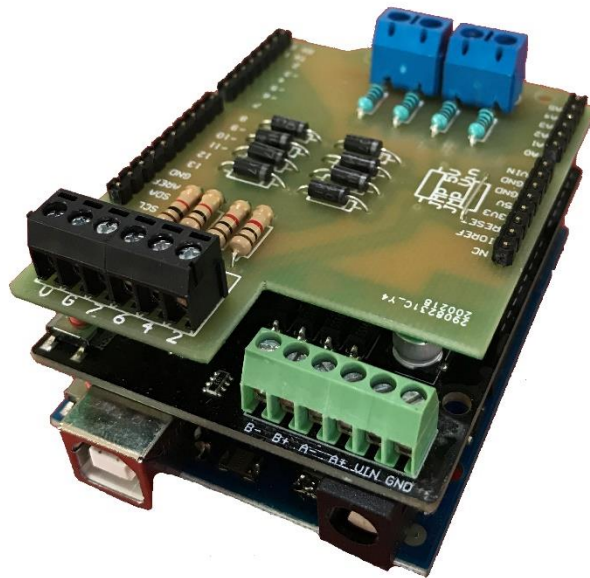


JTEDCS1

DC BACK AND FORTH SHUTTLE

OPERATION MANUAL

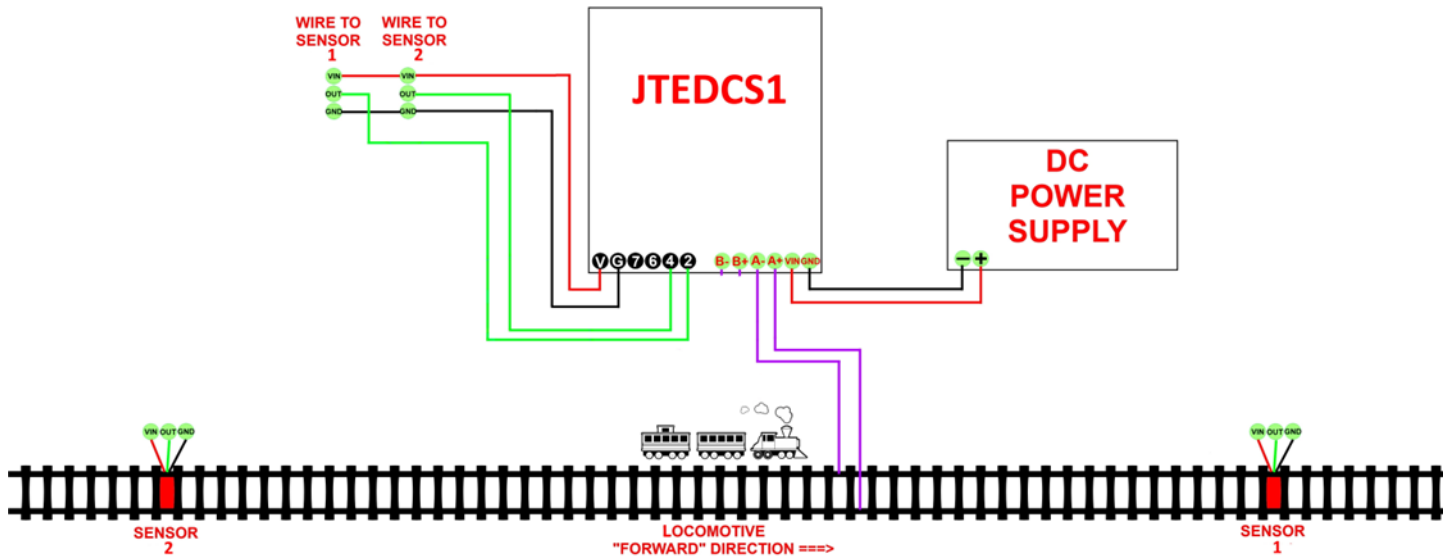


The JTEDCS1 is a simple DC locomotive back and forth shuttle controller and requires an additional DC power supply and two sensors to operate. It has many configurable options such as Minimum Speed, Maximum Speed, Acceleration and Deceleration times, as well as fixed and random wait delays at either end of the track.

