



Overview of operation modes

There are three main operation modes available. Any of the modes can be selected at any time. The three main modes are: manual, automatic and mappable modes 1 to 4. The MapDCCD controller lights indicate the current operation mode and the live DCCD output.

Manual mode

Manual mode is static DCCD control. The front dial or external thumbwheel input is used to vary the DCCD lock from 0 to 100%.

Automatic mode

Automatic mode is simple and automated DCCD control based on your throttle position and your vehicles lateral acceleration using the built in accelerometers.

The DCCD lock is calculated using a continuous mathematical model of vehicle dynamics to predict the required amount of DCCD lock as you drive.

The front dial or external thumbwheel input is used to vary the aggression of the vehicle dynamics model. Setting the dial high will bias the vehicle toward understeer tendencies, while setting the dial low will bias the vehicle toward oversteer tendencies. The dial can be adjusted to any position to allow you to precisely tune your vehicles response to your driving style.

Map modes 1-4

The map modes provide advanced DCCD control and are most suitable for a motorsports environment. The map modes allow fine tuning of all conditions including those of acceleration, braking, corner turn in and corner exit. The effect is increased driver confidence from a vehicle that has more stability and grip. This allows you to drive faster in a motorsports environment.

Each map mode has two main sections – a throttle section and a braking section. The braking section is activated when the foot brake is pressed. The throttle section is otherwise default.

Throttle section

The throttle section allows mapping of the DCCD lock based on four parameters: RPM, TPS, Vehicle speed and a sensor input. The sensor inputs available include internal lateral or longitudinal accelerometers or an external sensor.

Braking section

The braking section has two braking maps – one for when only the foot brake is applied and another for when the foot brake is applied and the throttle is also applied (and above a set threshold), deemed "left foot braking".

The braking section allows mapping of the DCCD lock based on four parameters: The foot brake being activated, TPS, vehicle speed and a sensor input. Like for the throttle section, the sensor inputs available include internal lateral or longitudinal accelerometers or any external sensor.



Hardware – Display interface



Mode select The mode select buttons are used to click through the operation modes of the MapDCCD controller in the left or right directions. The operation modes are ordered: Manual, Auto, Map 1, Map 2, Map 3, Map 4. When a mode select button is pressed, the MapDCCD controller will beep and the LED corresponding to the operation mode will flash rapidly before reverting to show the live output.

Note that the first time a mode select button is pressed the display will indicate the current operation mode. A second button press will change to the next operation mode.

In the software, the OEM thumbwheel input may optionally be selected to change the operation mode based on the thumbwheel dial position. The mode select buttons will be inactive when this option is selected.

Display The display has six LED lights. A mode indicator is located above each light where "M" = manual mode and "A" = Auto mode (green LEDs), and "1, 2, 3, 4" correspond to the four maps stored in the controller (orange LEDs).

By default, the six LED lights will show the current operation mode by flashing rapidly when a mode select button is pressed. After approximately 2 seconds, the display will revert to showing the live DCCD output. However, the display can be switched to only show the operation mode in the software setup page.

Gain dial In manual mode the gain dial sets the static DCCD lock from 0 to 100%. In auto mode, the gain dial sets the aggression of the vehicle dynamics algorithm. When the dial is low the vehicle will be biased toward oversteer and when the dial is high the vehicle will be biased toward understeer. The dial can be set anywhere between max and min to set the vehicle response you desire.

