Ride on Railways Ltd

Merlod
Locomotive



A 7 ¼” Gauge Industrial Locomotive.

OWNERS MANUAL

A large electric locomotive taking its inspiration from industrial battery locomotives. Merlod is Welsh for “Pony” with reference to pit ponies that worked in South Wales until 1999.

Dimensions

Total Length	1.4m
Width	0.45m
Height of loco	0.66m – rail to top of handle
Weight of loco	140kg – excluding batteries
Wheel base of loco	550mm
Wheel diameter	200mm (over flange) – EN8 steel
Axles	25mm diameter EN1A steel with 8mm key way slot
Bearings	UCT 204 self-aligning bearings



Control and Power

Motors	2 no.
Power	DC Geared Motor as follows: Motor Type: Brushed DC, 24V. Rated power: 525w S25 duty cycle – 1.5hp peak input per motor. Protection: IP40.
Transmission	Gearbox: Worm, 050 rectangular. Output: 400 rpm. Output shaft: 25.0mm diameter hollow. Low backlash allowing for free wheeling 8mm keyway
Motor Controller	Idrive – Penny and Giles Drive Technology (now t/a Curtiss Wright) 24v 180amp continuous

- Set for responsive acceleration/deceleration. (2 second ramp)
- Character switch Speed limit switch programmed to provide 60% power.
- Progressive regenerative braking – quicker you reduce power harder the braking.
- On board fault logs and traction use timer (used by us when docked with pc)

Connections

- Power 6mm ring terminals
- Control 14 pin minifit jnr connector
- Aux 1 - 2 pin minifit jnr connector

Batteries	2 x 110 ah lead acid batteries or 4 x 85ah
Wiring	Battery leads 10mm^2 Motor connections 10mm^2 Control wire 16/0.2mm Accessories – 1mm^2
Interface	• Brass tram controller moving 5k potentiometer • Brass reverse lever • Plug in Deadman's pedal – inhibit drive (1 second delay upon release) • Toggle switches for accessories • 4 port 3 position air valve – Apply, hold release.
Mechanical Brakes	Brake operated by electric actuator which is automatically controlled by the idrive. See below for override release.



Brake relay – Move green lever to vertical position, with the power on, to override and leave the parking brake in released position.

Materials

All parts of the chassis and body work are constructed from laser cut steel parts. Chassis' 5mm steel with additional stiffeners and cross supports. Deck is 3mm steel with the body work being a combination of 2 and 3mm steel parts.

