



A TRIMBLE COMPANY

1460 Load Indication/Auto Weighing Instruction Manual

MAN-1069 Rev D



Management
System
ISO 9001:2008

www.tuv.com
ID 9105072472

LSI-Robway Pty Limited, 32 West Thebarton Road, Thebarton, South Australia, 5031
Phone: +61 (0) 8 8238 3500 Fax: +61 (0) 8 8352 1684 www.lsirobway.com.au

Model 1460 Load Indication System for Material Handlers



Features

- Auto "on the run" weighing facility
- Compact powerful computer
- Backlit display for night operation
- Includes pushbutton tare & over-ride
- On-board calibration
- Motion cut and audible outputs
- Plug-in cables
- Totalizing Facility
- Compatible with radio transmitters (RS485 serial interface options)
- Target weight monitoring
- Simple calibration technique
- Fully tested against temperature, humidity, and vibration

<u>Contents</u>	<u>Page Number</u>
1. Important Safety Notice	4
2. General Description	5
3. Operating Instructions	6
3.1. Turning ON the 1460	6
3.2. Turning OFF the 1460	6
3.3. Display functions	6
4. Installation	10
4.1. General notes	10
4.2. System components	10
4.3. Installation guidelines	10
5. Calibration	13
5.1. Correct order of procedures	14
5.2. Function codes described	15
6. Troubleshooting	21
7. Appendices	26
7.1. Quick Guide – Operating Instructions for the Robway 1460 Load FLA Display	27
7.2. General Arrangement Drawing, 1460 System	29
7.3. Drawings (System Components)	31
7.4. Motion Cut Connection	34
7.5. 1460 FLA System Configuration Sheet	36
7.6. Function Codes	38

1. Important Safety Notice

The Model 1460 Load Indication System is an electronic device, designed for material handlers such as forklifts, bucket loaders, etc., which warns the operator of an impending overload condition which could cause damage to property, machine and personnel.

The system is not a substitute for good operator judgement, experience and safe operation of the machine. The operator is solely responsible for the safe operation of the machine.

The operator must, prior to operation of the crane, read this manual carefully and thoroughly and shall ensure that all operational instructions and warnings are understood and complied with.

The system is equipped with a Cancel/Mute-Alarm button on the panel which bypasses alarms and motion cut function (if motion cut controls are installed) at which time the system can no longer warn of impending overload condition and must only be operated strictly in accordance to the manufacturer's specified safe working load and operation procedures. The operator shall be solely responsible for the use and operation of this button.

2. General Description

The Model 1460 Load Indication System is a member of the ROBWAY 1400 series Semi Automatic Indicators and is specifically designed for material handling machines such as forklifts, bucket loaders, etc.

The 1460 System is a microprocessor-controlled load indication system.

It has been designed to provide a cost effective display of lifted load, safe working load, target load, and total load.

The 1460 System uses a pressure transducer to measure load. The 1460 includes the following functions:

- Normal load display,
- Sample/Hold load display,
- Adjustable Maximum S.W.L.,
- Audible and visual alarms,
- Adjustable trip points for alarms and motion cut,
- Adjustable delays for sample and hold functions,
- Tonnes or Kilograms mode,
- Variable graduation of load display,
- Manually or automatically totalising,
- Target load setting,
- Tare and Zero facilities,
- Printing facilities with time and date stamps,
- Customisable banner on print-outs,
- Optional data logging feature,
- The 1460 feature easy installation and minimal operator training.

ROBWAY can also cater for custom applications and special user requirements. Please contact your nearest ROBWAY distributor or ROBWAY directly for details.

3. Operating Instructions

The following sections explain how to operate the 1460 System and make best use of its capabilities.

3.1. Turning ON the Unit

Power to the unit is from the crane battery through the start-up or ignition key. In some applications an additional switch may be used to enable the operator to switch the unit on/off as required.

As soon as power is applied to the unit, its display and other indicators should light up and the unit should go through its self-test operation.

3.2. Turning OFF the Unit

The unit will stop working as soon as the power is removed from it by switching off any of the switches indicated in Section 3.1 above.

3.3. Display Functions

The display window functions are selected by the **SELECT** push button. The current function is indicated by the lamp next to its label being switched ON. *The initial function of this window is set to displaying LOAD.*

Other functions can be selected by pressing the **SELECT** key once to activate the next function or by pressing and holding the **SELECT** key to step through the functions in turn. The functions for the display window are as follows:

LOAD

The 1460 can be configured to operate in one of two modes: **Standard Mode** or **Sample/Hold Mode**.

In Standard Mode, the 1460 continuously measures and displays the calibrated load from the loadcell. This mode is suitable for applications where load cells are used for direct measurement of the lifted load where installations provide stable load readings.

