



M1 to PDM CAN Messaging

Version 1.0 Published: January 2017



M1 TO PDM CAN MESSAGING USER GUIDE

TABLE OF CONTENTS

►	Overview2
►	Limitations of CAN into PDM2
►	Standard Channels2
Þ	Output Resource Selectable Channels3
Þ	Channel Values and Resolution5
Þ	M1 Configuration6
Þ	PDM CAN Configuration Requirements6
►	Configuring PDM Outputs to use CAN Channels8
Þ	Direct Control8
►	Using Functions to Control Outputs9
►	CANBus Bitrate



OVERVIEW

This is a document to support the M1 PDM CAN communications template available for the MoTeC PDM units. This document relates to the use of GPx versions built using the 1.4 version of firmware.

In this document, the naming convention is that an input channel or function uses capitalisation in the channel name, and outputs use all lowercase.

LIMITATIONS OF CAN MESSAGING INTO PDM'S

Due to the 8bit nature of the CAN Bus communications between the M1 and PDM, some compromises have to be made in the availability and resolution of the data transmitted. This is explained further in the following examples.

The maximum value that can be expressed using an 8bit number in the manner that it is used in the PDM communications is 255; this produces limitations in the expression of larger numbers. The data will also always be whole numbers, with no decimal points being used in the PDM.

STANDARD CHANNELS

Channel	Data Size	CAN Address	Offset	Byte Order	Bit Mask	Divisor	Timeout Value
CAN.Engine.Speed	8bit	118 hex	Byte 0		FF hex		
CAN.Throttle.Position	8bit	118 hex	Byte 1		FF hex		
CAN.Vehicle.Speed	8bit	118 hex	Byte 2		FF hex		
CAN.Coolant.Temperature	8bit	118 hex	Byte 3		FF hex		
CAN.Engine.Oil.Temp	8bit	118 hex	Byte 4		FF hex		
CAN.Fuel.Temperature	8bit	118 hex	Byte 5		FF hex		
CAN.Transmission.Temperature	8bit	118 hex	Byte 6		FF hex		
CAN.Differential.Temperature	8bit	118 hex	Byte 7		FF hex		
CAN.Fuel.Pressure	8bit	119 hex	Byte 0		FF hex		
CAN.Steering.Angle	16bit (signed)	119 hex	Byte 1	Normal		1	
CAN.EngineState	8bit	119 hex	Byte 4		80 hex		
CAN.WarningSource	8bit	119 hex	Byte 4		40 hex		
CAN.BrakeState	8bit	119 hex	Byte 4		20 hex		
CAN.GearNeutralSwitch	8bit	119 hex	Byte 4		10 hex		
CAN.ClutchSwitch	8bit	119 hex	Byte 4		08 hex		
CAN.ClutchState	8bit	119 hex	Byte 4		04 hex		
CAN.DriverPitSwitch	8bit	119 hex	Byte 4		02 hex		
CAN.EngineRunSwitch	8bit	119 hex	Byte 4		01 hex		
CAN.DriverSwitch1	8bit	119 hex	Byte 5		80 hex		
CAN.DriverSwitch2	8bit	119 hex	Byte 5		40 hex		
CAN.DriverRotarySwitch1	8bit	119 hex	Byte 6		FF hex		
CAN.DriverRotarySwitch2	8bit	119 hex	Byte 7		FF hex		

These are the standard channels that are transmitted to the PDM in the GPx Packages. These channels are hard coded into the CAN transmit templates and cannot be changed.



The order that the CAN Channels are listed in this template is the same order as they are received by the PDM, and for ease of support it is recommended that they are left in this order. Changing any of the Data Size, CAN Address, Offset, Byte Order, Bit Mask, Divisor, or Timeout Value settings will result in the communications template no longer working.

OUTPUT RESOURCE SELECTABLE CHANNELS

In the Version 1.4 built M1 packages, there was a change made to how Output Resources where used, one of these being that the previously hardcoded CAN messages for the 11A CAN Message space have been removed, and are now able to be allocated via the use of the Output Resource allocation drop down list. This means that the CAN Input programming in the PDM needs to be modified if upgrading from V1.3, or the resource Allocation is redone to match the existing template. This can lead to CAN errors being reported in the PDM as it will be expecting channels to be present in the message stream that are not available.

