

RM01 Weight Indicator Light System Manual and Specifications

1 OVERVIEW

Loading trucks to a nominal weight limit is at current an imprecise process that largely relies on the accuracy of the earthmoving equipment operator filling the tray. Under-loading is generally not an issue (other than lowered efficiency and production) – it is overloading that is a very common occurrence and can lead to fines from the transport authority or the truck being forced to return to its place of departure to partially unload. Both of these events cause a loss of time and money.

The load weight of a truck can be determined to a suitable degree of accuracy by measuring the pressure of the airbag suspension system. Although such systems exist, they generally have the weight readout located in the cabin of the truck or on a wireless pendant that is prone to being left behind (as it would have to be in possession of the earthmover operator during the loading process).

Ross Mason has patented a solution which measures the airbag suspension pressure and uses this to light a series of lights in a visible position on the truck or trailer. As the weight increases (and therefore pressure) the lights will light in succession. Different colours and flashing rates indicate when the weight is below nominal, nominal, or overloaded.

Multiple sets of lights can be connected to the one controller unit and be mounted i.e. on opposite sides of the truck for maximum visibility.

2 OVERALL SOLUTION

The Weight Indicator Light solution has been developed into the following product design. There are two basic model configurations, master and slave, which are further broken into variants depending on the installation requirements. The master unit is the “brains” behind the system and has the airbag suspension pressure hoses connected to it in order to monitor the pressure. Up to five slave devices can be daisy chained from a master unit and all will synchronously copy the display patterns of the master unit.

2.1 Design Common Features

The features common to all variants are intended for maximum reliability in the harsh (both physically and electrically) automotive environment.

- Robust, black powder coated aluminium enclosure
- UV stabilised, clear polycarbonate front lens
- IP67 watertight
- Yellow, green and red indicator light bars with maximum horizontal viewing angle (120°)
- Waterproof connection cables in predetermined sizes
- Proprietary, robust communication between master and slave devices for maximum reliability
- Full electrical filtering, reverse polarity protection and spike suppression on the power supply

2.2 Master Unit Features

Features unique to the master unit include:

- Three IP67 waterproof switches for power and setpoint adjustment (up and down)
- ¼" BSP female connection for air pressure hose
- Optional second ¼" BSP connection for second air hose in installations that require averaging the weight from two airbag systems

2.3 Slave Unit Features

The slave units do not have buttons or pressure sensor connections and instead simply duplicate the light patterns sent to them by the master controller.

The following diagram depicts a set of master and slave units.

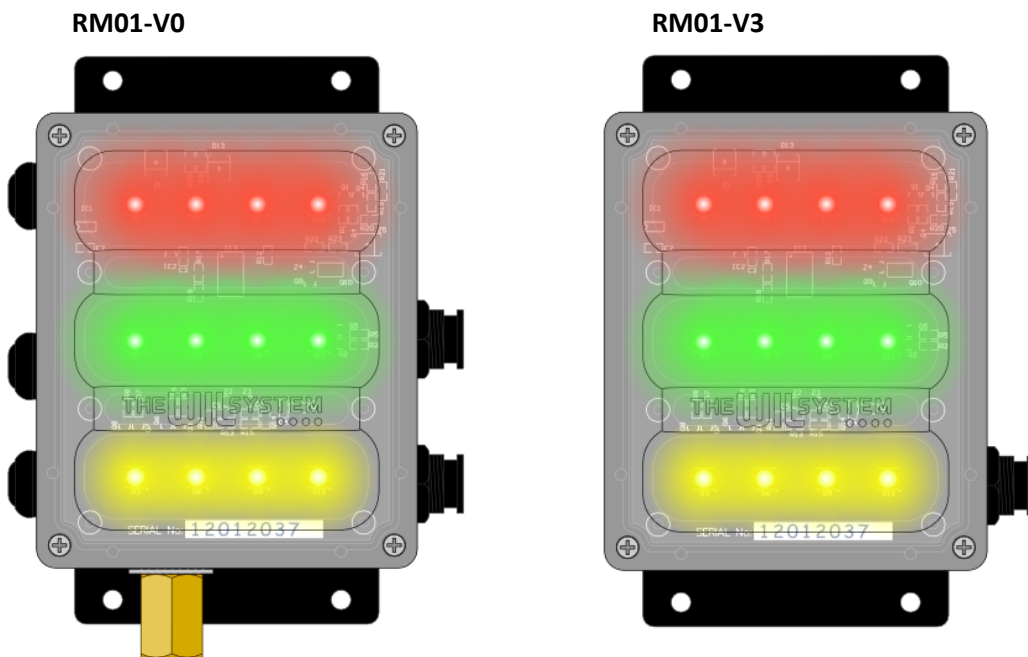


Figure 1: Depiction of master and slave units

3 HARDWARE

As mentioned above, the hardware will be produced in several variants, depending on the installation and configuration. The following table lists each of these variants:

