

## LUBRICURVE ELECTRO 10, 20, 30 Installation & Maintenance Manual

### TRACKSIDE ELECTRIC RAIL & WHEEL LUBRICATOR SYSTEM

#### Model Variants:

- Solar (Mast)
- Solar & Wind
- Battery
- Solar (Cabinet)
- Mains
- Control box MK3  
90Kg, 200Kg, 400kg Capacity



## Warning!

This lubricator uses a 12V-100Ah battery which contains a dilute sulfuric acid solution known as electrolyte. Care must be taken to avoid the electrolyte coming in contact with the skin or clothing as the electrolyte may cause severe burns.

If the electrolyte contacts the skin, wash with large quantities of clean water and seek medical advice.

### **DO NOT expose the battery to naked flames or cigarettes**

During the charging process hydrogen gasses are vented from the battery and these gasses when mixed with the air may explode if ignited.

Do not short circuit the battery terminals, as this may cause a spark or explosion.

## .Contents

1	General	5
2	Product Transport / Storage	5
3	Main Component Definitions	6
4	Preparation of Main Components for Installation	7
5	Equipment Handling	8
6	Typical Install Process	8
7	Site Preparation	9
8	Installation Trackside Items	12
8.1	Fitting the Trackside Cabinet to Mounting Base	12
8.2	Cabinet Door	13
8.3	Earth Bond	13
8.4	Lowering the Integral Lower Mast Unit	14
8.5	Option – Mast Removal / Alternative Lower Mast Orientation	14
8.6	Fitting the Upper Mast (wind turbine and / or solar power option)	15
8.7	Fitting the Solar Panel	15
8.8	Fitting the Wind Turbine	16
8.9	Raising the Integral Mast	17
8.10	Optional Mast Extension	18
8.11	Fitting of Cabinet Mounted Solar Panels	19
8.12	Battery Charger Electrical Connection	19
8.13	Solar & Wind Systems	20
8.14	Solar Systems - Mast Mounted	21
8.15	Solar Systems – Cabinet Mounted Panels	21
8.16	Mains Powered Systems	22
8.17	Battery Powered Systems	24
8.18	Replacing the Pump Sensor	24
9	System Wiring Diagram	25
10	Installation of Track Items	26
10.1	Wheel sensor	26
10.2	Wheel sensor – Single Direction Operation	27
10.3	Blade System	29
10.4	Installing the Blade Rail Clamps (Standard Style)	29
10.5	Installing the Blades (Standard Style)	29
10.6	EasiBlade Installation	30
10.7	Outing of delivery hoses, Cabinet to blade	31
10.8	Fitting the Main Delivery Hoses	32
10.9	Fill the Hoses and Blade's	33
11	Commissioning / Setting	34
11.1	Filling the Reservoir (Lid Lift Version)	34
11.2	Wheel sensor Heights and Operation	35
11.3	Pump Setting	35
11.4	Backlight & voltage display feature panel	<b>Error! Bookmark not defined.</b>
11.5	Non backlight panel	<b>Error! Bookmark not defined.</b>
11.6	Pump Settings / Operation	40
12	Routine Maintenance	41
12.1	Control Panel	41
12.2	Pump Setting	41

12.3	Measuring the Reservoir	42
12.4	Cabinet Maintenance	42
12.5	Battery Maintenance	42
12.6	Solar Panel Maintenance	43
12.7	Cleaning the Lubricator and Surrounding Site	43
12.8	Checking for Leaks	43
12.9	Measuring / Testing the Wheel sensor	44
12.10	Adjusting / Replacing Pump Sensor	44
12.11	Checking for Airlocks	45
12.12	Inspection of the Blade's	45
12.13	Filling the Reservoir	46
12.14	Maintenance Frequency	46
12.15	Periodic Replacement of Components	46
12.16	Maintenance Log Sheet Example	47
13	Parts List	48
14	Basic Installation Tool Kit	48

## 1 General

- Health & Safety legislation requires that rail lubricators are fitted by trained personnel only; warranty will also be affected if un-trained teams work on the LubriCurve products. Whitmore Rail provides suitable training courses.

This Manual should be used in support of training courses.

- This Instruction Manual is intended to be generic and concentrates on the full range of LubriCurve Electro 10/20/30 systems to suit flat bottom running rails; system install differences are highlighted as necessary.
- The lubricator uses a 12 Volt 115 Ah battery as a power source.
- Only lubricator greases approved for use by Whitmore Rail and the rail user can be used in these LubriCurve Electro systems. Use of other greases will invalidate warranty and could affect operation.

## 2 Product Transport / Storage

- Goods are packed and delivered to the requested address in a form that is suitable for the product, given good practice in the off-loading by the receiving company.
- LubriCurve systems are delivered on the basis that they will be installed within one month of receipt.
- Delivered systems are not intended for outside storage, equipment should be off loaded and stored inside a secure watertight building until required for installation.
- All items are carefully checked prior to despatch and any damage or missing parts should be advised to Whitmore Rail within five days of despatch from Whitmore Rail premises.

### **Note:**

**Keep the cabinet upright at all times from transport to install**

### 3 Main Component Definitions

<b>Pump Cabinet</b>	<p>Each trackside Cabinet contains: Reservoir, gear pump, gear pump hose, flow adjusters, control panel, battery charger, reservoir filling valve, Cabinet mounting brackets (fixed to the Cabinet).</p> <p>The grease is delivered from the reservoir via the gear pump to the bulkhead hose connectors on the external face of the Cabinet. Feed hoses then transfer grease to the Blade system.</p>
<b>Pump Reservoir</b>	This reservoir holds the rail grease. The LubriCurve Electro 10 reservoir is capable of holding 90Kg of grease, the Electro 20 – 200kg and Electro 30 – 400kg.
<b>Pump</b>	The pump unit consists of a twin chamber gear pump driven by a close-coupled 12v DC motor. The unit fits directly to the reservoir underside.
<b>Pump Control</b>	Triggered from the Wheel sensor the unit allows control of the pump and recording of key data. A number of operational settings are user adjustable to suit the site and application.
<b>Wheel Sensor</b>	The wheel sensor clamps to the running rail and provides non-contact sensing of passing wheels. Indicating lamps provide local indication of correct operation during test. Sensor is connected to control box through armoured cable.
<b>Integral Mast</b>	Generally integral with the Cabinet, the mast provides secure mounting of the solar panel or wind turbine at a high level. Various heights and options are available.
<b>Solar Panel</b>	Depending on the model a solar panel is supplied. The unit fits onto the mast and is used to provide power to the battery by utilising sun light and ambient light to generate electric power.
<b>Wind Turbine</b>	Depending on the model supplied a wind charger is supplied. The unit fits into the top of the mast and is used to provide power to the battery in conjunction with the solar panel.
<b>Delivery Hose</b>	<p>The delivery hose transfers the grease from the pump outlet to the Blade inlet.</p> <p>Lengths of hose are supplied with each lubricator, which have to be cut into suitable lengths to fit between the trackside Cabinet and Blade assemblies.</p> <p>The hose is secured using a hose clip at each end of the hose.</p>
<b>Blade (Grease Dispensing Unit - GDU)</b>	<p>Blades are provided which allows the grease to be delivered to the gauge corner and/or gauge face of the rail for the train wheels to pick up and spread along the curve. The quantity supplied is dependent on the application specified.</p> <p>Each consists of three rectangular plates, back plate, middle plate and grooved front plate (which has eight ports at the top of the grooved plate). Each Blade rail clamps are suitable for the blade type.</p>

## 4 Preparation of Main Components for Installation

<b>Application</b>	Ensure the correct pump type and system options have been selected for the application.
<b>Training</b>	Ensure the installation team has been fully trained on the product, siting and the application.
<b>Packing</b>	<p>The Cabinet is delivered pallet mounted and wrapped, the Cabinet contains the majority of loose items required for the install, and larger items are secured to a separate pallet and wrapped.</p> <p>Ensure the package has not been damaged during storage or transport to rail site, damage must be reported to the equipment supplier on initial receipt. Dispose of all waste packaging materials responsibly.</p>
<b>Cabinet</b>	<p>Visually inspect for any defects that will affect its operation.</p> <p>Ensure that all loose items are available with reference to items ordered.</p> <p>Ensure that the battery is fully charged with reference to the green indicator lamp on the charge controller or the voltmeter display.</p>
<b>Blade</b>	<p>Ensure the blades are not bent or damaged and all ports are free from blockages.</p> <p>Ensure that all bolts are present and are fitted securely.</p> <p>Ensure that the hose inlet tails, which the delivery hoses attach to, are in place and are not damaged.</p>
<b>Clamps</b>	<p>Ensure that both Sensor and Blade clamps are not damaged.</p> <p>Ensure that the threads on the clamp studs are not damaged.</p> <p>Ensure that the threads on the hook bolts are not damaged.</p>
<b>Hoses (feed and delivery)</b>	Ensure that the hoses are intact and free of holes and splits.
<b>Wheel sensor &amp; Cable</b>	Ensure that the cable and sensor are intact and free of sharp kinks and any kind of damage.
<b>Serial Numbers</b>	Lubricators are supplied with unique serial numbers; these should be recorded prior to installation and recorded on installation record sheets as required. Serial numbers are on both external and internal faces of the cabinet (door hinge side)

### **Note:**

**Keep the cabinet upright at all times from transport to install**

## 5 Equipment Handling

Generally Electro 10/20/30 items required for each site are delivered within the cabinet or attached to it. The lubrication system is heavy and care should be taken in general, ensure safe mechanical handling of the units from delivery truck off-load to site install (cabinet weight excluding grease is over 100kg). There are three appropriate methods of handling the unit:

- Fork Lift Truck.      Lift with forks fully engaged under the cabinet.
- Sling / Crane.      The unit is designed to be lifted from the mast by attaching a suitable sling around the 'H' frame. However the M12 fixings must be fitted through the mast base plate to securely clamp the mast base to the cabinet prior to lift.
- Personnel      There are four carry points on the unit to suit the Whitmore Rail carry kit (Part No. LCS105-01) and these should be used for all cabinet movements. The handle should be passed through the corner angle-fixing hole and rotated vertically through 90 degrees to secure. Four people are required, which should be trained and experienced in mechanical handling. To reduce the overall weight, the battery and other loose installation items that are shipped within the unit, should be carefully removed prior to the lift and handled separately.

### Note

- **The cabinet should be kept vertical at all times,**
- **Take care to avoid damage to the paint finish as this forms part of the corrosion resistance and general integrity of the unit.**

## 6 Typical Install Process

There are several possible sequences that can be followed to efficiently install the lubricator, this will largely depend on the personnel available, track access and general conditions – the following is recommended as a guide.

Activity	Manual Section
1. Equipment Handling	5
2. Prepare Base for Cabinet Install	7, 8.1
3. Connecting the Power Source (solar, solar & wind, mains, battery)	8.4
4. Electrical Connection	8.12, 10.1
5. Install Blades	10.3
6. Install Track Mounted Wheel Sensor	10.1
7. Hose connection and routing from Blades to Cabinet	10.8
8. System Priming	10.9
9. System Settings	11

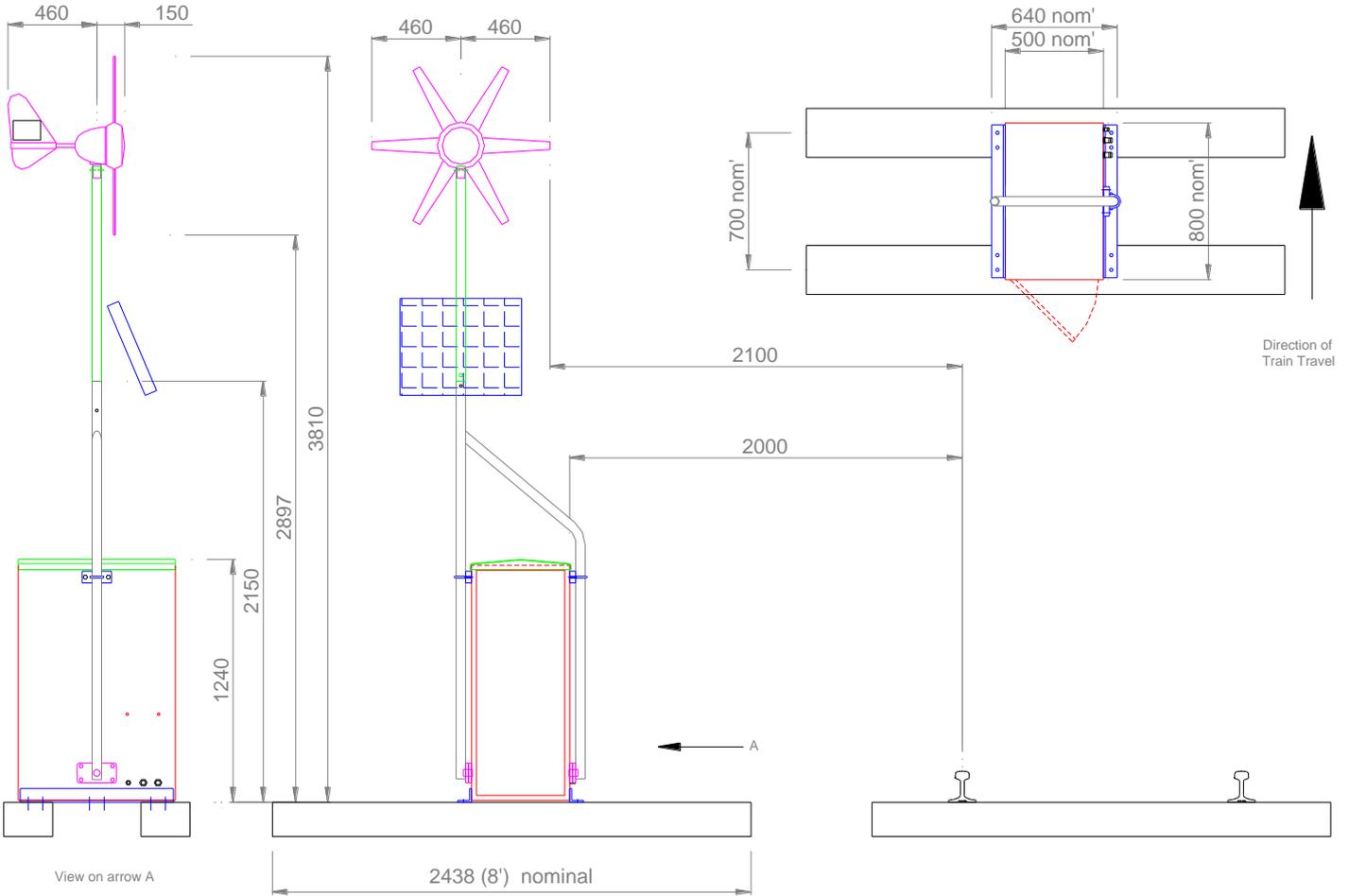
## 7 Site Preparation

To install a LubriCurve Electro 10/20/30 lubricator, a simple base is required to mount the Cabinet. The form and stability of the base is important as it resists the wind loads on the solar panel and / or wind charger. Typically the base would be formed from a pair of wood Sleepers / Ties suitably bedded into ballast or surrounding ground. Alternatively a concrete plinth can be formed but that can be a costly solution.

