Instruction Manual

AEM
PERFORMANCE ELECTRONICS

P/N 30-2206
VEHICLE DYNAMICS MODULE

STOP! - READ THIS BEFORE INSTALL OR USE!

WARNING:
THIS INSTALLATION MAY REQUIRE WELDING OR INTEGRATION INTO A VEHICLE'S ELECTRICAL SYSTEM. DAMAGE TO SENSITIVE ELECTRONICS, FIRE, OR EXPLOSION MAY OCCUR IF PROPER PRECAUTION IS NOT TAKEN. IF THERE IS ANY DOUBT, **DO NOT** ATTEMPT THE INSTALLATION AND CONSULT A PROFESSIONAL.
NOTE: IT IS THE RESPONSIBILITY OF THE ENGINE TUNER TO ULTIMATELY CONFIRM THE CALIBRATION USE FOR ANY PARTICULAR ENGINE IS SAFE FOR ITS INTENDED USE. AEM HOLDS NO RESPONSIBILITY FOR ANY ENGINE DAMAGE THAT RESULTS FROM THE MISUSE OF THIS PRODUCT.
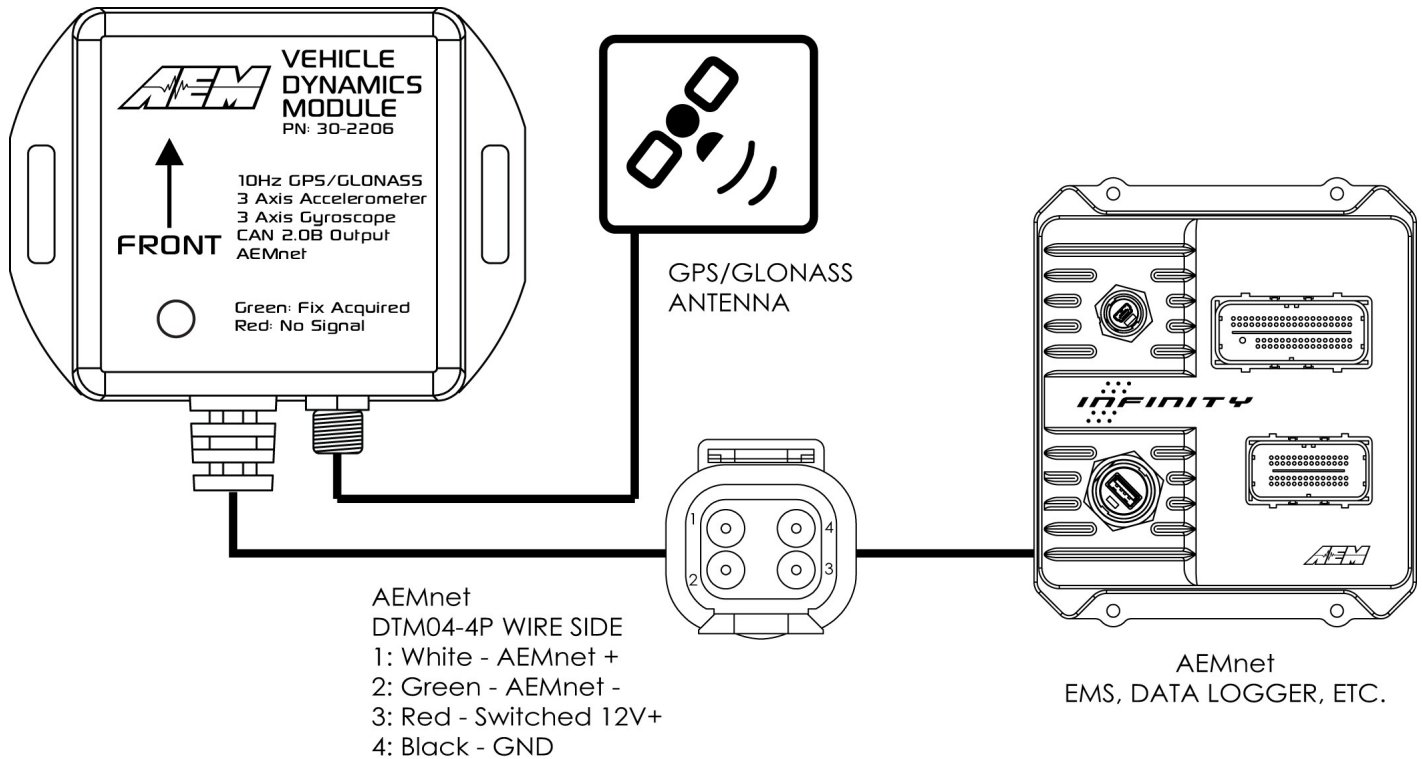
The AEM Vehicle Dynamics Module (VDM) features a a 10Hz GPS/GLONASS receiver, 3-axis accelerometer/gyro, external antenna, and AEMnet/CAN 2.0 output in a weather resistant enclosure. The VDM is ideal for generating track maps when used in concert with an AEM ECU and AEMData analysis software. In association with the GPS data, the accelerometer and gyro data can be analyzed to unlock more lap time from your race vehicle.