Order Code	Description	Number of sensors	Number of comms ports	Price Per Unit	GST	Total
RM01-V0	Standard master	1	1	\$631.57	\$63.16	\$694.73
RM01-V1	Dual sensor master with no comms	2	0	\$767.79	\$76.78	\$844.57
RM01-V2	Single sensor master with no comms	1	0	\$549.72	\$54.97	\$604.69
RM01-V3	End slave (standard)	0	1	\$372.30	\$37.23	\$409.53
RM01-V4	Chain slave	0	2	\$401.29	\$40.13	\$441.42
RM01-V5	Dual Sensor master with comms	2	1	\$778.71	\$77.87	\$856.58

Recommended combination of units for a semi-trailer:

- Dual height control valve prime mover = RM01-V1
- Single height control valve prime mover = RM01-V2
- Trailer = RM01-V0 and RM01-V3

Example -Therefore the cost to purchase The WIL System for a single height control valve truck, and trailer is \$1,553.59 (Ex GST)

3.1 Layout

The layout and connections for the master and slave units is shown in the following diagrams:

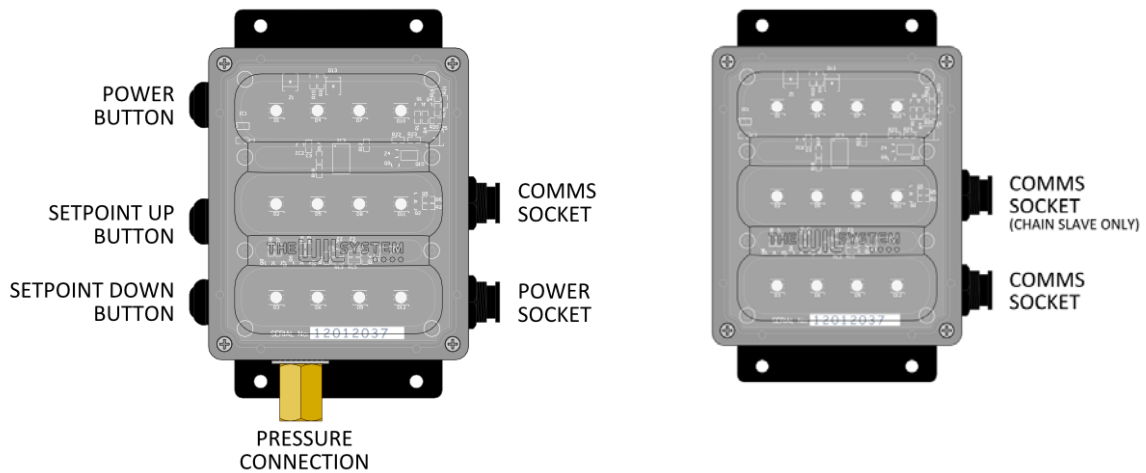


Figure 2: Master and slave layout and connections

3.2 Power Supply

The initial WILS design is intended to operate from 12VDC (10 to 18VDC operating range). At this time it is not possible to operate the system from 24VDC without a separate DC-DC converter, but in the near future a 24V suitable range of models will be produced.

The power supply connection is via a supplied 2M long dual core cable, featuring a waterproof plug on one end and bare wires on the other end. On the master requires a power connection – all slave units draw their power supply from the master via the communications cable connection.

3.3 Communications

Communications between the master and slave units is provided using pre-terminated 3-core cables 2.5M in length (other lengths may be made available at a later date if necessary). In installations with more than one slave each extra slave is daisy-chained from the one before it, as per the following diagrams. Note that the two comms port sockets on the chain slave are interchangeable.

