D153 - COLOUR MINI DISPLAY

The D153 display is part of MoTeC's D1 Series. This compact, configurable and high brightness colour display (readable in direct sunlight) is used with MoTeC data loggers.

It is designed primarily for mounting on steering wheels, with inputs provided to suit steering wheel mounted switches that allow transmission of switch state on CAN.

▶ FEATURES

- Colour LCD display
- Compact size to allow mounting on steering wheels
- High brightness for sunlight readability
- Receives display messages from MoTeC data loggers
- Sends input data to other devices via CAN

▶ SPECIFICATIONS

Analog inputs

- Amount: 8 (can be used for switches or potentiometers)
- Measurement range: 0V to 4V
- Maximum operating voltage = 7.0V *
- Maximum protected voltage = 32V
- Input equivalent: 10kΩ to 4.0V

* Above this voltage other inputs may be affected.

Switch inputs

- Amount: 6
- Threshold High max = 3.5V
- Threshold Low min = 0.8V
- Maximum operating voltage = 32V
- Input equivalent: 10kΩ to 4.0V

Power supply

- Operating voltage = 6.5V to 32V
- Operating current = 380mA (typical) at 14V, full brightness
- Reverse battery protected

Communications

- CAN 1 Mbit/sec

Display

- Type: TFT LCD, anti-reflective
- Resolution: 320 x 240, anti-aliased graphics
- Brightness: controlled via CAN message, 100 steps
- Layouts: selectable fixed layouts

Operating temperature

- Internal: -20°C to 70°C (above 60°C maximum backlight brightness progressively reduced)
- Typical maximum ambient temperature in free air: 50°C

Physical

- Weight: 200gms (excluding wiring)

- Anodised aluminium housing

▶ SCREEN CLEANING

Wipe using a clean water dampened microfibre cloth, followed by a clean dry microfibre cloth.

▶ DATA LOGGER COMPATIBILITY

MoTeC ACL, Dash Loggers and Enclosed Loggers.

▶ CONFIGURATION

Display configured via compatible MoTeC Data Logger using Data Logger Manager software.

▶ CONNECTOR AND PINOUT

No terminating connectors, two unterminated flying leads (cables A and B).

Cable A

Wire Colour	Name	Function	Internal Pin
Black	Bat Neg	Battery Negative	A 1
Red	Bat Pos	Battery Positive	A 2
Green	* CAN LO	CAN Bus Low	A 3

Wire Colour	Name	Function	Internal Pin
White	* CAN HI	CAN Bus High	A 4
Brown	AN1	Analog Input 1	A 7
Orange	AN2	Analog Input 2	A 8
Yellow	AN3	Analog Input 3	A 9
Blue	AN4	Analog Input 4	A 10
Violet	AN5	Analog Input 5	A 11
Grey	0V	Sensor 0 Volts	A 18

Cable B

Wire Colour	Name	Function	Internal Pin
Green	SW1	Switch Input 1	B 5
Blue	SW2	Switch Input 2	B 6
Violet	SW3	Switch Input 3	B 7
Grey	SW4	Switch Input 4	B 8
Orange	SW5	Switch Input 5	B 9
Yellow	SW6	Switch Input 6	B 10
White	AN6	Analog Input 6	B 12
Brown	AN7	Analog Input 7	B 13
Red	AN8	Analog Input 8	B 14

* The CAN wires must be twisted together.

