Weighbatch

MultiVac
Loading System

Operating Manual

August 2007

Operating Manual
MultiVac

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Introduction

This manual describes the installation and operation of the Weighbatch MultiVac Loading System. While we have designed the MultiVac to make it easy to use we encourage you to read this manual to fully understand how it operates and to benefit from the experience of ourselves and other users.

This manual contains information of use to everybody who uses the MultiVac but is written particularly for the person who installs it, sets it up and probably teaches others how it is to be used.

Not everyone likes reading manuals. If you are the sort of person who likes to try first and ask questions later please read the short section **"At the very least, Read This!"**.

The instructions in this manual are designed for the MultiVac as a stand alone unit. If you have other Weighbatch products using your MultiVac, such as the Weighbatch MiniBlend, the manuals accompanying these products should be read in conjunction with this manual.

How this manual is organised

The manual is grouped into four main areas. The first group (Read This, Principle of Operation and Safety) is a general introduction to the MultiVac and how it works.

The next group (Specification, Installation and Setup) describes how the MultiVac is installed and made ready to operate.

The next group (Operation and Maintenance) describe the day-to-day operation of the MultiVac and any regular maintenance requirements.

The final group (Troubleshooting, Warranty, Circuit Boards and the accompanying Electrical Layout) we hope you don't need to refer to very often. It covers what to look for when things go wrong and how to get things fixed.

If it doesn't work !

If you experience any problems with your unit, please refer to the **Operating** and then **Trouble Shooting** sections of this manual. We have attempted to cover the most likely problems. This will help you gain a better understanding of the MultiVac and may result in a quicker solution than going straight to your supplier.

At the very least, Read This !

The MultiVac is a fairly simple product and you probably can install and run it with your eyes closed but there are a few things we would like to draw your attention to.

- The Vacuum Pump will need to be connected to the three phase supply through an isolating switch. The supply needs to provide phase, neutral and earth. Manually actuate the contactor to check pump rotation. Correct rotation is shown by an arrow on the pump.

- Connect the Vacuum Pump Filter inlet to each of the Loader vacuum valves. This may require some form of manifold to be fabricated. The Vacuum Pump Filter inlet is a 50mm hose tail. The Loader vacuum valve inlets are typically 38mm hose tails.

- No compressed air supply is required unless you are using self cleaning blowback filters of some kind. For the Loader internal filters the air supply must be regulated to less than 8 Bar.

- If you have ordered a Portable Vacuum Pump unit (LS-VAC-VP) then you just need to connect the Loader to the Vacuum Pump using the supplied cable. Otherwise you will need to wire the loader cables into the Pump Interface box. Refer to the **Installation** section.

- Turn on the power to the Vacuum Pump. Turn on the low voltage power supply by the switch on the right hand side of the Pump Interface. For the Portable Pump, turn on the power switches for the connected loaders.

- On the loaders, press the **Run** button to start loading and the **Stop** button to finish loading. For the Portable Pump, the loaders can be powered off and on with the individual loader switches on the pump unit.

- The alarm light will flash if the Loader does not fill with material to the full sensor within the programmed fill time. This defaults to 30 seconds. It can be changed. Refer to the **Setup** section.