Features

- 10Hz GPS/GLONASS GPS receiver
- Latitude, Longitude, Speed, Altitude, Course, Satellite Count, UTC Time, UTC Date
- 50Hz 3-axis accelerometer +/- 8g
- 50Hz 3-axis gyroscope +/- 500 deg/s
- External magnetic antenna
- Supports vehicle/system voltages up to 16V
- Low-profile, weather resistant enclosure
- AEMnet (CAN bus) Output

PN	Description
35-2206	MODULE, VEHICLE DYNAMICS
10-2206	INST, VDM
1-3079	ANTENNA, GPS/GNSS
4-4065	VELCRO, 1.25" (2)

Installation



VEHICLE
DYNAMICS
MODULE
PN: 30-2206

10Hz GPS/GLONASS
3 Axis Accelerometer
3 Axis Gyroscope
CAN 2.0B Output
AEMnet

FRONT

Green: Fix Acquired
Red: No Signal

GPS/GLONASS
ANTENNA

AEMnet
DTM04-4P WIRE SIDE
1: White - AEMnet +
2: Green - AEMnet -
3: Red - Switched 12V+
4: Black - GND

AEMnet
EMS, DATA LOGGER, ETC.

VDM

The VDM is equipped with an AEMnet connector (power, ground, and CAN) so that it is a true plug and play experience when used with other AEMnet products such as the Infinity ECU.

Ideally, the VDM module should be installed near the center (both fore/aft and side-to-side) of the vehicle and as low as possible. For example, the module may be mounted to the floor of the vehicle between the two front seats. The module should be mounted using the provided "hook-and-loop" material or may be more rigidly mounted using fasteners through the module's mounting ears. Take care to avoid over-torquing mounting fasteners, if used. The arrow on the top of the unit labeled "FRONT" should be pointed towards the front of the vehicle in the direction of travel.

The antenna should be mounted in a location where the top is pointed towards, and has a clear view of, the sky. The bottom of the antenna is magnetic or additional hook-and-loop material is provided for mounting; the dashboard or rear package shelf are **not** acceptable locations. The antenna should be mounted as high as possible in the center of a metal roof away from other antennas or structures. If the roof of the vehicle is non-metallic then a flat piece of metal at least five inches in diameter, to function as a ground plane, should be fabricated upon which the antenna should be placed.
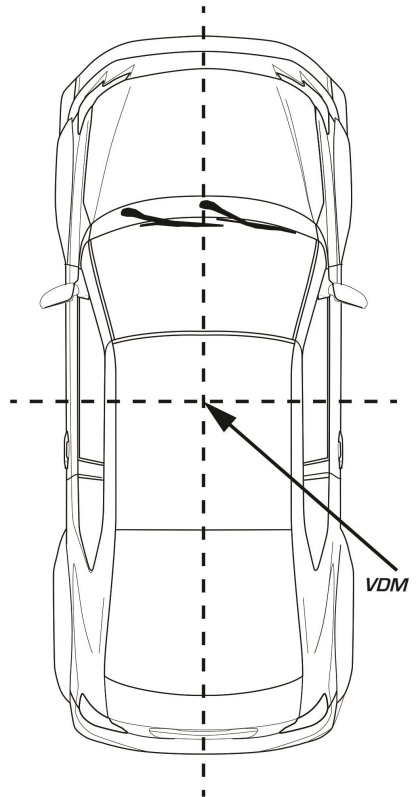
Status LED

There is a status LED located on the top of the VDM module that gives an indication of its operating status, specifically the quality of the current GPS signal:

LED	Description
OFF	The device is not powered
FLASHING RED	No valid GPS fix
FLASHING GREEN	Less than 4 satellites in view
GREEN	4 or greater satellites in view
OTHER	Please contact AEM Support

Channels / Data

GPS

The VDM utilizes an internal 10Hz GPS/GLONASS receiver with a matching external active antenna. Faster time to fix, and better global coverage is afforded by the support of both the GPS and GLONASS constellations. The module is designed with an internal battery that will retain the last known satellite position (ephemeris) while power is disconnected from the VDM for several days. This will allow for a very fast time to fix (<1 sec typ) once the device is turned on again; if power is removed for an extended period of time then the time to fix will increase. The internal battery is automatically recharged and never needs to be replaced.

