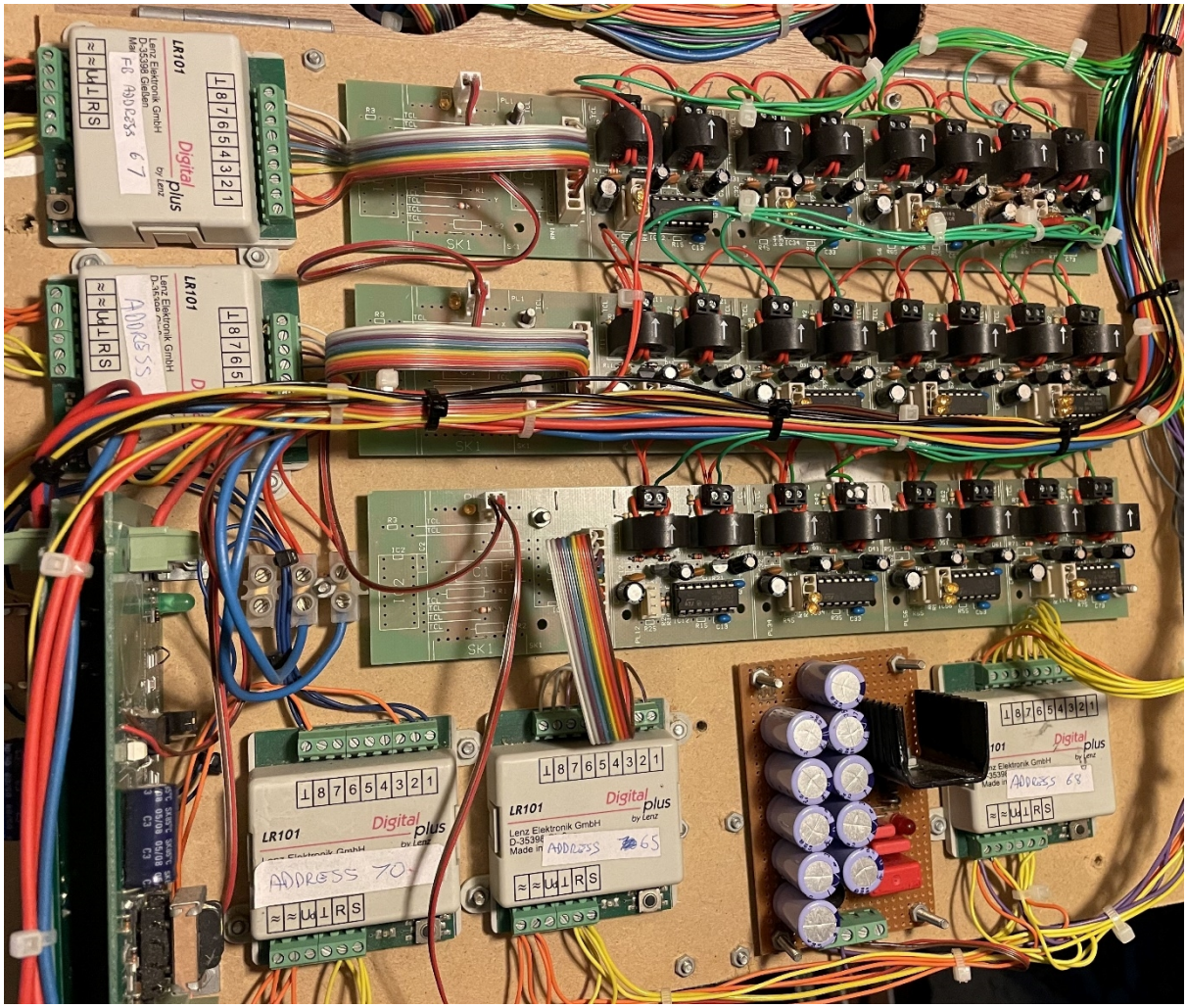
DCC Accessory Decoders incorporating Feedback Encoders

DCC has the ability to control items other than locomotives using accessory decoders. This is a separate range of addresses in the specification that can be used to control point motors, signals, servos, relays, etc. In addition most DCC systems have an optional feedback bus. This can be used to indicate that a point has moved, that a block is occupied, push button has been pressed etc.

There are different standards for feedback buses but I use Lenz DCC equipment and they use an RS bus. This is an open standard and software libraries are available to enable you to write your own interfaces.

The problem is that, with the exception of point motors, for Lenz equipment you have to purchase accessory decoders and feedback encoders (which connect to the RS bus) separately. You can buy third party accessory decoders and feedback encoders but no one appears to offer modules that incorporate both functions.