The sensors could be the JETILD infra-red sensors, reed switches & magnets or even track block detectors that put out a “ground” signal when triggered.

For optimum operation you will need to ensure the locomotive track pickups are clean, adjusted properly and working well.

EXPLANATION OF OPERATION



In this explanation of operation, the train starts near the left hand end of the track

1. Train accelerates forward to the configured maximum speed
2. Train coasts along the track at configured maximum speed
3. Train triggers SENSOR1 and decelerates to configured minimum speed
4. Train stops and waits for the configured Sensor1 Delay Time
5. Train also waits for the additional configured Sensor1 Random Time
6. Train accelerates reverse to the configured maximum speed
7. Train coasts along the track at configured maximum speed
8. Train triggers SENSOR2 and decelerates to configured minimum speed
9. Train stops and waits for the configured Sensor2 Delay Time
10. Train also waits for the additional configured Sensor2 Random Time
11. Train accelerates forward and the cycle repeats

SENSORS

You will need TWO sensors when running a train. The sensors are NOT supplied so you will need to provide these sensors as there are many options...

The sensors can be an electronic infra-red type, such as the JTEILD locomotive detector mounted below the track, or maybe you could use reed switches mounted just below the track and magnets attached to the bottom of the locomotive and the last rolling stock. The sensor must send out a low resistance ground / 0 volts signal when activated and this will be detected by the JTEDCS1 controller module.

The sensors are placed near each end of the track as indicated in the wiring diagrams. When the locomotive (and/or rolling stock) activates the sensor, the JTEDCS1 will send out the appropriate track voltages the locomotive to stop, wait, and change direction. The locomotive may take a while to slow down and stop before it changes direction (maybe because of the deceleration time setting) so you may have to place the sensors some further distance from the ends of the track to allow the locomotive to decelerate and stop. There is also a programmable random delay between the time the locomotive is sent the STOP command and sent the CHANGE DIRECTION command at the ends of the track.

Correct sensor operation is critical to the back and forth operation. The sensors must operate, which is send out a ground signal, for at least 100ms to be detected correctly.

Note: If you are powering the sensors from another power supply, make sure you connect the negative/ground terminal of the power supply to the ground (G) terminal of the JTEDCS1 controller, which will complete the electrical circuit to the sensor inputs.

Make sure you follow the wiring diagrams in this datasheet carefully as it is important to connect sensors to the correct sensor inputs on the JTEDCS1 controller module!

SPECIFICATIONS

Power Supply Voltage	8 to 15 volts DC depending on locomotive scale. 12 volts DC will be fine for most
Power Supply Current	500 milliamps minimum

MODULE DIMENSIONS (APPROX)

LENGTH	77mm
WIDTH	53mm
HEIGHT	40mm

This document is updated from time to time as new information becomes available – usually due to people asking relevant questions regarding usage or configuration. The “Document Updated” date in the bottom-right corner of each page shows what document date you have. The latest version of this datasheet document can be downloaded from <http://www.jtelectronics.co.nz/products/documents/> or Google “JTEDCS1”

This JTEDCS1 module is supplied as preassembled Arduino compatible shields like in the photos. It will be damaged by shorting out the pins, connections, or components, or by either of the shields (boards) coming into unusual contact with external voltages or metal/conductive objects.

The JTEDCS1 module will also be damaged by incorrectly connecting power to the wrong terminals of the motor driver shield. Make sure you connect your DC power supply to the VIN and GND terminals ONLY. Make sure you connect ONLY your tracks to the A+ and A- terminals and that no other power supply or train controller is connected to the tracks.

PLEASE REFER TO THE WIRING DIAGRAMS IN THIS DATASHEET FOR CORRECT WIRING INFORMATION

Like most electronic equipment the JTEDCS1 circuit boards contain static sensitive devices and may be damaged by high voltages present during electrostatic discharge. Avoid electrostatic discharge by handling the JTEDCS1 module as little as possible. To prevent damage, we suggest you put the JTEDCS1 module into an enclosure or locate it somewhere protected from contact with random external objects...