USB Socket For connecting to your PC to configure the MapDCCD controller (USB cable supplied)



Hardware - Connections



Pin	Function	Wire Colour	Specifications
1	Ground1 (Low Current)	Black (thin wire)	Sensor ground
2	Ground2 (High Current)	Black (thick wire)	Power ground
3	DCCD Output (to transmission)	White (thick wire)	High current PWM
4			
5			
6	Dash light dimmer input	Orange	0-15V
7	Thumbwheel input (Analog)	Aqua	0-5V
8	4D Input (Analog)	Brown	0-5V
9	TPS Input (Analog)	Purple	0-5V
10			
11			
12	ABS Input (Digital)	Grey	0-5V
13	Ignition switched high current power input	Red (thick wire)	12~15V
14			
15	DCCD Output (to transmission)	White(thick wire)	High current PWM
16			
17	Data logging output (Analog)	White (thin wire)	0-5V
18			
19	Handbrake Input (Digital)	Yellow	0-12V
20	Brake Input (Digital)	Pink	0-12V
21	RPM input (Pulses)	Green	0-5V
22	Speed Sensor Input (Pulses)	Blue	0-5V
23			
24			



Connection guide (basic)

Manual

Required connections:

- power (11~15V)
- Ground 1 (low current sensor ground)
- Ground 2 (high current power ground)
- Two DCCD control signal wires to gearbox

Auto

Required connections:

- Power (11~15V)
- Ground 1 (low current sensor ground)
- Ground 2 (high current power ground)
- Throttle position sensor
- Two DCCD control signal wires to gearbox

Maps 1 – 4

Required connections:

- Power (11~15V)
- Ground 1 (low current sensor ground)
- Ground 2 (high current power ground)
- Throttle position sensor
- RPM/tachometer signal
- Two DCCD control signal wires to gearbox

Optional map mode connections:

- Vehicle speed sensor
- Brake pedal
- 0-5V external input signal
- 0-5V OEM thumbwheel input

Further optional connections:

- Hand brake (overrides DCCD output signal to unlock center differential)
- ABS (overrides DCCD output signal to unlock center differential)
- 0-5 V output (for data logging, driving OEM DCCD control manual mode, or switching external device)



Connection guide (detailed)

Power connection (Thick red wire)

The power connection should be a high current feed that is ignition switched. Suggested locations are the power feed to the vehicle ECU or a dedicated ignition switched relay. The feed should be fused at 10 Amps. However, the MapDCCD control unit is also fused internally at 10 Amps.

If your vehicle already has a switch high current voltage feed to an existing or previous DCCD controller (OEM or otherwise), we highly recommend this high current voltage feed is used.

Ground connections (Two black wires)

The MapDCCD requires two separate ground connections. This is needed because the MapDCCD drives the cars DCCD directly which requires high currents but also accommodates low current signals like the TPS sensor.

Ground 1 is the low current ground which runs the MapDCCD unit. This can be connected to any ground location but the ideal and recommended place is the sensor or signal ground input to the vehicles ECU. This enables the MapDCCD unit to get a clear reading from the car sensors without any interference.

Ground 2 is the high current ground which must be connected to either the vehicle chassis or directly to the battery negative terminal.

To check your ground connections once the unit is installed you can perform the following;

- ▲ Connect the MapDCCD USB to a laptop and start the MapDCCD software
- ▲ Connect the software to the MapDCCD and switch it to "Setup" mode
- ▲ Set the MapDCCD to manual mode and adjust the gain adjustment to around 80%, but not full.
- ▲ Move the throttle pedal while watching the throttle position in the software. If the TPS position is smooth and doesn't jump around then the grounding is good. (The engine should be off for this test but the ignition may need to be on to power the MapDCCD)
- ▲ This may also be a good time to check/set the TPS calibration in the software. Calibration sets the MapDCCD TPS input to match your cars range for zero and full throttle. Read the software section in this document for more information.

Throttle position sensor input (0-5V, Purple wire)

The throttle position sensor is located on the throttle body on the engine and connects to your vehicle ECU. The voltage range is 0 to 5V (usually around 0.2V at no throttle and 4.2V at full throttle). The suggested TPS connection should be at or near the vehicle ECU. Consult your ECU pin out diagram to determine the TPS signal wire.

The TPS wire should not be cut. The MapDCCD TPS wire should be connected in parallel with the existing TPS signal wire to the ECU.