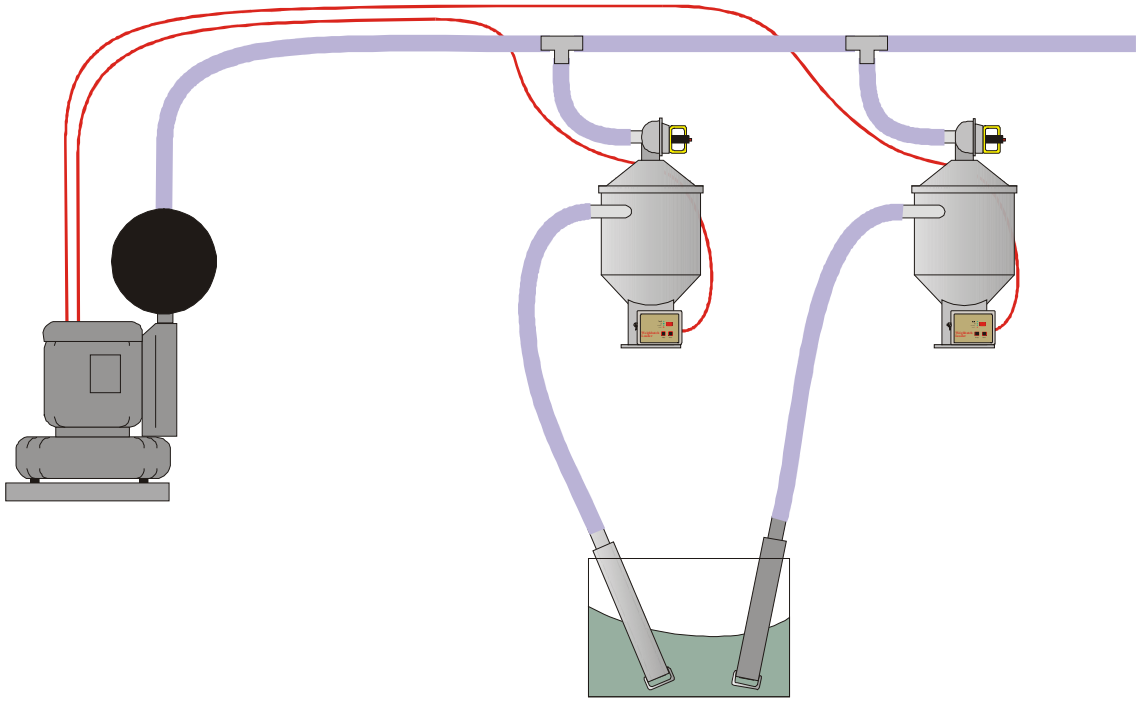
Principle of Operation

MultiVac is the generic name for a system with multiple vacuum loaders sharing a single vacuum pump. In the hierarchy of Weighbatch Loading Systems it falls between the simple LS-SGL standalone loaders with single phase motors and the fully featured LS-CTL centrally controlled system.

In a MultiVac system each Loader has its own controller which can activate the Vacuum Pump. However each Loader can also detect if the Vacuum Pump is in use by another Loader and will wait until the pump is free before attempting to use it. Each Loader has an alarm output and these outputs are connected to drive a single central alarm.

In order to share the pump, all Loaders have a vacuum valve mounted on the Loader lid. All of these valves are connected to a common vacuum line. The active loader will open its vacuum valve in order to suck material.

The following illustration shows how each of the MultiVac components are connected.