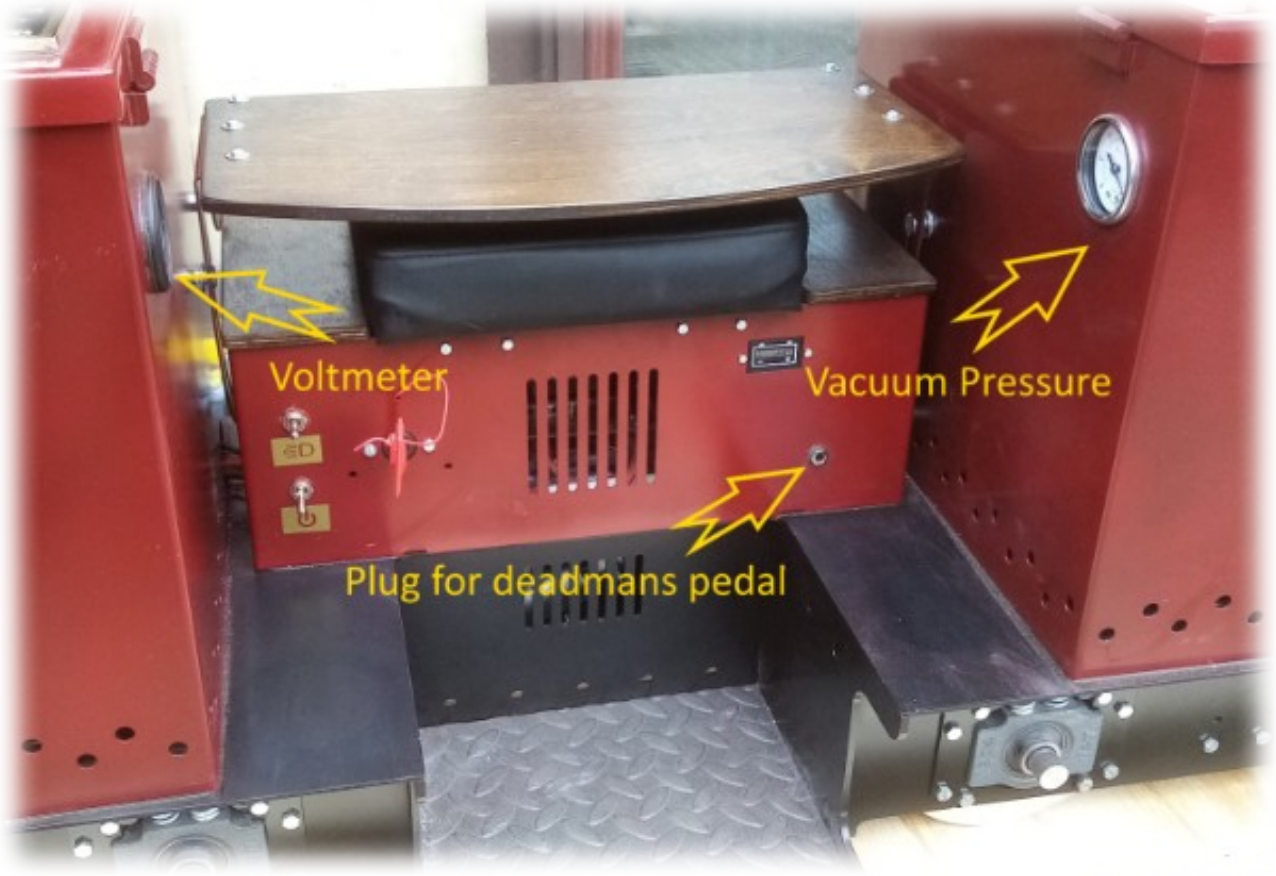
Seat back and side panels – 9mm birch plywood

Finishes

- 2 layers of Etchweld primer
- spray painted acrylic paint
    - 1 x white primer
    - 1 x grey primer
    - 1 x red primer
    - 2+ x maroon gloss for body work
    - 2 x black for chassis

Top lids have been baked under heat lamp and polished off to avoid damage in use.

All other paint is likely to contain solvent and will remain soft for several months.



Seat back and sides – Danish Oil dark oak.
Brass plates – polyester powder coat – does not react with metal polishes.

Running Notes

- Before running, -
    - Make sure the charger is unplugged and the mains lead carefully tucked up inside the battery box
    - Ensure the deadmans peddle is plugged in and in use.
    - Ensure drivers control handle is at min and direction knob in the off poistion
- If the Truecharge meter strobes up and down it means it has inhibited drive as the throttle handle is not at zero.
- There may be a delay when first switching on as the iDrive unit performs self-diagnostic checks – indicated by a pulsing red light for a second or two.
- If you are running with vacuum braked coaching stock, wait until the vacuum pump stops continuous running and gauge shows 16” hg.
- Slow acceleration and lower speeds will extend battery life.
- Merlod locomotives appreciate applying power slowly to the motors and working up the throttle rather than applying full power straight away.

Regenerative Braking

- Regenerative braking is when the motors are used to generate electricity, which is then put back into the batteries. For short light weight trains, the power saving advantage is minimal but having a loco which will bring a loaded train to a halt is a great advantage.
- The braking is so effective that on hard braking you may even get wheel slippage on the engine.
- Braking is progressive –

“the faster you shut the controller down the harder the braking will be”

- The controller also has an emergency stop feature which means at full shut down the controller will put power to the motors to achieve maximum braking. Try to avoid unless necessary.
- Aggressive braking will increase wear.

PLEASE NOTE

- The loco should never be left unattended unless it is turned off and isolator key removed
- If left on and not used, the iDrive will go in to sleep mode after 20 minutes. To wake up turn the loco off and on again.

SAFETY

- The locomotive has been supplied with an optional Deadman's pedal. This plugs in to a socket on the front of the seat box. This will inhibit the loco from driving until the pedal has been pressed. When released there is a 1 second delay before power is cut.
- The pedal is optional but as the manufacturer we have to recommend that this is used at all times.