▶ DIMENSIONS AND MOUNTING
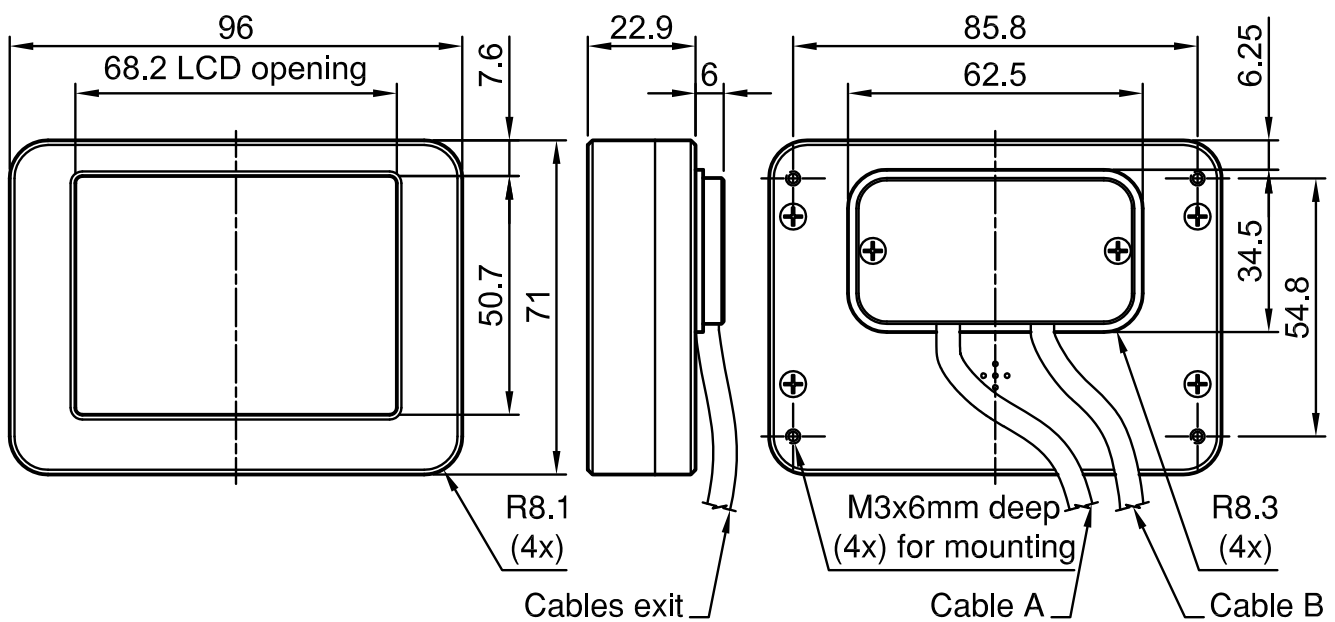
▶ INSTALLATION AND USAGE GUIDELINES

In its initial implementation, the D153 will only work with MoTeC data logger products.

Mechanical installation

The D153 is designed primarily as a steering wheel mounted device; it must be used as it is delivered, without disassembly.

To comply with EMC requirements, the case is designed to act as a heat sink for the display and to protect the components inside. There is no warranty for units that have been disassembled or removed from the original case.

It is important that the case is not removed or tampered with and that the unit is not completely enclosed when installed. Complete enclosure of the D153 will reduce cooling. If the display does start to overheat, the D153 will automatically reduce the backlight brightness to reduce temperature.

⇨ It is normal for the case to get hot, even too hot to handle.

Setting the brightness to 50% or less is sufficient for many applications and will reduce the amount of heat generated.

➡ Do not remove any part of the casing. The case provides electromagnetic screening to avoid interference with other equipment, and is also essential for thermal management. Thermal management may be compromised if mounted in a confined space, refer to the *Operating temperature* specifications and the *Mechanical installation* instructions.

Wiring

As the D153 is intended for steering wheel installation, there are no external connectors on the display. Instead, there are two wiring looms, one with 9 wires and one with 10. These looms connect power, CAN and additional switches and dials to the D153.

Wiring	Notes
Power	Run the power wires down the steering column (normally through a curly cord) to a power supply.
CAN	Run the CAN wires down the steering column and connect to the vehicle CAN bus. The CAN bus wires must be twisted together. **Important**: depending on the wiring design, a CAN terminating resistor may be needed on the steering wheel. All CAN bus wiring must follow CAN bus wiring standards.
Switches (SW)	All of the switch (SW) inputs are pulled up with 10k to 4.0V. When used as a switch, they should be connected across the switch to the 0V wire.
Analogue inputs (AN)	The analogue inputs are pulled up with 10k to 4.0V. When used as a switch, they should be connected across the switch to the 0V wire. When used as an analogue input, they should be used with a variable resistance dial that pulls the AN input progressively to 0V. The analogue inputs are designed for use with multi-position dials on steering wheels. They are **not** designed to be used as an input for high precision sensors, such as pressure sensors.

