

# Potential Pocket Money Kit

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*The Track Tester pocket money project PMP1 was first described, by Davy Dick, in the MERG Journal (2012 Vol 46 No. 3 p16-17). This kit while it was developed independently is similar but it also has whiskers for testing loco pickups.*

## Parts List

- ☐ PCB (Printed Circuit Board)
- ☐ One lead with a crocodile clip attached at each end
- ☐ One bi-colour LED
- ☐ One 1K resistor

There are many occasions when you may need to check if a particular section of track is receiving power.

Maybe -

- ☐ The power to a track section is switched by relays or switches.
- ☐ The wiring or connections to a piece of track is suspect.
- ☐ You want to check if you have wired a new piece of track with the polarity the correct way round.
- ☐ You need to test if individual pickups on a Loco are working
- ☐ You need to test that a slow action point motor is getting power reversals as it should.

This simple PCB can do all of this with a minimum of parts. Of course, you could always check with a multimeter but these are inconvenient, bulky and awkward to use in tight situations.

With this little board, for rail checks you can use either the crocodile clips, the whiskers, or the contact points on the bottom of the PCB to illuminate the LED. If the LED lights Red or Green you have DC power with the colour indicating polarity. If the LED lights orange your track is receiving DCC power.

For testing loco pickups attach the crocodile leads to the track and touch the whiskers one to each wheel on a single axle. If the wheel pickups are working as they should be the loco motor will operate. You can then use the whiskers to apply side to side force in either direction to ensure pickups maintain contact with the wheels throughout the range of side-to-side motion. Repeat this on each axle that has pickups to give your loco a thorough checkup.

## How it works

The circuit diagram is very simple. A bi-colour LED (light emitting diode) is connected across the track when the board's crocodile clips or the whiskers touch the rails. The 1k resistor is a current limiting resistor to ensure the track voltage does not result in excessive current that would destroy the LED. A bi-colour LED is simply two LEDs back-to-back and in the same LED package. So, if the track voltage is one polarity, the LED lights up in one colour (green for example), and if the track voltage is in the opposite polarity that same LED lights up a different colour (red for example). If the polarity is switching back and forth quickly (as in DCC) your eye perceives the blended colour.

## Building Instructions

The components are inserted on the printed side of the PCB, and soldered on the other side. As there only a few parts strict order of assembly is not critical however the following sequence is recommended.

Fit the LED with the long lead inserted in the hole nearest the flats on the symbol. Note that with back-to-back diodes in the same package there is no 'cathode lead' or 'anode lead'. The reason for setting the orientation is only to ensure the displayed colour shows consistently should you build several of these kits.

Ensure the LED is flush to the PCB and after soldering cut off both leads as close to the underside of the PCB as possible. **IMPORTANT: We will be using the cut off leads as our whiskers in the next step.**

Referring to Figure 6 use needle nose pliers put a 90 degree bend very close to one end in each lead. Insert the bent end into the PCB hole as indicated on the 'Common' set of pads. With the long end of the whisker roughly aligned solder the bent pin in place. Ensure the long end of the whisker lead goes over the center of the remaining hole (gently bending as needed) then solder the lead which is lying flat over the hole and extending past the edge of the board.

Depending on what gauge you are modelling (HO/OO or N) repeat this process for the second whisker using the appropriate set of holes.

Fit the resistor which can be inserted either way round.

Cut the crocodile lead in half, strip the ends of the "half leads" and solder them one at a time into the holes marked J1.

Lastly to avoid shorts if the board is laid on the track or other metalwork fit some insulation tape to one half of the back of the PCB (specifically under the resistor, LED and J1 part of the PCB. An alternative to tape is to apply hot glue from a glue gun.

<p>Figure 1: Schematic</p>	<p>Figure 2: Key Dimensions of PCB</p>
<p>Figure 3: Key Parts (Only 1 Resistor needed of course)</p>	<p>Figure 4: LED Orientation LED oriented with Flat matching the symbol.</p>
<p>Figure 5: Showing the long lead is on the side with the Flat on a Bi-colour LED</p>	<p>Figure 6: First solder location of the first whisker</p>

