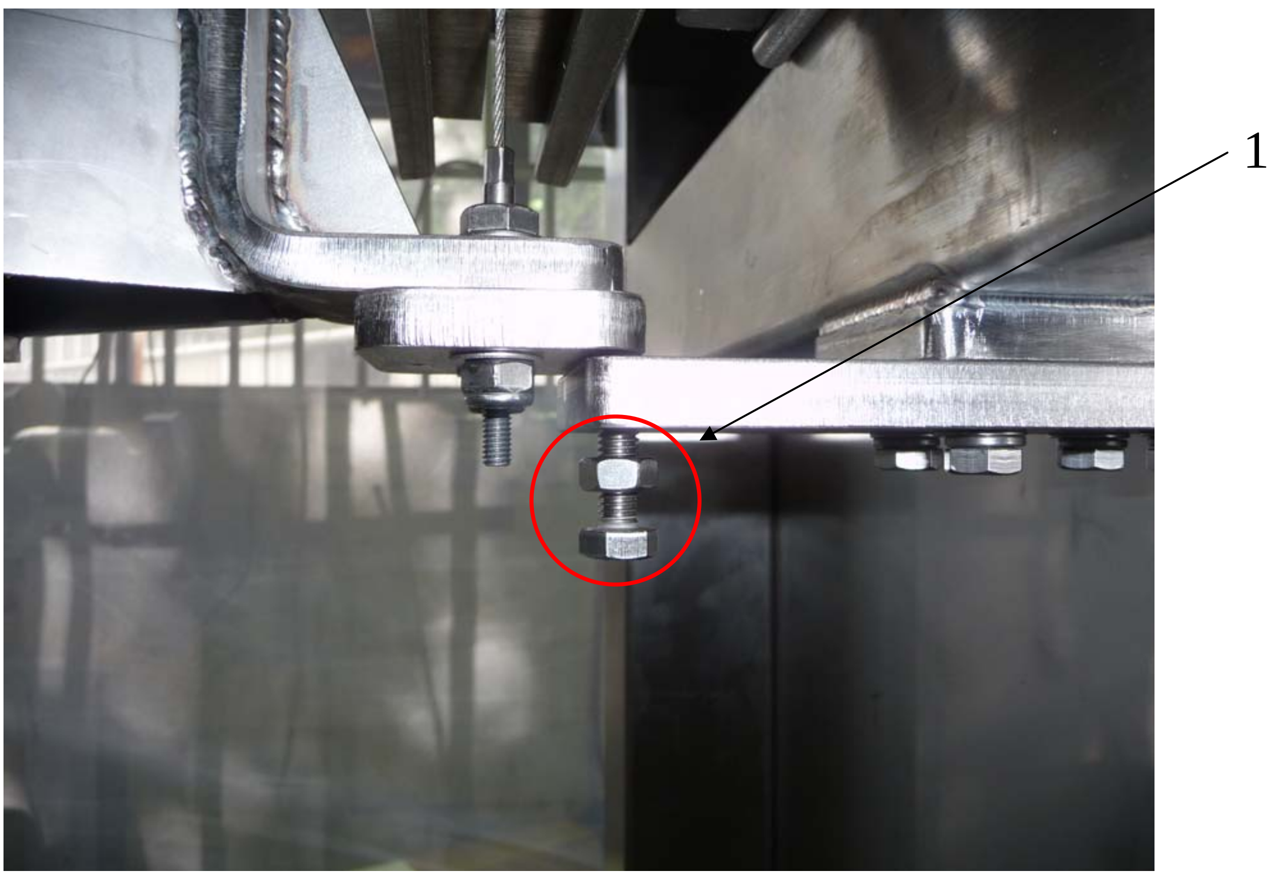
WEB-TECH

VIBRATORY FEEDER-*EASY* FLOW 2000

PLEASE ENSURE THE TRANSPORT BOLT IS REMOVED WHEN IN PLACE AND READY TO COMMISSION

The transport bolt is located under the loadcell cable mount

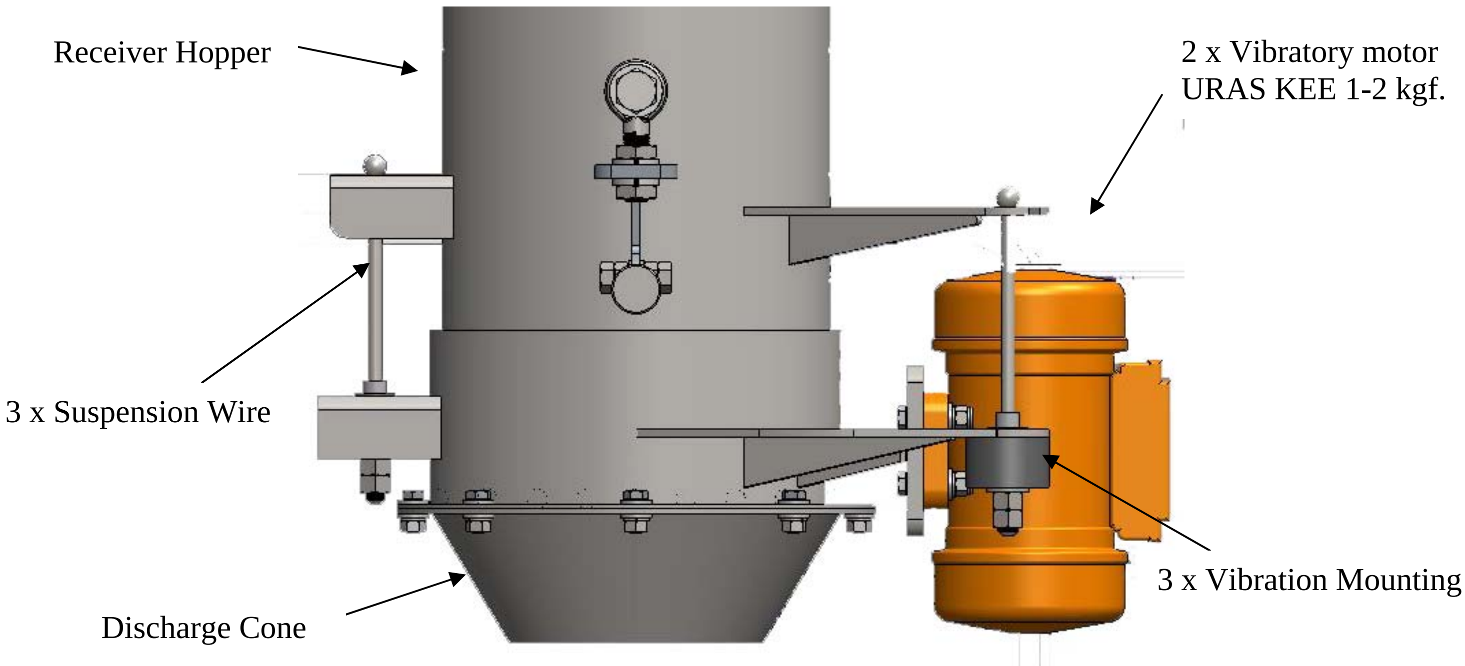


Wind out both bolts marked “1” until the loadcell mV does not increase (about 11.5mV)

Use these same bolts to set the overload to MAX 30mV- load up the hopper to read 30mV-then wind up the bolts until the mV start to drop.

System Description

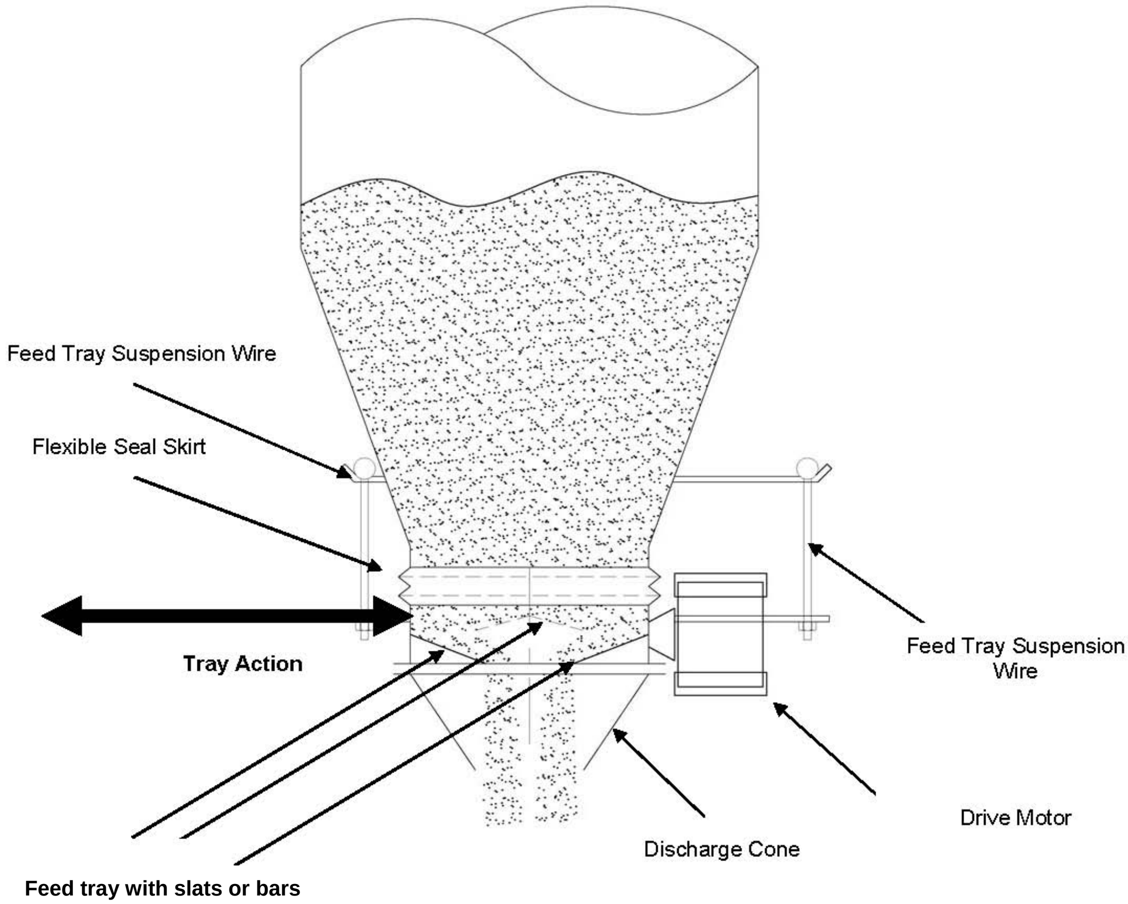
The Vibratory Feeder EasyFlo 2000 has been designed to provide mass rate control for products that are difficult to feed. The system consists of a pre-feed hopper of various capacities and designs, and a vibratory feeder (EasyFlo 2000).



The EasyFlo 2000 controls material flow using a vibratory motor attached to a one piece feed tray. The EasyFlo 2000 is used to induce product flow from a storage hopper or bin, and is particularly useful when feeding non free flowing materials. The horizontal action of the vibrations acts in a manner that shears the product at the feeder inlet and promotes flow. It is also effective in throttling and stopping the flow of free flowing materials.

The feed tray is attached to the supply hopper by means of three suspension wires, which isolate the tray and allow it to vibrate in unison with the vibratory motor. The feed tray is designed for each application, and can comprise of a number of bars and baffles. The number and position of these bars is a function of the materials flow ability. A well designed feed tray allows for control of the mass rate by adjusting the frequency, and inertia of the vibratory motor. The bars also act as a gate, and stop material flow when the vibrator motor is stopped; this negates the requirement for a slide gate or valve.

Web Tech Vibratory Feeder- *Easy*Flow 2000

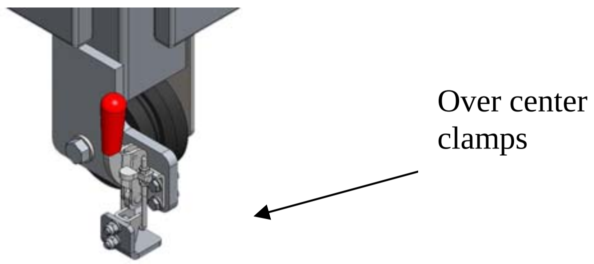


Optimus plus controls the mass rate by adjusting the frequency, and can maintain a rate set by a set point. The Optimus plus does this by monitoring the weight of the material in the hopper, It calculates the mass rate from the change in weight of the material (LIW). The frequency is controlled by sending a control signal (PID) via a 4-20mA current loop to a VSD. See the Optimus plus manual for further details on the operation and setup of the Optimus plus controller.

Installation

The feeder is designed to be rolled in and out of the normal operating position for easy cleaning. The angle iron rails that it runs on should be welded or bolted down to the floor. As most floors are not flat; the rails should be **shimmed** if necessary to level the frame.

The feeder assembly must be free standing. No other devices or structures can be bolted or welded to the feeder assembly. No welding should be performed on the feeder assembly, without disconnecting the electronics, as this can damage the load cell and or electronics.



The feeder should be locked down in the operating position using the over center clamps when running. The feeder is totally enclosed for safety and dust control. The feeder is fitted with doors for easy access, that should be keep closed during operation, to prevent any errors from wind,

Electrical connections

All wiring must be in accordance with local electrical statutes.

All motors that are supplied from a VSD must use shielded cable that is grounded at the instrument end.

All signal wiring must use shielded cable and be physically isolated from the motor power supply.

The feeder should be connected as per the supplied wiring diagram.

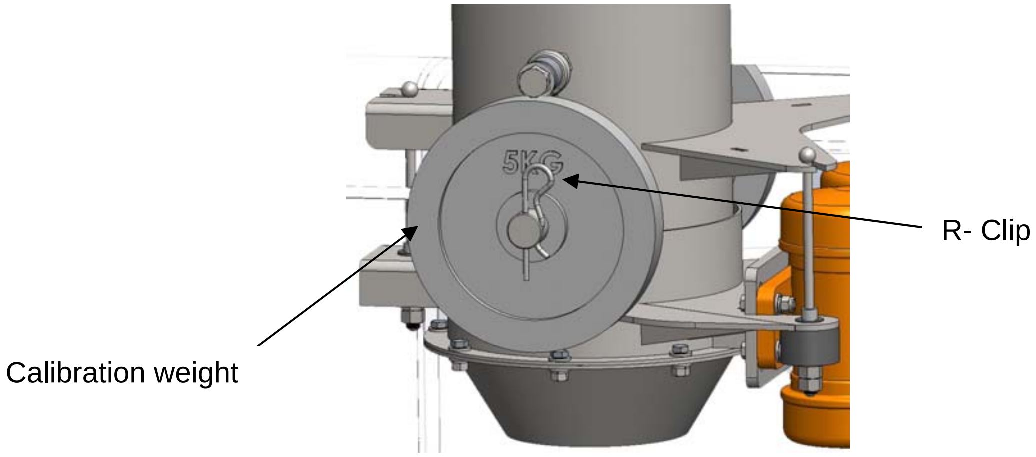
Commissioning

Although the EasyFlo 2000 Vibratory Feeder and the Optimus Plus controller are calibrated at the factory, they should be recalibrated as part of the commissioning procedure.

Please take note of our terms & conditions of sale regarding commissioning. It is recommended that the feeder is commissioned by Web-Tech, if it is to perform as required, as it is likely that some modifications may have to be done if the product does not flow as predicted.

Calibration

To ensure reliability and accuracy, the feeder needs to be regularly calibrated, as part of an ongoing maintenance program.



To make the calibration process simple, Web-tech have provided calibration weight carriers on either side of the hopper as shown above. The calibration weights are placed on the carriers, during the span procedure. Please note the R-clip must be in place when the weights are on the machine to prevent injury.

Calibration Procedure

To calibrate the feeder follow the procedure below:

a) Turn the feeder off.
b) Make sure the hopper is completely empty.
c) From the Optimus plus main menu press the CAL (F1) button to enter the calibration menu.
d) Press the zero buttons to perform a zero calibration.
e) Enter the total weight of the calibration weights (stamped on the weights), in the calibration data field.
f) Place the calibration weights on the weight carriers on either side of the feeder.
g) Press the span button.
h) Remove the calibration weights.
i) Press the home key to save the calibration data and return to the main screen
j) The calibration is complete.

Refer to Optimus *Plus* manual for further information on the calibration procedure.

TO OUR CUSTOMERS:-

We thank you for your selection of our Uras Vibrator. This is a rotary type electric vibrator which produces vibrations by means of centrifugal force of the rotating unbalance weights mounted at both ends of the rotor shaft. The Vibrator is basically different from ordinal type electric motors.

As the special care have been paid by the manufacturer in the manufacturing process, the Vibrator should be operated at its full efficiency to your satisfaction when it is properly used. This manual is prepared in order to invite your sufficient attention to the installation, handling, adjustment and maintenance because without such attention the Vibrator would not only be able to perform its full function but also be shortened its service life. During storage, make the following inspection and maintenance every 5 months.

- The Vibrator should be hand-rotated a number of times approximately to prevent the bearing from rusting. If power is available, about 5 minute running with load disconnected is preferable.
- Check coil insulation resistance. 5MΩ or above is satisfactory.

Please read this manual thoroughly before you use the Vibrator.

Thank you.

Manufacturer:
MURAKAMI SEIKI MFG., CO., LTD.
— Kitakyushu, Japan

Sole Agent
URAS TECHNO CO., LTD. — Kitakyushu, Japan

1. Receiving

This unit has been put through severe tests at the factory before shipment:

- Its nameplate rating meets your requirements.
- It has sustained without damage in the transit.
- Fastening bolts and screws are not loosened
- Connect the unit to the power, with reference to WIRING in this manual and make a test run to see if it properly starts, runs and stops.

If any part of the unit is damaged or lost, or any defective conditions are found, notify us giving full details and nameplate data.

2. Storage

When Uras Vibrator is not installed immediately, it shall be stored in a clean, dry indoor place.
If the Uras Vibrator is unavoidably stored outdoors, it shall be loosely covered with a tarpaulin, plastic cover or similar type of protective cloth to protect it from any precipitation, liquid, dirt, etc.

When the motor-driven vibrator must be stored for a long period of time (up to 2 years at most), ensure that the storage area is at ambient temperature (not less than +5℃) with a relative humidity of not more than 60%

3. Construction

The grease-lubricated Uras series of vibrator is classified into four types on the basis of vibrating force.
Table 1 shows the basis of selection.
Even though the outer and inner races of the roller bearings ⑳ are tightly fitted into the

Table 1

Type	Max. vibrating force [N]	Motor power [kW]	Full-load current 50/60Hz [A]	Protection	Drawing
KEE-0.5-2C	500	40 W	0.36/0.30	IP66	Fig.1
- 1-2C	1000	75 W	0.59/0.48		
- 2-2C	2000	0.15	0.79/0.71		
-3.5-2B	3500	0.25	1.4/1.2		Fig.2
- 6-2B	6000	0.40	1.7/1.7		
- 10-2B	10000	0.75	3.1/3.0	IP55	Fig.3
KEE-1.5-4B	1500	65 W	0.68/0.57	IP66	Fig.2
- 3-4B	3000	0.13	1.11/0.89		Fig.4
- 6-4B	6000	0.25	1.6/1.4		
- 9-4B	9000	0.40	2.2/1.9		
- 12-4B	12000	0.60	2.8/2.7		Fig.5
KEE- 3-6	3000	0.20	1.5/1.3	IP66	Fig.4
- 5-6	5000	0.35	2.3/2.0		
- 9-6B	9000	0.60	3.8/3.3		Fig.5
- 13-6B	13000	0.85	4.7/4.3		
- 18-6B	18000	1.20	6.2/5.8		
- 24-6B	24000	1.60	8.3/7.5		
KEE- 5-8	5000	0.40	3.2/2.7	IP66	Fig.4
- 10-8B	10000	0.75	6.5/5.1		Fig.5
- 20-8B	20000	1.50	9.2/8.2		
SEE-0.5-2C	500	30 W	0.64/0.54	IP66	Fig.1
- 1-2B	1000	65 W	1.2/1.2		Fig.2
- 2-2B	2000	0.12	2.2/1.9		
-3.5-2B	3500	0.22	3.3/3.1		

Note: The entries in the full-load current column above mentions are approximately and applied to the supply voltage 200V AC. When the power supply voltage 400V AC, the full-load current is about half the values given in the table.
The power supply for the SEE single phase 100V AC.
※ IP-55, IP-66 specified by IEC, indicates the type of construction adopted for Uras vibrators, which protects the operator from the vibrator, and protect inside from dust or water.

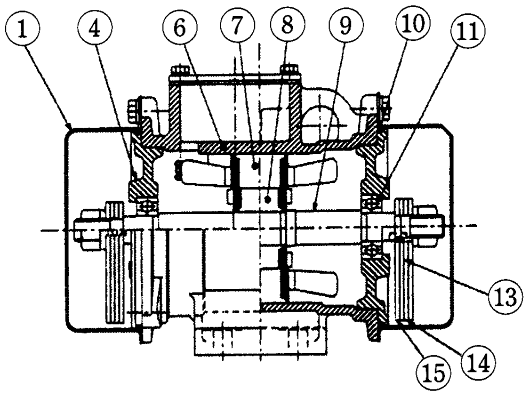


Fig. 1

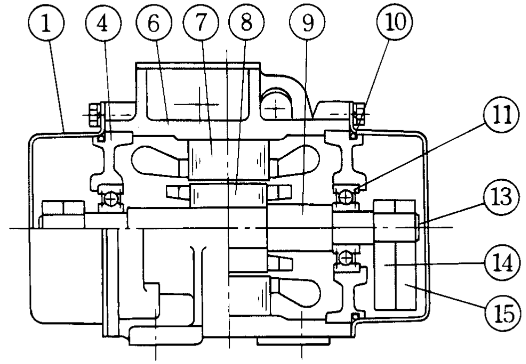


Fig. 2

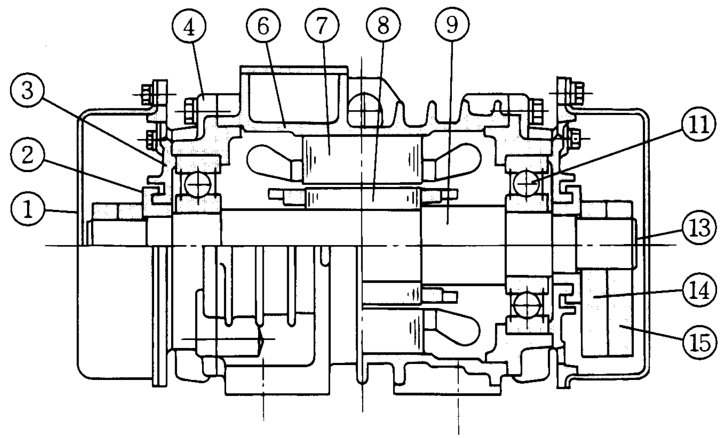


Fig. 3

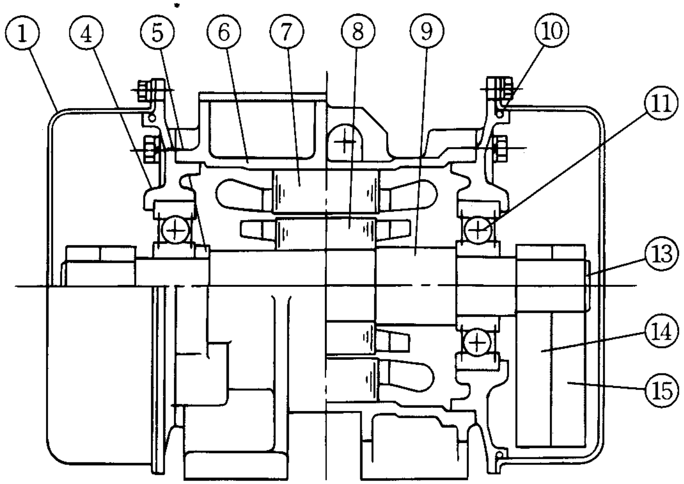


Fig. 4

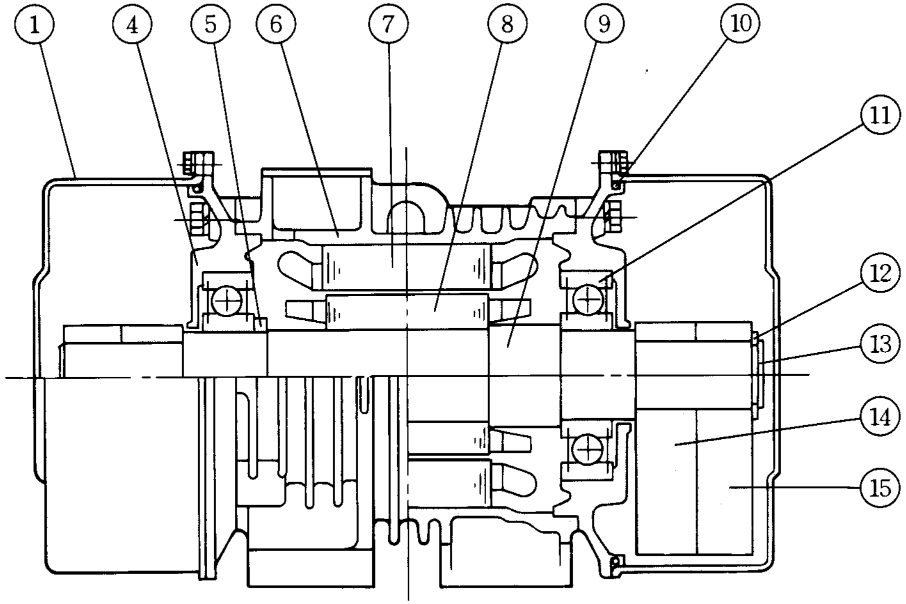


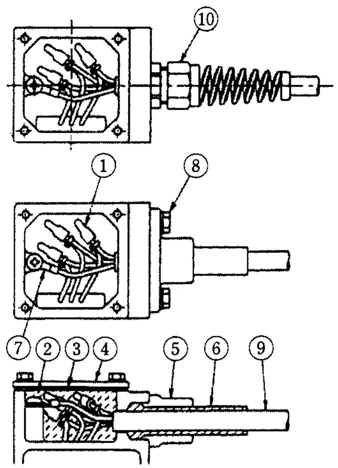
Fig. 5

Parts list

No.	Part name	No.	Part name
1	Weight cover	9	Shaft
2	Dust collar	10	Seal ring
3	Bearing cover	11	Ball Bearing
4	Bracket	12	Snap ring
5	Collar	13	Scale plate
6	Frame	14	Fixed weight
7	Stator core	15	Adjustable weight
8	Rotor core		

Construction of Terminal box

Construction of terminal box is as follows.
The terminal box is filled with Uras compound to protect the lead, and keep from contacting with the metal plane.



