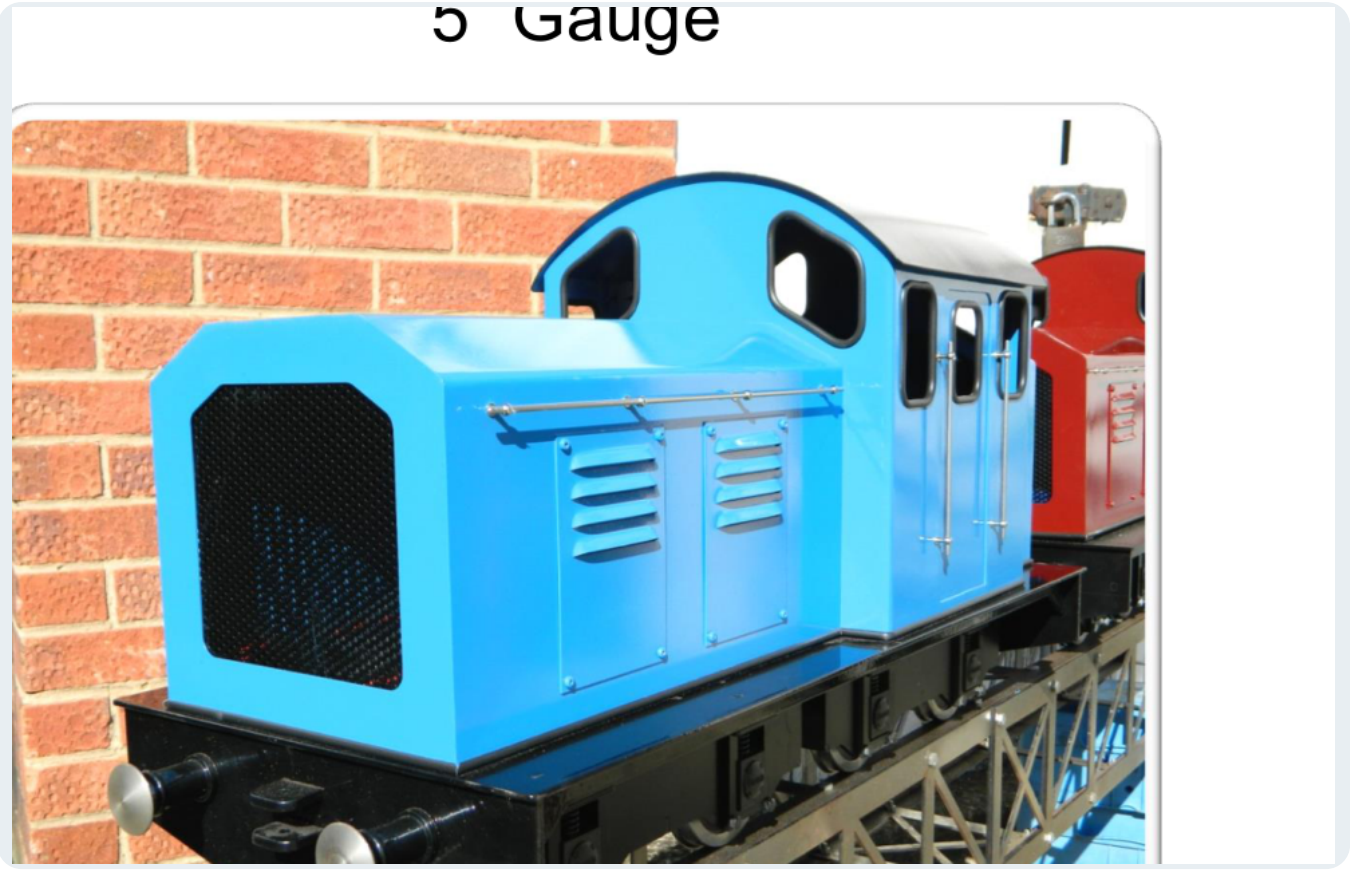
RIDE ON RAILWAYS LTD

HERCULES

Battery Electric Locomotive



OPERATING & MAINTENANCE MANUAL

Operation | Safety | Maintenance | Fault Finding | Wiring

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Forward

Thank you for purchasing a Hercules locomotive.

I have written these notes so hopefully you will have safe and trouble free running.