In Standard mode totalising and printing of the load is done manually, by pressing the CLEAR/ENTER button. Please note that although the same load can be printed as many times as required by pressing the button again and again, the 1460 will add the load to the total once only. A new load is only registered once the current load is put down, that is, if it measures less than that value set on function F-14 (Minimum Load to Totalise), during calibration time (*refer to Section 5. "Calibration" for details*).

Sample/Hold Mode should be used if, for example, in a pressure transducer application where the display does not stabilise readily or where load dynamics produce a relatively unstable display. In this case a Limit 'trigger' Switch must also be installed. This switch should be actuated where at a WEIGHING point where the pressure would be at its most stable & repeatable value.

In Sample/Hold mode the load display will be updated continuously as in Standard mode UNTIL the Limit Switch is activated.

As soon as the Limit Switch activates, the 1460 enters SAMPLE mode. This mode is indicated by a flashing ADD indicator. At this time a timer is started inside the 1460. Once the time expires **and** the switch is still actuated the 1460 enters HOLD mode. In HOLD mode, the LOAD display is frozen and no further updating will occur, and the ADD indicator will be ON continuously to indicate HOLD mode. Once HOLD mode is entered, the load is accepted as valid.

In Sample/Hold mode the 1460 can totalise and print either manually or automatically. To toggle manual or automatic mode press the CLEAR/ENTER button WHILE turning on the 1460. Once a short beep is heard from the 1460, release the button and make sure that the desired totalising mode is active. If the message BUTT shows up on the display during self-test, the 1460 is in manual (*or button*) mode. In this mode totalising and printing are done by pressing the CLEAR/ENTER button. If on the other hand the display shows AUTO then the 1460 is in automatic mode. In this mode totalising and printing will be done automatically as soon as the 1460 enters HOLD mode. *The totalising/printing mode will be remembered by the 1460 even after switch off.*

Just as in Standard mode, the load will only be added to the total once, however, it can be printed as many times as required, even if automatic totalising/printing is active. This allows the operator to print tickets for customers and management as well.

The frozen load display will not be released until the HOLD timer expires, which was started at entering the HOLD mode.

Please note that a new load cycle will not be started until after the limit switch has deactivated, the HOLD timer has expired AND the Limit Switch has been re-activated.

Both the Sample timer and Hold timer can be set to any desired value during the calibration/commissioning procedures. See F codes section.

The Lift Number - Operation and Resetting

Whether Standard or Sample/Hold mode is used the 1460 numbers every lift added to the total. This "Lift Number" is purely an operational aid for the User. It could be used to count the number of lifts to reach a desired total, or to count the number of lifts done by a particular Operator etc. The lift number is printed along with the load details whenever the 1460 is instructed to print a load. The lift number starts at one and increases until it is reset (i.e. it *is not* automatically reset by setting the total to 0). To reset the lift number simply hold the CANCEL button down for about 3 seconds. After a time the display windows will issue a prompt to inform the User that the lift number has been set to 1.

Applying Tare and Zeroing the Load Signal

While the LOAD display is selected the operator can press the TARE button. If this button is pressed and released quickly, in less than 2 seconds, then it will zero the load display. This function allows for minor variations in load display, due to temperature changes in the hydraulic oil, for instance. The operator can zero the load display whenever required as many times as required. *This zero offset, however, will not be remembered once the 1460 is switch off.*

If the TARE button is pressed and held for more than 2 seconds the current load display will be tarred out and the load set to zero. The TARE indicator should also come on at this time. To release tare, the operator must press and hold the TARE button until the TARE indicator goes out. *If there is a tare value the 1460 will remember it even after the display has been switch off, however, tare values are cleared when changing from "kg" to "tonnes" display mode and visa-versa.*

TOTAL

The TOTAL display always shows the sum of all loads lifted since the last clearing of the totals. TOTALS are *always displayed in tonnes* with a maximum resolution of 10kg increments. The TOTAL can be cleared by pressing AND holding the CLEAR/ENTER button until the TOTAL goes to zero. *Note that you can only zero the total while the TOTAL display is activated.* Clearing the TOTAL *will not* automatically reset the lift number to 1. The Lift Number can be reset by the operator at any time simply by holding the CANCEL button down for about 3 seconds as described above.

TARGET

For some applications it may be desirable to set a target load. This can be done while the TARGET display is selected. When the target display is selected the current target load is displayed as a value in tonnes with two decimal places for hundreds and tens of kilograms. To change this target, use the UP/DOWN keys to ramp to the new target load.

If the total load lifted reaches 100% of the TARGET value the TARGET indicator starts flashing even if the operator has selected a different display function. *To disable the target function set TARGET to zero.*

SWL

When the S.W.L. display is selected, the 1460 will show the maximum load allowed. The S.W.L. must be entered during calibration/commissioning time.

The S.W.L. value must be set correctly for the given application and it is the operator's responsibility to check this value before operating the lifting equipment.

If this value is set correctly the 1460 can give visual and audible warnings on approaching overloads.