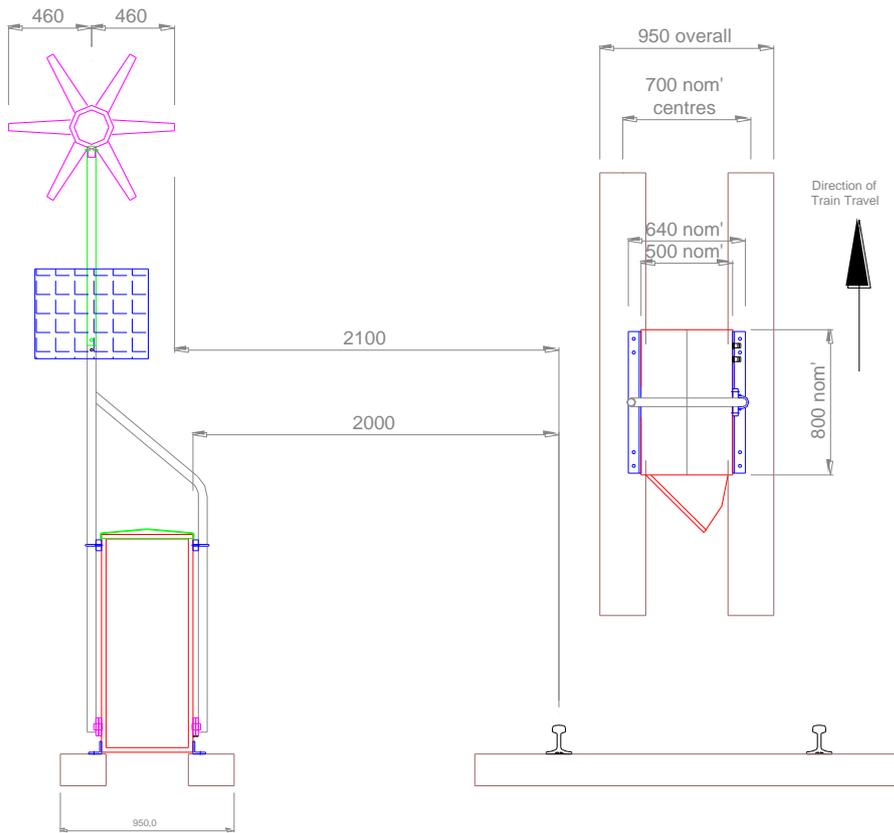
### **Systems with Masts**

- Outline and requirements are indicated in the diagram below. Recommendation is for two full length (8' 6") good quality hardwood Sleepers / Ties to be fitted at 90° to the track.
- Where there is insufficient space in the CESS for that arrangement then two alternative options are possible:
  - Two ¾ length (6') sleepers can be used in place of the 8' 6" standard, sleepers at 90° to the track. Sleepers must be ballast covered for adequate stability.
  - Two full length (8' 6") sleepers can be used. The sleepers must be parallel to the track and spaced 0.95 metres (37") apart. Sleepers must be ballast covered for adequate stability.
- For any orientation described, sleepers are to be horizontal and level relative to each other and fully bedded into ballast or secure ground.

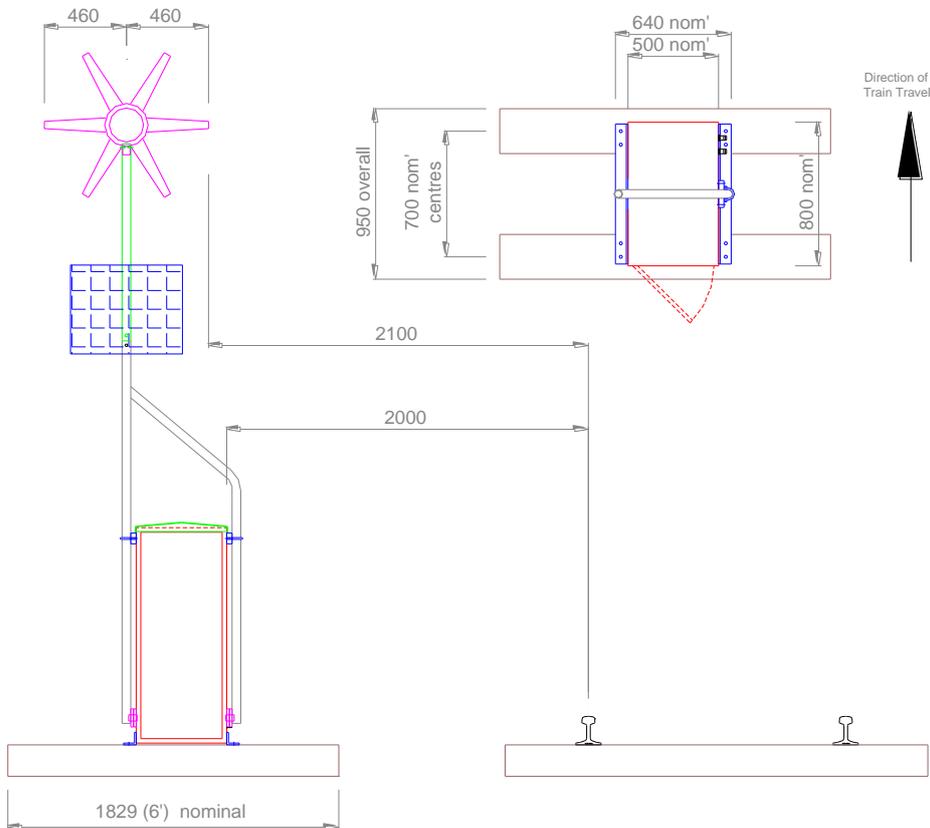
The drawings below are applicable to the Electro 10 and Electro 20 systems.



**Alternative Mounting Base**



Standard sleeper  
Dug in parallel to  
the track



Short Sleeper  
Dug in at 90° to the  
track

### Systems without Masts

- Applies to mains power units and cabinets with integral solar panels on two sides
- Wind loadings are much lower with these power configurations.
- Recommendation is for sleeper base as described above for cabinets with masts. However the use of 6' (1.8metre) wood sleepers is acceptable with the orientation either parallel or at 90° to the track.

### General

- The base and cabinet must be positioned to maintain the mandatory track and OLE clearances.
- Vegetation should be cleared around the unit where necessary to ensure a safe working environment.
- The base should be securely bedded into the ground / ballast to ensure stability, sleepers should be levelled in both planes (horizontal and vertical).
- As soon as the cabinet is manoeuvred onto the base it should be securely bolted down (see Section 8.1).
- The equipment required for the installation work includes the following:
  - All relevant P.P.E. needed to carry out the works safely.
  - Shovel or ballast fork whichever one is the most suitable.
  - Orange pipe to protect delivery hose and sensor cable across 4' and 6'.
  - Spirit level.
  - Compass.
  - Lubricator installation tool kit (see Section 14).
  - Wiring termination tools.
  - Cordless or portable drill and bits.

## 8 Installation Trackside Items

### 8.1 Fitting the Trackside Cabinet to Mounting Base

- 8.1.1 The sleeper or plinth base must have been fully installed before commencing any installation of the unit. Recommended platform / sleeper install dimensions are shown in Section 7.
- 8.1.2 The Cabinet includes two robust angle sections at the base of the unit with a pair of mounting holes at each end. Locate the unit in the required position ensuring that at least four holes (one of each hole pair) can be used.
- 8.1.3 Suitable fixings are available from Whitmore Rail to suit wood or concrete bases. Part Numbers LCS105-07 and LCS105-08 respectively.



- 8.1.4 Drill the base using the Cabinet fixing holes as guides; wood fixings require an 8mm diameter pilot hole, while concrete requires a 12mm diameter hole. Insert fixings and tighten securely. One fixing in each corner of the cabinet is required using either inner or outer holes as appropriate.



## 8.2 Cabinet Door

- 8.2.1 There are two options of door locks. The early units are supplied with one set of door locks, consisting of one security key and a hexagon tool to activate the three-point door lock. To open the door the key should be inserted and rotated clockwise (the key will now be captive in the lock). Insert the Hexagon tool, press inwards and rotate clockwise. The door can now be opened.
- 8.2.2 The later units have a single key door lock. To open the door the key is inserted into the lock, located behind the vertically sliding dirt shield. Rotate the key clockwise and pull the key and handle outwards. The handle can now be rotated clockwise to open the three point locking bars and then open the door.
- 8.2.3 The door stay at the base of the door should be located in the frame locator hole to prevent accidental door and hinge damage by over travel.
- 8.2.4 Closing is the reverse procedure.



## 8.3 Earth Bond

- 8.3.1 Subject to local regulation it may be required to bond the unit to the track. At the rear of the unit a mounting hole is available for a 16mm diameter earth stud (Whitmore Rail part No. LCS105-11).
- 8.3.2 The bond itself must be supplied and fitted directly by the Rail owner authorised personnel and not by the lubricator installer.

## 8.4 Lowering the Integral Lower Mast Unit

- 8.4.1 Solar and Solar / Wind powered models are supplied with the Lower Mast fitted vertically and held in place by two U bolts on each side of the cabinet. The mast needs to be rotated horizontally to ground level to attach the solar panel and/or wind turbine.
- 8.4.2 Remove the U bolts located toward the top of the Cabinet by removing the four M10 Nyloc nuts on the inside of the cabinet, (a 17mm AF ratchet spanner is recommended). Remove one U bolt at a time along with the spacer block, ensure that the mast does not rotate to either side; the mast will remain captive at the bottom pivot.
- 8.4.3 The mast should now be rotated to ground level. It is possible for the mast to be lowered to either side of the unit to best suit the site conditions. The door should first be closed if lowering in the door end direction.



## 8.5 Option – Mast Removal / Alternative Lower Mast Orientation

- 8.5.1 Generally the Cabinet will be installed with the Blade hose connectors towards the Track, the door hinged away from the Track and the mast upright to the rear of the unit (door hinge side). If necessary the mast can be turned to the opposite side.
- 8.5.2 Remove the mast fixing as per above procedure 8.4 and rotate the mast to ground level.
- 8.5.3 At the base of the mast pull at each side to withdraw the mast pivot point and while maintaining outward pressure at the bottom of the mast remove the mast to one end of the unit.
- 8.5.4 Ensure the paintwork is not damaged during the operation.
- 8.5.5 Rotate the mast so that the vertical side of the frame is on the door lock side of the cabinet, refit in the reverse manner.

## 8.6 Fitting the Upper Mast (wind turbine and / or solar power option)

8.6.1 With the Lower Mast rotated to ground level slide the spigot on the Lower Mast section into the Upper Mast and align the two M6 fixing holes.

8.6.2 Fit the two M6 Hexagon screws and tighten.

## 8.7 Fitting the Solar Panel

The panel is supplied boxed and should be treated with care, particularly the front face.

Adjacent photographs show the 30 Watt panel arrangement (upper photo) and 50 watt panel (middle photo).

8.7.1 With the mast at ground level:

8.7.2 Assemble the panel mounting kit as shown in the photograph using four M8 bolts, nuts and washers.

8.7.3 Slide the two M8 bolts into the upper and lower panel grooves and secure to the mounting bracket as shown.

8.7.4 The panel mounting module should be initially clamped to the upper mast section as shown in the picture using the two 48mm U Bolts around the mast tube. The height should be set so that the panel is well above head height when fitted.

8.7.5 With the panel roughly positioned on the mast it is necessary to fine tune its location and orientation to maximise the effectiveness of the unit.

- Rotate the bracket around the mast to aim panel due **south** and tighten U Bolts securely.
- Rotate the vertical panel orientation after loosening the four M8 bracket fixings and set the panel angle to the angle described on the label at the rear of the panel, the angle is dependent on Latitude of the site (latitude plus 12°); in the UK this will be around 67° below the horizontal.

8.7.6 Run the cable from the panel connector box through the Mast hole and route down the Mast Tube and into the Cabinet through the Mast Pivot tube. Secure the cable to the Mast with cable ties or tape.



## 8.8 Fitting the Wind Turbine

- 8.8.1 The wind turbine is supplied boxed and requires basic assembly on site, all required fixings are included in the turbine packing box.
- 8.8.2 Place the generator assembly on a flat surface hub-side down.
- 8.8.3 Position each of the six blades into the hub recesses by placing the protrusion at the trailing edge of the blade root into the socket first and then using a light lever action on the blade. Note the blades will only fit in one way.
- 8.8.4 Secure each blade using the four bolts provided (two from each side), do not over tighten the fixings.
- 8.8.5 Secure the front cover using the three provided plastic bolts.
- 8.8.6 Feed the extension cable down the Mast Tube and into the Cabinet through the hollow mast pivot tube.
- 8.8.7 Feed the remaining cable and Turbine spigot into the Mast and align the two fixing holes. Secure in position using the M10 Button Head bolts and spring washer provided.
- 8.8.8 Avoid damage to the blades at all times during this assembly operation. **DO NOT REST THE TURBINE DIRECTLY ON THE BLADES DURING ASSEMBLY.**



**Wiring from the turbine to the battery charger must be undertaken with the mast lowered and the windmill stationary.**

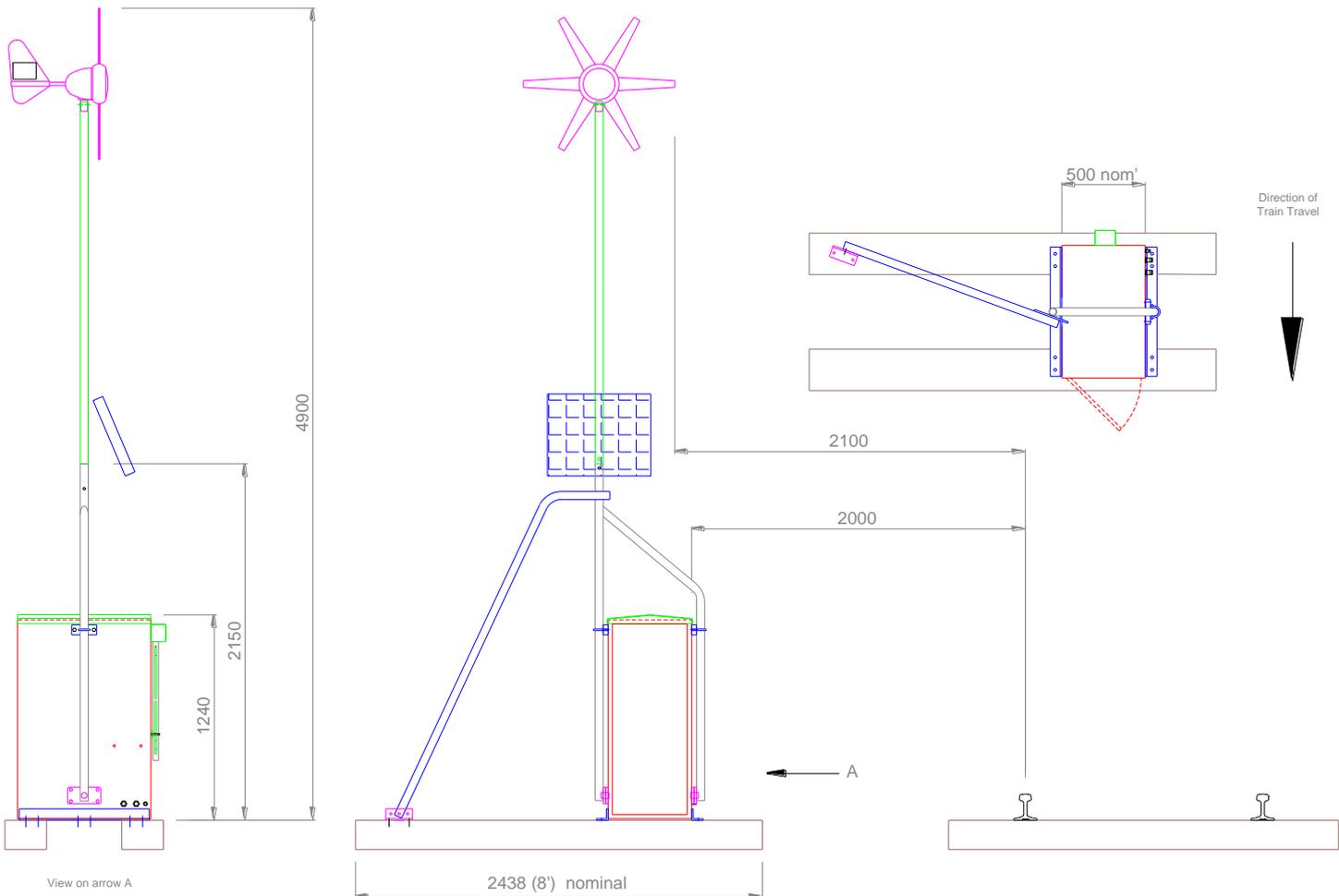
## 8.9 Raising the Integral Mast

- 8.9.1 With the Solar Panel and / or Wind Turbine mechanical fitted, the electrical connections to the battery charger should be completed before raising the mast (see Section 8.12).
- 8.9.2 The mast can be raised by lifting the mast from the upper / lower mast joint.
- 8.9.3 Great care should be taken particularly when installing in wind conditions as the turbine blades will spin, and there is load on the solar panel that can increase the required lifting load.
- 8.9.4 With the Mast vertical open the Cabinet door and fit the two U bolts around the mast and through the locating holes. Fit and tighten the four M10 Nyloc nuts on the inside of the cabinet (a 17mm AF ratchet spanner is recommended).
- 8.9.5 At the base of the Mast fit eight M12 Nyloc Nut and Bolt fixings (19mm AF spanner) and tighten securely.
- 8.9.6 At the base of the Mast insert the black plastic push in plugs to protect the cables and tube ends.