DCCD control signal wire (Thick white wires)

A DCCD gearbox has two DCCD control wires. These should be connected to the two thick white wires on the MapDCCD cable. The order of the wires does not matter. The gearbox DCCD wires should be connected only to the MapDCCD unit. Connecting the DCCD gearbox wires to any other place may damage the MapDCCD unit.

RPM/tachometer signal input (0-5V, Green wire)

The RPM/tachometer signal connection is a pulsed signal provide by your vehicle ECU to drive the dashboard tachometer. Consult your ECU pin out diagram to determine the RPM signal output.

The RPM/tachometer wire should not be cut. The MapDCCD RPM input wire should be connected in parallel with the existing RPM/Tachometer signal wire from the ECU.

Vehicle speed sensor input (0-5V, Blue wire)

The vehicle speed sensor signal is provided from a speed sensor located in the gearbox or dashboard. The vehicle ECU is supplied with a pulsed signal corresponding to the vehicle speed. Consult your ECU pin out diagram to determine the speed sensor signal input.

The speed sensor signal wire should not be cut. The MapDCCD speed sensor input wire should be connected in parallel with the existing speed sensor wire to the ECU.

The vehicle speed can be calibrated in the MapDCCD control software to account for variations in tire size.

Brake pedal input (0-12V, Pink wire)

A brake light input is not (usually) connected to the vehicle ECU. Suggested locations for connecting the MapDCCD brake signal input wire include the brake pedal switch located above the brake pedal, or a brake light wire near the rear of the car.

The existing brake light wiring should not be cut. The MapDCCD brake input wire should be connected in parallel with an existing brake light wire.

To verify the brake pedal connection has been made the brake pedal signal wire should be approximately 11 to 14 Volts when the brake pedal is pressed and approximately 0 Volts when the brake pedal is released. The brake pedal logic polarity can be reversed in the MapDCCD control software if required. The brake pedal input signal can be disabled in the MapDCCD control software if it is not used.

Hand brake input (0-12V, Yellow wire)

The handbrake input wire should be connected to the switched connection located at the hand brake mechanism.

To verify the hand brake connection has been made the hand pedal signal wire should be approximately 11 to 14 Volts when the hand brake is released and approximately 0 Volts when the hand brake is applied. This polarity can be reversed in the software if required. The hand brake input signal can be disabled in the MapDCCD control software if it is not used.

ABS input (0-5V, Grey wire)

The ABS input should be connected to the ABS control signal wire provided to the OEM DCCD controller on ABS equipped vehicles. The MapDCCD control system monitors the ABS signal input voltage and reduces the DCCD lock when the ABS is activated.

The ABS input can be disabled in the MapDCCD control software if this input is not required.

Data logging output (0-5V, thin white wire)

The data logging output is 0-5 Volt and can be used for data logging by connection to your programmable ECU or data logging device. The data logging output provides an analog voltage that reflects the current DCCD output PWM duty.

The 0-5 Volt output can also be used to drive an existing DCCD controller that has a manually adjustable mode, for example, the GC8 manual controller. In this way, the DCCD dashboard lights are functionally retained. If the 0-5 Volt output is used to drive an existing DCCD controller, the handbrake, ABS inputs and MapDCCD gearbox output wires can be omitted and these inputs should be set to "Not connected" in the MapDCCD software.

The 0-5 Volt output can control an existing DCCD controller by replacing the thumbwheel input to the existing DCCD controller. To implement this feature, cut the center (usually solid green) wire from the DCCD thumbwheel and connect the cut wire end going to the existing DCCD controller to the MapDCCD data logging output wire.

The cut wire end going to the DCCD thumbwheel can be connected to the 0-5V OEM thumbwheel input on the MapDCCD unit such that the thumbwheel may provide functionality to the MapDCCD control system to adjust the lock when in manual mode and the aggression when in auto mode, or can be used as a sensor input in the map modes, or can be used to change the operation mode.

