Ecumaster Gear Display

Manual

Revision 4.0

(Firmware 4.x)

1 Device description

Device is used to display gear information and shift light to driver. Gear, RPM, Brightness and Shift light can be read from CAN bus or from built in analog and digital inputs. Device sends gear and RPM information through CAN-bus using Export ID.

- Voltage range: 6V - 24V (12V automotive installations)
- Analog input: 0-5V
- Digital input: TTL 0-5V (VR sensor tolerant up to 100V), 0.1Hz-50kHz, rising or falling edge

2 Configuration

2.1 RPM settings

When the RPM source is CAN

RPM source	CAN
RPM input CAN ID	CAN-bus frame defined via ID
Byte position	Value must be between 0 and 7
Num bytes	*1 byte / 2 bytes* (*8 bit / 16 bit*) - number width
Endian (Only for *2 bytes*)	*big endian / little endian* - i.e. the "sequence" of bytes for 16-digit numbers. It shows how a number stored in two consecutive bytes is to be interpreted. E.g. numbers 0x12, 0x34 can be interpreted as 0x1234 for the *big endian* or 0x3412 for the *little endian*
Divider	For scaling the value
Multiplier	For scaling the value

When the RPM source is "CAN–OBD" default settings for ODB II are used.

When the RPM sourece is FREQ

RPM source	FREQ – RPM is read from digital frequency input
Signal edge	*Falling / Rising* - Choose signal edge that has faster passing through 2.5V threshold
Teeth per 720° (one full engine cycle – 2 revolutions)	Enter here number of digital signals per engine cycle. If you have trigger wheel with missing teeth, enter number EXCLUDING missing teeth. For example for 60 - 2 wheel enter "2*(60-2) = 116"

2.2 Gear settings

When the Gear source is CAN

Gear source	CAN
Gear input CAN ID	CAN-bus frame defined via ID
Byte position	Value must be between 0 and 7
Num bytes	*1 byte / 2 bytes*
Endian (Only for *2 bytes*)	*big endian / little endian* - i.e. the "sequence" of bytes for 16-digit numbers. It shows how a number stored in two consecutive bytes is to be interpreted. E.g. numbers 0x12, 0x34 can be interpreted as 0x1234 for the *big endian* or 0x3412 for the *little endian*

Type	*signed / unsigned* - ***signed*** is a number with a sign (it can receive positive and negative values, as well as zero). An example of such value is the value from the cooling liquid temperature sensor. ***Unsigned*** – numbers zero and above. For example engine speed (RPM)
Extract bitfield	take only a part of an 8- or 16-bit number, (for example, to check the setting of a bit of a 0x80 mask the following settings should be used: Bit count: 1, Bit position: 7)
Bit count	Value must be between 1 and 16
Bit position	Value must be between 0 and 15
Offset	
Park value	In decimal notation
Revers value	In decimal notation
Neutral value	In decimal notation

Example 1

Below is the gear data. We will need to read 1 byte, signed. The signal are on CAN ID 0x400.

Reverse- FF (Reverse value in decimal is -1)
Neutral- 00
1st Gear- 01
2nd Gear- 02
3rd Gear- 03
4th Gear- 04
5th Gear- 05
6th Gear- 06
7th Gear- 07

Gear settings:	
Gear source	CAN
Gear input CAN ID	0x400 Standard
Byte position	0
Num bytes	1
Type	Signed
Extract bitfield	☐
Offset	0
Park value	-2
Reverse value	-1
Neutral value	0

Example 2

Below is the gear data. We will need to read 1 byte, unsigned, extract 4 bits, starting from bit 0-th. The signal are on CAN ID 0x400.

Reverse- 2**F** (~~0010~~ 1111)
Neutral- 0**0** (~~0000~~ 0000)
1st Gear- 1**1** (~~0001~~ 0001)
2nd Gear- 1**2** (~~0001~~ 0010)
3rd Gear- 1**3** (~~0001~~ 0011)
4th Gear- 1**4** (~~0001~~ 0100)
5th Gear- 1**5** (~~0001~~ 0101)
6th Gear- 1**6** (~~0001~~ 0110)
7th Gear- 1**7** (~~0001~~ 0111)

Reverse value will be 0x0F (15 – in decimal notation).

Gear settings:	
Gear source	CAN
Gear input CAN ID	0x400 Standard
Byte position	0
Num bytes	1
Type	Unsigned
Extract bitfield	☑
Bit count	4
Bit position	0
Offset	0
Park value	10
Reverse value	15
Neutral value	0

Example 3

Below is the Ford F150 data that was read with the Light Client. All The signals are on Can ID 0x171.