This leads to a plethora of modules below the baseboard. For example this was my block occupancy modules using MERG detectors and separate Lenz feedback encoders.

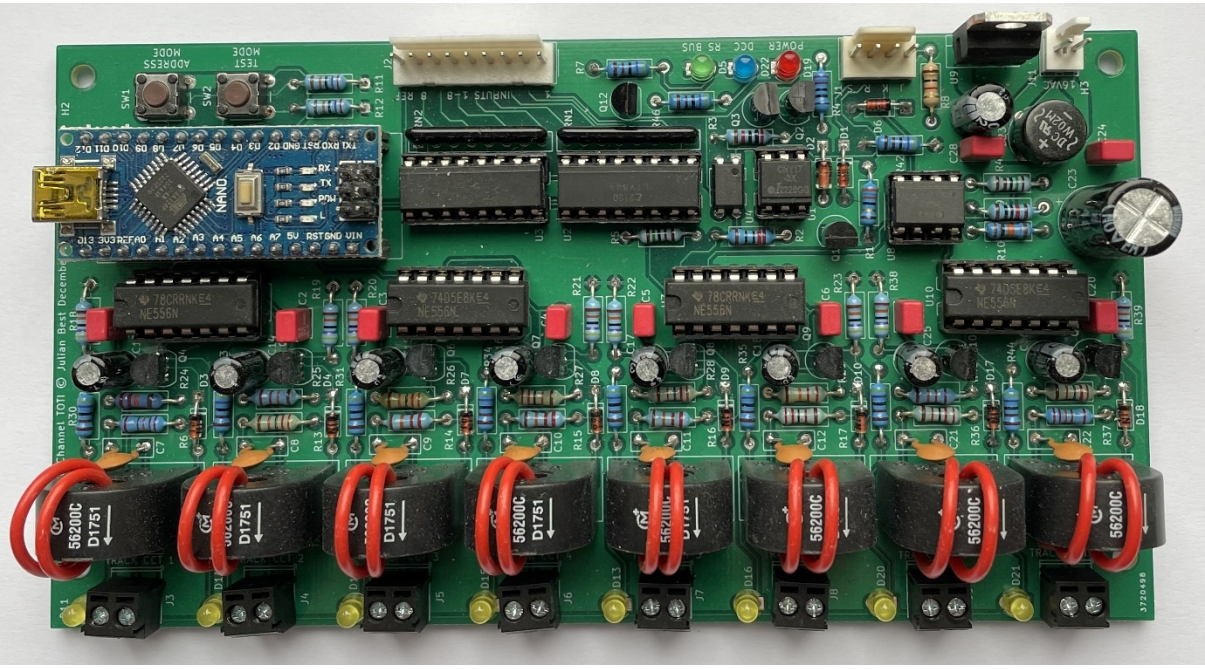


Therefore I decided that I could improve upon this by designing a circuit board that incorporated block detectors and a feedback encoder. This would simplify the wiring and setup, and I could customise the software for any future requirement or protocol changes that may come along. In addition it works out cheaper than buying commercial decoders and encoders.

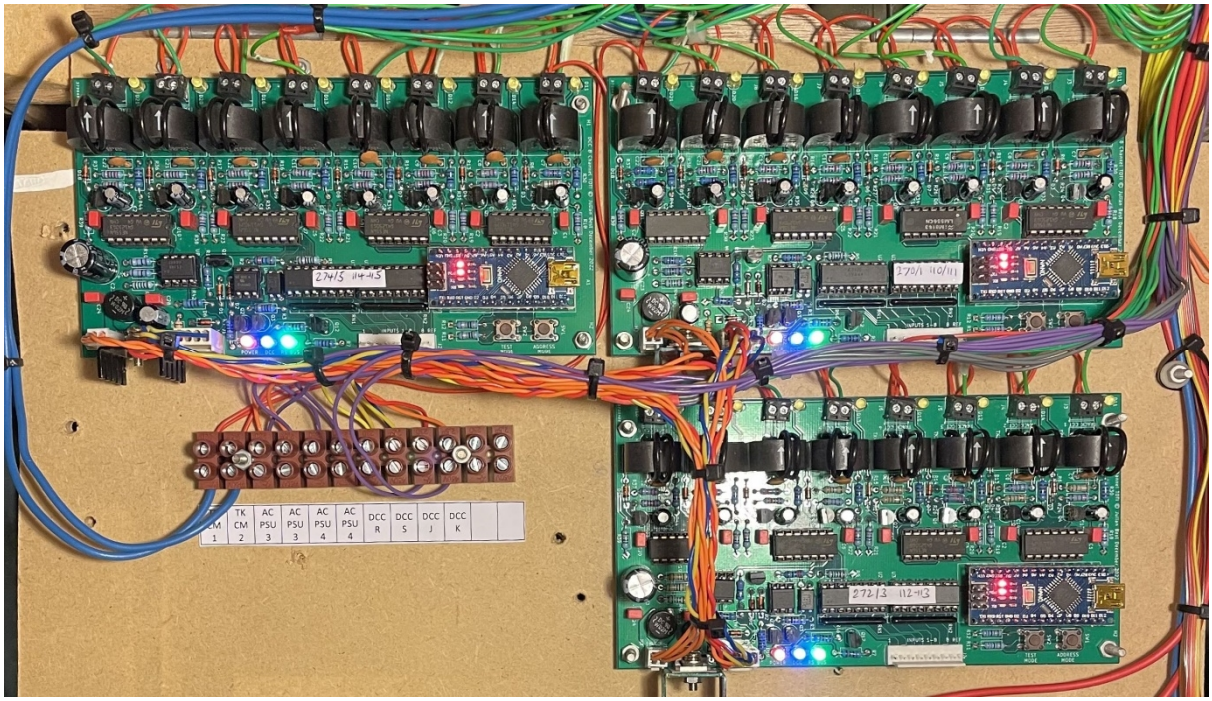
I used an Arduino Nano microcontroller as the brains for the board, transformer based current detectors and the NRMA accessory decoder library with Aiko Pras's RS bus library.

