



BUILD A DCC CONTROLLER

Determined to overcome a fear of electronics, **Phil Parker** builds a DCC system in kit form, sold by the Model Railway Electronics Group (MERG).

SHOPPING LIST

TOOLS

- | 15W soldering iron with fine bit
- | Cored electrical solder
- | Multimeter
- | Fine nosed pliers
- | Flush cutters
- | 2mm drill bits
- | Magnifying loupe
- | Anti-static wrist strap

KIT

- | MERG DCC Command Station with CBUS Interface
- | MERG Handset for DCC Command Station with CBUS Interface

CONTACT

MERG
W www.merg.org.uk

A visit to Pete Waterman's 'Leamington Spa' layout earlier this year was my first introduction to the CANCEB system produced by the Model Electronics Railway Group (MERG). I've never been a big DCC fan; some controllers are huge, covered in buttons or it's hard to achieve the precise driving I get from my Gaugemaster DC handheld controller.

The CANCEB system is different. It has many buttons, but they're contained in a handset little bigger than my DC one. Best of all, control is via a neat metal knob. Ergonomically, it works well.

Checking out the details online later, the first job was to join MERG.

Kits are only available to members, so once joined I headed to the 'Kit Locker' and spent less than £65 for a base unit and handset. For a full DCC system, it's a bargain.

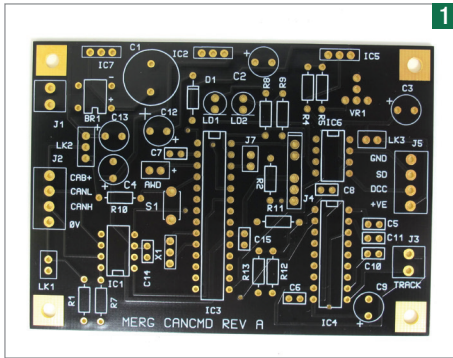
I'm pretty confident with a soldering iron and years ago I dabbled with electronics, but the idea of assembling my controller made me nervous. I needn't have worried. The moment I unpacked both kits it was obvious much time and effort had gone into making them as easy to build as possible. All components are clearly

labelled and stuck to sheets and the circuit boards have component locations marked. Just remove each component and solder it into position - simple.

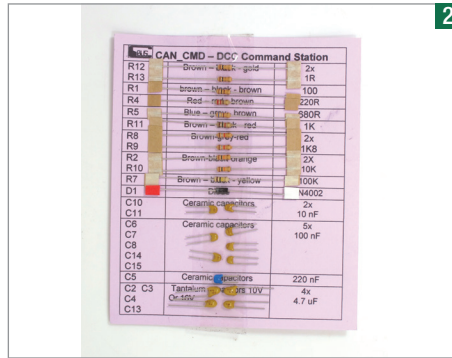
The instructions are clear and well written and once I got into it I really enjoyed it. Take your time, checking components are in the right places and each joint is as good as possible.

When it came to testing, everything worked. The moment I tuned the LCD display and could read words was a real joy. Shortly afterwards, a locomotive moved. ■

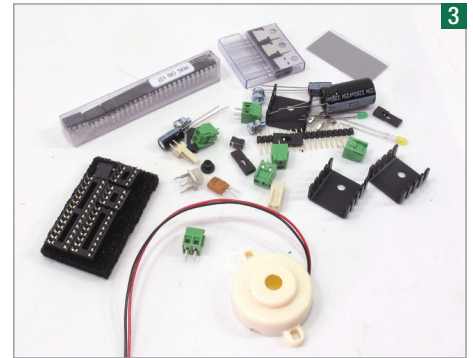
Electronics are more fun than you'd think when you buy a well thought out kit. I'm heading back to the MERG 'Kit Locker' for more.



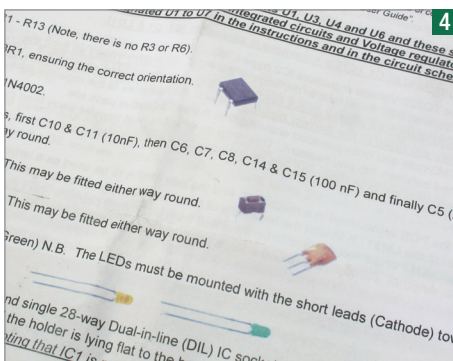
The printed circuit board (PCB) for the base unit. Locations for each component are clearly marked on the side to be fitted. Solder from the back.