Suggestions like “make sure the nuts are on the bogies before lifting the chassis” is not just waffle. I know from experience because if they aren’t on and you lift the chassis the bogies drop off and on to your foot (which is why I wear toe cap boots). Now you know I hope you won’t make that mistake.

If you are unsure of any advice given in this leaflet please get in touch with Ride on Railways. Similarly if you feel we have left anything out then please let us know.

Happy running

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IMPORTANT SAFETY INSTRUCTIONS!

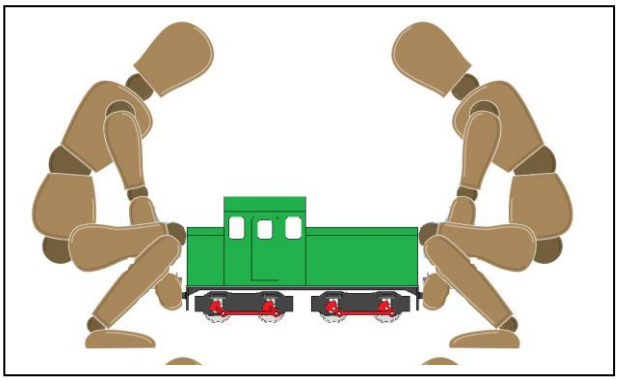
The warnings, cautions and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that COMMON SENSE AND CAUTION ARE FACTORS WHICH CANNOT BE BUILT INTO THIS PRODUCT, BUT MUST BE SUPPLIED BY THE OPERATOR.

PLEASE REMEMBER:

THIS LOCO IS DESIGNED TO BE TAKEN TO PIECES TO MOVE. ENSURE THE NUTS ARE FITTED TO THE BOGIES IF LIFTING IN ONE PIECE.

- Try to avoid lifting. If there is no alternative please lift the engine in component parts. Do not lift with batteries fitted.
- The chassis with bogies fitted is a two person lift. At 35kg lifting the chassis incorrectly may result in injury.

The chassis is a heavy item so a good lifting and manual handling technique is essential. If you are unsure The Health and Safety Executive produce good clear advice which is available for free from their website.



- Lift the chassis by the buffer shanks or by the buffer beam ends and deck. Do not lift by the buffer heads. PLAN YOUR LIFT.
- Do not roll the engine on concrete or other hard surfaces. Damage to the flanges can severely affect the performance and may damage track.
- Always buy batteries with lifting handles. Type 063 round post terminals are recommended.
- A “Traveller Hercules” has been designed to help with handling issues by allowing the engine to be broken down in to packages weighing less than 12kg.

<u>Before Use please check</u> –

- The battery leads should be tied to the chassis so the batteries can only be connected in the correct way.
- Use quick release connectors to avoid tools shorting out while connecting leads.
- Ensure the battery isolator is switched off before connecting batteries.
- The deadmans button on the controller clicks when pressed and again when released.
- Check for damaged cables – battery and control wires.

OPERATION



1. Plug in hand controller and turned control knob to off (fully anticlockwise).
2. Turn the battery isolator switch key clockwise to turn the power on.
3. Flip the top toggle switch on (below the battery isolator). This is the ignition switch.
4. The Truecharge Meter should flash as it checks the system before displaying the battery condition.
5. The engine has been fitted with a speed governor (lower toggle switch) which restricts the loco to 50% power/top speed. It is recommended that you leave the governor on until you are familiar with the performance of the engine.

6. To drive, click in the deadmans button and slowly turn the control knob clockwise. The faster you turn it down the harder the regenerative braking will be applied. There is no coast setting just keep the power applied.
7. Avoid driving by clicking the deadmans on and off (favourite with small children).
8. If in doubt let go of the deadmans button.
9. If towing the loco please ensure the power is turned off by the battery isolator switch and do not tow faster than 5mph.