The board has buttons which allow both the DCC and the RS bus addresses to be changed from the DCC command station. It also has a feature which allows me to interrogate the board remotely to check that it is operational and responding correctly. I envisage having an option in my web based railway management system which checks every module at start up to ensure everything is functioning correctly.

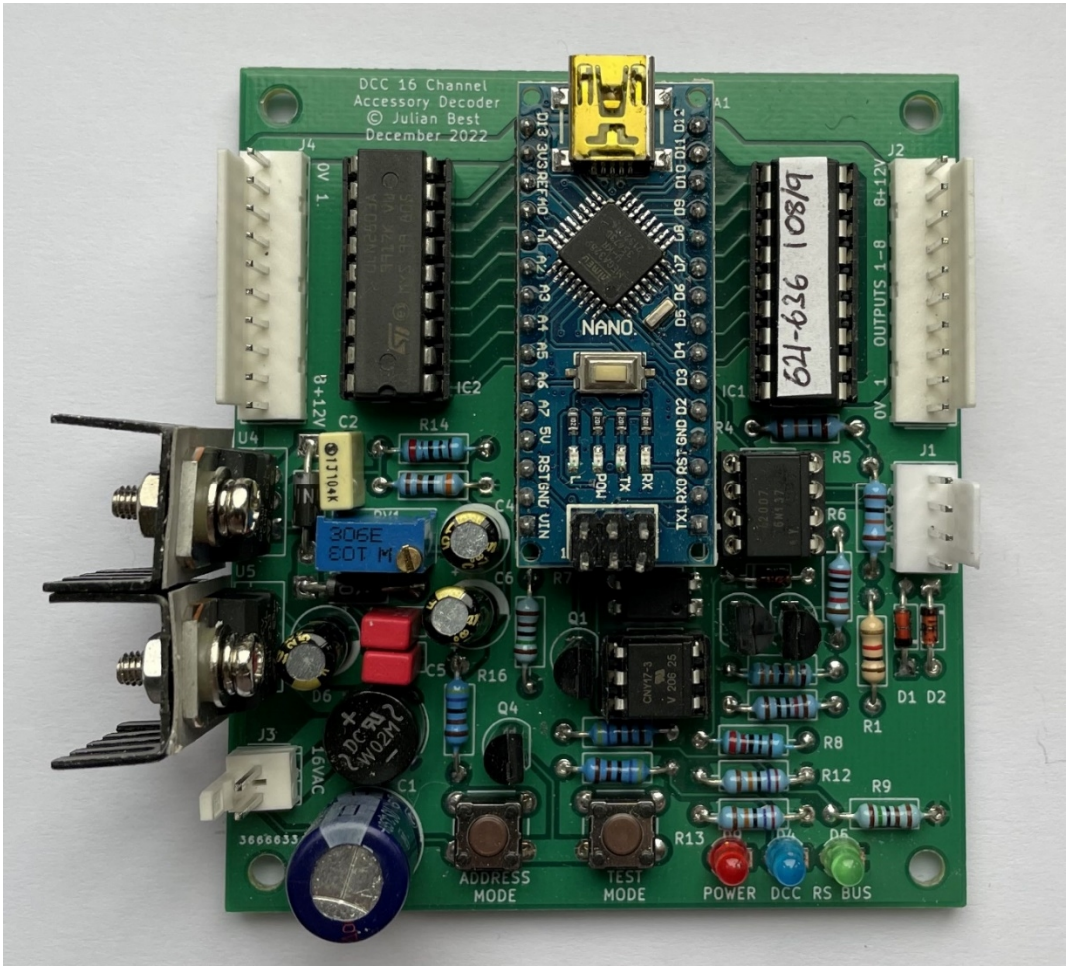
This is the 8 channel block occupancy detector with feedback. There are an additional 8 channels of opto-isolated feedback available which could be used for contact detectors, for example.