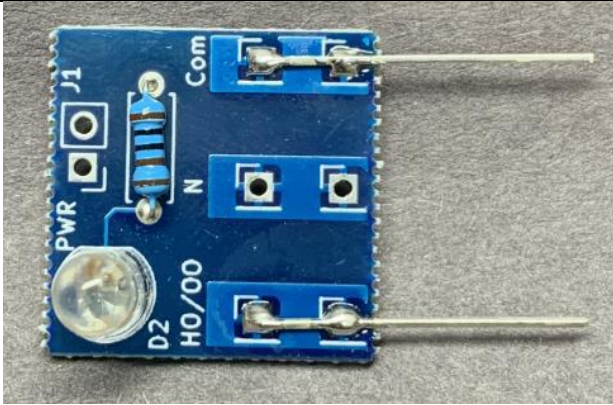


Figure 7:  
Whiskers aligned and Soldered, Components in Place

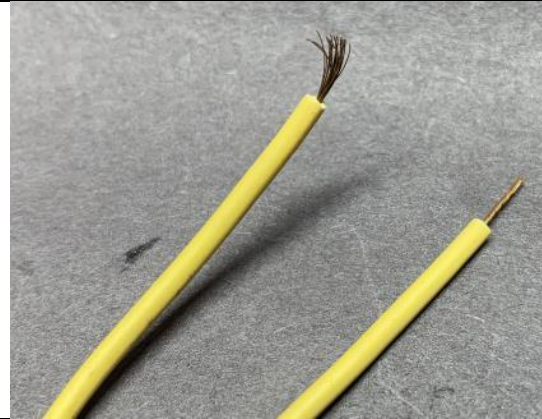


Figure 8: Leads stripped.

A gentle twist of the strands (lower lead) makes inserting into the PCB easier and more importantly reduces the risk of an inadvertent short circuit from a stray strand.

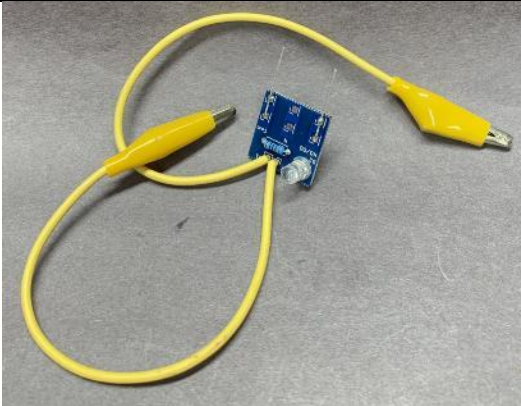


Figure 9: Fully Assembled and Ready to Use

## Usage Cases

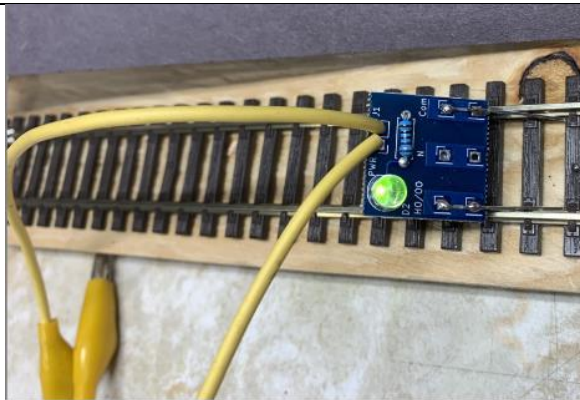
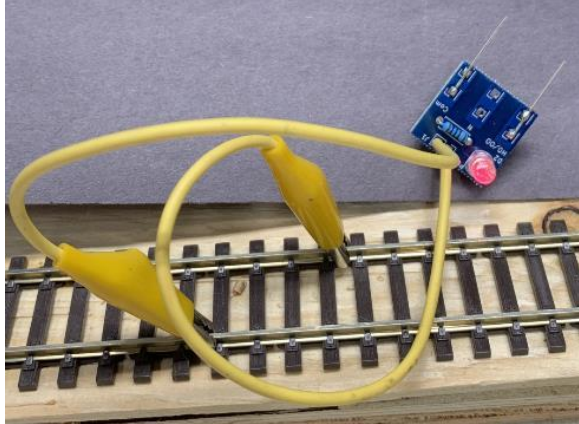
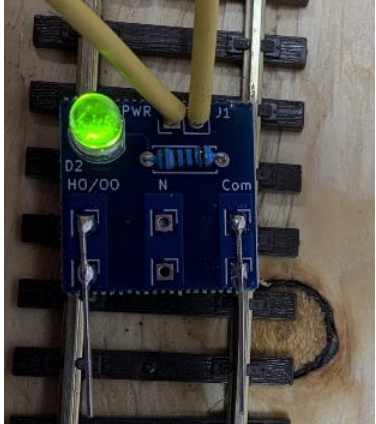

