

THUNDERBIRD

Agricultural Weighing Systems

SS1000 Instructions

Installation

Locate a weighing site that is well drained. For best weighing results, ensure the weigh bars and weighing platform are on a level hard surface (ie concrete), and free from contact of any obstruction. Do not use wooden platforms. Make sure the platform doesn't rock, pack with spacers if needed. If the installation has any flexing or twisting in the platform, inaccurate weights may occur. The weight should be evenly distributed over the top of the weigh bars.

When bolting the bars down, also eliminate any twisting of the platform. Avoid bolting everything down tight. If in a fixed situation, it is best practice to bolt the rear bars to the concrete, then bolt the platform or crush to the bars, then leave the front bars unbolted with only guide pins into the concrete. This will minimise any flexing that could occur.

When weighing animals, be sure that their weight is totally on the weighing surface, and not touching fixed gates, rails, etc. If at all possible use a crush or weigh box, and place the weigh bars so that the whole structure is weighed. This will eliminate weighing errors if the animal does lean on any part of the structure.

Care and Maintenance

WARNING! DO NOT WELD TO THE WEIGH BARS OR ANY STRUCTURE THAT THEY ARE ATTACHED TO. The voltage and current from the welder can instantly destroy the sensitive strain gauges used to measure the weight. Welding currents create observable damage to the strain gauges, and will void your warranty. Remove the weigh bars from the structure before attempting to weld.

Care of cables is important to avoid erratic readings or breakdown. Plugs should be covered when not in use to avoid corrosion of contacts and to prevent moisture penetrating the cables.

Do not allow the bars to remain wet or allow a build up of manure inside the bars for long periods of time. This will shorten the life of the weigh bars, can cause premature failure and may void your warranty. If the area does remain wet, remove the weigh bars when not in use. The weigh bars are sealed, and can be hosed out with low pressure water to keep clean.

Store the indicator in a dry area away from moisture when not in use. Although it has a gasket seal to prevent rain ingress, repeated cycling of warm and cool from day to night in a damp area can cause a build up of moisture inside the indicator.

Do not transport weigh bars or load cells with a weight on them. If the vehicle goes over a bump, the resulting "G" forces increase the effective weight applied, which may exceed the load cell capacity, causing damage to the load cells. Load cells that have had excessive weight applied to them are not covered by warranty.

Power Supply

Once the weigh bars are in position and the weighing surface is on top, plug weigh bars into indicator, connect the 12V battery cable into the indicator and then the red clip to the positive of the battery, and the black clip to the negative of the 12V battery. The indicator automatically turns on. The indicator is diode protected, so accidental incorrect polarity will not destroy the

unit. However if the weigh bars are electrically connected to the battery, the protection diode is bypassed. **Make sure that the weigh bars are isolated from the battery.** That is, don't sit the weigh bars on a tractor trailer or ute, and then power the indicator from that vehicle's battery. It may damage the indicator.

The indicator may have an optional internal Ni-MH battery, in which case you don't need to connect an external battery. The indicator will operate for approximately 12 hours on it's own battery, depending on the number of weigh bars attached and provided it is fully charged. A plug pack charger is supplied if the scale is purchased with an internal battery.

The internal battery will go completely flat after a few days. This is done on purpose, and is designed to extend the life of the battery as much as possible.

Charge the internal battery overnight before use. It takes approximately 15 hours to fully charge the battery.

There is a low battery indicator on the display. If the battery voltage starts getting low, a **LO BAT** indication will start to flash. The flash rate will depend on the battery voltage. If the external battery voltage falls to approximately 11 volts, the **LO BAT** indication will stay on continuously. Once the battery voltage falls to 10.5 volts, the indicator will turn off.

If the internal battery should go flat while weighing, an external 12V battery can be connected to continue weighing. The internal battery will start charging from this external power source while weighing is in progress.

Turning On

All mode setting changes are memorised by the SS1000. When the indicator is turned on, the weighing mode will be the same as it was when the indicator was turned off previously. A tare is performed automatically after a countdown delay of about 10 seconds. The scale is then ready for weighing. This means that no buttons need to be touched if the scale is used for weighing the same thing each time.

Operation

The SS1000 has a water resistant 8 button keypad for a user interface. An extra large 40mm digit display provides the user with the ability to view the weight at a distance. The display also has other indications which are used at various times. All settings are memorised, so that the indicator will return to the previous set up when it is turned on. The SS1000 contains highly stable circuitry, which is designed to improve accuracy.

Following is a description of each button and what it does.

Off/On - This button does what it says. When the indicator is turned off, power to all parts except the microcontroller are switched off. The microcontroller goes in a sleep mode, and can only be turned back on by pressing the Off/On button. The indicator counts down for 10 seconds when turning on. This is to give the converter circuitry time to normalise. If the indicator has been turned off, there will be a delay of a few seconds before it can be turned back on again.