## 8.10 Optional Mast Extension

8.10.1 The standard arrangements use the Lower Mast only for solar powered options and the Lower and Upper Masts for solar and wind powered options. Overall dimensions of the standard system are shown in manual Section 7. The overall arrangement of the Optional mast extension is shown on the scheme drawing below.



8.10.2 It is permissible to attach an additional mast section to achieve improved ambient light access to the solar panel or wind to the turbine; applications could be cuttings or where general vegetation obscures the charging systems.

8.10.3 Required mast extension items are covered in Whitmore Rail Part No. LCS105-03 and parts.

- Proceed with installation stage as per Manual Section 8.4 and 8.6.
- Slide final mast section into the upper mast and secure with M6 hexagon screws.
- Fit solar or wind panel to extended mast as per Sections 8.7 or 8.8 respectively.
- Raise mast as per Section 8.9.
- Secure Side Brace to Lower Mast using the supplied fixings set and fully secure to the sleeper or concrete base.

## 8.11 Fitting of Cabinet Mounted Solar Panels

- 8.11.1 Electro 10 & 20 products can be supplied with solar panels mounted directly to the side of the cabinet or existing units fitted with masts can be converted to such a panel arrangement.
- 8.11.2 If supplied as a factory cabinet option no work is required. If supplied for conversion then the following process should be followed:
- 8.11.2.1 Carefully unpack each solar panel taking care not to damage the panel or the cable.
  - 8.11.2.2 Panels should be bolted to the rear of the cabinet and to one of the sides, the panels must be pointing in a southerly direction and it may be necessary to turn the cabinet around if already fitted on its base to achieve this.
  - 8.11.2.3 From 2010 cabinets are supplied with predrilled holes in the cabinet to suit the solar panel. Fitting is therefore straightforward.
  - 8.11.2.4 On earlier cabinets. Hold one panel as high as possible on the rear side and drill four holes through the cabinet carefully, using the panel as a template. Secure using the tamper proof fittings provided. Drill a 20mm hole 20mm below the panel and slightly off centre to clear the central cabinet join. Fit a cable gland in the hole and run the panel cable through. Locate the cable cover over the cable and panel and then drill / fix at base of the cover.
  - 8.11.2.5 Fit the second panel to one side of the cabinet with the panel as far forward (near the door) as possible and around 10cm below the top.

### Do not:

- Shorten the length of the standard cable or change its end fittings.
- Stand on the panel.
- Drill additional holes in the panel.

## 8.12 Battery Charger Electrical Connection

The majority of the electrical termination is completed at the Whitmore Rail factory prior to despatch, therefore for battery charging:

- 8.12.1 Solar Panel Mast Mounted – The two core round cable has been routed down the mast and into the cabinet (see sections 8.7 and 8.14).
- 8.12.2 Solar Panel Cabinet Mounted – (see sections 8.11).
- 8.12.3 Wind Turbine - The two core flat cable has been routed down the mast and into the cabinet (see Sections 8.8 and 8.13).
- 8.12.4 Mains Power – two pole MCB for incoming 110 or 220VAC fused and earthed mains power (see sections 8.16)

### Warning!

This lubricator uses a 12V-100Ah battery which contains an acid based fluid, the electrolyte. Care must be taken to avoid the electrolyte coming in contact with the skin or clothing as the electrolyte may cause severe burns.

If the electrolyte contacts the skin wash with large quantities of clean water and seek medical advice.

### **DO NOT expose the battery to naked flames or cigarettes**

During the charging process hydrogen gasses are vented from the battery and these gasses when mixed with the air may explode if ignited.

### 8.13 Solar & Wind Systems

Post May 2011 lubricators are fitted with the type of charger pictured on the right (Marlec HRDi – dual battery controller) or the type of charger pictured below right (Marlec HRSi – single battery controller).

The HRDi consists of a digital display with push buttons to select optional screens. The HRSi has tri-colour LED indicators that inform the user about the battery voltage levels and charging status.

Cover the solar panel and stop the turbine before any wiring changes.

Shutdown the charger by moving the rocker switch to the off position as shown on the charger.

Cables from wind generator and solar panel should be terminated on the connector strip at base of the unit.

The terminals are visible at base of unit and are clearly labelled. Prepare and connect the cable to the points indicated.

The 'flat' wind turbine cable connects to terminals marked 'WG' (wind generator); Red '+', Black '-'.  
The round solar panel cable connects to the terminals marked 'PV'; Brown '+', Blue '-'.

**Ensure the correct cable polarity is maintained to avoid damage.  
Do not make connections with the turbine rotating or with the solar panel in direct sunlight.**

The battery will have been connected during initial assembly to the 'BAT 1' terminals; 'BAT 2' is not generally used.

**After connection ensure the charger is turned on,  
with reference to the indicators on the charger.**

Uncover the solar panel and free the turbine so it can rotate freely.

The display provides a range of information.

Press the lower 'lamp' button which will illuminate the display.

Press the upper scroll button which will scroll through the wind generator output, solar panel output and battery condition as required.

The 'central' button is to zero the historic readings and would not normally be used.



### 8.14 Solar Systems - Mast Mounted

Solar panel charged lubricator models use chargers similar to the following picture, the performance and operation is similar. Cable connection is directly into the left hand side bolts terminals indicated on the panel.

The battery feed cable will have been factory connected, the free end with ring terminals should be connected to the battery terminals; blue core to negative and brown core to positive.

The round solar panel cable connects to the terminals indicated with the solar panel legend; Brown '+', Blue '-'.



**Damage will result if incorrectly connected.**

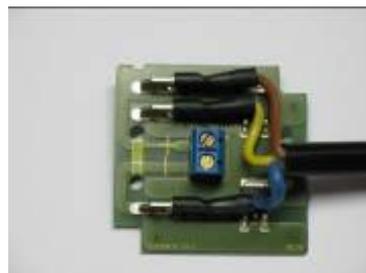
The controller contains two indicator lamps:

- A Green LED and this will be illuminated as soon as there is power from the module. When the controller starts to limit the charge current the LED will flash.
- The second LED can change colour from Red via Yellow to Green. Battery voltage is shown by the colour and legend on the controller – Green indicates a full charge, Red indicates a low battery charge.
- When the battery voltage falls below approximately 11V the multi-colour LED will start to flash FAST. If the battery remains at a low charge the LED will continue to flash slowly.

### 8.15 Solar Systems – Cabinet Mounted Panels

With cabinet mounted panels there are minor differences:

- 8.15.1 Each cabinet panel cable is connected to the standard charger (section 8.14 ) via a specialist connector block as shown on the pictures below.
- 8.15.2 Remove the top of the connector block by removing the two pozidrive bolts.
- 8.15.3 The three blade terminals (Brown, Blue, Green / Yellow) should be connected to the blade terminals as per the colour locations printed on the circuit board.
- 8.15.4 The link cable from the connector block to the charger will have been prewired to the two block screw terminals.
- 8.15.5 Connect the link cables to the charger (Brown to '+', Blue to '-').



## 8.16 Mains Powered Systems

Previously installation requirements for 12V battery systems with solar or wind turbine charging systems have been reviewed. An alternative system utilises local mains power to maintain battery charge.

Two arrangements have been provided within the lubricators; Section 8.16.2 details the type used prior to April 2011 and Section 8.16.1 after that time.

Cable routing and connection should be undertaken by trained and authorised personnel only. Using the following procedure:

- A suitable cable should be routed from the local trackside power source to the cabinet via suitable armoured cable and routed into the cabinet through a suitable waterproof gland. The cabinet can be drilled towards the base to suit the gland; care should be taken to avoid damage to any internal cabinet components.
- The cable incoming cable should be armoured and suitably routed and protected to avoid a hazard.
- Cable rating should be 220/110 Volt at 6 Amps minimum.
- Connection should be made on the two pole MCBs to the left of the main Control Box. All other power wiring will have been completed during product assembly.
- Connection should only be undertaken with the lubricator installer present.

### 8.16.1 Lubricators supplied after April 2011 will have an auto voltage sensing industrial battery charger

The unit is supplied pre-wired to the MCB.

Incoming voltage is auto-sensed in the ranges:

- 90-265 VAC, frequency 45 – 65 Hz
- 90 – 350 VDC

Connect the ring terminals to the battery terminal;

- Cable with RED sleeve to positive battery terminal. [Note: cable insulation is smooth].
- Cable with no sleeve to negative battery terminal. [Note: cable insulation has 3 longitudinal ribs].



The charger has LEDs to indicate operation:

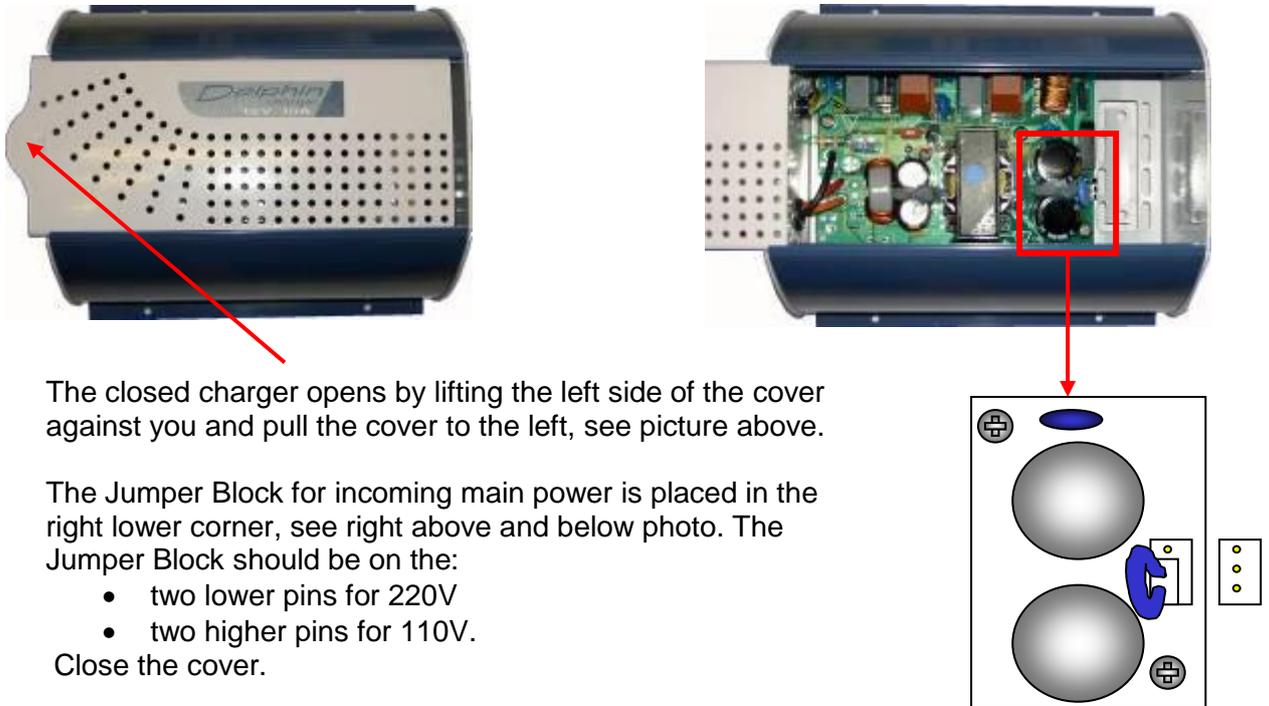
- Green LED indicates mains power from the MCB output
- Yellow LED:
  - Flashing indicates charging
  - Continuous indicates battery fully charged

**Do not remove the MCB cover unless fully trained and certified electrician.**

**Wiring the MCB's to the electrical supply must be undertaken by a qualified electrician.**

8.16.2 Lubricators supplied before April 2011 will have an industrial battery charger.

The design allows for input voltage of 110VAC or 220VAC, the charger must be configured as below for the correct incoming voltage.



The closed charger opens by lifting the left side of the cover against you and pull the cover to the left, see picture above.

The Jumper Block for incoming main power is placed in the right lower corner, see right above and below photo. The Jumper Block should be on the:

- two lower pins for 220V
- two higher pins for 110V.

Close the cover.

8.16.3 An LED on the left side of the charger indicates operation and provides basic fault finding:

- LED on
  - Battery charging
- LED blinking
  - Incorrect battery connection,
  - Battery fuses blown,
  - Very low battery
- LED Off
  - Check incoming supply voltages.

**Do not connect the mains supply to the MCB or remove the MCB cover or the battery charger cover unless fully trained and certified electrician.**

## 8.17 Battery Powered Systems

- 8.17.1 The Electro 10/20 are designed for minimum power consumption and where mains power is not available or site conditions are not ideal for solar or wind power charge systems then the unit will run on battery alone for a reasonable period.
- 8.17.2 Such systems will have been delivered with two 12V batteries connected in parallel. The battery condition should be monitored at monthly intervals while undertaking general lubricator maintenance. Irrespective of the condition the batteries should be exchanged with fully charged units at 6 week periods and the original batteries recharged off site.