TO AVOID RISK OF PERSONAL INJURY AND EQUIPMENT DAMAGE:

- Do not speed. These locos are capable of speeds of over 10mph. Serious injury can occur from inappropriate speeding.
- Ensure any coupling pin passes through the coupling by at least ¾" - 1" (18 – 25mm). If coupling to rolling stock with an excessively different height coupling use a pin which has a system in place to stop it being lifted out. An "R" clip or a bolt with a nyloc nut are two methods.
- Regenerative braking is very effective but does not work when the engine is stationary or on wet/greasy track. It cannot replace the need for train brakes especially if you intend to pull large loads.
- Drivers should be familiar with the locomotive and its performance before carrying passengers. Drivers should be judged by their skill and ability rather than age. Insurance and club policies will have their own criteria which should be followed.
- DO NOT disable the deadmans switch without first finding a safe alternative. A run away uncontrolled engine is incredibly dangerous. Link driving truck and loco with chains if the deadmans button is to be disabled.
- Keep fingers, toes, body parts, loose clothing etc away from moving parts and wheel sets.
- We do not make any minimum age recommendation for driving as it should be done on ability. That said beware that children under 8 are more likely have trouble at judging the speed of moving vehicles.

Care and Maintenance

For your own safety, checks and maintenance should be performed regularly.

Bodywork –

- The body work should require little or no maintenance.
- In line with traditional practice a wipe over with an oily rag should keep the body in a presentable condition.
- Any chips in the paint work should be sealed with a suitable acrylic paint.
- Do not use solvents to clean as it may damage the paint.

Chassis –

- Regularly wipe the exposed paint work of the top deck with an oily cloth or wax furniture polish. Not only will this help protect the paint it will help stop the rubber body trim sticking to the deck.
- If you have metal buttons or belt buckle take care not to scratch the chassis when lifting.

Every 5-10 uses –

- lightly oil the delrin gears on the bogies using a light thin oil. In dusty conditions increase the frequency of oiling
- If cranked version oil the axles between the cranks and the axle box. Also oil the cranks.
- Check battery leads and control leads for mechanical damage
- Check all bolts are all in place.
- Meshing of the gears. The metal spur gear should be able to move very slightly without moving the delrin gear. A thin piece of paper wound between the gears should see the gears lock together. Adjust the meshing if the gears are too loose.

Every 20-30 Outings or yearly

- Grease the rubbing plates between the bogies and chassis. This requires taking the bogie bolts off and lifting the chassis to allow access underneath
- All electrical connections for tightness. Tighten where necessary.
- Using an 8mm spanner check the tightness of the motor mount bolts. The top bolt may require the bogies to be dropped.
- Oil the iolite bushes on the motor mounts

Transportation

Transportation is often overlooked and yet has potentially the highest risk to users.

1. The locomotive should always be secured in transit. In many countries it is a legal requirement. Ideally all heavy objects should be separated from passenger –i.e. behind the steel bulkhead of the rear seats.
2. Wet cell batteries should be tied down to avoid acid spillage. Any wet on the batteries should be wiped with a disposable cloth. If it comes in to contact with skin or clothing wash immediately with plenty of clean water.
3. Avoid reaching in to cars with heavy loads. Try to roll or slide heavy weights to make a better lifting position.

TOP RISKS - Recap

1. Lifting

- Avoid lifting – use ramps, lift tables etc.
- Plan the lift – start to finish – avoid obstacles, awkward turns, bending etc.
- Reduce component sizes/weight, remove batteries as a minimum.
- Use two people to share the lift weight

2. Impact

- Drive at appropriate speed
- Know your own and others driving ability
- Train brakes for larger loads 1 or 20 passengers can mean a 20m difference in stopping distance.
- Always drive with an emergency stop option – “deadmans switch” (+ train brakes if available).

3. Electrical

- Make sure batteries can only be connected the right way round.
- Wash any wet liquid from batteries with plenty of water. Acid burns are painful but don’t appear immediately. If in doubt wash.
- Keep metal tools away from battery terminals.
- Do not make electric connections to the control side of the controller unless you are competent and fully aware of how this may affect the loco performance. This has resulted in runaway locomotives in at least two locomotives.