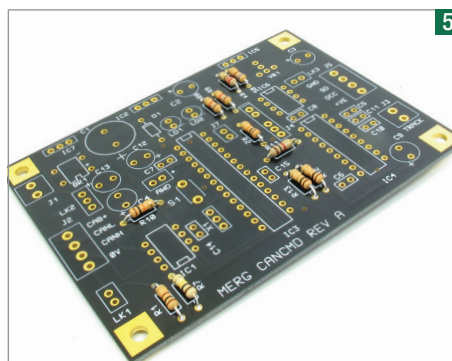
One of the biggest challenges is identifying similar-looking components. MERG has made this easy by sticking them to a piece of paper with relevant details.



Larger components are packed in a separate bag. The chips are kept together in a plastic tube for safety and shouldn't be unpacked until required.



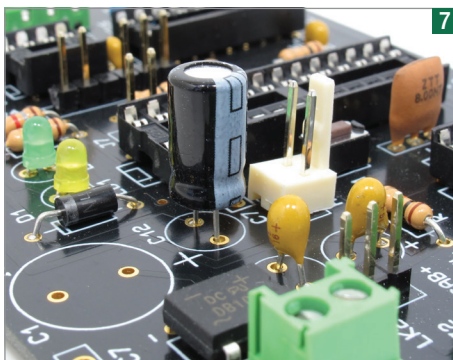
The instructions are clear, just follow them to the letter, ticking each step off as you go. I liked being told when a component should be inserted a certain way round.



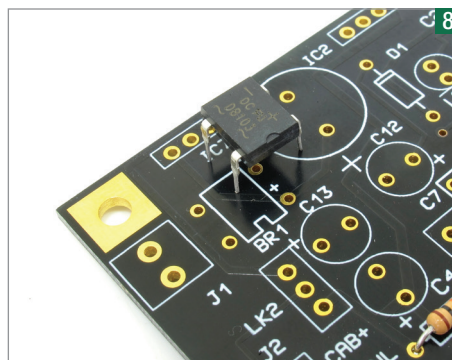
Resistors are fitted first and provide an excellent introduction to construction - there's no polarity to worry about and they stand up to clumsy soldering efforts.



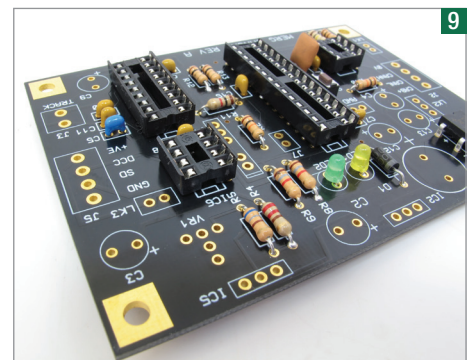
Where polarity matters, identify the + and - sides of a component. Tantalum capacitors like this have different length leads, the longest being positive.



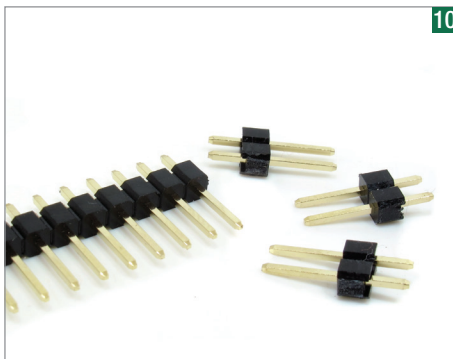
Electrolytic capacitors are printed with a '-' symbol on the side, the PCB with a '+'. With just two legs it's not hard to work out which way around they fit.



Square components such as the bridge rectifier and chips have a notch in the end to indicate correct orientation. The PCB drawing shows the correct position.



Rather than solder delicate chips to the PCB, dual-in-line (DIL) sockets are fitted into which they are later inserted. An indent shows correct orientation.



Many parts are connected with header pins and corresponding sockets. Pins are supplied on a strip with can be snapped to length.