### Note:

**Batteries that have dropped below 10V must be clearly marked as defective and correctly discarded. They must not be reused as the internal cells will have been damaged.**

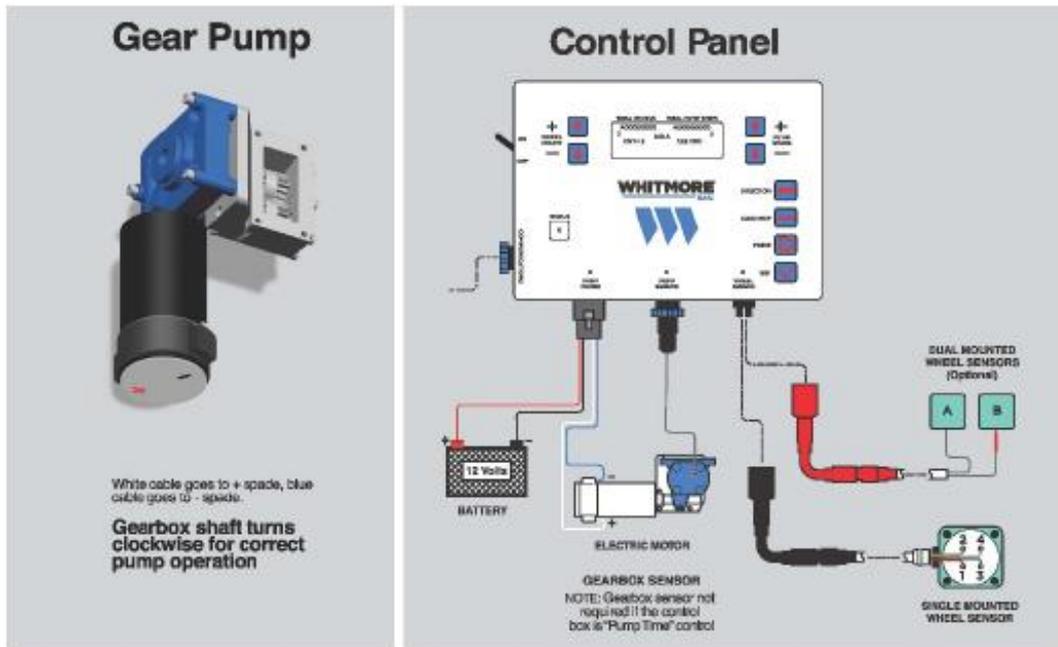
## 8.18 Replacing the Pump Sensor

- 8.18.1 Disconnect the battery.
- 8.18.2 Remove the control box terminal cover and disconnect the three core grey cable from the terminals and draw clear of the control box through the cable gland (see wiring diagram in Section 9), remove any cable ties and pull the cable to the base of the cabinet at the rear.
- 8.18.3 The sensor is secured to the pump body with two M8 nuts (13mm open spanner needed). Loosen the outer nut, loosen the inner nut and then unscrew the sensor fully from the pump body.
- 8.18.4 The new sensor is supplied with two loose nuts and one lock washer. Discard the lock washer and spin both nuts along the sensor and over the grey cable.
- 8.18.5 Wind the sensor into the pump body by hand until it cannot be turned further; turn the sensor back one revolution. Holding the sensor in that position fit the first nut tight to the pump body and then tighten the locknut.
- 8.18.6 Route the cable behind the drum plate and to the control box. Reconnect the three cores.
- 8.18.7 Reconnect the battery.
- 8.18.8 Press pump run and ensure the 'motor sense' LED next to the sensor cable just connected flashes.

If the lamp flashes all is correct

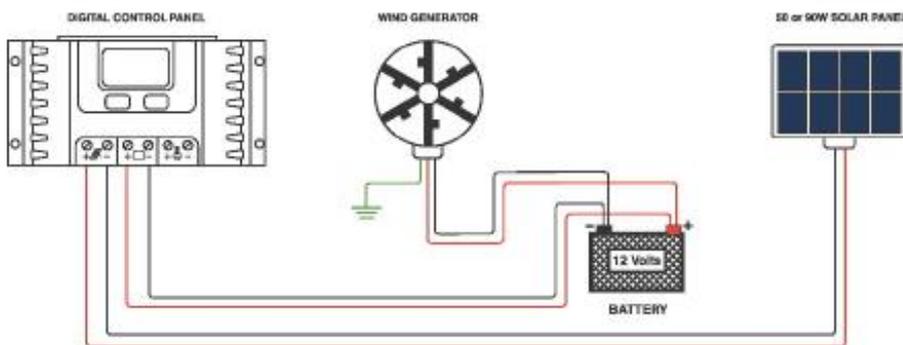
If the lamp does not flash then loosen the sensor and reset by turning it clockwise or anti-clockwise.

## 9 System Wiring Diagram

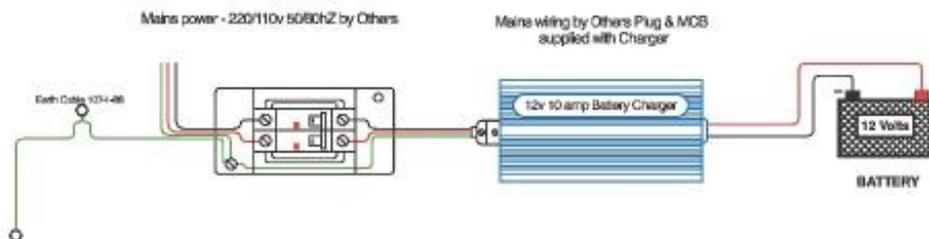


### Power Options

#### Solar & Wind Power



#### Mains Power



#### WARNING!

This applicator uses a 10V-100Ah battery which contains an acid based fluid, the electrolyte. Care must be taken to avoid the electrolyte coming in contact with the skin or clothing as the electrolyte may cause severe burns. If the electrolyte contacts the skin, wash with large quantities of clean water and seek medical advice.

DO NOT expose the battery to naked flames or cigarettes. During the charging process, hydrogen gases are vented from the battery and these gases, when mixed with the air, may explode if ignited. Do not short circuit the battery terminals, as this may cause a spark or explosion.

## 10 Installation of Track Items

This aspect of the installation involves fixing of the wheel sensor to the running rail, fixing of the Blade system and running of the feed delivery hose system.

### 10.1 Wheel sensor

The wheel sensor is a non-contact proximity device that will detect a passing wheel when correctly set. The unit is pre-assembled on an aluminium mounting plate and needs to be clamped to the rail 3 to 6 metres upstream from the furthest rail mounted Blade. The sensor will be in the “4 foot” and can be on either rail as best suited to the site.

There are two forms of wheel sensor:

- Fixed sensor as pictured below right and using a rail clamp at each end of the sensor bracket.
- EasiSensor pivoting sensor as pictured bottom right which fits between the sleepers and has a single hook bolt to clamp it to the rail. Fixing details are described below.

#### 10.1.1 Fixed Sensor

- Sensor rail fixing clamps are similar to the blade rail fixing clamp and fitting is generally covered in Section 10.4, the key differences are:
  - Space the clamps to suit the sensor brackets.
  - Fix one clamp on each side of the sleeper.
- Clamp the sensor to the M16 rail clamp studs with the sensor uppermost.
- Adjust the height of the sensor to 42 / 45mm below the rail head crown and securely tighten the M16 fixings.



#### 10.1.2 EasiSensor

- Sensor rail fixing clamps are similar to the EasiBlade arrangement and fitting is generally covered in Section 10.6, the key differences are:
- Clamp the sensor to the M16 rail clamp studs with the sensor uppermost.
- Adjust the height of the sensor to 42 / 45mm below the rail head crown and securely tighten the M16 fixings.



**Note: If required by site conditions the sensor can be reversed on the sensor mounting plate such that the cable exits in the opposite direction.**

- 10.1.3 Run the cable from the sensor along the foot of the rail on the cess or field side and fix to each rail clip using cable ties and into the trackside Cabinet.
- 10.1.4 The cable must route through protective pipe when running across the “4 foot” or “6 foot”, in third rail applications the cable should pass through robust insulated pipe work below the conductor rail.
- 10.1.5 Route the cable within the Cabinet to the Control box. The sensor cable is armoured and the ends will need to be prepared prior to connection.
- 10.1.6 Remove the two screw connector strip cover screws and route the sensor cable through the cable gland and terminate all three cores as indicated.
- 10.1.7 Cable connections are as follows:

**Control Box:**

- Brown: +ve terminal
- Black: -ve terminal
- White: S terminal

**Wheel sensor:**

- Brown terminal 1
- Black terminal 3
- White terminal 4

Care should be taken to ensure connections are made correctly and that the terminals are not over-tightened and damaged.

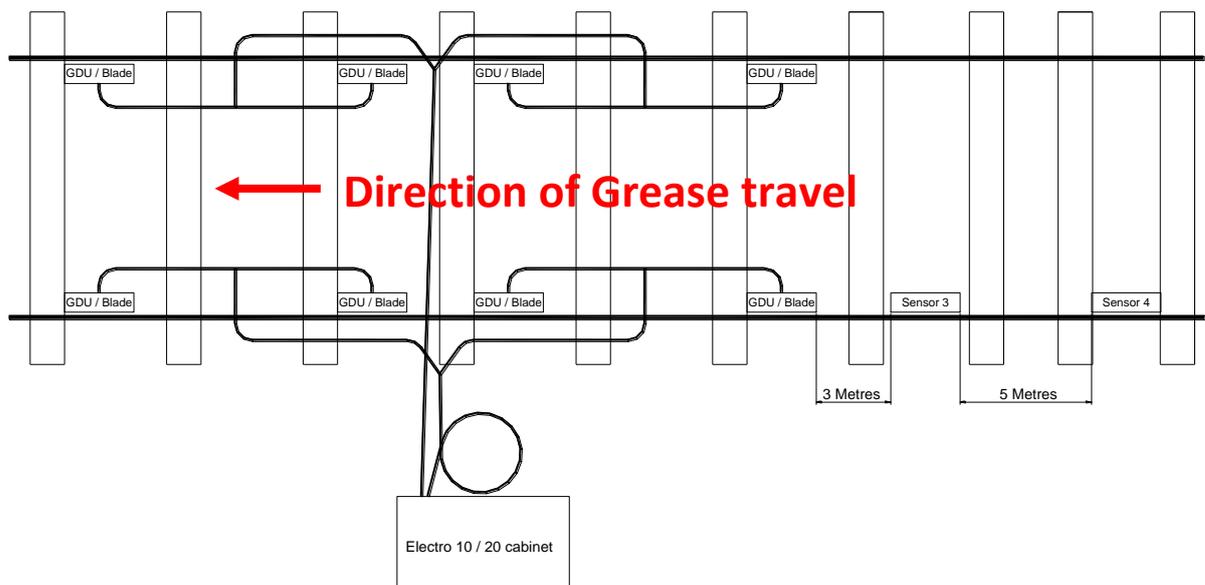
**10.2 Wheel sensor – Single Direction Operation**

On Bi-directional track where the pump operation is required in one direction, a special wheel sensor arrangement is available.

The system comprises of two wheel sensors and one link enclosure mounted in the cabinet. The actual Sensors look identical but are marked to identify them. The most obvious difference is that one sensor uses 3 core armoured cable and the other uses 4 core armoured cable. This is how the sensors will be identified; with a number 3 or a number 4 printed on the Sensor Bracket.

**Positioning the Wheel sensors**

The following sketch shows a typical Cabinet / EasiBlade Installation, as described in this manual.



The Wheel sensor marked “3” should be positioned 3 Metres from the first EasiBlade the train will meet when travelling in the direction of the required grease travel; as indicated in the previous page. Wheel sensors are always fitted in the “4 foot”.

The Wheel sensor marked “4” should be positioned 5 Metres from Sensor “3” further away from the cabinet; as indicated in the previous page. Wheel sensors are always fitted in the “4 foot”.

Wheel sensors should be fitted to the rail and set as described in Section 10.1. Both armoured cable lengths must be run along the foot of the rail on the CESS side back to the cabinet. The cable should be secured in position on the foot of the Rail using cable ties.

The cabinet has one pre-drilled hole for the 3 core armoured cable. The hole is located next to the two Grease Outlet hoses. Position a Grey Cable Gland through this 20mm hole and thread the 3 core armoured cable through it.

A 20mm hole needs to be drilled for the 4 core cable, the gland fitted and cable to be passed through.

### Wiring the Terminal Box

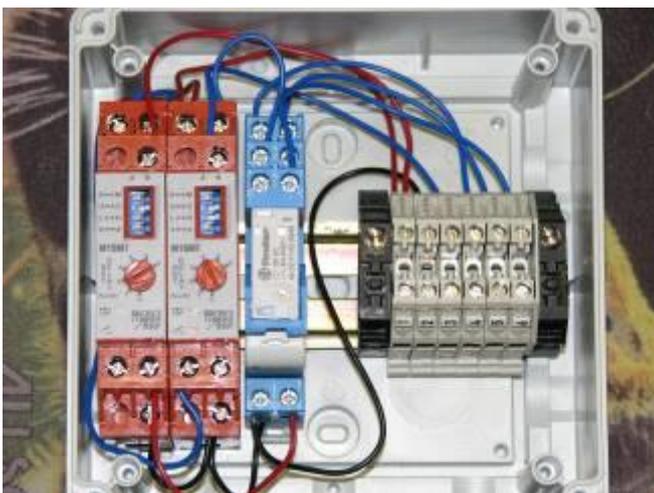
Prepare the Cable ends of both the 3 and 4 core cables, and insert through the cable glands in the Terminal Box.

The 3-core cable goes through the Right hand Cable gland.

The 4-core cable goes through the Left hand Cable gland.

A 1.5m length of 3-core flex is required to connect the Control Box to the Terminal Box. This is fed through the Centre Cable gland.

The Terminals in the terminal box are numbered 1 to 6, as shown in the picture below.



Wire the terminals as follows:

#### Terminal 1

Connect the 12V DC from the Control Box using the 3-core flex. Connect the Brown wires from Both Wheel sensors (Pin 1 in both Sensors).

#### Terminal 2

Connect the 0V DC from the Control Box using the 3-core flex. Connect the Black wires from Both Wheel sensors (Pin 3 in both Sensors)

#### Terminal 3

Connect the Blue wire on 4-Core Sensor – Pin 2 on the wheel sensor.

**Terminal 4**     **3-Core Sensor** cable Grey Wire from wheel sensor Pin 2.

**Terminal 5**     **4-Core Sensor** cable Grey Wire from wheel sensor Pin 4.

**Terminal 6**     To Wheel input on Control Panel marked ‘S’ using the 3-core flex.

### 10.3 Blade System

The system allows use of a range of grease distribution units (blades):

- Running Rail Blades
  - 2 blades on high rail.
  - 4 blades on the high rail and 4 blades on the low rail.

There are two styles of Blade available; standard (reference Section 10.4, 10.5 below) and EasiBlade. Each is available in 40 or 60cm lengths.

#### 10.4 Installing the Blade Rail Clamps (Standard Style)

10.4.1 Once the position of the Blade to be fitted has been identified, lay the Blade unit adjacent to the rail (on the “4 foot” side) in order to locate where the Blade clamps need to be fitted.

10.4.2 Both Blade clamps can now be fitted (image on the right).

10.4.3 The main part of the clamp is fitted on the “4 foot” side of the rail with the threaded stud at the top and facing away from the rail.

10.4.4 The hook bolt is then fitted under the rail with the hook clasping the foot of the rail on the field side with the threaded part inserted through the hole at the base of the clamp.

10.4.5 The washers and nyloc nut are then to be fitted to the hook bolt and fastened tight.

10.4.6 Repeat for the second clamp.



#### 10.5 Installing the Blades (Standard Style)

10.5.1 Fit the Blade onto the clamps using the M16 flat washer, spring washer and nut onto each clamp and secure. Hold the blade against the gauge face of the rail, if there is a gap between the back plate and the gauge face of the rail spacing shims will need to be fitted.

10.5.2 To fit the spacing shims loosen the two M10 bolts that fit the Blade plates to the brackets. Slip the number of shims needed behind the plate and over the threads of the M10 bolts between the bracket and the blade backplane.

10.5.3 Repeat for the other end of the blade if necessary.

10.5.4 Once again fit the blade onto the clamps and hold the blade against the gauge face of the rail.

10.5.5 If there is no gap, fit the M16 flat washer and nyloc nut onto each clamp and tighten lightly so the blade can still be moved.



- 10.5.6 Set the blade to the required height below the railhead using a suitable gauge / measuring device. The minimum distance is 18mm. The precise height dimension is subject to rail profile and blade configuration and is covered in section 10.6. If required a suitable gauge is available from Whitmore Rail (Part No. LCS104-06), shows how to set the blade with the Whitmore Rail gauge).



- 10.5.7 Repeat from 10.5.1 for the other Blades.