OEM DCCD thumbwheel input (0-5V, Aqua wire)

The 0-5V OEM DCCD thumbwheel input provides a signal that can be used to control a parameter in the MapDCCD control system or switch maps. The MapDCCD 0-5 Volt thumbwheel input can be connected in parallel or series with the wire from the thumbwheel depending on whether the MapDCCD controller is driving an existing DCCD controller or replacing it.

The thumbwheel input can be used to adjust the lock when in manual mode and the aggression when in auto mode, or can be used as a sensor input in the map modes, or can be used to change the operation mode.

4D input (0-5V, Brown wire)

This feature is subject to a future firmware upgrade. Additional sensors can be added as requested by users. Check the website regularly for firmware updates or contact us if you wish to have a particular sensor added.

The 0-5 Volt input provides a signal that can be used to control a parameter in the MapDCCD control system where desired. The MapDCCD 0-5 Volt input can be connected in parallel or series with a wire providing 0-5 Volts. The 0-5 Volt signal could be provided, for example, from a programmable ECU or an external sensor desired to be part of the DCCD control.

Dash light input (0-12V, Orange wire)

The dash light input can be used to change the brightness of the MapDCCD controller display lights when the headlights are switched. Use as desired.



Verifying your wiring

We highly recommend checking your wiring before the MapDCCD control unit is connected to the loom and powered. This can potentially avoid creating a bigger issue that can take time, effort and cost to rectify.

We recommend testing the following:

- 1. Measure the resistance between the two DCCD output wires (thick white wires: pins 3, 15) on the loom plug.**

These wires connect to the DCCD coil inside the transmission. The coil resistance should measure 2 to 3 Ohms for a six speed transmission; or 4 to 5 Ohms for a five speed transmission.

Resistance below the applicable range indicates a short circuit that may cause a fuse to blow, wiring or the MapDCCD controller to be damaged. Carefully inspect all of the wires between the loom plug and the transmission for breaks.

If your wiring appears good, locate the 2-wire plug approximately 12 inches/30 cm from where the wires exit the transmission housing. Measure the resistance of the coil across this plug to verify the same measurement you made at the loom.

If your resistance measurement is still low, there may still be a fault within the transmission housing. The rear section of the transmission that houses the DCCD coil should be removed and the wiring inspected for faults.

Resistance above the applicable range may indicate a bad connection or a damaged DCCD unit. Contact us for advice before powering your control unit.

- 2. Measure the voltage between the switched power and ground (thick red and thick black wires: pins 2, 13) on the loom plug.**

The expected voltage range is 11 to 15 volts when the ignition is switched on and 0 volts when the ignition is off.

- 3. Measure the continuity or resistance between each individual DCCD output wire and the vehicle ground on the loom plug.**

If there is continuity or your meter registers a resistance, there is a wiring problem that could cause a fuse to blow, wiring or the MapDCCD controller to be damaged. Carefully inspect your wiring. If your wiring appears ok there may still be a fault within the transmission housing. The rear section of the transmission that houses the DCCD coil should be removed and the wiring inspected for faults.



Controller mounting position

The MapDCCD controller should be installed facing the front of the car as indicated by the arrow in the below diagram. The controller should be held securely in place and not move during vehicle use.

It is not necessary to mount the controller perfectly flat and level, although this is recommended. Once the controller is mounted, run the accelerometer calibration algorithm in the software.

Mechanical fasteners or double sided tape are adequate securing methods.

Front of vehicle





Software – installation and setup

Connecting the MapDCCD controller to your computer

Download the MapDCCD Install program to your computer and double click on the file to begin the install process. During the install you will be asked which units you would prefer, metric or imperial, (this can also be changed later if desired). Once the install is complete you will have a MapDCCD shortcut on your desktop to launch the application.

To connect to the MapDCCD device plug the USB cable into the laptop and MapDCCD. The first time this is done your computer may download and install a driver. This can take a few seconds.

