



Silo Weigh II Pro

Models 1X3-2670-CAB3P and 1X3-2670-CAB5P

Installation, Setup and Operation

User's Manual Version 2.3

**Firmware to Ver. 3.1.9
November 27, 2023**

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Please read, follow, and understand the steps in this manual.
Failure to do so can result in a faulty installation, and erroneous readings

Should you have any difficulty in installation, operation or maintenance of your SiloWeigh II Pro system, our staff are available to help you during normal business hours and at any other time by special arrangement.

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1.0 Introduction

It is essential that you read the parts of this manual that apply to your installation. A check of the table of contents will show which parts these are; you will notice that out of the many variations in applications, you can read only a small part and learn what you need to know in a short time. If you don't read anything else, you MUST read the Sensor Installation Manual. Without reading this, your installation could easily be a failure!

This manual contains complete instructions for the setup and calibration of the SiloWeigh II Pro system. SiloWeigh II Pro tells you the weight of the contents of your vessel – not as an empty or full signal, or even a percentage full signal based on a level measurement. SiloWeigh II Pro measures the actual weight of the contents inside a silo to give a true picture of the amount on hand – and it costs little more than a level sensor. SiloWeigh II Pro can display the weight of practically any material such as cement, sand, aggregates, flour, mineral ores, coal, coke, chemicals, plastics, grains, food and animal feed products. **Specification – see section 9.0**

Main features:

- Displays one to six vessels on standard 3.5" (102mm) or 5.7" (145mm) display screen.
- Digital connection to transmitters at each vessel, connected by single cable.
- Symbols show level at a glance, % full and actual weight or volume in your choice of units (tons, gal. etc.).
- Level display changes color as alarm points are passed, to emphasize alarm condition.
- Dust and splashproof NEMA-4 (IP65) plastic wall-mount cabinet.
- Standard digital 24 VDC I/O allows connection to horns, lights etc. and optional relays allow isolated contacts to operate 110 to 250 VAC equipment. Standard analog outputs connect to control systems.
- CE and UL/CUL certified.
- Touch any vessel's display to switch to a trend graph of readings, zoomable in time.
- View average usage per hour and per day.
- Monitor amount of each delivery or scan back in time to verify that the correct amount was delivered.
- Record all data on USB memory for use in Excel files at a later date.
- Advanced predictive filter eliminates errors caused by rapid temperature changes.
- Operate in language of your choice: presently languages include English, French, Spanish, Chinese traditional and simplified. Contact us for availability of other languages and scripts including Thai, Japanese and Korean.

Digital outputs can be connected to alarms and lights, corresponding to a variety of alarm conditions. This allows a buzzer, light, or other peripheral device to be activated by the system, once specific configurable criteria have been met. SiloWeigh II Pro can also accept input from an external source such as a pressure sensor, via standard analog inputs, and can also monitor contact closures from security devices or pressure switches to trigger a warning message based on the input. SiloWeigh II Pro also allows viewing and control (with the appropriate passwords) from a network computer or WiFi connected smartphone/tablet computer.

Throughout the manual, warnings, cautions, and special notes are added to indicate a potentially hazardous condition, or to identify a potentially hazardous situation if not corrected.



Describes a condition that may prove to be harmful or fatal to either personnel, equipment or both.

NOTE:

Describes a condition which requires special attention.

2.0 Before you start

Please read, understand, and follow the steps relevant to your application in this manual. Failure to do so can result in a faulty installation, and erroneous readings.

Installation is simple and straightforward, with every step detailed, and presented in order. Anyone with a modicum of mechanical aptitude and manual dexterity can perform the installation. The installation is broken down into several steps, with each step being described in detail in a later section of this manual. The steps, in the order they are to be performed are:

- Installing the sensors
- Installing the cabinet
- Setting up the software
- Operating the system

Installation of the SiloWeigh II Pro system requires the use of a few basic tools. Ensure the installer understands how to use the tools, and that they are used in a safe manner. The less common tools are provided with the installation kit. Below is a list of the tools needed to perform an installation of the system, although in practice you may choose to use other tools if they make the job easier.

- Emery cloth or sanding discs (variety of grits)
- Drill
- 3mm, 5mm, 8.5mm and 13mm drill bits, or step drill (included)
- Center punch (included)
- M6 and M10 tap set (included where necessary)
- Digital Multimeter (must read millivolts, ohms, and megohms)
- 10mm & 17mm wrenches for M6 & M10 bolts & nuts
- Torque Wrench to fit 17mm nuts & bolts, with long socket if using weld tabs
- Small slot blade screwdriver
- Wire cutter and stripper (for #22AWG wire)
- Knife
- Tools for mounting the cabinet

2.1 Installation of sensors

Sensor installation, including L-Strain, Silex and liquid hydrostatic pressure sensors, have been moved to a new manual, **SiloWeigh Sensor Installation**, and removed from this manual as a result. Please ensure that the **SiloWeigh Sensor Installation** manual has been supplied with your kit.

3.0 Connecting from vessels to indicator

At this point in the installation process, the assumption is that the sensors, junction boxes, and DJBs have been installed, and wired to one another. If desired, the sun shields have been installed. If these steps have not been completed, the cabinets can still be mounted, but connecting the cabinet to the sensors will not be possible.

These steps will see the cabinet installed, and connected to the sensors, to your network, and to power.

3.1 Mounting indicator cabinet

Affix the metal mounting clips to the back of the cabinet with the supplied hardware. Mount the indicator cabinet on a convenient wall with the supplied wood screws. Any additional mounting components are not supplied by Scale-Tron and depend on the specific installation location.

3.2 Connecting DJB cables

Feed the cable coming from the DJB(s) through the strain relief into the cabinet interior. Cut the cable and strip 3 inches from the outer insulation. Remove the aluminum shield and use the cable jacket to insulate the shield wire. Note that the DJB can accept either 12- or 24-volt DC power. Connect the wires as follows:

Wire Insulation Color	DJB terminals	Indicator cabinet terminals
Red	12V+ or V+	24V+
Black	0V	24V-
Green	TR+ or A	TR+
White	TR- or B	TR-

Run the shield to the ground connector provided on the DIN rail.

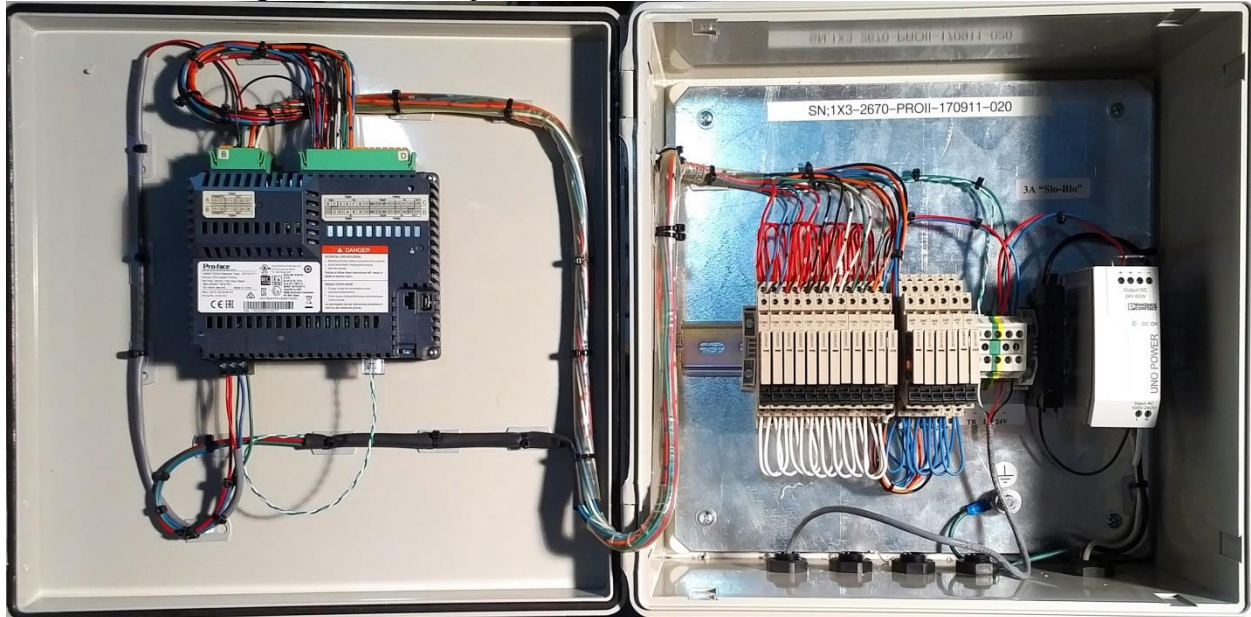


Illustration shows cabinet with incoming power and DJB cables. Digital Relay Option is shown installed.

3.3 Connecting Power

Connect the power cable to an AC outlet or to a dedicated junction box if permanent connection is preferred.

3.4 Grounding

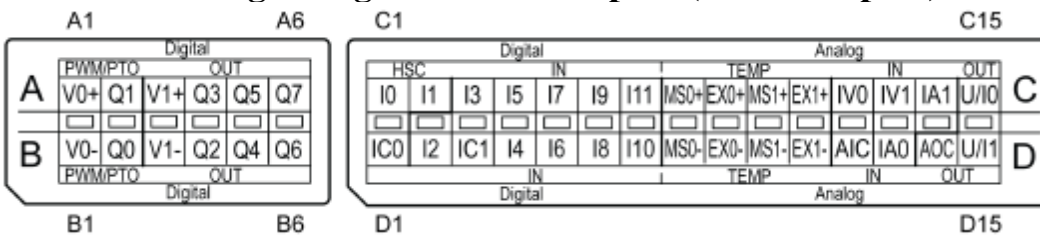
To avoid damage due to lightning or static build-up on the vessel, both the vessel and the display cabinet should be at the same potential. Run #10 or thicker wire from a convenient location on the silo structure to the GND stud inside the indicator cabinet. If this is not done, the system could be damaged during a lightning storm; this is not covered by the warranty.



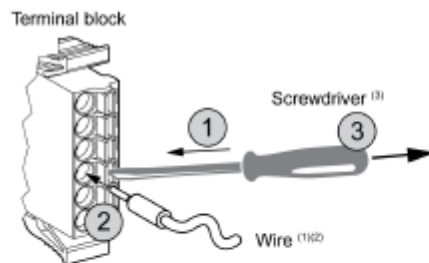
DANGER – DO NOT APPROACH OR TOUCH THE DISPLAY CABINET DURING A LIGHTNING STORM. The internal components are connected to the silo and can become charged with high voltages during these events. Flashover to your body can occur, with possibly fatal results. Lightning is dangerous – keep away from all

electrical devices.

3.5 Connecting to Digital Alarm Outputs (Direct outputs)



The SiloWeigh II Pro display unit includes digital and analog I/O as standard. These are connected through the connector on the top of the display unit; the terminal arrangement is shown above. All inputs/outputs are galvanically isolated, both digital and analog, as individual blocks with a common connection for each section.

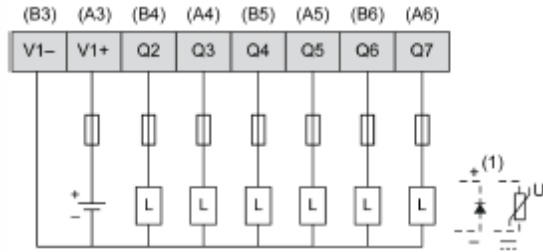


Use the following procedure to connect the wires to the terminal blocks:

Step	Action
1	Insert the screwdriver into the square-shaped hole. This will open the wire's round-shaped hole.
2	Hold the screwdriver and insert the wire into the wire's round-shaped hole.
3	Take out the screwdriver from the square-shaped hole. The round-shaped hole will then close, and the wire will be held securely in place.

NOTE:

To remove a wire, insert the screwdriver into the square hole and when the spring clamp releases, pull out the wire. Insertion is the reverse.

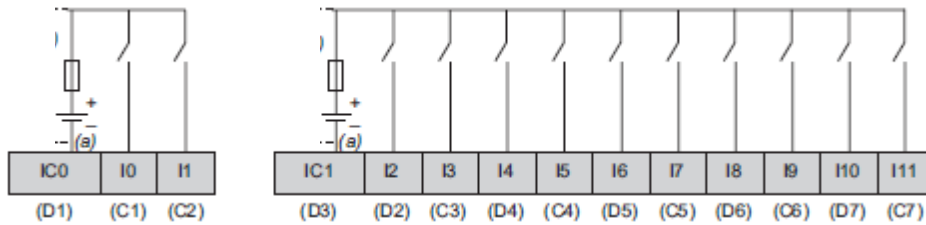


(1) Inductive loads such as relays, buzzers and solenoid valves require transient suppression – a rectifier diode or varistor should be connected as shown.

Connect the loads as shown, using fuses if extended wiring (outside the cabinet) is used. Note that the power 24 VDC + and – should be already connected to V1+ and V1- as shown above. If not connected, please connect as shown, to the power connector on the bottom of the display unit.

Outputs Q2 to Q7 can be connected to any combination of horn and lights and the outputs can be programmed in the Vessel Setup menu, where several or all alarms and several or all vessels can share the same output; for example, to operate a horn. Outputs can be set to be pulsed or continuous (See I/O Setup screen 4.4). If 110 or 220/240 VAC outputs are required, see Digital Relay Option, below.

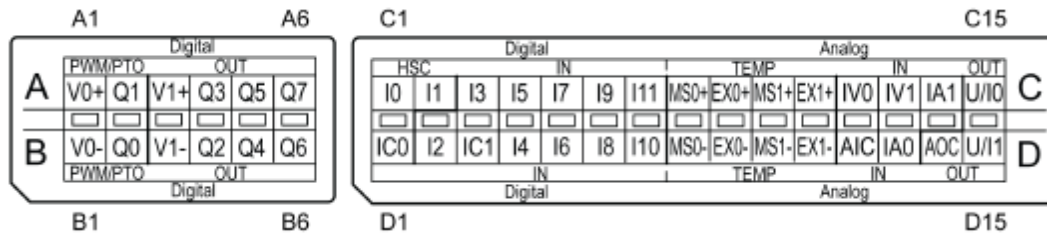
3.6 Connecting to Digital Reset and Warning Inputs



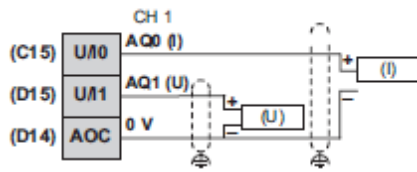
Connect input contacts as shown, using a fuse if extended wiring (outside the cabinet) is used. Note that the power 24 VDC – is already connected to IC0 and IC1 as shown above.

Input I0 can be used either as Audible Alarm Cancel or as an input for displaying warning messages. Input I11 can be used either as Master Alarm Cancel or as an input for displaying warning messages. Both these options are selectable on the I/O Setup screen, 4.4. If 110 or 220/240 VAC inputs are required, see Digital Relay Option, below. All inputs/outputs are galvanically isolated, both digital and analog, as individual blocks with a common connection for each section.

3.7 Connecting to Analog Outputs



Voltage and current outputs



Two analog outputs are available for transmitting vessel weights to a nearby control system. When more than two vessels require analog outputs, the two outputs are multiplexed, with two digital outputs defining the address for each set of two vessels in 10 second intervals for each pair. Multiplexed mode must be enabled on the I/O Setup screen, 4.4. When reading analog outputs in either binary or sequence mode, It is recommended that you sample the analog levels (store them in your control system) a short time after they change, to allow them to settle. The easiest method is to use a 1 second timer, triggered on positive or negative transitions of either address line, and store the analog values at the termination of the 1 second delay.

Binary Mode (for PLC addressing):

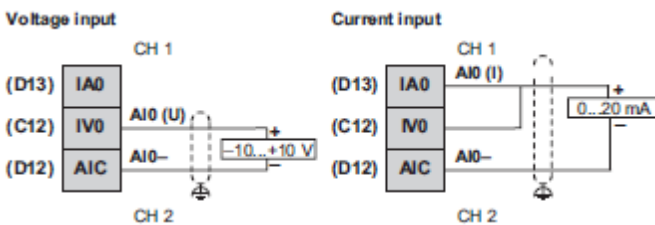
Address output Q6	Address output Q7	Output U/I0	Output U/I1
0 (low)	1 (high)	Vessel 1	Vessel 2
1 (high)	0 (low)	Vessel 3	Vessel 4
1 (high)	1 (high)	Vessel 5	Vessel 6

Sequence Mode (for use with relays):

Address output Q5	Address output Q6	Address output Q7	Output U/I0	Output U/I1
0 (low)	0 (low)	1 (high)	Vessel 1	Vessel 2
0 (low)	1 (high)	0 (low)	Vessel 3	Vessel 4
1 (high)	0 (low)	0 (low)	Vessel 5	Vessel 6

NOTE: The analog inputs and outputs can be set up to give 0 to 10V, -10 to +10V, 0 to 20 mA or 4 to 20 mA full scale for 0 to 100% capacity of each vessel. This cannot presently be set by the user and must be done at time of order or by reloading of the program file with USB memory stick. See 7.8 for details. All inputs/outputs are galvanically isolated, both digital and analog, as individual blocks with a common connection for each section.

3.8 Connecting to Analog Inputs



Two analog inputs are available for receiving vessel levels from either level sensors when weight measurement is not practical or pressure sensors for measurement in liquid tanks. When more than two vessels require analog inputs, they can be multiplexed, with two digital outputs defining the address for each set of two vessels in the following manner:

Binary Mode (for PLC addressing):

Address output Q6	Address output Q7	Input IA0 / IV0	Input IA1 / IV1
0 (low)	1 (high)	Vessel 1	Vessel 2
1 (high)	0 (low)	Vessel 3	Vessel 4
1 (high)	1 (high)	Vessel 5	Vessel 6

Sequence Mode (for use with relays):

Address output Q5	Address output Q6	Address output Q7	Input IA0 / IV0	Input IA1 / IV1
0 (low)	0 (low)	1 (high)	Vessel 1	Vessel 2
0 (low)	1 (high)	0 (low)	Vessel 3	Vessel 4
1 (high)	0 (low)	0 (low)	Vessel 5	Vessel 6

Note that when current (0-20 or 4-20 mA) input is used, terminals IA and IV for the related input must be connected together as shown.

Note that the analog inputs and outputs can be set up to give 0 to 10V, -10 to +10V, 0 to 20 mA or 4 to 20 mA full scale for 0 to 100% capacity of each vessel. This cannot presently be set by the user and must be done at time of order or by reloading of the program file with memory stick. See 7.8 for details.