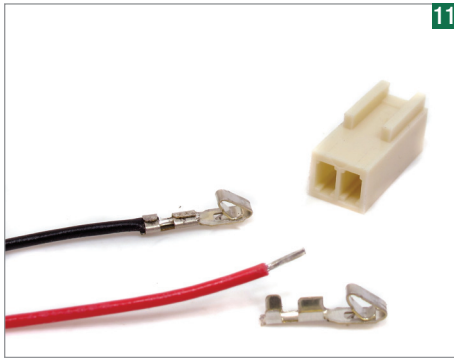
Ask the expert

Q Who or what is MERG and why should I buy its kit with lots of components when many DCC systems are ready to use off the shelf?

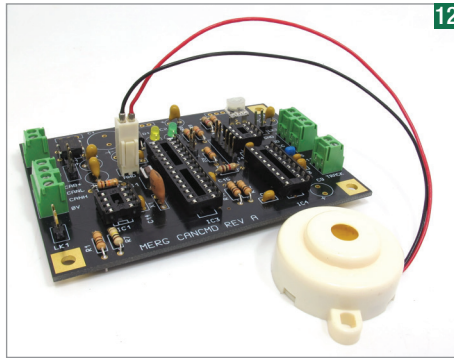
A MERG, the Model Electronic Railway Group, is a UK group set up in 1967 to promote interest in the use of electronics and computers for all aspects of railway modelling. Members are railway modellers with an interest in using electronics in their hobby. MERG has developed a number of kits for its members, from the simple 'Pocket Money Kits' ideal for electronic newcomers to DCC equipment of great sophistication, there is something for all budgets and skill levels.

Support is provided on its website by forums, technical bulletins, a journal or local area groups where you can meet to try new systems or ask for advice if you have trouble with something you've built. See more on the MERG website or chat to members manning stands at the many exhibitions it attends nationwide.

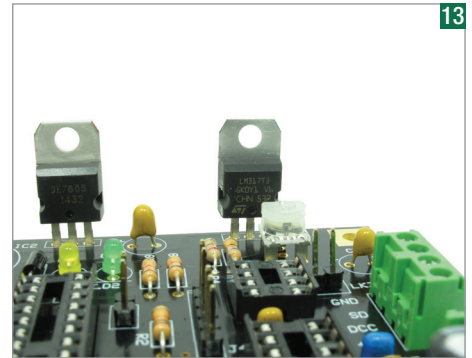
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The fiddliest component to make up is the Molex connector for the short circuit sounder. Crimp the wires in the connectors with small pliers.



The short-circuit sounder can be plugged into the PCB. Leave it off until construction is finished otherwise it gets in the way.



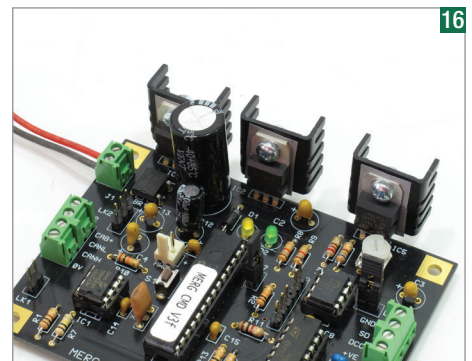
Three voltage regulators are fitted to the edge of the PCB. They all look the same, but mustn't be mixed up. A magnifying glass helps to identify them.



Testing starts by connecting the board to a 16V AC feed. The voltage is checked at several points using a multimeter and the regulators checked for excess heat.

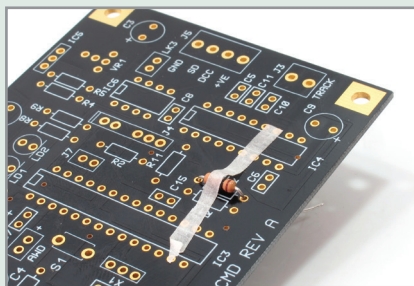


The chips can be damaged by static electricity so earth yourself by wearing an anti-static wristband clipped to a nearby water pipe before handling them.

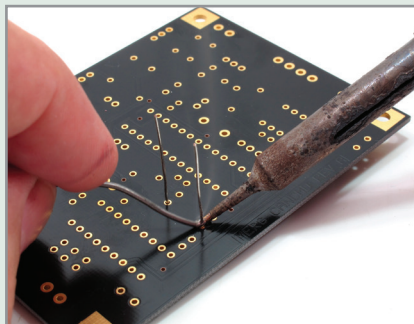


The green light is a big step, indicating the processor is working. If it doesn't light up, turn the power off and check that chips are correctly inserted.