## 10.6 EasiBlade Installation

- 10.6.1 EasiBlades are supplied as complete single units. From the "4 foot" and midway between the Sleepers / Ties, slide the base (W bracket) over the rail foot as shown. Locate the hook bolt around the opposite side of the foot and tighten the single nyloc nut. Fully bed the base onto the rail using a hammer on the vertical faces of the 'W' bracket. Retighten the nyloc nut.
- 10.6.2 Where 4 blades per rail systems are installed, it is important that the two inner blades are in adjacent beds, then leave an empty bed and then the outer blades. This arrangement allows wheel circumference pick-up and also benefits hose layouts.
- 10.6.3 The blades are provided in left and right hand forms; the difference being the direction of the hose tail points, the correct layout is shown in the adjacent picture, outer pairs with hose tails pointing towards each other.
- 10.6.4 Tilt the blade up so that the blade tip is towards the rail head and as high as possible, lightly tighten the two pivot bolts.
- 10.6.5 Decide the required blade height and tap the two steel lugs on the blade evenly down using a hammer to achieve the required height. The setting gauge described in Section 10.5.6 should be used to verify heights.
- 10.6.6 There may be a slight gap between the tip of the blade and the rail. To close this gap tap the corner of the lug as necessary, **do not hammer the blade itself**.



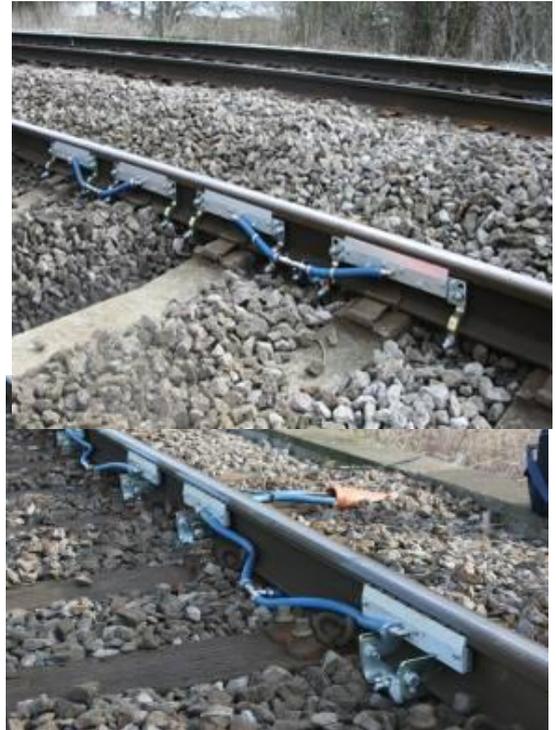
Strike here to angle in the blade ●

- 10.6.7 Repeat the process for each EasiBlade.

## 10.7 Outing of delivery hoses, Cabinet to blade

10.7.1 As outlined previously there are a number of options to allow the connections to the relevant blade option.

10.7.2 The upper right picture shows the standard blade layout, where the blades are over adjacent sleepers. The lower picture shows the EasiBlade layout with an empty bay between the sleepers.



10.7.3 The hoses are 16mm bore for systems with pump distances up to 8 metres and 25mm bore for longer distances. The correct type and length of hose will have been despatched with the system.

10.7.4 Irrespective of the hose type the principals of running the hose are similar and shown below for a typical installation with blades on both rails.

10.7.5 **Note:** to assist balanced flow:

- The main delivery hose runs should be of the same length.
- Individual hose lengths between each interconnection should be the same length.

10.7.6 Hoses should be protected within suitable piping when passing under rails across the “4 foot”.

10.7.7 Systems with two blades have one feed hose for each:

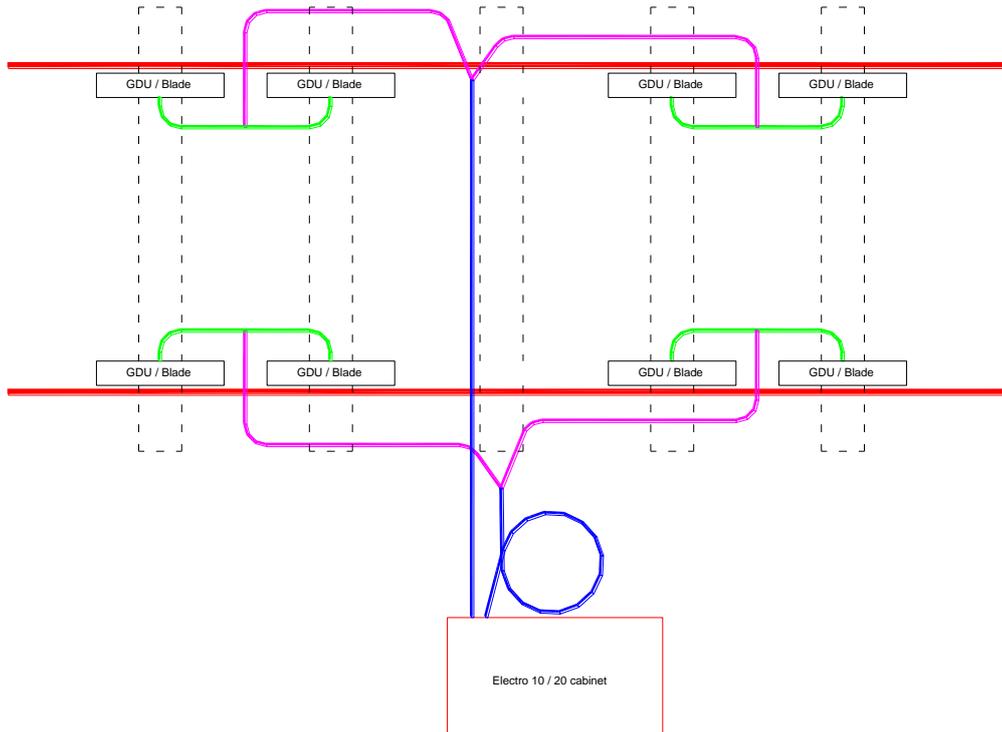
- For applications up to 8 metre pump distance, the 16mm hose will connect directly to the blade.
- For applications up to 25 metre pump distance, the 25mm hose should be routed as close as possible to the blade and then reduced down to the 16mm hose for the final section before connecting. All required parts are supplied.

10.7.8 Systems with multiple blades on high and low rails have one feed hose for each rail:

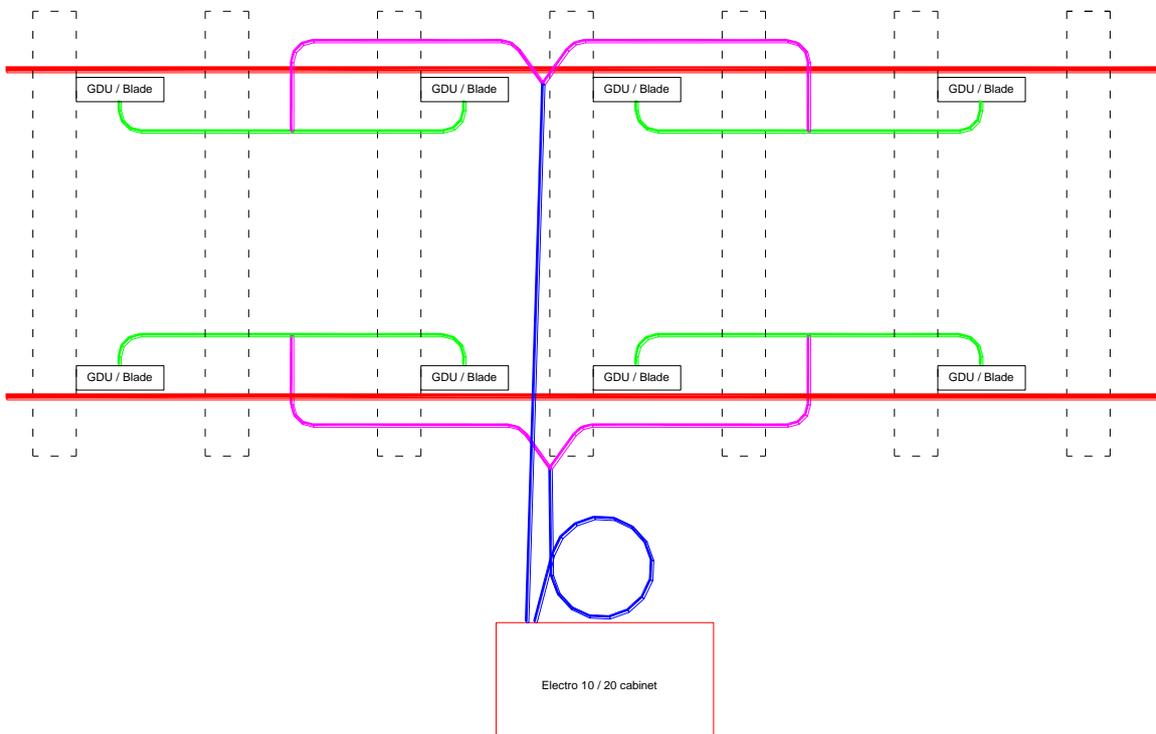
- For applications up to 8 metre pump distance, the 16mm hose will be used throughout the system.
- For applications up to 25 metre pump distance, the 25mm hose should be routed as close as possible to the first “Y” pieced in the system and then reduced down to the 16mm hose for the final sections of each Blade. All required parts are supplied.

10.7.9 Specific hose routing will depend on each site, the type of blade (Standard or EasiBlade) and should be arranged to allow modifications.

## Standard Blade



## EasiBlade



## 10.8 Fitting the Main Delivery Hoses

- 10.8.1 Having first filled the reservoir, operate the pump by pressing the “run” button until grease is present at both hose tail fittings on the outside of the cabinet.

10.8.2 Fit one end of a delivery hose to the hose tail inlet on the blade with a hose clip and after routing and filling the delivery hose, connect to the hose tails on the outside of the cabinet.

10.8.3 Repeat the procedure for the other hose.

### **10.9 Fill the Hoses and Blade's**

On relatively short hose runs the main lubricator pump can be used to pump grease from the reservoir to the Blades.

On the Control Panel periodically press the Pump Run button.

Continue cycle until grease is evident at all Blade ports.

**Do not run for more than 10 seconds with a 30 second interval between operations.**

Note: On multiple (greater than two) blade systems it can be useful to close the restrictor valve at all but one of the blade sets to aid the process and then alternate the open blade until all grease paths are primed.

On longer hose runs it can be more efficient to connect the motor directly to the battery and leave it running for 60 seconds and then allow a 2 minute break before continuing the cycle.

# 11 Commissioning / Setting

## 11.1 Filling the Reservoir (Lid Lift Version)

The Electro 10, 20 and 30 Lubricators have been designed with a direct fill reservoir via a secure opening lid. The opening lid forms the rear half of the cabinet roof. This direct fill method is the quickest and most user friendly filling method.

### 11.1.1 Access the Grease Reservoir

- Open the main door of the cabinet using the key and hexagon tool entry method as described in section 8.2.
- Inside the cabinet, in the top right hand corner, you will find a locking mechanism for the lid. Rotate the lock handle into a horizontal position then gently pull towards the main door. This will unlock the lid. Ease the opening portion of the lid upwards until the supporting hinge clicks in place.
- Through the open portion of the lid you will be able to see the grease reservoir.



**Note: ensure only approved grease enters the reservoir. Any non-approved materials could severely damage the electric pump.**

### 11.1.2 Filling the Grease Reservoir

- Grease can be poured directly from the drum or storage bag, into the reservoir.
  - Electro 10 reservoir will hold 90kg.
  - Electro 20 reservoir will hold 200kg.
  - Electro 30 reservoir will hold 360kg.
- Do not over fill the reservoir.
- Once filled close the lid by releasing the supporting hinge. Press firmly shut and secure using the locking mechanism. It is important that the lid is locked correctly; if the lid is left open, the grease may biodegrade rapidly.

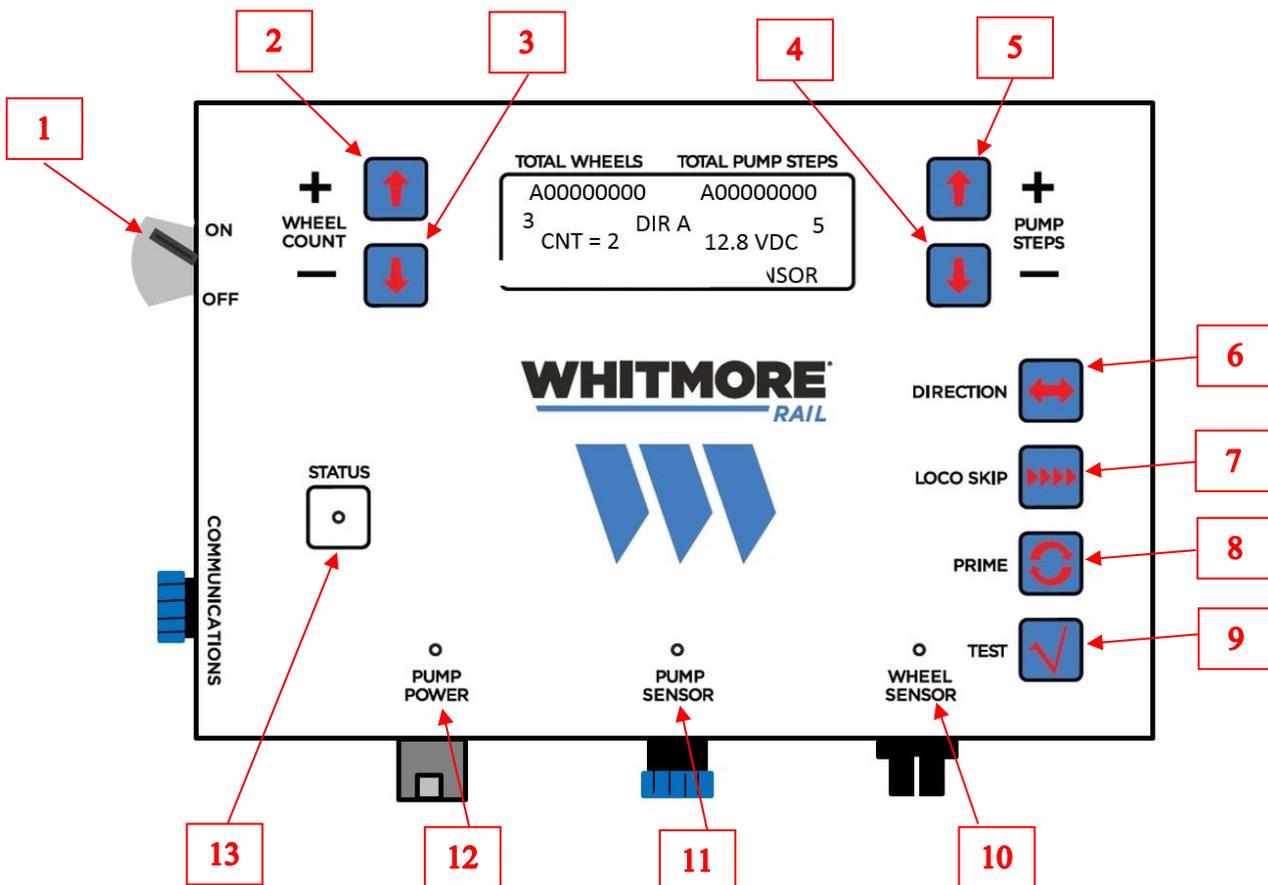


## 11.2 Wheel sensor Heights and Operation

Procedure for height adjustment and testing operation are covered in Section 12.9.

## 11.3 Pump Setting

The Electro 10 & 20 Lubricators are controlled and set by a control panel located inside the cabinet. This control panel allows the user to set the grease output from the blades with respect to the rail traffic using rail.