NOTE:

If you need to view or activate digital and analog inputs / outputs, see section 7.17.1, I/O Monitor screen.

4.0 System setup

The SiloWeigh II Pro must be configured correctly before calibration is attempted. Failure to configure the vessel graduation size and capacity will result in incorrect calibration. Note that all parameters are stored permanently as soon as entered, even if power is subsequently lost.

4.1.0 Touch screen navigation and entry

Before viewing vessels or calibrating them, it is necessary to set up each vessel. The touch screen uses on-screen buttons for navigation between screen pages. These buttons show the symbol ► for advancing the page and ◀ for returning. The ⏠ button returns the user to the ‘Home’ screen.

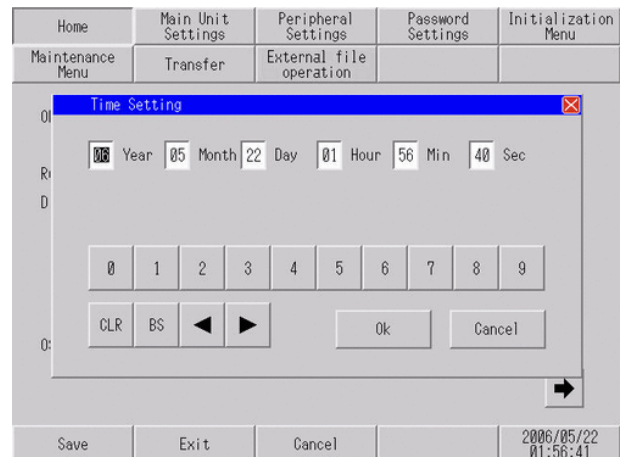
To enter a new value or change an existing one, touch the value field on the screen. This will cause a keyboard to appear for entry of alphabetic or numeric values, as shown at right. Enter the desired name or number, using the ALT button for numbers and symbols, CLR to clear the field and DEL to delete the last character entered.



4.1.1 Touch screen configuration menu

In order to modify various touch screen parameters that cannot be modified in any other way, they must be set in the following manner. These parameters are identified in the appropriate sections as “Touch screen setup parameters”.

At any time during regular operation, touch and hold the top right or top left corner of the touch screen (within 40 pixels of the edges), then immediately release the corner you were touching and touch the opposite corner (bottom left or right) to obtain the bottom menu showing OFFLINE and RESET. Touch the OFFLINE button to display the Setup menu, showing the Home settings.



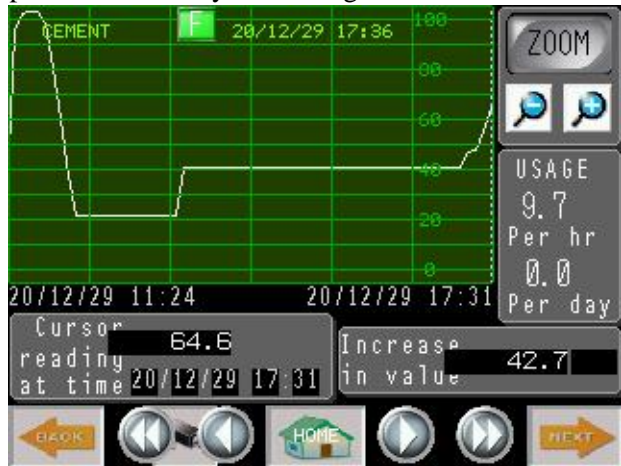
Time and Date - On the bottom menu bar is the time and date. Touch this area and the keyboard at right will appear. Touch any area and enter new values followed by OK and Save before exiting. Note that a time and date update menu has been added to the Vessel Setup screen, see 4.5.3.

Beeper On-Off – Touch Main Unit button followed by Operation. This displays the Buzzer Sound Enable and Disable buttons.

Analog Inputs and Outputs - The analog inputs and outputs cannot presently be set up for 0 to 10V, -10 to +10V, 0 to 20 mA or 4 to 20 mA. Touching Peripheral button, I/O Driver, STD4S Driver, I/O monitor, 4 – Analog output or 3 – Analog input and CH 1 and CH2 will display the setting and this can be forced to a different setting for testing, but it will revert to the factory setting when power is cycled off/on and cannot be changed permanently. Note that Default setting is 0-10V. For a different setting, the display must be reprogrammed with a USB memory stick. See section 7.8 for details and contact us for the password.

4.1.2 The camera button

At the bottom of most screens is the button at right. If a USB memory stick is installed, pressing this button takes a snapshot of the current screen and all displayed values. This can be used for fault diagnosis or recording of the values for later comparison or re-entry. The images are found in the folder named CAPTURE. The button flashes when the capture is successful. On the Home screen, this button is hidden under the Capacity display, vessel 1, and in the Alarm Log screen in the same position, top left hand corner of the screen.



4.2 System Setup 2 menu

The Setup menu is available on the touch screen. Touch any vessel's bar graph (vessel 1 is recommended as a starting point) and you will see the historical trend graph at right. Touch the ► button to view the alarm log. Touching the ► button again shows the password entry screen below. Enter the **level 2 password** (see appendix 10.1), and touch the ► button repeatedly until you reach the System Setup 2 screen below. Any value can be changed by touching the entry area and using the keypad that appears, followed by CLR, DEL or ENT. Each vessel should have a DJB already connected. Enter the total number of vessels (equals the number of DJBs) by touching the entry area. When a keyboard appears, enter the number followed by ENT.



Vibration (Raw values) filter - versions 1.4.0 and higher include a vibration filter to prevent repetitive vibration or electrical interference affecting the readings. This is technically a 2-stage "pseudo-average" filter. Default is 50%, which means that it will be 50% dependent on the last reading and 50% dependent on all previous readings. This gives a rise time of 10 seconds for one vessel. A value of 100% disables it and 10% will give a rise time of 50 seconds. Multiply these values by the number of vessels in use. Fast fills, indicated by the F indicator on the graph screen, disable this filter to allow the unfiltered values to show true weight as the vessel is filled.



Display filtered/unfiltered – On a temporary basis you can allow all home-screen displayed items (bar-graph, % full and weight value) to update every few seconds instead of waiting for the Filter Sampling Time for the next sample from the filter. This is useful for setup and testing or for product demonstrations. Touch the Display Filtered button; it will change to Display Unfiltered. The history graph screen remains unchanged. Do not forget to change

this button back to Display Filtered after completion of calibration. On removing power this reverts to the Display Filtered setting as default.

Filter active/bypassed – If necessary, you can permanently bypass the filter when fast response is required. Touch the Filter active button; it will change to Filter bypassed and the Display filtered button will change to Display unfiltered. This is a permanent change and will not reset at power down.



All normal applications for silos and bins require filtering. Only a very few special applications need fast response. Use your discretion.

Filter Sampling Time – The update rate on the Home and graph screens is fixed by the Sampling Time and the filtering parameters are related to it; if the sampling time is shortened, the filter parameters must all be increased in proportion. Refer to the Filter Settings section, 5.5 for details on how to set these parameters. Default Sampling Time is 5 minutes (300 seconds) and unless filter parameters have already been set, the default parameters will appear.

Average Hourly/Daily usage, averaging factor - The hourly and daily averages are technically “pseudo-averages” which are calculated from the last hour’s usage, modified with a falling percentage of all previous averages. To display ONLY the last hour’s usage, enter 100%. To smooth the average and make it less dependent on the last hour but more dependent on previous hours, enter a smaller value. 50% will be 50% dependent on the last hour and 50% dependent on all previous hours, with the most recent having the highest influence. Default is 50%. Filling the vessel is detected by an increase of 5% or more in the hour and disables the usage calculation for the hour(s) of fill. The daily usage is the sum of all the hourly totals, applied to the daily total with the same averaging factor as for the hourly.

Data error rate – Communication with the DJBs at the silos can create received data errors and a low error rate is an indication of system health. In comparison, high error rates indicate problems. It is recalculated every 30 minutes. We recommend an error rate of 2% or less. If your rate is higher, check for a forgotten DJB termination resistor, too long an RS485 cable, branched cable (must be daisy-chained or multi-drop single cable connecting all silos) or issue with radio link if used (see Sensor Installation Manual for RS485 cable or **Error! Reference source not found.** for radio).

4.3 System Setup 1 menu

Proceed to the next step by use of the ◀ button and work backwards through the setup screens.

Total Vessels – The maximum number of vessels to be displayed. This is automatically updated as new vessels are entered but a higher number can be manually entered if desired. If you touch a vessel that is not in use, the maximum number of vessels will be unchanged until the password is entered, when it will be changed. Editing the value is possible at any time, however.



Display alarm window – allows you to choose whether an alarm window appears. If you do not want alarms to be announced on the screen, press to show ‘Do Not Show Alarm Window’. Note that in this case, the only method to cancel the alarm outputs is by the hard-wired inputs.

On audible cancel – allows you to choose whether, when an alarm window appears on the main screen, cancelling the audible alarm will also make the window disappear. You can choose to leave the window visible and be able to operate the Master Cancel button later or make the window disappear and either leave the alarm active or cancel it via the hard wired input.

Backup all parameters to USB – You can back up the system settings, including all of the setup information described in this section plus the calibration data and any other pre-set variables, for safe keeping, transfer to a computer and for restoring all the settings if the display unit has to be repaired or replaced. It is also used when upgraded software is installed, which will erase all existing settings. For this you need a USB memory stick which has been formatted with a FAT file system (the usual format for PC computer use). Once the memory stick is inserted in the socket on the rear of the display, touch Backup all parameters to USB to transfer the data to the memory stick. The button will show Exporting during the transfer process and the lights at right will illuminate briefly. A Transfer OK or Error message will appear for a few seconds.

Restoring from USB – Follow the same procedure as above, using the memory stick holding the setup data. When the restore button is pressed, the setup data is transferred to the display unit. Error codes are as above. If reconstructing the folder from a computer, the file 00001_parameters must be contained inside a folder named Recipe.

NOTE: When restoring all parameters following a software update, the Restore operation must be executed twice. Wait a few seconds after completion before pressing Restore again.

USB Free Space – typically will show 61155 when available memory exceeds this number of Kbytes, and a lower number when less than this limit. Use this as a warning that the memory is almost full.

4.4 I/O Setup

Pulsed / Continuous - For each of the physical alarm outputs it is possible to choose pulsed or continuous operation. Pulsed is typically used when driving a horn or other audible device and it operates on a timed 3 seconds off, 1 second on basis. Continuous is used for illuminating lamps or passing the alarm to another control system. It operates continuously until reset from the on-screen button in the alarm window or the external input (see below).

Outputs 5 - 7 usage – Select either Alarm Output to use these outputs as alarm outputs or Analog Address (shown), which outputs the binary address of the analog channels being transmitted (see section 4.4).

Sequence / Binary – Select Sequence for outputs 7, 6, 5 to each activate for 10 seconds, or 6 and 7 only as a binary address (shown) – both are used for multiplexing the analog inputs and outputs (see section 4.4).





Analog outputs – Select 1 and 2 only to output vessels 1 and 2 continuously or All channels to output vessels 1 and 2, 3 and 4, 5 and 6 in sequence every 10 seconds with the binary address of these pairs of vessels appearing at digital outputs 6 and 7.

Audible Alarm Cancel – Select YES if a Cancel Audible Alarm button is connected to input address I-0. Select NO to disable it if the input is needed for another function. When this input is activated, the audible alarm output is suppressed but other (visual) alarms are still active.


Master Alarm Cancel – Select YES if a Cancel Audible Alarm button is connected to input address I-11. Select NO to disable it if the input is needed for another function. When this input is activated, all alarm outputs are suppressed until any new alarm appears, when the alarm window will be activated and the associated audible/visual alarms will be activated.

4.5 Vessel Setup

4.5.0 Input Setup

This must be repeated for each vessel connected to the display unit. Unlike the System Setup screens, the vessel setup screens are loaded with the data for the associated vessel when the user navigates from the Home screen to the following screens. If you have not already done so, use the  button to return to the Home screen and press the relevant vessel symbol to navigate through the vessel setup screens. Use the  button repeatedly until the DJB Setup screen at right is seen and verify that the vessel number is the one chosen.



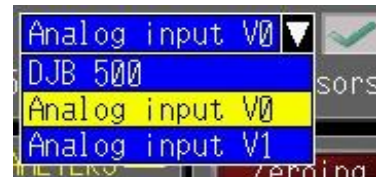
Input Type – Touch the Input Type entry area and choose from the following; press the  button to store your choice and verify that the new choice is shown below:

DJB500 for standard silo leg sensors with digital transmitters (default)

Analog Input V0 for the first analog input

Analog Input V1 for the second analog input

The two analog inputs are used for sensors with either 4-20 mA or 0-10V output. See sections 3.7 and 4.4 for connection and setup of these inputs. Note that only two analog inputs are available and if more than these are required, the address outputs must be used to switch the inputs in pairs with relays.





Filter Parameters – See Filter Settings section in Calibration.

Zero Button Enable – The Home screen includes buttons at the bottom of each vessel bar-graph for re-zeroing the displayed values when the vessel is empty. This is useful in applications where the display varies a lot or where an accurate weight is required over a short time period and long-term drift can be ignored, as in systems for weighing crane loads and asphalt silos with conveyors attached to the structure. If the Zero button for the applicable vessel is to be enabled, touch the Zeroing Disabled button. It lights green and shows Zeroing Enabled. Each vessel can be enabled or disabled individually.

Zero Band - Enter the desired Zero band (the positive and negative range within which the button is active, as measured from the initial zero point – as shown at power-up) as a percentage of vessel capacity. Outside this range, re-zeroing is not permitted. The range is based on the initial calibration and is not progressive, i.e. the range is not changed based on any previous zero setting. If the zero drifts out of range of the initially calibrated zero point, either the range must be increased or an Offset Adjustment must be done (Calibration section). To revert to the original zero value, power down and up; the true zero offset will be displayed when the first reading appears. To speed up the process, turn the display to “Unfiltered”, see System Setup 2 screen, 4.2.


4.5.1 DJB Setup

This must be repeated for each vessel or DJB connected to the display unit. Unlike the System Setup screens, which are common to all vessels, the vessel setup screens are loaded with the data for the associated vessel when the user navigates from the Home screen to the following screens. If you have not already done so, use the  button to return to the Home screen and press the relevant vessel symbol to navigate through the vessel setup screens for the applicable vessel. Use the  button repeatedly until the DJB Setup screen at right is seen and verify that the vessel number or name is the one chosen.



DJB address – Touch the DJB address entry area and enter the address given on the sticker in the DJB box at the vessel, followed by ENT. Typically these addresses start at 80 and are hexadecimal numbers between 80 and FF. Once the address is entered correctly, a response will be seen on the bottom line and numbers will appear in the Raw input and mV columns. Version 2.0.3 and later – data will blank if the DJB loses communication.

sensors per input – For each input of the DJB, enter the number of sensors connected. Typically in new installations a separate sensor should be connected to each input for vessels of 4 legs. A single sensor can be connected to any of the 4 inputs and if more than 4 sensors are used, it is acceptable to connect 2 or more in parallel to each input, when the value should be set to the number of sensors connected, e.g. 2. In the picture, a single sensor is connected to each input. If the display unit and DJB are replacing an existing installation with all sensors connected to a single cable from the vessel to the DJB near the display unit, connect this sensor cable to input LC1 and enter 4 or the number of sensors used. Enter 0 for all unused inputs. This type of connection will hamper attempts to find a faulty sensor, however, and older systems using the parallel connection should always be re-wired to separate inputs for each sensor where possible. Once values are entered, the Raw average field should show a value, as above.

This is a good time to re-check the mV values for each of the sensors. They should confirm the readings taken during sensor installation. Proceed to the next step by use of the  button or return to the Home screen.

Delay OK/Bad – this is an indication of the response time of the DJBs running in the system. If dangerously long, this will be indicated BAD (in red) from time to time.

Data OK/Bad – similar indicator based on the received transmission from the DJBs. The bottom line shows the received string as it is captured from the DJBs in the system; this can be used to diagnose transmission issues. You can check the Data Error Rate on the System Setup 2 page.

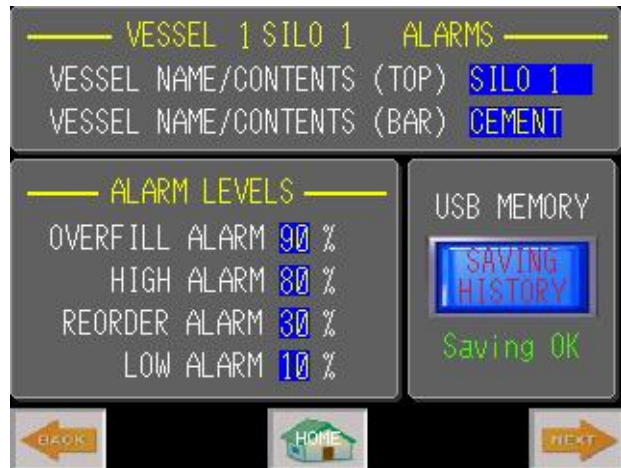
Chksm – The checksum is displayed in green at the end of the receive string and a lamp flashes green when the checksum is verified on reception. This should flash on every received DJB value.

NOTE: If a sensor has been found to be faulty, it can be removed from the system by disabling it here. Un-check the input for the faulty sensor. This will create a shift in zero reading or intercept which can be corrected by the Calibration Adjustment facility when the level in the vessel is accurately known, or when it is empty. The span or slope should remain accurate within 10% in most cases. This allows the system to be used while a new sensor is delivered and installed.

4.5.2 Vessel Names, Alarms

From the Home screen, touch the associated vessel symbol followed by the ► button to reach the password screen. Enter the Level 1 password (or level 2 password if going further than this setup screen, see appendix, 10.1) to reach the associated Vessel Setup screen. Check that the vessel number is correct before proceeding. Touch the Vessel Name/Contents (top) entry area and enter the vessel name or description, followed by ENT. This name will appear at the top of each vessel area on the main screen and all subsequent screens during entry of parameters. Repeat this process for the Vessel Name/Contents (bar). This name will appear in the upper central area of the vessel bar graph. You can use these two fields in any way you wish and you can experiment to see what it looks like on the Home Screen.

Alarm levels – Enter the levels, as a percentage full value from 0 to 100%, for which you want the appropriate alarms to be activated. When activated a window will appear, showing the vessel number, name and type of alarm, as at right. The High and Overfill alarms activate when the set level is exceeded and the reverse for the Reorder and Low alarms.