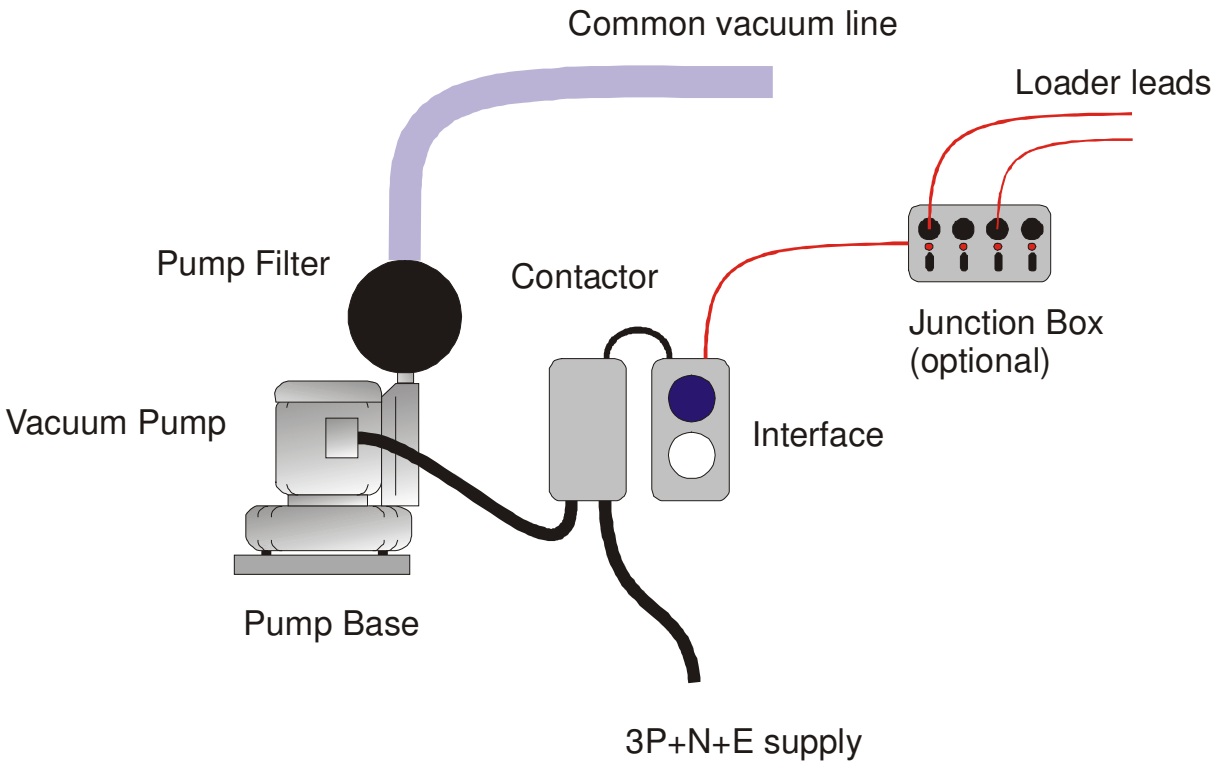


A common vacuum line runs from the Vacuum Pump Filter past each Loader. A “T” junction (or similar) connects each Loader’s vacuum valve to this common line using flexible hose. The other hose feeds material from a storage bin to the Loader. A filter just upstream of the Vacuum Pump prevents material and dust from passing through the Pump.

A power and signal cable connects the Vacuum Pump to each of the Loaders.

Vacuum Pump

There is considerable flexibility in the type and arrangement of the Vacuum Pump(s) and their control wiring, however all have a number of things in common as illustrated below:



Vacuum Pump

All vacuum pumps are three phase units. Two types are common. The Side Channel pumps are simpler and lighter. They typically have high air volume at low maximum vacuum. These are the pumps normally used in MultiVac systems. Rotary Claw pumps are more complex and heavier and typically have smaller air volume but much higher maximum vacuum. They would typically be used for long material lines.

All Vacuum Pumps are supplied on a base frame which can be fixed in position.

Pump Filter

The Pump Filter is supplied with the vacuum pump. It is a paper cartridge type filter with a replaceable paper element. It is essential that this filter is kept clean and not allowed to clog. Clogging of the filter will reduce the performance of the Loaders but more importantly may lead to the filter splitting and allowing material to pass into the Vacuum Pump.

Material passing through the Vacuum Pump can destroy it. It is a basic operation requirement that the filter be maintained !

Contactor and Interface

The contactor is a standard 3 phase DOL starter with electronic overload. It has a blue Reset button on the front cover which can be used to reset the overload if it trips. The contactor is operated by a 24V signal from the Interface box.

The Interface box provides the 24V power supply to the Loaders and provides wiring terminals to connect the Loader cables. The system alarm (strobe light and siren) is mounted on the lid of the Interface. This alarm can be moved to a remote location if you wish.