And this is what the updated modules under the layout look like.

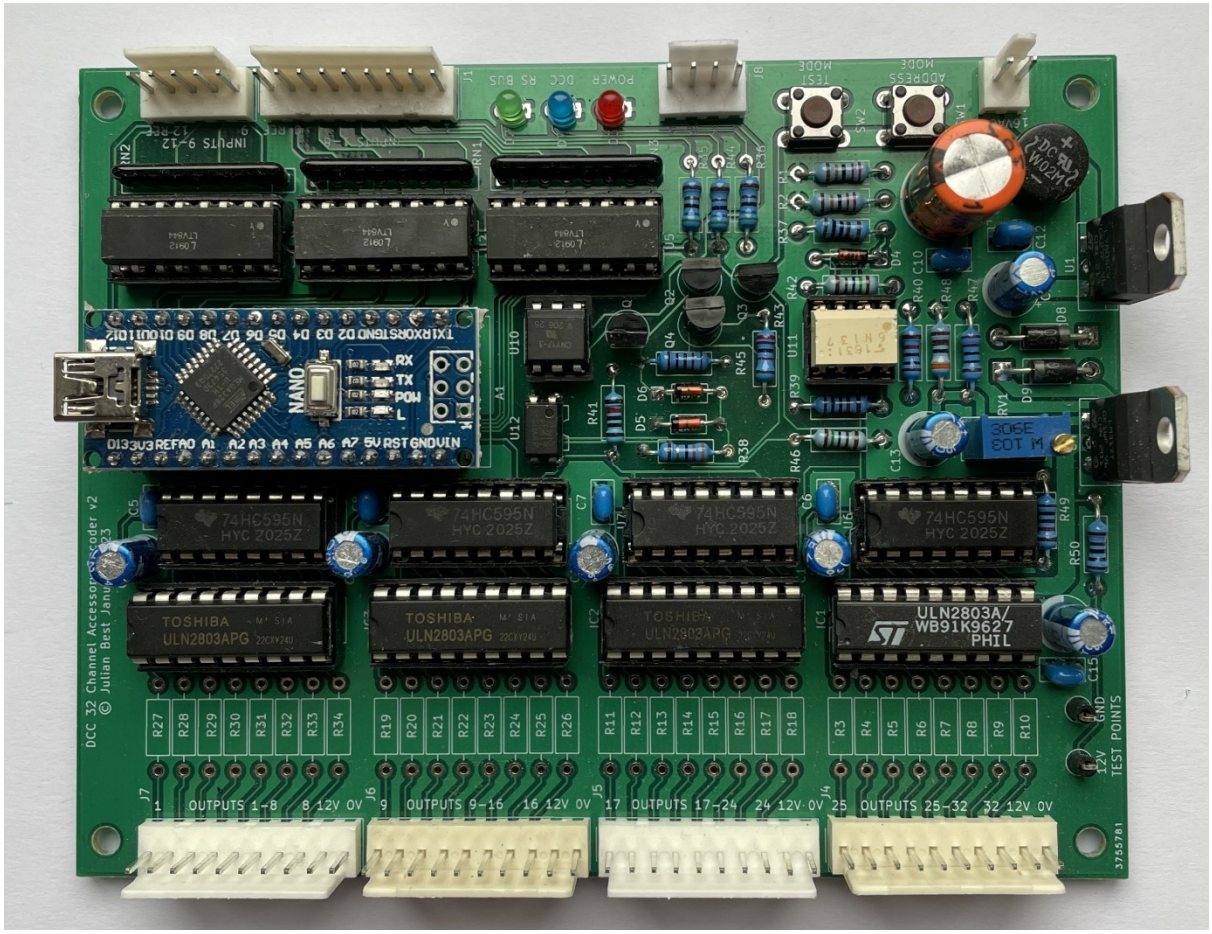


After the success of this module I thought I could expand the concept to include other types of accessory decoders with feedback. This is a 16 channel accessory decoder with feedback. The feedback can confirm that the accessory decoder has responded.