The following GPS channels are output on AEMnet for logging on your Infinity ECU or other device:

Channel Name	Notes
GPS Latitude [deg]	+ = North, - = South
GPS Longitude [deg]	+ = East, - = West
GPS Speed [mph]	Speed
GPS Altitude [ft]	Above Mean Sea Level (MSL)
GPS Course [deg]	Course over ground, NOT heading
GPS Satellite Count	"Visible" number of satellites
GPS Valid	1 = Valid Fix, 0 = No Fix
GPS Year	UTC Time
GPS Month	UTC Time
GPS Day	UTC Time
GPS Hours	UTC Time
GPS Minutes	UTC Time
GPS Seconds	UTC Time

Accelerometer / Gyroscope

The following accelerations and yaw rate channels are output on AEMnet for logging on your Infinity ECU or other device:

Channel Name	Notes
Acceleration X [g]	*Longitudinal
Acceleration Y [g]	*Lateral
Acceleration Z [g]	*Vertical
YawRate X [deg/s]	*Roll
YawRate Y [deg/s]	*Pitch
YawRate Z [deg/s]	*Yaw

*If +x is mounted in the direction of travel
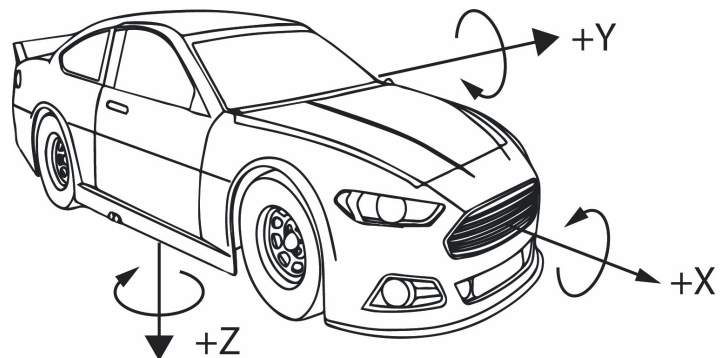
AEMnet (CAN Bus) Output

WHITE WIRE WITH BLACK STRIPE = AEMnet+ / CANH
GREEN WIRE WITH BLACK STRIPE = AEMnet- / CANL

The AEMnet output is suitable for output to AEM devices such as the AQ-1 data logger or Infinity ECU. The following CAN configuration and message definition information is provided below to facilitate interface with third-party devices.

Bus Termination

All AEMnet/CAN networks must be terminated to have an equivalent of approximately 60 Ohms of resistance. Generally, this means a 120 Ohm resistor connected in parallel to AEMnet+/AEMnet- (or CANH/CANL) at both physical ends of the bus run. The VDM does not have any internal termination and is intended to be connected to a pre-existing, properly terminated network. Please refer to the Bosch CAN2.0B specification for further detail.

bit rate	500	kb/sec
format	29	bit ID
transmit rate	100	Hz
terminating resistor	none	
endianness	big / Motorola	
DLC	8	

0x0000A0000 at 20Hz

Byte	Label	Data Type	Scaling	Offset	Range
0	GPS Latitude	32 bit float	Degrees	0	+90.00 (north) to -90.00 (south) Degrees
1			reference		
2			WGS-84 datum		
3			North is positive		
4	GPS Longitude	32 bit float	Degrees	0	+180.00 (east) to -180.00 (west) Degrees
5			reference		
6			WGS-84 datum		
7			East is positive		

0x0000A0001 at 20Hz

Byte	Label	Data Type	Scaling	Offset	Range
0	GPS Speed	16 bit unsigned	0.01 mph/bit	0	0 to 655.35 MPH
1					
2	GPS Altitude	16 bit signed	1 ft/bit	0	-32,768 to 32,767 Feet
3					
4	GPS True Course	16 bit unsigned	0.01 deg/bit	0	0 to 655.35 degrees
5					
6	GPS Satellites in Use	8 bit unsigned	1	0	0 to 255 Satellites
7	GPS Valid	8 bit unsigned	0 = N/G, 1 = OK	0	0 to 255

0x0000A0002 at 5Hz

Byte	Label	Data Type	Scaling	Offset	Range
0	GPS Valid	8 bit unsigned	0 = N/G, 1 = OK	0	0 to 255
1	UTC Date Year	8 bit unsigned	1	0	0 to 255 Years
2	UTC Date Month	8 bit unsigned	1	0	0 to 255 Months
3	UTC Date Day	8 bit unsigned	1	0	0 to 255 Days
4	-	-	-	-	-
5	UTC Time Hours	8 bit unsigned	1	0	0 to 255 Hours
6	UTC Time Minutes	8 bit unsigned	1	0	0 to 255 Minutes
7	UTC Time Seconds	8 bit unsigned	1	0	0 to 255 Seconds