1	Crimp contact
2	Uras Compound
3	Rubber gasket
4	T-cover
5	Bell mouth
6	Protective tube
7	Grounding wiring
8	Bell mouth retaining bolt
9	Lead wire
10	Supper gland

3-1 Construction (Fig. 1 and 2)

The brackets ④ are tightly fitted into the frame ⑥. Both outer races of the sealed ball bearings ⑪ are tightly fitted in to the holes in brackets ④. While the inner race of the ball bearing at the left, viewed from the cable connection opening of the terminal box, is fitted tightly to shaft ⑨, the inner race of the other ball bearing slides in to the shaft ⑨.
The vibrators are equipped with seal rings ⑩ between brackets ④ and weight covers ① to protect inside the vibrators.
Both SEE-0.5-2C, and SEE-1-2B employ a capacitor in the terminal box, while KEE-0.5-2C does not. Fig.1 show how the stamping weight employed.
The SEE and KEE-0.5-2C employ a fixed and an adjustable weight at both ends of the shaft ⑨, KEE-1-2C employ two fixed and two adjustable weights at each end of the shaft ⑨ and KEE-2-2C employ the four fixed and four adjustable weights.

3-2 Construction (Fig. 3)

The brackets ④ are tightly fitted into the frame ⑥ and the bearing covers ③. Both outer races of the sealed ball bearings ⑪ are tightly fitted in to the holes in the brackets ④. While the inner race of the ball bearing at the left, viewed from the cable connection opening of the terminal box, is loosely fitted to the shaft ⑨, the inner race of the other ball bearing is slide fitted into the shaft ⑨.
We supply labyrinth packing to protect inside from dust due to their well ventilated structure.

3-3 Construction (Fig. 4 and 5)

The brackets ④ are tightly fitted into the frame ⑥ and the weight covers ①. While both the outer races of the sealed ball bearing ⑪ are closely fitted into the holes in brackets ④. The inner races are loosely fitted to the shaft ⑨.
The vibrators are equipped with seal rings ⑩ between the brackets ④ and weight covers ① to protect inside from dust.

4. Installation and operation

4-1 Installation and retightening of screws

Uras vibrators of KEE-18-6B, -24-6B, -10-8B and -20-8B models can be installed in any positions. When installing KEE-18-6B, -24-6B, -10-8B and -20-8B models at an angle or vertically, they shall be positioned with the snap ring ⑫ side facing down.
The rough surface of the equipment the vibrator mounted on should below 25 S.
Install the vibrator scenery using flat and spring lock washers to prevent screws from loosening.
Causes audient.
All securing screws should be retightened after installation, because the initial tightening force will be reduced when the mounting base surface is broken in.
Retighten the securing screws once a week after operation. Although the loose screws may be found when retightening periodically check for looseness. Retighten the screws as for initial installation after reinstallment.
The KEE-2-2C Uras vibrator must be rigidly fixed with 8.8 type bolts.
Table 2 shows the suitable tightening torque for securing screws.

Table 2

Type	Mounting bolt	Tightening torque [N · m]
KEE-0.5-2C KEE-1-2C KEE-1.5-4B SEE-0.5-2C	M8	13
KEE-2-2C	M8 (Type 8.8)	20
KEE- 3-4B SEE-1-2B	M10	25
KEE-3.5-2B, 6-4B, 3-6 SEE-2-2B	M12	43
KEE-6-2B, 9-4B, 5-6 SEE-3.5-2B	M16	110
KEE-10-2B, 12-4B, 9-6B, 5-8	M20	210
KEE-13-6B, 18-6B, 10-8B	M24	370
KEE-24-6B, 20-8B	M30	740

4-2 Wiring

Install the cable carefully not to bend it at the cable connection opening to radius smaller than that of indicated in Table 3 to prevent it from being damaged by any vibration may be transferred from the vibrator.
Clamp the cable on a stand insulated against vibration, leaving an extra cable length of from 500 to 1,000 mm to let it vibrate freely with the rubber insulator, being careful the cable doesn't come into contact with any devices.

Table 3

Type	Conductor sectional area and cable dia.	Min. bending radius [mm]
KEE-0.5-2C 1-2C 2-2C 3.5-2B 6-2B KEE-1.5-4B 3-4B 6-4B 9-4B KEE-3-6 5-6 SEE-0.5-2C 1-2B 2-2B 3.5-2B	0.75 mm² ϕ 11.0	65
KEE-10-2B 12-4B 9-6B 13-6B 18-6B KEE-5-8 10-8B	1.25 mm² ϕ 11.5	75
KEE-24-6B 20-8B	2.0 mm² ϕ 14.4	85

4-3 Grounding

Grounding the green wire, marked E, of the four-core cabtyre, which is connected to the vibrator body at the terminal box.
For the SEE-0.5-2C or -1-2C Uras models, ground the green wire, marked E, of the three-core cabtyre.

4-4 Precautions

When the vibrator is used for feeder or screen, the current supplied to the vibrator usually does not exceed the rated value, because the effect of spring constant and damper coefficient are negligible.

However, the current may exceed the rated values depending on application. In the latter event, adjust the position of adjustable weight ⑮ to reduce the vibrating force and current below the rated value.

Install an electromagnet switch with a thermal relay to open the power supply circuit when excessive current is supplied to the vibrator.
Set the thermal relay tripping ampere to from 100 % to 120 % of the vibrator rated current.

4-5 Vibrating force adjustment (Construction of Fig. 1)

The vibrating force of the Uras vibrators in Fig.1 adjusted to 38 % of the maximum vibrating force with 50 Hz power supply is equivalent to 54 % of 60 Hz power supply at the factory.

It can be adjusted to any specific values by changing the position of adjustable weights ⑮ at both ends of the shaft ⑨. Adjust the vibrating force in the following manner as required.

Two wrenches are needed to adjust the vibrating force.

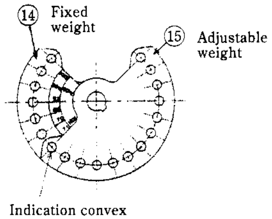


Fig. 6

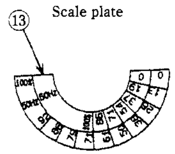


Fig. 7

Slacken the nuts securing the left and right adjustable-weights at a time by the wrench on the both of the nuts as nearly as horizontal. (See Photo 1.)
Either of the two securing nuts loosens.
Then the wrench push into the ribs of the bracket ④ that nut loosening side, take the fixed ⑭ and adjustable ⑮ weights as stopper, i.e., prevent the turning of the shaft ⑨. (See Photo 2.)
Slacken the other arbor nuts securing with the wrench as nearly as horizontal. (See Photo 3.)
Caution must be taken to remove the nuts from the shaft ⑨.
Set the indication convex on the adjustable weight ⑮ to the desired graduation indicated, set the on indication convex adjustment hole, on the scale plate ⑬. (See Photo 4.)


Photo 1

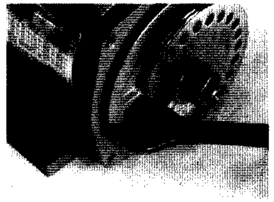


Photo 2

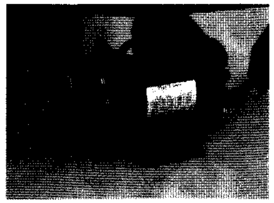


Photo 3

As shown in Fig. 6, the scale plate ⑬ has 10 graduations for 50 Hz power supplies and 6 graduations for 60 Hz power supplies, according to the vibrating can be adjusted.
Select the graduation according to the power supply frequency.
The larger the figure selected, the greater the vibrating force, thus when the pit is positioned at figure 10, the maximum vibrating force is obtained.
After setting the convex to the desired graduation, tighten the adjustable-weight ⑭ securing nut with the two wrenches. Reversing the steps for slacken the nuts, photo 1. (See Photo 5.)

Caution

- Take notice that the key, 4×4×6L, lose because of the shaft ⑨ outfitted with it.
- The numeric value of the tightening torque for the securing nuts is 32 N·m±2 N·m.

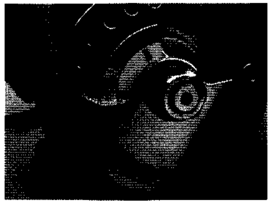


Photo 4

Photo 5

Fig. 5 shows the convex set to 71% of 50 Hz equivalent to 100% of 60 Hz graduations, i.e., the vibrating force is adjusted to 71 % of the 50 Hz maximum vibrating force or that of 60 Hz.
Fig. 6 shows the scales.

4-6 Vibrating force adjustment (Expect Fig. 1)

The vibrating force, except the KEE- and SEE-0.5-2C, KEE-1-2C and -2-2C Uras vibrators, is adjusted to 40 % of the maximum vibrating force with 50 Hz power supply at the factory.
It can be adjusted to any desired values by changing the position of adjustable weights ⑮ at both ends of the shaft ⑨. Adjust the vibrating force in the following manner as required.
Loosen the adjustable-weight securing screw, then set the indication dot on the adjustable weight ⑮ to the desired graduation indicated on the scale plate ⑬.
As shown in Fig. 9, the scale plate ⑬ with 10 graduations enables the vibrating adjust for both 50 and 60 Hz power supplies.
Select the graduation based on the power supply frequency.
The larger the figure selected, the greater the vibrating force, thus when the dot is positioned at figure 10, the maximum vibrating force is obtained.
After setting the dot to the desired graduation, tighten the adjustable-weight ⑭ securing screw, being careful not to loosen the fixed weight securing screw.
Fig. 8 shows the dot set to 5 of 60 Hz graduations, i.e., the vibrating force is adjusted to 50 % of the 60 Hz maximum vibrating force. Fig. 9 shows the scales.

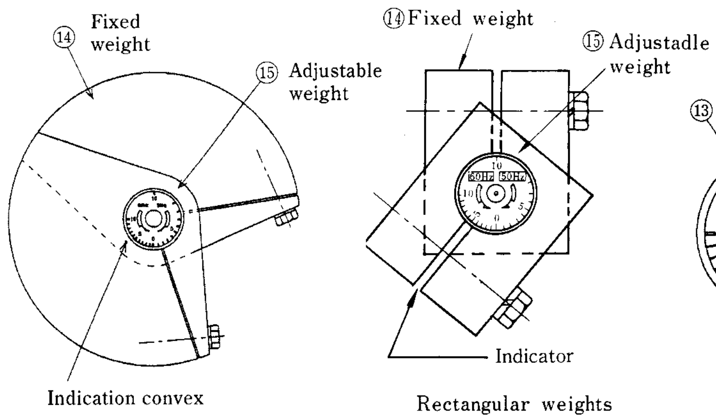


Fig. 8

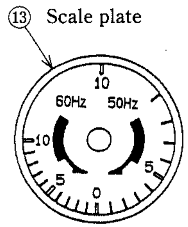


Fig. 9

Table 5 shows the tightening torque for securing screws of the fixed ⑭ and adjustable weights ⑮.

Table 5

Securing bolt	Tightening torque [N · m]
M5	4.5
M6	8.0
M8	20
M10	40
M12	70
M16	170
M20	340
M24	600

5. Bearings and maintenance

The shielded ball bearings filled with Urea grease is applied for models as shown in Figs. 1 to 5, it is not necessary to supply oil to the bearings. The expected fatigue life of the bearing for 2 pole types is 5,000 hours (min.), 4,6,8 pole types of vibrator is 10,000 hours (min.).

Table 5

Type	Bearings (Q'ty × type)	Maintenance
KEE-0.5-2C	2×6202ZZC4	Grease replenishing is not needed. Replace the bearing when Broken.
1-2C	2×6202ZZC4	
2-2C	2×6203ZZC4	
3.5-2B	2×6305ZZC4	
6-2B	2×6306ZZC4	
10-2B	2×6407ZZC4	
KEE-1.5-4B	2×6203ZZC4	
3-4B	2×6304ZZC4	
6-4B	2×6306ZZC4	
9-4B	2×6308ZZC4	
12-4B	2×6309ZZC4	
KEE- 3-6	2×6305ZZC4	
5-6	2×6306ZZC4	
9-6B	2×6308ZZC4	
13-6B	2×6309ZZC4	
18-6B	2×6312ZZC4	
24-6B	2×6314ZZC4	
KEE- 5-8	2×6306ZZC4	
10-8B	2×6308ZZC4	
20-8B	2×6312ZZC4	
SEE-0.5-2C	2×6202ZZC4	
1-2B	2×6202ZZC4	
2-2B	2×6303ZZC4	
3.5-2B	2×6305ZZC4	

6. Disassembly

6-1 Vibrators shown in Fig.1

Figs.10 show the disassembled vibrators mentioned in Fig.1, respectively.
Follow the process as bellows.

(1) Loosen the screws securing the left and right weight covers ①, then remove the weight covers.
The weight covers ① are attached to the frame ⑥ by brackets ④.

(2) Loosen the nut securing the fixed ⑭ and adjustable weights ⑮, then remove the fixed and adjustable weights. Disengage the keys from the shaft ⑨.

(3) Receiving force at the flange of the frame ⑥, push the end of the shaft ⑨ to remove Bracket ④from the frame.

(4) Remove ball bearing ⑪ from the brackets ④ using a metal disk with a slightly larger diameter than the outer race ID, holding the outside of the bearing hole in the brackets.

6-2 Vibrators shown in Figs.2, 4 and 5

Figs.11 and 12 show the disassembled vibrators which shown in Figs.2, 4 and 5, respectively.
Follow the process as bellows.

(1) Loosen the screws securing the left and right weight covers ①, then remove the weight covers.
The weight covers ① of the vibrators shown in Fig.2 are attached to the frame ⑥ by brackets ④.

(2) Remove the snap ring ⑫ if it is provided. Loosen the screws securing the fixed ⑭ and adjustable weights ⑮, then remove the two fixed and two adjustable weights.

(3) Loosen the screws securing the brackets ④ to the frame ⑥, then remove the brackets from the frame by tapping a metal piece with a plastic hammer or wooden mallet, while positioning the metal piece diagonally on the perimeter of the brackets.
Vibrators shown in Fig.2, receiving force at the flange of the frame ⑥, push the end of the shaft ⑨ to remove Bracket ④ from the frame.

(4) Remove ball bearing ⑪ from the brackets ④ using a metal disk with a slightly larger diameter than the outer race ID, holding the outside of the bearing hole in the brackets.

6-3 Vibrators shown in Fig.3

Fig.13 shows the disassembled Vibrator of the kind shown in Fig.3.
Follow the process as bellows.

(1) Loosen the screws securing the left and right weight covers ① and remove them.
(2) Loosen the screws securing the fixed weights ⑭ and adjustable weights ⑮, then remove the two fixed and two adjustable weights.
(3) Loosen the screws securing the bearing covers ③ and remove the covers with the dust covers ②by inserting two M8×30mm set screws in the tapped holes of the bearing covers.
(4) Loosen the screws securing the brackets ④ to the frame ⑥, then remove the brackets from the frame by tapping a metal piece with a plastic hammer or wooden mallet, while positioning the metal piece diagonally on the perimeter of the brackets.
(5) Remove ball bearing ⑪ from the brackets ④ using a metal disk with a slightly larger diameter than the outer race ID, holding the outside of the bearing hole in the brackets

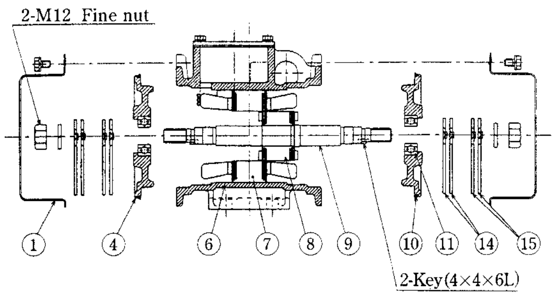


Fig. 10

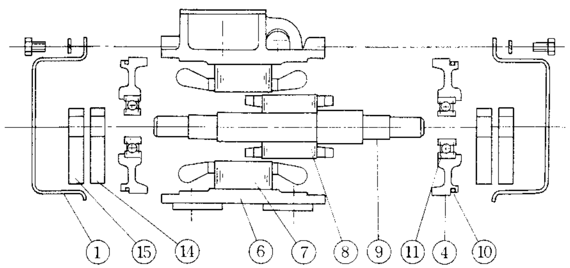


Fig. 11

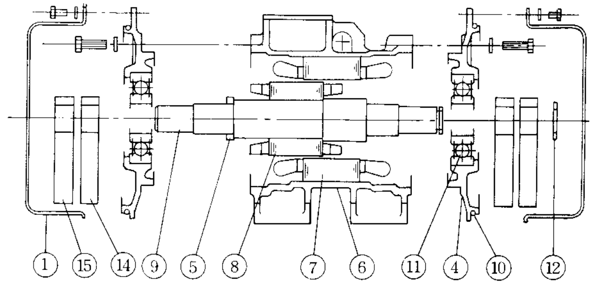


Fig. 12

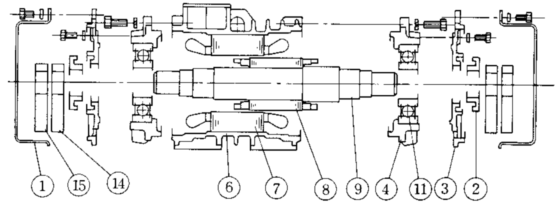


Fig. 13

7. Reassembly

Reassemble the vibrator, reversing the steps for disassembly, observing the following precautions.

(1) Gradually press the outer race of the roller bearings ⑪ into the bracket ④ using a metal disk with a slightly smaller diameter than the outer dia. of the outer race, holding the outside of the bearing hole in the bracket.
(2) For vibrators as shown in Fig. 1 and 2, first slide-fit the ball bearing on the right, viewed from the cable-connection opening of the terminal box in the following manner.
Place the shaft at the center of the bearing pressed into the bracket, then press the other end of the shaft to insert the shaft into the bearing, holding the inner race.
(3) When pressing the bracket ④ to the frame ⑥, screw the studs into the tapped holes in the frame to align the bolt holes in the bracket and the tapped holes in the frame.
Insert the bracket into the frame using a press or by diagonally tightening the bracket securing screws one sixth of a turn each time, being careful not to damage the bearing.
(4) For vibrators as shown in Fig.3, uniformly warm the dust cover ②, which should be shrink fitted into shaft ⑨, to from 100 ℃ to 120 ℃ in an oil bath, then quickly attach them to the shaft ⑨ and leave them there until the temperature drops.

8. Bearings and Breaking-in

8-1 Bearings

(1) Use the ball bearings with their radial gap C4
(2) Extreme care must be taken not to damage the bearings, because even a small defects affects their performance.
(3) Gradually insert the ball bearings in the brackets by pressing the outer race with a metal disk, or by tightening the screws. Never tap the bearings.
(4) Replace the bearings when reassembling the vibrator.

8-2 Breaking-in

After reassembling the vibrator, rotate the shaft 60 to 70 turns by hand with the weights balanced to spread the grease to the inner and outer races and bolls.
Adjust the vibrating force to from 20 % to 30 % of the maximum value, then break in the vibrator for about 30 minutes.
When breaking in the vibrator, put two-pole Uras vibrator up to 0.4kW on a sponge mat.
For two-pole Uras vibrator with a motor power greater than 0.4kW, or a four-pole, six-pole or
Eight-pole Uras vibrator, suspend it by a spring, or put it on a used tire or a surface plate supported by an elastic material.
At the beginning of the breaking-in process, a current greater than the rated value may be supplied to the vibrator due to the resistance of the grease to spreading. The current will drop to about half the rated value in a short time.
Adjust the vibrating force to the desired value, then install the vibrator.

9. Capacitor for Single-phase SEE Uras Vibrator

This vibrator has a capacitor-start induction motor.
Both SEE-0.5-2C and -1-2B Uras vibrators have a capacitor in their terminal boxes, while a capacitor box for SEE-2-2B and 3.5-2B is separate in stalled
Table 6 shows the capacitance of each type of capacitor. Fig. 15 shows the cable connection between the single-phase Uras vibrator and control box.

Table 6

Type	Control Box	Capacitance	Fuse capacity
SEE-0.5-2C	—	SH220Vac 6 μF	—
1-2B	—	SH220Vac 12 μF	—
2-2B	KC-C-20	SH220Vac 20 μF	8A
3.5-2B	KC-C-33	SH220Vac 33 μF	10A

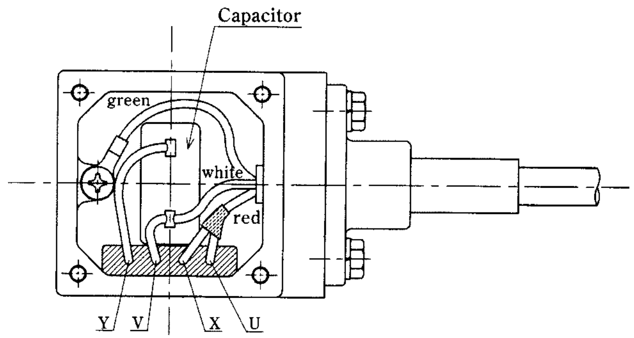
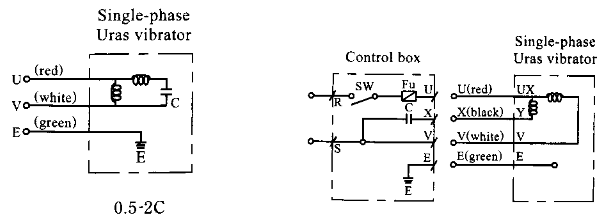


Fig. 14 Construction of Terminal Box
(SEE-0.5-2C, -1-2B)



0.5-2C
SEE-1-2B
(Be not in use black lead)

SEE-2-2B~SEE-3.5-2B

Fig. 15

10. Periodical Inspection and Troubleshooting

10-1 Periodical inspection

Interval	Check points	Procedures and criteria
Daily	Load current	The load current measured with an ammeter should be less than the rated value.
	Bearing noise	Check the bearing noise using a rod. Bearings should not generate intermittent or metallic noise.
Monthly	Loose screws	Check screws for looseness. Screw should be tightened to the specified torque.
	Cable	Visually inspect the cables, ensuring no damage.
Annually	Insulation resistance of stator coil by megger	Approval resistance ≦5 MΩ (min.).