The percentage of safe working at which the alarms or motion-cut activate can be set to any desired value during commissioning time. *Please refer to Section 5. "Calibration" for details.*

The operator can bypass all warnings and alarms by pressing the CANCEL button. As a reminder, however, the ALARM light and the O/RIDE indicator will be switched on until the overload condition is removed. *We strongly recommend that bypassing of alarms be only done when it is absolutely necessary and the alarms should be re-enabled as soon as possible.*

If over load does occur and the bypass has not been turned on, visual and audible alarms will be activated and an ERROR CODE shown in the display window. This error code can indicate over load situations as well as problems with load cells or load leads. It is important that these errors are not ignored or bypassed with the CANCEL key. If any error codes are shown they should be immediately investigated and the cause rectified. *Please refer to Section 6. "Troubleshooting" for details.*

CANCEL

Should any over-load condition occur and alarms/motion cut activate, the operator can disable these by pressing the CANCEL button. As a reminder that the system is on override (or is bypassed), the 1460 will have both its O/RIDE LED and red "ALARM" lamp/indicator ON.

The CANCEL button should only be used if it is absolutely necessary and must be de-activated as soon as possible. If the CANCEL button is not de-activated after use, you may not be able to see approaching overloads.

4. Installation

This part of the manual is intended for technical people who have been trained by ROBWAY or its distributors. It contains all necessary information to install and commission the ROBWAY 1460 load indicator.

The following sections should be read initially, at least once to understand the general concept of the installation and calibration procedures. Special attention should be paid to Section 5.1 which describes the **CORRECT ORDER OF PROCEDURES**.

Using the **FUNCTION CODE** listing at the rear of this manual, the installer should then use those functions to carry out the required operations. For a detailed description of the individual function codes the installer should refer to **Section 5.2 FUNCTION CODES DESCRIBED**.

4.1. 1460 System Components

- **The 1460 Display Module**

The computerised display and control systems.

- **Pressure Transducer**

Used to send a signal which is proportional to the load lifted.

- **Cabling**

Allows the connection of system components in a convenient manner.

- **Limit Switch (optional item)**

This is only used when Sample/Hold Mode is utilized. The switch is used to 'trigger' the load weight calculation with-in a 'weigh zone' where the hydraulic pressure is expected to be at its most stable value. Please see also Section 3.3 "Display Functions – Sample/Hold Mode" for operation details.

Please Note: *The 'trigger' switch roller arm has a 'one way' switching action and must be mounted such that roller contact with the striker plate causes the switch contacts to close during the 'down' cycle. This requires the operator to first raise the load above the 'weigh zone' then smoothly lower down into the 'weigh zone' causing a 'flashing' ADD light. The operator then gently pauses until the ADD light changes to 'continuous'. The lifted weight will then be displayed.*

A 'timer' facility is provided to set the required 'flashing' (or sampling) time to obtain a good weight reading (Function code F-20). This time can range from 1 to 3 seconds, depending on hydraulic seals etc.

Ensure the ends of the striker plate/bar do not damage the switch roller arm during both up & down cycles.

4.2. Installation Guidelines

4.2.1. Display Unit

Fit the Display Unit in a water-free area and in a convenient position in the cabin such that the operator can view the display and reach the push buttons comfortably.

Standard back plate bracket and kit comprising of bolts and nuts are provided. Special bracket may need to be fabricated on site for suitable mounting in the cabin.

Care must also be taken to ensure that the mounting bracket for the display is earthed onto the chassis of the crane to ensure the display is protected against radio frequency interference.

Drawing References:

DWG 0876 – “Dimensional Details, 14XX Display”

DWG 3074 – “General Arrangement Drawing, 1460 Standard System”

4.2.2. Pressure Transducer

Install the transducer into the base of the lift frame hydraulic cylinder, between the control valve and the lift cylinder. The pressure transducer is supplied with a standard 9/16” JIC tapered male thread for installation. A union adapter with 1/4” BSP male thread is also supplied with the installation kit for use if required. Bleed out any trapped air after installing the transducer. Secure the transducer lead and connect into the 5 pin connector of the display.

Drawing Reference:

DWG 1810 – “Dimensional Details, 5k/10k PSI Pressure Transducer”

4.2.3. Cables

The cable for the transducer is a shielded instrumentation cable and is normally quite robust. It should be treated with care, however, as even a small amount of damage can be very costly due to down-time or intermittent behaviour. Always support the cable in such a way that there is no "excessive" strain applied, such as tension or flexing. The cable should be strapped to a fixed member that it runs along, unless it is held within a cable tray. Avoid sharp bends such as around a sharp corner. Where there is to be flexing, the installer must ensure that the bending is reduced to an absolute minimum to avoid fatigue breakage of the conductors.

4.2.4. Connectors

It is recommended that the installer applies suitable silicone grease (e.g., Dow Corning 4 “Electrical Insulating Compound”) on the plugs and sockets prior to connecting the cables. The silicone grease should be smeared across the connector contact points to increase the water proofing of the connector.