Park- A5 00 A0 00 00 00 00 00
Reverse- A5 20 A0 00 00 00 00 00
Neutral- 15 40 A0 00 00 00 00 00
1st Gear- 15 80 A0 00 00 00 00 00
2nd Gear- 25 80 A0 00 00 00 00 00
3rd Gear- 35 80 A0 00 00 00 00 00
4th Gear- 45 80 A0 00 00 00 00 00
5th Gear- 55 80 A0 00 00 00 00 00
6th Gear- 65 80 A0 00 00 00 00 00
7th Gear- 75 80 A0 00 00 00 00 00
8th Gear- 85 80 A0 00 00 00 00 00
9th Gear- 95 80 A0 00 00 00 00 00

First nibble from the left is gear number. So some bit extraction is needed. We will need to read 2 byte little endian (16 bits). Extract 11 bits, starting from bit 4-th.

00 A5 – for park (0000 0000 1010 0101)
20 A5 – for reverse (0010 0000 1010 0101)
40 15 – for neutral (0100 0000 0001 0101)
80 **1**5 – for 1st Gear (1000 0000 0001 0101)
80 **2**5 - for 2nd Gear, (1000 0000 0010 0101)
80 **3**5 – for 3rd Gear (1000 0000 0011 0101)
80 **4**5 – for 4th Gear (1000 0000 0100 0101)
80 **5**5 – for 5th Gear (1000 0000 0101 0101)
80 **6**5 – for 6th Gear (1000 0000 0110 0101)
80 **7**5 – for 7th Gear (1000 0000 0111 0101)
80 **8**5 – for 8th Gear (1000 0000 1000 0101)
80 **9**5 – for 9th Gear (1000 0000 1001 0101)

Gear settings:	
Gear source	CAN
Gear input CAN ID	0x171 Standard
Byte position	0
Num bytes	2
Endian	Little endian
Type	Unsigned
Extract bitfield	☑
Bit count	11
Bit position	4
Offset	0
Park value	10
Reverse value	522
Neutral value	1025

Park value will be 0x00A (10 – in decimal notation), reverse value 0x20A (522) and neutral value 0x401 (1025).

When the Gear source is AIN

Gear source	AIN - analog input – gear sensor calibration with 9 position Voltage table. Current voltage is visable in Channels log
Offset	
Revers	This section contains voltage values for gear reading from analog input. Gear with voltage closest to analog input voltage is set.
Neutral	
# (1-7)	

When the Gear source is VAG DSG (ECU CAN) default settings are used.

2.3 Shift light

LED # (1-3) color	color on # shift light led
LED # (1-3) RPM	LEDs are lit based on RPM thresholds
ALL RED RPM	threshold for overriding all LEDs to red color
BLINK RPM	threshold for all LED blinking

2.4 Brightness

LED	Brightness settings for Shift Light LEDs. Values from 0 - 100
Gear	Brightness settings for Segment display. Values from 0 - 100

Device has brightness limit in case of overheating. Brightness is limited linearly from 100@40°C to 0@80°C.

Temperature reading is only for overheat protection. Precision is +- 10°C

2.5 Export data

Channels are the data values sent over CAN-bus. Channels are sent as raw values, which means that obtaining values with correct units requires some calculations.

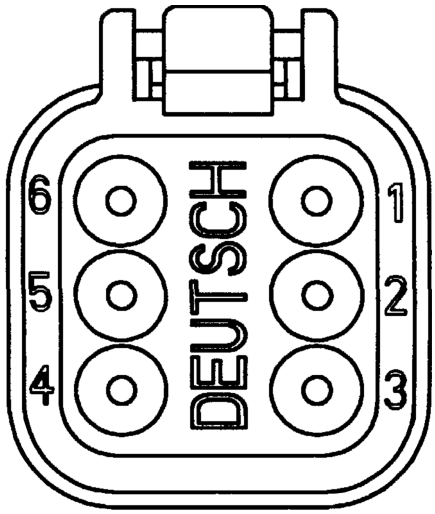
$$Value[unit] = \frac{Value[raw] * Multiplier}{Divider} + Offset$$

The table below describes how each channel is positioned inside CAN frame and how to obtain the correct value.