Junction Box

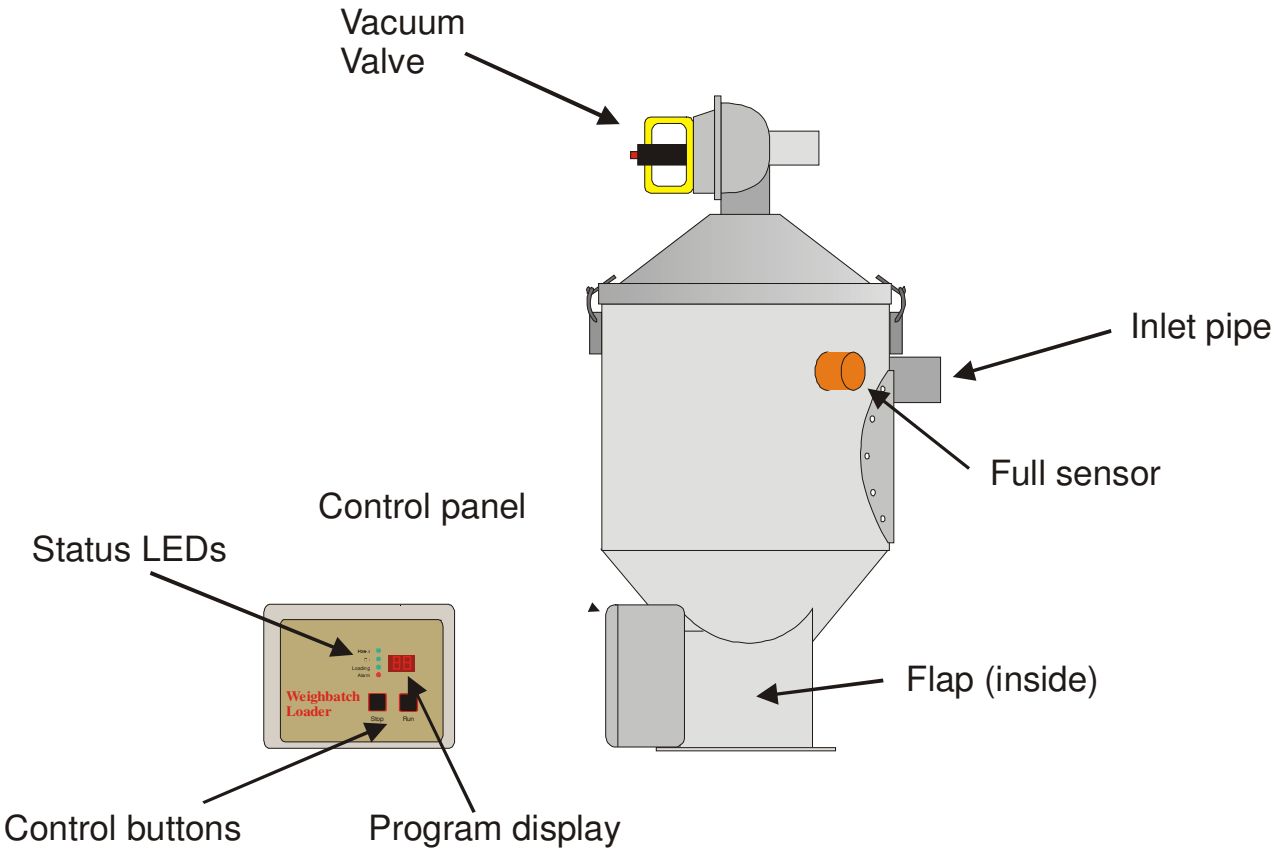
A switched junction box can be used to simplify the wiring of a number of MultiVac Loaders. A single cable runs from the Interface to the Junction. The Junction Box has plugable connections for 4 loaders plus separate alarm indicators an power switches for each Loader.

Use of the Junction Box is optional. If not used then the individual Loader cables run back to the Interface Box where they are permanently wired.

Portable Vacuum Pump Unit

While all of the components of the Vacuum Pump are available separately the LS-VAC-VP Portable Vacuum Pump units combine a Side Channel pump, Filter, Contactor, Interface and Junction Box into one package. This can be fitted with wheels and rubber feet to allow it to be moved around or it can be permanently fastened in one position.

Loader



When the Vacuum Valve is turned on, air is draw through the Loader. The Loader sucks material into the body of the Loader.

The cyclone effect and mesh filter within the Loader allows the air to pass through the Loader and leaves the material behind.

When the material reaches the Full Sensor the Loader is full of material. The Loader stops sucking and allows the material to fall out through the flap at the bottom of the Loader.