CONFIGURATION OPTIONS

Speeds are configured as a percentage of the power applied to the track. They are not an absolute train speed setting, and the speed settings will depend on the DC power supply voltage and your locomotive's motor characteristics. Settings for your train will be determined by trying various settings to suit desired operation. Times are configured in milliseconds (1/1000th of a second) so 1 second is configured as 1000ms, 12 seconds would be configured as 12000ms etc.

minimumSpeed The "start" power applied to the track to get the locomotive moving and accelerating to maximumSpeed. The train will also slow down to this minimum speed at the end of decelerating. This is one of the more critical settings as different locomotives will require a different minimum power setting to get them moving smoothly. Configurable from 1% to 99%.

maximumSpeed The "coast" power applied to the track after acceleration has completed. Configurable from 5% to 100%.

startPulseTime The time that the start pulse power is applied to the track to get the locomotive moving from standstill. This start pulse time will usually be very short, maybe 5 milliseconds. Configurable from 0ms to 500ms.

startPulseSpeed The amount of additional power applied to the track to get the locomotive moving, just before it starts accelerating. A value of 25% additional speed pulse may be useful getting a locomotive moving. Configurable from 0% to 100%.

accelerationTime The time it takes for the train to accelerate from minimumSpeed to maximumSpeed when the train starts moving. Configurable from 1000ms to 30000ms.

decelerationTime The time it takes for the train to decelerate from maximumSpeed to minimumSpeed when a sensor is triggered. Once deceleration to minimumSpeed is reached, the train is stopped (track power is turned off). Configurable from 1000ms to 30000ms.

sensor1delayTime The wait time after the train has decelerated and stopped at SENSOR1. Configurable from 0 to 60000ms.

sensor1randomTime The additional random wait time after sensor1delayTime has elapsed. Configurable from 0 to 60000ms.

sensor2delayTime The wait time after the train has decelerated and stopped at SENSOR2. Configurable from 0 to 60000ms.

sensor2randomTime The additional random wait time after sensor2delayTime has elapsed. Configurable from 0 to 60000ms.

SERIAL PORT COMMUNICATION

The JTEDCS1 is configured by connecting it via a USB cable to your computer and will be detected as a serial COM port. You can “talk” to the JTEDCS1 using serial terminal emulation software. The JTEDCS1 also sends status and configuration information to the serial terminal software so you can “see” what it is doing. In your serial terminal software, you will need to configure the appropriate COM port that is detected and the communication speed of 115200 baud. Suitable terminal software is included in the “Arduino IDE” which can be downloaded from <https://www.arduino.cc/en/software> and is available for Windows, Mac & Linux. The serial COM port is configured using menu option Tools / Port and the serial terminal software window is opened using menu option Tools / Serial Monitor. The communication speed is set near the bottom right corner of the Serial Monitor window. There are many other serial terminal software programs available, but I cannot help you with these because there are so many different configuration methods, and computers.