4.5.3 Vessel Setup

Before calibration can be started, the vessel setup information must be entered. This can be done before the DJB setup if you wish, but DJB or analog input setup must also be done before calibration.

Graduation size – Touch the entry area to display the drop-down menu and select a graduation size to suit the vessel capacity. Do not choose too fine a graduation size, since the display will seem to drift and be unstable with temperature changes; a good value is between 1/200 and 1/2000 of the capacity. For example, if capacity is to be 100 ton or 200 Klb, choose 0.1 (1/1000 of capacity) for the graduation size. Touch the \checkmark button to enter the value.

Capacity – Enter the capacity of the vessel for the material to be used, in the units of choice; for example, 100.0 ton as shown. Note that many vessels are designed conservatively and if you expect to fill it past the official design capacity, enter a value that is higher to ensure that your readings do not run off-scale before you stop filling; in the above example, 120 ton would be a good choice for a cement silo. Note that this entry can be changed later without affecting the calibration.

Units - Enter the Units of measurement (3 characters maximum). This is a free-form field. Examples are TON, Klb (thousands of pounds), Kkg, Lt, Gal etc. International convention is to not pluralize units (e.g. kg, not kgs and lb, not lbs).

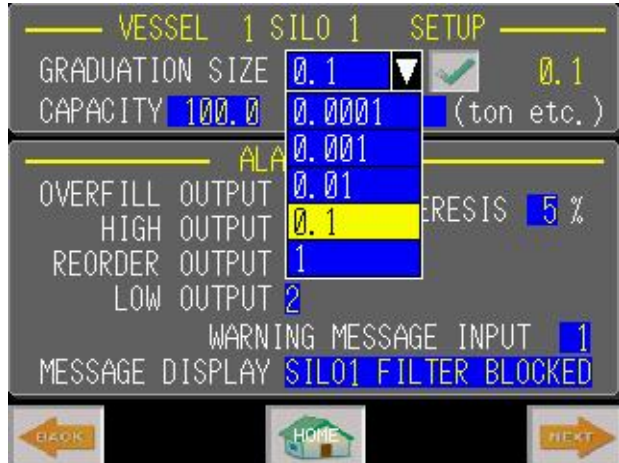
Hysteresis – this prevents any of the alarms chattering on/off when the weight value is continually crossing the alarm setting. Enter a value, in % of vessel capacity, which will prevent chattering with the expected variations as temperature changes. Recommended, (default) which is adequate in most cases, is 5%.

Alarm I/O – if you are going to connect devices such as horns and lights to the output terminals or you have the Digital Relay option D18, enter the output numbers (Q)2 to (Q)7, which refer to the output numbers marked on the I/O connectors. Note that more than one alarm can be connected to each output and the output will be activated when any of the alarms is exceeded; for example, a single horn, connected to (2) can be used for both Overfill and Low outputs, with High and Reorder left without any output (0) or connected to a second output (3) to activate a light or separate warning device.

NOTE: The alarm window will only be displayed if there is a valid output number entered; if you want to eliminate the need to see and cancel alarms, enter zero for all outputs.

Warning message – any of the available inputs 0-11 can be used to activate a 20 character warning message (can be in any language).

General usage: when the associated input is activated, plus a 5 second time delay to eliminate nuisance triggering, the associated warning message will appear. If this is cancelled but the cause is not eliminated, the message will re-appear every time the power is removed and reapplied.



Use with silo pressure switches: This is a feature that can be ignored if not required. In silos containing powdered materials such as cement, filters are used to prevent fine dust from escaping during the filling operation. These filters are typically cleaned by shaking occasionally but eventually will clog and inevitably will rupture if not replaced. By installing a pressure switch and connecting it to one of the spare inputs it is possible to display a warning message which appears as a window when the input is activated. Pressing the window's Cancel button deletes the message but it will reappear each time power is removed and reapplied, until the input is de-activated. Enter the input to be associated with the vessel's switch and the message you wish to appear (20 characters maximum). This feature can also be used for other contact activated events, such as security door switches etc.

Date and Time: For convenience, a method to update these without need to access the System Setup screen has been added to the Vessel Setup 1 screen. You can view the current time/date on the DJB Setup screen. If setting is necessary, enter the values here.



5.0 Calibration

5.1 Calibration, Single Vessel

Navigate to the Vessel Calibration screen: from the Home screen, touch the associated vessel symbol followed by the ► button to reach the associated Vessel Calibration screen or continue from the previous setup screen. It is possible to calibrate vessels that are single, divided or on a shared frame (see appropriate section). For Vessel Type, select Single Vessel and touch the ✓ button to enter the selection.

The calibration process depends on two things: your estimate of the amount remaining in the vessel (zero if the vessel is empty) and the amount of the fill. If the fill is from a truck (or trucks) that is weighed before and after, the weight is accurately known. For best accuracy, always record the Low value immediately before the filling process and record the High value immediately after the filling process, to minimize any error due to temperature change. Note that any Adjustment values (bottom of screen) are cancelled during a calibration, to eliminate confusion later.

NOTE: The calibration can be done in any order at any time. You can enter a zero or Low value and exit. The low value is then stored and you can re-enter the calibration program at a later time and go straight to the High (Full) calibration setting. Likewise, if the vessel is part or completely full and you know the contents accurately you can do the High value calibration first, then empty the vessel and complete the Low value calibration. If material is used from the silo as it is being filled, note the quantity accurately and deduct this from the total when entering the High value.

If a calibration has been recorded previously, the boxes will be filled with values, as shown, and both ‘Enter high value’ and ‘Enter low value’ sections will have both weight and raw values visible. It is not necessary to clear the current calibration values since any new calibration overwrites the old but record the Offset and Slope values before you start; they can be re-entered if your calibration fails. The ADJUST fields at lower right will be cleared automatically when a new calibration is started. Following all calibrations, your settings will be transferred to the Previous Calibration on the previous page and backed up on the USB memory if installed.

5.1.0 Enter Low Value

Before proceeding with calibration, access the DJB Setup screen and write down the mV and Raw readings for all active inputs in the Calibration Table, section 10.4, for use later.

The Low Value line is highlighted in RED on the picture. Touch the ‘Enter low value’ box and enter your best estimate of the contents of the vessel, in the units you already selected (e.g. ton), at its current low level. The more accurate the estimate, the more precise the calibration, although the calibration parameters can later be tweaked to accommodate an inaccuracy in the estimate. Press the STORE and CONFIRM buttons; note that the raw value next to it changes and the Low Stored message is displayed.



Use a USB flash memory and the Camera button (section 4.1.2) to record the DJB SETUP screen at this point, or record all values on paper, before the next step.

5.1.1 Enter High Value

The High Value line is highlighted in YELLOW on the picture. Wait until a known quantity of material has been deposited in the vessel. It is critical that the quantity being deposited is known accurately. The larger the quantity of material deposited, the more precise the calibration will be, but filling should always be done over a period of 2 hours or less if possible, to minimize temperature induced errors.

Touch the 'Enter high value' box. Enter the new contents of the vessel, in the units you already selected (e.g. ton), including both the original (low value) plus the delivered material (minus estimated usage). Use the calculation in the Calibration Table, section 10.4 for convenience. Press STORE and CONFIRM buttons; note that the raw value next to it changes and the Calibration Complete message is displayed. Calibration for the chosen vessel is now complete. Record the mV and Raw readings for all active inputs from the DJB Setup screen, 4.5.1 in the Calibration Table, section 6.10. Check that the difference between Low and High Raw values is at least 1000. If less than this amount, the output from the sensors is insufficient. If it is less than 292, the error message appears and prevents calibration. Recalculate the stress using the Stress Calculator and verify that all the sensors are connected exactly as detailed in the Installation section. Check the mV values of all active inputs from the DJB Setup screen, 4.5.1; if the change from low to high value is less than 0.2 mV in the positive direction for increasing weight, this indicates a fault.

The Offset and Slope values shown at the bottom left of the screen are calculated from the calibration values and stored in permanent memory. Following all calibrations, your settings will be transferred to the Previous Calibration on the previous page and backed up on the USB memory if installed.

Record these values for each vessel in the Calibration Table or use the camera button to record them on the USB memory stick and place inside the cabinet for use if the touch screen has to be replaced at any time in the future.

Repeat the process for each additional vessel to be calibrated.

Use a USB flash memory and the Camera button (section 6.10) to record the DJB SETUP screen at this point, or record all values on paper, so that we can diagnose any faults if your calibration fails.

NOTE: Once you have saved the information, we strongly recommend keeping a backup. See section 4.3 for details.

5.1.2 Calibration issues and remedies

Simply explained, the Low and High settings can be entered in either order – low, then high (the usual) or high, then low (if your known weight is being discharged from the vessel). It is critical to enter a Low value which is lower than the High value and touch the STORE button in the Low area (shown in red) when the weight or volume is low and touch the STORE button in the High area (shown in yellow) when the weight or volume is higher. Note that divided silos must be done in the order specified.

If your Slope value, at bottom, shows as a negative number, either the sensors are connected incorrectly or the calibration has been reversed. Please read and try again or call Scale-Tron's Service dept. for help.

If you forgot to set the capacity, or you want to set a higher capacity (see 4.5.3) after calibration is complete, it is safe to change it (unless your vessel is a divided silo). The only things affected by a different capacity value are the % readings on the bar graph, the bar graph itself and the trend graph. The weight readings remain unchanged.

Other common errors will display error messages above the STORE buttons:

- High value = Low.** You have entered the same values for both Low and High weight values. Please check and re-enter.
- No raw input.** The DJB for the vessel must be reporting before calibration can take place. View the DJB setup screen and correct the problem, then start calibration again.
- Weight change low.** Warning that your entries for the Low and High values are too close for accuracy. Try to sequence deliveries to the vessel which create an increase or decrease of 20% of capacity or greater.
- Raw diff <0.07mV.** The difference in raw value is not enough to give an accurate calibration. If a delivery or discharge of 20% of capacity or more has been made, the raw value should have changed by more than this.

See section 7.0 for troubleshooting.

5.1.3 Direct entry of Offset and Slope values

For convenience when replacing the touch screen or after other catastrophic events, the Offset and Slope values can be entered if they are already known or recorded after a successful calibration. Although these values are shown in “Display Only” format, touching their values brings up a keyboard and the values can be changed. **Take great care not to erase existing values.** Since all transmission from vessels is digital, replacement of the touch screen or DJBs does not change the calibration settings and they can be re-entered with confidence. If only the Raw Average or mV values were recorded, these can be used to calculate new values for slope and offset; see 10.3, Manual Calibration Method.

5.1.4 Direct entry of Raw calibration values

Versions 1.5.2 and higher have the ability to directly enter values for both the calibration Low and associated Raw values and the High and associated Raw values. Although these values are shown in “Display Only” format, touching their values allows them to be changed. **Take great care not to erase existing values.** After entering one or more values, touch the RECAL button at upper left. The Confirm / Cancel window will appear, allowing you to cancel if this was a mistake. If you touch Confirm, the edited values will be used to calculate a new Slope and Offset. Be sure about this before proceeding.

5.1.5 Calculation of slope and offset

Very rarely, the stored parameters file can be corrupted. If the Low and High values are shown, with their corresponding Raw values, it is possible to calculate the Slope and Offset from the following formulas and enter them manually in the Slope and Offset fields:

Wt(hi) and Wt(lo) are the weight values in the blue fields and Raw (hi) and Raw (lo) are the raw values shown in yellow.

$$\text{Slope} = [\text{Raw (hi)} - \text{Raw (lo)}] / 10 * [\text{Wt (hi)} - \text{Wt (lo)}]$$

$$\text{Example: Slope} = [10826 - 3360] / 10 * [45 - 5] = \underline{18.665}$$

$$\text{Offset} = \text{Wt (lo)} - [\text{Raw (lo)} / 10 * \text{slope}]$$

$$\text{Example 5} - [3360 / 186.65] = \underline{-13.001} \quad \text{Be careful if you have negative numbers!}$$

NOTE:

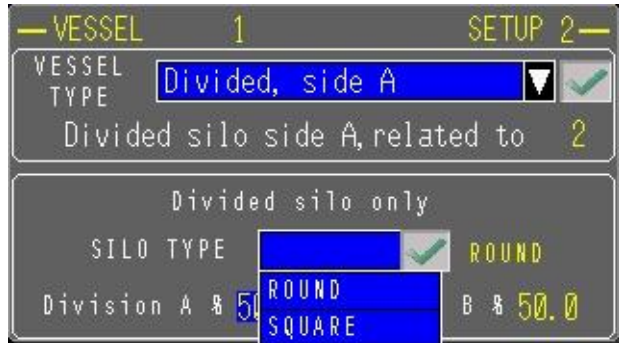
Once you have saved the information, we strongly recommend keeping a backup. See section 4.3 for details.

5.2 Calibration, Divided Silo

The Divided Silo is a special case where the silo has a division, making two compartments with separate outlets and inlets. The angle of the division relative to the legs is not important but the legs must be wired correctly in reference to this division and the contents of each partition (see Sensor Installation Manual).

NOTE:

Calibration of a divided silo is more critical than for regular or shared frame silos. For this reason, you need to start with both compartments empty or nearly empty and have a delivery ready for each compartment in turn, within as short a time as possible, to minimize errors. The calibration can be done in any order. First, you need to save the Low value for both the compartments. You can then exit the calibration screen if you wish, re-enter at a later time and go straight to the High calibration setting for either compartment. *Unlike the single vessel calibration however, you cannot do the High value calibration first, then empty the vessel and complete the Low value calibration. Likewise, you cannot take any material out of either compartment until the full calibration for both compartments is complete.*



A divided silo is set up as two consecutive silos, for example: silos 1 and 2 or 2 and 3 etc. On the Home screen, touch the symbol for the lower of the two silo compartments (example: Vessel 1 if using 1 and 2) and navigate to the Vessel Setup screen. This vessel must always be the smaller of the two if they are unequal. The screen will not accept values greater than 50%. Enter the graduation size and capacity, plus the other related information for this vessel. Touch ► to access the Setup 2 screen. Touch the drop-down menu at top, choose Divided Silo and touch the ✓ button. Verify that “Divided silo” is confirmed, with the number of the related vessel displayed. The Related Vessel is the other half of the divided silo and is always the next higher (and larger) vessel in the Home screen. Note that the section below the Vessel Type now appears, to allow entry of the related parameters. Check the diagram in the Sensor Installation Manual and enter the division percentage for the first (smaller) partition (A) and the type (round or square), storing with the ✓ button; note that the partition size for side B is calculated. Repeat these settings for the related vessel but do not select Divided for this side – this is automatically selected as the related silo.

Select the Calibration screen for either side of the divided silo, enter the Low value if not empty, or zero, repeat for the related silo and touch the Low value STORE and CONFIRM buttons when on either vessel. This stores the Low values for both sides; the message “Low Stored” confirms the action. There is no need to press Store for the related silo but you can change the Low values and press the Low Store button as many times as you wish, to cancel any variations or changes in Low value prior to filling. Once the High

Store button is pressed, Low Store cannot be repeated. Do not use out of either side until calibration is complete. Note that if power is lost at any point during calibration, the readings are preserved and calibration can be resumed when power comes back again.

Either compartment can be filled first – the order of filling is not important. Wait until a known quantity of material has been deposited in the first compartment. It is critical that the quantity being deposited is known accurately. The larger the quantity of material deposited, the more precise the calibration will be, but filling should always be done over a period of 2 hours or less if possible, to minimize temperature induced errors and this is more critical with divided silos.

Navigate to the Calibration screen for the compartment being filled. Enter the new contents of the vessel, in the units you already selected (e.g. TON), including both the original (Low value) plus the delivered material and touch the High value STORE and CONFIRM buttons; note that “1st High stored” is displayed. Calibration for the first compartment is now complete, but no results will be displayed yet.

Repeat the process for the second compartment, filling it as quickly as possible to reduce possible errors and navigating to the second compartment’s Calibration screen before entering the weight. Touch the High value STORE and CONFIRM buttons; note that “Calibration complete” is displayed. Set Display Unfiltered on System Setup 2 screen, or touch the Filter Refresh button on the Filter screen. Exit to the Home screen and verify that the correct values now appear. No values will be shown on the Home screen or Calibration screen until the Calibration Complete message is seen.

While the Low values can be stored any number of times, compartments can be filled in any order and the first compartment Store can be re-entered any number of times, the second compartment Store can be entered once only and will be locked out for the 10 second Cal. Complete display time. After this, the process must be started from the beginning with empty or mostly empty compartments. If calibration is inaccurate and you have minor errors in either the zero offset or slope, you can use the Offset and Slope Adjust entries to correct them. Following all calibrations, your settings will be transferred to the Previous Calibration on the previous page and backed up on the USB memory if installed.

5.3 Calibration adjustments

When calibration has been completed, allow several days of operation and check incoming deliveries or outgoing shipments against the changes in weight indicated by the system. If possible, run the vessel to completely empty, or if this is not possible, to a known level that can be estimated to the accuracy required by the system. This will give you two values that can be used to adjust overall accuracy, as follows:

Navigate to the Vessel Calibration screen: from the Home screen, touch the associated vessel symbol followed by the ► button to reach the associated Vessel Calibration screen or continue from the previous setup screen.

5.3.0 Adjust zero offset

This adjusts the reading when the silo is empty. If you know that the reading is in error by a fixed amount across the whole range, an offset adjustment is necessary. The adjustment should be equal and opposite to the error; for example, if readings are known to be consistently high by 5 tons, the correction amount should be -5.

In the Offset row, 'Adjust' box, enter the adjustment value as a number without sign or with negative sign if the adjustment is to be downward (e.g. -5 ton in the text example above). Do not use the RECAL button; values take effect immediately.



Click ENT and verify that the Current value changes as expected. Your setting is transferred to the Previous Calibration settings on the previous page. Note that all adjustment values are cancelled during a subsequent calibration.

5.3.1 Adjust slope at current value

This adjusts the reading when the silo is part full, holding the empty reading steady; it alters the slope of the calibration line, giving a correction that increases as the reading increases. Since this correction is dependent on the reading, it is based on the reading at the current value and the correction at other weights will be different in proportion.

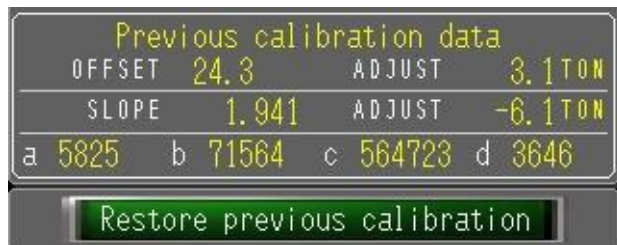
Example: If reading is 7 tons high at the current reading of 81.8 ton, make the adjustment value -7. The reading at 100 ton will change by $100/81.8 \times 7 = 8.56$ ton.