Tare - When pressed, the scale will display 4 dashes ("----") and cancel any weight that exists on the weigh bars. After a few seconds the display will show zero weight, regardless of any weight (such as a weigh box) that may be present. Tare also has other functions that will be described in calibration.

Mode - Mode selects the weighing mode. The current mode is displayed during normal operation. There are 4 available weigh modes, each with a different purpose. They are:

Livestock - This mode is designed to weigh moving weights, such as animals. The indicator switches to a damping system that filters out sudden changes in weight, and averages

many weight samples over a couple of seconds. The weight must be relatively continuous for a time before the weight is displayed. The displayed weight will change if the indicator determines that the weight isn't quite right.

Livestock Locking - Locking mode works the same as normal livestock mode, except that once a weight is displayed, any change in weight won't be shown until the change exceeds +/-5% of that displayed. The indicator will beep to indicate that it has locked the weight.

General - This mode is for weighing static weights and produce. The displayed weight is updated every second, and doesn't have any weight damping. It is suitable for weighing products that are slowly added to, such as weighing grain being augered into a bin.

Fine - Fine mode weighs in smaller increments than general, and has a maximum weight of 50kg. It is suitable for weighing fleece or domestic pets.

Mode also has other functions described later in calibration.

Kg/lb - The indicator is capable of displaying weights in either pounds or kilograms. Alternate presses of this button swaps between units. The screen shows which units the weight is displayed in.

Up and Down Arrows - Use these arrow to change the contrast level of the display. This only works while the scale is displaying a weight. There are 16 step of contrast available. Repeated pressing of an arrow key changes the contrast level one step at a time. These arrows have other function described in calibration.

Calib. - This button is used to enter the calibration mode or other specific functions described later. This button would normally be rarely used.

Enter - The enter button is only required for calibration or selecting functions described later. It is rarely used for normal weighing.

Calibration

The SS1000 has the capability of being calibrated in the field. The electronics in this weighing system is very stable, and this calibration procedure should rarely need to be done. However, if the weights are critical, it is advisable that the scale be calibrated every year or so. If the load cells have been slightly overstressed, or specific errors have been displayed as described later, it is also advisable to re-calibrate the system before returning the scale for repair. It may be that re-calibration will solve the problem. Re-calibration may not fix the problem if the weigh bars or load cells have been grossly overstressed.

To perform the calibration, a known fixed weight must be at hand. The capacity of the total system, and the number of load cells in the system must also be known. The capacity will be printed on the label attached to the weigh bar or load cell. The test weight must be a minimum of 5% of the capacity of the system, and small enough to be able to balance easily on 1 weigh bar or load cell. The maximum test weight is the total capacity of the system divided by the number of weigh bars or load cells. For example, a 4 tonne system with 4 load cells would have a maximum test weight of 1 tonne. Similarly, a 200kg system with 2 bars has a maximum test weight of 100kg.

Each weigh bar or load cell is calibrated independently, and they must be removed from any structure that they're supporting before calibration starts.

The procedure is as follows:

1. Press **calib.** "??" will appear. Press **calib** again then hold down **enter** within 1 second to proceed or **tare** if you do not wish to calibrate at this time. The calibration procedure **must** be performed if you proceed past this point. If the power is turned off during calibration, you will have to re-do the calibration from the start when the power is turned back on.

2. "SYS1" or "SYS2" will be displayed if there is more than one system in memory, depending on the system in use. The SS1000 is capable of remembering the calibration

parameters of 2 separate weighing systems. This will be described later. Press **enter** to proceed.

3. A zero will be displayed and capacity will flash. This is where the total capacity is to be entered. The capacity must be in kilograms and must contain 4 digits, even if it's only in the hundreds of kilograms. For example, a 500kg system would be entered as "0500". Use the **arrow keys** to adjust the digit, then press **enter** to move on to the next digit. Repeat this process for all 4 digits.

4. "1 LC" will be displayed. Use the **arrow keys** to select the number of load cells in the system. The 4 options are; 1 load cell (1 LC), 2 load cells (2 LC), 2 load cells linked (2LLC), and 4 load cells (4 LC). Linked load cells have a cable between them and only one plug to connected to the indicator. **WARNING! If there are 2 load cells linked and they use an adaptor to convert from a 4 pin to a 7 pin plug, select 1 load cell. If there are 4 load cells linked and two 4 pin plugs with adaptors, select 2 load cells.** Once the correct number is displayed, press **enter**.