When the driver has finished installing, launch the desktop MapDCCD shortcut. In the software click the “Connect” and the program should find and automatically connect to the MapDCCD controller within a few seconds. The maps and settings currently stored in the MapDCCD unit will then automatically download.

Note:

If you do not have an internet connection available when your laptop is in the car you can download the drivers here <http://www.ftdichip.com/Drivers/VCP.htm>

Download and unzip the Windows 32 or 64bit driver (depending on your windows version) to a folder. When you plug in the MapDCCD USB cable windows will detect new hardware and ask you for a driver. Select the folder where you unzipped the drivers too.

TPS calibration

The voltage levels from throttle position sensors (TPS) can sometimes be different between models. The MapDCCD comes set to OEM specified throttle range. However it is not uncommon to require some tweaking. To check if the default works for you, change to the “Setup” page of the software and watch the “Throttle” level as you put your foot on the throttle pedal. If the maximum and minimum throttle level matches your foot position then this setting does not need changing.

If the “Throttle” level in the software isn't covering the correct range you can make adjustments to correct for this. In the “Throttle calibration” sub-window, adjust with the up/down buttons for either the zero or full throttle setting changes until the range spans correctly.

Vehicle speed multiplier

This setting allows you to match the speed in the software with your speedometer. A difference may exist due to over or under sized tires. Click the up/down buttons to get the desired correction.

ABS, Footbrake and Handbrake inputs.

All of these three inputs can be set to "Not connected", "Active when low" and "Active when high". It is important to get this correct or the MapDCCD may not function correctly.

Not connected – Set this when you are not using the input at all. The MapDCCD will ignore the input regardless of any noise or shorts on the wire.

Active when low – Set this mode if the signal is inverted and outputs zero volts to represent the input (like ABS active, Handbrake active or Footbrake active).

Active when high – Set this mode if the signal outputs a high signal level (5-12V) to represent the input (e.g. ABS active, Handbrake active or Footbrake active).

The Setup Display

The setup display screen shows live information on the state of the MapDCCD inputs. The setup display can also be used to confirm that wiring and input selection is correct.

For example, pressing the foot brake should light up the "Foot brake" indication light. You can also use it to see the current throttle position display to help setting the throttle voltage limits.

Do not attempt to set the vehicle speed sensor while driving the car alone. This should be done by a passenger. Alternatively if you know your car is 10kph fast it is usually acceptable to just set the speed multiplier to correct for this without needing a road test.

Saving your changes

Setting changes made in the setup window are saved automatically.

Changes made to any of the maps must be uploaded to the MapDCCD controller by clicking the "Upload" button. Uploading will take approximately 10 seconds.

Changes to any of the maps can be saved to a .DMF file by clicking "File">"Save all maps to file" and naming the file.

Software – Setup page



Setup options

- Throttle position sensor - Zero and full throttle voltage levels used for setting throttle range.
- Thumbwheel input - Sets the function of the thumbwheel input (if used). It can be set to control the gain or the mode.
- Foot brake input - Sets how the foot brake is connected. If you are using the footbrake input then this can be set normal (active high) or inverted (active low).
- Display mode - Sets how the MapDCCD front display behaves. They can show either the current mode or both the mode and current lock.
- Start up mode - Sets what mode the MapDCCD is in when it powers up. This can be any more or it can remember the last mode it was in.
- Speed calibration - Sets a multiplier to correct for inaccurate vehicle speed readings.
- RPM calibration - Sets the number of pulses used to read the vehicle RPM (2 is OEM).
- Parking brake input - Sets how the parking brake is connected. If you are using the parking brake input then this can be set normal or inverted.
- Parking brake function - Sets what DCCD lock limit to use when the parking brake is active.
- ABS input - Sets how the ABS is connected. If you are using the ABS input then this can be set normal or inverted.
- ABS Function - Sets what DCCD lock limit to use when the ABS is active.
- Display brightness input - Sets whether the headlight input is used to dim the MapDCCD display.
- Display brightness - Sets the normal and dim led brightness levels.