10-2 Troubleshooting

Phenomena	Causes	Inspection procedures	Remedial action
Vibrator won't start	① Two cables of the or two phases of the coil are broken	Measure the voltage drop across the two phases.	Replace the broken cables or rewind the coil.
The vibrator moans and dose not accelerate	② Single phasing	Same as above and check cable for looseness.	Same as above or securely connect the cables.
	③ Ambient temperature is too low or there is an excessive amount of grease	Remove the weight covers (1), then rotate the shaft (14) 30 to 50 turns by hand.	Adjust the vibrating force to from 20 % to 30 % of the maximum value, then break in the vibrator.
Thermal relay is tripped	④ Ambient temperature is too low or there is anexcessive amount of grease	Ditto	Ditto
	⑤ Vibrator takes too long to start. (This may be caused by ④ above)	Measure the time required for vibrator to start.	If the vibrator takes seven seconds or more to activate with the thermal relay adjusted to 120 % of the rated current, replace the thermal relay with a slow-activation relay.
	⑥ Short circuit between phases of the coil	Compare the resistance between phases of the coil.	If there is large difference in resistance between the phases of coils. Replace the coils.
	⑦ Loose screws	Check screws for looseness.	Tighten screws.
	⑧ Abnormal vibration	Ensure that the vibrator rotates in the correct directionand that the vibrator body is free of defects.	Correct vibrator rotation direction or repair.
	⑨ Load is too large	Measure load current.	Decrease vibrating force
	⑩ Damaged bearing	Rotate the shaft by hand and check that the bearings are not damaged.	Replace the bearing
Abnormal bearing noise	⑪ Damaged racewaysurface	Check bearing noise using a rod or bearing checker.	Replace the bearing
Temperature of the vibrator body is too high	⑫ Ambient temperature is too high	Measure ambient temperature.	Decrease ambient temperature to a maximum of 40°
	⑬ A lot of foreign matter has adhered to the vibrator	Check the condition of the foreign matter attached to the vibrator.	Carry out dust prevention measures

10-3 Guarantee

Besides the provisions specified in the supply contract, the Manufacturer guarantees the products for a period of 12 (twelve) months from the date of purchase. This guarantee solely covers free repair or replacement of those parts which, after having been carefully examined by the Manufacturer's technical department, are recognized as being defective.

WARNING-for mounting motor on an angle or vertically

1. Models with Snap Rings

Note "BOTTOM SIDE" as per label on motor.

If motor not positioned correctly, the adjustable weight may fall and cause injury or damage.

2. Models without Snap Rings

BEWARE when adjusting bottom weight as it may fall when loosened and cause injury or damage.

OPERATION MANUAL

Masterweigh Optimus *Plus*

Web-Tech Australia Pty Ltd

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Phone: (07) 3841 2844
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EIGHT MILE PLAINS
BRISBANE QLD 4113
AUSTRALIA

MAN Optimus 12/07

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OPTIMUS PLUS

General Description.

Optimus is a powerful, microprocessor based Loss-in-Weight (LIW), Gain-in-Weight (GIW) and batching controller. By design it can be used as a "stand alone" or slaved to a PLC or other plant supervisory system. Communication between the plant controller and Optimus being effected by one of the following Profi-Bus®, Device-Net®, TCP-IP, 4/20mA, a range of digital inputs and outputs and relays (clean contacts). When used in the stand alone mode, control of the LIW / GIW feeder and associated equipment, valves, slide gates and conveyors is performed by Optimus.

The electronics are house in an IP67- NEEMA 4 rated enclosure, suitable for use in most industrial environments. However it is advisable that the package be shielded from continuous sun light and running water. The use of high pressure hoses to wash down the enclosure is not recommended. The electronics can be accessed through the accessed door which can be either latched, latched and padlocked or the latches removed and screw closed.

The Central Processing Unit (CPU) printed circuit board (PCB) is a six layers and contains all the main electronic components. In the unlikely event and Optimus fails, field fault finding is made easy as CPU, PCB is easily changed.

The Terminal PCB has been made extra thick (3mm) to provide a mechanically secure platform for the angled connectors.

The Power PCB is fitted with an auto voltage and frequency select power supply that makes Optimus suitable for use in most countries in the world. A switch and fuse provide a suitably qualified technician with a convenient method of mains power isolation and fuse checking.

All functions are made available through the front interface keypad and black and white (256 shades of grey) 1/4 VGA screen. Colour screens are available as an option ional extra. (Consult the factory or your local agent for price and availability). Multifunction keys are made available through the use of screens and function keys. By using a 1/4 VGA screen and interactive programming, we have been able to make Optimus user friendly. The use GUI style screen - keyboard, I/O, which most PC users are familiar with also assists the user in operating Optimus.

Optimus uses "state of the art" electronic components and programming techniques. It has been designed to operate with screw and vibratory style mechanical feeders.

At the heart of the controller is an eLAN 520, 32 bit microprocessor, running at 100mHz connected to a highly accurate and stable three channel analogue to digital converter (A/D converter). Optimus is supplied with a generous amount of 32 mbytes of SDRAM . This allows for future firmware expansion and customers specific custom software. Some of this storage is used for firmware, default variables and customer specific variables.

Should firmware upgrades be made available, Web-Tech will make the program available on Compact Flash modules, that simply plug into a socket on the CPU printed circuit board and automatically download the program. The Compact Flash module also serves as a storage device for the data logging feature incorporated in Optimus. The logged data can be sent back to Web-Tech for analyses should there be a problem with the system.

The analogue inputs from the load cells are channelled through a 24 bit analogue to digital converter specifically designed for use with load cells in an industrial environment.

Six auxiliary 12 (4096 values) bit analogue inputs, locally programmable as 4/20mA - 0/20mA - 0/25mA & 0/50mA . along with six digital outputs provide Optimus with the ability to monitor other processes associated with the feeder and process.

Five digital outputs provide voltage free contacts for use with PLC and SCADA systems.

One digital output (solid state switch) provides a means of indicating weight accumulation at low and high speed rates.

OPTIMUS PLUS GENERAL DESCRIPTION.

Specifications and Site Requirements.

Power Requirements.

240V AC +/- 10% 50/60 Hz
117V AC +/- 10% 50/60 Hz.
2amps @ 240V
4amps @ 117V

Main Board.

AMD Elan SC520 microprocessor running at 100 MHz.
8 Mb DRAM.
1 Mb soldered-down flash memory (expandable up to 4 Mb).
Compact Flash card type I or II header (supports any density CompactFlash cards).
Socket for up to 1Mb Flash or PROM BIOS (can replace soldered down flash).
Industry standard PC/104 expansion header with: 13 redirectable interrupts, 2 DMA channels and 8/16 bit I/O and memory interface.
Watchdog timer
Voltage supply brownout protection and reset generation.
Industry standard JTAG boundary scan interface for board testing & debugging.
High efficiency 3.3V and 2.5V on-board power supply for digital logic.

User Interface.

Support for up to 28 front panel keys.
¼ VGA (320 x 240 pixel) LCD screen support with digitally adjustable CCFL backlighting and screen contrast.
Internal switch for locking of calibration settings (for weights & measures laws).

Loadcell Interface.

Supports up to three independent loadcell channels.
22 bit (4.2 million values) analog to digital converter (ADC) on each channel.
Temperature compensated / self calibrating ADC.
Fourth order digital filter attenuates interference at the sampling frequency and its harmonics by 160dB, e.g. 50 & 60Hz sampling rate negates mains power interference.
Sampling rate up to 1kHz (with slightly reduced effective resolution – 19 bits).
Ultra stable loadcell drive circuitry capable of driving 8 loadcells in parallel.
Loadcell interface is shielded in a metal can.

Current loop input and output.

Supports up to 8 0-25mA inputs (circuit presents 200 ohm load).
Supports up to 8 0-25mA outputs (drives up to 1k ohm load).
Loop input sampling rate up to 200kHz.
Loop output data rate up to 100kHz.
12 bit (4096 values) ADC resolution on both inputs and outputs.
Optically isolated from rest of circuit.

Specifications and Site Requirements.

Serial Input/Output.

Optically isolated full/half duplex RS485 at up to 38400 baud.
RS232 port with RTS/CTS handshaking signals at up to 115200 baud.
Up to six optically isolated 24V digital inputs (PLC interface).
Up to eight digital output lines to drive relays on wiring board
12V relay activation supply to wiring board
Dual channel tachometer inputs

Initial Setup and debugging interface.

Four pole DIP configuration switch.
Reset pushbutton.
Four configurable LED status lights (Red).
HDD (compact flash) activity LED (Red).
Voltage rail monitor LEDs (Green).
Current loop output monitor LEDs (Orange).
Digital input monitor LEDs (Yellow).

Options.

High volume (92dB @ 10cm) full bridge driver for an internal piezo speaker
Battery backup for real-time clock and calendar – CR2032 coin cell.
1.5Mbaud IrDA transciever.
Optically isolated half duplex RS485 at up to 38400 baud (for relay controller/expansion).
Isolated, current limited 1.5W 12V supply for relay controller/expansion power.
Temperature sensor - can be used for monitoring/alarms and for automatically changing the contrast of the LCD screen with ambient temperature variations.
256 byte EEPROM for storing configuration and setup data.

Terminal PCB.

5mm pitch screw terminations for all inputs, outputs and shields.
Clear labelling for each connection on PCB.
Support for up to eight relays for digital outputs (either 24V PLC type or 240V mains type) with 12V coil drive.
Support for up to eight relays for digital outputs (either 24V PLC type or 240V mains type) with 12V coil drive.

Power Board.

5mm pitch screw terminations for Active, Neutral & Earth.
Universal voltage supply with no voltage selection required   85VAC to 285VAC, 50/60 Hz.
Regulatory agency approvals on switch mode modules.
Input filtering.
Supplies +5V, +12V, -12V at 25W max total to main board.
Supplies +24V at 25W max to main board.

Specifications and On Site Requirements/ Enclosure .

Manufacturer.

Hoffmann.

Application.

Designed for use a an instrumentation housing enclosure, for use in highly corrosive environments including oil refineries, coal mines, chemical processing plants, waste water treatment and marine installation, electroplating plants, agricultural environments and food or animal processing plants.

Construction.

Moulded fibreglass polyester has outstanding chemical and temperature resistance and exhibits excellent weather-ability and physical properties.

Seamless foam-in-place gasket assures watertight and dust-tight seal.

Polyester mounting feet and stainless steel attachment screws.

Scratch-resistant GE LEXAN MARGARD® permanently bonded in place window.

Quick releases latches with corrosion resistant polyester latches located in corners which provides unobstructed access to enclosure.

Hinge and bail are corrosion resistant monel.

Knock out padlock provisions included in each latch.

Industry Standards.

NEMA / EEMAC (Type 4, Type 4X, Type 12 and Type 13).

UL 508 (Type 4, Type 4X, Type 12, and Type 13).

Enclosure flammability rating UL94-5V

CSA Type 4 and Type 12.

IEC 529 , **IP66**

OPTIMUS PLUS GENERAL DESCRIPTION.

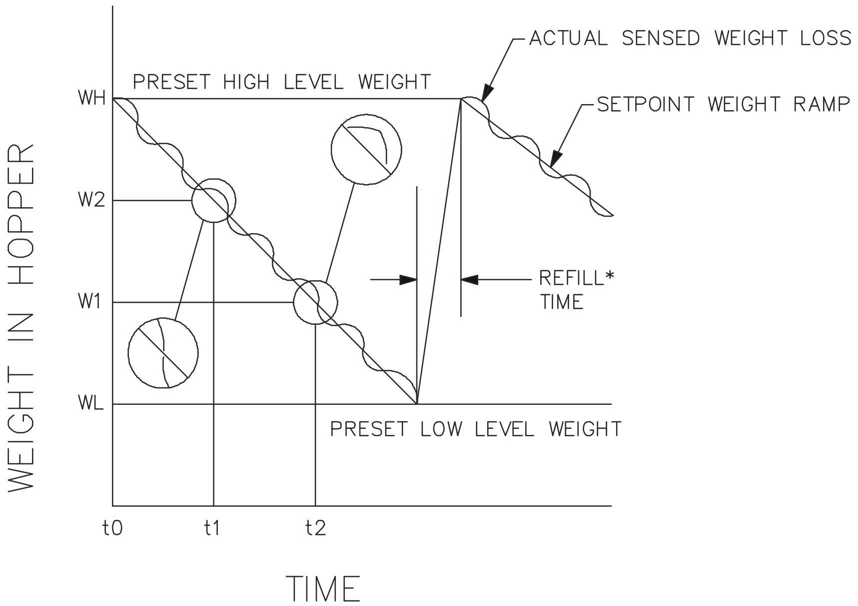
Loss-in-Weight Theory of Operation.

Loss in weight is a method of weighing and dispensing bulk materials from a hopper via a screw feeder.
The principle is based on weighing the entire mass of the hopper, feed-out mechanism and bulk material.
The discharge rate is determined by measuring and computing the loss in weight per unit time of the entire system.

The feed hopper must be re-filled at regular intervals, this is initiated when the weight of the material in the feed hopper falls below a pre-set level.
While the feed hopper is re-charging it is not possible to measure during the loss in weight of the system.
During hopper re-fill the system operates in volumetric mode, maintaining the feeder screw speed in use just before re-fill and integrating mass total on the basis of mass rate x re-fill duration.
Normally total accumulated discharged mass is computed on the basis of the cumulative absolute loss in weight of the system.

Optimus is an industrial quality Loss in Weight controller, optimised for screw and vibratory style feeders.
Following on site commissioning, Optimus will control the rate of feed into a process.

When signalled to start Optimus accurately monitors the output of load cells to determine any change in output. This change will be either a gain in signal or a loss in signal and is used to compute the feeders mass rate. This calculated mass rate is compared with a desired mass rate and a process variable signal is output to the feeders drives, to keep the feeder delivering mass at the desired rate.



In the above diagram the desired mass rate is represented by a decreasing scheduled weight ramp. This ramp is entered into Optimus either Remotely or Locally. The slope of the scheduled weight ramp is a direct representation of the setpoint (i.e. weight of delivered material per unit of time). Increasing the setpoint increases the slope and reducing the setpoint reduces the slope.

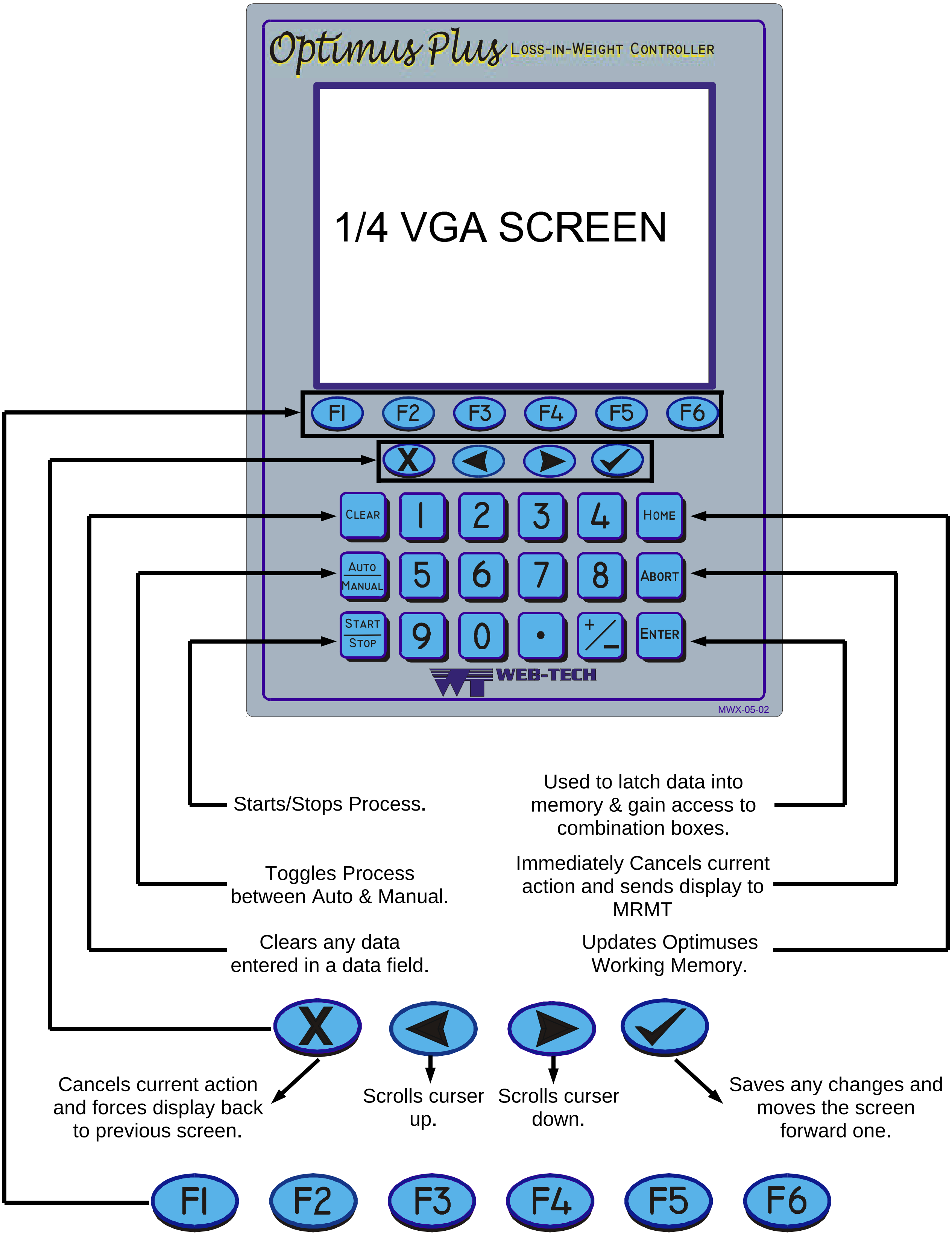
As the hopper weight decreases, the actual weight loss is compared with the desired weight loss over time. required changes in the feed rate are bought about by changes in the feeders output. For Example, the sensed weight loss at point (t2 ,w1) is less than the desired weight loss. Since the feeder has delivered too little material and the feed rate is now lower than it should be , the feeder will commanded to increase it’s weight loss, bringing the hopper weight back on to setpoint. Similarly, at point (t1,w2) the sensed weight loss is greater than desired weight loss. In this case, since the feeder has delivered too much material, a corrective signal will decrease the feeder’s flow rate, bringing the feed rate once again into the setpoint.

When the sensed weight decreases to an adjustable preset low weight level (WL) a fill cycle is initiated to refill the weigh hopper. During this refill period the feeder output is held constant in order to maintain the material discharge at it’s existing rate. A refill indication is given to trigger a refill mechanism to start the fill cycle. When the adjustable preset high weight (W H) has been achieved, a command is given to shut down the refill mechanism and the feed system reverts back tp closed loop control after the “Delay After Refill” function has timed out.

Note It is recommended that the refill rate is a minimum of 12 times the maximum expected discharge rate.

OPTIMUS PLUS GENERAL DESCRIPTION.

Keypad Description.

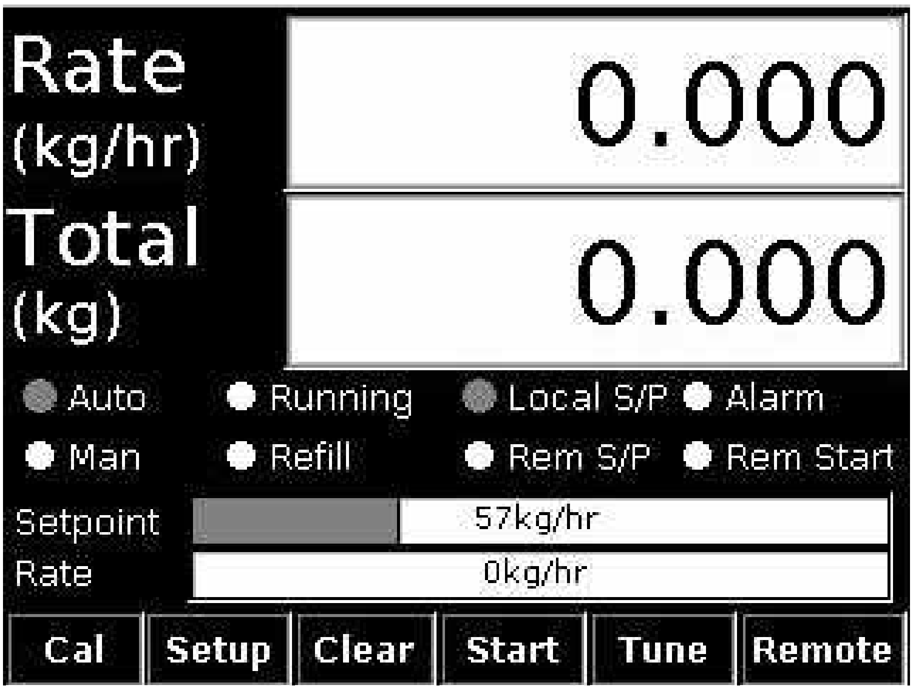


The above function (f) keys are associated with the boxed message displayed directly above the f key.

OPTIMUS PLUS GENERAL DESCRIPTION.

Power Up.

Once Optimus has been connected up as per the drawings in the rear of this manual. The unit can be powered up. The unit has a local power switch located on the power PCB, this should now be moved to the on position. Optimus will now power up, load the operating software and perform a series of self diagnostic routines. During this time the Web-Tech logo will be displayed. Following a successful power up the screen display will change to the following.



This screen is the screen that should be displayed whilst Optimus Plus is running. We call this particular screen Mass Rate, Mass Total (**MRMT**) and is the default screen. Take time to make yourself familiar with the data that is available on this screen and how it interacts with the keypad.

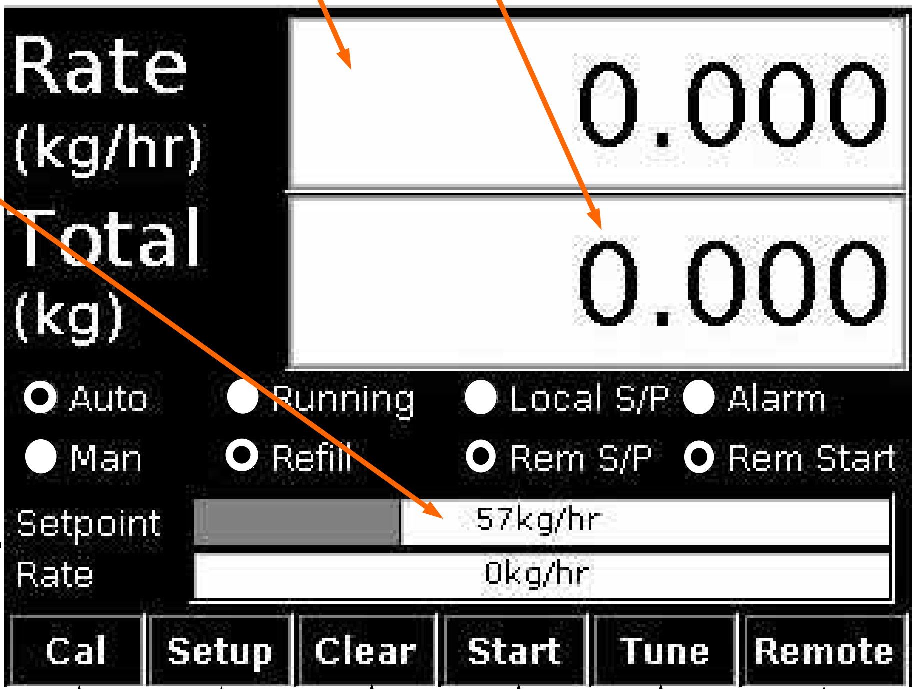
See over for detailed description of functions available from this screen.

Main Display MRMT Description.

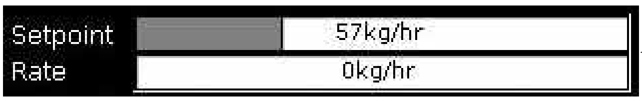
This screen panel displays the instantaneous mass rate, The units are selected in the set up routine

This panel displays the total weight of product that has passed over the scale since the last time it was zeroed. The units are

The mass rate ribbon, graphically and digitally displays the current mass rate. When Optimus is in "Local Mode" the cursor will be focused over the digital portion of the mass rate display. This allows the user to adjust the set point.



All these displayed functions are available by pressing the function key situated directly below it.



Bar graph showing instantaneous mass rate & set point. Digitally and proportionately.

Optimus in Auto running under PID

Set Point generated locally.

Optimus is Running.

There are no alarms current

Optimus is feeding under automatic control.

The LIW hopper is currently being refilled.

The set point is being generated by a remote device.

Optimus has been given a remote start signal.

OPTIMUS PLUS GENERAL DESCRIPTION.
Printed Circuit Board location.

Optimus comprises three printed circuit boards (PCB). Main processor PCB, field wiring PCB and power PCB.

Main Processor PCB.
The main processor PCB is located on the door of the enclosure. Generally there is no field wiring to be connected to this board. However if a communications package is to be used, wiring will be required to be connected to the PC 104 communications PCB. This PCB is piggy backed onto the main PCB.

Field Wiring PCB.
This card is located in the main portion of the enclosure, below the main processor PCB (when the door is closed) and above the power PCB. This PCB will be loaded with connectors strips and relays that are required for the application. Any parts not loaded have been deliberately omitted. This PCB along with the power PCB has been designed to be easily removed for servicing, if required. This PCB is reasonably robust by design, it has been made from a thicker than normal fibreglass, under normal operating conditions a reasonable amount of torque can be applied to the terminal screws with out damage occurring, however damage will occur if too much force is applied.
As space within the enclosure is limited, all wiring should be neat and trimmed to suit.
See drawing at the rear of this manual for field wiring details.