To resolve this issue, the following relationships between the Resources allocated in the M1 and the CAN Inputs needs to be followed.

M1 Resource Name	PDM CAN Message	Offset	Data size	Mask
PDM Byte 0 Mask 01	0x11A	Byte 0	8 bit	01
PDM Byte 0 Mask 02	0x11A	Byte 0	8 bit	02
PDM Byte 0 Mask 04	0x11A	Byte 0	8 bit	04
PDM Byte 0 Mask 08	0x11A	Byte 0	8 bit	08
PDM Byte 0 Mask 10	0x11A	Byte 0	8 bit	10
PDM Byte 0 Mask 20	0x11A	Byte 0	8 bit	20
PDM Byte 0 Mask 40	0x11A	Byte 0	8 bit	40
PDM Byte 0 Mask 80	0x11A	Byte 0	8 bit	80
PDM Byte 1 Mask 01	0x11A	Byte 1	8 bit	01
PDM Byte 1 Mask 02	0x11A	Byte 1	8 bit	02
PDM Byte 1 Mask 04	0x11A	Byte 1	8 bit	04
PDM Byte 1 Mask 08	0x11A	Byte 1	8 bit	08
PDM Byte 1 Mask 10	0x11A	Byte 1	8 bit	10
PDM Byte 1 Mask 20	0x11A	Byte 1	8 bit	20
PDM Byte 1 Mask 40	0x11A	Byte 1	8 bit	40
PDM Byte 1 Mask 80	0x11A	Byte 1	8 bit	80

PDM Byte 2 Mask 01	0x11A	Byte 1	8 bit	01
PDM Byte 2 Mask 02	0x11A	Byte 1	8 bit	02
PDM Byte 2 Mask 04	0x11A	Byte 1	8 bit	04
PDM Byte 2 Mask 08	0x11A	Byte 1	8 bit	08
PDM Byte 2 Mask 10	0x11A	Byte 1	8 bit	10
PDM Byte 2 Mask 20	0x11A	Byte 1	8 bit	20
PDM Byte 2 Mask 40	0x11A	Byte 1	8 bit	40
PDM Byte 2 Mask 80	0x11A	Byte 1	8 bit	80

When you enter these values into the CAN Input Properties in PDM Manager, this is how it looks.

N Input Propertie	s	Σ
Setup		
Channel		
Name:	CAN.Coolant.Fan.1	
CAN Source		
CAN Message:	Message 2 (0x11A)	
Offset:	Byte 0 🔹	
Data Size:	8bit 🔻	
- Channel Convers	ion	
Alignment:	Normal	
Mask:	01	hex
Divisor:	0	
Settings		
If the CAN message	ge times out	
hold the prev	ious value	
i use value:	0 ×	
		OK Cancel
		Cancer

MoTeC

CAN Input Properties		
Setup		
Channel]
Name:	CAN.Fuel.Pump.Primary	
CAN Source		
CAN Message:	Message 2 (0x11A) 🔹	
Offset:	Byte 0 🔻	
Data Size:	8bit 🔹	
- Channel Conversio	n	
Alignment:	Normal 👻	
Mask:	02	hex
Divisor:	1	
Settings		
If the CAN message	times out	
o hold the previo		
ise value:		
		OK Cancel



CHANNEL VALUES AND RESOLUTION

The CAN data values that are transmitted on the 0x11A address range are sent as a compound message, and are read as being either on or off by the PDM, if the value that the PDM is displaying in the monitor program is greater than 0 then the value is being transmitted by the M1 as being enabled on the M1, if it is 0 then the function on the M1 is in a disabled state. These values will be reported by the PDM in the Monitor window as values based on their location in the CAN message, and do not have any effect on the actual operation of the function on the PDM.

CAN.Coolant.Fan.1 CAN.Fuel.Pump.Primary 1 2

As per the CAN Input Properties for the two resources shown above, the reported values for the two CAN channels matches that of their Mask Value. If the resource is not enabled in the M1, then the value reported is 0.