⇨ Do not pull the Switch or Analogue inputs up to Battery Positive. Any input pin pulled up above 7V will affect the readings of all other inputs.
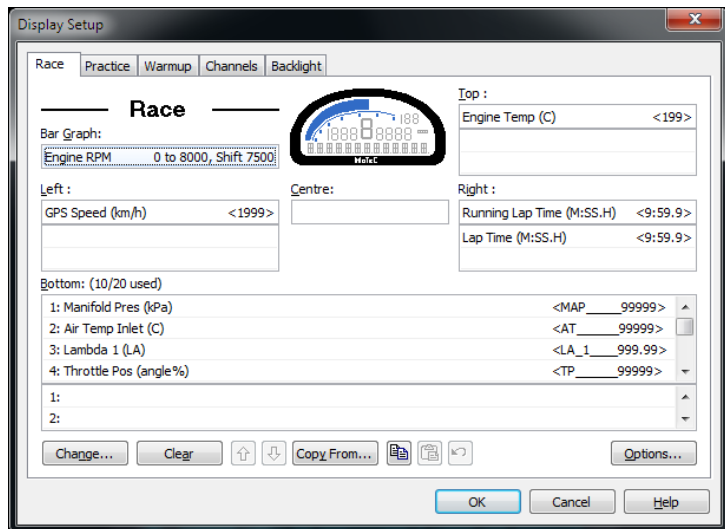
COMMUNICATIONS

The D153 has been designed as a replacement for the MoTeC Mini Digital Display (MDD). As such, it uses the same CAN communications methods as the MDD. Therefore, all configuration and setup activities for the D153 are conducted using the MoTeC data logger software.

SETUP

While the D153 uses the Data Logger software (dedicated software is expected in future releases), the following setup information applies.

The Data Logger software - *Display Setup* window shown below is used to customise where to display channels on the D153. All the modes on the *Display Setup* window are available on the D153, along with most of the other configurations available in the software. This includes such things as labels, overrides, units etc.

The D153 receives CAN messages from the Data Logger that indicate which channel should go into what location on the D153 colour display.

D1 Transmit template

The **D1 Transmit** template is used to transmit messages from the Data Logger to the D153.

In the *Connections/Communication* window, add the supplied **D1 Transmit** template. No customisation of this template is required as it is pre-configured to send the details configured in the *Display Setup* window.
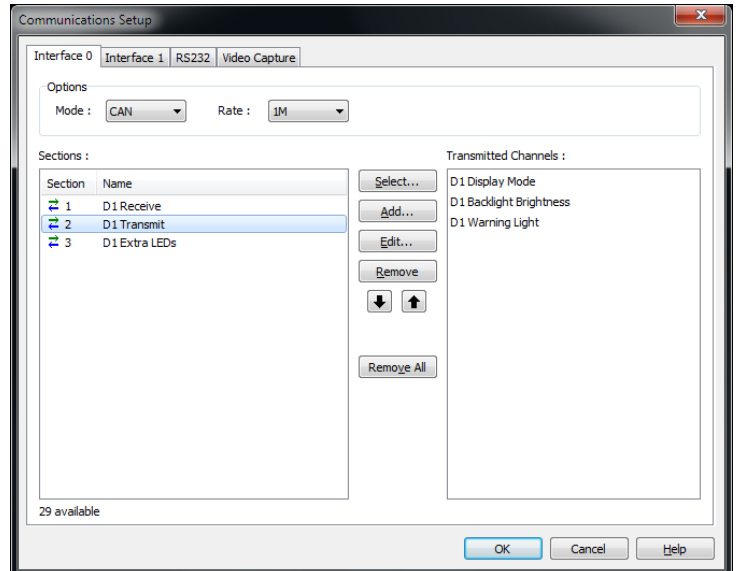
The Transmitted Channels available in the **D1 Transmit** template allow setting of options as described in the following table.

Transmitted Channels	Description
D1 Display Mode	Can be configured to allow the user to change which background to use. This can also be set as a fixed value using the Constants setup. A value of 17 displays a black background on the D153, while any other value displays the white background.
D1 Backlight Brightness	Allows the D153 backlight to be set to a fixed channel, or configured to be altered via a switch or a dial. This switch or dial could come from the steering wheel itself via one of the D153 inputs.
D1 Warning Light	This is used by the D153 to change the bottom row colour to Red when active. This is generally configured to be set as active when the Data Logger Warning Light channel is active.

D1 Receive template

The **D1 Receive** template is used to receive the messages from the D153 buttons and dials. These channels will be received into the pre-defined template, where the Data Logger can use them.

Received Channels	Description
Batt Volts D1	The diagnostic channel that shows the current battery voltage at the D153.
D1 Input 1-8	The 8 analogue inputs from the D153. These inputs will show a 0-100% channel as a percentage of 4V on that input pin.
D1 Switch 1-6	The 6 switch inputs that will show only an On or Off (1 or 0) value depending on the state of the switch.