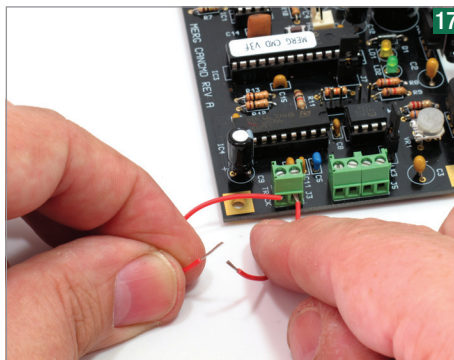
Soldering components



Feed each component leg through ready-made holes in the PCB, ensuring it lies flat on the surface. Masking tape is handy to keep it in place.



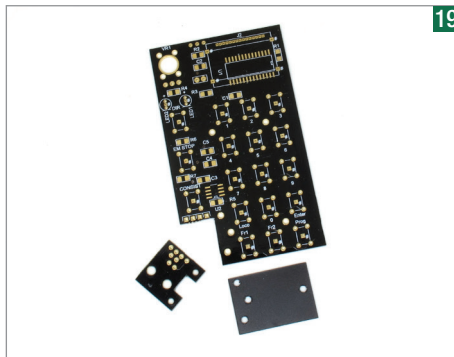
Heat the joint between board and component leg, then feed enough cored solder to flash around the leg. Avoid creating mountains of excess solder.



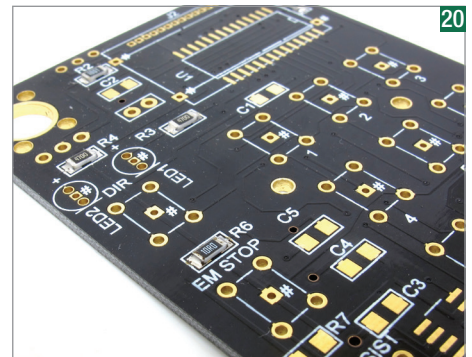
A final test is to short-circuit the track outputs. This should set the sounder off and make a yellow LED flash. If this works then you can build the handset.



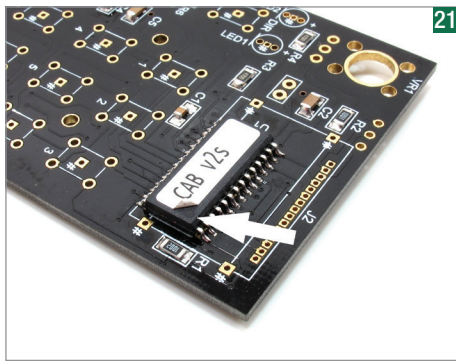
At first glance the packed handset kit looks simpler than the base unit. That is until you realise that most of the components are in the plastic box.



A corner of the PCB is removed for later use with cutters. A piece of plastic sheet is drilled to match the fixing holes in the bottom of the board, both are used later.



Construction makes use of surface mount device components such as the tiny resistors and capacitors seen fitted here.



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Correct orientation of the chips is essential. Pin 1 is marked by a dimple on the plastic body, hidden by a label. Don't assume the writing is the correct way round.



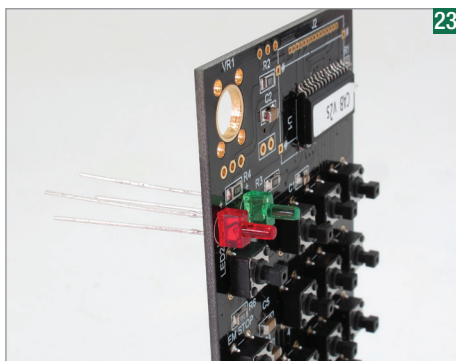
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Each switch clips into the holes in the PCB and is then soldered from the back once you're happy it is sat flush on the board.

Using SMDs

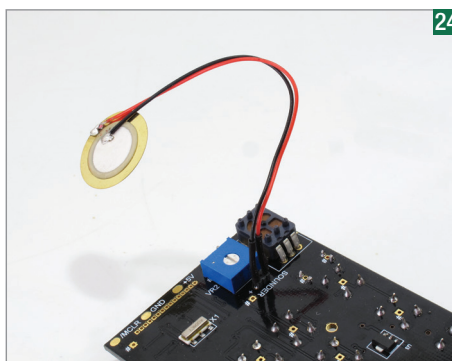
Surface Mount Devices (SMDs) are tiny electronic components. With care they aren't much harder to fit than conventional components.