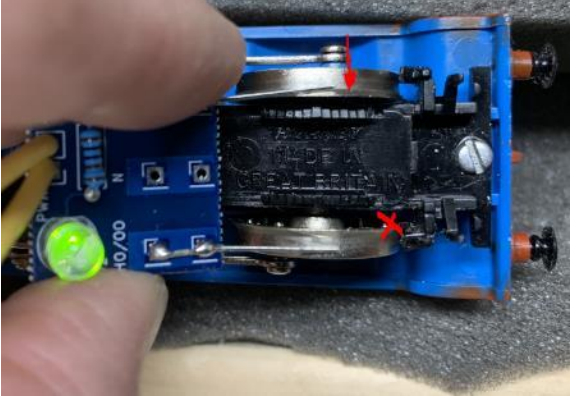


Figure 10a:  
Track power via the whiskers.  
Lower rail (The LED side) is positive green LED.



Figure 10b:  
Alternate method using the crocodile clips.



	
<p>Figure 10c: Crocodile clips crossed over. Red LED indicates polarity is reversed (of course it is the leads that are actually reversed not the track voltage).</p>	<p>Figure 10d: Alternate method – lay flat on the rails. Caution – Use only with whiskers in direction of track.</p>
	
<p>Figure 11a With crocodile clips on track use whiskers to apply power to a single wheel set. Wheels will turn if pickups are working correctly. Lateral force up on the lower flange reveals if the pickup on the upper wheel is breaking contact. As the motor keeps running these pickups are operating as expected.</p>	<p>Figure 11b Lateral force down opens up the gap as shown by X. The motor stops running but the LED indicates I still have power. The pickups on the side marked X need a slight adjustment.</p>

## Ideas for Variations:

It may be desirable in some situations to use terminal blocks instead of directly soldering the crocodile clips in place. At the moment the spacing of the PCB holes does not accommodate dropping in a terminal block so some customization will be required.

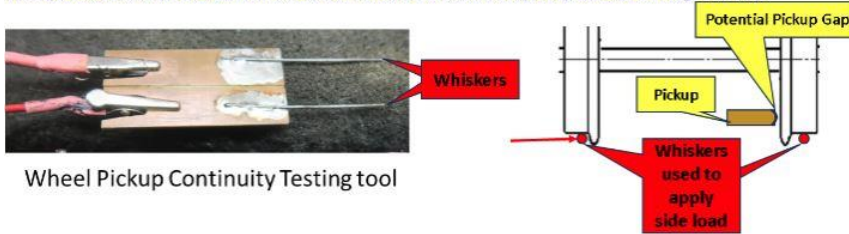
Using the LED leads for whiskers may not allow for enough lateral force for your application. It is possible to substitute 0.8 mm stainless steel piano wire (two pieces each 2 cm long). Note however that soldering of stainless steel requires a fit for purpose acid flux applied to the piano wire (at the end with the 90-degree bend plus half the remaining length). This much of the whisker is then tinned with solder. The flux must be cleaned off thoroughly before the whiskers are installed on the PCB. (If not the Acid could continue to work away potentially damaging the board)

## Acknowledgements

Mike Walton of the Platelayers MRC in Ontario Canada who patiently explained his 'snag report' and the home-made whisker set up that he came up with to find that pesky loco pickup that only failed in a certain location of his layout.

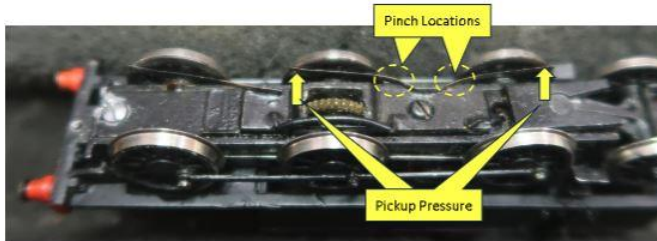
Snag #7 – Webb Coal Tank (K's White metal kit) – Stalled occasionally – Returned to the bench after the session.

The special tool shown below was used to check that all the wheel pickups were working correctly.



As power is applied through the whiskers, one wheelset at a time the wheels should turn. The whiskers can be used to apply a side load to make the wheelset float sideways. If the wheel can float clear of the pick-up, the wheels will stop turning. If the wheel is floating clear, then the float or the pickup spring needs to be adjusted.

On test I found the front wheelset passed the test but with tests on the middle and rear wheelsets the continuity could be broken. To alleviate the problem, I adjusted the pickup springs as shown below.



The locomotive ran reliably but noisily as usual after the rework.