Power PCB. **(DANGER MAINS VOLTAGE MAY BE PRESENT)**
This PCB is located under the Field Wiring PCB. A cut out in the has been provided in the Field Wiring PCB so that access to can be provided to the main supply terminal strip, the fuse and local on/off switch.

Installer / Electrician Note.

Care must be taken when cutting holes in the enclosure to provide cable access. It is recommended that the Power & Field Wiring PCB be removed prior cutting holes. Take note of cable entry with respect to PCB when re installed.
All cables should enter the enclosure via site approved cable glands.
The entry of water into this enclosure will damage the electronics and void and warranty.

OPTIMUS PLUS GENERAL DESCRIPTION.

Power & Field Wiring PCB.

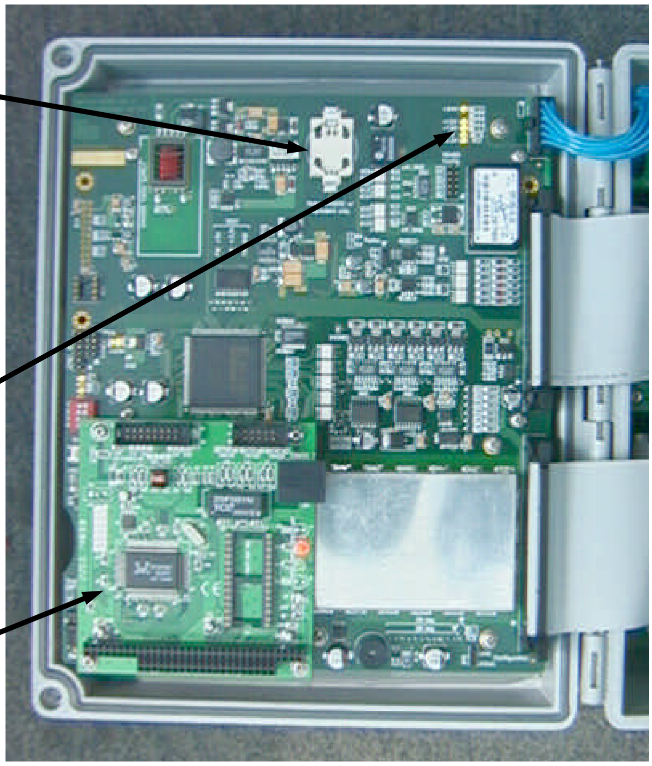
CPU PCB.

Battery Seiko Cr 2032 or equivalent. This battery is used to hold up the information stored in the screen “System Information” All operating variables are stored in non volatile memory, which does not require battery power.

The 5 yellow LED’s when lit, show that the operating voltages required by Optimus and it’s sub-assemblies are all healthy.

+24V
+12V
-12v
+5V
+3.3V

Optional communications card. TCP-IP, Profibus, DeviceNet



Power & Terminal PCB.

Optional RS 232 Output

Optional RS 485 Output

Generally Digital Inputs.

Generally analogue outputs.

Generally Analogue Inputs.

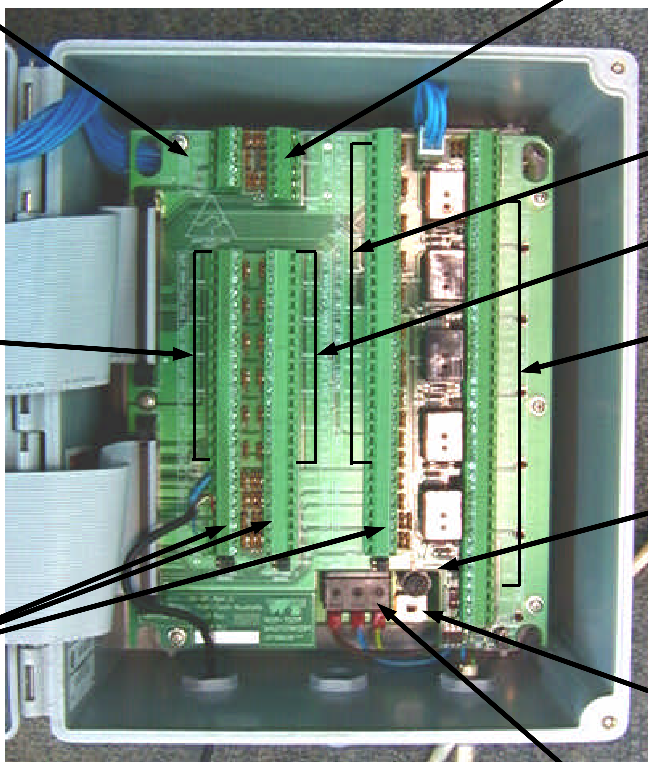
Generally Relay I/O

Fuse

Load Cell Inputs Channel 1-3

Local On/Off Switch

Multi Voltage/Frequency Mains Input.



OPTIMUS PLUS GENERAL DESCRIPTION.

Getting Started.

To assist in getting the system running as quickly as possible, we have provided the following brief instructions. We urge that you read further, so that a better understanding of the instrument and it's features can be gained.

The following are the basic steps in setting up a Continuous LIW system, it assumed all relevant field wiring is in place and done correctly and that the system is a LIW with the set point generated locally. The PID variables will be the defaults.

It should be noted that Optimus does not accept changes to variables made to any menu inputs until the "HOME" key has be pushed followed by "ENTER" .

Power up Optimus.

1 At the first screen **(MRMT)** press the **F2** key. This will take you to the System Set up Menu.

(a) Select "System Type" (*In this instance Loss in Weight Continuous).*
(b) Select the desired units.
(c) Select and enter the systems capacity *(See accompanying documentation).*
(d) Select and enter displayed accumulated weight increments.
(e) Select the method for feeder run acknowledgement. *(Usually Tachometer).*

PRESS THE TICK KEY TO EXIT THIS MENU
The displayed screen will go to "System Setup Menu"

2 Select "Hopper Parameters" by pressing the scroll down key followed by ENTER.

(a) Select "Max Hopper Weight" and enter the max "**live load**" weight.
(b) Select "Hopper Refill Start" and enter the weight where you wish the hopper to start refilling after the discharge cycles.
(c) Select "Hopper Refill Stop" and enter the weight of the hopper when you wish to stop filling the hopper.
(d) Select "Delay After Refill" and enter a time in seconds the must elapse before Optimus resumes LIW control after a refill.

PRESS THE TICK KEY TO EXIT THIS MENU
The displayed screen will go to "System Setup Menu"

3 Select "PID Mode" by pressing the scroll down key followed by ENTER.

(a) Select "Setpoint Source" and choose Analogue input 1.
(b) Select the type of remote input signal from the combination box.

PRESS THE TICK KEY TO EXIT THIS MENU
The displayed screen will go to "System Setup Menu"

4 Select "Analogue Outputs Setup"

(a) Select "Rate Output Type" to desired type.
(b) Select "PID Output Type" to that signal required by the variable speed drive.
(c) Press the **HOME** key to return to **MRMT.**

The above set up provides only a basic system. Further programming is required if all the features available are to be used. The system is now ready for calibration. See following page for instructions.

OPTIMUS PLUS GETTING STARTED
Zero and Span.

Following the completion of the basic set up procedures. Optimus needs to be calibrated, the procedures for calibration are found by pressing the (F1) key, which is directly below the screen window “Cal”. The screen will change to that shown below.

It should be noted that Optimus does not accept changes to variables made to any menu inputs until the “HOME” key has be pushed followed by “ENTER” .

Zeroing of the Feeder.

1 At the first screen **(MRMT)** press the **F1** key. This will take you to the calibration screen.
(a) Press the f1 button and Optimus will automatically zero.
(b) Confirm the entry by pressing the “Enter” key.

The feeder is now zeroed.

From the same screen go on and span the feeder.

Spanning the Feeder.

2 (a) Check that the weight value shown in the “Calibration weight” box corresponds with the calibration weight supplied or to be used.
(b) Load the weights onto the feeder in the manner shown in the manual.
(c) Press the f2 key to span.
(d) Confirm the entry by pressing the “Enter” key.

The feeder is now spanned.

3 Return to the MRMT screen by pressing the “HOME” key and confirming the changes by pressing the “ENTER” key.

The feeder is now zeroed and spanned.

The feeder will run if the “Start” key is pressed and there is a setpoint coming from either the local entry or remotely. Note the PID variables may need to be adjusted if an acceptable mass delivery required.

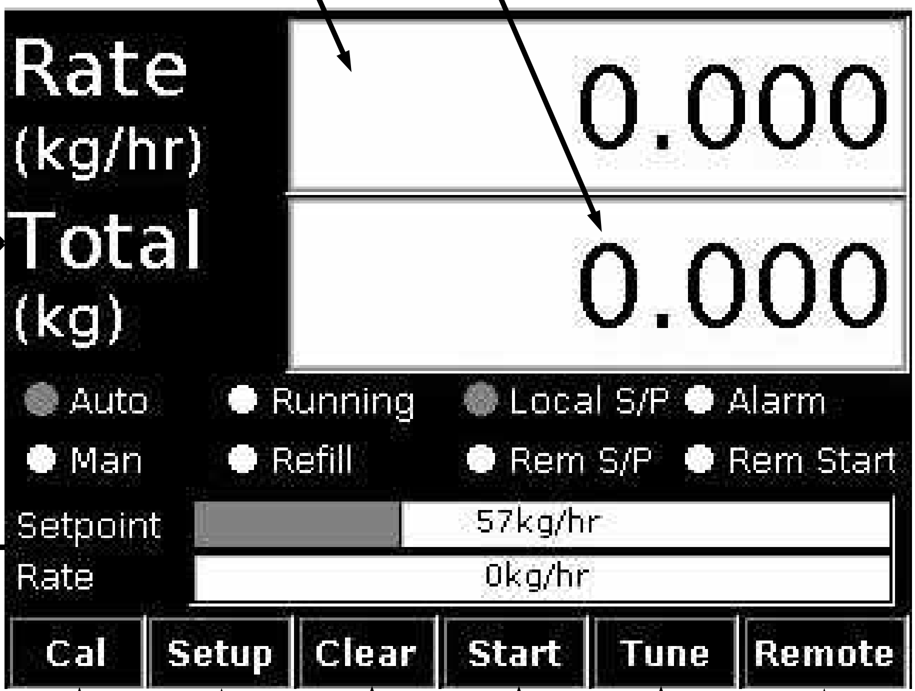
OPTIMUS PLUS DETAILED DESCRIPTION.
MRMT SCREEN.

The **MRMT** (Mass Rate Mass Total) screen is the default viewing screen. From this screen all other screens can be accessed. Optimus is a multi tasking instrument and all screens and screen modification routines can be run whilst controlling the feeder.

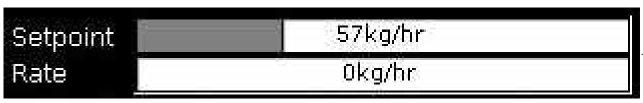
This screen panel displays the instantaneous mass rate, The units are selected in the set up routine

This panel displays the total weight of product that has passed over the scale since the last time it was zeroed. The units are select through the **Setup** routine. It is set to zero by pressing the **F3** key.

MRMT SCREEN



All these displayed functions are available by pressing the function key situated directly below it.



Bar graph showing instantaneous mass rate & set point. Digitally and proportionately.

Optimus in Auto running under PID

Optimus Running.

Set Point generated locally.

A designated alarm has been activated.

Optimus is feeding under manual control.

The LIW hopper is currently being refilled.

The set point is being generated by a remote device.

Optimus will start when the designated digital input is signalled.

Mass Rate Mass Total (MRMT) Screen.

Rate Display Box.

This display box shows the instantaneous mass rate. The precision shown in this box has been set in the "System Setup / System Config / Displayed Increments". The value shown in this box has been subjected to a number of processes prior to being printed to the screen. On start up, the box is loaded with the value of the current setpoint. After the computer has acquired a series of "good" data points the box is updated with real time data. This data will have been filtered and averaged to provide the observer with a meaningful read out of the instantaneous mass rate.
Access to filters can be found under "System Setup / 8. Filters / Display Filter.

Total Display Box.

The total box displays the accumulated total since the last reset. the precision of this box is set in the "Display Increment" field. The Display Increment field can be found:- MRMT / 1 System Config / Display Increment. The box is a combination box, select the precision required and press ENTER to exit.

Notes Optimus does not accept the change unless you exit the menu screen correctly.
The remote totaliser is not linked to the displays precision and should be set elsewhere.

Radio Buttons.

There are two rows of "Radio Buttons", each button being assigned to a specific task. The button is active when a black target dot is showing.

◉ **Active.**

○ Inactive.

Auto. When active Optimus is in the "Automatic" mode. Optimus will read the start stop command input set on Digital Input 1, or the Start/Stop key, if either is set Optimus will drive the Analogue 1 output under PID control. The setpoint value being derived from either the remote or local source, depending on the users selection.

Man. When active, Optimus is in the "Manual" mode. The ribbon display "Setpoint" in the MRMT screen will change to a % and Optimus will drive the Analogue 1 output to a percentage of the value of the current loop. The on initiating the Manual mode the percentage shown on the ribbon and output on Analogue 1, will correspond to the last valid output.

Running. This radio button is active if the tachometer is rotating and producing a frequency of greater than 5Hz or a digital input has been selected in menu, MRMT / Setup / 12 Digital Inputs Setup / Digital Input 2-6 (select any unassigned input) .

Refill. This button is active when Optimus has signalled for a refill.

Local S/P. This button is active when the setpoint is set to Local. The setpoint can be set to local from three positions. From the MRMT screen f6 button and MRMT / Setup / PID Mode / f4 button **&** the Setpoint Source combination box.

Rem Setpoint. The remote Setpoint radio button is active when Optimus is being controlled via a remote setpoint. The setpoint can be set to remote from three positions. From the MRMT screen f6 button and MRMT / Setup / PID Mode / f4 button **&** the Setpoint Source combination box.

Alarm. This radio button is active when any alarm is active.

Rem Start. This radio button is active when Optimus has been signalled to start using digital input 1.

Setpoint Ribbon.

The “Setpoint Ribbon”, is a horizontal bar graph. The bar is scaled against the feeders capacity as set in MRMT / Setup / System Config / System Capacity. When Optimus is the Local mode as indicated by the active radio button “Local S/P” the ribbon will show one of the following.

Condition 1. Optimus is set to **Auto** and **Remote**. The ribbon will graphically and digitally display the setpoint as sent by the remote device (PLC or Current Generator). The digital value being embedded in the ribbon and the size of the ribbon proportional to the feeder capacity.

Condition 2. Optimus is set to **Auto** and **Local**. On switching to Local, Optimus will maintain the current setpoint value and wait for change in setpoint from the local keypad. Pressing the “Down Arrow” at this point will position a cursor over the digital value embedded in the ribbon. A new setpoint can now be entered into Optimus using the numeric keypad, followed by the “ENTER” key. The PID algorithm will control the action to the new setpoint.

Condition 3. Optimus is set to **Man** and **Remote**. On switching to this condition, Optimus will convert the remote setpoint signal level, to a percentage of the feeders capacity. The digital value shown in the ribbon will change from a mass rate to a percentage. Any signal changes made will be converted to a percentage of the feeders capacity and the Analogue 1 current loop will step to the required value immediately.

Condition 4. Optimus is set to **Man** and **Local**. The ribbon will graphically and digitally display the current setpoint to a percentage of the feeders capacity. As with condition 2 a cursor can be positioned over the displayed digital value and adjusted. However as Optimus is in the manual mode any changes made, will be a percentage of the feeders capacity and the Analogue 1 current loop will go to the required value immediately the “ENTER’ key confirms the entry.

Note. Optimus uses the last setpoint received in the Auto mode, local or remote to seed the setpoint in the Manual mode. This is done to provide a near “bump less” change over, from remote to manual.

Rate Ribbon.

The “Rate Ribbon” is a horizontal bar graph. The bar is scaled against the feeders capacity as set in MRMT / Setup / System Config / System Capacity. The instantaneous mass rate is graphically and digitally displayed in it.

Function Buttons.

Cal (f1) Activating the “Calibration” key will change screen to the calibration screen.

Mass Rate Mass Total (MRMT) Screen.

Setup. **(f2)** Activating the "Setup" key will change screen to the Setup Screen.

Clear. **(f3)** Pressing the "Clear" key will clear the result in the total box.

Start **(f4)** Pressing the "Start" key will set the feeder running.

Alarms **(f5)** On detection of an alarm, Optimus will flash the "Alarm" text on the screen and sound the internal buzzer. On pressing of the f5 key the Optimus will change the MRMT screen to the "Alarms" screen.

Remote. / Local. **(f6)** The f6 button toggles Optimus between the "Remote and Local" modes.

1 Calibration.

Calibrating a LIW system using the Optimus controller can be done using one of two methods, empirically (using a known test weight) and electronically.

Fixed Weight Calibration, (Using Test Weights).

This method is the recommended method by Web-Tech as it generally provides the best results.

From the MRMT screen press the Cal f1 key to change the screen to the “Calibration Screen”.

Current Zero Value.

The number displayed in this box is the millivolt output of the feeder load cell/cells when the feeders discharge hopper is empty. This value is updated automatically each time the feeder is zeroed. The user has been given the ability to manually change this value if required.

Current Hopper Weight.

This display box, displays the weight of the load in the feeder discharge hopper.

Calibration weight.

If the LIW feeder has been supplied with calibration weights the value of these weights is entered into Optimus here.

Span Constant.

The span constant is a number generated by Optimus that is used to display the calibrated weight. Under certain circumstances it may be necessary to adjust this constant, the display box is also a data entry point.

Load Cell Configuration.

Where a feeder design calls for more than one load cell (3), Optimus can read each load cell into the A/D converter and arithmetically sum then, negating the use of a load cell summing box. The display under the title “Load Cell Configuration.” indicates the number of load cells used in the feeder. See MRMT / Setup / Hopper Parameters / No Load Cells. for the setting of this field.

Calibration Sequence, Using Test Weights.

1. **Make sure the scale is empty of any material.**

2. **Press the Zero (f1) key. Optimus reads the load cells. A confirmation box is displayed and on pressing the “ENTER” key, Optimus calculates a zero, stores and displays the millivolt reading. The confirmation box provides an escape route if there is a problem with the zeroing action.**

3. **The calibration weights total mass should be added and entered into the “Calibration Weight” box. It should be noted that this weight need only be entered once. The value of the weights will stored for the next calibration.**

4. **Place the weights in position as advised in the feeder manual. Press the Span (f2) key, a confirmation box will appear, follow the prompt, on pressing the “ENTER” key. Optimus will calculate a new span value and display the weight in the hopper (the calibration weight).**

5. **Press “Home” and follow the prompt box to confirm the calibration.**

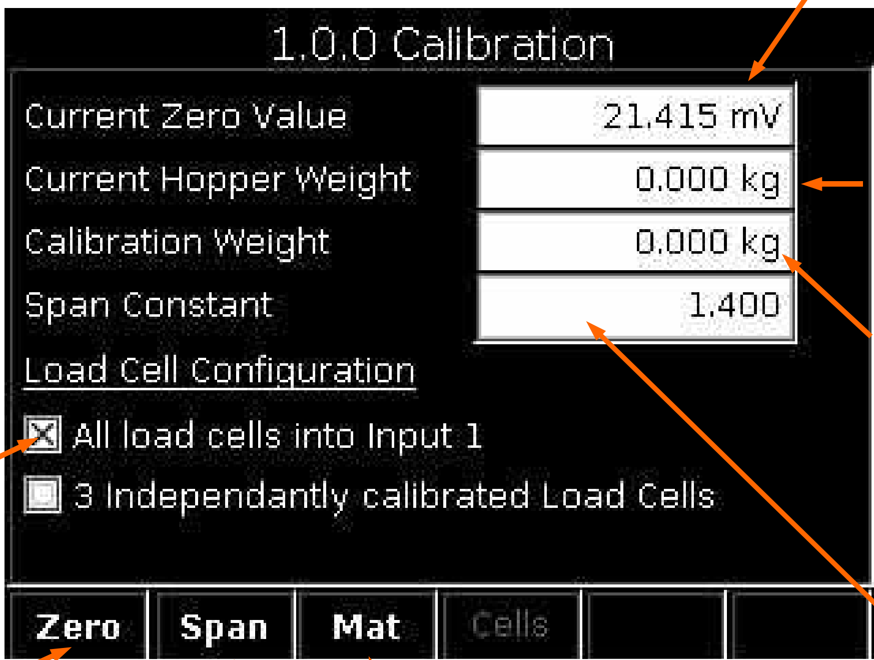
Optimus is now calibrated.

OPTIMUS PLUS DETAILED DESCRIPTION.

1 Calibration (Fixed Weight Calibration Screen).

Following the completion of the basic set up procedures. Optimus needs to be calibrated, the procedures for calibration are found by pressing the (F1) key, which is directly below the screen window "Cal". The screen will change to that shown below.

Current Zero.
This is an editable box which displays the milli-volt output of the load cell at the time of zeroing. This box is editable so that technicians can modify the value if necessary.



This box shows the current load on the feeder. It is not editable.

This box shows the weight of the calibration weight supplied with the feeder. If weights have not been supplied with the system enter the available weight.

The checked box indicates how many loadcells Optimus has been configured to use.

Pushing the f1 key below the box zeros the feeder.

Pushing the f2 button below this box with the correct calibration weight fitted to the feeder calibrates the feeder.

Pushing this key presents the "Empirical Calibration menu screen.

The span constant is an engineering unit generated by Optimus following a successful calibration.

Confirm that the weight shown in the "Calibration Weight" box is correct and change if necessary. make sure the feeder is empty and there is no producer build up on the live surfaces or hopper walls. Pres the f1 button followed by the "Enter" key and the feeder will automatically zero it's self. The calibration weights should now be placed on the feeder and the f2 key pressed. Optimus will now calibrate it's self.
If calibration weights are not available see detailed description.

1 Calibration Empirical.

Empirical. Calibration, Using A Weighed sample from the Feeder.

From the MRMT screen press the Cal f1 key to change the screen to the "Calibration Screen".

Mat. (f3).

Mat "Material" screen allows the user to calibrate Optimus using the results of a "Live Load Test" To successfully perform a calibration using this method a representative sample taken from the feeder should be accurately weighed and the results recorded.

Indicated weight.

The data entry box here should be loaded with the results of the test as displayed by Optimus.

Actual Weight.

The weight of the sample should be recorded in this data box.

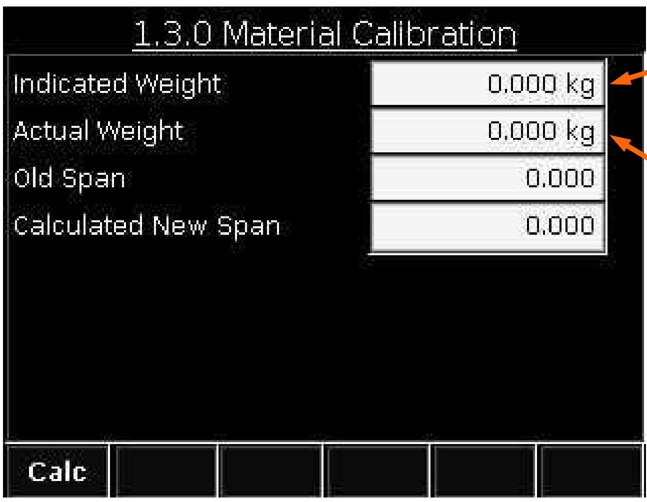
Calc (f1).

On pressing the "Calc" (f1) key Optimus will calculate a new span and display the old span.

Press the ENTER key Optimus is now calibrated.

For those users who are unable to perform an Empirical test or Fixed weight test, because of site constraints or shear physical size of the feeder. Optimus has been provided with an **Electronic** method of calibration. This method depends on using the load cell manufactures data. All good quality load cells are supplied with a data sheet. This data is specific to the load cell and describes the performance of the cell under laboratory test conditions. The millivolt per Volt value, along with the load cell excitation provide enough data for Optimus to calibrate it's self.

The data entry box here should be loaded with the results of the test as displayed by Optimus.