4.2.5. Limit Switch (Optional Item)

This is only used when Sample/Hold Mode is utilized. The switch is used to 'trigger' the load weight calculation with-in a 'weigh zone' where the hydraulic pressure is expected to be at its most stable value. Please see also Section 3.3 "Display Functions – Sample/Hold Mode" for operation details.

Please Note: The 'trigger' switch roller arm has a 'one way' switching action and must be mounted such that roller contact with the striker plate causes the switch contacts to close during the 'down' cycle. This requires the operator to first raise the load above the 'weigh zone' then smoothly lower down into the 'weigh zone' causing a 'flashing' ADD light. The operator then gently pauses until the ADD light changes to 'continuous'. The lifted weight will then be displayed.

A 'timer' facility is provided to set the required 'flashing' (or sampling) time to obtain a good weight reading (Function code F-20). This time can range from 1 to 3 seconds, depending on hydraulic seals etc.

Ensure the ends of the striker plate/bar do not damage the switch roller arm during both up & down cycles.

4.2.6. Motion Cut Control Wiring

The 1460 System provides an output signal that can be utilised for motion cut control if required (e.g., stopping lift when on overload condition).

The ampere rating of this signal is approx 1 ampere only and must not be used to directly operate hydraulic or mechanical solenoid devices or high capacity relays. For such devices a "slave" relay must be used to switch ampere ratings exceeding 1 ampere.

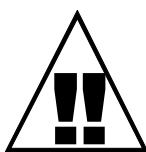
This signal is at 'negative polarity' when all is normal and no alarm state exists. In alarm, this signal will "float" causing the motion-cut switching device to drop out through loss of sufficient voltage potential across the coil.

If motion cut is required the client shall provide appropriate solenoids (or relay devices) to de-activate the appropriate function and wire them as shown per the drawings at the back of this manual.

A typical automotive type relay (contact rating of 10 amperes) can be used as a "slave relay". Most of these relays usually have 5 push-on spade type connections, 2 for coil +ve and -ve and 3 for the relay contacts, one for common (COM) , one for normally closed (NC) and one for normally open (NO) condition. The coil voltage must match the crane electrics.

Drawing Reference:

DWG 1011 – "Typical Motion Cut Control Wiring"



Warning

1. Permanent display damage may occur if incorrect motion-cut connections are made.
2. POWER MUST BE DISCONNECTED before attempting connections.
3. NEVER insert larger capacity fuses than those originally supplied.
4. Obtain specialist assistance if you are unfamiliar with crane electrics.

5. Calibration

After installing the 1460 System modules, the unit must be calibrated to ensure accurate load measurement. The following sections explain how it is done.

Before calibrating the 1460, make sure that all system modules are correctly installed as described in Section 4. "Installation" and attached drawings at the rear of the manual.

Procedures in the following sections can only be used while in CALIBRATION MODE.

To enter CALIBRATION MODE you have to SWITCH OFF the 1460 unit, then press and hold the CANCEL button WHILE SWITCHING ON the unit. You should release the CANCEL button after hearing the first beep from the unit.

If CALIBRATION MODE is successfully entered the 1460 will show "F-00" on the display. If this message does not show, repeat above procedure.

Once in calibration mode all procedures are activated via a FUNCTION CODE. Each FUNCTION CODE enables ONE procedure. A list of available FUNCTION CODES can be found at the rear of this manual.

Note that the FUNCTION CODE listing can be different from application to application and therefore the one supplied with this manual must always be used.

To select a FUNCTION CODE use the UP/DOWN arrows to select its code then press the ENTER button in the lower right corner of the display. Once a function code is selected and the ENTER key pressed you are expected to enter a new value for the function code selected.

Normally the current value of the function is used as the starting value. You have the option of using the UP/DOWN arrow keys to change this value or can press the CANCEL or the ENTER keys.

If the CANCEL button is pressed the operation will be cancelled and previous calibration value will be retained, the 1460 should return to the F-xx prompt.

If the ENTER key is pressed, however, the last value shown in the window will be accepted and calibration data changed accordingly.

5.1. Correct Order of Procedures

When calibrating the 1460 the installer should follow the following order of procedures.

1. Verify load sensor operation,

View Amplifier Signal: F-01

2. Configure settings/parameters,

Setting Date: F-05, F-06,

Set Time: F-07

**Change Printout Title (if required): F-08*

Percentage SWL Limits: F-10, F-11, F-12

Safe Working Load: F-13

**Minimum Load to totalise (if required): F-14*

Unit of Measure (Tonnes/Kg): F-17

Graduation: F-18

Sample & Hold Mode (if required): F-19

- Sample Delay: F-20

- Hold Delay: F-21

Above items with asterisk (*) are optional functions. Use only if required by the specific application.