SERIAL CONFIGURATION COMMANDS

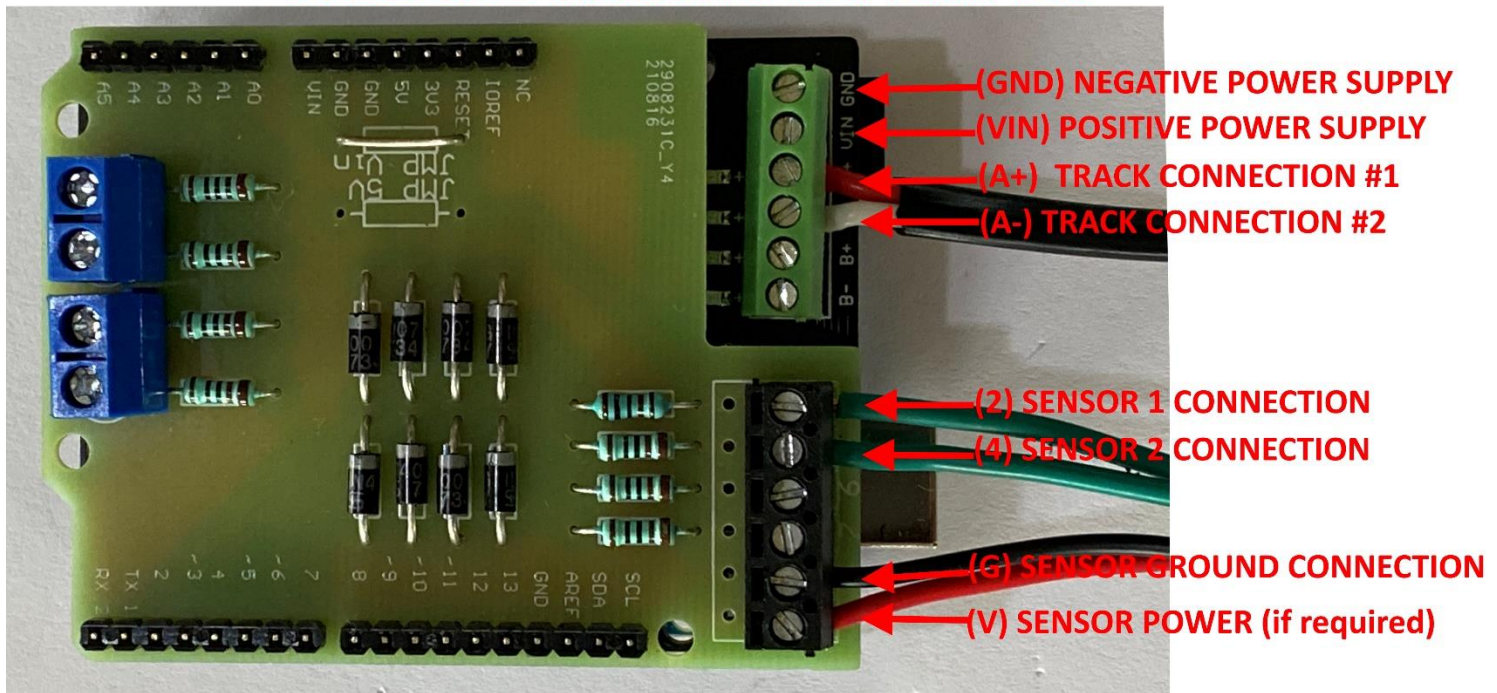
Configuration commands are entered at the top line of the Serial Monitor window of the Arduino IDE and clicking the SEND button. Once a configuration command is accepted, the setting is automatically saved when entered. Configuration commands are entered as a three letter command followed by a space and then a number within the acceptable range of that command. For example:

To set the maximumSpeed to 70% power, send the command: **max 70**
To set sensor2RandomTime to 15 seconds, send the command: **s2r 15000**

? or help	Show configuration settings and help
min xxx	Set minimumSpeed to xxx percentage (1 -> 99%)
max xxx	Set maximumSpeed to xxx percentage (5 -> 100%)
spt xxx	Set startPulseTime to xxx milliseconds (0 -> 500ms)
sps xxx	Set startPulseSpeed to xxx percentage (0 -> 100%)
acc xxxxx	Set acceleration Time to xxxxx milliseconds (1000 -> 30000ms)
dec xxxxx	Set decelerationTime to xxxxx milliseconds (1000 -> 30000ms)
s1d xxxxx	Set sensor1delayTime to xxxxx milliseconds (0 -> 60000ms)
s1r xxxxx	Set sensor1randomTime to xxxxx milliseconds (0 -> 60000ms)
s2d xxxxx	Set sensor2delayTime to xxxxx milliseconds (0 -> 60000ms)
s2r xxxxx	Set sensor2randomTime to xxxxx milliseconds (0 -> 60000ms)
oct xxxx	Set overcurrentTrip to xxxx . A value of 500 should be sufficient for most setups
res	Reset all settings to factory default configuration and restart the JTEDCS1