5. The Bar No. to be calibrated will be displayed. If the indicator has 2 load cell sockets, bar 1 is the one connected to the left hand socket looking at the front of the indicator. In a 2 linked bar system, bar 1 is the bar with 2 leads connected to it. In a 4 bar system, bar 1 is the bar connected to the left hand socket and has 2 leads connected to it. Press **enter**.

6. "0000" will flash. Make sure that there is nothing sitting on the weigh bar to be calibrated, and the bar is sitting on a flat, level surface. Press **enter**.

7. "----" will be displayed while a reference value is recorded. Don't touch or move the bar while this display is shown, it will create an incorrect calibration.

8. A zero will be displayed after a few seconds. This next step requires a known test weight. This test weight must be a minimum of 5% of the total capacity of the system. **Before** entering the test weight, place the known weight on the appropriate load cell. Use the method described in step 3 to enter the known weight. If the entered value is less than 5% of the total capacity, the minimum required weight will be displayed for 2 seconds before another test weight value is asked for. **WARNING! When enter is pressed to accept the 4th digit, the indicator immediately starts obtaining a reference value for this weight.**

9. "----" will be displayed while a reference value is recorded. Don't touch or move the weight while this display is shown, it will create an incorrect calibration.

10. If there are other bars in the system, steps 5 through to 9 must be repeated for each load cell. Once all load cells have been calibrated "donE" will be displayed. Remove the test weight, then press **enter** to exit the calibration mode. A tare will be performed on exit.

Displaying the Total Capacity

The total capacity that was entered during calibration can be displayed by the following procedure:

1. Press **calib**. "??" will be displayed.
2. Press **mode**. The number "1" will flash.
3. Press **enter**. The total capacity in kilograms will be displayed.

Pressing any key after this will exit from this display and a tare will be performed.

Adding a Second System

The SS1000 is capable of remembering the parameters of 2 separate weigh systems. An example

of this would be having one set of weigh bars under a cattle crush, and another set under a feed bin. The one indicator can be used for both systems, and it saves moving load cells from one location to another and setting them up.

The procedure is:

1. Press **calib**. “??” will be displayed.
2. Press **mode**. The number “1” will flash.
3. Use the **arrow keys** to change the number to a “3”.
4. Press **enter**, or press **tare** to exit. If there are already 2 systems in use, “FULL” will be displayed, in which case press any key to exit.
5. The new system will be displayed, for example “SYS2”. Press **enter** to add it, or **tare** to exit. If the system is added, this will become the current system, and calibration mode will be entered. Take note of which system is which, because incorrect weight readings will result if the wrong system is selected.

Swapping Systems

To swap from one system to the other, follow this procedure:

1. Press **calib**. “??” will be displayed.
2. Press **mode**. The number “1” will flash.
3. Use the **arrow keys** to change the number to a “2”.
4. Press **enter**, or press **tare** to exit. If enter was pressed, the current system will be displayed.
5. Use the **arrow keys** to select the desired system, then press **enter**. This system will now be the current system. Make sure that the system is the one connected. Errors in weight will result if the incorrect system is selected.

Deleting a System

Only the weigh system not in use may be deleted. To delete the current system, it must first be swapped as described above. A weigh bar system may be deleted by the following procedure:

1. Press **calib**. “??” will be displayed.
2. Press **mode**. The number “1” will flash.
3. Use the **arrow keys** to change the number to a “4”.
4. Press **enter**, or press **tare** to exit. “DEL” is displayed, and the system number will flash.
5. Press **enter** again to delete, and other key will exit the procedure.
6. “donE” will be displayed for 2 seconds before exiting.

Increments

The SS1000 displays in varying weight increments, depending on a number of factors. These

factors include the capacity of the system, the weighing mode, and the amount of weight applied. The guide below shows the increments used.

If system capacity is 200kg (440lb) or less;

General-	0.1kg (0.2lb)
Livestock-	0-50kg, 0.2kg; 51-200kg, 0.5kg 0-100lb, 0.5lb; 101-400lb (1lb)
Fine-	0-50kg, 0.05kg 0-100lb, 0.1lb

For 201kg (441lb) to 2000kg (4400lb) load bar systems;

General –	0-200kg, 0.5kg for systems over 500kg, otherwise 0.2kg; 201-1000kg, 0.5kg; >1000kg, 1kg 0-440lb, 1lb for systems over 500kg, otherwise 0.5lb; 441-2200lb, 1lb; >2200lb, 2lb
Livestock-	0-100kg, 0.5kg; 101-500kg, 1kg; >500kg 2kg 0-200lb, 1lb; 201-1200lb, 2lb; >1200lb, 5lb
Fine-	0-50kg, 0.1kg 0-100lb, 0.2lb

For systems over 2000kg (4400lb);

General-	0-1000kg, 1kg; 1001-4000kg, 2kg; >4000kg, 5kg 0-2200lb, 2lb; 2201-8800lb, 5lb; >8800lb, 10lb
Livestock-	0-200kg, 1kg; 201-2000kg, 2kg; >2000kg, 5kg 0-440lb, 2lb; 441-4400lb, 5lb; >4400lb, 10lb

There is no fine mode selection on these systems.