As the material from the body of the Loader drains through the bottom flap it forces the flap open. While the area below the Loader remains full the flap is held open by the material. This flap has a proximity switch fitted to it, which indicates the flap is open and the area below the Loader is full.

The bottom flap is lightly weighted so that when the material falls away from the Loader the flap will close indicating that the Loader is no longer full. While the loader is sucking material this flap is held shut by the vacuum within the Loader.

Full Sensor

A capacitive proximity sensor is used to detect when the loader has filled with material. Use of this sensor allows for more efficient use of the Vacuum Pump since the Loader can stop loading when full rather than loading for a set time. The sensor also allows the generation of “Not Filling” alarms.

Control Buttons

Two buttons are used to control the Loader. One button turns the Loader On, one turns it Off. These buttons are also used in programming the Loader.

Status LEDs

Four Status LEDs show the current status of the Loader. The top green LED indicates power is connected. The second green LED indicates whether the Loader is On. The third green LED indicates if the flap is closed, ie. if the Loader is empty. This LED will flash on and off when the Loader is loading. The bottom red LED indicates an alarm condition for the Loader.

Program Display

The Loader can be programmed with various options such as “Maximum Fill Time”. The two character display is used during programming. A list of these options is given in the **Setup** section.

Safety

The following is a list of safety points that should be adhered to at all times:

Follow the normal safety provisions for working with compressed air when using MultiVac products which use it.

Treat your MultiVac with the respect you give any other electrical machinery in your plant.

Ensure all material is free from foreign objects.

Do not modify your MultiVac without consulting Weighbatch.

Only use Weighbatch supplied spares or recommended parts if you are replacing any parts.

Specification

Vacuum pump

Parameter	Value	Condition
Power Supply (3P+N+E)	400VAC	
	3 kW	RL-140
	4.5 kW	RL-250
	1.9 kW	SC-200
	2.6 kW	SC-300
	5.5 kW	SC-500
DC output	24V	
	1500 mA	Max
Alarm siren	110 dB	Standard
	90 dB	Optional

Conveying Rate

Conveying rate through 10m flexible hose at 8:1 mass/air ratio with clean filters.
Actual loading rate will be reduced for a single loader due to the emptying time.

Parameter	Value	Pump
Conveying rate (kg/hr)	900	RL-140
	1300	RL-250
	800	SC-200
	1400	SC-300
	1700	SC-500

Loader

Parameter	Value	Condition
Power supply	24 VDC	
	500 mA	
Compressed air (filter)	8 Bar	Max
	3 Bar	Min
Material volume	3 litre	LS-150
	6 litre	LS-200
	12 litre	LS-250
	25 litre	LS-320
	100 litre	LS-500

Installation

Portable Vacuum Pump

If using the Portable Pump as a moveable unit then screw the supplied rubber feet into the underside of the base frame and attach the wheels to the outside of the frame uprights.

Fixed Vacuum Pump

Position the Vacuum Pump and fasten in position through the holes in the base frame. Attach the Pump Filter to the Pump. Use the supplied elbow to ensure that the filter is mounted horizontally. If mounted vertically dust can fall into the Vacuum Pump during filter servicing. Ensure the pump and filter are positioned to allow easy access to the filter for servicing as this must be done regularly.

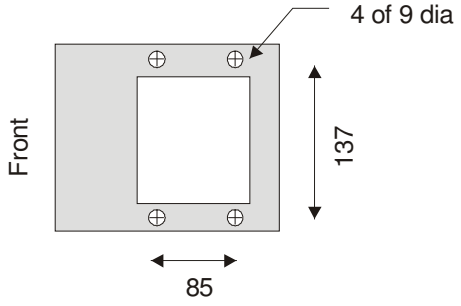
Pump Wiring

Connect the power cable from the pump Contactor to the three phase supply. This supply must include Neutral and Earth. The supply should be connected through an isolating switch and optionally through a plug.

Manually operate the contactor to check rotation of the Vacuum Pump motor. The correct rotation is shown by an arrow on the body of the pump. Check for vacuum on the filter inlet.