Ecumaster CAN profile description

Byte (bit)	Channel	Data type	Endian	Range	Multiplier	Divider	Offset	Unit
Export CAN ID+0 (default: 0x6A4)								
0..1	ain	16bit unsigned	big	0 – 20000	1	1	0	mV
2..3	engine speed	16bit unsigned	big	0 – 20000	1	1	0	RPM
4..5	temperature	16bit signed	big	-50.0 – 200.0	1	10	0	°C
6	gear number	8bit signed		-128 – 127	1	1	0	
7	heartbeat	8bit unsigned		0 – 255	1	1	0	

3 Pinout



1 - V (6V - 24V)

2 - GND

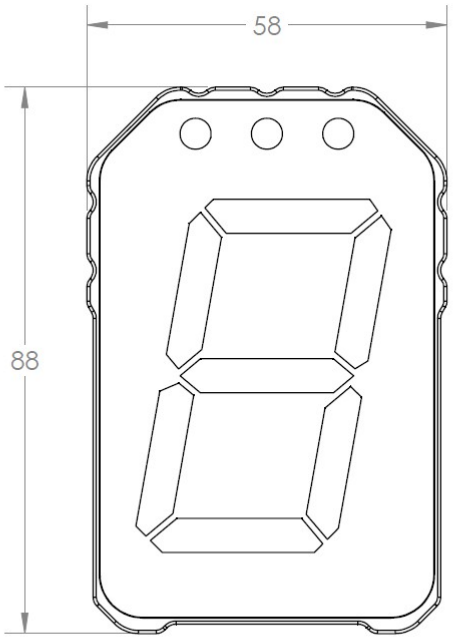
3 – AIN Analog input

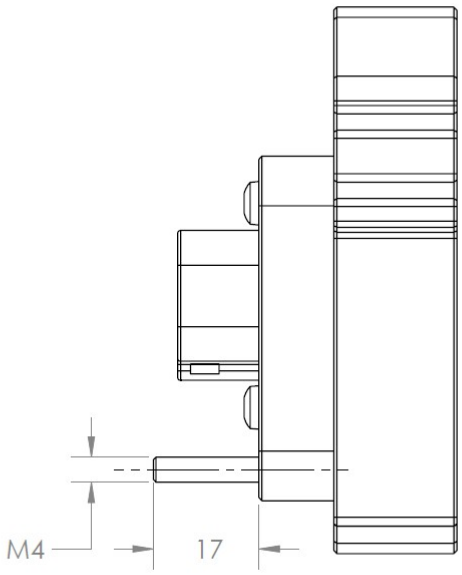
4 – FREQ Frequency input

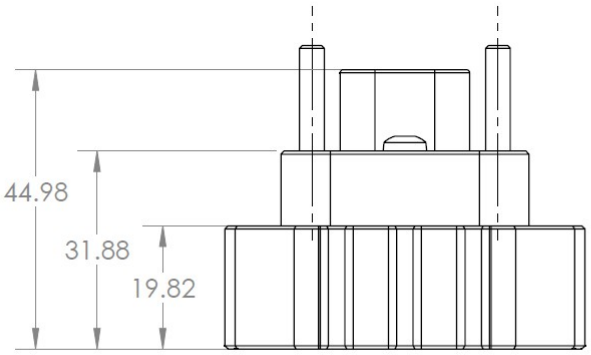
5 - CAN low

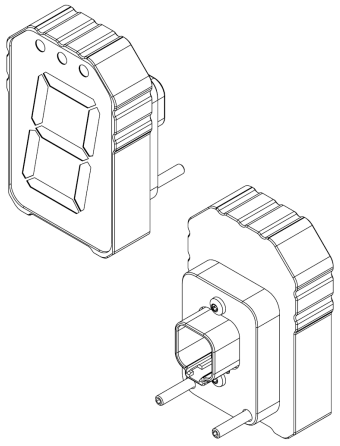
6 - CAN high

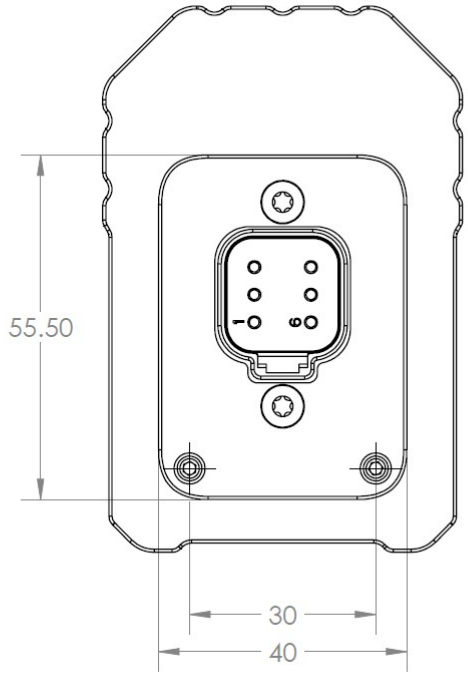
4 Dimensions











5 Revision history

Revision	Date	Changes
0.2	14.06.2019	Initial revision
4.0	13.01.2023	Clarified that the device only works in 12 V installations Updated to version 4.0