In the Slope row, 'Adjust' box, enter the adjustment value as a number without sign or with negative sign if the adjustment is to be downward (e.g. -7 ton in the text example above).

If both zero and current value are to be adjusted, they can both be entered at the same time. However, the full scale adjustment assumes that the zero offset has already been corrected – in other words, they are independent. When calculating the current value adjustment, make your Offset adjustment first. Then watch the display change in the 'Current value' box and make your change to the NEW current value. Your setting is transferred to the Previous Calibration settings on the previous page. Note that all adjustment values are cancelled during a subsequent calibration.

5.4 Restore previous calibration

If the latest calibration has been lost (due to Asynchronous Mode selected on GP Viewer etc.) you can restore the previous calibration from the Silo Setup 2 screen. This data is not shown if you have a divided silo (changing the vessel type to Single Vessel will display the data), otherwise the action is the same. After verifying that the current calibration is faulty, press the Restore Previous Calibration button and, after verifying your action, press Confirm. The Offset and Slope values shown above the button will be transferred to the calibration values on the Calibration page.



5.5 Weather filter settings

The filter samples the vessel data on a programmable time interval and the bar-graph display updates at this same interval. The history trend graph samples this filtered data every 345 seconds, or 5.75 minutes, in order to match the 24 hour/12 day display grid of the graph.

It is possible to see the instantaneous data by use of the Display Filtered / Unfiltered button on the System Setup screen. Default is to display filtered data but touching this button changes the display to the current readings, with only a few seconds delay, for testing when necessary. The display reverts to Filtered data when power is lost.



‘Filter parameters’ determine how the readings and graph are derived from the raw values. Since fast temperature changes caused by the sun can affect the readings and cause temporary errors, the advanced filter in the SiloWeigh II Pro software has been developed to hold the readings steady during these fluctuations. SiloWeigh is the only system to have this type of advanced reading correction. When a real change occurs, the filter recognizes it and responds with very little delay. How it responds can be altered by the settings of the parameters. Recommended default values for average silos using L-Strain or Silex sensors are shown in bold type.

NOTE: The “R” parameters are dependent on the Filter Sampling Rate, in the System Setup 1 screen, and defaults shown below are based on the default Filter Sampling Time of 300 seconds (5 min.). If the sampling time is made shorter, R+ and R- should be increased in proportion, and vice versa. Example: If Filter Sampling Time is set to 150 seconds in place of 300, default for R+ should increase to 60. L+ and L- are not affected except for L+ relationship to fill rate.

‘L+’ – filling threshold value, above which the filter response is made much faster. Use the default value as a starting point and watch the result over a few days. Check that the filtered value follows the raw value.

Value = 6	Fill rate of 2 to 10 % of capacity per minute
Value = 2	Fill rate of 0.5 to 1 % of capacity per min.
Value = 1	Fill rate of 0.1 to 0.5 % of capacity per minute
Value = 20	Parameter disabled (full filtering)

Always use the maximum value, consistent with the filling error that you find acceptable. Recommended values are for a 100 ton capacity cement silo which receives deliveries of 25 to 30 tons over a 40 to 60 minute period. The fill indicator, F, on the trend graph page can be used to check for fast fills and adjust L+ accordingly. During a fill, check that the fill indicator is lit during most of the samples (but not necessarily all samples), at intervals set by Filter Sampling Time. Adjust L+ to meet this condition. *These values are thresholds and are not totally dependent on Sampling Time.*

‘L-’ – discharge threshold value, below which the filter response is made equal to the R-value. Use the default value as a starting point and watch the result over a few days. Always use the most negative value, consistent with the error that you find

Value = -0.7	Discharge rate of 5 to 10 % of capacity/hour.
Value = -0.5	Discharge rate of 0.5 to 4 % of capacity/hour.
Value = -0.1	Discharge rate of 0.02 to 0.2 % of capacity/hour.
Value = -9.9	Parameter disabled (full filtering)

acceptable. Values are recommendations only. Contact our office for a full no-cost analysis. ***These values are thresholds and are not dependent on Sampling Time.***

‘R+’ – determine how closely the readings follow the raw value during stable periods, slow increase or decrease. Smaller values will allow it to follow more closely with less time delay but will increase the possibility of response to temperature fluctuations. Always use the maximum value, consistent with the reading delay that you find acceptable. ***Values are dependent on Sampling Time and weather.***

Value = 100	Rise/fall time of 100 hours
Value = 30	Rise/fall time of 30 hours
Value = 1	Rise/fall time of 1 hour

‘R-’ – controls how closely the readings follow the raw value during discharges greater than the L- threshold. A value of 5 is acceptable for discharges of less than 2% per hour. For discharge rates of 5 – 10% per hour, values of 1 to 3 will give delays of 15 min to 1 hour. Results are somewhat related to the R+ and L- values.

Value = 10	Delay of 2 hours
Value = 2	Delay of 1/2 hour
Value = 1	Delay of 15 min.

To disable all filtering (filtered = raw values), Go to SYSTEM SETUP 2 screen and set the FILTER ACTIVE button to FILTER BYPASSED.

Repeat the process for each additional installed vessel.

Check your settings by touching the **Tuning Mode** button, placing it in the Tuning Mode ON position as shown. This will display the unfiltered readings on the Trend Graph screen as a blue line, allowing you to verify the accuracy and delay mentioned above.

As an extra tuning aid, for the difficult cases, we can enter your recorded data on a special spreadsheet and optimize the values. This is presently a no-charge service. First, add a USB memory to your display. Find and press the SAVE HISTORY button on any VESSEL ALARMS screen (first screen after password is entered). The system will record the raw input values for all vessels. We need a week or more of these values, including a period with little or no weight change. From the USB memory, send us the file named SA00001.csv or similar, found in your USB memory folder. Example: G:\SAMP01\00000.

Refresh – Updates the filter for the selected vessel to equal the raw (unfiltered) value.

NOTE: Once you have saved the information, we recommend keeping a backup. See section 4.3, Backup to USB to backup all setup parameters on a USB memory stick. Keep it in a safe place in case your display unit is reprogrammed or needs replacement.

5.6 Vibration filter

This filter is positioned ahead of the Unfiltered value, therefore the unfiltered values show the result of the vibration filter. Its 2-stage pseudo-random operation eliminates foundation vibration and wind effects which can cause rippling of the unfiltered values and upset the weather filter in extreme cases. The default setting is 50%, which is adequate for most applications, giving a rise time of 10 seconds for one vessel. A value of 100% disables it and 10% will give a rise time of 50 seconds. Multiply these values by the number of vessels in use. Fast fills, indicated by the F indicator on the graph screen, disable this filter to allow the unfiltered values to show true weight as the vessel is filled.

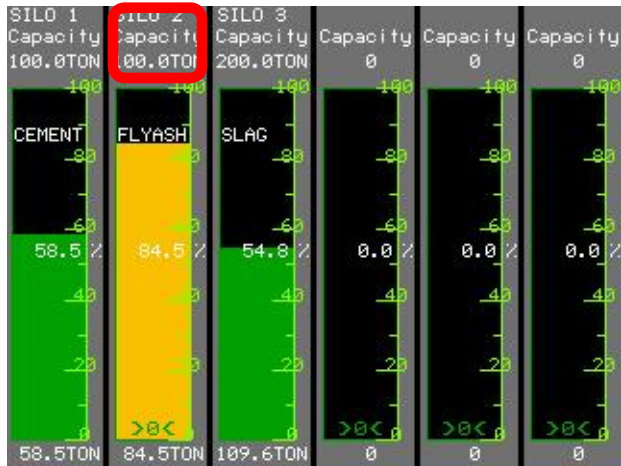


6.0 Operation

Once the system has been installed, configured, and calibrated, regular operation may begin.

6.1 Language

When first powered up, the initial screen is displayed, giving company and product information as well as the Language drop-down menu. Touch anywhere in the entry area, choose the language of operation and touch the \checkmark button. Touch the bottom button to close this screen and access the Home screen. It can be accessed again to change language by touching a hidden button above the Vessel 2 bar on the Home screen. The area above vessel 1 is the Camera button (see section 6.10).



6.2 Home Page

On the Home page, a single bar display is shown for each vessel that has been added to the system. The level of the bar indicates the level of material in the vessel. Depending on the active alarms, the color of the bar will change. Red indicates Overfill or Low level. Orange and Yellow indicate High and Reorder levels. This screen is likely to be the most used screen when observing the level in all your vessels. The title at the top usually shows the vessel name, which is followed by its capacity and units of measure. On the bar you will see the vessel contents or other information and further down is the current fill amount in % of capacity. At the bottom, the weight/volume is displayed in the chosen units of measure.

Also at the base of each vessel is the re-zero button, shown by ">0<". If re-zeroing has been enabled and the value is within the Zero Band in the Vessel Input Setup screen, touching this area will re-zero the displayed weight, percentage and bargraph. If the value before re-zeroing was outside the Zero Band, based on the initial (non-re-zeroed value), nothing will happen. To view the true value (before re-zeroing), remove and re-apply power.



6.3 Alarm and Warning windows

Whenever one of the bars shows an alarm level (color changes), a window opens showing the vessel number and applicable alarm. The assigned alarm output is activated and a horn, if connected, will sound. This Audible Alarm can be silenced by touching the Cancel Audible Alarm button or operating the external input, if connected. A visual alarm lamp, if connected will still continue to show the appropriate alarm and the window will still be visible if this choice was made in the System Setup section, allowing you to operate the Master Cancel button later, or external input at any time.



The Warning window operates when the selected external input is energized. This can warn of filter blockage by monitoring air pressure, door closure from a door switch etc. This warning will not activate an alarm output and disappears once cancelled. If still activated it will reappear if power is cycled down/up.

6.4 Input Error Warning

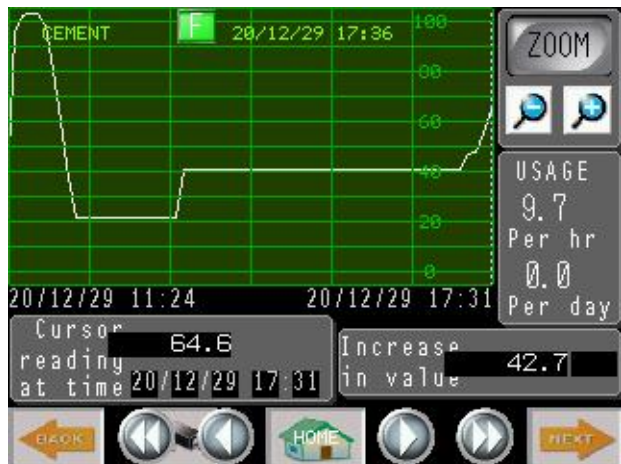
If communication between any DJB and indicator cabinet is lost, a message appears in the affected bar-graph on the Home page. If this is displayed, proceed to section 7.0, troubleshooting or check 4.5.1, DJB setup.



6.5 Trend Graph

If you would like to see more information about a particular vessel, touch the associated bar. A new page showing the historical trend graph appears.

From this screen you can see the history for the chosen vessel. The line graph displays the level history. The time period for which the history is graphed is normally 24 hours in intervals of 4 hours but this can be adjusted using the ZOOM button. Touch ZOOM followed by the + or - button to zoom in or out in time. Zooming-in halves the time range for every touch while zooming out reverses the process, the last step giving a 12 times change to show 12 days in the same graph. The horizontal scale is divided into 6 equal time intervals while the vertical scale is % of capacity and shows 5% below zero and 5% above capacity plus 10% intervals. The green indicator at the top signifies a fill when lighted, with the symbol F to denote filling.



Average Hourly/Daily usage

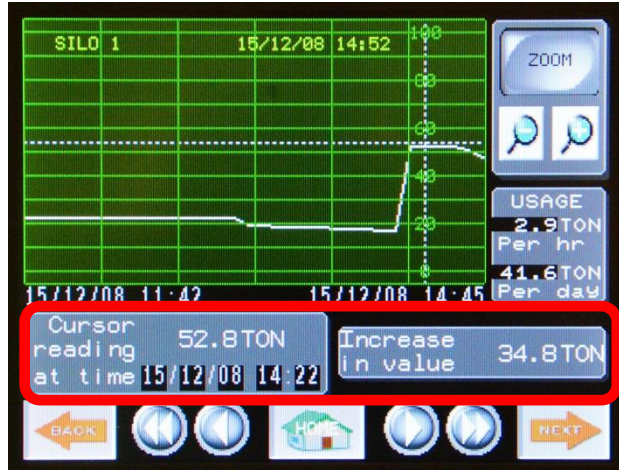
The hourly and daily averages are calculated from the last hour's usage, modified with a falling percentage of all previous averages as detailed in section 4.2. When a fill is detected, the usage values are disabled until the weight starts falling again.

Fast Fill indicator

The 'F' indicator at the top of the graph illuminates when a fast fill is taking place. You can use this indicator to adjust the filter L+ value during a fill. Just be aware that it takes 2 x the filter sampling time to reset.

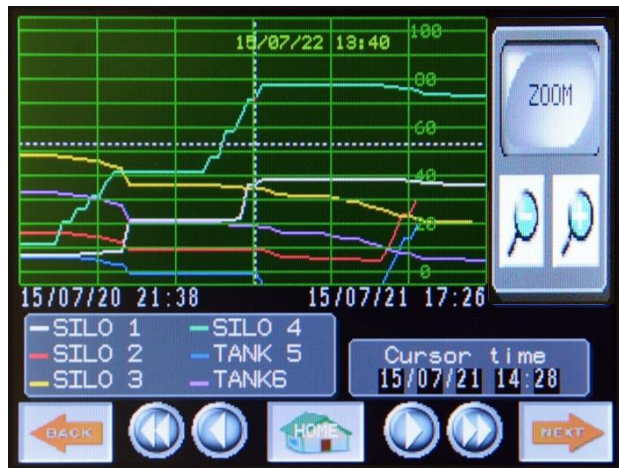
6.6 Delivery Measurement

Use the ZOOM button to access the cursor function; you will see dotted cross lines appear on the screen. Use the ◀ and ◀◀ buttons to navigate to the position of interest and touch a point before the filling operation has started, which will position the cross lines at the position chosen. Ignore the horizontal line; it is not used. Note the reading of weight/volume and its associated time in the box below the graph. Continue by touching a point after the filling operation; note the new value and the Increase in value shown in the box at right (34.8 ton in the picture). Remember to manually add any known usage (from batch records) during this time interval to determine the actual delivery amount.



6.7 All Vessels Trend Graph

When in the Trend Graph page, touch the NEXT▶ button to display all vessels on one graph. Graphs are color coded with the color legend shown below the graph. The same zoom features apply to this page as available on the previous graph page, although the delivery measurement is missing. You can zoom and touch any position to display the date and time at which an event occurred.



6.8 Alarm Log screen

When in the Trend Graph page, touch the NEXT▶ button to display the Alarm Log. This shows the history of all alarms for the chosen vessel since the last time cleared, with date, time and type of alarm, which can be cleared or edited as below:

START – initiates editing. Use the ▲ and ▼ buttons to scroll and navigate to the desired alarm, or just touch desired entry.
 EXIT – terminates editing.
 CLR – deletes highlighted entry.
 CLR ALL – deletes all entries.
 ACK, ACK ALL – not presently used.

6.9 Vessel Alarms screen

When in the Alarm Log page, touch the NEXT▶ button to display the Vessel Alarms page (Level 1 or 2 password required for access). Check that the vessel number/name is correct before proceeding.



Vessel Name/Contents (top) – 8 character entry field. This name will appear at the top of the vessel display on the Home page and all subsequent screens during entry of parameters. Otherwise, it is interchangeable with the Vessel Name field below. You can use these two fields in any way you wish and you can experiment to see what it looks like on the Home Screen.

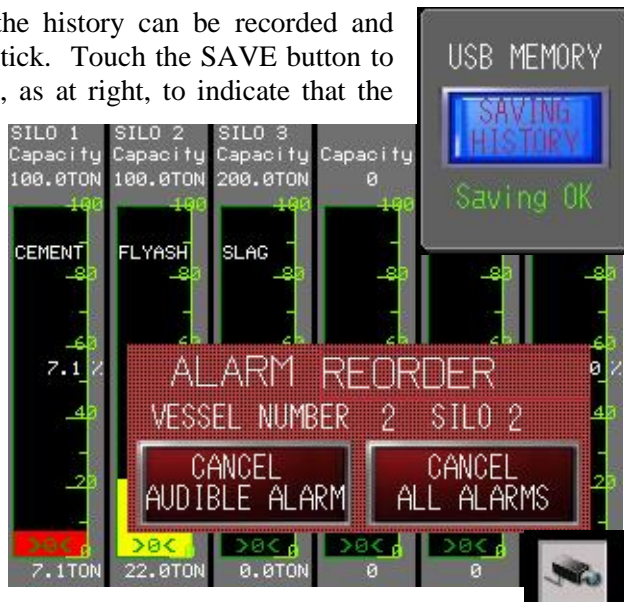
Vessel Name/Contents (bar) – 6 character entry field. This name will appear at the in the center of the vessel bar graph on the Home page but not on the vessel trend graph screen. Otherwise, it is interchangeable with the Vessel Name field above.

Alarm Levels – for each of the four available alarms, enter the levels as a percentage full value from 0 to 100%, for which you want the appropriate alarms to be activated. When activated a window will appear, showing the vessel number, name and type of alarm, as at right. The High and Overfill alarms activate when the set level is exceeded and the reverse for the Reorder and Low alarms.

Trend Graph History – a permanent record of the history can be recorded and downloaded at any time by use of a USB memory stick. Touch the SAVE button to start the process. The button changes to SAVING, as at right, to indicate that the ongoing data for all vessels is being saved on the memory stick and a status message appears below; this shows the error type if saving is not possible. To remove the memory stick, touch the SAVING HISTORY button to halt the saving process. The stick can now be removed. Do not remove the stick if recording is in process as the file can be damaged. Remove power first. The history files are saved as SAMP01\00000\SA00001.csv etc.

6.10 The camera button

At the bottom of most screens is the button at right. If a USB memory stick is installed, pressing this button takes a snapshot of the current screen and all displayed values. This can be used for fault diagnosis or recording of the values for later comparison or entry. The images are found in the folder named CAPTURE. The button flashes when the capture is



successful. On the Home screen, this button is hidden under the Capacity display, vessel 1, and in the Alarm Log screen in the same position, top left hand corner of the screen.

