

DCCD Controller

User manual

Introduction

MicroRally DCCD Controller is a simple, yet powerful replacement for Subaru's DCCD ECU. Ideal for retrofitting 6MT DCCD gearbox in older models, or if ABS module omitted and there are no more all the necessary signals and sensors to operate OEM DCCD ECU. This controller supports both 5MT and 6MT DCCD coils. MicroRally DCCD Controller offers only manual control of lock force, there is no automatic mode, but it still offers some advanced motorsport functionality.

This controller is compatible with OEM control inputs (either thumbwheel or Si-drive buttons) and instrument panel LED indicators. If no OEM controls are available then MicroRally DCCD Interface board is available.

Basic specification

Supply inputs

1x High power input - 6V to 18V, 10A max. Use an external 10A fuse.

1x Logic power input - 6V to 18V, 1A max. Internally fused.

Supply outputs

1x 5V for inputs and LEDs. 1A max, internally fused.

Control inputs

3x High voltage (12V) digital inputs.

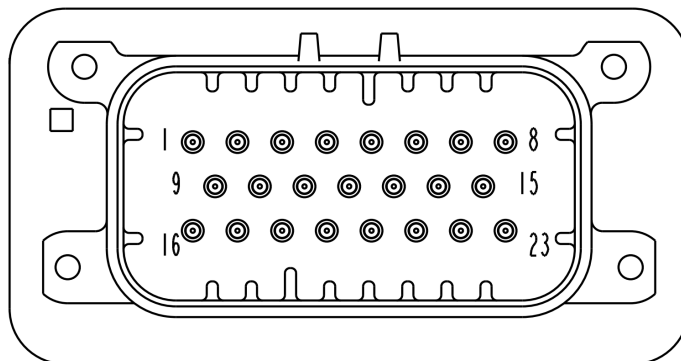
3x Low voltage (5V) digital inputs.

1x Low voltage (5V) analog inputs.

Control outputs

6x Open drain LED outputs.

Connector pinout



Connector: TE Ampseal 23 pin, A-key.

#	Name	Type	Function	Installation notes
1	VBAT	P	Battery positive supply	
2	DCCD+	AO	Output for DCCD coil	
3	DCCD-	AO		
4	PGND	P	Power ground	
5	LED1	OD	20% LED output	
6	LED3	OD	60% LED output	
7	LED5	OD	100% (LOCK) LED output	
8	5V	P	5V supply output	
9	VIGN	P	Ignition supply	
10	n.c.		Not connected	
11	n.c.		Not connected	
12	LED0	OD	0% (OPEN) LED output	
13	LED2	OD	40% LED output	
14	LED4	OD	80% LED output	
15	UP	DIN	Up [+] button input	
16	GND	P	Optional power ground	
17	DIMM	HIN	Dimm signal input	
18	BRK	HIN	Brakes signal input	
19	HBRK	HIN	Handbrake signal input	
20	MODE	DIN	Mode button input	
21	POT	AIN	Potentiometer input	
22	DOWN	DIN	Down [-] button input	
23	IGND	P	Inputs ground	

P - Power, AO - Analog output, HIN - 12V digital input

DIN - 5V digital input, AIN - 5V Analog input, OD - open drain output

Functional description

DCCD driver

DCCD lock force adjustment is achieved by modulating current through the coil. MicroRally DCCD Controller controls current through coil, by varying average output voltage with high frequency PWM. Target output voltage is determined by measuring coil resistance and targeting set percent of the preset LOCK state current. Control algorithm also compensates for varying battery voltage, maintaining constant current through the coil, independent of supply voltage. Both coil terminals must be connected to the DCCD Controller. DCCD coil driver outputs are overcurrent (OCP) and overvoltage (OVP) protected, as well loss of load (increase in load resistance) can be detected. The DCCD Controller automatically detects (calibrates) and differs between 5MT and 6MT coils, based on their typical resistance.

Fault handling

When OCP fault is detected, then coil driver output is momentarily disabled, and retry sequence is initiated. Output is shut off for 1 second, allowing the output driver to cool down. After this period, output is reset to its previous state. If fault reoccurs within 1 second, then output is shut off again, and retry counter is increased. If there have been 5 consecutive failures, then output is permanently shut off and no more retries are performed. Controller logic supply must be restarted.

When loss of load condition is detected then output is also shut off, and periodically the output resistance is measured. If valid resistance reappears, then output is reset to its previous state, and normal operation is continued.

Advanced control functions

DCCD Controller implements some necessary set lock force overrides. Those are - opening of the center differential when the handbrake is pulled and opening or locking when brakes are pressed. Brake pedal action can be changed by MODE input. The priorities of actual output force are as follows:

- 1 - Fault protection
- 2 - Handbrake override
- 3 - Brake pedal override
- 4 - User set force

Mode input selects between two brake pedal actions:

- 1 - Open differential, when brakes are applied
- 2 - Lock differential, when brakes are applied

High voltage inputs

The DCCD Controller has three high voltage capable inputs, for interfacing with the rest of the vehicle's systems. Each has dedicated functionality. The inputs are - Handbrake, Brakes and Dimm.

Handbrake input

This is the only active low high voltage input. Connect this to the existing handbrake signal, that is 0V when the handbrake is pulled (active). If a non-OEM handbrake is used, that doesn't have any switch, then such switch must be fitted. Add a non latching switch (button) that connects to ground (0V) when activated. For such cases, DCCD controller has a built in 5V 4.7k pull-up resistor.

Brakes input

This is active high input. Connect this input to brake lights.

Dimm input

This is active high input. Connect this input to clearance lights or other backlight control signal. When active, LED outputs will be dimmed (be less bright).

Low voltage inputs

The DCCD Controller has three digital and one analog 5V input. These are used for user settings. With these inputs either old style (with potentiometer) or Si-Drive style (with buttons) control can be used. Control with dedicated buttons is preferred. All three digital inputs are active low, with integrated 5V 4.7k pull-up. *Inputs ground* signal can be used to have a clean ground path for potentiometer and buttons. For digital inputs use of it isn't necessary, but is recommended. As well 5V supply output is present for powering potentiometer. Any resistance, linear potentiometer can be used.

LED outputs

The DCCD Controller has six open-drain LED outputs. Same as for the OEM instrument panel. Outputs show the set force from 0% to 100%, and error codes. LED outputs have a built in series 470R resistor, for limiting output current. It is perfectly sized for controlling LEDs that are supplied from 5V output.

User interface indications

OPEN	20%	40%	60%	80%	LOCK	Description
Status indications						
						Not powered, or critical supply fault
						Open while braking, mode selected
						Lock while braking, mode selected
					SLOW	Slowly flashing, indicates failed OCP retry
FLASH						Flashing, indicates failed calibration
FLASH	FLASH	FLASH	FLASH	FLASH	FLASH	Flashing set force, indicates loss of load
Set or actual force indications						
						OPEN
						10%
						20%
						30%
						40%
						50%
						60%
						70%
						80%
						90%
						LOCK

Advanced configuration options

Bootstraps

The DCCD Controller has three bootstraps that are used to change configuration. They are located inside of the device on the PCB as solder jumpers, marked BOOT0, BOOT1 and BOOT2. Refer to the table below for their functionality.

To be defined.