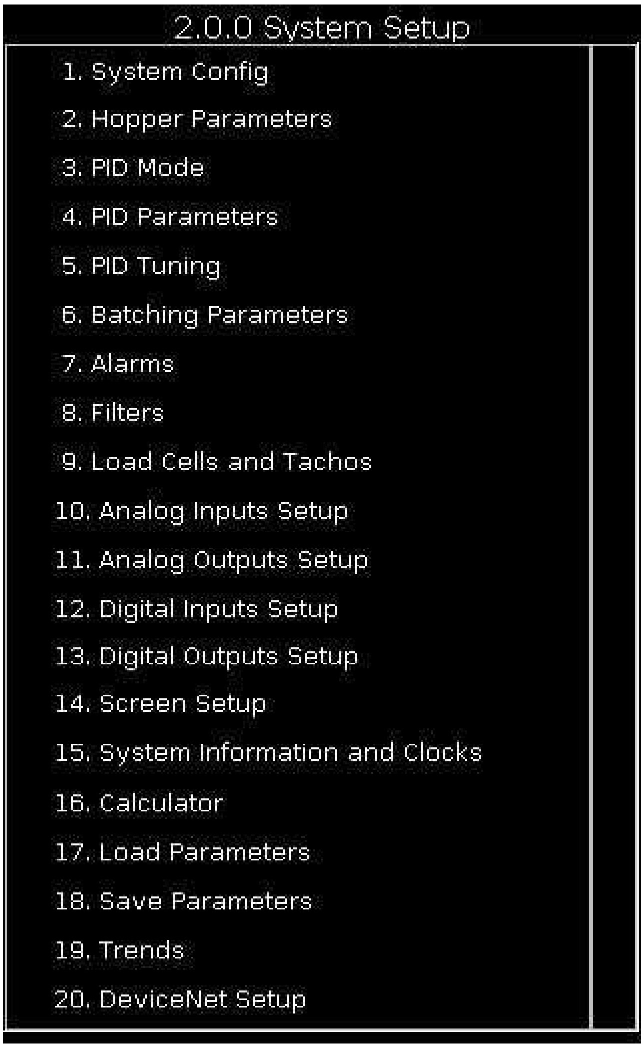


The weight of the sample should be recorded in this data box.

On pressing the "Calc" (f1) key Optimus will calculate a new span and display the old span.

System Set Up.

Web-Tech manufacture many types of feeders with a wide variety of prefeed devices and capacities. In order that Optimus is able to act as a universal controller for a wide range of feeders, data relevant to the feeder must be provided for the controller. Some of this data can be entered into Optimus by the factory prior to shipping. This data generally takes the form of capacity, number of load cells used etc. The remainder of the data being inputted during commissioning. It is important that the commissioning engineer be suitably qualified to work with Optimus and familiar with loss in weight concepts and industrial control techniques. Commissioning data is entered in Optimus via the screens in the “System Setup”, comprises 19 primary screens and multiple sub screens. The exact number of screens being dependant on the version of software being used and any special requirements a user may have ordered. Entry to the “System Setup” is gained by pressing the f2 key. On entering the MRMT screen changes to this screen:-



Many of the screens/menu entry points are loaded with factory defaults. These default values may not suit the process. It is therefore necessary for a commissioning engineer / technician to carefully step through each of the screens and verify that the data stored is suitable for the duty required of the feeder.

System Setup. *(2 System Configuration).*

System Type. Optimus can be used as a Loss in Weight (LIW) controller, a Gain in Weight (GIW) controller or a Batching Controller (*Optional Extra*). It's mode of operation is determined by selecting from the combo box.

In the LIW mode, the instrument controls the rate at which the feeder hopper loses weight.

In the GIW mode, Optimus controls the rate at which a receiving hopper/vessel is filled.

Both the above modes are said to be continuous, that is Optimus will control feed rate and command auxiliary equipment to fill the hopper/silo on an on going bases, as long as feed stock is available and all feed parameters are met.

Two other modes are available to the user. LIW Batching and GIW Batching. These modes allow users to set a batch size and feed material into an other vessel or from a vessel until the required weight is achieved.

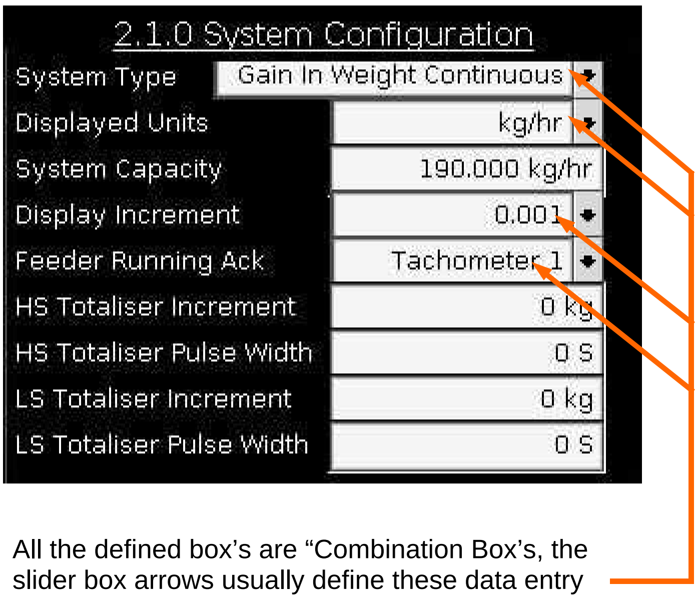
For Optimus to perform in any of the above mentioned modes, it must be correctly configured. Configuration involves the entry of appropriate data into pre defined field.

The **"System Type"** box is known as a combination box. A combination box can be identified by the down arrow located to the right of the entry line. This box type is used through out the menu structure and it's explanation here will serve all other box's that you will encounter.

1. Place the cursor in the box by using the up and down keys and press the "ENTER" key.
2. Use the up and down keys once inside the combination box to select the field required.
3. Loss in weight Continuous, Gain in Weight Continuous, LIW batch and GIW Batch.
4. Press the "ENTER" key to lock in the selection.

All the variables selected to this point can be discarded by pressing the **X** button. Pressing the tick button accepts the variable and changes the screen to the "System Setup" screen. Pressing "Home" changes the screen to the "Acceptance Box" The "ENTER" key will accept all the updated variables and select the MRMT screen. The "ABORT" key will cancel the selection.

Acceptance Box



All the defined box's are "Combination Box's, the slider box arrows usually define these data entry points.

System Setup. (*1 System Configuration).*

Now Optimus has been assigned a task (LIW Continuous will be assumed), On pressing the **“ENTER”** key the cursor will automatically position it’s self in the “Displayed Units box” This is a combination box, using the procedure as previously defined select the units that best suit your requirements. press the **“ENTER”** key to lock in the units and move the cursor onto the **“Displayed Units”** entry point.

Displayed Units.

This entry point is a combination box associated with a predefined set of units. (lb/min: kg/min: lb/hr: kg/hr: tons/hr: tonnes/hr:) Scroll over the units required and “ENTER”. The selected increments will be displayed in the **MRMT** screen and any value displayed in other units will be converted and displayed.

System Capacity.

Optimus uses the value set in this menu to set the 20mA & 25mA points for the analogue loops, **in** and **out**. It is advisable to check the supplied documentation, where the mechanical designed capacity will have been defined. This capacity should be entered here, followed by pressing the “ENTER” key, which will place the cursor into the **“Display Increments”** box.

Display Increments.

At this point the precision of the mass rate and accumulated total. It is advisable to set a the precision to that which will be set in the remote totaliser combination box. Following the setting of this field press the “ENTER” key the cursor will now move on to the “Feeder Running Acknowledge”

Feeder Running Acknowledge.

This combination box allows the user to select a pre defined method of providing Optimus with a feeder running signal. This signal is required in order that Optimus can alarm if the feeder is set to run but the screw motor fails to run because of a mechanical or load cell signal corruption. Tachometer refers to an incremental encoder which may or may not be fitted to the feeder’s screw. Some feeder designs do not use screws, they use vibratory motors etc. In these instances The selection should be a digital input or none. The digital input should be a set of clean relay contacts or a DC signal +5Volts - 24V. Held high while the motor etc is running.
Press the “ENTER” key to proceed.

HS and LS refer to High Speed and Low Speed relays. Optimus Plus has been designed with these two speed relays to satisfy the requirements of certain PLC’s and SCADA systems. The LS relay is an electro mechanical relay which may not be able to respond to high mass rates when small increments are selected. Use the HS relay when this situation is encountered.

HS Totaliser Increment.

The High Speed (HS) totaliser output is can be configured on the Terminal PCB as either +5VDC or 24VDC . The out put is provided via a **Solid State Relay (SSR), Digital output 1.** Note digital output 1 is reserved for **HS Totaliser Increment.** When selecting the pulse width, consideration must be given to the ability of the receiving device to respond to high pulse rates, especially when high feeder mass rates are called for.

HS Totaliser Pulse Width.

This menu entry allows for the selection of pre defined pulse width times, 100 mS -1000 mS in 100 mS steps. Select the pulse width that best suits the application. Consideration should be given to the use of high mass rates and long pulse widths. This can result in increments being stored in a limited sized buffer. Once the buffers capacity is exceeded, pulses will be lost. Following the setting of this field press the “ENTER” key the cursor will stay over your selection, select the “DOWN ARROW” to move on to the “LS Totaliser Increments”.

LS Totaliser Increments.

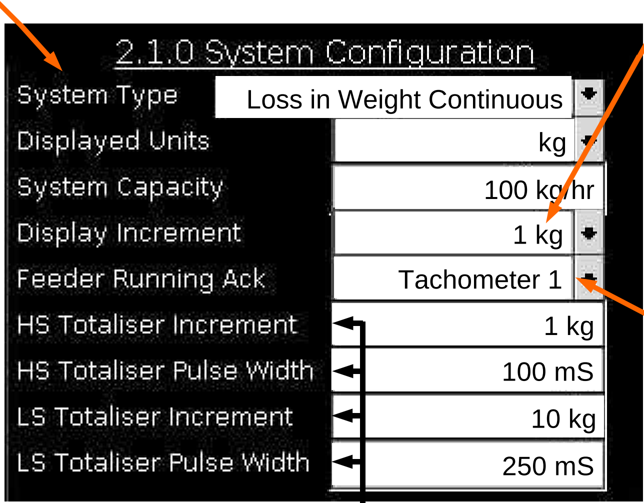
The Low Speed (LS) totaliser output is can be configured on the Terminal PCB as a set of “clean contacts”, +24VDC or +5VDC, see drawing “**OPTIMUS 02**”.

OPTIMUS PLUS DETAILED DESCRIPTION.
System Setup. (*1 System Configuration*).

System Type.
System Type, is combination screen, it allows the user to set up Optimus as either a LIW, GIW continuous feeder or a batching LIW, GIW feeder. Scroll over the type of feeder you want and press enter or tick.

Display Increments.
This menu entry allows the user to set the minimum increments that will be displayed in the MRMT screen.

Displayed Units.
Displayed Units, is a combination screen allows the user to select from a range of metric and imperial units.



System Capacity.
The data for this menu can be found in the documentation provided with the feeder. If Optimus has been provided with out the feeding mechanism, set this value to the max capacity of the feeder. This value allows Optimus to set the 20mA & 25mA points on the analogue outputs.

Feeder Running Ack.
Optimus needs to know that the feeding mechanism is running during a refill. Screw type feeders can be fitted with tachometers/ encoders. For those feeders that do not use screws such as vibratory types, a contact closure can be used. There are 4 ports into Optimus available. (See electrical drawing) for the port positions.

HS = High Speed. Assigned to relay 1 Solid State Relay

HS Totaliser Increment. This menu entry point is a combination box. It allows the user to select from a number of pre defined increments. As the feeders accumulated weight increases the HS totaliser Solid State Relay **(Relay 1)** is energised each time the selected predefined increment is satisfied.

HS Totaliser Pulse Width. This menu entry point is a combination box. A selection of predefined pulse widths are available. The user should be aware that high mass rates and long pulse widths can result in increments being stored in a limited sized buffer. Once the buffers capacity is exceeded, pulses will be lost.

LS = Low Speed. Assigned to relay 1 Mechanical Relay

LS Totaliser Increment. This menu entry point is a combination box. It allows the user to select from a number of pre defined increments. As the feeders accumulated weight increases the LS totaliser Electro Mechanical **(Relay 2)** is energised each time the selected predefined increment is satisfied.

LS Totaliser Pulse Width. This menu entry point is a combination box. A selection of predefined pulse widths are available. The user should be aware that high mass rates and long pulse widths can result in increments being stored in a limited sized buffer. Once the buffers capacity is exceeded, pulses will be lost. Consideration should also be given to the response time of the relay contacts

System Setup. (2 *Hopper Parameters).*

This screen and the associated data entry points allow the user to enter data relevant to the operation of the feed hopper and extension hopper if supplied. Much of the following data will be have been entered into Optimus Plus at the factory. If the data could not be entered during the feeder manufacture then it must be added during commissioning.

Maximum Hopper Load.

This menu entry requires the maximum hopper load to be calculated and entered. It is important that the correct load expected in the hopper be entered here. Optimus uses this field to monitor the level in the hopper, set alarms and activate digital outputs that may be monitored by PLC's or SCADA systems.

Hopper Refill Start.

During commissioning the point where the LIW feeder must be refilled will need to be determined. This point is determined observing the systems operation and finding a load that is left in the feeders hopper that provides for:-

Enough material to be left in the feeder for feeding to the process during a refill.

That the incoming feed material has enough time to settle and de-aerate before being fed into the process
Note should also be taken of the volumetric restart time set and delay after refill.

Hopper Refill Stop.

As with the 'Hopper Refill Start". The "Hopper Refill Stop" is generally determined during commissioning. The entire feeder system should be observed and a hopper load that allows for feed shut off delay should be determined and entered here.

Delay after Refill.

Some materials may cause the hopper to shake or the materials keep moving in the feeder, causing the load cell out put to fluctuate. This could affect the calculation of the new loss in weight variable, delaying the point where Optimus Plus resumes calculating the new loss in weight allows for the natural mechanical dampening of the system to work.

Maximum Refill Time.

Situations can occur when the pre-feed device fails to deliver the prescribed amount of feed over a given time. Generally most LIW and GIW systems require that the delivery hopper be filled 12 times per hour. By determining the refill time and entering this time at this point. Optimus will alarm if the hopper takes too long to fill thus negating good LIW and GIW practises.

Normal Discharge Time.

This menu entry point requires that a time in minutes be entered. In this case, the time is related to the discharge of material from the feeder, prior to a refill. If the time to discharge is greater than the time entered here Optimus will alarm. Care should be taken when using this feature as the discharge rate may be changed to a slower rate as demanded by the plant operations. This may cause an alarm event.

In-flight Mode.

When Optimus is configured as a GIW Batching Controller. Material will be "in-flight" following the stopping of the feeder or closing of the valve. This "in-flight" material must be taken into account when requiring accurate batches. This menu entry point allows the commissioning engineer to adjust the feeder cut off point to take into consideration any material that is "in-flight". The data to be entered here is determined by recording the results of a batching cycle and entering the data into the fields provided. By providing a manual entry point for this data, Optimus provides flexibility in the operation of the batching process.

Auto in Flight Amount.

Unlike the above menu entry point, if Optimus is signalled to use data entered in this screen. Each batch will be automatically monitored to adjust for 'in-flight" material

Volumetric Restart Time.

Some processes are subject to frequent stoppages. Following the stoppage and a subsequent restart there can be problems in settling down a feeder to the prescribed mass rate. Product that is difficult to feed, low quality variable speed drives or a poorly set-up PID loop, can cause unacceptable delays in the feeder acquiring the required mass rate. This menu entry point allows the user to freeze the control loop that provides the signal to the variable speed controller for a prescribed amount of time, thus allowing time for the process to settle down.

Tacho P.P.R.

This menu entry point is used only when a screw is used to feed material. Generally an encoder/tachometer is fitted to the feed screw. Encoders/tachometers can be supplied with a number of pulses per revolution (P.P.R.). This menu entry point allows the commissioning engineer to enter the number of P.P.R. for the encoder supplied. This device sends a series of +5 Volt pulses to Optimus, which Optimus uses to verify that the status of the screw (stopped or rotating). Normally Optimus knows that the screw is turning from the load cell feed back, the system is either losing weight or gaining weight. However during a hopper refill, the device goes into a volumetric mode, during this time Optimus does not know the status of the screw. However the signal from the encoder/tachometer provides a feed back during this time. It is also important that Optimus shuts down various outputs when the feeder is being shut down. Should an operator isolate the prefeed in order to make sure the feeder is not loaded with product during a shut down. The feeder will continue to run under LIW until the refill level is actuated. at this point the feeder will go into volumetric mode. If an encoder/tachometer is not used then the feeder will keep the screw rotating and maintain the mass rate as displayed at the point the feeder went into volumetric mode. Even if the motor is manually switched off the mass rate signal will be maintained. This could cause problems down stream in the plant.

No. Load Cells. (Number of load cells)

Some large LIW/GIW systems along with the range of Web-Tech vibratory type feeders use three load cells place around the hopper, 120° apart. Whilst some manufacturers just tie the outputs from each other together in a junction box Web-Tech like to arithmetically sum the outputs from the individual load cells. This is a superior method for weighing hoppers as out of balanced load cells caused by off centre loading, can cause inaccuracies in the overall output from the load cells. Where 3 load cells are employed enter the number of load cells at this menu entry point. If three load cells are used then each cell’s milli-volt output can be viewed by accessing the “PID Tuning Screen” and at “Load Cell and Tachometer Inputs”.

OPTIMUS PLUS DETAILED DESCRIPTION.

<u>System Setup. (2 *Hopper Parameters Screen*).</u>

Some materials may cause the hopper to shake or the materials keep moving in the feeder, causing the load cell out put to fluctuate. This could affect the calculation of the new loss in weight variable, delaying the point where Optimus Plus resumes calculating the new loss in weight allows for the natural mechanical dampening of the system to work.

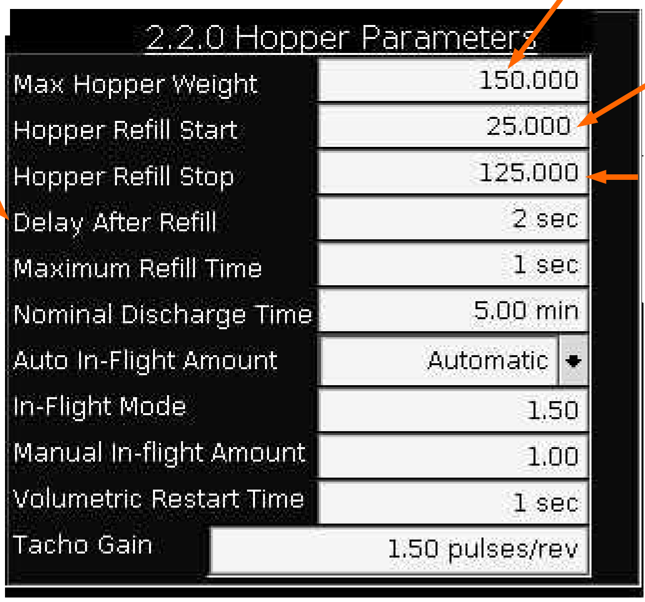
Used to set an alarm if the feeder takes to long to fill.

Enter the time that it takes for the feed hopper to discharge under normal conditions.

This menu entry requires the maximum hopper load to be calculated and entered. It is important that the correct load expected in the hopper be entered here. Optimus uses this field to monitor the level in the hopper, set alarms and activate digital outputs that may be monitored by PLC’s or SCADA systems.

When the weight in the hopper reaches this value, Optimus will send a command for a refill.

When the weight in the hopper reaches this value, Optimus will send a stop command.



System Setup. (*3 PID Mode).*

The screens and menu entry points associated with the "PID Mode" allow the user to use Optimus in a number of ways. It can be controlled by an external supervisory system (PLC. SCADA or remote set point generator), it can also be run locally from the keypad. The "PID Mode" screens allow the user to configure Optimus to the method that best suits the process operation.

Remote.

When active Optimus uses the remote rate signal applied to (TB16 REM/SET) on the Terminal PCB to determine the setpoint.

Local.

When activated Optimus uses data input from the keyboard to determine the setpoint.

Auto/Automatic.

When active Optimus uses the PID algorithm to control the variable speed drive through (TB17 PID O/P) terminal on the Terminal PCB.

Manual.

When active Optimus reads the remote setpoint input (TB16 REM/SET) or the keypad, which ever is selected and step sets the output of (TB17 PID O/P) terminal on the Terminal PCB.

Current Set Point.

This is not a data entry point. The values displayed here are a facsimile of the set point being sent to Optimus or that has been entered locally.

Setpoint Source.

This combo box allows the user to toggle between setting the set point locally or remotely. To select remote, select "Analogue 1". This label refers to the analogue input number 1 as the location where Optimus expects to find the remote analogue rate signal.

Local Setpoint.

The user can use this menu entry point to enter a set point value for the "Local Setpoint"

PID Output.

This is a view port only, and shows the current output on "PID Output" pins on the relay PCB. The value is a percentage referenced to the type of output selected in the following combo box.

0% Input.

The hardware used in Optimus is very accurate and will have been calibrate during manufacture. However many industrial plants have degraded analogue systems and the following feature allows Optimus to compensate for any differences that there may be between these analogue systems and Optimus.

With the cursor focused over the displayed value, which will reflect the convention used. 4/20mA or 0-20mA, 0-25mA or 0-50mA. and the supervisory system sending zero mass rate. On pressing the **"ENTER"** key Optimus will record and use the value set on "Analogue Input 1" as zero rate.

100% Input.

With the cursor placed over the value displayed here and the supervisory system sending 100% mass rate. Pressing the "ENTER" key will record the milliamp value set on "Analogue Input 1" as 100% mass rate. It is assumed that this value corresponds with the maximum mass rate as set as the "System Capacity in the System Configuration" screen.

Present Input.

This is a view port only, and shows the calibrated milliamp value on "(TB16 REM / SET) ".

System Setup. (*3 PID Mode*).

The following describes the action of the software keys as displayed on the "PID Mode" screen.
The keys are active when high lighted.

Auto **(f1)** Puts Optimus into the "Automatic" mode. Optimus will read the start stop command input and when it is set, will command the feeder to start and feed at the rate set on the remote set point input.

Manual **(f2)** When active, Optimus will use the set point entered from the **MRMT** screen. The start command is transferred to the "START/STOP" key found on the front door keypad.

Remote. **(f3)** When active, Optimus will use the remote set point analogue channel to derive the required set point.

Local **(f4)** When active, Optimus will use the value entered into the "Setpoint" ribbon in the **MRMT** screen or the current screen. "Setup / PID Mode / Local Setpoint".

Param **(f5)** Activating the Parameters key will change screens to the "PID Parameters.

Tune **(f6)** Activating the Tune key will change screen to the Tuning Screen.

System Setup. (*3 PID Mode*).

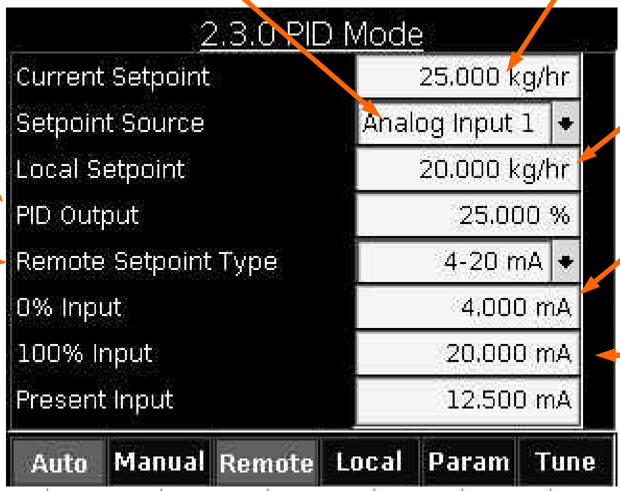
This viewing box shows the instantaneous PID signal as a % of the max available output. See the box below for units and range used .

This combo box is used to select the source of the remote setpoint.
Note The position REM SET as displayed on the connection PCB has been exclusively reserved for this function.

This is a viewing box only and displays the setpoint as selected by the active setpoint source.

This data entry point is one of two provided to enter the set pint required when in the local mode.

This combo box allows the user to select the analogue signal convention to be used.
4/20mA; 0/20mA
0/25mA; 0/50mA



Pressing the “ENTER” or “tick” key will force Optimus to read the current input on Analogue 1 as 4mA.

Displays the current adjusted value of the input on Analogue 1

Pressing the “ENTER” or “tick” key will force Optimus to read the current input on Analogue 1 as 20mA.

Activate f1 key to put Optimus into the Automatic mode.

Activating the f6 screen take the operator to the

Activate f2 key to put Optimus into the Manual Mode.

Activating the f5 key swaps screens to PID parameter entry screen. screen.

Activate f3 key to put Optimus into the Remote Setpoint

Activate f4 key to put Optimus into the Local Setpoint Mode.

System Setup. (PID Overview (*3 PID Mode*)).

The Optimus Plus uses a PID algorithm modified to suit LIW feeders, to control the operation of the feeder in gravimetric mode.

Expressed in analog form, the PID algorithm used by the Optimus Plus is:

$$OP(t) = OS + FF \cdot SP(t) + \frac{100}{PB} \cdot \left(E(t) + RR \cdot \int_0^t E(s)ds + K_D \frac{dE(t)}{dt} \right)$$

where $E(t) = SP(t) - MR(t)$

and *SP(t)* is the setpoint, *MR(t)* is the mass rate, E(t) is the deviation, *OP(t)* is the PID output, *OS* is the output offset, *FF* is the feed-forward term, *PB* is the proportional band, *RR* is the reset rate, K_D is the derivative gain and *t* is time.