FAULT FINDING

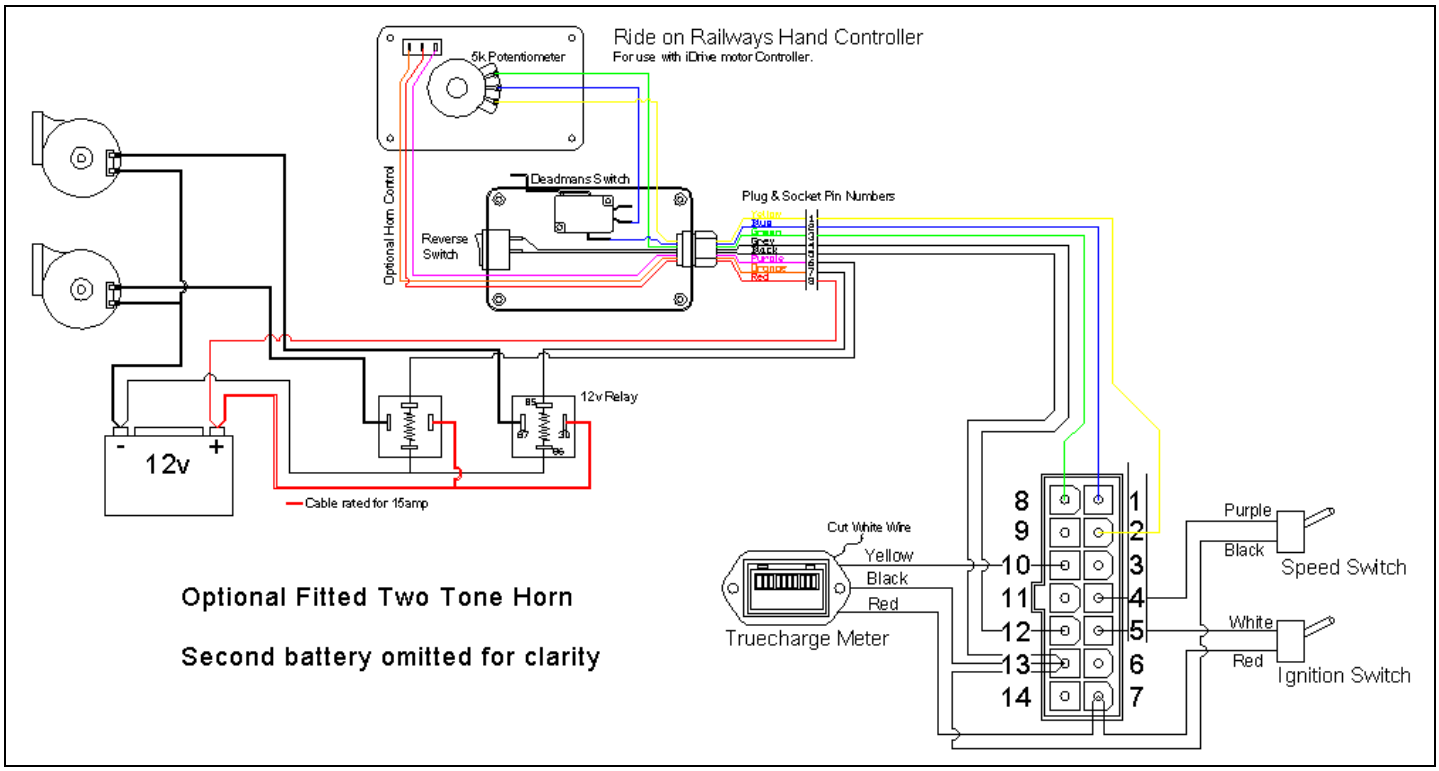
Symptom	Possible Causes
No Power – no lights on True Charge	○ Check batteries are charged ○ Check battery connection + battery key switch and ignition toggle switch are both on ○ Check all the battery leads, controller connections + handset wiring plugs
True Charge meter lights up but no power to motors	○ Make sure deadmans switch is applied ○ Check wire connections in handset, plug, socket and plug on iDrive – see wiring diagram
TrueCharge meter just flashes	○ See fault code chart. Switch off by ignition switch for 30 seconds before switching on ○ If possible, rectify fault shown on chart
TrueCharge doesn't show green lights	○ 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	○ Gears are pinned on the motors so unlikely to be slipping but could be a motor slipping out of mesh. Check and reset meshing ○ Check to see if Truecharge Meter drops when power applied if yes - failing batteries ○ 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	○ STOP IMMEDIATELY. Check for meshed gears and trapped debris ○ Oil all oilite bearings and Delrin boxes on cranked locos
Acceleration and deceleration is "lumpy"	○ This could be a symptom of a faulty or failing potentiometer in the handset. Replace the 5k linear potentiometer if in doubt. ○ Grease on the track – clean track
Electrical smell coming from the engine	○ Switch off the power immediately by the battery isolator switch. ○ Investigate using smell and touch for hot wires and components. Report back to RoR ○ The controller is rated for 120amp continuous running. Do not over load 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.