- 1) Power Switch – This toggles the power to the controller ON when in the up position and OFF when in the down position. There is a clear protective rubber cover to keep the switch liquid tight. DO NOT try and remove this cover.
- 2) Wheel Increment Button – This *increases* the wheel setting for enabling pump activation, and the setting for Loco Skip when enabled (see 7) by an increment of one each time the button is pressed. Hold down the button and it will increment at a steady rate.
- 3) Wheel Decrement Button – This *decreases* the wheel setting for enabling pump activation, and the setting for Loco Skip when enabled (see 7) by a decrement of one each time the button is pressed. Hold down the button and it will decrement at a steady rate.
- 4) Pump Decrement Button – This *decreases* the pump output setting by a decrement of one each time the button is pressed. Hold down the button and it will decrement at a steady rate.
- 5) Pump Increment Button – This *increases* the pump output setting by an increment of one each time the button is pressed. Hold down the button and it will increment at a steady rate.

- 6) Direction Button – This toggles the directional setting of the controller for Direction A and Direction B as shown on the display. Upon powering up the controller Direction A is displayed as a default. Press Direction Button once to go to Direction B settings, if using a dual direction sensor. Press Direction Button a second time to go to the Total Wheel Counts and Total Pump Steps screen. Press Direction Button a third time to return to Direction A. When Loco Skip is selected (see 7) the direction button (6) is used to alternate between Direction A and B.
- 7) Loco Skip Button – Press this button once to enter the Loco Skip feature. This allows a delay in the pump activation by “skipping” a set amount of wheels before beginning the standard pump activation process. Once in the Loco Skip feature, use the Wheel Count increment (2) and Wheel Count decrement (3) buttons to adjust the amount of wheels to skip. Use the Direction Button (6) to switch between A and B directions for Loco Skip to be enabled. Press Loco Skip Button to exit the feature.
- 8) Prime Button – Press button once to begin pump prime process. The pump will run continuously for up to 4 minutes, or until the Prime Button is pressed again. Line 4 of the display will show “PRIME IN PROCESS”.
- 9) Test Button – Press button once to activate the pump for the set amount of steps according to the display and direction selected.
- 10) Wheel Sensor Light – When the track sensor detects a wheel is passing this red LED will illuminate. This corresponds with the change of wheel sensor counts on the display. This light will remain illuminated when there is a wheel present above the track sensor.
- 11) Pump Sensor Light – When the pump sensor detects a gear tooth this red LED will illuminate. This corresponds with the change of pump step counts on the display. The LED could potentially remain illuminated depending on the position of the gear pump relative to the pump sensor.
- 12) Pump Power Light – When the pump is activated this red LED illuminates
- 13) Status Light – This is a multicolor LED light that is always on when the controller is powered up, even when the display is in sleep mode. When the LED light is green there are no errors and the controller is functioning as it should. When the LED light is red there is some type of error occurring that relates to the battery being low, or there is a wheel sensor cable error. When the LED light is blinking orange there is a pump sensor error 1 or 2. On the third pump sensor error the status light turns to solid red. These changes in color helps indicate trouble shooting when an error occurs in conjunction with the display. A message will appear on the display in conjunction with a red or orange Status Light error.

### **TURNING POWER ON/OFF**

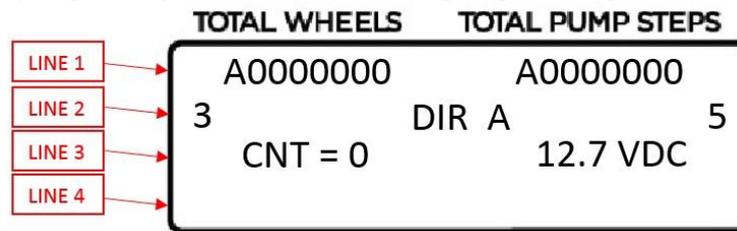
- In order to access the control panel, open the main door of the cabinet by rotating the door handle clockwise.
- To turn the controller ON locate the toggle switch (1) on the left side of the control box and flip upwards. The display and status light (13) will become illuminated.
- Upon the controller powering up, there is a splash screen that displays for approximately four seconds. This splash screen displays which configured version of the software the controller is currently set to use. The two types are “WHITMORE RGD” and “WHITMORE TOR”. (See DISPLAY INFORMATION section below for details)
- To turn the controller OFF locate the toggle switch (1) on the left side of the control box and flip downwards. The display and status light (13) will become inactive.

**11.4 Display information**

**Splash Screen** – upon powering on the controller, the display initially shows a message that pertains to the controller configuration. The two possible configurations are “RGD” and “TOR”. The RGD configuration resets the current wheel count back to zero after a train has passed for approximately 45 seconds. The TOR configuration does not reset the wheel count back to zero and simulates one continuous train.

**Screen Time-Out** – If there is no input from any button on the controller within approximately 90 seconds the display will turn off. Press any button on the controller once to turn the display back on. (Note: the button pressed to turn the display back on will not function other than to just turn on the display)

**Default Screen Direction A** – this is the default screen that appears upon powering on the controller. The default setting for the controller upon initial installation will be 3 wheels and 5 steps. The wheel and pump settings on Line 2 can vary depending on what they were upon powering down the box previously.



Line 1 – Total Wheel direction A

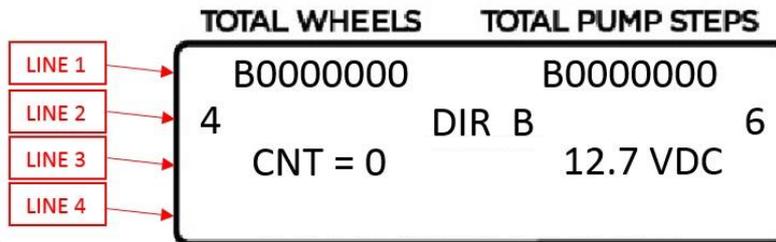
and Pump Steps for

Line 2 – Wheel count setting, direction, and pump step setting

Line 3 – Current wheel count and voltage of battery

Line 4 – Will display various status and error messages. (See troubleshooting section for clearing errors)

**Direction B Screen** – press the Direction Button once from default screen to access the direction B information screen.



Line 1 – Total Wheel counts on this screen with single direction c

counts on this screen with

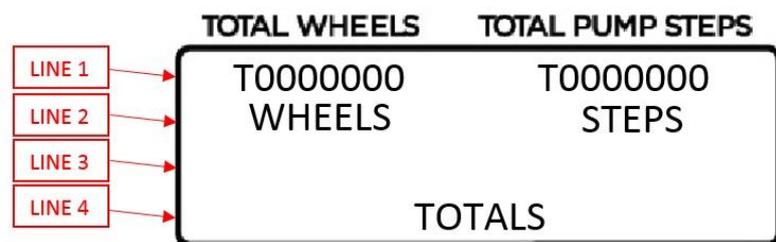
Line 2 – Wheel count setting, direction, and pump step setting

Line 3 – Current wheel count and voltage of battery

Line 4 – Will display various status and error messages (See troubleshooting section for clearing errors)

Note: Message “Single Sensor Cable” will appear on Direction B Screen if using a single sensor system that does not allow dual direction capability.

**Totals Screen** – press the direction button (6) until the Totals Screen appears to access the totals for wheel counts and pump steps



Line 1 – Total and Pump combined

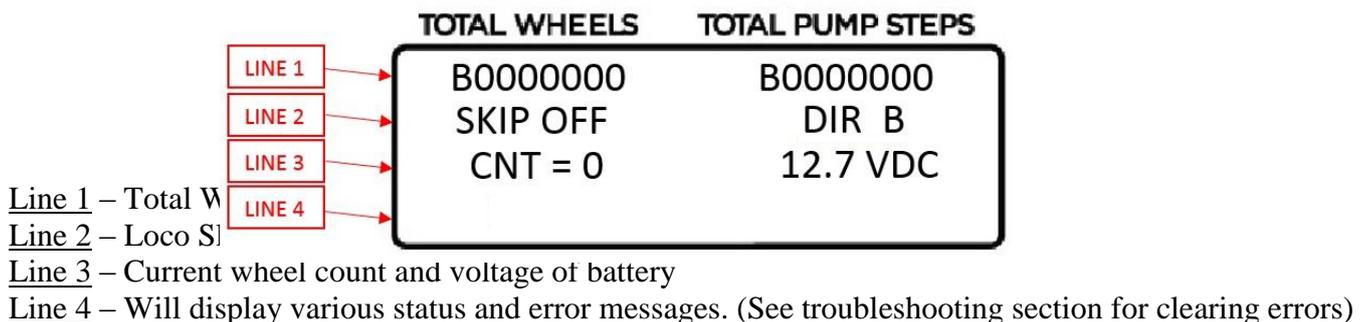
Wheel Counts for A & B Steps for direction A or B

Line 2 – States “WHEELS” for count number above, and “STEPS” for count number above

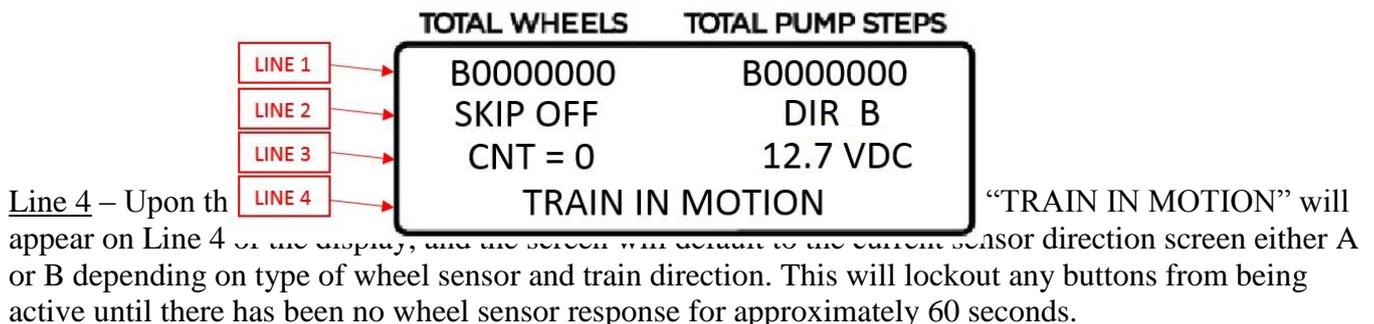
Line 3 – BLANK

Line 4 – will display “TOTALS” only

**Loco Skip Screen** – access this screen by pressing the Loco Skip Button (7). Change the direction setting of the skip feature by pressing the Direction Button (6).



### **TRAIN IN MOTION**



**NOTE:** For installation convenience only you may exit the TRAIN IN MOTION lockout screen by holding down the Wheel Count increment button (2) and Pump Count increment button (5) simultaneously for approximately 5 seconds. This should NOT be done as a train is passing by, but only during sample testing conditions.

### **PUMP TIME-OUT**

In certain circumstances where high train speeds and controller settings are not ideal, the pump steps will accumulate faster than the pump can carry out the operation. To prevent the pump from running continuously after a train has passed, the pump will stop after approximately five seconds if no wheel has been seen by the controller. If a consecutive wheel is seen after the five second time-out, but before the 60 second train reset period, then the pump steps will return to the normal operation.

### **RESETTING WHEEL COUNTS TO ZERO**

Using two hands, at the same time press and hold down the WHEEL INCREMENT BUTTON (2) and the WHEEL DECREMENT BUTTON (3) for approximately five seconds until counts return to zero. This will only zero out the current direction selected.

**NOTE:** From the TOTALS screen you will not be able to zero out any counts for wheels or pump steps.

## **RESETTING PUMP STEPS TO ZERO**

At the same time press and hold down the PUMP STEP INCREMENT BUTTON (5) and the PUMP STEP DECREMENT BUTTON (4) for approximately five seconds until counts return to zero. This will only zero out the current direction selected.

**NOTE:** From the TOTALS screen you will not be able to zero out any counts for wheels or pump steps.

## **ERROR MESSAGES & TROUBLESHOOTING**

- **WHEEL SENSOR CABLE ERROR**



This error will only occur upon powering on the controller with the wheel sensor cable being unplugged or not having a good connection. The STATUS LIGHT (13) will illuminate red and the message WHEEL CABLE ERROR will display on line 4. To fix this power down the controller and ensure the wheel sensor cable is properly connected. You must power cycle the controller in order to clear the error. (**NOTE:** cables should never be connected/disconnected with the controller powered on)

- **DUAL WHEEL SENSOR ERROR**

This error will only occur when a dual direction wheel sensor misses the leading axle in the A or B direction. For example, if a train's lead axle passes over the wheel sensor B, but the controller does not get a reading from wheel sensor A and gets a consecutive wheel sensor B reading, then the error "TRAIN WHL A ERROR" displays on line 4. The STATUS LIGHT (13) will illuminate orange when this occurs. After 60 seconds of no train motion the display on line 4 will display "WHEEL A SENSE ERROR" or "WHEEL B SENSE

ERROR” depending on the sensor that missed the leading wheel of the train. The controller will check to see if the error is cleared on the passing of the following train, and if cleared the message on line 4 of the display will return to “TRAIN IN MOTION” and STATUS LIGHT (13) will return to green. To troubleshoot, turn off the controller and ensure the connection and height setting of the track sensors are correct.

(NOTE: cables should never be connected/disconnected with the controller powered on)

## 11.5 Pump Settings / Operation

- 11.5.1 For maintenance log purposes the display screen also records the total wheel count and also the total pump steps. It is possible to zero the display following direct discussion with Whitmore Rail.
- 11.5.2 The set of Test Buttons, Test Run (6) and Test Stop (7) can be used to run the pump settings without the wheel sensor being activated. These buttons are useful during initial Lubricator set-up or maintenance periods.
- 11.5.3 The Run Pump Button (8) can be pressed and held for continuous pump operation. This button is useful during the initial priming of the pipes and Blade blades.

**Note: The gearbox output shaft is clearly visible and should rotate in a clockwise direction when pumping.**

The required pump settings will vary for each site and depend on such items and train type and speed. For guidance the table below should be followed and then adjustments made to suit local conditions during subsequent visits.

### Initial Electro 10 / 20 Settings

Speed		Carriages 2		Carriages 3		Carriages 4	
Speed mph	Speed kph	Wheel Count	Pump Steps	Wheel Count	Pump Steps	Wheel Count	Pump Steps
<15	<25	3	4	3	4	4	5
<50	<80	3	4	3	4	4	5
<90	<120	3	4	4	4	6	5
<100	<160	3	4	4	4	6	5
<125	<200	-	-	-	-	-	-

Speed		Carriages 8+		Carriages 20+	
Speed mph	Speed kph	Wheel Count	Pump Steps	Wheel Count	Pump Steps
<15	<25	4	4	3	4
<50	<80	6	4	8	5
<90	<120	6	5	30	10
<100	<160	40	8	-	-
<125	<200	40	8	-	-

## 12 Routine Maintenance

**Prior to any maintenance it is necessary to have the following data:**

- The date that the lubricator was last maintained.
- The final depth of the reservoir when the lubricator was last maintained.
- Blade and wheel sensor heights when the lubricator was last maintained.
- Any works that were carried out when the lubricator was last maintained that could change the grease output.
- Any work that was identified but not carried out on the previous visit.

### **12.1 Control Panel**

- 12.1.1 The control panel incorporates all operational functions for pump setting and also historic data logging of activities.
- 12.1.2 Record the Total Wheel Count and Current Wheel Count Setting from the Panel LCD readout.
- 12.1.3 Record the Total Pump Steps and Current Pump Steps Setting from the Panel LCD readout.
- 12.1.4 Note these 'total' settings can be zeroed by depressing the buttons adjacent to the readout but this should be recorded as a specific maintenance activity.

### **12.2 Pump Setting**

- 12.2.1 The Pump Run and Wheel Count Inhibit are set on two red push buttons on the control panel as described in earlier Section 11.3.
- 12.2.2 Record the settings shown on the display as per Section 12.1.
- 12.2.3 Establish by visual inspection that grease output is correct or requires adjustment (plus or minus):
  - If **additional** grease output is required then:
    - Increase Pump Steps setting by pressing and holding of the 'more' button.
    - or
    - Reduce the Wheel Count Inhibit such that the pump will operate for a second cycle after fewer wheels have passed. It may also be necessary to reduce Pump Steps as part of this adjustment to prevent over greasing.
    - Assess Blade output and make further adjustments as necessary.
  - If **reduced** grease output is required then:
    - Reduce Pump Steps setting by pressing and holding the 'less' button.
    - or
    - Increase the Wheel Count Inhibit time such that the pump will operate for a second cycle after a greater number of wheels has passed.
    - Assess Blade output and make further adjustments as necessary.