WIRING DIAGRAM

JTEDCS1 WIRING DIAGRAM

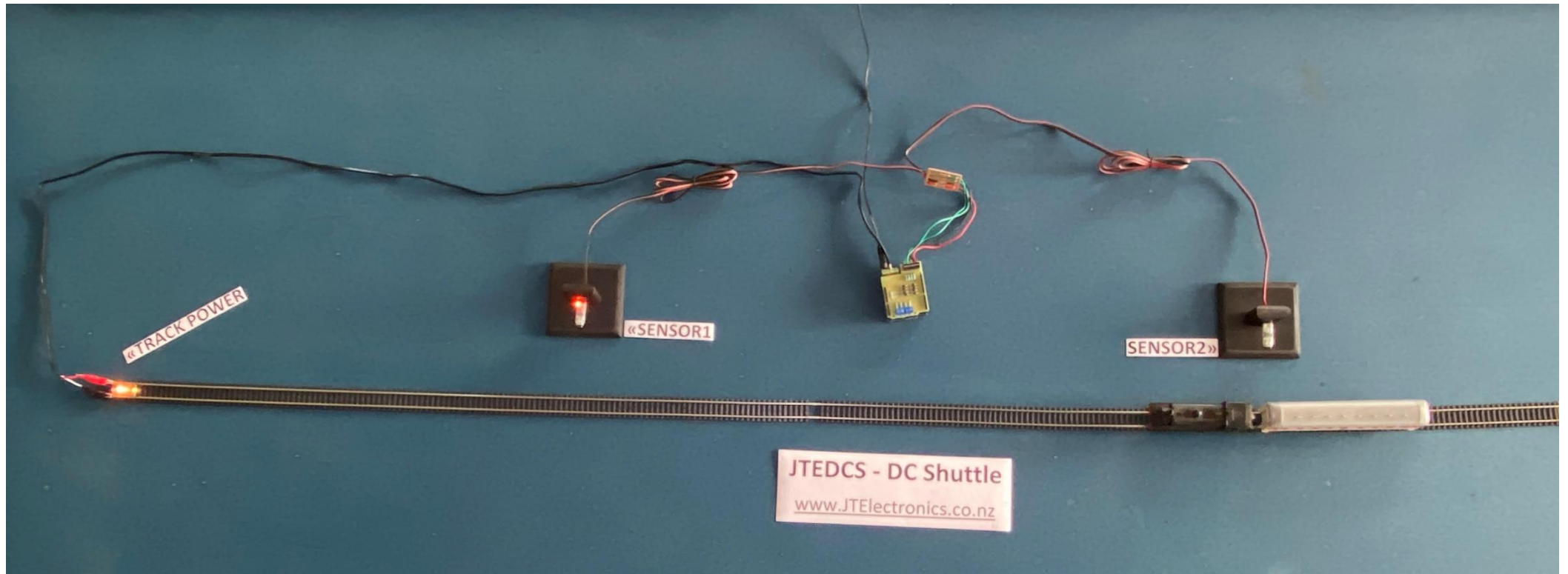


1. Wire your DC power supply to the “VIN” and “GND” terminals
or you can use the DC power jack on the bottom board (centre pin positive)
2. Wire your track to “A+” and “A-” terminals
3. Wire SENSOR1 input to “2” and “G” terminals
4. Wire SENSOR2 input to “4” and “G” terminals
5. If required, connect power to your sensors from “V” terminal, or “VIN” terminal

If the train is moving in the wrong direction either turn around the locomotive or swap the track wires.

There are small red LED's beside the B+ and B- screw terminals that light up when SENSOR1 or SENSOR2 are activated to assist with sensor detection testing.