3. Calibrate load,

Calibrate Light Load: F-03

Calibrate Heavy Load: F-04

4. Verify correct operations,

View Load: F-02

5. Apply load sample filtering if needed.

Number of Samples to Filter: F-15

Filter Guard Band: F-16

This function may be used to improve stability of load readout (only if display readout has erratic highs and lows).

5.2. Function Codes Described

This section describes the individual calibration functions in more detail.

5.2.1. Exit Calibration Mode (F-00)

This function is normally used after all desired calibration functions have been completed. Once selected the 1460 exits calibration mode and re-enters normal operating mode.

Exiting calibration mode can also be achieved by pressing the CANCEL key while the F-xx prompt is shown in the display window.

5.2.2. View Amplifier Signal (F-01)

Signal from any sensors are converted to a number in the range 0 - 1023 by the 1460.

An open circuited sensor (*or extension lead*) is represented by a number in the range 1000 - 1023 and a short circuited sensor (*or extension lead*) is represented by a number in the range 0 - 32. Any other number is accepted as a valid signal.

These numbers can be used to verify proper sensor operation. The procedure is as follows:

1. Select the F-code F-01 and lift up a light test load. The number on the display should be in the range 33 - 300 as described above.
2. Lift up a heavier load and make sure that the number seen for the light load has increased by at least 50 or 100 counts (*the more the better*) and it is still less than 1000. If the number does not change you need to check that you are using the correct function code, that the leads or load cells are not faulty (*you may have to use a load cell simulator or a load cell tester*).

5.2.3. View Load (F-02)

This function is only useful when you want to look at the actual load without leaving calibration mode. Remember that calibration mode can only be entered by switching the 1460 off and then on again. This may not always be desirable or practical. In such cases use this function to look at the actual winch line pull.

While this function is active you can disable the load channel by pressing the ENTER key. This will instruct the computer to ignore input from the load sensor. It will remain in this mode until the ENTER key is pressed again while in this function.

When the load channel is disabled the OFF message will be shown as a reminder.

Press the CANCEL key to exit this function.

5.2.4. Calibrate Light Load – Empty Fork or Bucket (F-03)

For an accurate load calibration, determine and mark (with a pen, paint, or any other suitable marking tool) a “reference point” for calibrating load. This could be somewhere between the ground and any point along the lifting range of the lift-frame or bucket. This point is where the load is expected to be at its most stable value. If the optional “Limit Switch” is used, this is where it is installed. Procedure in calibrating light load is as follows:

- Lower empty lift frame or empty bucket to ground, raise lift-frame to slightly above the reference point, and then gently lower to reference point and hold,
- Select function code F-03, and then press the ENTER button,
- Use the UP/DOWN buttons to dial up 0.0, then press ENTER key,
- If you need to cancel this function press the CANCEL key,
- Repeat the above procedure if necessary.

5.2.5. Calibrate Heavy Load – Loaded Fork or Bucket (F-04)

Calibrate heavy load in the same manner as calibrating light load but with the lift-frame or bucket loaded with a test load of at least 75% of the capacity or SWL of the machine, as follows:

- Lower test load to ground, then raise test load above the reference point, and then gently lower to reference point and hold,
- Select function code F-04 then press the ENTER button,
- Use the UP/DOWN buttons to dial up the correct weight for the test load, then press ENTER to accept the new value,
- If you need to cancel this function press the CANCEL key,
- Repeat the above procedure if necessary.

5.2.6. Set Current Date and Time (F-05, F-06, F-07)

Date is in **day.month** format and time is in **hours.minutes** format. Date and time are only used when printing tickets.

5.2.7. Change Printout Title – Optional Item (F-08)

The 1460 can print out individual lifts and totals when the optional printer is installed. When a ticket is printed the heading will normally read: **ROBWAY 1460 LOAD FLA.**

If you wish to change this heading you need a communications cable from ROBWAY or its distributor and access to a computer which can run TERMINAL EMULATOR software. Any software should work with the 1460. Some examples are: Simterm, Procomm, andTelix. Since most companies have access to the Windows™ operating system, which has a built-in terminal emulator, we will use this in the following procedure.

(If you are not familiar with Windows, read the manual first or ask for assistance.)

1. Switch off the computer and the 1460,
2. Connect the communications cable to the back of the 1460 and then to one of the communications ports of your computer,
3. Switch on your computer and start up Windows,
4. Activate the Terminal application (*normally found in the Accessories group*),
5. Configure the communications settings to use *4800 Baud Rate, 8 Data bits, No parity, No Flow control, 1 Stop bit and the correct Connector*,
6. Click on the OK button to get back to the terminal screen,
7. Now switch on the 1460, enter Calibration mode and select function code F-08,
8. The 1460 should show TYPE and on the computer screen there should also be a short description of what you should do next, follow the instructions and type in the new banner, ***please note that you can only type in a maximum of 40 characters.***
9. Once you have finished with entering the new name, the 1460 should go back to the function menu and show F-08,
10. You may now exit calibration mode.