Error Messages

The SS1000 has a very comprehensive self monitoring system that detects any problems that may occur. Should such a problem be detected, an error message will be displayed on the screen, for example “Er36”. Most error messages displayed concern problems with the signal coming from the weigh bars or load cells. The signals from the sensitive strain gauges are extremely small. A load bar that has its rated capacity weight applied outputs less than 0.01 volts of signal.

Each load cell is sampled independently many times per second, which allows the SS1000 to continuously monitor any problems that could occur. One of these problems is an overload condition. Any bar that is overloaded will be displayed, even if the overload only lasts for a fraction of a second. This feature enables the user to minimise possible damage and ensure a more reliable weight, as well as extending the useful life of the scale.

If an error message is displayed, turn the indicator off, and closely inspect the cables connecting the weigh bars or load cells. If there is a cut in the outer sheath, or a squashed section of cable, it may have to be replaced.

If there doesn't appear to be any visible damage after inspecting the installation, contact your

supplier or distributor, quoting the error number that appeared. They may be able to help with a cure.

Options

The SS1000 can be supplied with various options. These are:

Internal Battery:- This is an Ni-MH battery pack and a charger. This battery has no memory effect and should last up to 1000 charge/discharge cycles. If the internal battery is fitted, the battery must be charged overnight for 15 - 18 hours before use.

Weigh Bar Size:- Thunderbird currently manufacture 4 different sized bars. They are:-

- Easymove 500kg bars- 2 bars, 580mm in length designed for portability.
- Easymove 2000kg bars- 2 bars 580mm in length also designed for portability.
- Extender 3000kg bars- 2 bars 1000mm in length.
- Quad 4000kg bars- 4 bars 580mm in length.

The 3000kg and 4000kg bars are designed to fit under cattle crushes or large weigh bins for maximum stability.

Specifications

Indicator:

External Supply Voltage:	12Vdc nominal
Internal Battery Voltage (optional):	7.2Vdc
Supply Current:	System with 1 weigh bar- 100mA System with 2 weigh bars- 140mA System with 4 weigh bars- 260mA
Load Cell Excitation Voltage:	5Vdc
Load cell input sensitivity:	Maximum 2.2mV/V
Maximum offset voltage:	+/- 25mV
Accuracy:	Greater than 99% at full scale
IP Rating	IP24 (provided indicator is at 45 degrees or more)

Weigh Bars:

Gauge resistance:	120 Ohms
Offset Error:	Within +/- 10mV
Sensitivity:	Approx 1.35mV/V
Overload Capacity:	150% of rated capacity

Battery Charger (optional):

Input Voltage:	240Vac 50Hz
Output Voltage	9Vdc at 500mA

Troubleshooting

Problem	Cause	Remedy
Won't turn on	Battery not connected	Connect to a charged, 12V battery
	Battery leads in reverse	Make sure the +ve clip is on the +ve terminal
	Battery lead has been stretched	The battery lead wires are connected to the battery clip with a push on connector, this may be disconnected. Simply push it back onto the terminal.
	Internal battery (if fitted) is flat	Charge the battery or connect an external 12V supply.
Won't tare	Moving weight	The weight must be still and stable before the indicator is able to obtain a tare reading, make sure any weight still on the load cells does not move.
	Poor installation	The load bars must be installed on a solid base such as concrete. Sitting them on the ground is not satisfactory. Refer to the installation section.
	Flexible platform	Any platform that may be used on top of load bars must be rigid, and must spread the load over the entire bar. Timber panelling is not acceptable.
	Moisture in plug	Moisture is the most common cause of erratic weights in any scale. If there is moisture in the plug, undo the plug, and thoroughly wipe out and dry all parts of the plug before re-assembling.
Erratic weight	Moisture in plug	Moisture is the most common cause of erratic weights in any scale. If there is moisture in the plug, undo the plug, and thoroughly wipe out and dry all parts of the plug before re-assembling.
	Poor installation	The load bars must be installed on a solid base such as concrete. Sitting them on the ground is not satisfactory. Refer to the installation section.
"Er15" displayed	There is most likely a short in the weigh bar or its cable.	If the cable is damaged it must be replaced. If the problem is in a weigh bar, return the system for service.
"2 OL" displayed	There is too much weight on the bar indicated.	This error will self clear when the weight is removed. This display could flash up for a fraction of a second if there is a momentary overload due to a heavy weight being put down.
"OL" displayed	There is too much weight applied	This error will self clear when the weight is removed.