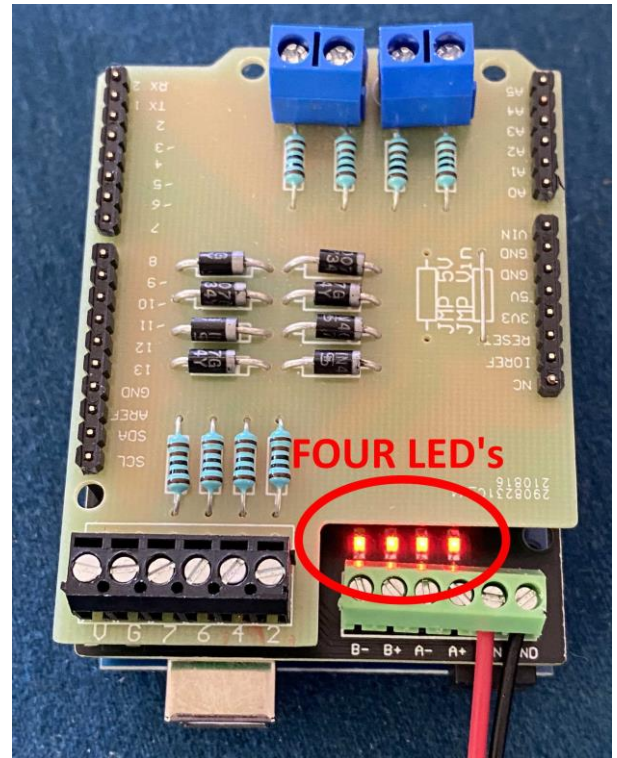
TYPICAL TEST LAYOUT



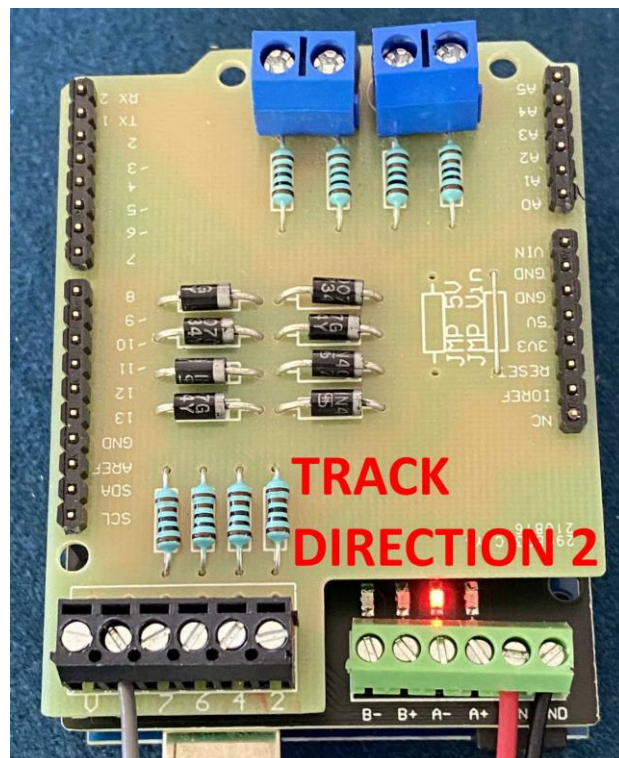
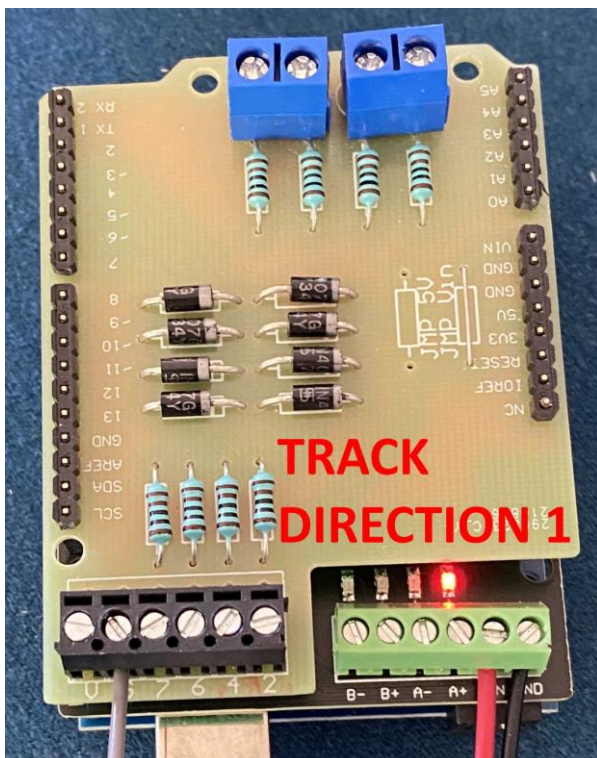
DIAGNOSTIC LEDs

To assist with diagnosing why the DC shuttle may not be operating as expected, there are four small red LEDs adjacent to the terminal block for power and track connections.