Equation (1) is expressed as a function of continuous time. The Optimus Plus implements this equation in discretized form:

with $$OP(t_k) = OS + FF \cdot SP(t_k) + \frac{100}{PB} \cdot E(t_k) + RR \cdot \sum_{i=0}^{k} E(t_i) \cdot \Delta t + K_D \frac{E(t_k) - E(t_{k-1})}{\Delta t}$$

where Ä*t* is the sampling interval, and $X(t_k)$ is the value of signal *X(t)* at the *k*-th sample time.

System Setup. (*4 PID Parameters).*

The screens and menu entry points associated with the "PID Parameters" allow suitably qualified personnel to load the PID algorithm with variables that best suit the operation of the feeder. It should be noted that a good understanding of process control loops is required for successful tuning of a LIW feeder.

Proportional Gain.

The contribution of the proportional term to the PID output is determined by the proportional band *PB*. Decreasing *PB* increases the contribution of the proportional term. Increasing *PB* decreases the contribution of the proportional term. *PB* is expressed in units of %. When *PB*=100%, the effective gain applied to the error term is 1.

Decreasing *PB* will result in faster response and reduce the error signal (so that the mass rate more closely matches the set point signal), but will simultaneously increase the system's tendency to overshoot, hunt and even oscillate.

Integral Gain.

The contribution of the integral term to the PID output is determined by the reset rate *RR*. The reset rate has units of resets/sec. Increasing *RR* increases the contribution of the integral error term. Decreasing *RR* decreases the contribution of the integral error term.

Decreasing *RR* will cause the PID loop to reduce the offset error (the difference between the mass rate and the set point) to near zero. The smaller *RR*, the more rapidly the PID loop will reduce an offset error to zero. Decreasing *RR* to very small values will increase the tendency for the PID loop to oscillate.

Integral Upper Limit.

It is possible for the integral term to become quite large in the presence of a persistent error in the system. This phenomenon is called reset windup and if not controlled can cause unpredictable behaviour in a PID control loop. The integral upper limit specifies the maximum positive value the integral term may reach. If the calculated integral term exceeds the integral upper limit, it is replaced with the integral upper limit in computations of the PID output.

Integral Lower Limit.

The integral lower limit specifies the maximum negative value the integral term may reach. If the calculated integral term is less than the integral lower limit, it is replaced with the integral lower limit in computations of the PID output.

Derivative Gain.

The contribution of the derivative term to the PID output is determined by the derivative gain K_D. The derivative gain has units of seconds. Increasing K_D increases the contribution of the derivative error term. Decreasing K_D decreases the contribution of the derivative error term.
Increasing K_D reduces the hunting and tendency to oscillate which results from decreasing *PB*. K_D does not act to correct offset error.

Output Offset.

The output offset, *OO*, is defined as the percentage offset to add onto the control output, and has units of percent.

Feed Forward Gain.

The feed-forward gain, *FF*, is defined as the percentage of the setpoint to add on to the control output, and has units of percent.

Fast Track Multiplier Explanation.

The fast-track multiplier allows the Optimus Plus to effectively use a second reset rate when the calculated mass rate is away from the setpoint by a predefined threshold (the fast track threshold). The new reset rate is obtained by applying the fast track multiplier. Systems requiring a high integral time, or low RR, generally are slow to respond to perturbations in the mass rate. By setting the fast-track multiplier to a value greater than 1.0, the integral time may be sped up.

Fast Track Multiplier.

The reset rate applied in fast-track mode is obtained by multiplying the normal reset rate by the fast-track multiplier. A reset multiplier of 1.0 effectively disables the fast track feature. Thus:

fast track multiplier > 1.0, increases reset rate
fast track multiplier = 1.0, leaves reset rate unchanged
fast track multiplier < 1.0, reduces reset rate

Fast Track Threshold.

The fast track threshold defines the deviation, as a percentage of full-scale capacity, that the calculated mass rate may be away from the setpoint before applying the fast track multiplier as described above. A threshold of 100% effectively disables the fast track feature.

Explanation of PID Override Feature

The PID override mode provides a means to override the PID calculation process when the calculated mass rate is away from the setpoint for too long, and go into a form of volumetric mode. The volumetric output used by Optimus Plus when the PID Override mode is activated is determined by the feed forward gain (FF) and output offset (OO) values, even though the PID calculation routine itself is overridden. For correctly chosen FF and OO terms, the output in the override mode can approximate the output required for a given setpoint instaneously and can thus bring the mass rate into line should it suddenly deviate substantially from the setpoint for a period of time (for example, after a setpoint change). Once the deviation returns below threshold, the Optimus Plus resumes automatic control mode.

In order for the PID override to operate effectively, the feed forward gain (FF) and output offset (OO) values should be set up correctly). To do this, a graph should be established which shows the mass rate, as a percentage of capacity, obtained for different volumetric outputs. A line of best fit can then be determined which will give a y = mx + c graph (where y = mass rate (%), x = volumetric output (%)) from which the feed forward gain, m, and the output offset, c, can be determined.

The over-ride threshold parameter allows the user to define the deviation from the setpoint that must be maintained before the PID over-ride feature is activated. The over-ride activation delay parameter defines how long the mass rate can be outside the allowable threshold before the over-ride is activated. The over-ride hold delay parameter defines how long Optimus Plus remains in PID over-ride, once activated, before resuming automatic control mode.

Over Ride Threshold.

The over-ride threshold defines the deviation, as a percentage of full-scale capacity, from the setpoint that must be maintained before the PID over-ride feature is activated. Once the deviation exceeds the over-ride threshold for a time specified by the over-ride activation delay, the Optimus Plus overrides automatic PID control and selects a volumetric output (determined by the feed forward gain and the output offset), which takes into consideration the current setpoint. A threshold of 100% effectively disables the PID override feature.

System Setup. (*4 PID Parameters*).

Over-Ride Activation Delay.

The over-ride hold delay, in seconds, defines how long the Optimus Plus remains in the PID over-ride mode, or volumetric mode, before resuming automatic control after the deviation has returned to below the over-ride threshold. **Care** must be taken in choosing this value: sufficient time for the process to respond to the PID override must be allowed, whilst not removing the system from automatic control for too long.

Over-Ride Hold Delay.

The over-ride activation delay, in seconds, defines the period for which the deviation must exceed the over-ride threshold before the PID over-ride feature is activated.

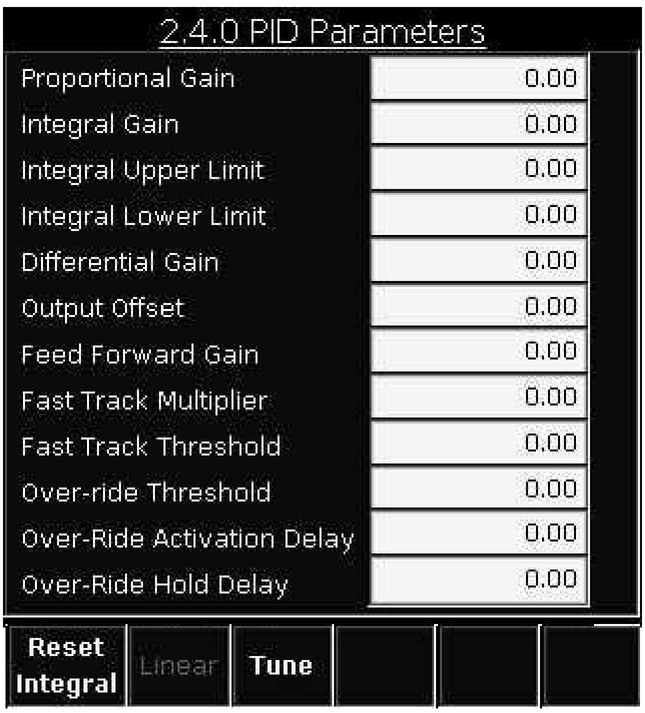
The following describes the action of the software keys as displayed on the "PID Mode" screen.
The keys are active when high lighted.

Reset Integral (f1)

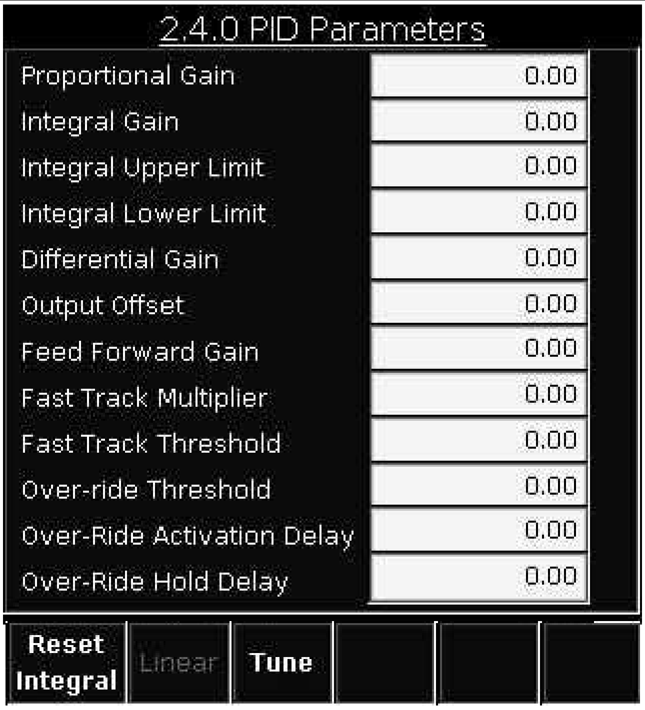
Linear (f2)

Tune (f3)

This key takes the user to a screen, where a complete view of the control action of Optimus. can be viewed and modified.



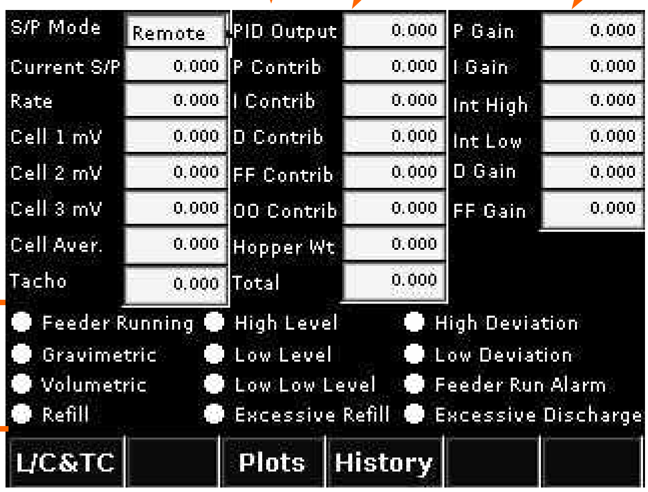
System Setup. (*4 PID Parameters*).



f1

This column displays the action of the PID algorithm.

This column shows and allows the user to adjust the values entered into the PID algorithm.

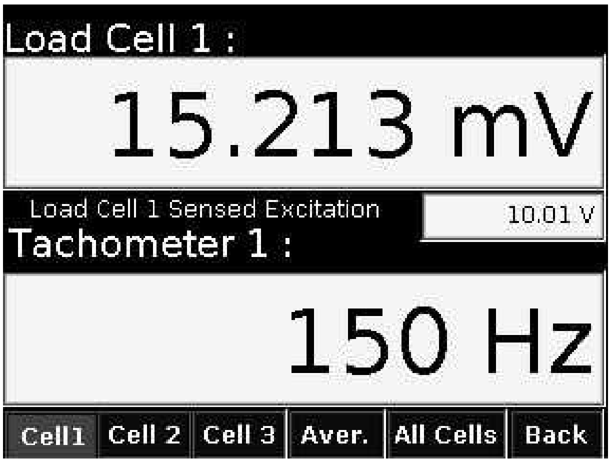


I/O Status, defined by label.

f1 f2 f3 f4

See over Page

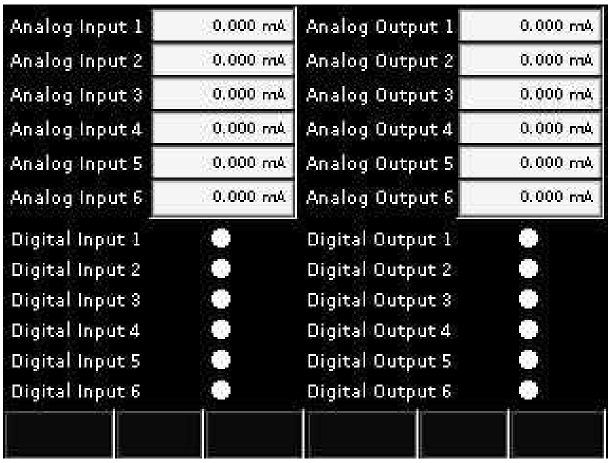
System Setup. (*4 PID Parameters*).



f1

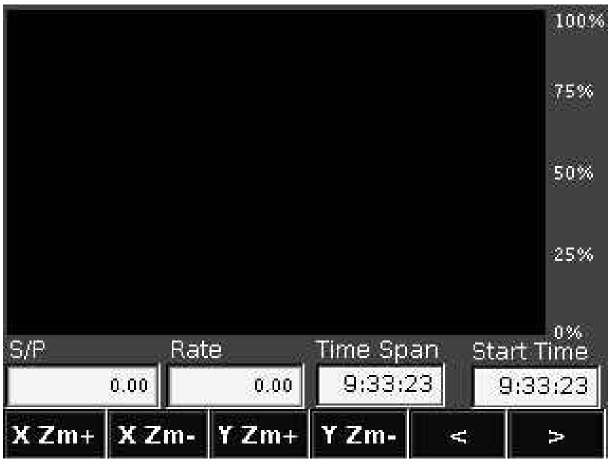
L/C & TC (Load cell & Tachometer)

Multiple views of tachometer output and load cells



f2

I/O Status, defined by Connector Idee on Terminal PCB.



Rate / Setpoint Plot.

The Plot feature will assist a commissioning engineer/ technician to tune the PID loop output.

f3

X Zm+ (F1) - Decreases the x scale (time scale) of the plot.
X Zm- (F2) - Increases the x scale of the plot.
Has the effect of making the plot larger in the x direction.
Y Zm+ (F3) - Decreases the y scale (rate scale) of the plot.
Has the effect of making the plot larger in the y direction.
Y Zm- (F4) - Increases the y scale of the plot.
< (F5) - Increases the x scale offset of the plot.
Has the effect of scrolling the plot to the right.
> (F6) - Decreases the x scale offset of the plot.

Alarm History Display.

f4

f1 Pressing the f1 key will clear the alarm event the cursor is focused over.

f2 Pressing the f2 key will clear the entire alarm event register.

System Setup. (*5 PID Tuning).*

This screen and associated menu entry points provide the commissioning engineer with a comprehensive, overall view of the feeders status and a quick method of changing PID values, setpoint, and mode whilst viewing the results in real time of any changes. The PID algorithm operation can also be monitored by reading the PID contribution boxes.

The following describes the action of the software keys as displayed on the "PID Tuning" screen.
The keys are active when high lighted.

L/C & TC **(f1)** Activating the L/C & TC key will change screen to a variety of screens where the Load Cell and tachometers output can be viewed.

The **Cell 1** through **Cell 3** (f keys), display the millivolt in a large font size of output along with the frequency output from the encoder/tachometer.

The **Aver.** (f4 key) (Average). This screen displays all load cells output or one if only one is selected, along with their respective excitation voltage. The bottom view box shows the averaged out put of all three cells if selected. If one cell is selected then only the filter associated with this input channel is displayed.

The **All Cells.** (f5 key). This screen provides the user with a view of all three load cells outputs and their associated excitation voltages. in a large format.

The **Back** (f6 key) Provides for a quick return to 5 PID Tuning screen.

I/O. **(f2)** Activating the I/O (Input Output) key changes the screen to a screen showing a comprehensive range of Optimus's I/O status.

Plots **(f3)** Activating the Plots key will change the current screen to a screen where a real time plot of, Setpoint and Mass Rate, can be viewed.

History **(f4)** Activating the History key will changes the current screen to the History screen. This screen displays a list of all alarms that have occurred, along with the date and time that they occurred.

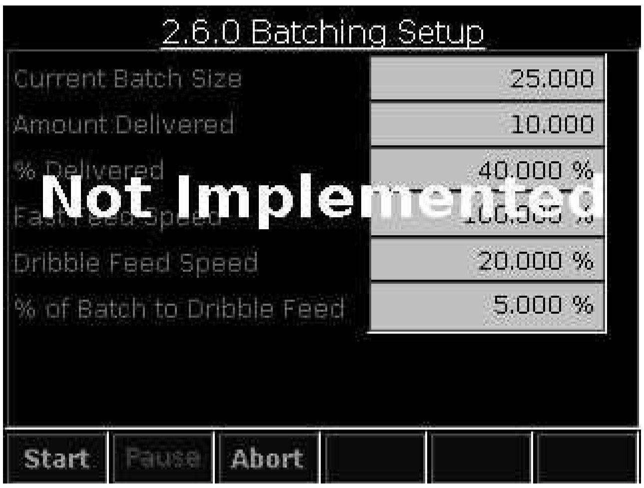
Clear (f1) Clears the alarm event that the cursor is focused over.

Clean (f2) Deletes Optimus's entire alarm event record.

System Setup. (6 Batching *Parameters).*

This function is not implemented in this system.
Batching is an OPTIONAL EXTRA.

Contact the factory for implementation details.



System Setup. (*7 Alarms*).

This screen and the menu entry points associated with it, provide a method of setting parameters associated with an alarm condition.

Deviation Alarm Type. This menu entry point allows the user to define what the deviation alarm will be referenced against. The combination box allows this alarm to be referenced against instantaneous mass rate or the percentage deviation from the setpoint mass rate.

High Deviation Alarm. This data entry box allows the user to enter the values used by the above box to activate the alarm.

High Dev alarm Delay. It may be beneficial to delay the triggering of the above alarm if the process is subject to mass rate transients caused by lumpy material being discharged. This menu entry point allows the user to suppress the deviation alarm for a required time. if the condition is still present at the end of time out the alarm will be active. If the conditions for an alarm are not present at the end of the prescribed time then the alarm will not be active.

Low Deviation Alarm.
This alarm acts as the deviation alarm does except it works for low flow settings.

Low Dev Alarm Delay.
This alarm works in the same manner as the high deviation alarm.

High Level Alarm.
The high level alarm allows a user to assign an alarm to a particular weight in the prefeed hopper.

High Level Alarm Delay.
This menu function allows for a delay in the triggering of the above alarm.

Low Level Alarm.
The low level alarm allows a user to assign an alarm to a particular weight in the prefeed hopper.

Low Level Alarm Delay.
This menu function allows for a delay in the triggering of the above alarm.

Low Low Level Alarm.
The low level alarm allows a user to assign an alarm to a particular weight in the prefeed hopper.

Low Low Level Delay. This menu function allows for a delay in the triggering of the above alarm.

Feeder Run Alarm Delay. This menu input point allows the user to suppress the feeder not running alarm. It allows to delay transients in plant signalling.

System Setup. (8 *Filters).*

This screen and the menu entry points associated with it, provide a method for setting up filters around Optimus displays, Inputs and Outputs.

Display Filter. This filter allows the user to filter the screen display. It takes out transients in the view boxes, making the display easier to read.

Display Fast Track Band. This function allows the user to apply the above filter to a particular range above and below

Rate Output Filter.

Rate Output Fast Track Band.

Deadband Filter Type.

Deadband Filter Threshold.

PID Input Filter.

PID Input Fast Track Band.

PID Output Filter.

PID Output Fast Track Band.

Setpoint Filter.

Setpoint Fast Track Band.

System Setup. (*9 Load Cells and Tachos).*

This screen shows the current status of the load cells and encoder / tachometer There are no data entry points associated with this screen. If only one load cell has been selected in the "Hopper Parameters" then data that would be associated with load cells 2 & 3 will be suppressed. The term sensed output is used to show the excitation voltage at the load cell. If load cells are used that do not have sense wiring a link must be provided on the "Terminal Board" between sense and excitation for positive and negative supplies. If three loadcells are used then all three loadcells must be connected in this fashion.

Load Cell 1 Input.
Displays the unfiltered millivolt output of load cell one.

Load Cell 1 Input ADC Counts.
Displays the real time readings of load cell 1 in A/D Counts (the output of channel one in the analogue to digital converter.

Load Cell 2 Input.
Displays the unfiltered millivolt output of load cell two.

Load Cell 2 Input ADC Counts.
Displays the real time readings of load cell 2 in A/D Counts (the output of channel two in the analogue to digital converter.

Load Cell 3 Input.
Displays the unfiltered millivolt output of load cell three.

Load Cell 1 Input ADC Counts.
Displays the real time readings of load cell 3 in A/D Counts (the output of channel three in the analogue to digital converter.

Average Load Cell Output.
Displays the arithmetical sum of the load cell outputs 1,2, and 3.

Tacho Output.
Displays the output frequency of the tachometer, assuming that the feed screw is rotating.

Large. (f1)
On activating the this key the screen changes to display the load cell and tachometer outputs in a large format.

When in the large format screen the following keys provide the following functions.

Cell1. (f1) Displays Cell 1 in the large format along with the tachometer frequency.

Cell2. (f2) Displays Cell 2 in the large format along with the tachometer frequency.

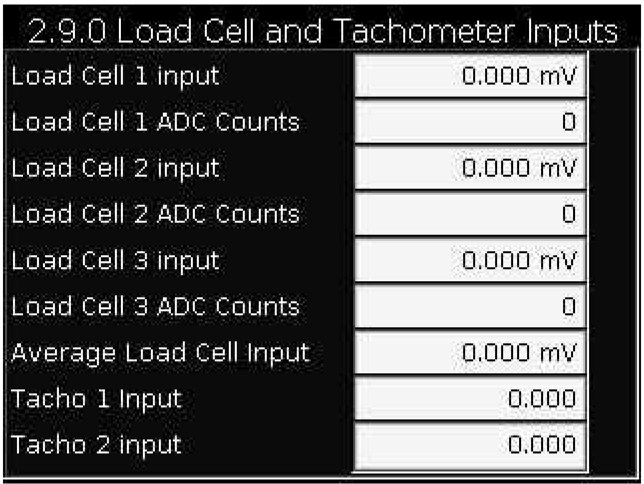
Cell3. (f3) Displays Cell 3 in the large format along with the tachometer frequency.

System Setup. (*9 Load Cells and Tachos).*

Aver. **(f4)** This key activates the average screen. All three load cells outputs are shown along with the average output and tachometer frequency.

All Cells. **(f5)** This key changes screens to show all load cell outputs along with the sense voltage.

Back. **(f6)** Activating this key returns the user to the first Load Cell and Tachometer screen.



System Setup. (10 Analogue Input Setup.).

This screen and the menu entry points associated with it, provide a method for setting up the analogue inputs and the type. The type refers to the current specification. (4/20mA, 0-20mA, 0/25mA, 0/50mA)

Remote Setpoint Type.
Select the current output specification you wish to assign to the “remote Setpoint”.

Analogue Input 2 Type.
Select the current output specification you wish to assign to “Analogue Input 2”.

Analogue Input 2 Use.
This combination box allows the user to assign a label to a particular input.

Analogue Input 3 Type.
Select the current output specification you wish to assign to “Analogue Input 3”.

Analogue Input 3 Use.
This combination box allows the user to assign a label to a particular input.

Analogue Input 4 Type.
Select the current output specification you wish to assign to “Analogue Input 4”.

Analogue Input 4 Use.
This combination box allows the user to assign a label to a particular input.

Analogue Input 5 Type.
Select the current output specification you wish to assign to “Analogue Input 5”.

Analogue Input 5 Use.
This combination box allows the user to assign a label to a particular input.

Analogue Input 6 Type.
Select the current output specification you wish to assign to “Analogue Input 6”.

Analogue Input 6 Use.
This combination box allows the user to assign a label to a particular input.

The Ghosted boxes represent functions not implemented and reserved for customer specific applications.

System Setup. (11 Analogue Outputs Setup.).

This screen and the menu entry points associated with it, provide a method for setting up the analogue outputs and the type. The type refers to the current specification. (4/20mA, 0-20mA, 0/25mA, 0/50mA).

Rate Output Type.

Select the current output specification you wish to assign to the “Rate Output”.

PID Output Type.

Select the current output specification you wish to assign to the “PID Output”.

Hopper Weight Output Type.

Select the current output specification you wish to assign to the “Hopper Weight”

Analogue Output 4 Type. Not implemented.

Analogue Output 4 Use. Not implemented.

Analogue Output 5 Type. Not implemented.

Analogue Output 5 Use. Not implemented.

Analogue Output 6 Type. Not implemented.

Analogue Output 6 Use. Not implemented.

The Ghosted boxes represent functions not implemented and reserved for customer specific applications.

System Setup. (12 Digital Input Setup.).