If you struggle with the footswitch the using the 6.35mm audio socket alternative devices can be made, such as a seat switch. Just close the circuit to inhibit drive.

FAULT FINDING

Symptom	Possible Causes
No Power – no lights on True Charge	o Check batteries are charged o Check battery connections + isolator is in the correct position o Check ignition switch is on o Check all the battery leads, controller connections
True Charge meter lights up but no power to motors	o Check wire connections – see wiring diagram
TrueCharge meter just flashes	o See fault code chart. Take note of the number of leds that are flashing. o Switch off by ignition switch for 30 seconds before switching on o If possible, rectify fault shown on chart
TrueCharge doesn't show green lights	o The TrueCharge Meter reads the voltage from the batteries. Some batteries can give a slightly lower voltage and yet still provide the capacity required.
Engine seems to be losing power	o Check to see if Truecharge Meter/ voltmeter drops when power applied. If yes - could be failing batteries or loose connection o Grease on track. This will affect acceleration and regenerative braking. This is more common than you may think. Clean track and wheels to cure.
Strange whirring sounds coming from under loco	o STOP IMMEDIATELY. Check for trapped debris
Acceleration and deceleration is "lumpy"	o This could be a symptom of a faulty or failing potentiometer drivers handle. Replace the 5k linear potentiometer if in doubt. o Grease on the track – clean track
Electrical smell coming from the engine	o Switch off the power immediately by the battery isolator switch. o Investigate using smell and touch for hot wires and components. Report back to RoR o The controller is rated for 180amp continuous running but has been restricted to 180amp boost and 140amp continuous. Do not overload the loco as it can result in damaging the motor wires and overheating of the motors. If in doubt check motor temperature regularly by reaching under the loco and feeling the

	motors.

Batteries



- **Do not run the batteries below their stated 50% capacity**.

- Plug the charger in at any opportunity you can. Even on running days, plug it in when in the station area. Doing so will prolong the life of batteries and should see you get in excess of the 50 running days you may otherwise achieve.

- The loco has been fitted with a high-quality charger. It is designed to charge the batteries and switch to top up/trickle charge mode once charged. There shouldn't be any issues with leaving the loco on charge full time. If the batteries are known to be fully charged, then it can be unplugged and just topped up before running.

- The iDrive unit has been programmed to protect the batteries from being excessively drained. If it detects the voltage dropping below **22.8v** for more than **20** seconds, it will inhibit drive and flash up 1 red led on the truecharge meter. Do not continue to use batteries which continually trips the unit out with low voltage.
- Single flashing LED can also indicate bad battery connection.

- Wet cell batteries should always have the lead plates covered in electrolyte. If exposed, then top up with distilled/ deionised water. Only top up when fully charged. Low electrolyte can allow the build-up of hydrogen gas and the high risk of an explosion.

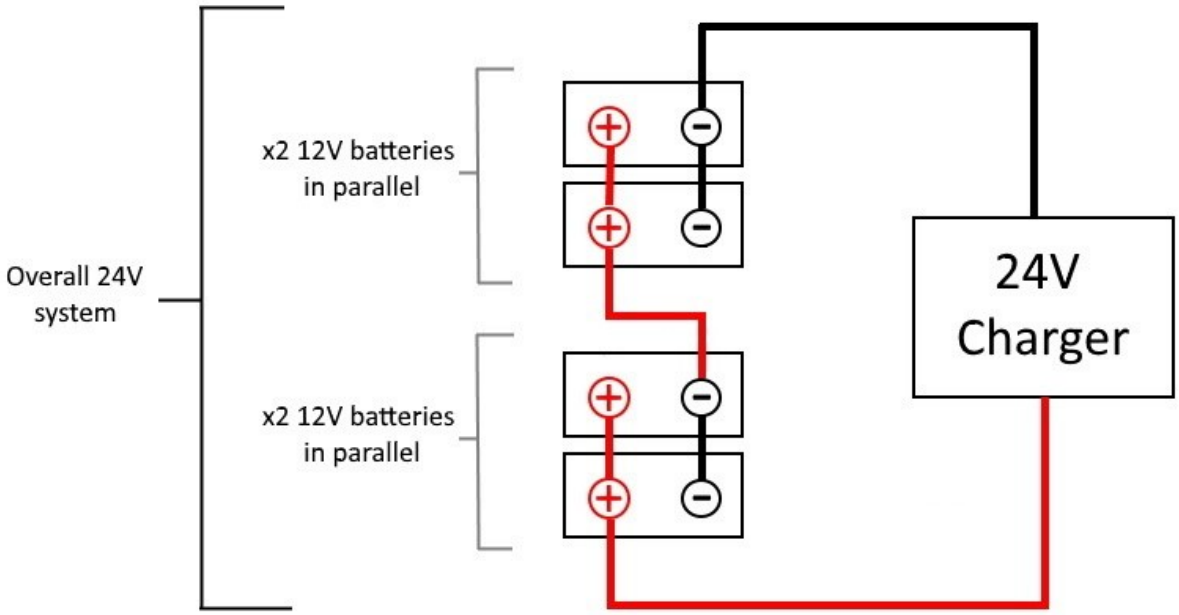
- Batteries will generally lose 2-3% charge a month when left.