Please note that this new heading is stored with the calibration data in a battery-backed memory inside the 1460. If you clear the calibration data either by accident or by using F-09, the print-out header will be reset to read ROBWAY 1460 LOAD FLA and you will need to re-enter your required header.

5.2.8. Clear All Calibration Data – Use Extreme Caution (F-09)

This function must be used with extreme caution!!!

It erases all calibration data currently stored in the unit and a complete re-calibration must be performed before the unit can be used again.

It should only be used in special cases where the calibration data needs to be reset to a known state.

5.2.9. Percentage Limit for Flashing Light and Intermittent Audible Alarm (F-10)

This function is used in applications where a limit is placed on the maximum load which can be lifted. This function sets up a percentage at which an intermittent audible alarm and a flashing RED warning light are activated. The factory default setting is 85% which can be changed using function code F-10 to suit specific application if required.

To change this percentage to a different value, follow the procedure below:

1. Select the correct code for this function,
2. Use the UP/DOWN arrow keys to ramp to the desired percentage value,
3. Press the ENTER key to lock in the new percentage value.

You may press the CANCEL key to abort this procedure any time *before pressing the ENTER key.*

5.2.10. Percentage Limit for Continuous Red Light and Continuous Audible Alarm (F-11)

This function is used in applications where a limit is placed on the maximum load which can be lifted. This function sets up a percentage at which a continuous RED warning light and a continuous audible alarm are activated. The factory default setting is 100% which can be changed using function code F-11 to suit specific application if required. *Refer to previous Section 5.2.9. for procedure in changing this % value.*

5.2.11. Percentage Limit for Motion Cut and Continuous Audible Alarm (F-12)

This function is used in applications where a limit is placed on the maximum load which can be lifted. This function sets up a percentage at which the motion cut relay and the continuous audible alarm are activated. The factory default setting is 110% which can be changed using function code F-12 to suit specific application if required. *Refer to previous Section 5.2.9. for procedure in changing this % value.*

5.2.12. Maximum S.W.L. (F-13)

Use this function to set the maximum load capacity or Safe Working Load of the machine. Please see also Section 5.2.xx. "Unit of Measure" to verify the current unit in use (i.e., tonnes or kilograms). The unit of measure can be changed by using function code F-17. *Refer to previous Section 5.2.9. for procedure in changing this value.*

5.2.13. Minimum Load to Totalise – Optional Item (F-14)

Use this function to set the minimum load value required to start a new load cycle in "Standard Mode". *Please see also Section 3.3. "Display Functions – Standard Mode" for details. Refer to previous Section 5.2.9. for procedure in changing this value.*

5.2.14. Number of Samples to Filter (F-15) Filter Guard Band as a Percentage of Load (F-16)

The 1460 has a software filter programmed into it. The purpose of this filter is to smooth out the variations in the load signal caused by load dynamics. For most applications the default values for functions F-15 and F-16 are appropriate. If, however, you still find that the display is too "jumpy" and hard to read as you move the load, you may be able to make it more stable by changing the values for F-15 and F-16.

In most cases the setting up of F-15 and F-16 is by trial and error as a lot depends on the lifting machinery and the application itself. However, you should keep the following in mind while adjusting F-15 and F-16:

- Increasing F-15 makes the load display more stable; however, it makes display update slower,
- Increasing F-16 will make the load display less stable and display update quicker.

The maximum value for F-15 is 25. The value for F-16 can range from 0.0% to 100.0%. However, in real-life only the range of say 5% to 30% would be reasonable.

To find out what the optimal settings are for your system do the following:

1. Set F-15 to 2 and F-16 to 50,
2. Exit Calibration mode and check the load display,
3. If the load display is accurate and stable enough go to step 6,
4. Increment F-15 by 2 and decrement F-16 by 5, if F-15 reached 20 and you are not satisfied then filtering will not help and you should check your system for other causes of unstable load display,
5. Go to step 2 above,
6. Filter setup is done.

5.2.15. Unit of Measure – Tonnes or Kilograms (F-17)

F-17 is a toggle function. When selected it will display either ON or OFF. If it is ON then the load and SWL displays will be in tonnes. If it is OFF then the load and SWL displays will be in kilograms. Note that the total and the target total are always displayed in tonnes with maximum resolution of 10 kg.

To change from one to the other select F-17 and press the ENTER key. If you only want to check which mode is active, select F-17 as normal. Once you see ON or OFF press the CANCEL key to go back to the function code menu.

If you change F-17, we recommend that you exit Calibration Mode, switch off the 1460 and then re-enter calibration mode. This will ensure that all functions of the 1460 will work with the newly selected unit of measure. Factory default setting is OFF (kg).

5.2.16. Graduation (F-18)

Use this function to set the required graduation or scale.