6.11 Preparing a memory stick for use

Any memory stick pre-formatted with the normal Windows FAT format can be used for storage. Erase all unnecessary files and ensure that the available space is sufficient, based on the following:

Recording period	1 day	30 days	1 year	2 years	5 years
Memory used	28KB	840KB	10GB	20GB	50GB

Insert the memory stick into the USB slot on the lower back surface of the touch screen.

6.12 Viewing contents of a memory stick

Navigate to the Edit USB Files screen (requires level 2 password): from the previous or Home screen, touch the associated vessel symbol followed by the ► button to reach the Edit USB Files screen. The files and folders contained on the USB memory stick can be displayed in a similar way to the Windows method. Touch the Edit USB Files button to display the directory and use the ▲ and ▼ buttons to reach the desired folders and files. Use the Disp button to enter a folder or display a file’s contents. Use the Del button to delete a file or folder. When a csv file of stored readings is displayed, it will appear as at right, in a similar format to an Excel file. Use the Up, Down, Left and Right buttons to move through the table. Remember that, as seen in the Excel files produced, the percentage values are shown without a decimal point, as numbers from 0 to 1000. Divide by 10 to obtain the % value.



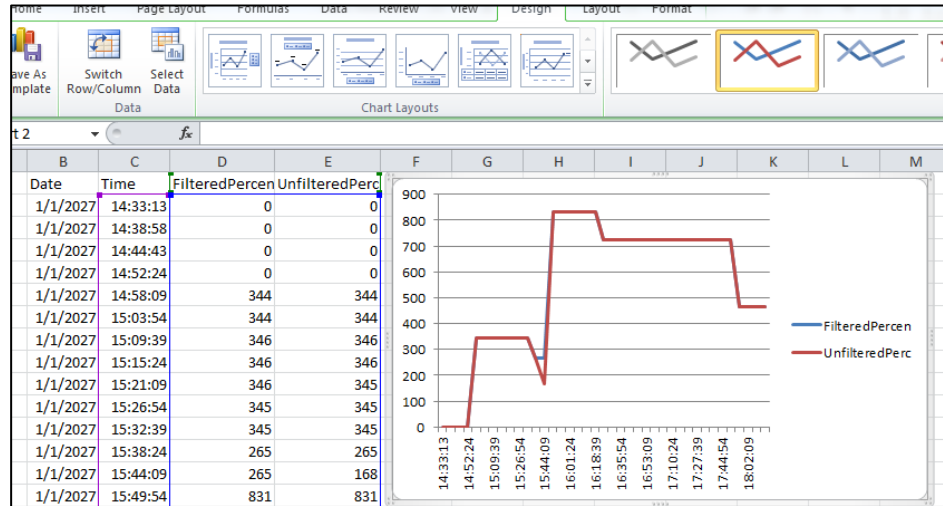
Folders and files have the following functions:

SAMP01\00000\SA00001.csv – saved history file.

Recipe\00001_parameters.csv – saved setup and calibration parameters.

6.13 Removing memory stick and use in a PC computer

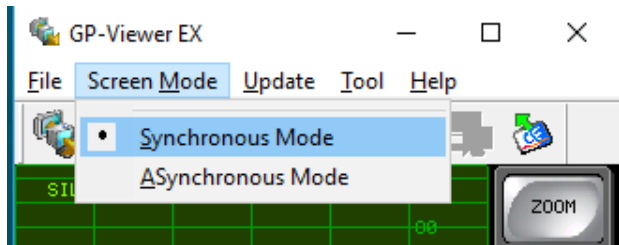
Before removing the memory stick, touch the SAVING HISTORY button to turn all recording off. The memory stick can then be unplugged and transferred to any computer. In each folder you will find files of the Excel type. These files can be viewed in Excel as lists of unfiltered and filtered values for each vessel 1 to 6 with associated date and time. The values appear as % of



full scale with no decimal place, i.e. values from 0 to 1000; divide by 10 to obtain the % value. Note that when your filter is adjusted correctly, it will remove most of the errors caused by weather changes and the Filtered values are a better measure than the Unfiltered. By choosing Insert and Graph, various graphs can be plotted, as shown, or calculations of fill / discharge amounts can be made.

6.14 Remote Viewer operation

Synchronous mode: The screen will start and operate in Synchronous mode unless the mode is changed, where the screen viewed remotely is also seen on the main display and vice-versa. A second viewer will also be shown the same screen as the one viewed on the main display or the other remote viewer.

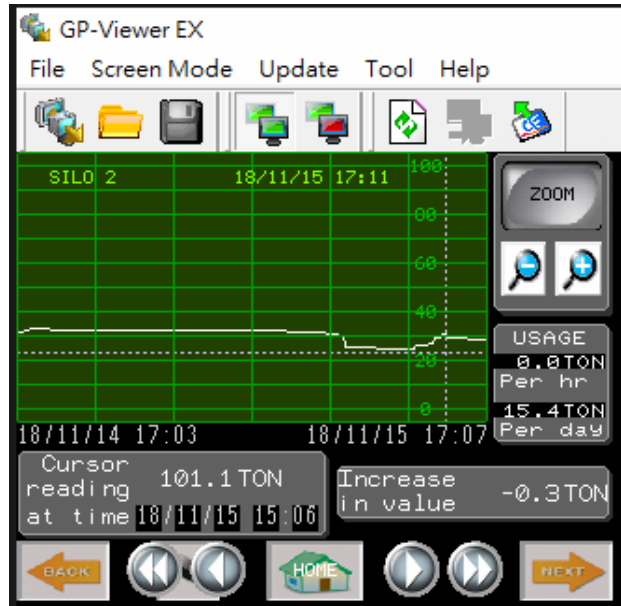


Asynchronous mode: If you wish, it is possible for a second viewer to select Asynchronous mode from the Screen Mode menu, in order to view the Home screen while the main user does a calibration, for example. If you do so, go directly to the Home screen and do not attempt to access the Setup menus or Calibration. The reason is that the vessel index is not set and any entries of data may delete the existing data in other vessels. The Trend Graphs and Alarm Log (prior to the password screen) can be accessed safely, however. **In general, if in asynchronous mode, screens not requiring a password are safe but do not go further than the password screen.**



Use of Asynchronous mode is dangerous and can cause loss of critical data. Do not use this mode unless it is essential to monitor levels while a second user does calibration etc.

Zoom operations: The Zoom button will work normally in Synchronous mode but not in Asynchronous mode. You can stretch and compress the display using the + and – buttons, and you can move throughout the recorded range using the <, >, << and >> buttons. However, even in Synchronous mode, the cursor position readings and Increase in value display will not work from the remote viewer. If someone accesses the physical screen and touches two points, the results will be shown on both the local screen and the remote viewer, as shown at right.



7.0 Troubleshooting and Upgrading

Troubleshooting the SiloWeigh II Pro system can be narrowed down to troubleshooting the sensors, troubleshooting the SiloWeigh II Pro display and troubleshooting the hardware (wires, junction boxes and DJB), between the sensors and the display. Each component has its own issues and solutions.

NOTE: Make sure you have a backup of the setup and calibration parameters. See section 4.3, Backup to USB to backup these parameters on a USB memory stick. Keep it in a safe place in case your display unit is reprogrammed or needs replacement.

The sensors respond to weight changes of the material in a silo. If the weight in the silo remains stable but the readings fluctuate and are erratic then there is probably an issue with one or more sensors. In addition, if the SiloWeigh II Pro system is unable to cover the full range of weight in the silo then there can be a problem with one or more of the sensors. However, in the second case, the problem can be one of calibration. Refer to **Troubleshooting the DJB500 board**, section 7.4.

The DJB500 board takes the millivolt signal from the sensors and converts it to a digital weight value. If the weight changes are accurate at the low end of the range and give errors that increase as the range increases, then the weight entered during calibration was probably incorrect. In addition, if the SiloWeigh II Pro system shows over full scale when the silo is still not full, then the Capacity value used during calibration was not large enough. It can be changed without affecting the calibration.

The hardware (wires and junction boxes) is responsible for transmitting the weight changes from the sensors to the DJB500 board. If adding weight shows a weight decrease, or the weight in the silo changes but the system does not respond, there is probably a connection issue.

7.1 I/O monitor screen

The I/O monitor screen follows the DJB setup screen. This screen allows monitoring and testing of all digital I/O as well as the values of the analog input and output channels.

Each digital input and output is shown in its current state – OFF (red) or ON (green). To force any channel to the ON state, touch the associated button. Touch a second time to un-force or return to its natural state. This can be used to activate and test external devices such as relays, lamps and horns.

Each analog input and output is shown as a value in percentage of full scale; the actual value depends on whether the channel has been set up for 0-10 volts or 4-20 mA. See section 4.1.1 for temporary setup procedure. To change from 0-10V to 4-20mA or vice-versa, a new program needs to be installed after backing-up your settings. See section 7.8 for this. Also shown on this screen is the Group Address output for multiplexing inputs or outputs when used with more than 2 input or output channels. This address is output on digital outputs 6 and 7.



7.2 Troubleshooting the Sensors

Take mV readings for each individual sensor by accessing the DJB setup screen. They may not all have the same value because installation creates stresses which change the output. However, the CHANGE in readings as the vessel is loaded should be similar since the sensors share the load. A sensor that has a change value significantly different from the other sensors is either faulty or incorrectly installed.

When you bolt a sensor, you can stretch or compress it, causing damage. You can therefore go beyond the offset capability of the electronics, so you can never calibrate. If the readings for signal voltage (white, - to green, +) on any sensor are outside the range -5 to +5mV, loosen the bolts on the sensor. Position the sensor so that the bolts are free to move on all sides and tighten finger tight, then tighten each bolt a quarter turn at a time until the specified torque is reached, while monitoring the signal voltage at each step. The signal should remain within this range until the full torque (30 lb-ft) is reached.

Install the sensors on the right part of the structure. They must be on main load bearing members. Try to minimize external influences. For example, try to separate structures, such as freeing welds on catwalks at one end by loosening bolts. Make sure to install the sensors where there is no rust or thick layers of paint. Ensure that the mounting surface is bare or single coat of paint and flat.

If you find that readings jump when the sun rises, or at the same time of the day, then you can minimize variations by installing the sun shields. In addition, mount the sensors on the north or west facing sides of the silo legs.

It is important to remember that any readjustment of a sensor necessitates a new calibration or offset setting.

A faulty sensor can be disabled by un-checking its associated DJB input in the Setup software and making an Offset Adjustment. See section 4.5.1, DJB Setup and 5.3, Calibration Adjustments.

7.3 Troubleshooting the Hardware

Test the wires. An electrician or qualified person needs to verify that each wire is well connected. Starting from the sensors, test each wire going into each DJB box and going out of each junction box. If there is a problem with the wiring then this approach will help isolate where there is a break or a short circuit. Visually examine the wires and connections. Make sure that there is no moisture or irregularities. Verify the voltage on each sensor connector is as follows:

Connect voltmeter negative (black) to black wire.

Red – 4.5 to 5.2 volts DC

White, Green – exactly half of voltage reading on red, e.g 2.25 to 2.6 volts.

Voltage between white and green must be between -5 and +5 mV. Also verify that the voltage shown at the DJB display is the same as the voltage at the sensor, for each sensor.

Anything different from the above readings indicates a bad connection or a bad sensor.

7.4 Troubleshooting the DJB Board

Verify that the signal voltage (white to green) is valid (between -5 and +5+ mV). If this is correct and the mV values shown on the DJB Setup screen, 4.5.1 are different, connect a shorting wire between terminals 3 and 4 (with green and white wires still connected) at the board connector for the related input, LC1 to 4, to short-circuit the input only.

Navigate to the DJB Setup screen and check the mV value for the related input. It should now show between -0.1 and +0.1 mV which verifies that the DJB is operating correctly. Any reading outside this range indicates a faulty DJB input.

Verify that the power coming into the board (at connector marked 12V or V+) is between 7 and 24 volts.

Verify that the power between terminals 1 and 2 of any input (red and black) is 4.6 to 5.2 volts DC.

Verify that the signal at each input (between SIG -, terminal 4, white wire and SIG+, terminal 3, green wire) is in the range -5 to +5 mV max. and the same readings are shown on the DJB setup screen.

Should you have any problems with your set-up, installation and/or calibration, refer to the table following. If your particular issue is not listed, please call us for immediate assistance.

7.5 Replacing the DJB board

Record positions of all wires. Remove incoming power and then disconnect connectors (or wires in older models), remove the whole board and carrier and replace with a new board/carrier assembly. Restore power and test as above.

DJB500 boards are normally preset with the correct parameters for the application and a serial address prominently marked on a label, e.g. "80". This address must match the one being removed; if a different address is the only one available, ensure it is different from all other addresses used and enter this address in the DJB Setup screen (section 4.5.1). When you replace a DJB500 board, calibration is retained and no recalibration is necessary.



Take precautions against static electricity. Electronic devices are sensitive to static charges and can be destroyed by careless handling. Only remove items from the protective package at a static workstation. If this is impossible, eliminate any static charge by grasping the metal silo leg, conduit, building column or concrete wall. Do not touch the module unless these steps have been followed first. Ensure that the equipment cabinet is securely grounded to earth ground or power ground. Always connect the shield, power or communication wires before connecting signal or load cell wires. Static damage is not covered by warranty.

7.6 Troubleshooting/replacing the touch screen/power supply

The touch screen is powered by the same 24 volt power supply that supplies the DJB500 units at the silos. Verify that this supply is operating by observing the green POWER LED or measuring the voltage at one of the power connectors. This should be 23.5 to 24.5 volts DC. If the internal program is running, the screen will show the normal displays seen in previous pages of this manual.

Before replacing the touch screen, first try resetting it by turning the AC supply off and on again. When replacing the touch screen, observe static precautions above.

The 24V DC power supply negative output is connected to power ground by a resistor which should eliminate any induced AC voltage throughout the DJBs and sensors. If the power supply is defective or an AC voltage source is connected externally, this resistor usually burns and imparts a characteristic smell which is easy to recognize. If this occurs, check the voltage between 24V- terminal and backing plate ground. Trace the voltage or replace the power supply accordingly.

7.7 Checking the Empty level and Calibration

To be completed every 6 months or when a significant error is suspected. When the level shows a low value (within 10% of zero), it is recommended that the silo level be checked by either hitting the side of the silo with a rubber mallet or with a string and plumb bob to find the average level of material. This can then be converted to weight and compared with the displayed amount. See section 10.2 for the calculation of the silo volume, assuming the dimensions are known. If a correction is required, navigate to the Calibration screen for the required silo and enter an Offset Adjust value to correct the error.

The slope can be checked and adjusted by reading before and after a delivery. Proceed to measure the delivery amount on the display and add any material used during delivery. If the result differs from the actual delivery amount, it can be corrected with a Slope Adjust value. Assuming that the adjustment is made after the delivery is complete, before any major usage from the silo, enter the error amount as a negative value (or a positive value if the error is negative).

Both slope and offset adjustments can be made as many times as necessary. The Offset Adjust value is independent of the amount in the silo but the Slope Adjust is dependent on the amount at the time of adjustment. If repeating this, it is best to first enter zero for the Slope Adjust and then make the new adjustment based on the value at that time. It is always better to recalibrate if possible, and recalibration will erase all adjustment values.

7.8 Upgrading the system software

If the touch screen is replaced or has lost its program, a program upgrade is available, or if the analog I/O settings need to be different from the default settings, the program will require reloading. This is a simple operation, using a USB memory stick for transfer. If the USB memory is supplied by Scale-Tron, follow the steps below. If you have received the software by Email, transfer the zip file to the USB memory, open the Zip file and extract all the contents. You should then have a folder named prj001 and files boot.cfg, SYSFONTTBL.BIN and two files SWxxx-0-10V.CML and SWxxx-4-20mA.CML where xxx is the version number.

NOTE: Be sure to back up your settings and calibration data to a USB memory before you start (see section 4.3) since they will be lost during software download. You can use the same memory stick for both this and the program files.

At power on, when the initial screen “SiloWeigh II Pro” appears, or at any time during regular operation, touch and hold the top right or top left corner of the touch screen (within 40 pixels of the edges), then immediately release the corner you were touching and touch the opposite corner (bottom left or bottom right) to obtain the additional bottom menu showing OFFLINE and RESET as shown at right.

Press the button marked => 1/3 to see the SD/USB button. Press this followed by USB Start. After a few seconds the screen will show two buttons, Upload (-> storage) and Download (->Display). Press Download (->Display). A new screen, not shown at right, will appear.

Press SELECT FILE and use the ► button to scroll to select the appropriate file (0-10V or 4-20mA) with extension .CML as shown in the lower picture, second line, followed by the Enter button. Enter the password (obtain this from Scale-Tron), using the ▼ button for the numeric keyboard or CAPS for lower case letters, followed by Start and when the question “Do you want to download the data?” appears, press Yes.

After completion, press the Back button twice followed by Exit to return to normal operation.

After new software is loaded, proceed to section 4.3 and Restore the setup and calibration parameters.



7.9 System troubleshooting table

Issue / problem	Probable Cause	Solution
Bar-Graph not reading	Sensors not connected correctly or DJB settings incorrect	Check wire connections to DJB and sensors. Check voltages at sensor connector. Volts between blk-red should be 4.6V. V blk-grn and blk-wht should be 2.3 V. V wht-grn should be -5 to +5 millivolts. Check DJB address and mV values (see section 4.5.1). If an adjustment has just been made, go to System Setup 2 screen and press Display Unfiltered to speed up readings temporarily (section 4.3)
	No power	Check power voltage, power fuse, power supply unit, power at DJB box and indicator cabinet power connector.
	Calibration not completed correctly	Practice calibration procedure and re-calibrate. View Offset and Slope values, see section 5.1.2
During dead-load adjustment (section 4.4), voltage between wht-grn is too high and cannot be brought within range	Disconnected or damaged sensor	If mV signal is greater than 15mV, disconnect sensor connector at DJB and check resistance between blk-red and between wht-grn. Each should be equal and should be 350Ω (Ohms) divided by number of sensors connected to the relevant input, i.e. 175Ω for 2 sensors. If not, disconnect and check each sensor.
	Overstressed sensor	If mV signal is greater than 15 mV, it is possible that the sensor has been damaged during installation. If the mV value is not higher than 10 mV, it can often be brought within range temporarily (-5 to +5 mV) by squeezing or stretching it while tightening the mounting bolts.
Weight reading decreases or does not change when weight added	Calibration done incorrectly	Check low weight and high weight settings. High must be greater than Low weight. Check DJB readings and received data (4.5.1)
	Wires crossed at DJB or in sensor junction boxes	Check wiring of sensors (Installation manual)
	No power at sensors	Check for 24 volts between black-red Power cable at DJB, recheck connections at DJB
	Shorted signal wires	Disconnect sensor connector at bar graph. Resistance between blk-red and between wht-grn should be 350Ω (Ohms) divided by number of sensors, i.e. 175Ω for 2 sensors.
Display shows 'overfill' even though silo is empty	Lost connection or incorrect sensor output	Check wiring and mV signal between white-green wires. Remove covers and check for water. May need to replace DJB if this is the cause.