This screen and the menu entry points associated with it, provide a method for setting up the digital input labels. The digital inputs are of the voltage type. (+5VDC - 24VDC).

Digital Input 1.

Digital Input 2.

Digital Input 3.

Digital Input 4.

Digital Input 5.

Digital Input 6.

System Setup. (13 Digital Outputs Setup.).

This screen and the menu entry points associated with it, provide a method for allocating a label to an output and testing individual outputs.

Digital Output 1.

Digital output 1 is preassigned to the “High Speed Totaliser”. The high Speed Totaliser comprises a solid state relay (SSR).

Digital Output 2.

Digital output 2 is preassigned to the “Low Speed Totaliser”. The Low Speed Totaliser is a miniature electromechanical relay (clean contacts).

Digital Output 3.

Digital Output 3 is an assignable, miniature, electromechanical relay (clean contacts).

Digital Output 4.

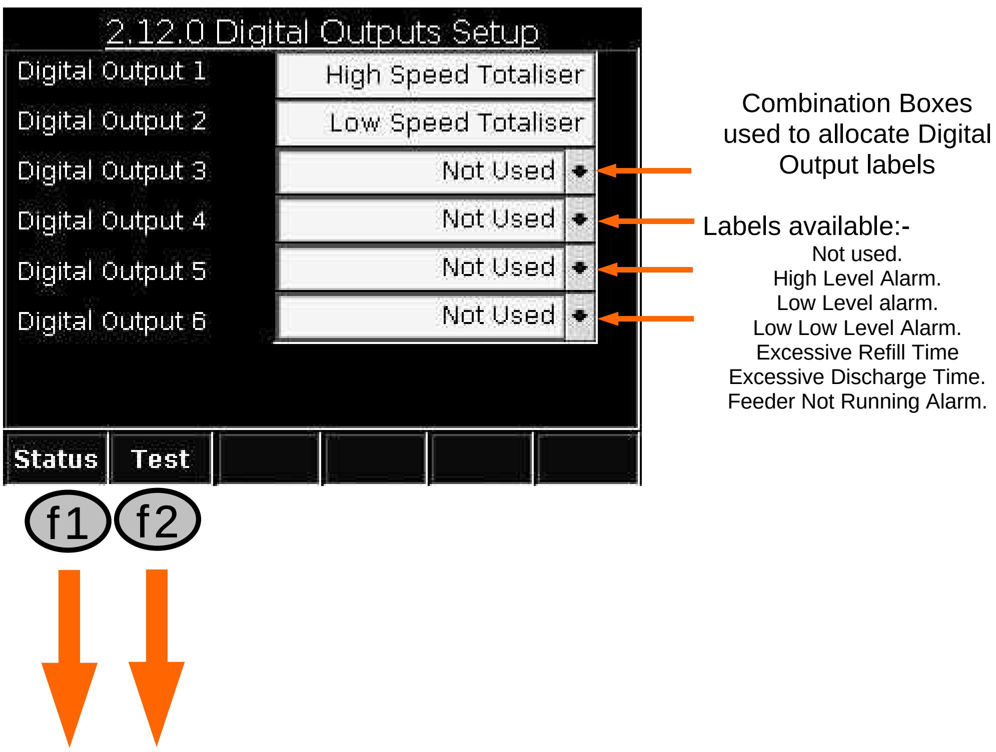
Digital Output 4 is an assignable, miniature, electromechanical relay (clean contacts).

Digital Output 5.

Digital Output 5 is an assignable, miniature, electromechanical relay (clean contacts).

Digital Output 6.

Digital Output 6 is an assignable, miniature, electromechanical relay (clean contacts).



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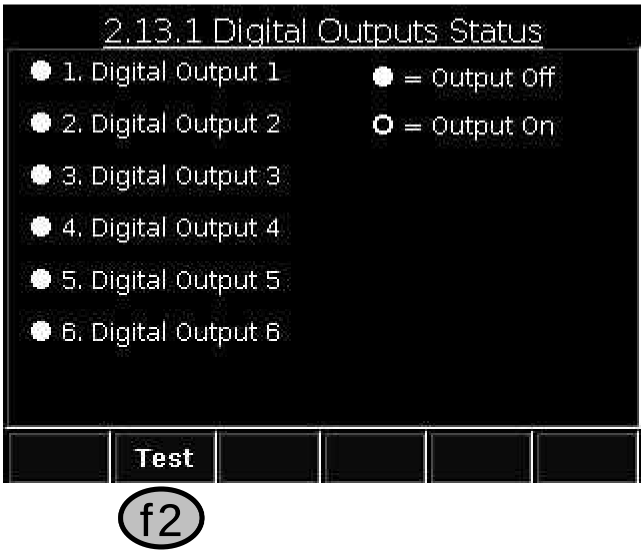
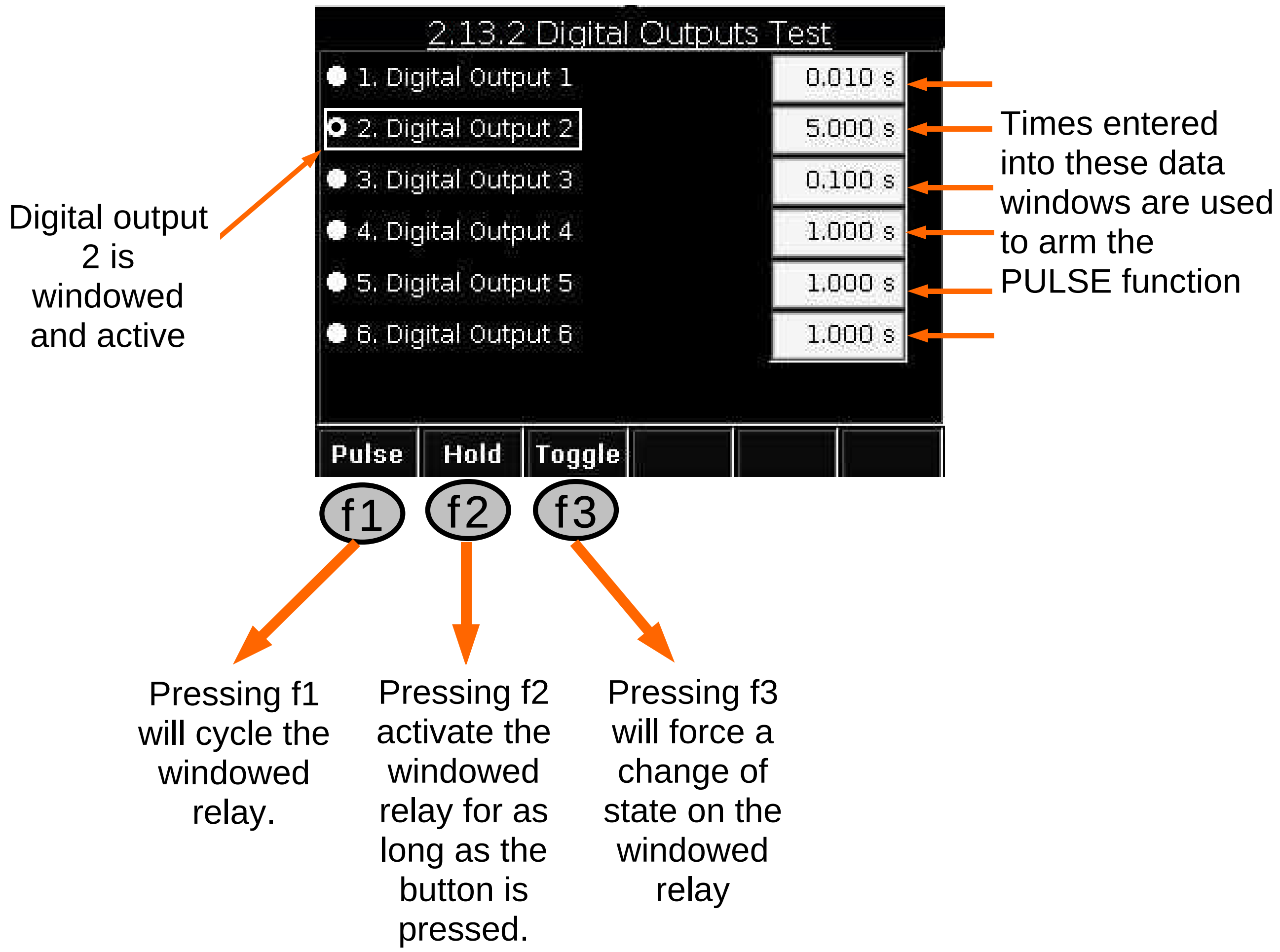
OPTIMUS PLUS DETAILED DESCRIPTION.

System Setup. (13 Digital Outputs Status & Test Screens).

Status Screen



Test Screen



System Setup. (14 Screen Setup.).

This menu entry point allows the user to adjust the way the screen so that the view best suits the application. The back light consumes a moderate amount of power. The generation of suitable power for the back light from the input power produces heat. The switching off of the back light power will lower the temperature inside the enclosure.

Backlight off after.

This entry point allows the user to select the time that the display will remain active after the final key stroke has been entered through the keypad. Switching off the back light reduces the load on the power supply and helps keep heat out of the enclosure.

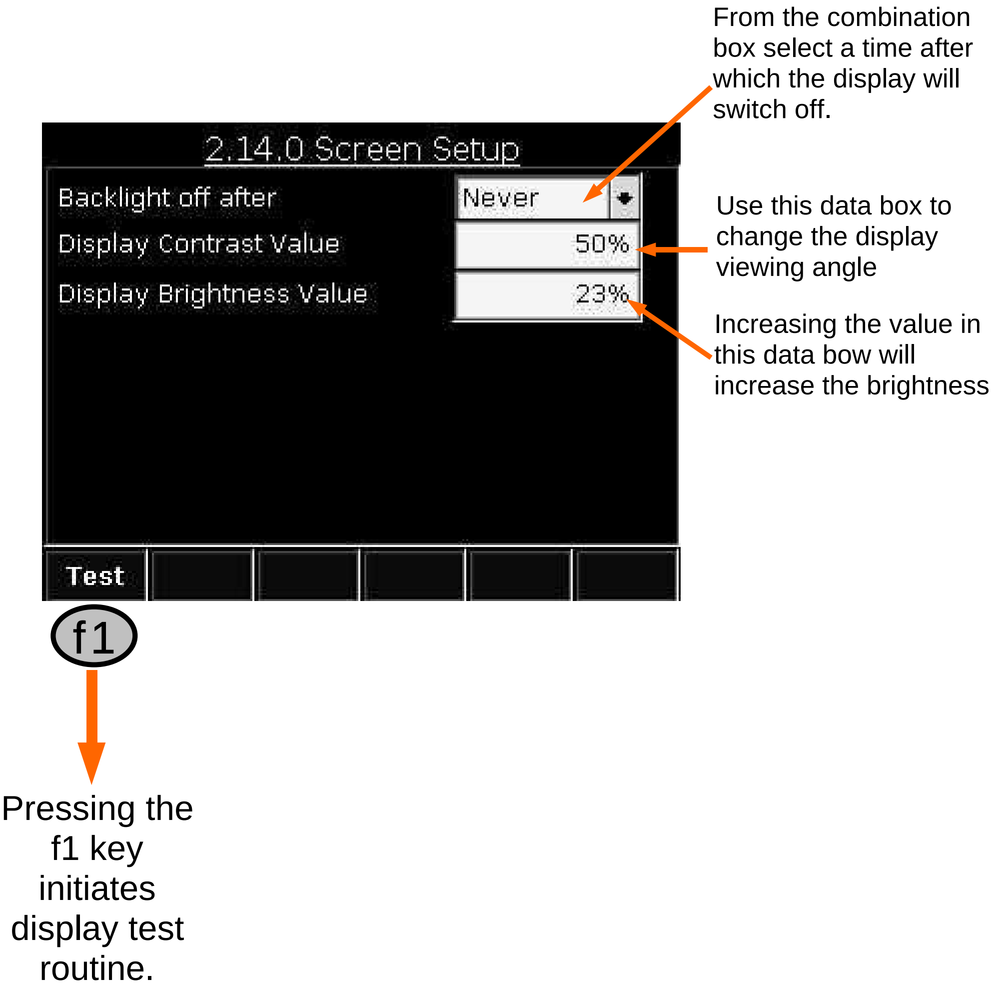
Display Contrast Value.

Liquid Crystal Displays (LCD) have an optimum viewing angle. The height at which the enclosure is mounted relative to the viewer may not provide the best viewing angle. by judicious use of the software control the best viewing angle can be set.

Display Brightness.

This menu entry point allows the user to adjust the brightness.

Test **(f1)** Activating the f1 key invokes the display test routine. It allows the user to check the LCD screen for defects and adjust the brightness and viewing angle.



Masterweigh Optimus Plus.

Software Version : LIW.
At Web-Tech we are constantly improving the software used in Optimus, each time we build in a new feature or provide custom feature we allocate a new software number. This number is embedded in the software and will displayed here.

Build Number.
Each Optimus is provided with a unique number at the time of manufacture. Which is the “Build Number”.

Reset Count.
Optimus logs the number of times power is applied to it. The result are displayed here.

Reconfigure Count.
Shows the number of times that Optimus has been reconfigured. Reconfiguring resets all the variables in Optimus to factory defaults. Optimus may have to be reconfigured if the memory has been corrupted. Memory corruption can occur under certain circumstances, faulty memory components, noisy electrical mains, strong magnetic forces can, under certain circumstances corrupt electronic memory devices. Optimus has been designed using all the known best

Current Date.
Optimus is fitted with a “Real time Clock” chip. It performs a number of operations. It computes the current date from a seed date. The seed date is entered here and Optimus tracks the date from here . The box is a combination viewing and data entry port.

Current Time.
Shows current time.

Optimus Power-On Hours.
Displays the number of hours the Optimus has been powered up since it’s first power up after manufacture.

Clock Compensation Factor.
Because some timing components associated with the clock circuit may be at the limit of the their stated tolerances. It is possible that the clock can be running fast or slow. This data entry point allows the user to use software to adjust the speed of the clock.

On-Board temperature.
Displays the temperature of the PCB.

System Setup. (15 System Information and Clocks.).

The following describes the action of the software keys as displayed on the "PID Tuning" screen.
The keys are active when high lighted.

Clear Resets **(f1)** Pressing the f1 key resets the reset counts.

Clear Configs **(f2)** Pressing the f2 key clears the configuration counts.

Note the above parameter are an important diagnostic tool for service technicians and should not be reset.

Set Clock **(f3)** Pressing the f3 key allows the user to set the current date and time into Optimus. The cursor focuses over the date initially. the date should be entered in the format.
DDMMYY (251102) 25 November 2002 Followed by the "ENTER" key. The cursor will re focus over the time entry window were the time should be entered in the 24 hour clock format. **(1630) (4 : 30pm).** Followed by the "ENTER" key The time and date is only entered in working memory on pressing the "HOME" Key.

Error Log **(f4)** Pressing the f4 key changes the current screen to a screen displaying the detected alarms.

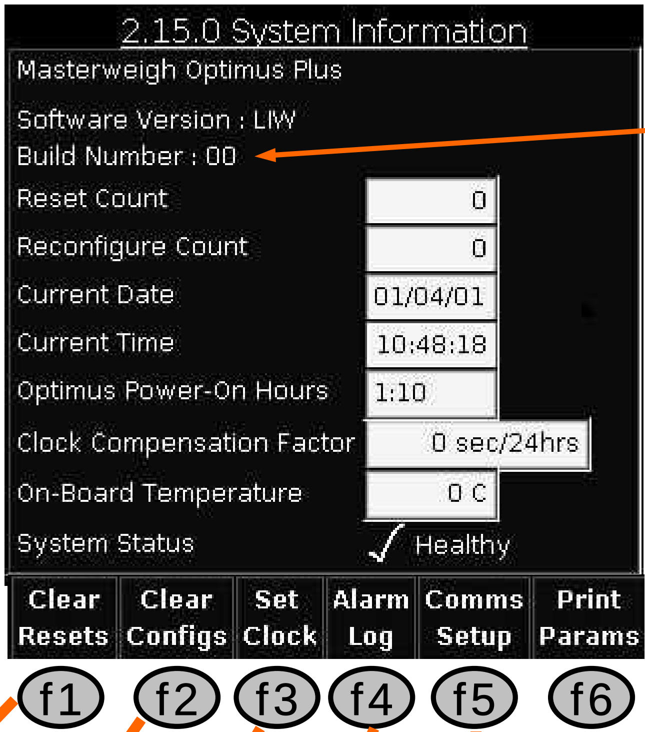
The data currently stored in this screen can be **Cleared or Cleaned.** Clearing erases an individual event. Cleaning erases all events.

(f1) Pressing the f1 key Clears the log.
(f2) Pressing the f2 key Cleans the log.

Comms Setup **(f5)** Comms Set up allows the user to configure the RS 232 & RS485 Port.

Print Params **(f6)** On activating the f6 key all the Optimus variables are sent to the RS232 and RS485 ports. It is assumed that a suitable printer is set up to receive and print this data.

System Setup. (15 System Information and Clocks.).



Each Optimus is provided with a unique number at the time of manufacture. Which is the “Build Number”.

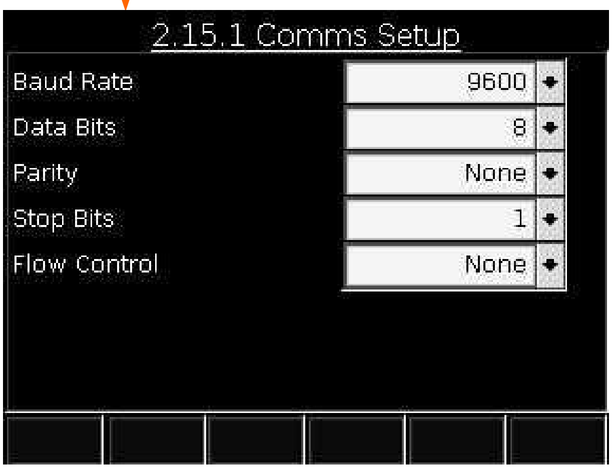
Clears the reset. The number of times Optimus has been cycled on & off.

Clears the configuration counter.

Focuses cursor over the time & date entry boxes.

For Details regarding this function see,

System Setup. (*4 PID Parameters*).



Enter the setup configuration that is compatible with the

PRINTER / PLC / SCADA

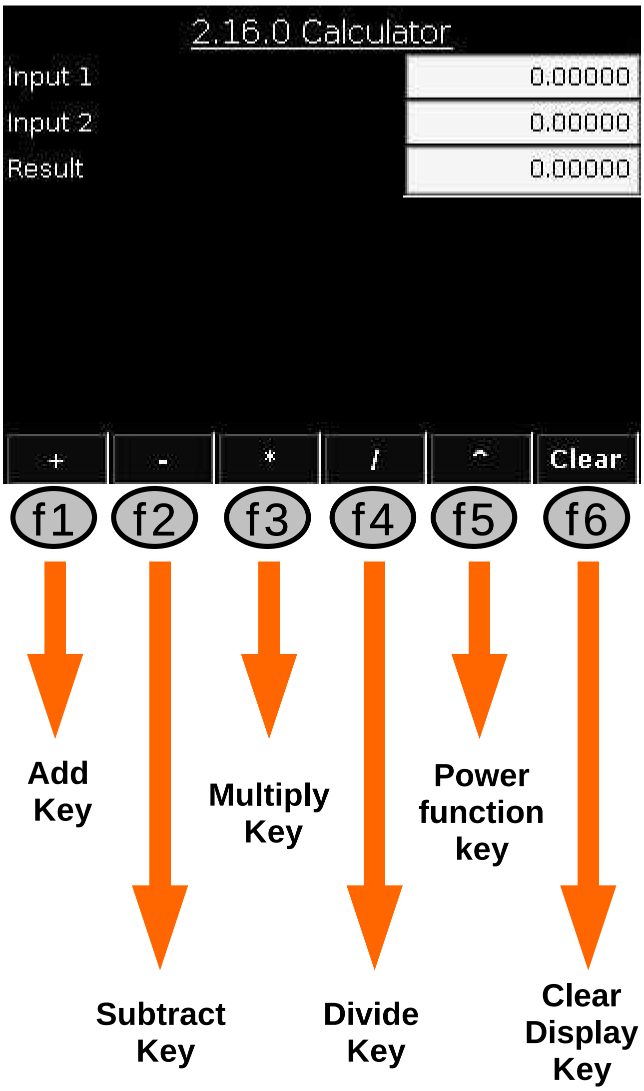
System Setup. (16 Calculator.).

In some situations during calibration it may be useful to manually calculate the results of a calibration. There are also many occasions where a calibrating engineer requires the use of a calculator. This menu turns Optimus into a basic calculator. When the calculator is first entered the cursor jumps to Input 1 after pressing the Enter key the cursor moves to input 2, the function required is then entered and the result is placed in the result box.

Input 1 Enter data.

Input 2 Enter data. Followed by the function required.

Result. The result of the above is placed here.



OPTIMUS PLUS DETAILED DESCRIPTION.

System Setup. (17 Load Parameters.).

The “Load Parameters” screen allows the user to reload all the parameters that have been load into in to Optimus during commissioning as well as the original factory defaults. Files 00000000 & 00000001 are reserved. File 00000000 contains the factory default variables. File 00000001 is reserved for the commissioning engineer. All files with file numbers over 00000001 have to be written to “Flash Card Memory” This card is supplied as an optional extra. If the card is not fitted the save action will not function. This menu has been designed to allow the user to go back to either the original factory settings or those left during commissioning should the electronic memory fail or an operator of technician accidentally changes a value somewhere and get the value back. The menu allows for multiple entries this allows for multiple entries and should be updated every time changes have been made to any variables.

File to Load.

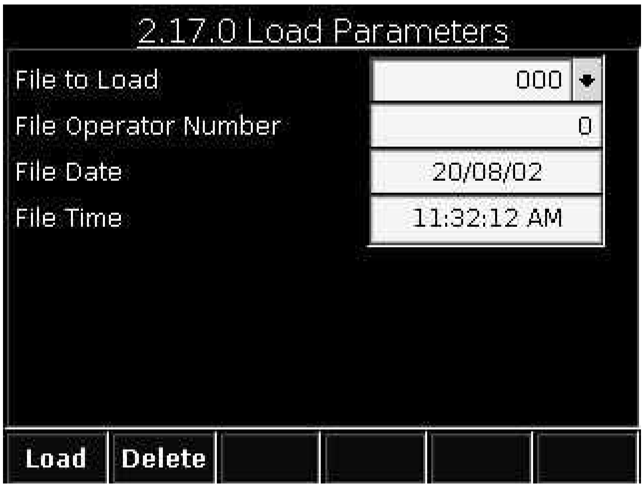
This combination box shows all the records that have been saved. Select a file by placing the cursor over the file and pressing the “ENTER” key.

File Operator Number.

The operator number is a number used to identify the operator who saved the file, and is stored with the file. In the load parameters screen, the File Operator Number box isn’t editable and shows the operator number stored in the currently selected file. In the save parameters screen, the Operator Number box allows the user to specify an operator number to store with the file.
The ‘File Number’ box in the Save Parameters screen isn’t editable but shows the next available file for the user to save. Save (F1) will store variables on the flash card only

File Date. Displays the date that the selected file was written.

File Time. Displays the time that the selected file was written.



Load **(f1)** Activating the “Load” key loads the select file (Optimus parameters) into the working memory. If file 00000001 is selected then all the data recorded during commissioning will be loaded.

Delete **(f2)** Activating the f2 key will delete the selected file.

OPTIMUS PLUS DETAILED DESCRIPTION.

System Setup. (18 Save Parameters.).

This screen allows the operator to organise and save Optimus's variables.

Card Slots Free. This viewing port checks the Compact Flash to confirm the that a card is present.

Operator Number. A qualified operator / technician needs to enter his idee here so that an any data saved will be associated with the number.

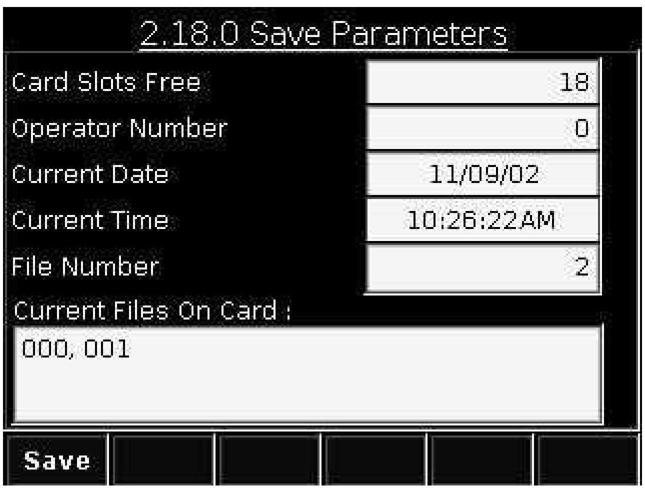
Current Date. Displays the date that will be saved with the file.