0x0000A0003 at 100Hz

Byte	Label	Data Type	Scaling	Offset	Range
0	X-Axis Acceleration	16 bit signed	0.000244141	0	+8g to -8g
1					
2	Y-Axis Acceleration	16 bit signed	0.000244141	0	+8g to -8g
3					
4	Z-Axis Acceleration	16 bit signed	0.000244141	0	+8g to -8g
5					
6	-	-	-	-	
7	-	-	-	-	

0x0000A0004 at 100Hz

Byte	Label	Data Type	Scaling	Offset	Range
0	X-Axis Yaw Rate	16 bit signed	0.015258789	0	+500deg/s to -500 deg/s
1					
2	Y-Axis Yaw Rate	16 bit signed	0.015258789	0	+500deg/s to -500 deg/s
3					
4	Z-Axis Yaw Rate	16 bit signed	0.015258789	0	+500deg/s to -500 deg/s
5					
6	-	-	-	-	
7	-	-	-	-	

FAQ / Troubleshooting

I just installed my VDM, why is the accelerometer or gyro output not zero when my car is stationary?
The VDM's internal accelerometer/gyro is zeroed at the factory and requires no further action by the end user. The module must be mounted perfectly flat and in line with the axes of the vehicle. In addition, the use of screw fasteners to mount the module may induce stress into internal sensor causing a slight offset. Please also remember that the module's vertical axis will always read the Earth's 1g (gravity) in addition to any vehicle accelerations induced while in motion.
For support, contact AEM Technical Support at 1-800-423-0046 or gentech@aemelectronics.com.

12 Month Limited Warranty

Advanced Engine Management Inc. warrants to the consumer that all AEM High Performance products will be free from defects in material and workmanship for a period of twelve (12) months from date of the original purchase. Products that fail within this 12-month warranty period will be repaired or replaced at AEM's option, when determined by AEM that the product failed due to defects in material or workmanship. This warranty is limited to the repair or replacement of the AEM part. In no event shall this warranty exceed the original purchase price of the AEM part nor shall AEM be responsible for special, incidental or consequential damages or cost incurred due to the failure of this product. Warranty claims to AEM must be transportation prepaid and accompanied with dated proof of purchase. This warranty applies only to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 12-month warranty period. Improper use or installation, accident, abuse, unauthorized repairs or alterations voids this warranty. AEM disclaims any liability for consequential damages due to breach of any written or implied warranty on all products manufactured by AEM. Warranty returns will only be accepted by AEM when accompanied by a valid Return Merchandise Authorization (RMA) number. Product must be received by AEM within 30 days of the date the RMA is issued.

UEGO oxygen sensors are considered wear items and are not covered under warranty.

Please note that before AEM can issue an RMA for any electronic product, it is first necessary for the installer or end user to contact the EMS tech line at 1-800-423-0046 to discuss the problem. Most issues can be resolved over the phone. Under no circumstances should a system be returned or a RMA requested before the above process transpires.

AEM will not be responsible for electronic products that are installed incorrectly, installed in a non-approved application, misused, or tampered with.

Any AEM electronics product can be returned for repair if it is out of the warranty period. There is a minimum charge of $50.00 for inspection and diagnosis of AEM electronic parts. Parts used in the repair of AEM electronic components will be extra. AEM will provide an estimate of repairs and receive written or electronic authorization before repairs are made to the product.

Specifications

Dimensions	width	2.6 / 66	in / mm
	length (incl coax)	2.3 / 58	in / mm
	height	0.8 / 21	in / mm
Supply Voltage	min	7	VDC
	max	18	VDC
Supply Current (13.8V)	nominal	175.0	mA
Operating Temperature	min	-4 / -20	degF / degC
	max (16V Supply)	185 / 85	degF / degC
CAN 2.0B Output	bit rate	500	kb/sec
	format	29	bit ID
	terminating resistor	none	
	endianness	big / Motorola	
	DLC	8	
GPS	Frequency (GPS)	(L1) 1,575	MHz
	Frequency (GLO)	(FDM L1) 1,602	MHz
	Tracking Sensitivity	-167	dBm
	Horizontal Position Accuracy	2.5 m CEP (SA off)	
	*Time To First Fix - TTFF**		
	Reacquisition^	1	sec
	Aided	2	sec
	Cold	26	sec
Notes	*=theoretical minimum values; values in real world may differ		
	^=Hot start battery backup lasts several days w/o 12V supply		