Loaders

Bolt the loaders onto their respective hoppers. Ensure that there is sufficient clearance for the flaps to open fully without binding. The flange detail for the loader (except LS-500) is shown below.



FLANGE DETAIL:
200 x 160 external,
110mm square opening,
4 of 9 dia holes at 137 * 85

The Loader should be bolted to the hopper lid using M6 bolts with “nyloc” or other vibration proof fastenings. If you are mounting the Loader on a Weighbatch hopper the hopper lid will already have threaded mounting holes installed.

Loader Wiring

Connect each loader to the Vacuum Pump Interface box. If using the Portable Vacuum Pump then this is done by plugging one end of the supplied cable into the loader and the other end into one of the sockets on the pump unit.

For a fixed pump installation the loaders can be either connected directly to the Pump Interface or you can use a plugable Junction Box with the Junction Box connected to the Interface. Or you can use a combination of both. However the arrangement the Loaders and Junction Boxes are all connected to the following terminals in the Interface Box:

No.	Cable Core	Function
Earth	Shield	Shield
1	Green	0V
2	Yellow	Vacuum pump run output
3	Red	Alarm output
4	Blue	+24V supply

Cable shields should only be connected at one end and this is typically at the pump end. Our experience has been that leaving the shields unconnected causes fewer problems than connecting then incorrectly or to a poor Earth.

If connecting the Loaders directly to the Interface you may need to cut the plug off one end of the Loader Cable unless it has been supplied without this plug.

Vacuum Piping

Connect the Loader vacuum valves to the Vacuum Pump Filter inlet. Most Loaders use 38mm hose for their vacuum connection (the LS-500 uses 50mm). The standard filter inlet is 50mm. A single Loader system would need a simple reducer. More typical multi Loader installations would use some form of vacuum main with takeoffs and manifolds where required.

Typically, in a fixed installation, the main vacuum line is run using 50mm rigid pipe. PVC pressure pipe is suitable for this and is cost effective and easy to install.

Material Piping

Material conveying lines can be run in flexible or rigid pipe. Typically when using rigid piping there will still be flexible sections at the Loader and pickup ends. The size of material line can be critical in the performance of the loading system and may have already been recommended by Weighbatch or your supplier.

It is a common misconception that material is conveyed by vacuum. It is in fact conveyed by the movement of air. The material line size must be small to generate high enough air velocity to keep the material moving but not so small as to cause too high a pressure loss in the line. A balance must also be struck between high velocity to promote good transport and low velocity to avoid damaging the material.

Short material runs are less critical in their choice of material line size. For runs of less than 10m the following guidelines may be used:

Pump Capacity(m3/hr)	Material Line ID
0 - 200	38mm
300+	50mm

The material line size may also be influenced by inlet size of Loaders. The various model Loaders have the following inlet sizes. Some loaders have adaptors to provide two alternative sizes:

Loader Model	Inlet sizes
LS-150	32mm
LS-200	38mm
LS-250	38 and 50mm
LS-320	38 and 50mm
LS-500	63 and 75mm

Loader Air Supply

Normally the Loaders do not require a compressed air supply as the vacuum valves are vacuum operated. However if the Loader is fitted with an internal filter with self cleaning blowback it will require an air supply.

The air supply to the Loader must be dried and regulated to a maximum of 8 Bar. The air supply is connected to the blowback valve on the Loader using a 6mm “push-on” type fitting.

Setup

The MultiVac system is very simple and has only a few parameters which can be changed. Each Loader has its own controller and they share access to the vacuum pump on a simple first-come-first served basis.

Turn on Power

Having installed the Vacuum Pump and Loaders (at least electrically) apply power on the system. Turn on the low voltage power to the loaders using the switch on the right hand side of the Interface Box (normally the one with the alarm light mounted on the top).

If using a Portable Pump, or if otherwise using a Junction Box, turn on power to each loader using the rocker switches on the Junction Box.

The green Power light on the Loader should be on at this point.