Readings erratic and drifting with time	One or more sensors installed incorrectly	Check DJB input values over time or disconnect sensors one leg at a time until readings stabilize. May be water, below.
	Water in sensor or connection box, bad connection at DJB or junction box	Remove sensor wires from DJB connector. Check insulation resistance between any sensor wire and ground or silo leg. Must exceed 20 Megohms. Remove covers and check for water. May need to replace sensor or J-box if this is cause.
Readings still erratic and drifting with time after checking and eliminating causes above	Sensors installed in wrong part of structure	Must be on main load bearing members – send sketch or picture and get advice.
	Structure too sturdy for application	When calculated loading is 1000 psi (per leg) or less, these errors increase proportionally. Replace with latest model sensors.
	Structures interconnected	Check possible impediments and ask for advice. Try to separate structures – free any welded catwalks at one end.
Reads correctly after calibration but jumps suddenly to an incorrect value	Faulty installation of sensor	Silex or L-Strain sensor – remove, check and eliminate paint or rust layers, ensure mounting surface is bare and flat, reinstall with correct torque and recommended bonding agent.
	Strong local RF field may cause temporary jumps	Check for walkie-talkie or mobile radios, local radio station etc. May need steel cabinets to shield electronics.
Reading follows true weight over some, but not all, of the ‘empty to full’ range	Incorrect initial checking of sensor output in millivolts	Estimate % filling of silo and check mV outputs of each sensor. Release and re-tighten if you estimate that the max limit of -5 to +15 mV could be exceeded.
When not every leg of silo is gauged, readings are erratic or filter not performing correctly	Load not shared by all legs equally, foundations not level or soft on one leg	Fit sensors on more of the available legs. Ideally all legs should be gauged. If all gauged, check leg output and add shims if necessary to give output when empty.
DJB or power supply destroyed	Electrical storm damage	Ensure indicator cabinet is grounded to silo structure with thick, direct copper ground cable (see Installation Manual).
Reading jumps when sun rises	Local heating of sensors	Some variation is normal and is minimized by sun shield. Oversized legs make problem worse. Use larger shield for sunlight. Mount Silex or L-Strain sensors on north or west facing sides of legs.
Voltage at blk-red sensor wires is less than 4.5 volts and varies	Power supply cannot supply enough power or is faulty	Too many sensors (capacity is 8 sensors per DJB) or DJB supply is low in voltage. Power voltage must be in the range 100 – 260 volts and DC voltage at DJB power input must be greater than 7 volts.

7.10 Replacement of Touch-Screen display

If the touch screen requires replacement, follow these instructions:

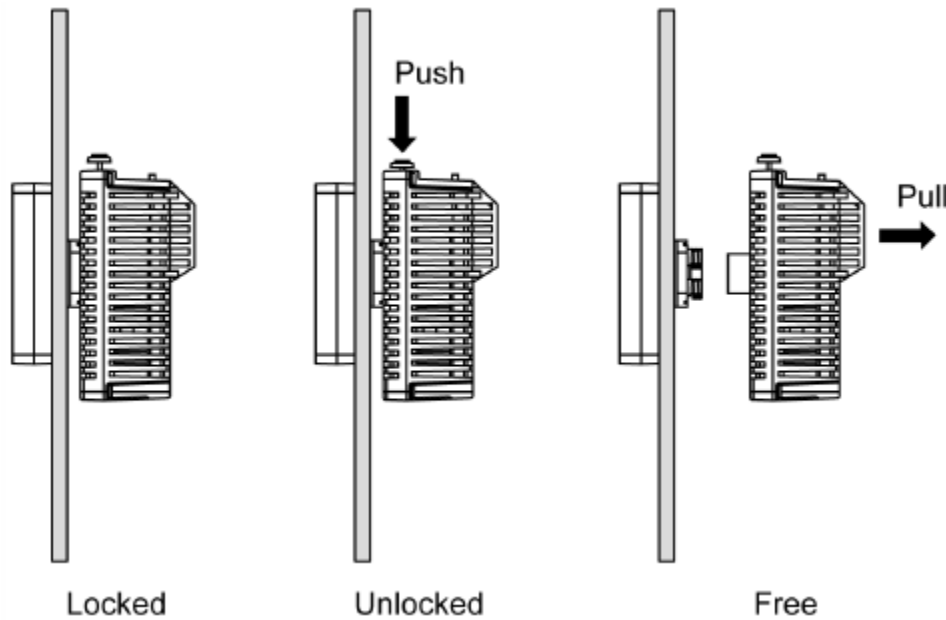
NOTE:

Be sure to back up your settings and calibration data to a USB memory before you start. See section 4.3.

Remove power before going further. Scale-Tron is not responsible for personal injury due to electrical power causing shocks or electrocution.

Open the cabinet and remove the power connector at the display by pulling directly on the connector or levering with a screwdriver. Note positions of all connectors. Remove the communications connectors by pinching the locking tail and pulling directly on the connector. Remove the long green I/O connectors by pinching the ends to disengage the latches and pulling the connector vertically.

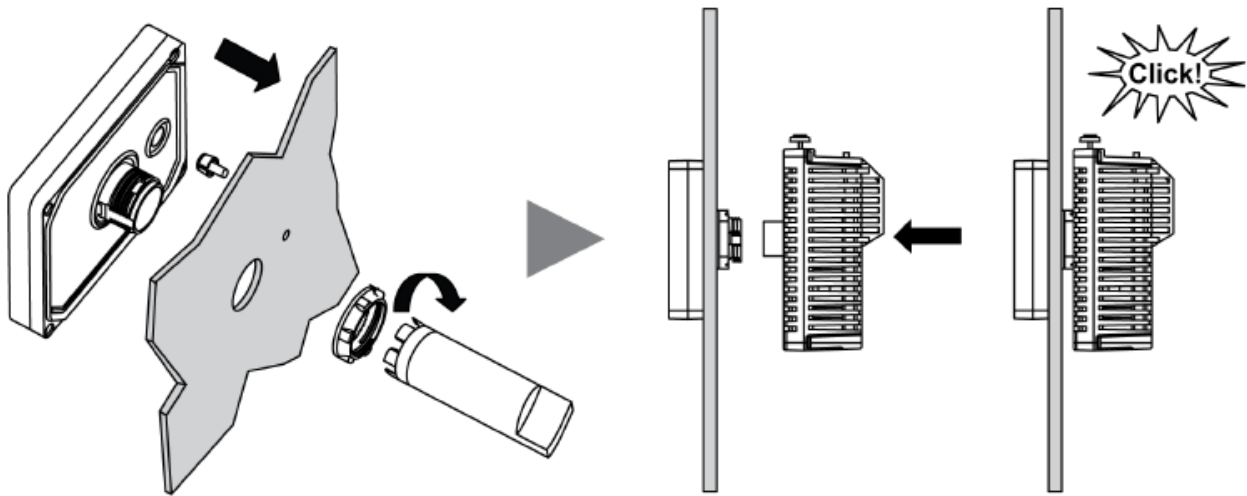
On the top center of the back module, locate the yellow “Press To Open” button and press it to release this module from the panel; see diagram below.



Using the tool supplied, and if replacing both modules, unlock the front module and remove it.

Replace the front and rear modules according to the diagram below.


The figure shows how to install the panel with the rear module:



Replace all the connectors in the correct receptacles. Note that the green connectors are labelled A to D according to the markings on the display rear unit housing.

After new software is loaded, Restore the setup and calibration parameters. See section 4.3.

NOTE: When restoring all parameters following a software update, the Restore operation must be executed twice. Wait a few seconds after completion before pressing Restore again.

Use the  button to return to the Home screen.

The replacement display unit is normally supplied without any loose connectors. It is expected that the original connectors will be re-used but if any are damaged, we will replace them free of charge if notified before shipment of the new display.

8.0 Connecting and using the Digital Relay Option

The Digital Relay Option, 1X4-2670-D18 includes:

6 output relays for alarm functions and analog channel addressing, with double throw (one NO and one NC) isolated dry contact outputs.

12 input relays for Alarm Cancel and status functions, plus external analog channel addressing. Input relays are 110 volt AC 50/60 Hz, isolated coils, unless an alternative voltage is requested at time of order. The relays are widely available and can be replaced from local suppliers if a different voltage is required.

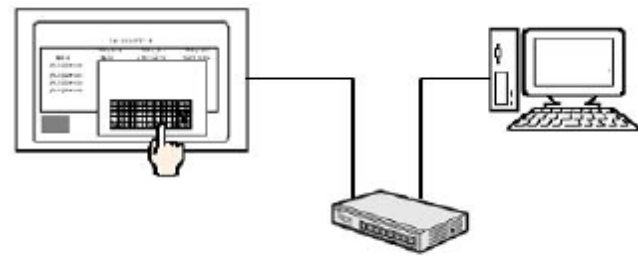
Relays are pre-installed and pre-wired to the display unit if ordered with the system. If supplied as a separate option package, they include a wiring harness, ready for connection. Snap the relays onto the rear-mounted DIN rail and wire as shown (see wiring and schematic diagrams, in Appendix 10.5).

Output relay contacts are shown in the schematic diagram. Contacts are rated 5A min. at 110-250 VAC, non-inductive and 2A min. at 30 VDC, inductive. These contacts are not pre-wired but can be connected to the AC internal Line connection, 1, and Neutral, 2, as required.

Input relay coils are pre-wired to the AC Neutral, 2 at the A2 connections and the A1 contact is left free. You can use the AC internal Line connection, 1, or an external source, as you wish. Remember if using an external source, that there will be two sources of power within the cabinet and if primary power is removed, a shock hazard can still exist.

8.1 Connecting and using a local network computer viewer

The SiloWeigh II Pro screen can be connected to the local network to allow multiple computers on the network to view or control the system. First, run an Ethernet cable from the local area router into the cabinet and plug into the Ethernet connector on the rear bottom of the display.

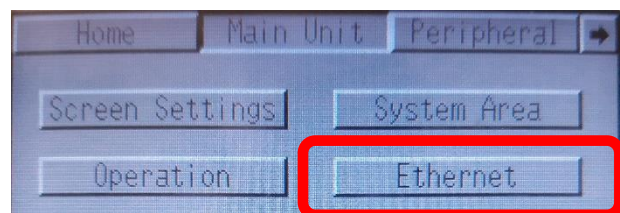


HUB

NOTE:

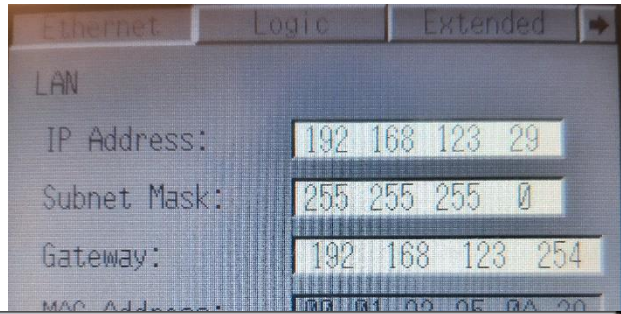
It is recommended that you connect to a local computer and install the free version of viewer, even if you do not intend to use it on a regular basis. This will allow our service personnel to access the system, allowing them to diagnose problems and assist in correcting them through remote connection to your computer. Note that this is a secure connection and no access is possible without your permission.

8.1.0 Touch screen setup

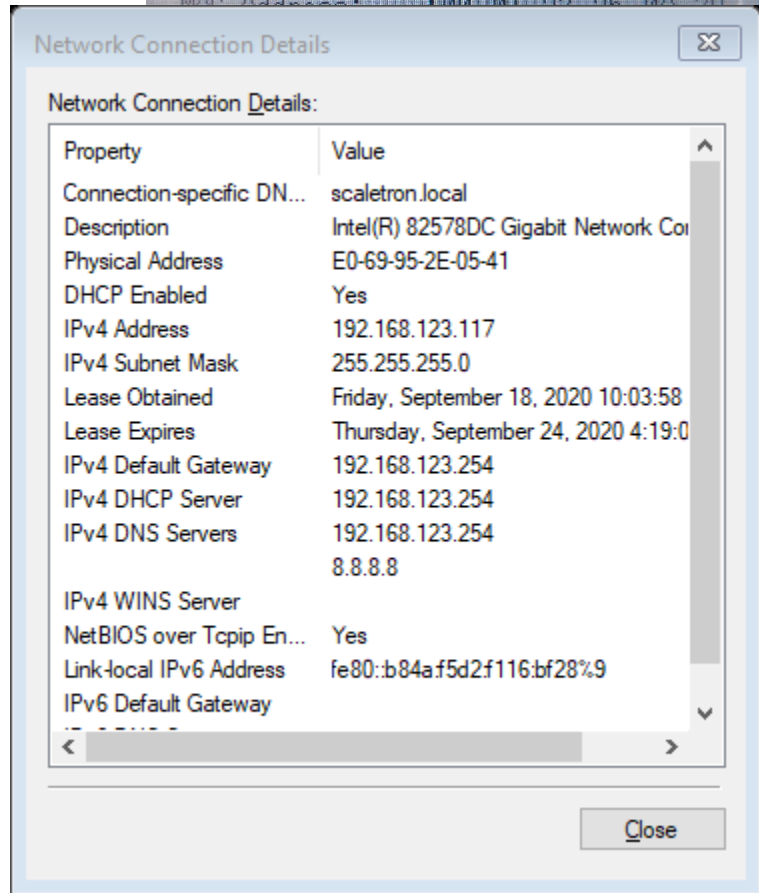


At power on, when the initial screen “SiloWeigh II Pro” appears, or at any time during regular operation, touch and hold the top right or top left corner of the touch screen (within 40 pixels of the edges), then immediately release the corner you were touching and touch the opposite corner (bottom left or bottom right) to obtain the additional bottom menu showing OFFLINE and RESET. Touch the OFFLINE button and proceed as follows:

Touch Main Unit followed by Ethernet. Set the Port to the default 8000 and press LAN. Set Primary DNS and Secondary DNS as advised by your local network administrator or IT professional.



Alternatively, check the computer to which you want to connect, click the Network icon (small computer screen at bottom right) and open the Network and Internet Settings. Click Change Adapter Options and right-click on the Local Area Connection that appears. Choose Status and click the Details box to get the menu at right. In the IPv4 settings, find any unused IP Address (the one shown on the computer is already used, for example). It is safe to copy the Subnet Mask address used by the computer as well as the Gateway setting.



8.1.1 Installing Windows application

To install GP-Viewer EX on the computer, use this link <https://www.proface.com/en/download/trial/gpviewerex/v30> And follow the prompts

Start GP-Viewer EX

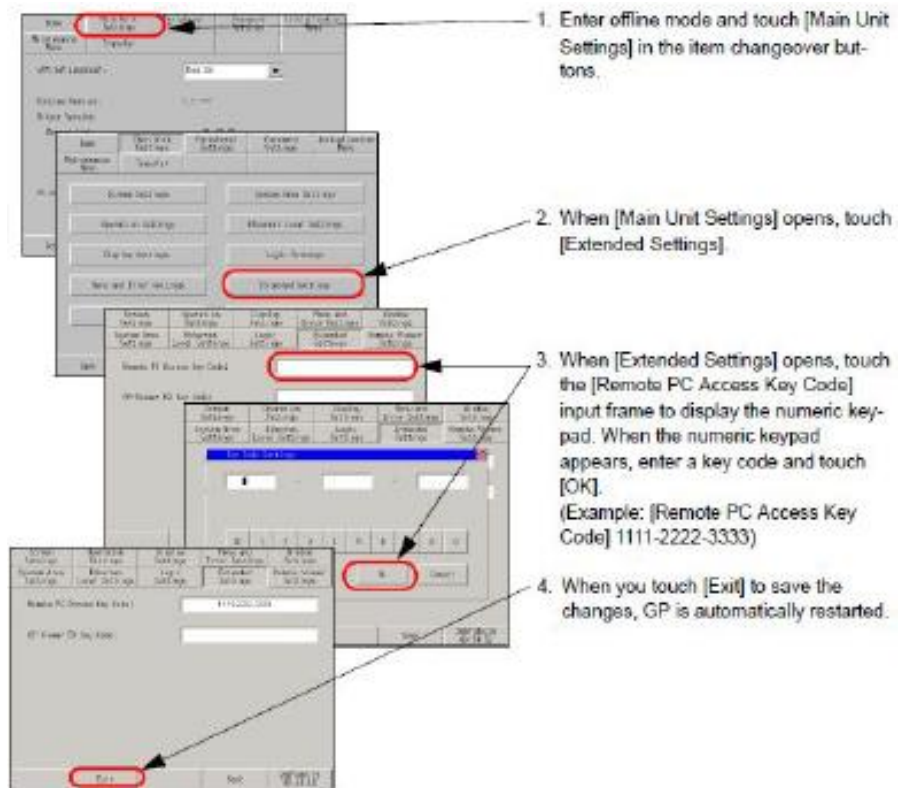
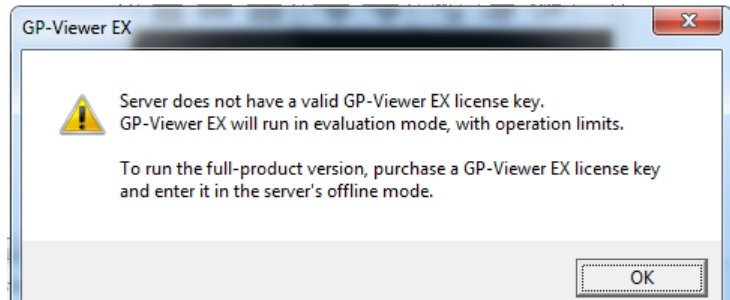
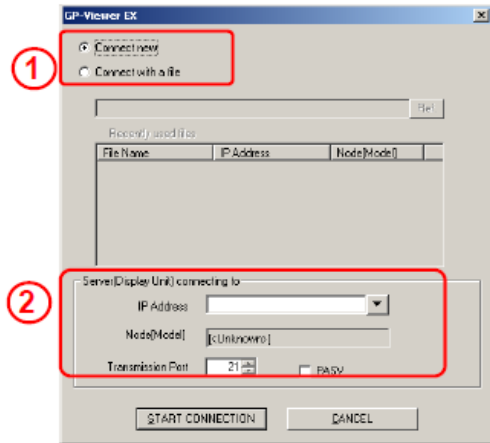
NOTE: When using the GP Viewer, ensure that you have the Mode set to **Synchronous**. If it is set to Asynchronous, you could write data into vessels other than the one displayed. Take care to always use Synchronous mode when using the GP Viewer and save calibration and setup data to a USB memory. This will allow you to restore everything if data is overwritten.