M1 CONFIGURATION

To get these functions to operate properly in the M1 and to generate the correct CAN messaging for the PDM, the functions have to be setup in the M1 in the same manner as if they were directly controlling the output, this means that they have to have a resource allocated to the relevant output for that function, i.e. Coolant Fan 1 in the M1 has to have the Coolant Fan 1 Output Resource populated with a relevant output, such as PDM Byte 0 Mask 01 for this to work.

E Coolant		
■ Fan 1		
Output Resource	pa	PDM Byte 0 Mask 01 📼

PDM CAN CONFIGURATION REQUIREMENTS

The user needs to ensure that the CAN Inputs in the Global Setup are set to the default settings in the base configuration that is installed on the PDM when shipped from MoTeC. These are shown in the two screen captures shown below.

PDM	Type = PDM30, Serial Number = 11437
CAN Inputs	Message 0 = 118 hex, Message 1 = 119 hex, Message 2 = 11A hex, Message 3 = 11B hex
Output Pins	Master Retry Disabled, Master Shutdown Disabled
Keypad 1	Disabled
Keypad 2	Disabled
Keypad 3	Disabled
Keypad 4	Disabled

Global Setup						X
	Dutput Pins Keypad 1 Keypad	2 Keypad 3 Keypad 4				
CAN Messages						
Message 0 Address:	Standard 👻	118	hex	Timeout:	1.0	× S
Message 1 Address:	Standard 👻	119	hex	Timeout:	1.0	S
Message 2 Address:	Standard 💌	11A	hex	Timeout:	1.0	s s
Message 3 Address:	Standard 💌	11B	hex	Timeout:	1.0	s s
Message 4 Address:	Disabled 🔹	11C	hex	Timeout:	1.0	× S
Message 5 Address:	Disabled 💌	11D	hex	Timeout:	1.0	× S
Message 6 Address:	Disabled 👻	11E	hex	Timeout:	1.0	× S
					Restore Defaults	
·						
					ОК	Cancel

If the Message 0, 1 and 2 address configuration is different from this then the standard template will not work. If the user clicks on the Restore Defaults button the settings are reset back to these settings, but the addresses are disabled.



MoTeC

These need to be restored back to being Standard messages by selecting the option of Standard from the dropdown list.



CONFIGURING PDM OUTPUTS TO USE CAN CHANNELS

The CAN channels into the PDM can be used in different ways, either directly controlling the output, or by being filtered through a PDM function.

Both of these ways for controlling the output can be used, but typically if you have an output from the ECU that has settings that control how that outputs functions, for example thermo fans, then setting up the PDM output to be directly switched by the CAN channel is the better way to control that output.

If the output does not have controls within the ECU function that allow for setting hysteresis values or other controls, then the use of a function can make it easier to control the output in the most effective manner. This can also be used where the ECU output may have hysteresis values, but other controls are also wanted on the output.