- If the loco is to be left off charge for prolonged periods of time, please unplug the charger from the batteries as some chargers can draw a slight current.

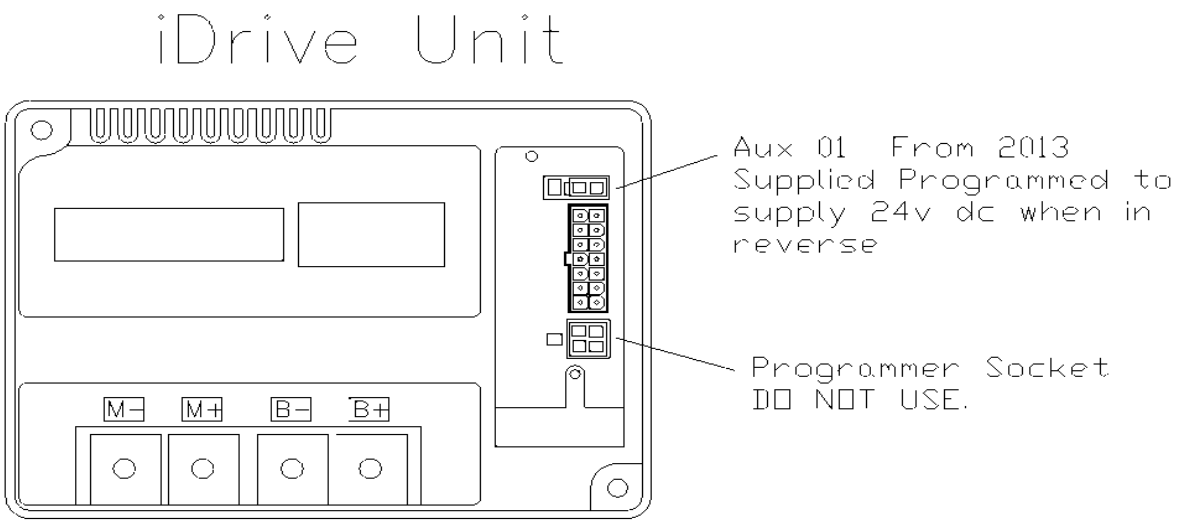
  Rough guide of the correlation between voltage and capacity.

24 Volt Lead Acid Battery State of Charge	
Level	Voltage
100%	26.00 Volts
90%	25.55 Volts
80%	25.00 Volts
70%	24.60 Volts
60%	24.30 Volts
50%	24.10 Volts
40%	23.90 Volts
30%	23.62 Volts
20%	23.32 Volts
10%	23.02 Volts
0%	21.00 Volts

Batteries are put in pairs ad wired as below to ensure equal balance of the sets.



iDrive Unit (motor control unit)



The idrive unit has been programmed by Ride on Railways. The unit is factory sealed and contains no user serviceable parts. Do not open the unit as it will invalidate the manufacturer guarantee and may affect how the company deals with a repair.

The Truecharge Meter not only acts as a basic battery condition meter but a fault reporter. If the unit flashes up a code, please use the chart below to identify the fault. If the unit is flashing and the engine does not power up, take note of the fault before switching off the ignition switch. If the unit fails to reset, please contact Ride on Railways.

Do not worry if you do not get all the green lights lit up on the meter. Its meter is only a basic guide to battery condition and works on the assumption that when batteries are running low the voltage drops. Some batteries can give out a slightly lower voltage yet still have good capacity.