5.2.17. Sample and Hold On/Off (F-19) Sample Delay in Seconds (F-20) Hold Delay in Seconds (F-21)

Function code F-19 is a toggle function. When selected it will display either ON or OFF. If it is ON then the 1460 is in Sample/Hold mode. If it is OFF then the 1460 is in Standard Mode.

To change from one to the other select F-19 and press the ENTER key. If you only want to check which mode is active, select F-19 as normal. Once you see ON or OFF, press the CANCEL key to go back to the function code menu.

SAMPLE DELAY is the time between activation of the limit switch and when the 1460 freezes the load display. This time is entered in seconds, using function code F-20.

HOLD DELAY is the time for which the load display will be frozen. This is also entered in seconds, using function code F-21.

5.2.18. Data Logging On/Off (F-22) Transmit Logger Data Over RS-232 – 4800, 8N1 (F-23) Clear All Logger Data (F-24)

These function codes are currently disabled and not used for this standard application.

6. Troubleshooting

Symptom	Cause/Action
Indicator not working at all	<ul style="list-style-type: none"> • <i>Check supply voltage to the display and make sure it is between 10 - 54VDC</i> • <i>Check the fuse</i> • <i>Check for loose wires</i> • <i>Replace or repair fault indicator</i>
Indicator readings do not change with applied weight	<ul style="list-style-type: none"> • <i>Transducer connected to wrong side of control valve - reconnect to output side of control valve</i> • <i>Loose connections, open circuit transducer cabling or damaged cabling - check for cuts or abrasions and cable continuity</i> • <i>Hydraulic hose obstruction – repair or replace hose</i> • <i>Damaged transducer - unplug transducer and check with a multimeter as follows</i> <p style="margin-left: 40px;"> Pins A to B = 275 - 295 ohms Pins B to C = 275 - 295 ohms Pins C to D = 275 - 295 ohms Pins D to A = 275 - 295 ohms </p>
Inconsistent weight reading	<ul style="list-style-type: none"> • <i>Inconsistent weighting method - driver to follow correct procedure</i> • <i>Leaking hydraulic hoses, fittings or lift cylinder - repair leak or mast cylinder seals</i> • <i>Air in hydraulic system - bleed air from transducer fitting</i> • <i>Hydraulic system low on fluid and is pumping air - top up to correct reservoir level</i> • <i>Mast slides dirty, stiff or bent - clean, straighten and lubricate mast</i> • <i>Transducer getting too hot, cant keep hand on it - relocate transducer on to end of 300mm length of high pressure hydraulic hose</i> <p style="margin-left: 40px;"> <i>Supply voltage below 10 VDC - rectify reason for low charging/battery voltage</i> </p> <p style="margin-left: 40px;"> <i>Hydraulic oil is not up to working temperature - operate mast up and down for 5 minutes o obtain working oil temperature</i> </p> <p style="margin-left: 40px;"> <i>A.C. (alternating current) voltage in electrical system. Any A.C. voltage above 120mV may cause unstable display.- Check for dirty battery terminals, alternator/regulator output fault</i> </p>
Faded display or missing digits	<i>Return for service</i>

6.1. Check the Obvious.

- Make sure all of the connectors are tight.
- Is the motion cut output connected to an external relay?
- Check that terminals and wirings are connected to existing power.
- Before any connection is made to an existing installation check for power on those connections.

6.2. Do not modify the Calibration.

- It is rare for calibration data to be corrupted.
- When a re-calibration has been attempted in order to rectify a problem before that problem has been correctly identified, it leads to added confusion as the perspective is moved from the real fault to "calibration problems".
- If the system had previously been operating correctly and suddenly developed a fault, the culprit is likely to be something external to the display rather than the calibration.
- If all of the external inputs appear to be operating correctly but the readouts do not show the correct values, then view all of the calibration data and record it.
- If in doubt, send a copy of this data to Robway Safety Systems, so that it can be analysed.
- If this is not possible, re-calibration may be attempted.
- Re-calibration must only be performed when all physical inputs have been verified for correct operation.
- If a re-calibration has been performed, record the new data. The new calibration data must always be recorded and a copy sent to Robway so that records reflect the current status of the display. This will ensure correct information is passed onto the next person needing to attend the site.

6.3. Know what information you need to gather.

- Check that the display is correctly configured for the crane environment.
- Are all of the sensors connected? The display will check them continuously and issue an error if that sensor cannot be detected.

6.4. Identify the symptom.

- Identify the end problem.
- Work backwards identifying what is causing the problem.
- If possible, have the problem demonstrated so you can "describe it in your own words". Sometimes what someone else has told you is only part of the story.
- Check the "raw counts" for the load input. *Refer to Section 7.5. "1460 FLA System Configuration Sheet" & Section 7.6. "Function Codes" for details.*
- The raw count shows what the actual load input is doing (i.e., like a signal strength indication). These raw counts are then manipulated in software according to the calibration data stored in the display to produce the readouts on the front panel. If the calibration has been done incorrectly, or the configuration is incorrect, or something else is wrong, then the front panel readouts e.g. LOAD value may provide you with misleading information.
- Cycle the sensor through a range, for example lift a load and check that the raw counts vary from a low value (around 200) to a high value, around 800.
- For correct operation, these raw counts must be in the range 33 to 999 for each sensor used. Anything outside of this range will produce an error.