Entering Setup

On the Loader, press the **Stop** button and hold. After a couple of seconds the two character display on the control panel will light up and show:

Continue to press the **Stop** button for a further 5 seconds. The control panel display will show something like:

The character on the left indicates the parameter being programmed. These are:

- the maximum fill time,

- the auxiliary input mode,

- the vacuum pump startup delay time,

This character is changed by pressing the **Stop** button. After 3 presses the display will go back to blank and the programmed values will be saved.

The character on the right is the parameter value. These are described below. This value is changed by pressing the **Run** button.

Maximum Fill Time

This parameter is the maximum time allowed for the Loader to fill with material before the alarm output is turned on. The time is given by the displayed value multiplied by 10 seconds. The default value is 30 seconds.

Auxiliary Input Mode

A0 The Loader control board has an auxiliary input which can be used to override the normal running of the Loader. For example this could be used with a low level sensor in the material bin so that the Loader would not attempt to suck if the bin was empty. The values are:

0 = Auxiliary input not used (default)
1 = Loader sucks only when auxiliary input is ON
2 = Loader sucks only when auxiliary input is OFF

Pump Startup Delay Time

d2 This parameter controls the delay time (in seconds) between the output to start the vacuum pump and the opening of the vacuum valve. If the Loader is connected to a permanent vacuum source then it can be set to zero.

Operation

The MultiVac Loaders are pre-programmed for typical use and can be used immediately without further programming. To change your Loader set-up refer to the **Setup** section. It is important to document any changes done to this standard setup.

Turn on Power

Turn on the three phase power to the Vacuum Pump. Turn on the low voltage power to the loaders using the switch on the right hand side of the Interface Box (normally the one with the alarm light mounted on the top).

If using a Portable Pump, or if otherwise using a Junction Box, turn on power to each loader using the rocker switches on the Junction Box.

The Power indicator light on the Loader front panel should now be on.

Starting the Loader

Press the **Run** button to start the Loader. The Loader will now start sucking and will continue to load material as required.

Stopping the Loader

Press the **Stop** button to stop the Loader.

Junction Box Switches

If using a Portable Pump or other Junction Box then each Loader can be turned off and on using this switch as well as from the Loader. Actually this switch just turns the power to the Loader off/on but because the Loader remembers whether it was off or on it will return to the same state when the power is switched on. This means that if the Loader was turned off when it is switched off it will still be turned off when the power is switched on again and you will need to use the **Run** button on the Loader to turn it on again.

Power Failure

The same mechanism that the Junction Box switches use also applies if there is a power failure. When power is restored all Loaders which were turned On at the time will turn themselves On.

Alarm

The Loader has a programmed Maximum Fill time. If the Loader sucks for longer than this time without filling with material the alarm light will be turned on. The alarm light will continue to flash until the Loader is stopped or until it manages to complete a fill within the maximum time.

If using a portable Pump or Junction Box an alarm on a Loader will cause the corresponding alarm light on the Junction Box to be illuminated.

Any alarm on any Loader will cause the central Alarm Light to flash and the siren to sound.

To stop an alarm just turn the faulty Loader off (**Stop**) and then on again (**Run**).

Maintenance

Daily:

- Check and clean any Loader internal filters (if fitted).

Weekly:

- Check and clean Vacuum Pump Filter. Check for holes or splits in filter material. Replace if required.

Monthly:

- (Rotary Claw Vacuum Pump) Check gearbox oil level (refer pump documentation)

Other

- (Rotary Claw Vacuum Pump) 20000 hour gearbox oil change (refer pump documentation)

Troubleshooting

There are very few things that can go wrong with the MultiVac Pump or Loader. This section describes typical problems and their solution.

No Power

The green Power On LED on the control panel does not light and the Loader does not work at all.

Check power supply. Check three phase power is turned on. Check low voltage power is turned on. Check Junction Box switch is on (if used). Check AC input voltage to power supply (located in the Interface Box). Check 24V output from power supply.

No Vacuum

The Loader runs as expected but the Vacuum Pump does not start.

Check for overload tripped on the Vacuum Pump. Press the blue **Reset** button on the pump contactor cover. Check the three phase supply circuit breaker.

