if blown (2 amp anti-surge). Check connections inside Interface Unit.
Audible Warnings do not sound on switch on.	Faulty Relays in Interface Unit, faulty audible warnings	Replace.
<u>Message:</u> "IC5 missing or Faulty!"	IC5, the machine Data memory has been removed from the main PCB or is damaged	Replace or Refit.
Overload warning on <u>only</u> . Blank display.	Complete programme failure.	Check that IC1 and IC3 are correctly fitted to their sockets. Check +5V supply at TP1 to TP2. Replace PCB.

<p>Approach and overload Warning</p> <p><u>Message:</u></p> <p>"SENSOR FAULT LO" or "SENSOR FAULT HI"</p>	<p>Bottom line shows which external sensor input is faulty.</p> <p>If more than one sensor is faulty, descriptions will alternate</p>	<p>Check wiring to appropriate sensor for damage. When repaired turn WW650L on again.</p>
<p><u>Message:</u></p> <p>"Fault Clear. INFO continue ACKN to review"</p>	<p>Fault has cleared or has been rectified</p>	<p>Press INFO button to restart system.</p> <p>Press ACKN button to review which sensor caused fault.</p>
<p><u>Message:</u></p> <p>Disp. or Sys. Failure! No Comms. with DSP</p>	<p>Faulty connection between display and main PCB. Main PCB supply failure or program failure.</p> <p>Display module failure.</p>	<p>Check connections</p> <p>Check +5V supply son TP1 to TP2. Replace PCB.</p> <p>Replace module.</p>
<p><u>Message:</u></p> <p>Display Failure (U4) SEE C/S Error</p> <p><u>or</u></p> <p>Display Failure (U1) Code C/S Error</p>	<p>Display module internal failure</p>	<p>Replace module</p>

30.2 Voltage levels on Interface Unit Main Circuit Board

30.2.1 Reference

TP1 - isolated from machine supply. Reference point for most voltage measurements.

30.2.2 +5V Analogue

TP2 (+ve) to TP1 (-ve). Should be 5.0 0.25 volts.

Supplies Digital, Analogue and Sensor circuits.

30.2.3 -5V Analogue

TP3 (+ve) to TP1 (-ve). Should be -5.0 0.25 volts.

Supplies Analogue and Sensor circuits.

30.2.4 Signal Levels

All measurements should be made with the DVM leads connected as indicated in order to give a positive, increasing voltage for an increasing signal. In all cases approximately +100mv represents zero, +2.5 volts represents maximum.

30.2.4.1 PD1 Loadcell 1 (one half of a dual bridge Loadcell)

Black DVM lead on TP5.

Red DVM lead on TP4. Voltage represents Pressure.

30.2.4.2 PD2 Loadcell 2 (one half of a dual bridge Loadcell).

Black DVM lead on TP7

Red DVM lead on TP6. Same note as above.

30.2.4.3 Boom Angle (Inclinometer)

Black lead on TP1.

Red DVM lead on TP8.

Voltage represents base section angle.

30.3 Built-in Test Facilities

A suite of test programs are available by switching on the WW650L with ACKN button pressed (SW3 switch 2 must be off). Also note that after initialisation the display shows the operating system version number and data EPROM number and issue.

To carry out the tests proceed as follows (see notes below for more information about each test program):

- a) With SW3 switch 2 off, press ACKN button whilst switching on the WW650L.
- b) Press DUTY or TEST button to scroll through test programs.
- c) Press ACKN button when required test program is displayed.
- d) Carry out any instructions on the display.
- e) Once finished with one test, press DUTY or TEST button to scroll through and then press ACKN button to select next test.
- f) After tests have been carried out pressing INFO button returns the WW650L to normal operating mode.

Test Programs:

"External Switches"

The display shows a line of lower case 's', five in total. Each 's' corresponds to one of the external switches connected to Main PCB terminals S1 - 5 (ie terminal numbers 32, 34, 36, 38 and 40 respectively).

If any of these switches are active ie at positive machine supply the appropriate number will appear on the display following an 's' otherwise it will be blank.

"Alarm Test"

This initiates a display of which button number to press to check an alarm eg.

The ACKN button operates the CUT (relay RL3).

The DUTY button operates the APPROACH warning (Buzzer and RL1). The TEST button operates OVERLOAD alarm (external audible and RL2).

"DIL and CAL Test"

This initiates a display of the status of SW3 switch.

"A to D Inputs"

This initiates a display of the 4 analogue inputs in Hexadecimal format. These are from left to right top line PD1, PD2, Boom Angle and unused input. This unused input should be approximately zero.

Button Test

This mode is entered by moving SW3 switch 2 to the 'ON' position before power is applied.

As each button is pressed its corresponding number is displayed.

After test move SW3 switch 2 away from the 'ON' position. The WW650L then returns to the normal operating mode.

APPENDIX A

Additional information available on display when
SW3/2 is 'ON'

Use INFO button to scroll through.

SA	=	Superstructure angle in degrees if inclinometer connected to "AN 2/LN" input. (not normally used).
PD1	=	Measured line pull in Kgs from Main hoist.
PD2	=	Measured line pull in Kgs from Aux hoist.
		Status of Main hoist Rope Direction Sensor (4 alternatives).
Tot	=	PD1 + PD2
HOISTSTP 1)	Hoist motion stopped, after hoisting up
HOISTING 1)	Hoisting - dynamic
LOWERSTP 1)	Hoist motion stopped, after lowering
LOWERING 1)	Hoist lowering - dynamic
		Status of Dyno 2 Rope Direction Sensor (4 alternatives).
HOISTSTP 2)	
HOISTING 2)	
LOWERSTP 2)	Not used
LOWERING 2)	
Sag	=	Correction angle for boom deflection
Wrap	=	Compensation value (%) for wrap angle change
Shv	=	Correction value (Kg) for measuring sheave weight change