6.5. Perform test with a Robway simulator, if available.

- A Robway simulator is a very quick way to verify if the fault is external to the display.
- It allows the input voltage to be easily varied without the need to physically move the crane or lift weights.
- If extension cables are used, try connecting the simulator both directly to the display and via the cable. If the results are not identical, suspect the cable as being faulty.

6.6. Consult the Manual and System Configuration Sheets.

- As most systems are highly customised, it may be necessary to consult the manual to identify peculiarities or variables, specific to that system.

6.7. Error Codes and Displayed Messages.

The following Error Codes cover both old and new versions of software. The old version error codes have four digits, while the new version codes have the letter "E" followed by three digits.

6.7.1. Error code 0010 (or E201)

This is indicating that the signal from the load sensor or transducer is too low. This should be confirmed by viewing the Amp 1 raw counts and noting that the "r" value is lower than 33.

Possible causes:

- Load cell signal wires shorted together.
- The signal + is shorted to the shield.
- The excitation - is shorted to the shield.
- The excitation supply is shorted together. This will obviously affect all of the external sensors. Measure the excitation voltage and compare it with the expected value. If this is the cause, the raw counts will generally be non-zero, but below 33.

6.7.2. Error code 0020 (or E201)

This is indicating that the signal from the load sensor or transducer is too high. This should be confirmed by viewing the Amp 1 raw counts and noting that the "r" value is higher than 999.

Possible causes:

- The load cell is disconnected or there is an open circuit in one of the signal wires.
- The signal - is connected to the shield.
- The signal + and the excitation + are swapped.
- The signal - and the excitation - are swapped.

6.7.3. Error code 0400 (or E240)

This is indicating that an overload has been detected. This error generally accompanies most other errors simply because most other errors will place the display into an overload condition. This being the case, you need to check what other errors are present and correct them first. Once these have been addressed, the 0400 (or E240) error generally takes care of itself. The exception is, of course, when the equipment has been put into a genuine overload situation, which has not been caused by any external faults.

Possible causes:

- A genuine overload condition exists.
- It has been caused by another Error code condition.

6.7.4. Multiple error codes on display (loss of calibration data)

Loss of calibration data can be determined when the system gets into fault during start-up, displaying multiple error codes. When the override (bypass) key is turned ON, the LOAD function on the screen will display high values (i.e., it will show the default factory setting values or uncalibrated data values).

This indicates a fault on the Dallas Chip (memory chip). Replace the Dallas Chip and recalibrate the system (or restore the calibration data if previously recorded). The Dallas Chip is available at Robway.

6.8. *Problems that Do Not Produce Error Codes/Messages.*

6.8.1. The load does not vary when weight is lifted.

- Check the raw counts while lifting a weight and check variation.
- If the raw counts did vary when a load was lifted, then check the calibration data. If the value entered was the same for both the light load and the heavy load, then the display will assume that any input represents the same load. If this is the case, then re-calibrate.
- If the raw counts did not vary when a load was lifted, then there may be a number of causes;
 - There may be an open circuit in the load cell excitation wires,
 - The fuse may be blown in the amplifier. Check the excitation voltages,
 - The load sensor is faulty. Check the resistance values. This does not give the complete story. Even if the resistances are correct, there is still a chance that a fault exists.

6.8.2. The load display is very erratic and displays massive changes in value.

- Check the raw counts for the load channel.
- If the counts are flickering by 2-3 counts while the display is changing by say a number of tonnes, then the cause is most probably calibration.
- One common cause of this is if different load values were entered for the high and low calibration without the actual load being altered (or there was an error in a load channel while calibrating). That is a heavy load was not lifted.
- In this situation, the calibration data is representing both the low load value and the high load value simultaneously.
- Recalibration is required. This can also occur if only part of the calibration procedure has been completed.

6.8.3. On start-up the displays are erratic, but settle during the day.

- This is a common sign of moisture ingress into the display, the connectors, the sensors, or the cable. These should be checked, dried and sealed.

6.8.4. The display does not start.

- Check the power supply. The recommended range for the systems is 10VDC to 40VDC.
-

7. Appendices

- 7.1. *Quick Guide – Operating Instructions for the Robway 1460 Load FLA Display***
 - 7.2. *General Arrangement Drawing, 1460 System***
 - 7.3. *Drawings (System Components)***
 - 7.4 *Motion Cut Connection***
 - 7.5. *1460 FLA System Configuration Sheet***
 - 7.6. *Function Codes***
-