If in doubt check batteries with a load bank tester.

Truecharge Meter Readings



The meter can show potential issues through the battery condition meter. It does this by flipping into fault reporting mode and flashing up a certain number of led's.

To switch back to battery condition, switch the controller off and back on. If the fault flashes again further action should be taken to sort out the fault.

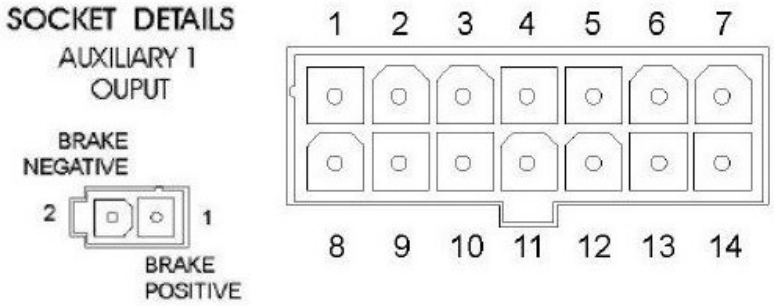
1 Bar	The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, try charging the battery.
2 Bar	There is a bad connection to the motor. Check all connections between the motor and the controller.
3 Bar	The motor has a short circuit to a battery connection. Contact your service agent.
4 Bar	Not used.
5 Bar	Not used.
6 Bar	The controller is being inhibited from driving.
7 Bar	A throttle fault is indicated. Make sure that the throttle is in the rest position before switching on the machine.
8 Bar	A controller fault is indicated. Make sure that all connections are secure.
9 Bar	The parking brakes have a bad connection. Check the parking brake and motor connections. Make sure the controller connections are secure.
10 Bar	An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check the battery connections.

If the lights are lighting up and down in sequence it means the regulator is not in the shut position (safety lock out to avoid runaways). Return to shut position to start.

Control Wiring

KEY CONTROL WIRES – do not modify or splice in under any circumstances.

- Pins 12 & 13 – Black and grey – reversing switch
- Pins 8, 1 & 2 – Green, Blue and Yellow – Speed potentiometer
- Pins 4 and 13 – Black and Purple – Character/governor
- Pins 5 and 7 – Ignition switch



Pin Number	Description	
1	Throttle Wiper	BLUE
2	Throttle High Reference	YELLOW
3	Auxiliary 2 Output	BROWN
4	Slow/Fast Switch	PURPLE
5	On/Off Switch	WHITE
6		
7		RED
8	Throttle Low Reference	GREEN
9	Speed Limiting Potentiometer Wiper / Belly Button Input	
10	Status Indicator	YELLOW
11	Auxiliary 3 Output	
12	Reverse Switch	GREY
13	0V	BLACK
14	Inhibit 2 / Tiller Switch* + 13 = Deadmans	

Maintenance and Servicing

- If the loco is to be pushed or towed, please make sure the main battery isolator is switched on. Do not tow faster than 10mph otherwise the regenerative braking will kick in.
- Deep cycling leisure batteries will severely reduce the number of recharging cycles to be expected from the batteries.

Before Running

- Visually inspect for any loose parts
- Roll loco by hand with ignition off to ensure the loco freely runs.

Ever 6-8 running days

- Spray oil to the axle keeps where the take up bearings slide
- Roll engine by hand and listen for any irregular noises or lumpy rolling

Once a season

- Remove and check all battery terminals for scaling – clean as necessary
- Inspect wheel sets for damage and axle box grub screws are tight on to axle
- Visual check on all nut and bolts for missing or loose components.
- Physically check all cabling for damage, fraying or signs of overheating.

As Required

- Touch up any chipped paint to avoid moisture ingression.
- Investigate any strange noises or electrical smells - if in doubt turn it off.

Spares

- Tram lamps - Barthelme 00112404 Small Filament Lamp E14 24V 4W Base: E14 Clear
- Fuses are standard car fuses – replace like for like.

Should you have any queries or questions then please do get in touch.

Paul Middleton
Mob 07757 321851
paul@rideonrailways.co.uk

Formal inspection checklists, inspection records and service history are maintained separately in RailStock. This manual does not replace those records.