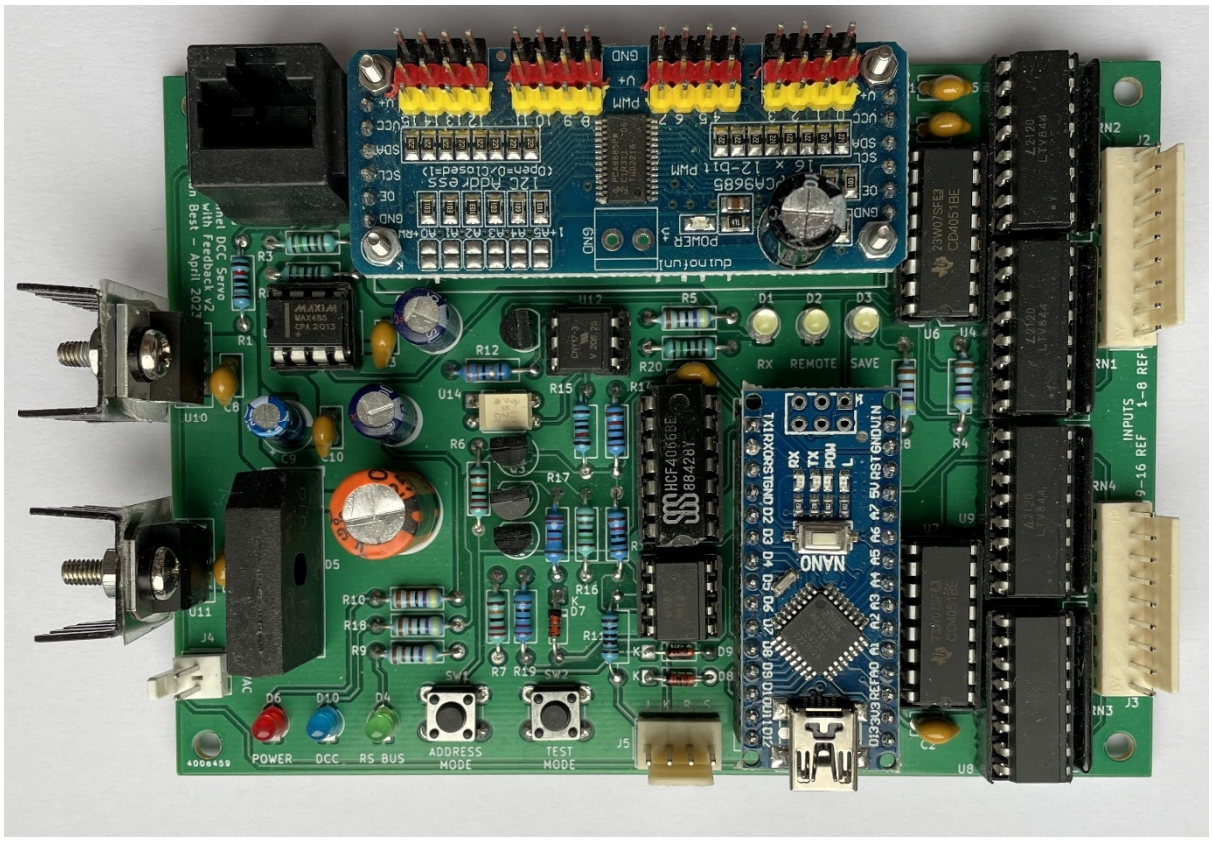


I then added a 32 channel accessory decoder. Each output can individually sink 500mA but I primarily use it for driving LEDs. The current can be set by inserting appropriate resistors (or none) for each channel.

The feedback can either confirm that the accessory decoder has responded or it can use the 12 channels of opto-isolated feedback. This could be from a switch, a relay contact or whatever is required.



Finally I designed a servo control module which can control 16 channels of servos. Each servo can have its rotation, speed and type of effect set for each direction. There are currently 18 different effects which range from linear motion to various types of bounce. I use this for controlling a range of devices from semaphore signals to gates to a private siding. There are 16 channels of opto-isolated feedback which I use to confirm, via microswitches, that the servo has moved.



To enable the board to be easily configured I built a setting module. This connects to each servo board via an ethernet cable and allows each servo to be precisely set up before being saved to the module.

In summary this range of DCC modules has enabled me to add more features and functionality to my railway whilst reducing the number of commercial modules required.

Finally a quick video of the oil siding gates as controlled by the servo module. I must add a sound effect when the gates clang against the stops!

https://www.youtube.com/watch?v=a9kcdZkEUWs