Check the joints with a magnifying glass. It's essential that adjacent pins on chips aren't joined and that solder looks shiny and is a fillet, not a blob.



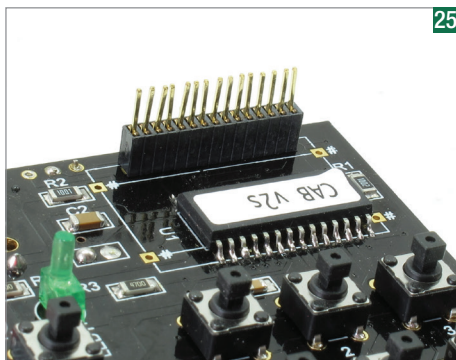
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Direction LEDs fit flush to the board. The leads are cut off but retained for later use. Make sure these poke through the holes in the handset easily.



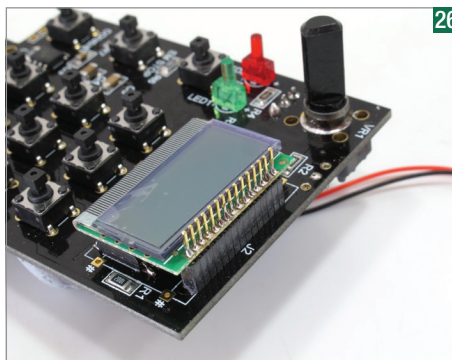
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The control potentiometer needs modification to fit in the board, all clearly explained. As well as the connections, the body is soldered to the PCB for extra strength.



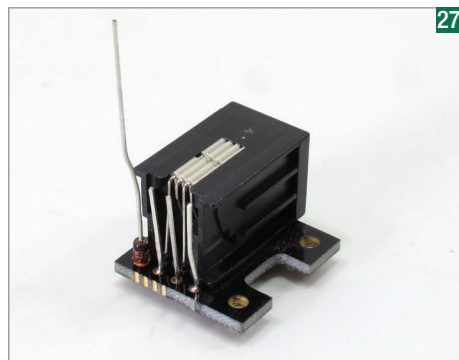
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On the back of the board, a piezo sounder is fitted to a couple of header pins. The joints are protected by heat shrink sleeving, heated with the soldering iron.



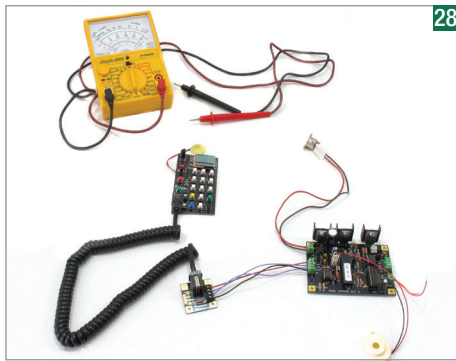
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The display slots over the pins. It's easier to only use the two end pins at first and then put the others in through the holes in the display PCB.



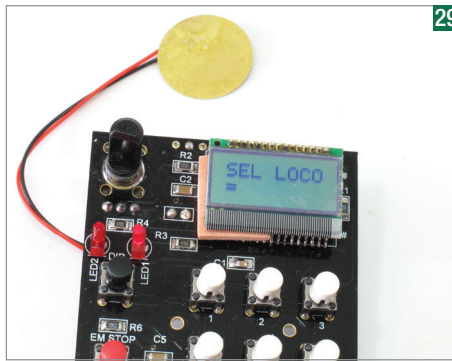
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The handset connects to the base unit via an RJ22 socket, fitted to the PCB off-cut using leftover LED legs. This is soldered and bolted to the main PCB.



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With everything soldered, we are ready for testing. Clear some space, set up the multimeter and dig out some track and a DCC-fitted locomotive.



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Assuming the multimeter checks go OK, adjust the blue potentiometer on the back of the handset board until the display is clear.



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Tape the piezo sounder to the back of the case, then bolt in the plastic rectangle cut earlier and use the self-tapping screw provided to hold the back and complete.