## 12.3 Measuring the Reservoir

### 12.3.1 Systems without external grease level indication

- This measurement is the only true guide to how much grease the lubricator has used since it was last visited. It is necessary to have the previous recordings of the last inspection, this will enable you to make judgements and carry out corrective action if needed without any guesswork.
- Using a flexible steel tape, insert it through the top of the reservoir, holding the tape vertical extend until the end is touching the top of the grease surface.
- Check exactly the measurement (in millimetres) from the surface to the top of the reservoir.
- Record this measurement and compare it to the data that you have brought to site.
- By subtracting the final measurement recorded from the last time the lubricator was maintained from the measurement you have recorded this time would give you the grease used in millimetres.

## 12.4 Cabinet Maintenance

- 12.4.1 The cabinet should be cleaned at each site visit and any damage to the paintwork attended to help prevent corrosion, damage could result from stone chips and general trackside activity in the vicinity.
- 12.4.2 It is important that both door locks are lubricated at each visit to ensure effective long-term operation.
- 12.4.3 Any water from rain or condensation should be removed so the inside of the cabinet is dry. In extreme environments where condensation forms then a suitable desiccant or dryer should be installed.

## 12.5 Battery Maintenance

### **Warning!**

This lubricator uses a 12V-100Ah battery which contains an acid based fluid, the electrolyte. Care must be taken to avoid the electrolyte coming in contact with the skin or clothing as the electrolyte may cause severe burns.

If the electrolyte contacts the skin wash with large quantities of clean water and seek medical advice.

### **DO NOT expose the battery to naked flames or cigarettes**

During the charging process hydrogen gasses are vented from the battery and these gasses when mixed with the air may explode if ignited.

- 12.5.1 The battery is not maintenance free and standard practices should be employed to correctly maintain by trained operatives. This test will include:

- Check battery fluid levels regularly, and top up with distilled water as necessary. Typically checks should be at two to three months intervals and this would tie in with normal lubricator maintenance schedules.

- Integrity of the battery connections should be checked, in particular the positive and negative post terminals should be cleaned and suitable anti-corrosion material applied. **WARNING: DO NOT** short circuit the battery as this may cause an explosion.
- Battery should be checked for signs of physical damage and replaced should anything be found.
- Maintenance records should include details of the battery with indelible marking of 'replace by date'.
- Batteries should be changed with new units at 2 (max 3) year intervals.

## 12.6 Solar Panel Maintenance

- 12.6.1 The panel will become dirty over time. At regular intervals to suit general environment conditions the panel should be cleaned with water and a mild detergent using a sponge or soft cloth, scrub brush or abrasive materials should not be used.
- 12.6.2 If the panel surface is physically damaged it must be replaced.
- 12.6.3 Check the mechanical integrity of the unit and its alignment.
- 12.6.4 Check electrical connections are tight and free from corrosion.

## 12.7 Cleaning the Lubricator and Surrounding Site

- 12.7.1 The lubricator and site must be cleaned so that when maintenance checks are made, you will be able to note measurements and assess the operations of the lubricator accurately and carry out the works in a cleaner and safer environment.
- 12.7.2 The whole of the lubricator must be cleaned thoroughly.
- 12.7.3 The site must be cleared of excess grease.
- 12.7.4 If oil absorbent granules are being used, the existing, soiled granules should be removed and replaced with fresh granules. This must be done with extreme caution, if the granules are allowed to get into the lubricator system via the blades, the system may become blocked.
- 12.7.5 The surrounding rail chairs and clips, all rails in the immediate vicinity and the insulator pots need to be cleaned. 3rd and 4th rail are needed to be cleaned to ensure they are free of grease and dirt, this is to avoid causing a fire risk and hazardous under footing.

**Note: Do not attempt to clean live traction current rails with the current switched on.**

## 12.8 Checking for Leaks

- 12.8.1 The lubricator should be checked for leaks. With some leaks it will be necessary to take the leak into consideration in regards to the grease output that you have noted.
- 12.8.2 Leaks on the primary side (i.e. within the cabinet) of the lubricator will cause an increase in grease output that is not due to the settings of the lubricator.
- 12.8.3 Tighten any hose clips or nuts / bolts / screws that maybe the cause of the leak and / or replace the faulty part that is causing the leak.

## 12.9 Measuring / Testing the Wheel sensor

- 12.9.1 The sensor height to be measured is the vertical distance between the top of the green sensor body, and the top of the crown of the rail.
- 12.9.2 The sensor height should be 42 to 45mm.
- 12.9.3 If the lubricator has not used the amount of grease that is required for this lubricator since the last time that it was maintained.
- Check that the sensor heights are the same as when the lubricator was last maintained.
  - You may find that the sensor height has changed due to loose bolts on the mounting bracket causing the assembly unit to move, check the bolts and tighten if necessary. If necessary reset the heights once all other checks have been carried out.
  - If the sensor height has been reset on this visit record the new heights.
- 12.9.4 Check the sensor is operating:
- With the Control Panel powered, a 'green' LED will be visible at one end of the wheel sensor (opposite end to cable entry). If the lamp is not illuminated there is no power to the sensor and the cause should be investigated.
  - With the Control Panel powered, move a solid metallic ferrous object (i.e. 2lb Ball Pein hammer) over the sensor. The second indicating LED should illuminate 'yellow' to show the sensor has detected the object.
  - Repeat the test with a person viewing the red sensor-indicating lamp on the Control Panel. The lamp should illuminate when the sensor is activated.

## 12.10 Adjusting / Replacing Pump Sensor

- The pump sensor is located on the side plate of the grease gear pump. It is identified by the grey wire and the two M8 lock nuts.
- To remove the sensor undo the two M8 lock nuts and unbolt the sensor from the grease pump side plate.
- Ensure no debris enters the pump sensor port whilst the sensor is removed.
- To install a new sensor, first check that there is no dirt in the threads and that the sensor threads are also clear of debris. Screw the sensor body into the grease pump side plate by hand. The sensor will go in until there is only 8~10 mm (5/16~3/8") of the sensor body showing. It is screwed in until the end of the sensor touches the gear inside the pump body. When screwing the sensor into the pump side plate take extra care not to force the sensor, but make sure it does just touch the gear inside the pump. Thread the two lock nuts onto the wire and screw onto the rear of the sensor. DO NOT tighten at this stage.
- With the sensor touching the gear in the pump, UNSCREW the sensor ½~¾ of a turn and lock in-place with the two M8 nuts.
- This provides the necessary running clearance for the sensor.
- To test: Connect the pump sensor and the motor to a control box connected to a 12V battery (as per the wiring diagram).

- Switch on the control box and press the pump run button for 1 second. Check that the LED in the end of the pump sensor “flashes” when the motor runs.

### 12.11 Checking for Airlocks

12.11.1 The following shows steps taken to check for airlocks.

- Remove both delivery hoses from the cabinet hose outlet. Operate the Run button on the control panel and check grease flows freely from each outlet.
- Remove delivery hoses from the Blade’s. Operate the Run button on the control panel and check grease flows freely from each outlet.

**Note:**

- If the test was not satisfactory:
  - Check the reservoir is full of grease.
  - Clear the block within the grease path.
  - Operate the Pump by activating the ‘Run’ button.

**Do not run for more than 10 seconds with a 30 second interval between operations.**

12.11.2 Air locks that are present on arrival at the lubricator will give you certain information into why the lubricator has not had a sufficient grease output.

12.11.3 If the lubricator has not used any grease, but no air locks are present other corrective actions should be undertaken.

### 12.12 Inspection of the Blade’s

12.12.1 Visually check the Blade’s for damage and / or wear. Record and report findings.

12.12.2 Check that each port is clear and that there is a vertical stand of grease from each running rail blade.

12.12.3 Check blade height with reference to initial installation height settings.

12.12.4 Check that the fastenings are secure.

12.12.5 Operate the pump from the Test button and ensure all of the ports on the top face of the spreader bar are dispersing grease. This will show if there is hardened grease, inside the blade and/or if the blade slots are blocked.

12.12.6 If the blade is partially blocked:

- For each delivery hose run, close flow valves on all blades other than the blade to be worked on (note: on two blade systems there are no flow valves).
- Cover each working port while operating the pump, this should clear minor blocks.
- If blockage persists then strip and clean the blade.

12.12.7 If the blades are fully blocked then remove, strip and clean.

12.12.8 Record your findings and any works carried out.

### 12.13 Filling the Reservoir

Refer to Section 11.1.

### 12.14 Maintenance Frequency

Maintenance is recommended at 8 week intervals. This period could be extended or shortened depending on customer preferences and train activity.

### 12.15 Periodic Replacement of Components

It is recommended that various system items are replaced periodically; exchange will be dependent on traffic frequency and should be monitored during maintenance visits, but as a minimum should include the following.

Item	Exchange Frequency
Battery	2 years
Control Box	5 years
Fasteners	5 years
Blade and pump Hose	2 years
Wheel sensor	3 years

12.16 Maintenance Log Sheet Example

Whitmore Rail Electro Lubricator Maintenance Log Sheet								
Maintained By	Maintainers Name	Maintain Date	Lubricator No.					
Lub' Manufacturer	W' Rail		Mileage					
Pump Model		Serial	ELR					
			Road					
			Rail Type					
GDU / Blade Config	2 - 4 - 8	Power Source	Solar	Wind	Mains	Battery		
Special Product Notes								
1. Reservoir Capacity		Initial 0 - ¼ - ½ - ¾ - full		Final 0 - ¼ - ½ - ¾ - full				
2. Grease Integrity / Leakage		Comments on leakage						
2.1 Pump	Yes / No							
2.2 Reservoir	Yes / No							
2.3 Hoses	Yes / No							
2.4 Blades	Yes / No							
3. Wheel sensor:		Initial Height	mm	Final Height	mm			
3.1 Sensor LED test			PASS / FAIL					
3.2 Control panel sensor indicating lamp			PASS / FAIL					
4. Battery charger unit panel								
4.1 Battery volts	Volts		n/a	Comment				
4.2 Wind turbine volts	Volts		n/a	Comment				
4.3 Solar panel volts	Volts		n/a	Comment				
5. Solar panel condition	PASS / FAIL	Panel Cleaned Yes / No	6. Wind turbine operation	PASS / FAIL	7. Mains charger	PASS / FAIL		
If failed, action taken	n/a		n/a	n/a	n/a	n/a		
8. Pump settings		Initial		Final				
8.1 Wheel Inhibit								
8.2 Pump Steps								
8.3 Total wheel count reading								
8.4 Total pump steps reading								
9. Pump:								
9.1 Operation Test			PASS / FAIL					
If above test failed, action taken								
9.2 Airlocks			PASS / FAIL					
If above test failed, action taken								
10. Blade height.	1	2	3	4	5	6	7	8
Initial								
Final								
		LH Rail / Running-on			RH Rail / Running-off			
9.1 Visual check			PASS / FAIL			PASS / FAIL		
9.2 Pumped through GDUs			PASS / FAIL			PASS / FAIL		
9.3 Removed & cleaned plates			YES / NO			YES / NO		
9.4 Fitted new plates			YES / NO			YES / NO		
11. Grease distribution through curve								
11.1 Over rail head			YES / NO					
11.2 If yes, number of sleepers								
11.3 Grease distribution			¼ - ½ - ¾ - Full Curve			PASS / FAIL		
11.4 Total Miles Covered			Miles					
If any part of section 10 has failed what action, if necessary, was taken								
12. Lubricator fastenings check		YES / NO						
WORK / GENERAL		Enviromental/Waste			Spares Required			
		Any waste including packing and empty grease tubs handed over to Client for appropriate disposal						
Post Install site accepted by:								
Customer		Name		Date				

## **13 Parts List**

Contact Whitmore Rail for advice / availability.

## **14 Basic Installation Tool Kit**

A selection of hand tools are suggested to correctly fit and maintain the pumps, specific recommended Whitmore Rail products are referenced above.

Ratchet Handle 1/2" Drive  
 Combination Spanner 24mm  
 Combination Spanner 19mm  
 Combination Spanner 17mm  
 Combination Spanner 13mm  
 Combination Spanner 10mm  
 Nut Spinner 7mm  
 Socket 13mm 1/2" drive  
 Socket 17mm 1/2" drive  
 Socket 19mm 1/2" drive  
 Socket 24mm 1/2" drive  
 1lb Ball Pein Hammer  
 Side Cutter  
 Spirit Level with Adjustable Level Angles  
 Junior Hacksaw and Blades  
 Screwdriver 6" x 1/4" flat blade, flared tip  
 Screwdriver Pozidrive No. 0, 1 & 2  
 Terminal Screwdriver  
 Cordless Drill  
 8mm Drill Bit