Control Wiring Diagram

Our standard wiring looms use coloured wire to help identify their purpose. The pins in the metal 8 pin plugs and sockets are identified with very small numbers.

If you do open either the plug or socket please ensure there is insulating material between the pins and the outer casing.

On later models the deadmans switch is on the yellow control wire. This was done as to avoid potential issues with sound systems that need to tap in to the potentiometer wires.



We would not recommend using sound systems that tap in to the control wires unless you can guarantee there will be no interference with the function of the iDrive unit. Stray voltage from sound systems have been known to cause controllers to power up or lock in full speed.

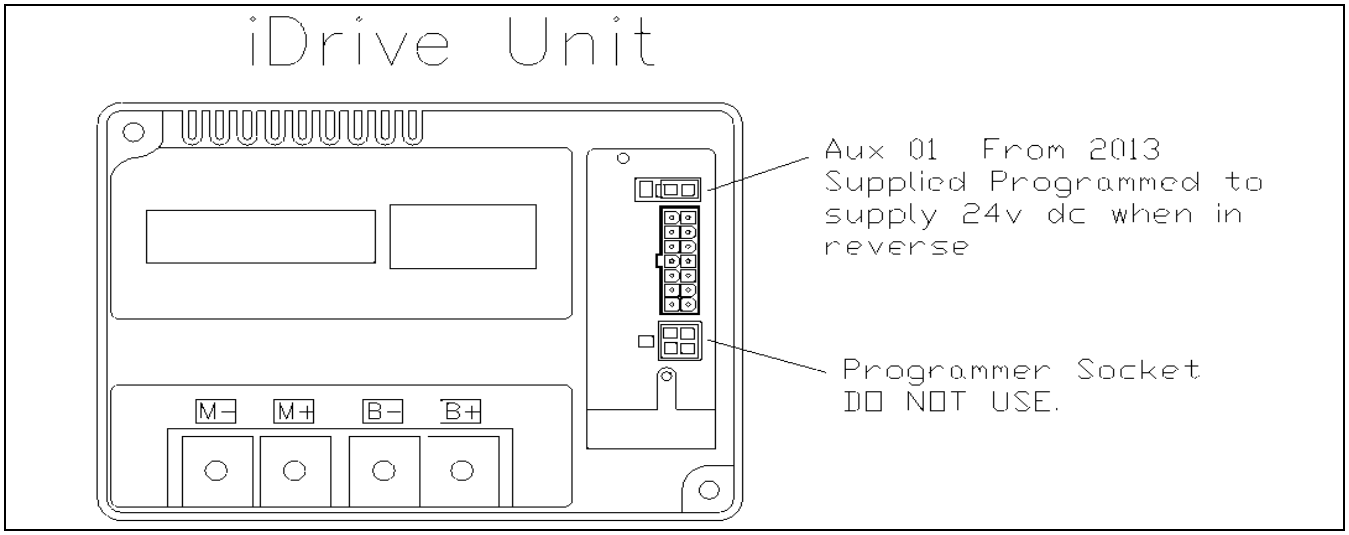
If you need to synchronise sound it is best to find a system that monitors power to the motors.

Battery Charging

The Hercules is designed to accept two type 063 car batteries or similar.

- Avoid running batteries flat or to a very low state. For prolonged life charge after use and never leave batteries in a low or flat state. Doing so can easily reduce the battery life by 80%.
- Avoid over charging batteries – use an automatic charger that drops to trickle charge once the batteries are charged.
- Although the batteries can be charged in series with a 24v charger we would still recommend charging separately with two 12v chargers ever so often as this helps balance the battery levels. Especially important if there is a 12v tap from one battery.

iDrive Unit (motor control unit)



We have various options of programming with the iDrive.
Auxiliary socket 1 is programmed to supply 24v dc (3 amp protected) when the engine is put in reverse) as standard. On request we can supply Aux 1 for use with an electronic brake with slight delay to avoid roll back when setting off. Call if you would like custom programming.

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.

Regenerative Braking

Regenerative braking is when the motors are used to generate electricity which is then put back in to 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.

Truecharge Meter Readings

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 controller has been switched on with control knob left with power on (safety lock out to avoid runaways). Return control knob to zero for the controller to unlock.

P Middleton January 2013