Very Slow Filling

The Loader runs as expected but sucks poorly causing Not Filling alarms.

Typically caused by a vacuum leak in another loader or elsewhere in the vacuum piping. Check the flap is closing fully. Check the Vacuum Pump Filter is clean. Check any Loader internal filter. Check for dust accumulation inside the vacuum valve.

This can also be caused by a badly adjusted probe which attempts to suck to much material and not enough air. When loading correctly there should be a continuous flow of material without plugging and surging.

Not Stopping at Full Sensor

Loader is loading as expected but does not stop when material reaches the Full sensor.

Check that the sensor is operating correctly. There is a light on the sensor which indicates the presence of material. It should be off at the start of a cycle and should turn on when material reaches the sensor. Adjust the sensitivity as required with the small screw in the rear of the sensor. If the sensor cannot be adjusted it should be replaced. Check the sensor input LED on the control board.

Not Starting with Flap Closed

Loader is turned On but does not start when flap is closed.

Check that the flap sensor is operating correctly. The light on the sensor should come on when the flap is closed and turn off when it opens. If it does not come on check with a screw driver and adjust the sensor closer to the flap weight if required. Check the sensor input LED on the control board.

Stopping after 5 Seconds

The Loader runs as expected but stops loading after 5 seconds and before the material reaches the full sensor.

Check the full sensor is operating correctly. Refer **Not Stopping at Full Sensor**.

Warranty

Service

Weighbatch machines carry a limited parts warranty as stipulated in Weighbatch's Terms and Conditions of Sale.

If your service request is not covered by this warranty you will be charged for parts, time and disbursements accordingly.

This manual is set out to cover most situations but should you require further assistance please call your supplier. Quote the model number of your unit when requesting service. In the case of a fault with the unit, please describe clearly the symptoms of the problem.

Warranty Procedure:

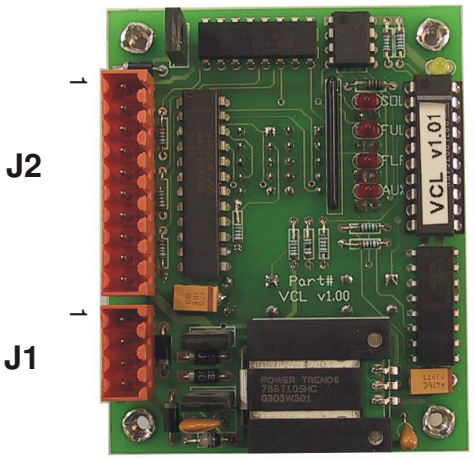
If you believe the fault is a warranty problem you need to advise Weighbatch as soon as possible and supply the following details of the fault:

- Company Name
- Contact Name
- Date Fault Occurred
- Model Number
- Your machine name/number
- Description of Fault (Please describe accurately nature of fault)
- Description of circumstances when fault occurred (throughput of your machine etc)

Circuit Boards and Modules

Loader Control Board

The Loader is controlled by a single circuit board (VCL) pictured below.



All connections to the board are through the two connectors.

Connector J1	
Pin	Use
1	Power 0V
2	Pump run output (24V, 500mA max)
3	Alarm output (24V, 500mA max)
4	Power +24V

Connector J2	
Pin	Use
1	Vacuum solenoid 0V
2	Vacuum solenoid output (24V, 500mA max)
3	Auxiliary input (NPN)
4	Auxiliary +24V
5	Full sensor 0V
6	Full sensor input (NPN, N/C)
7	Full sensor +24V
8	Flap sensor 0V
9	Flap sensor input (NPN, N/O)
10	Flap sensor +24V

Recommended Spares

Part No	Description
312110	Valve stem 49 series
321121	Vacuum valve 40mm diaphragm
331222	Power supply, 24V, 30W, micro
331342	VCL – Vacuum Loader Board
335310	Prox. Sensor, inductive, 12mm
335410	Prox. Sensor, capacitive, 30mm
336330	Izumi 1 pole relay, 24VDC