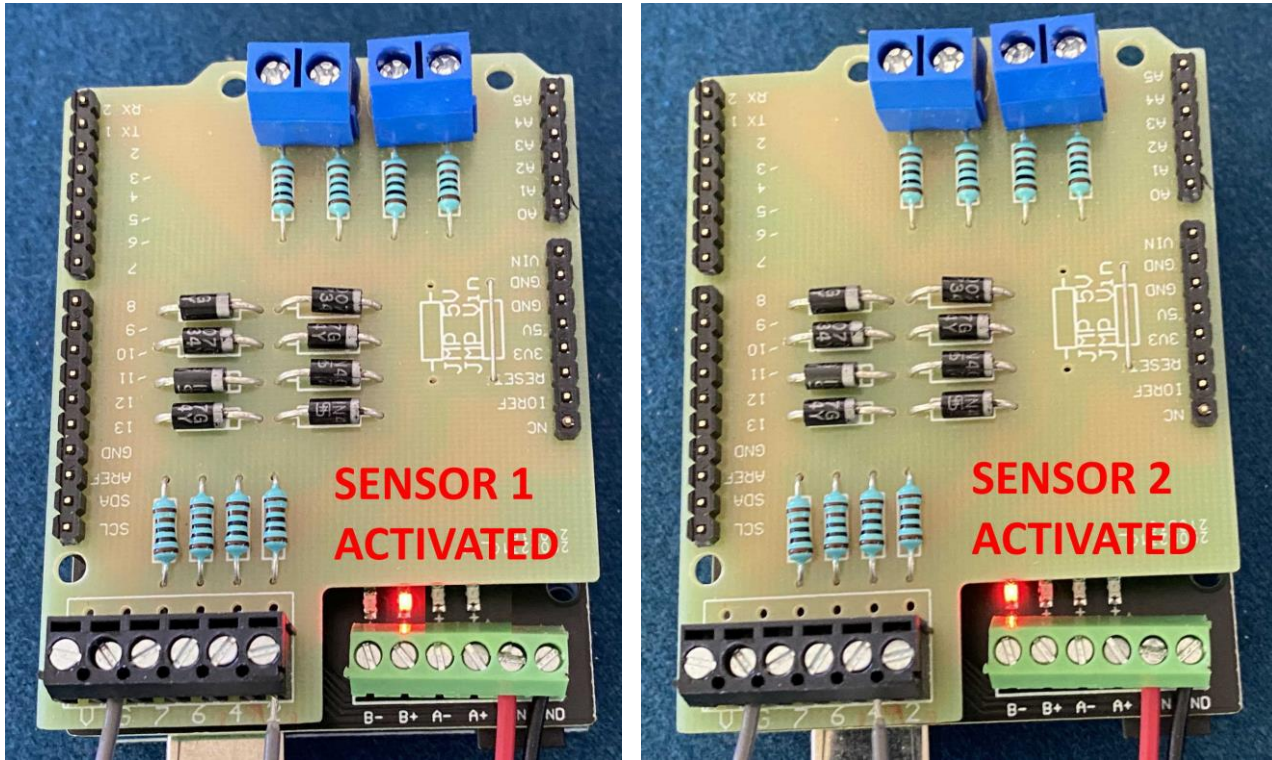
The picture to the right shows all four diagnostic LEDs lit up so you can locate them on your JTEDCS1 module. You are unlikely to see all four LEDs lit up at the same time like shown in this photo.



These pictures below show the two “Track Power” diagnostic LEDs on the right-hand side. One LED will be lit depending on whether the locomotive is travelling forward, or backward. One of the two “Track Power” LEDs will be bright, and the other LED will be dim or off (depending on acceleration or deceleration progress). Both Track Power LED’s will be off when the locomotive is waiting at either end of the shuttle track as no power is sent to the track.



These pictures below show the two “Sensor” diagnostic LEDs on the left-hand side and will assist in showing when a sensor is activated. The right-hand Sensor diagnostic LED will light if Sensor1 is activated and the left-hand Sensor diagnostic LED will light if Sensor2 is activated. Both LEDs will light if both sensors are activated (which would be very unusual).



GENERAL DIAGNOSTIC INFORMATION

- Check your tracks are clean. DC locomotives will be very susceptible to not moving reliably on dirty tracks.
- Check the Track Power LEDs light up as described above.
- Check the Sensor LEDs light up as described above.
- Check DC power is at the JTEDCS1 “VIN” and GND” terminals with a multimeter.
- Check DC power is at the tracks with a multimeter.