Display

The display area shows real time input and output information. This area provides you a button to reset the internal g-force sensor to compensate for tilt in the controller mounting position.

Displayed analog information: Vehicle speed, Vehicle RPM, Throttle position, gain dial position, DCCD 4D input voltage, DCCD output lock, and internal X and Y G-force sensor indication.

Displayed digital information: Footbrake, handbrake, ABS and headlight states.

Software – Mapping interface

The screenshot shows the MapDCCD software interface with several key components labeled:

- Setting button:** Located at the top right of the window.
- Upload button:** Labeled 'UPLOAD MAPS' in the top navigation bar.
- Connect button:** Labeled 'Connect' in the top navigation bar.
- Map select:** Buttons for 'MAP 1', 'MAP 2', 'MAP 3', and 'MAP 4' in the top navigation bar.
- Throttle Map:** A 10x10 grid table with TPS % on the y-axis (0-100) and RPM on the x-axis (0-8000+).
- Throttle Modifier:** A 10x10 grid table with speed on the x-axis (0-255+ km/h) and a y-axis from 0.00 to 1.50+.
- Braking Modifier:** A 10x10 grid table with speed on the x-axis (0-255+ km/h) and a y-axis from 0.00 to 1.50+.
- Braking Map:** A 1x10 grid table with speed on the x-axis (0-255+ km/h).
- Left foot brake:** A 1x10 grid table with speed on the x-axis (0-255+ km/h).
- Optional description:** A 'Map Notes' field at the bottom left.
- Modifier Options:** Checkboxes for 'Enable Throttle Modifier' and 'Enable Braking Modifier'.

Setting button - Used to switch the window to the setup page

Upload button - Used to save map changes to the controller (**changes made to maps will not be stored or functional until they are uploaded**).

Connect button - Used to connect to the MapDCCD controller once the USB cable has been connected.

Map select - Used to select maps 1 to 4 to be viewed or edited. The active map is highlighted.

Throttle map - Used to tune a TPS vs. RPM DCCD lock map. Values represent DCCD lock from 0 to 100% to be sent to the throttle modifier map (when the throttle modifier map is enabled) or the DCCD center differential (when the throttle modifier map is not enabled).

Throttle modifier	- Used to tune a vehicle speed vs. Sensor input map. The sensor input can be selected from the drop down box below the map. Options include internal accelerometers and external sensors. Values in the throttle modifier map are added (when positive) or subtracted (when negative) from the value output from the Throttle map. The output of the throttle modifier map is sent to the DCCD center differential.
Braking map	- Used to tune the DCCD lock with speed when the foot brake is pressed.
Left foot braking map	- Used to the DCCD lock with speed when the foot brake is pressed and the throttle is above a threshold set in the above box.
Braking modifier	- Used to tune vehicle speed vs. Sensor input map. Values in the braking modifier map are added (when positive) or subtracted (when negative) from the value output from the braking maps. The output of the braking modifier map is sent to the DCCD center differential.
Description text field	- For notes.
Modifier options	- A drop down list of selectable sensor inputs that can be used as part of the DCCD control strategy.



Help

Please email info@mapdccd.com

Included hardware with your purchase:

One MapDCCD control unit

One MapDCCD 1.5 m loom

One Mini-B 1.5 m USB cable



Limitations

The MapDCCD differential control system is for off-road use only.

The MapDCCD differential control system is to be installed by a qualified automotive technician. Should an issue arise, we will help you. However, you will be responsible for the cost of any shipping and repairs if a non qualified automotive technician installs the MapDCCD differential control system.

Installation of the MapDCCD differential control system acknowledges the above limitations and that the user is solely responsible for their own safety and the safety of their vehicle and other vehicles.