# Schematic of Solar & Wind Powered Electro 10 Electric Rail Lubricator (ex blades, hoses & fittings)

LCS103-12 0057/051952

**LCS205-02**  
0057/051973  
Wind Generator

**LCS205-01**  
0057/051972  
30W Solar Panel

**LCS105-12**  
0057/051968  
Upper 1.1m Mast Section

**LCS205-27**  
0057/055190  
Mast and Fittings

**LCS205-03**  
0057/051974  
Battery charger Solar/Wind

**LCS205-39**  
0057/055200  
Cabinet door & locks

**LCS205-11**  
0057/051982  
Battery assembly

**LCS205-16**  
0057/055077  
Graffiti/Vandalism Cover

**LCS205-51**  
0057/055309  
Cabinet Hinged Lid

**LCS205-34**  
0057/055197  
Cabinet Filling Lid Lock Plate

**LCS205-43**  
0057/055204  
Control Panel Fascia with Back Light

**LCS205-04**  
0057/051975  
Pump control unit

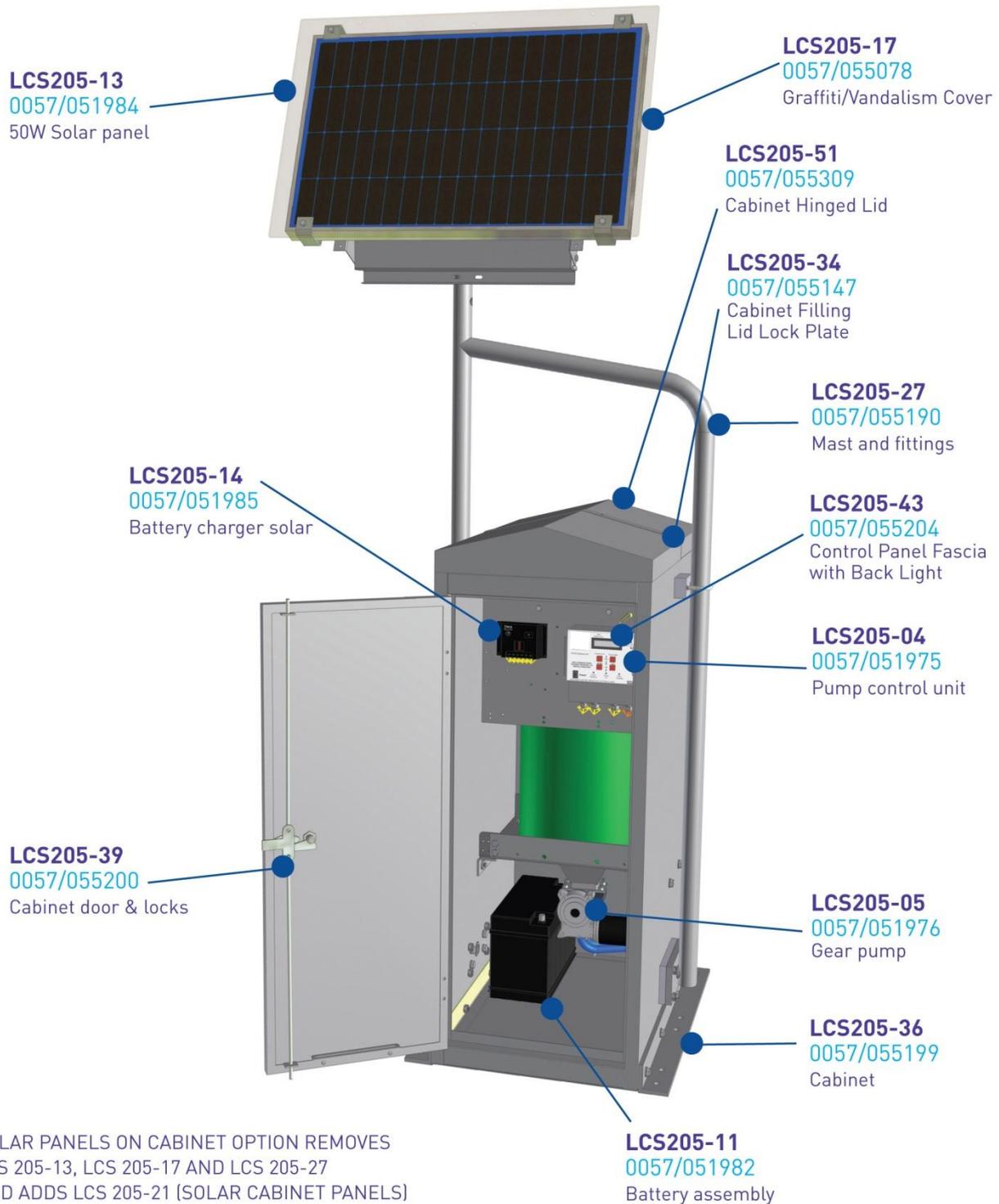
**LCS205-05**  
0057/051976  
Gear pump

**LCS205-36**  
0057/055199  
Cabinet



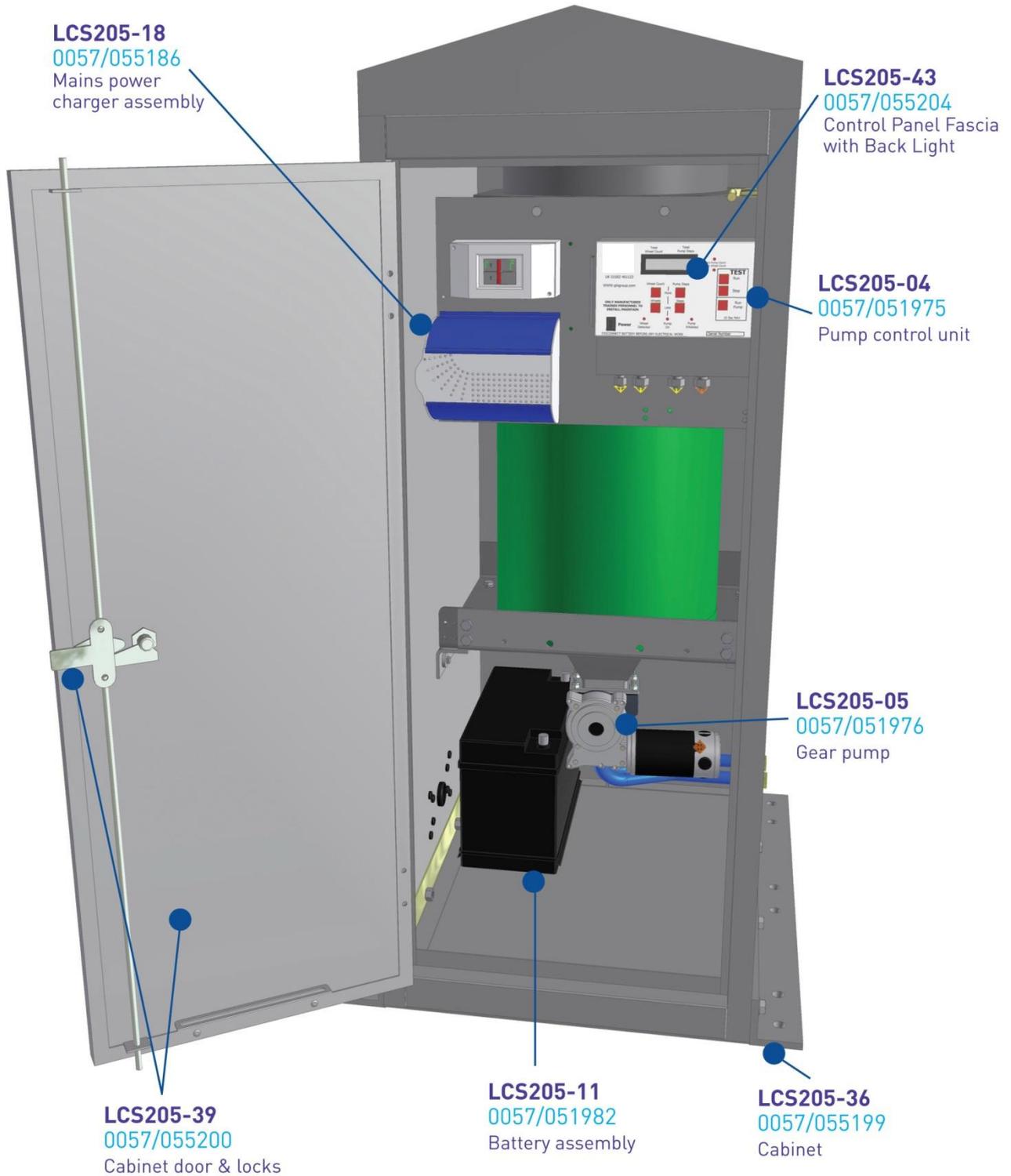
# Schematic of Solar Powered Electro 10 Electric Rail Lubricator (ex blades, hoses & fittings)

LCS103-11 0057/051951

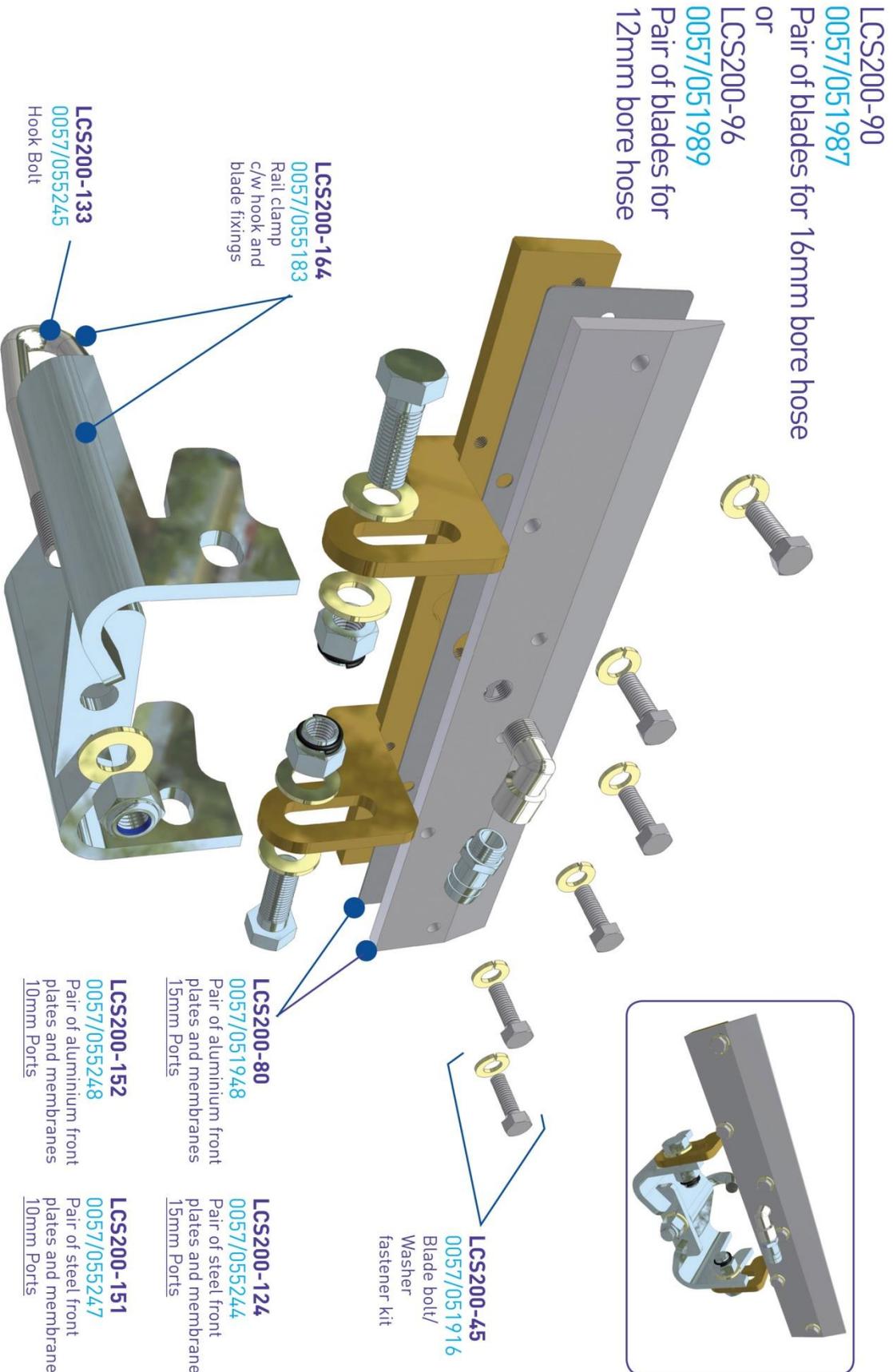


# Schematic of Mains Powered Electro 10 Electric Rail Lubricator (ex blades, hoses & fittings)

LCS103-13 0057/051953



# Schematic of EasiBlade for rail 113, UIC54, UIC56, UIC60



# 60cm EasiBlade Complete blade (trough and infill option)

Suits 113, UIC54, UIC56, UIC60 rails

LCS200-206  
16mm hose

LCS200-218  
12mm hose

LCS200-200  
Grease trough  
and fixings  
(Pair)

LCS200-198  
Steel blade front with 16  
narrow (10mm) port front  
plate and membrane (Pair)

LCS200-195  
Grease trough and  
infill and fixings

LCS200-207  
Blade membrane

LCS200-224  
Backplate for 113,  
BV50, UIC54, UIC56,  
UIC60 rails (Pair)

LCS200-223  
W rail clamp kit for 113, BV50, UIC54,  
UIC56, UIC60 rails

LCS200-133  
0057/055245  
Standard rail clamp hook



# EasiSensor – Track sensor 4'

LCS205-06 0057/051977

Lubricurve Electro 10/20/30

Track mounted wheel sensor system

Suits 109, 110, 113, UIC54, UIC56,

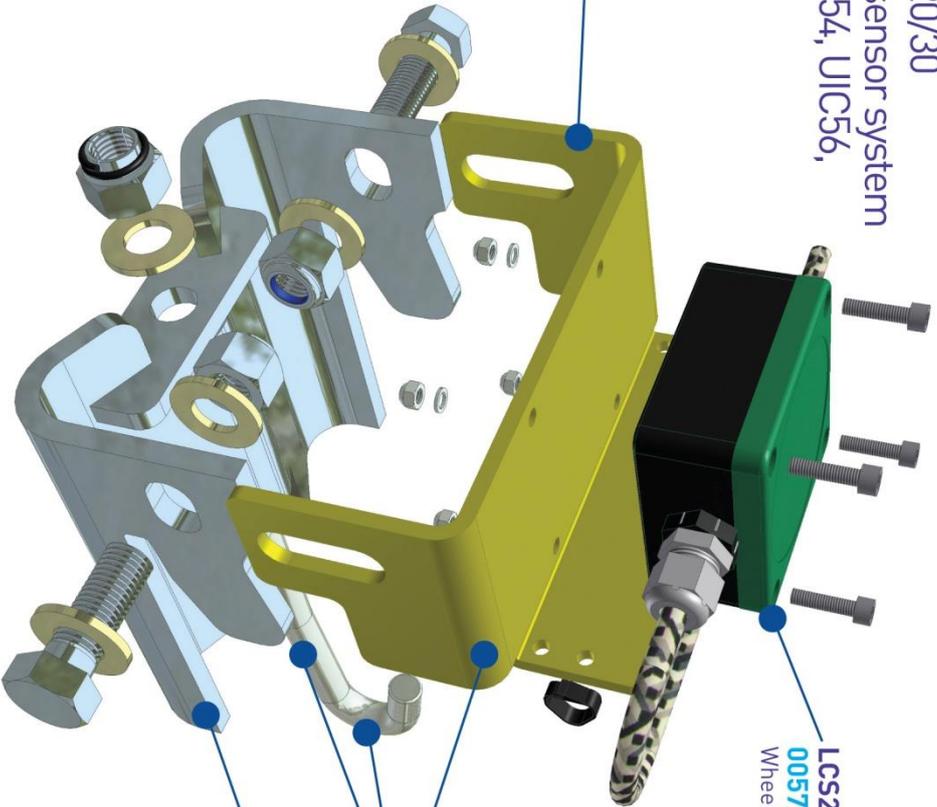
UIC60 rail

LCS205-15  
0057/051992  
Wheel sensor

LCS205-62  
0057/055313  
Upper track mounted wheel sensor  
bracket suits 109, 110, 113, UIC54,  
UIC56, BV50, UIC60 rail

LCS205-52  
0057/055297  
Track mounted wheel sensor brackets  
suits 109, 110, 113, UIC54, BV50, UIC60 rail

LCS200-133  
0057/055245  
Hook bolt





## EC Declaration of Conformity

In accordance with EN ISO 17050-1:2004

**We** Whitmore Europe Limited

**of** City Park  
Watchmead  
Welwyn Garden City  
Hertfordshire AL7 1LT

*in accordance with the following Directive(s):*

2006/42/EC The Machinery Directive

2004/108/EC The Electromagnetic Compatibility Directive

*Hereby declare that:*

**Equipment** Electro 5, 6, 10, 15, 20 & 30, Track Mounted, Electrical, Rail & Wheel Flange Lubricator System

**Model number** LCS103, 105, 108, 110, 113, 115, 120, 121, 205, 206, 210, 211, 212, 213 Series Lubricators and accessories.

*is in conformity with the applicable requirements of the following documents*

Ref. No.	Title	Edition/date
ISO 9001	Quality Management System Requirements	2008
ISO 14001	Environmental Management System	2004

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications and is in accordance with the requirements of the Directive providing the Lubricator has been installed in accordance with Whitmore Europe's Installation & Maintenance Manual

**Signed by:**

**Name:** Craig Foster

**Position:** Managing Director

Whitmore Europe Ltd., Welwyn Garden City AL7 1LT

**On** 5<sup>th</sup> February 2017

The technical documentation for the machinery is available from:

**Name:** Operations Director

**Address:** Whitmore Europe Ltd., Welwyn Garden City AL7 1LT

01707 379870 info-UK@whitmores.com www.whitmores.com  
City Park Watchmead Welwyn Garden City Hertfordshire AL7 1LT United Kingdom  
An ISO 9001 and ISO 14001 registered company registration no. 7678917

01707 379870 info-UK@whitmores.com www.whitmores.com  
City Park Watchmead Welwyn Garden City Hertfordshire AL7 1LT United Kingdom  
An ISO 9001 and ISO 14001 registered company registration no. 7678917