DIRECT CONTROL

Retry Delay: 1.00 is Number of Retries: 0 is Shutdown when the Master Shutdown condition is true in Always Retry Allow this output to stay alive during standby mode (low current loads only) Control Control Output is active when the following is true: O Condition CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edit iso			
Comment Primary fuel pump, Bosch 044 Settings Maximum Current: 20 ARetry Delay: 1.00 Solution Soluti	Channel		
Primary fuel pump, Bosch 044 Settings Maximum Current: 20 A Retry Delay: 1.00 s Number of Retries: 0 a Always Retry Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: Control Output is active when the following is true: Condition fuel.pump.primary = Add Remove Edt Edt	Name:	fuel.pump.primary	
Settings Maximum Current: 20 Maximum Current: 20 Retry Delay: 1.00 Image: Settings S Number of Retries: 0 Image: Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: Image: Ocndition Image: Condition Image: Fuel pump.primary = Add Image: Condition Image: Condition Image: Condition Image: Condition	Comment		
Maximum Current: 20 A Retry Delay: 1.00 S s Number of Retries: 0 Aways Retry Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edt Condition	Primary fuel pump,	Bosch 044	*
Maximum Current: 20 A Retry Delay: 1.00 S s Number of Retries: 0 Aways Retry Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edt Condition			
Maximum Current: 20 A Retry Delay: 1.00 S s Number of Retries: 0 Aways Retry Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edt Condition			
Maximum Current: 20 A Retry Delay: 1.00 S s Number of Retries: 0 Aways Retry Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: Output is active when the following is true: CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edt Control			Ŧ
Retry Delay: 1.00 Number of Retries: 0 Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: Ochannel CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edit	Settings		
Number of Retries: 0 Always Retry Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edit Column	Maximum Current:	20 A	
Shutdown when the Master Shutdown condition is true Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: CAN.Fuel.Pump.Primary Condition Fuel.pump.primary = Add Remove Edit	Retry Delay:	1.00 s	
Allow this output to stay alive during standby mode (low current loads only) Control Output is active when the following is true: CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edit Control	Number of Retries:	0 Always Retry	
Control Output is active when the following is true: CAN.Fuel.Pump.Primary CAN.Fuel.pump.primary = Add Remove Edit C	Shutdown when	the Master Shutdown condition is true	
Output is active when the following is true: Channel CAN.Fuel.Pump.Primary Condition fuel.pump.primary = Add Remove Edit	Allow this output	to stay alive during standby mode (low current loads only)	
CAN.Fuel.Pump.Primary CAN.Fuel.Pump.Primary Add Remove Edit C			
Condition fuel.pump.primary =			
Remove Edit	Output is active whe		
Edit	Output is active whe		
	Output is active whe	CAN.Fuel.Pump.Primary	
	Output is active whe	CAN.Fuel.Pump.Primary	
	Output is active whe	CAN.Fuel.Pump.Primary	
Remove A	Output is active whe	CAN.Fuel.Pump.Primary)
	Output is active whe	CAN.Fuel.Pump.Primary)

This is a simple direct control of the fuel pump, where the PDM output goes active when the CAN channel from the M1 goes active, all of the control functionality is performed in the M1 and the PDM is essentially acting as a switch.



USING FUNCTIONS TO CONTROL OUTPUTS

unction Properti	es	×
Setup		
Channel		
Name:	function.transmission.cooler	
Function:	Condition	
Comment		
		*
		*
Condition		
	ansmission.cooler =	Add
	Insmission. Temperature = true I.Vehicle.Speed >= 30, true for 5.00s, false for 5.00s	Remove
and		Edit
or		
		Remove All
		OK Cancel

This is a function setup to drive a transmission cooler pump; the transmission pump function in the M1 has a temperature hysteresis function, and is used in this example, which is why the **CAN.Transmission.Temperature** condition is a simple condition switch. The use of **CAN.Vehicle.Speed** as another condition that needs to be true for the PDM output to switch to active, in this function it is set that the pump will not turn on until the **CAN.Transmission.Temperature condition** is active, and the **CAN.Vehicle.Speed** has been greater than 30 for 5 seconds.



	l Channels	
etup Wiper Contro Channel		
Name:	transmission_pump	
Comment		
		*
		-
Settings		
Maximum Current:	5 A	
Retry Delay:	1.00 s	
Number of Retries:	0 Always Retry	
Shutdown when	the Master Shutdown condition is true	
Allow this output	to stay alive during standby mode (low current loads only)	
Control		
	n the following is true:	
	n the following is true:	
Output is active whe	function.transmission.cooler	
Output is active whe	function.transmission.cooler transmission.pump = Add	
Output is active whe	function.transmission.cooler	
Output is active whe	function.transmission.cooler transmission.pump = Add	ve
Output is active whe	function.transmission.cooler transmission.pump = Add. Remo	ve
Output is active whe	function.transmission.cooler transmission.pump = Add Remo Edit	
Output is active whe	function.transmission.cooler transmission.pump = Add. Remo	

The output properties are setup in the same manner as a directly controlled output, this time using the function output as the control channel rather than the CAN channel.



CANBUS BITRATE

The CANBus bitrate must be set to match the bitrate used on all other devices on the CANBus. This is done through the **Tools | Options | Communications** drop down menu.

Options	×
File Locations Communications CAN Bus Bitrate PDM Manager CAN bus bitrate: 1 Mbps All devices on the CAN bus must be set to the selected bitrate. The bitrate of a PDM device can be set using the conversion tool. Bitrate conversion tool Bitrate conversion tool	
ОК Са	ncel