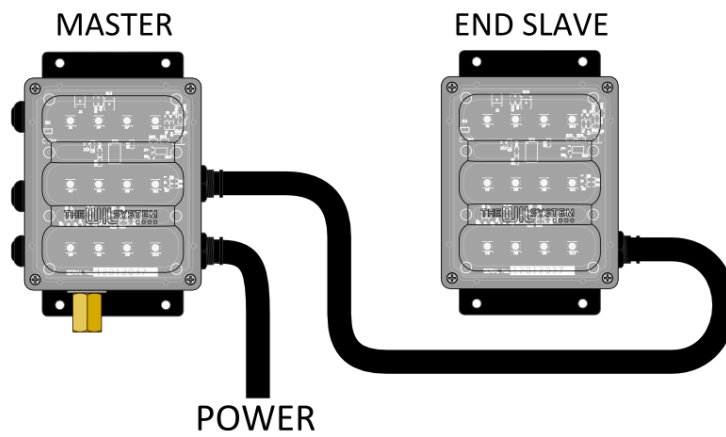


Figure 3: Connection of single slave to master

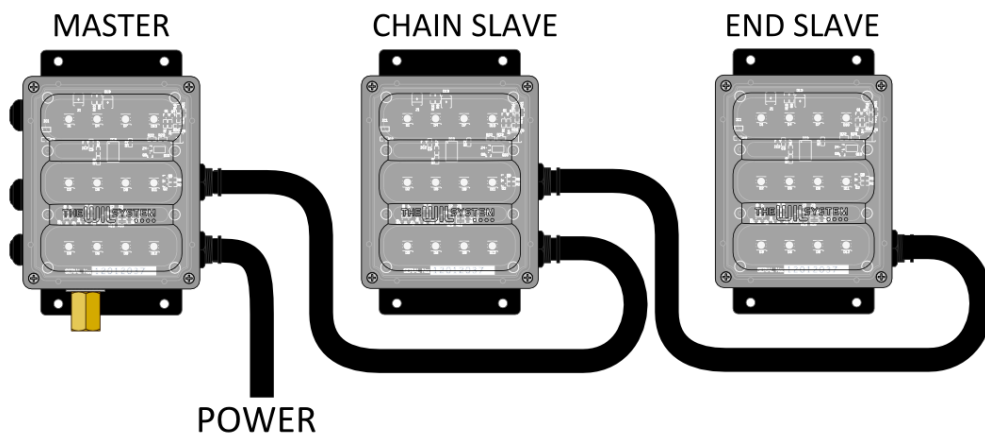


Figure 4: Connection of two slaves to master via "daisy chaining"

The actual communication uses a 12V, synchronised, pulse width modulated signal that is transmitted via the 3-wire comms cables in addition to power and ground.

3.4 Pressure connection

The pressure sensor connection is a female ¼" BSP fitting. While the pressure sensor has a measuring span of 1000kPa (1 MPa), it is rated for an overload pressure of 1500kPa and must not be exposed to a pressure above this level.

Since the BSP thread is not self sealing, a suitable thread sealant (either tape or a liquid compound) must be applied to the thread to be screwed into the fitting.

3.5 Serial number

Each device will be marked with a unique serial number used not only for tracking manufacturing date, but also software revision and batch numbers. The number will be marked on the internal PCB just below the bottom indicator light so that it is visible when looking up at it from an angle.

4 OPERATION

4.1 Base Operation

Using the pressure sensor connection the unit continually monitors the pressure in the airbag suspension system. The indicator lights will be lit according to this pressure in relation to the setpoint, as per the following table.

The default setpoint for the system is 450kPa, which is equivalent to approximately 22.5 tonnes for the prime mover or 20 tonnes for the trailer.

EXAMPLE

Pressure less than	Yellow light	Green light	Red light
Setpoint - 40kPa (Setpoint - 0.8 Ton)	Flashing	Off	Off
Setpoint - 15kPa (Setpoint - 0.3 Ton)	On steady	Off	Off
Setpoint	On steady	Flashing	Off
Setpoint + 10kPa (Setpoint + 0.2 Ton)	On steady	On steady	Off
Setpoint + 35kPa (Setpoint + 0.7 Ton)	On steady	On steady	Flashing
Maximum pressure	On steady	On steady	On steady

When a light is flashing the rate of flash will increase with pressure (weight).

4.2 Setpoint adjustment

The setpoint can be adjusted up or down in 5kPa increments by briefly pressing the setpoint up or down buttons on the lower left side of the master unit. This adjustment is automatically applied to all slaves connected to that master. The three lights will flash in sequence up or down to indicate that the setpoint has been adjusted.

4.3 Setpoint calibrate

By pressing and holding both setpoint buttons simultaneously for 3 seconds the setpoint will calibrate itself to the current pressure (weight). The yellow and red indicators will light, then the green indicator to signal that this operation has been performed.

4.4 Setpoint reset

Pressing and holding both setpoint buttons simultaneously will force the unit back to the default setpoint (450kPa). The green indicator will light, followed by the red and yellow indicators to signal that the operation has been performed.

4.5 Faulty sensor

If the master detects a fault with the pressure sensor it will cease normal operation and continually flash all three indicator lights once every second.

5 SPECIFICATION OVERVIEW

Size:	TBD
Weight:	TBD
Operating temperature range:	-10 to +50°C
IP Rating (theoretical; untested):	IP67
Power consumption:	2W max per master/slave
Supply voltage:	12VDC nominal (10VDC to 18VDC)
Internal operating voltage:	12VDC, 5VDC
Communications link	12V synchronised, pulse width modulation