At 1. Opposite, select Connect new.

At 2. Opposite, specify the IP address of the display unit, selected by your network administrator. You will be asked to input the password; contact Scale-Tron Inc. at 514 940 0337 or info@scaleton.com for this password.

Start the application and enter the password. Close the GP Viewer and save the file when requested. This will allow you to open it without the password from that point forward. If you have not registered and paid for the application, the window at right will appear. You have the choice of using the trial version or paying right away. If you choose the trial version and want to upgrade to the paid version, contact Scale-Tron for your key code.

To enter the GP-Viewer EX key code, enter Offline mode as above, follow these instructions and touch OK on completion. Touch Exit to return to the normal operating mode.

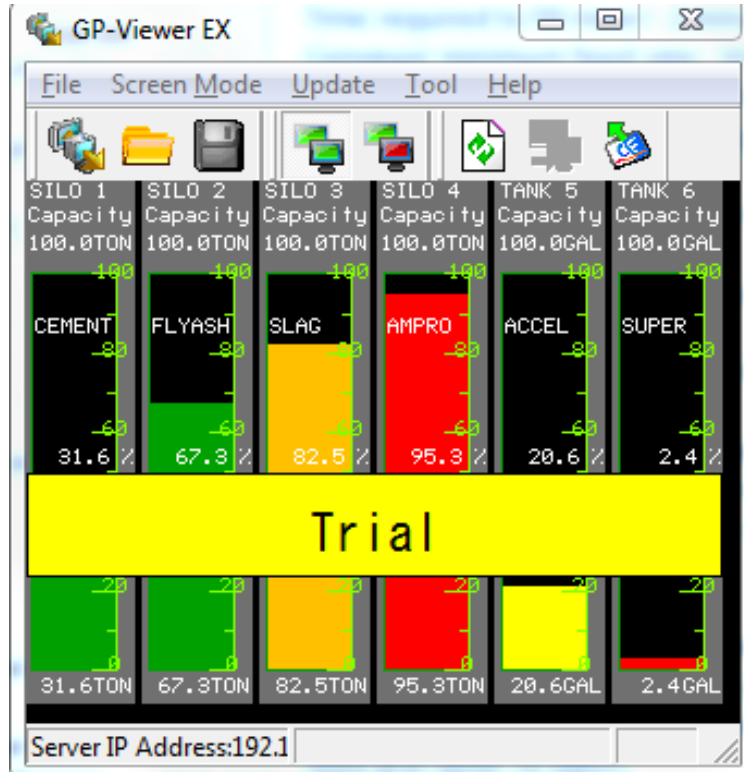


Once connection has been made successfully, the screen will appear, as at right.

On the Screen Mode menu, select Synchronous Mode to avoid overwriting data as above.

Synchronous Mode: Viewer displays the same screen as the host display. If you have only one remote display, always use this mode.

Once the GP-Viewer EX key code has been entered, the “Trial” bar shown at right will be eliminated.



8.2 Connecting and using a WiFi phone/tablet viewer

The SiloWeigh II Pro screen can be connected to a wireless router to allow multiple WiFi devices (phones and/or tablet computers) to view or control the system. Typically the WiFi viewer and tablet or phone are set up at the Scale-Tron facility before you receive it. If you need to set this up as an after-market addition, proceed as follows:

First, run an Ethernet cable from the wireless router into the cabinet and plug into the Ethernet connector on the rear bottom of the display.

If not set up already, set up the new Android tablet, phone or iPhone:

If the screen cannot be wired directly to your network, set up a wireless network by adding a WiFi modem. The tablet, if supplied by Scaletron, will have the following credentials. Or you can set them yourself:

ID: stmobconxxx@gmail.com (where xxx is 200 for the first tablet then is increasing by 20 for successive tablets)

Password: ScAL3tR0n (same for all where 0 is number zero)

Set up Google email account for this ID:

ID: stmobconxxx@gmail.com

password: Scaletron1



Connect the ethernet port of the SiloWeigh screen to one of the LAN ethernet ports of the WiFi modem.
Set up the modem according to the manufacturer instructions:

In this example, a DLINK model AC750;
Leave the default IP address: 192.168.0.1
Wireless network name SSID - change from dlink... to: Scaleton
Wireless password: Scaleton1

Set up the Pro-face screen:

Touch two opposite corners of the screen to obtain the Offline menu (see section 4.1.1). Then assign the IP address to one in the LAN range of the wireless modem. In this example: 192.168.0.128

Assign a gateway IP address; in this example: 192.168.0.1 (the modem IP address) and save.

Connect the tablet/phone to the "Scaleton" wireless network, using the password assigned for the wireless network in the modem.

Run the remote HMI application on the tablet/phone and input the credentials for the HMI server, assigned in the SiloWeigh screen (by the GP-Pro Ex software):

HMI Server name: Pro-face

HMI Server password: Pro-face123

If there is a possibility to connect directly to your network by ethernet cable, set up the screen (in Offline mode) with an available address within your network range and also the gateway address of your network. The access of the screen from the Pro-Face Remote HMI application will be the same as from the wireless network (in regard to credentials).

8.2.0 Operation of Remote Viewer

Refer to section 6.0 for SiloWeigh II Pro operation and related passwords in section 10.1.

Synchronous mode: The screen will start and operate in Synchronous mode unless the mode is changed, where the screen viewed remotely is also seen on the main display and vice-versa. A second viewer will also be shown the same screen as the one viewed on the main display or the other remote viewer.

Asynchronous mode: If you wish, it is possible for a second viewer to select Asynchronous mode from the Screen Mode menu, in order to view the Home screen while the main user does a calibration, for example. If you do so, go directly to the Home screen and do not attempt to access the Setup menus or Calibration. The reason is that in asynchronous mode the vessel index is not set and any entries of data may delete the existing data in other vessels. The Trend Graphs and Alarm Log (prior to the password screen) can be accessed safely, however. In general, if in asynchronous mode, screens not requiring a password are safe but do not go further than the password screen.



Use of Asynchronous mode is dangerous and can cause loss of critical data. Do not use this mode unless it is essential to monitor levels while a second user does calibration etc.

9.0 Specification

SiloWeigh II Pro is a system for measurement and display by bar-graph and trend-graph of the weight or level, temperature or other parameter of up to 6 vessels. The standard configuration is a display unit with touch-screen display and digital communication to the vessels with signal conversion at each vessel from up to 8 strain sensors per vessel. Communication can be any combination of 4-conductor RS485 cable or digital radio between display unit and vessels.

Digital vessel electronics:	DJB500 or DJB-2, 24 VDC input, 1.2W max, 8 strain sensors of 350-ohm max at 4.6V. Conversion accuracy 0.1% of full scale.
Reading accuracy:	Dependent on sensing method. For strain sensors, 2% to 5% nominal but accuracy depends on weather effects and may be reduced by the vessel support structure.
Display inputs/outputs:	2 analog 4-20mA or 0-10V inputs, galvanically isolated. 2 analog 4-20mA or 0-10V outputs, galvanically isolated. 10 digital inputs, 24V 5mA, galvanically isolated. 8 digital outputs, 24V 300mA, 1.8A total, galvanically isolated.
RS485 port:	Dedicated to communication with DJBs above.
Ethernet port:	10 M half duplex (auto negotiation)/ 100 M full duplex (auto negotiation), suitable for connection to external network or computer.
Power:	100 to 250V, 50/60Hz, 25VA max.
Temperature:	Display cabinet 0 - 50 °C, 32 - 122 °F. Sensors and outdoor electronics 60 °C, 140 °F max.
Water resistance:	Display cabinet IP65, NEMA-4. Sensors and outdoor electronics IP67, NEMA-4X.

10.0 Appendices

10.1 Passwords

Remove this page if this manual is to be given to unauthorized personnel.

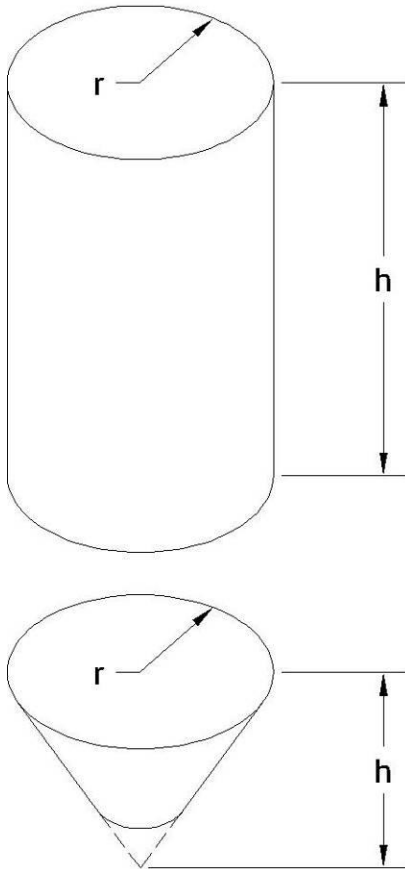
Level 1 password (access to vessel names and alarm values): **1515**

Level 2 password (access to all setup functions and calibration): **9625**

Software updates (password to download new versions): **6549**

These passwords are pre-programmed and cannot be changed unless by special request/program upgrade.

10.2 Calculate Silo Volume



To calculate the volume of a silo:

Calculate the cylinder volume:

$$v=3.1416r^2h$$

Calculate the cone volume:

$$v=1.0472r^2h$$

Add the two volumes together to get the overall volume of the silo.

Example:

Silo measures 50' high, 12' diameter
(Cylinder = 40' high, cone = 10' high)

Upper cylinder volume:

$$3.1416 \times (6 \times 6) \times 40 = 4523.8 \text{ cubic feet}$$

Lower cone volume:

$$1.0472 \times (6 \times 6) \times 10 = 376.9 \text{ cubic feet}$$

$$\text{Silo} = (376.9 + 4523.8) = 4900.7 \text{ cubic feet}$$

The radius of a circle is $\frac{1}{2}$ its diameter.

A 12' diameter circle has a radius of 6'

Tonnage can be calculated by multiplying the silo volume by the material density.

In most cases, the typical material in the silo will be Cement (Portland)

Portland cement = 94 lb/cu.ft (density) when compacted. 70 lb/cu.ft as it is blown into a silo

Fly Ash = 40 lb/cu.ft

From the example above, 4900 cu.ft x 70 = 343,000 lb of cement

To get tons, divide lb by 2000 (1 ton = 2000 lb)

343,000 lb / 2000 = 171.5 ton of cement (conservatively)

10.3 Manual Calibration method

If all else fails (and we sincerely hope that it doesn't), you can calculate the calibration coefficients using the method below and enter them directly in the Vessel Calibration Screen, shown in 5.1. This method depends on recording of the Raw values or mV values obtained from the DJB Setup screen, 4.5.1, both before and after a delivery or other measurable change in weight. This method can also be used to restore the calibration after touch screen replacement or other disaster as long as the data has been recorded and is known to be accurate. An Excel spreadsheet is available to help in these calculations.

Example, using Raw Average recorded before and after either filling or discharge. We have assumed a delivery (positive change in weight) for this example:

Raw Average **A**, before filling, = -5318
Raw Average **B**, after filling, = -2463
Difference, **B-A** (for delivery) = +2855. **C = +2855**

Weight in silo before filling = +1.0 ton
Weight in silo after filling = +25.2 ton
Difference, delivery weight = +24.2 ton. Ignore decimal, **D = +242**

Slope = C/D, = 2855/242 = **11.797**. Enter this value as the Slope on Vessel Calibration Screen.

Offset, E = -A/(Slope*10). In example above, E = --5318/11.797 = +451/10 = **+45.1 ton**.
Enter this value as the Offset on Vessel Calibration Screen, or if you know the current weight accurately, adjust the Offset value to obtain the correct Current value shown on this same screen.

Using mV values

If the Raw Average was not recorded, you can use the mV values with additional calculations:

The Raw value for each input LC1 – LC4 = mV value multiplied by 4300, to about 2% accuracy.

Example, Raw1 = -.73 x 4300 = -3139 (R1) and number of sensors per input,	N1 = 2
Example, Raw2 = -.34 x 4300 = -1462 (R2)	N2 = 1
Example, Raw3 = -.07 x 4300 = -0301 (R3)	N3 = 1
Example, Raw4 = +.58 x 4300 = +2494 (R4)	<u>N4 = 1</u>
N is sum of all sensors per input	= 5

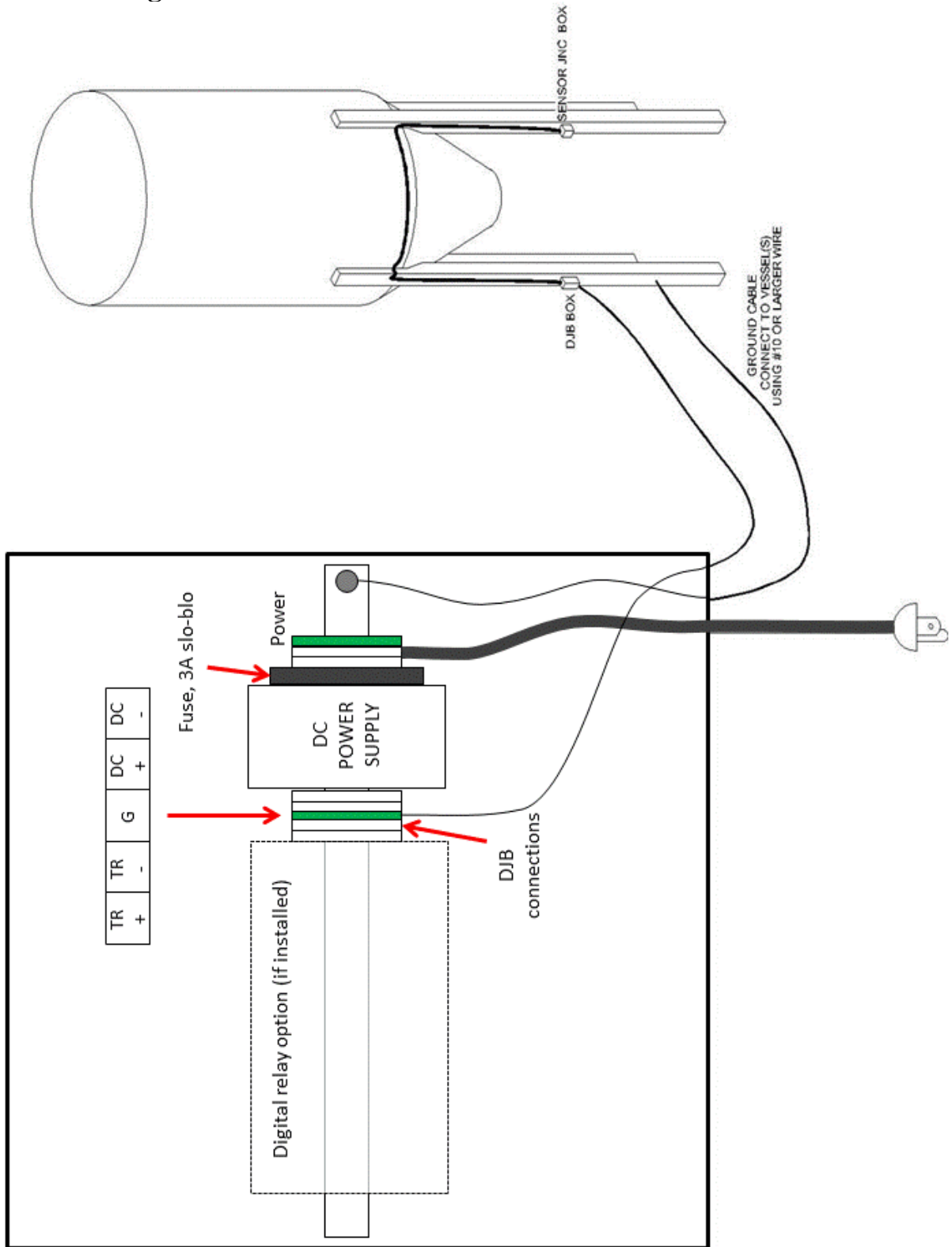
The Raw Average is calculated from the raw values in the following way:

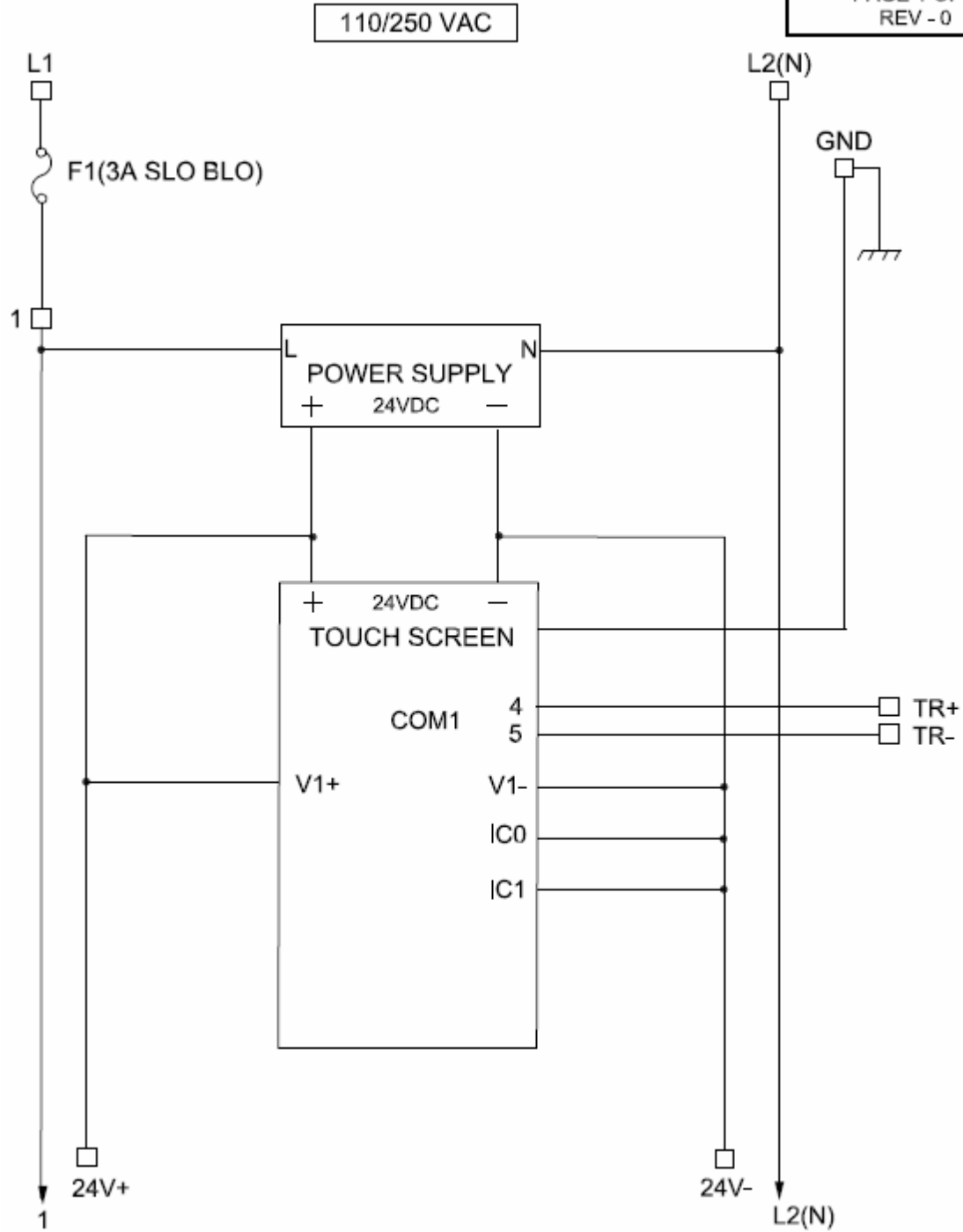
Raw Average (A or B above) = (R1 x N1 + R2 x N2 + R3 x N3 + R4 x N4)/N

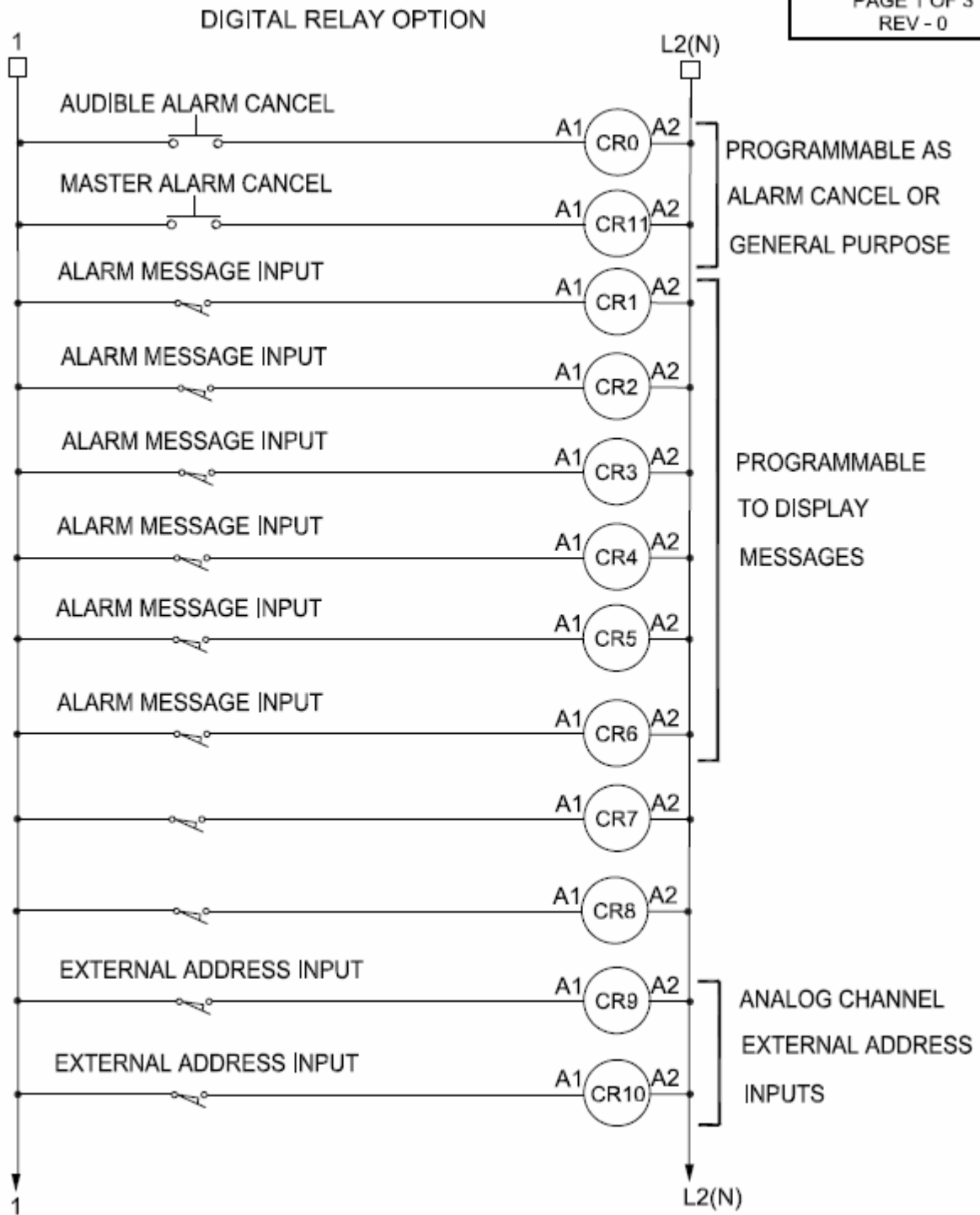
Example: (-6278 – 1462 – 301 + 2494)/5 = 1109

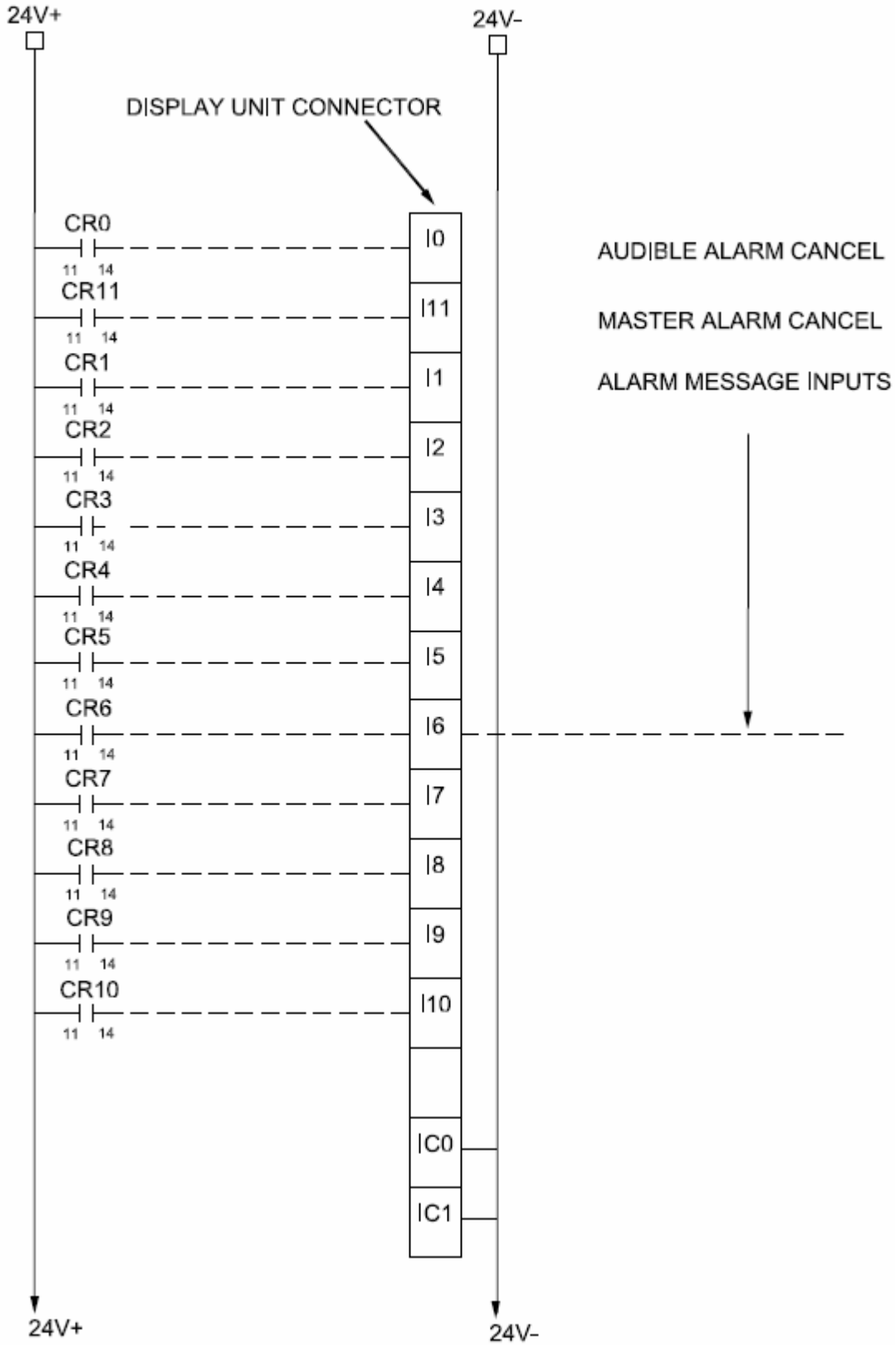
This method can be used with the mV readings on the DJB Setup screen or from external voltmeter readings taken on the DJB input terminals but if the voltmeter reads only to 0.1 mV, errors as high as 10% can be expected.

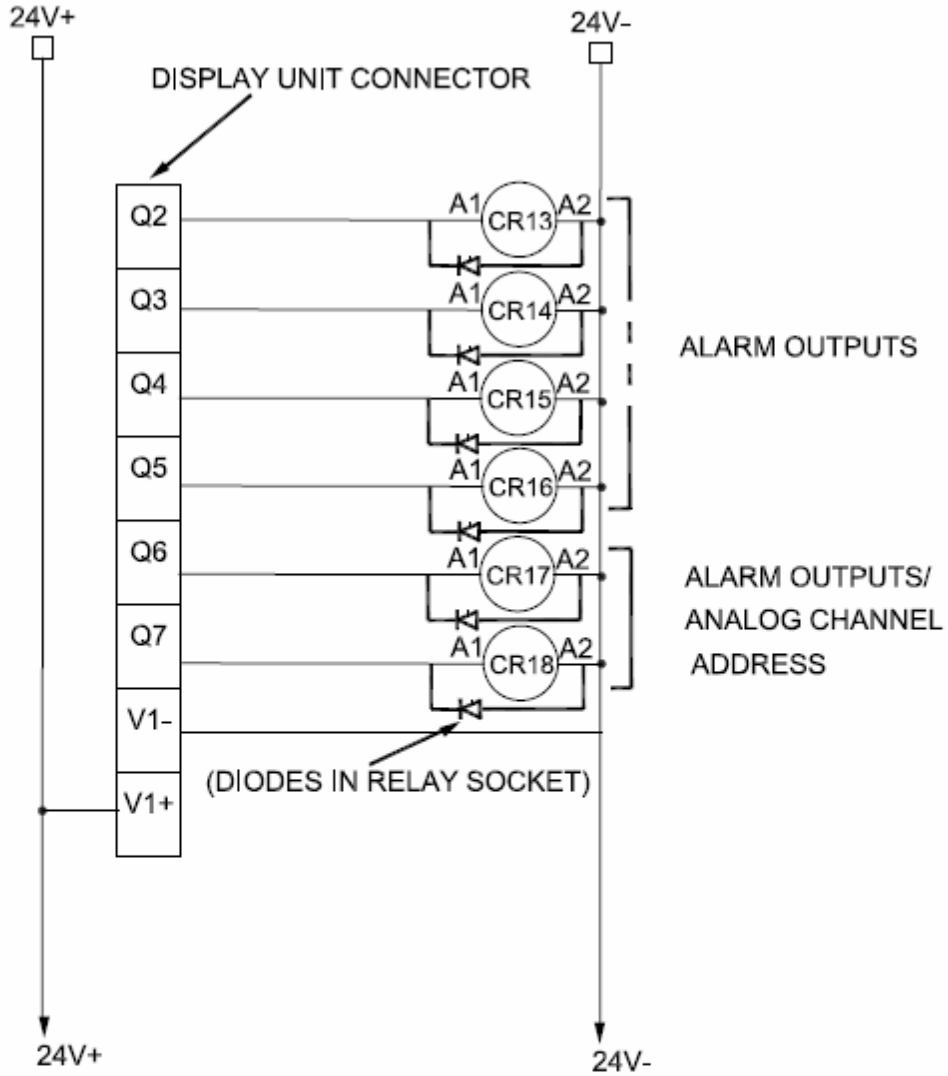
10.5 SiloWeigh II Pro Electrical Schematic



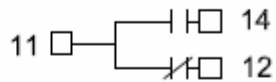








ALL OUTPUT RELAYS:



CONTACT RATINGS:

5A MIN, 110-250VAC

2A MIN, 30VDC INDUCTIVE

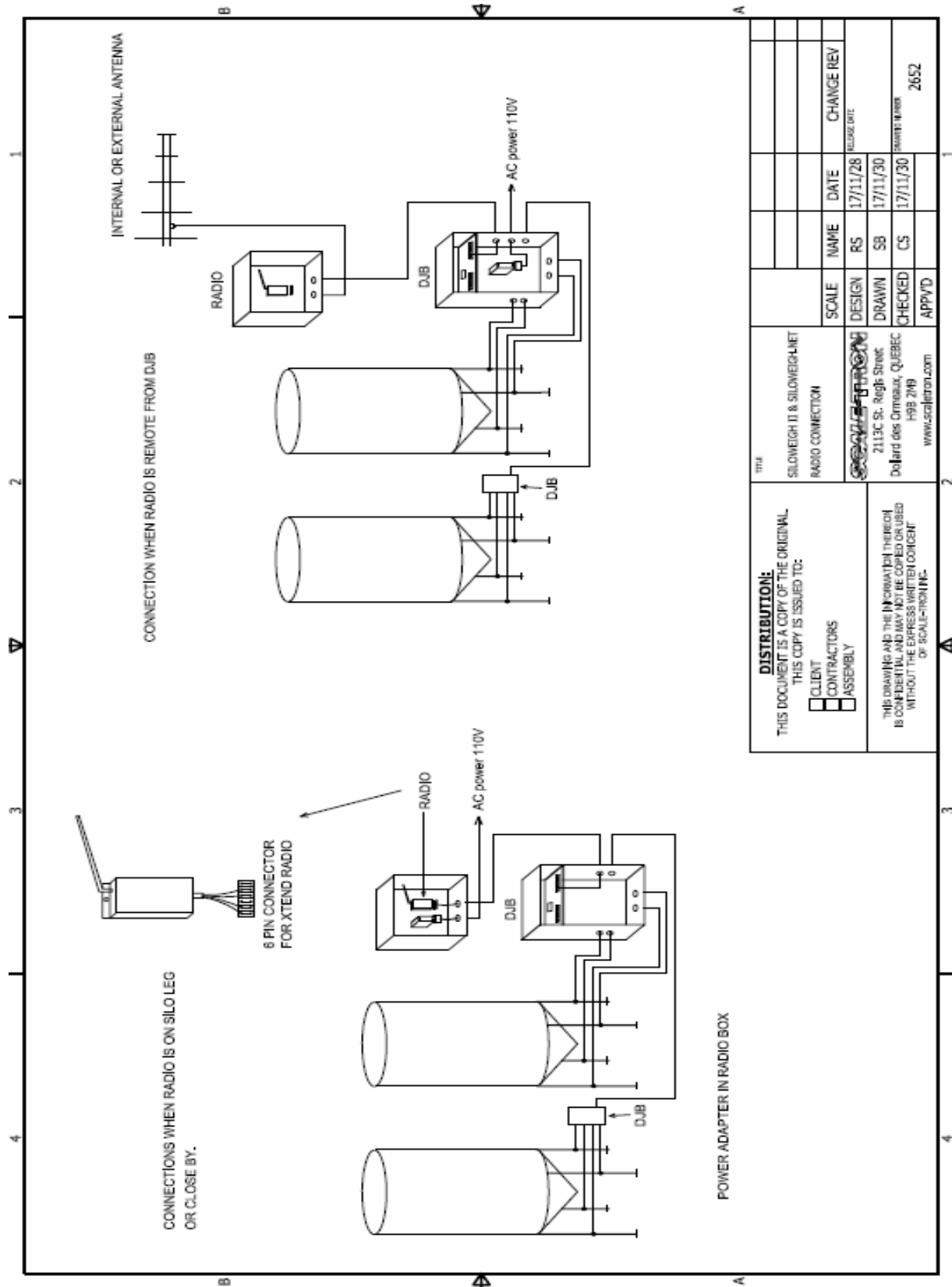
ALL RELAYS: OMRON G2 RV TYPE

24V DC: G2RV-SL700-DC24(DC21) (OR-SL500)

110V AC: G2RV-SL700-AC110 (OR-SL500)

230V AC: G2RV-SL700-AC230 (OR-SL500)

10.6 Connections to DJBs and radio link



10.7 Calibration record

SETUP AND CALIBRATION RECORD						
Parameter name	Vessel 1	Vessel 2	Vessel 3	Vessel 4	Vessel 5	Vessel 6
Vessel name (top)						
Vessel name (center)						
Overflow alarm %						
High alarm %						
Reorder alarm %						
Low alarm %						
Graduation size						
Capacity						
Units						
Overflow alarm output						
High alarm output						
Reorder alarm output						
Low alarm output						
Warning message input						
Message display						
Vessel type						
Divided silo Div. A %						
Calibration - Offset						
Calibration - Offset adj.						
Calibration - Slope						
Calibration - Slope adj.						
Input type						
Filter L+						
Filter L-						
Filter R+						
Filter R-						
Zero band %						
DJB address						
LC1						
LC2						
LC3						
LC4						
COMMON SETTINGS FOR ALL VESSELS	Audible cancel reset					
	Filter active				Filter sample time	
	IP address			Display alarm wndw	Averaging factor	
	Gateway			Subnet mask	Remote PC key code	8000



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