Current Time. Displays the current time that will be saved with the file.

File Number. Allows a user to allocate a file number.

Current Files on Card. Displays the files that are currently stored in E^2 PROM and Flash Card Memory.

Save **(f1)** On pressing of this key Optimus will store it's variables to E^2 PROM and Flash Card.



System Setup. (19 Trends.).

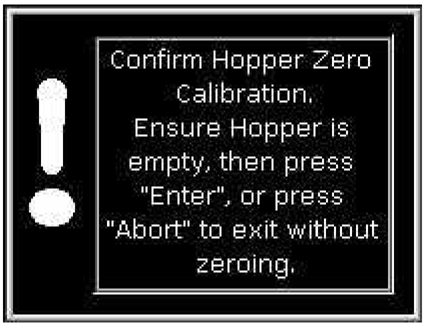
This function is not implemented in this system.
Trends are an OPTIONAL EXTRA.

Contact the factory for implementation details.

System Setup. (Message Boxes.).

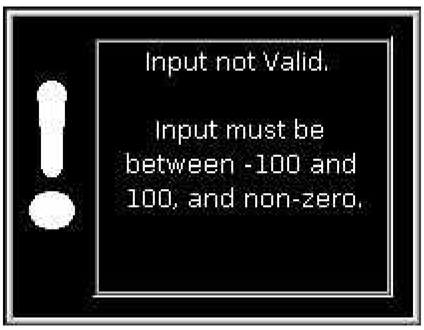
Following any changes to Optimus's variables this box will be displayed. It provides an escape route if the user does not wish to delete the relevant configuration file.

Following the activation of the "Clear Total" key on the keypad. Optimus confirms the action of clearing the total prior to deleting.



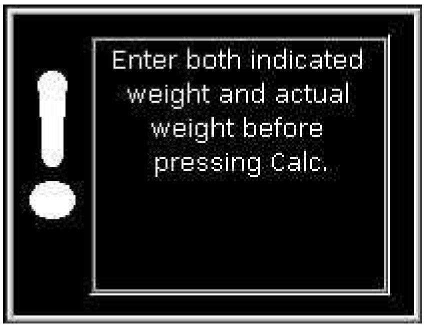
It is important that the hopper is empty prior to zeroing. This prompt confirms with the operator that the hopper is empty.

It is important that the hopper is loaded with the correct calibration weights when spanning. This message box confirms with the operator that the correct weight has been applied to the hopper.

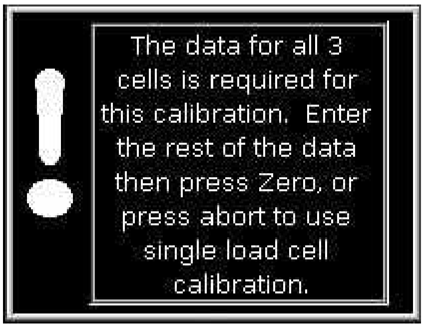


If the user enters a value in a numeric box that is outside the expected range. This error box will be presented.

System Setup. (Message Boxes.).

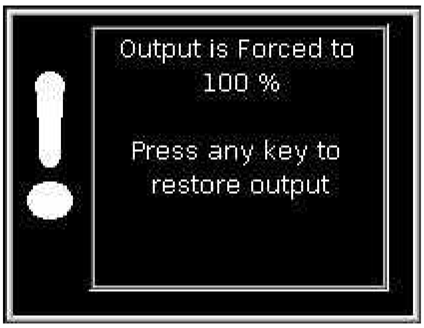


This box appears when using the Empirical calibration method, if a required value is absent.



This function not implemented.

During the calibration of the analogue output current loops. The loop can be forced to 0% output. This prompt box keeps the operator informed of the loops status and provides a reminder that the previous output will be restored when any key is pressed at the end of the test.



During the calibration of the analogue output current loops. The loop can be forced to 100% output. This prompt box keeps the operator informed of the loops status and provides a reminder that the previous output will be restored when any key is pressed at the end of the test.

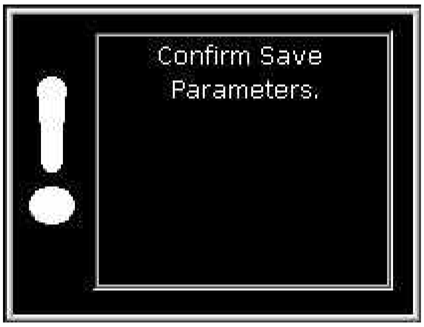
Following a user command to reconfigure Optimus with previously stored operating parameters. This message will confirm the operation.

OPTIMUS PLUS DETAILED DESCRIPTION.

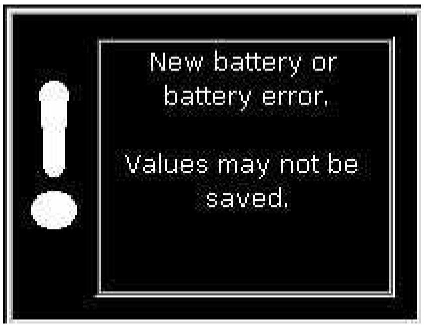
System Setup. (Message Boxes.).

This box will appear if the user presses Delete (f2) key. It provides an escape route if the user does not wish to delete the relevant configuration file.

It is possible to overwrite



Pressing “ENTER” saves the parameters. The prompt box lets the user know the process has happened.



This box is displayed if the internal battery is flat or defective. It will also display this message when first switched on

When calibrating empirically calibrating Optimus, this message box may appear if a complete data set is not provided. Weight achieved by Optimus and the weight achieved by a static scale.

System Setup. (Message Boxes.).

If the batching option is being used this screen will be displayed if the batching parameters can't be realised.

DeviceNet .

DeviceNet is a connection based protocol, i.e. all devices are required establish a connection prior to exchanging information.

DeviceNet adopts the so-called object modelling approach, i.e. each of the information are structured in different objects. Services (such as Get and Set) can be applied to these objects to extract/change these information. Four basic objects are required to handle these information exchange:

1. Identity object. Identification information (such as vendor ID, Device Profile, Revision etc.) of a device are stored in this object. Users can identify a particular object by remotely access to this object.

2. Message Router. This object handles the explicit messages received by routing it to the proper destination objects.

3. DeviceNet Object. This object stores all DeviceNet related information, e.g. MAC ID and baud rate.

4. Connection Object. This object handles the connection of the module, such as Explicit Messaging or I/O Messaging.

Each object has its own parameters called attributes (such as vendor ID). These attributes govern the behaviour of a device.

When a connection has been established, all data exchanged across this connection will be handled by the corresponding connection instance.

System Setup (Digital Communications DeviceNet®.).

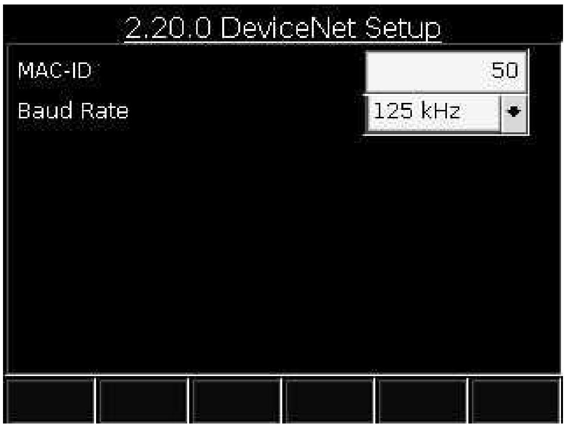
Optimus may be fitted with a DeviceNet communication interface module (Hilscher COM DNS). the module has been mounted on a PC 104 style interface PCB.

MAC ID.

The DeviceNet specification allows for up to 64 discrete nodes. Consult your network designer for an address allocation. Select the corresponding address from the box.

Baud Rate.

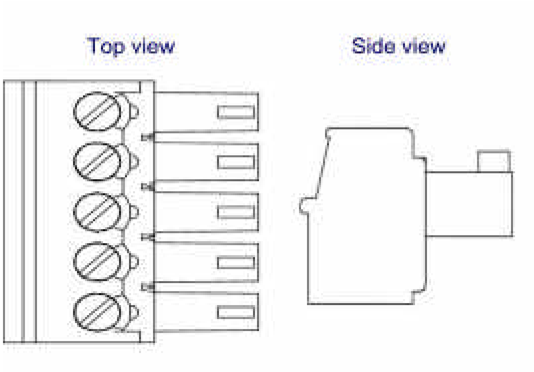
The DeviceNet specification allows for a number of pre-assigned baud rates. Select the baud rate required from the combination box. Consult your network designer for the required baud rate.



Supplied with the controller is a 3½ diskette. This diskette contains the Electronic Data Sheet (ESD) file which provides the user with information regarding the embedded communication port.

Data Inn	Set Point.
Data Out.	Mass Rate. Accumulated Total. Digital Output status. Digital Input Status. Analogue Output Status.

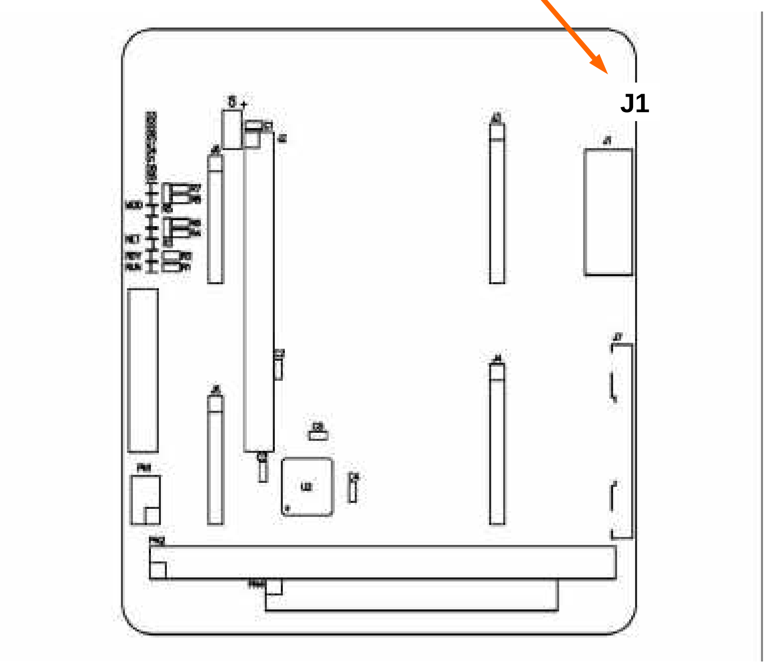
J1



Phoenix series Combicon
Part number 1803604
Part designation MC 1,5/ 5-ST-3,81
Part description Combicon Plug, 8 A , 160 V , 5-position , Screw connection , Connection direction: 0°

J1
User/Network Connector

PC 104 Carrier Board



Embedded PCB

Digital Communications DeviceNet® (Fault Finding.).

Technical Help.

Poor grounding
Grounding is achieved by connecting the DC power supply common (V-) wire and the shield to a low-impedance ground at the power supply. If multiple power supplies are used, the ground connection must be made at only one power supply, preferably the power supply nearest the centre of the network. All splices and taps in the network must connect the shield as well as the signal and power lines.

General Field Testing Techniques.

After the network is installed, there are several tests you can perform to diagnose common problems before communication faults occur. All of the following tests are performed
with all devices installed and all power supplies turned on.

Do not perform these tests while the system is operating (no communication)!

Network Termination & Communication Wires: Check the resistance from CANH to CANL at each device. It should be between 50¿ and 66¿ . If the value is greater than 66¿
there could be a break in one of the signal wires or missing network terminator(s). If the value is less than 50W there may be a short between the network wires, extra
terminating resistor(s), faulty node transceiver(s) or unpowered nodes (unpowered node transceivers have an unacceptably low input impedance).

Grounding: Break the shield at a few points in the network and insert a DC ammeter. There should be zero current flow in the shield. If there is current flow, the shield is
connected to DC common or ground in more than one place (possibly within a device).

Connect an ammeter (one that can handle the maximum power supply output current) from DC common to the shield at the opposite end of the network from the power supply
(or both ends if the power supply is centrally located). There should be significant current flow. If there is no current, check for breaks in the shield at each connector, tap and
junction, also check that the shield is connected to DC common (V-) at the power supply. This test can also be performed at the end of each drop if practical.

Network Power: Measure the power supply voltage at each device. It should be 11Vdc or higher. If it is not, check for faulty or loose connectors and verify power system design
calculations by measuring current flow in each section of cable with an ammeter.

Measure and record the voltage between the shield and DC common at each device. This voltage should be between -5Vdc and 5Vdc at each device and the difference between
the highest and lowest measurements should be less than 5Vdc. If the values are out of range check power system design, verify current flows in each section of cable and
check the integrity of the shield.

Station Addresses & Baud Rate Settings: The Network Status LED included in many products is an excellent diagnostic tool for this purpose. The LED should be flashing green on
all devices. Solid RED indicates a communication fault (possibly incorrect baud rate) or a duplicate MAC ID (station address). Connecting the non-functioning devices
one-on-one to a network configuration tool is an easy way to diagnose the problem.

Using a network configuration tool to perform a "network who" verifies that all stations are connected and capable of communicating.

Diagnosing Faults

DeviceNet is subject to the same types of problems as any other network; faulty devices, opens and shorts in the network wiring, electrical interference, signal distortion due to
incorrect termination or failure to adhere to topology guidelines and signal attenuation due to faulty connectors and loose terminal blocks.

Digital Communications DeviceNet® (Fault Finding.).

There are some additional problems that are more specific to DeviceNet; excessive common mode voltage, low power supply voltage and excessive signal propagation delay.

Low-tech Approach: Many problems can be identified using the low-tech approach of disconnecting parts of the network and watching where the fault goes. Another extremely successful diagnostic method for previously functioning networks is simply to ask the question "What has changed?".

The low-tech approach does not work for other problems such as excessive common mode voltage, ground loops, electrical interference and signal distortion because disconnecting part of the network frequently solves the problem. The test procedures in step 7 can be helpful in diagnosing these types of faults.

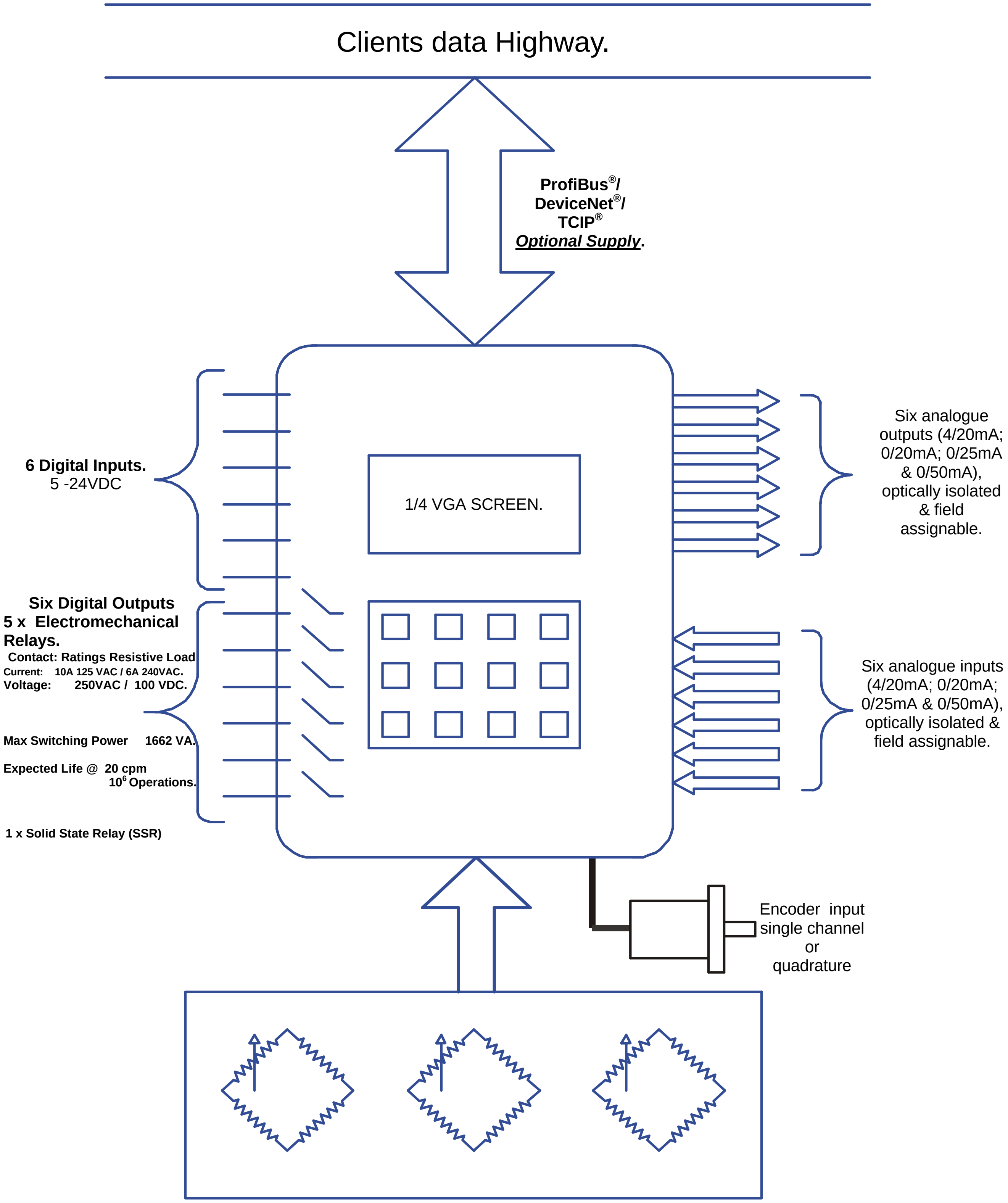
Using an Oscilloscope: Looking at the network signal with an oscilloscope can be misleading since many perfectly good differential signals look perfectly awful when viewed individually. Also consider that most network problems you are tempted to diagnose with an oscilloscope are intermittent. Unless you are able to trigger your scope on the bad signal, you will probably spend your time looking at good signals.

Viewing network signals with an oscilloscope is seldom fruitful except when done by an experienced diagnostician with access to supplementary tools to trigger the scope on specific network occurrences.

Your Brain is Your Best Diagnostic Tool: Be a detective. Write down the symptoms including as much detail as possible. Ask yourself things like "Do intermittent problems occur when other un-related equipment is in use?" Look for patterns in the symptoms: do some nodes communicate correctly? What do they have in common? What is the difference between the functioning nodes and the others? Consider factors such as proximity to the power supply, proximity to the terminator and proximity to the scanner. Even if you cannot locate the problem yourself, your notes are invaluable when you enlist assistance.

OPTIMUS PLUS

Wiring Block Diagram.



Three discrete load cell input channels, that are arithmetically summed. Negating the requirement for a summing junction box.

Vibratory Feeder Setup

Material: Owens corning-CS 790a-1/2” CHOPPED FIBREGLASS

Pan size: 285mm 11”

Bar size and spacing (if applicable): 8 mm Ø / 21 mm

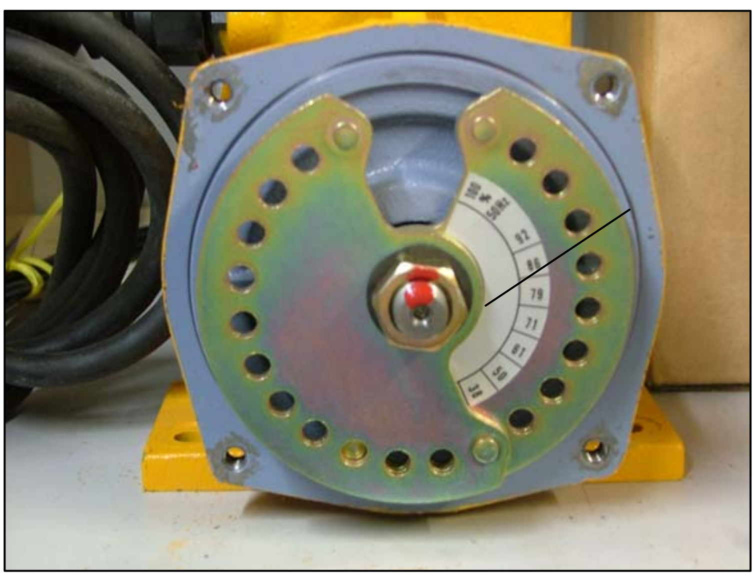
Vibratory Motor Size: 100KGF(x2)

Vibratory Motor Hz (Min Feed Rate): 45Hz @0.5kg/min

Vibratory Motor Hz (Max Feed Rate): 65Hz @ 1.8kg/min

Vibratory Motor Weigh Configuration (mark Hole used)

Weight Qty: 2 plates per side



Three holes showing 86%

Comments…setup for rate 0.5Kg/min to 1.8kg/min

Drop test

Motor Hz	**Motor hole**	**Weight 1 min**	**Weight 5min**	**P**	**I**
10				**170**	**0.1**
20					
30		420 g			
40		500 g			
50		620 g			
60		1550 g			
65		1800 g			
70		2350 g			
80		2500 g			
100					
Motor Hz	**Motor hole**	**Weight 1 min**	**Weight 5min**		
10					
20					
30					
40					
50					
60					
70					
80					
90					
100					
Motor Hz	**Motor hole**	**Weight 1 min**	**Weight 5min**		
10					
20					
30					
40					
50					
60					
70					
80					
90					
100					

OPTIMUS CALIBRATION DATA

Customer : **CSR Fibreglass feeder** Designation : **Gyproc-QLD**

Material : **Plaster** Model : **Optimus Plus** Date : 28/08/2012

Load Cell: **Tedea 20KG(tare7kg)** Tacho : **None** Data By : ADC

Serial No: Software Build : **59** Contract No : 4123-10

SYSTEM SETUP

1. System Configuration	System Type	**Loss In Weight Continuous**	
	Displayed Units	**kg/min**	
	System Capacity	**2.20**	**kg/min**
	Display Increment	**0.01**	
	Feeder Running Ack	**None**	
	HS Totaliser Increment	**0.10**	**kg**
	HS Totaliser Pulse width	**100**	**ms**
	LS Totaliser Increment	**0.1**	**kg**
	LS Totaliser Pulse width	**100**	**ms**
2. Hopper Parameters	Max Hopper Load	**22.000**	**kg**
	Hopper Refill Stop	**21.000**	**kg**
	Hopper Refill Start	**12.000**	**kg**
	Delay After Refill	**5**	**sec**
	Maximum Refill Time	**30**	**sec**
	Nominal Discharge Time	**8.60**	**sec**
	In-Flight Mode		
	Auto In-Flight Amount		
	Manual In-Flight Ammount		
	Volumetric Restart Time	**1**	**sec**
	Tacho PPR	**100**	**PPR**
	No Load Cells	**1**	
4. PID Parameters	Proportional Gain	**170.000**	
	Integral Gain	**0.100**	
	Integral Upper Limit	**35.000**	
	Integral Lower Limit	**-7.000**	
	Differential Gain	**0.000**	
	Output Offset	**0.000**	
	Feed Forward Gain	**0.700**	
	Fast Track Multiplier	**1.000**	
	Fast Track Threshold	**100.000**	**%**
	Over-ride Threshold	**60.000**	**%**
	Over-ride Activation Delay	**1**	**Sec**
	Over-ride Hold Delay	**2**	**Sec**
	PID Averaging Duration	**3**	**Sec**

OPTIMUS CALIBRATION DATA

8. Filters

Display Filter	**5**	**sec**
Display Fast Track Band	**40**	**%**
Rate Output Filter	**1**	**sec**
Rate Output Fast Track Band	**100**	**%**
Deadband Filter Type	**% of Setpoint**	
Deadband Filter Threshold	**0**	**%**
PID Input Filter	**3**	**sec**
PID Input Fast Track Band	**100**	**%**
PID Output Filter	**5**	**sec**
PID Output Fast Track Band	**1**	**%**
Setpoint Filter		
Setpoint Fast Track Band		**%**
Setpoint Lock Threshold	**1**	**%**
Mass Rate Averaging	**5**	**sec**

9. Digital Inputs Setup

Digital Input 1	**Start Feeder**
Digital Input 2	**Not Used**
Digital Input 3	**Not Used**
Digital Input 4	**Not Used**
Digital Input 5	**Not Used**
Digital Input 6	**Not Used**

10. Digital Outputs Setup

Digital Output 1	**High Speed Totaliser**
Digital Output 2	**Low Speed Totaliser**
Digital Output 3	**Feeder Start**
Digital Output 4	**Refill Hopper**
Digital Output 5	**Weigher Healthy**
Digital Output 6	**Auto/Man**

CALIBRATION MENU

Current Zero Value	**11.020**	**mV**
Current Hopper Weight	**0.000**	**kg**
Calibration Weight	**20.164**	**kg**
Span Constant	**1.892**	

Load Cell Configuration

X	**1 Load Cell**
	2 Load Cell
	3 Load Cell