

TRaQMate

GPS DATA ACQUISITION SYSTEM

TRaQDATA



APPLICATION GUIDE

VERSION 3.40

MARCH 27, 2013



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Table of Contents

TRAQDATA INPUT DEVICES 4

ADDING DATA INPUTS AND VIDEO CAMERAS..... 5

 CONNECTING A TACH INPUT (TRAQDATA, TRAQTACH, TRAQSYNC) 5

Changing Voltage Range of TraqTach, TraqSync, TraqData II, TraqData HD, TraqData PRO, and TraqData HD2..... 5

Selecting the Tach Signal 5

Terminating Wire at Input Device..... 6

 CONNECTING DATA INPUTS AND OUTPUTS 7

Digitals 7

Analogs..... 8

AEM FLUID PRESSURE SENSOR 11

AEM FLUID TEMPERATURE SENSOR 12

APPENDICES..... 13

 TABLE OF FIGURES13

 WARRANTY INFORMATION.....14

GLOSSARY 15

TraqData Input Devices

Traqmate has manufactured several data input devices for the Traqmate system and all are supported. Here is a description of the devices and their capabilities.

TraqTach (original) – gray 15 pin connector with 3 screw-down terminals. This device is used to connect a tach input. It came in either COIL or ELECTRONIC voltage ranges.

TraqTach (revised) – black 15 pin connector with blue wire. This device is used to connect a tach input. This unit can be switched for COIL or ELECTRONIC ranges with a microswitch on the circuit board inside the connector cover.

TraqSync (original) - black 15 pin connector with blue wire and RJ-45 cable. This device is used to connect a tach input and control a ChaseCam PDR-100 video recorder. This unit can be switched for COIL or ELECTRONIC ranges with a microswitch on the circuit board inside the connector cover.

TraqSync PRO - black 15 pin connector with blue wire and RJ-45 cable. This device is used to connect a tach input and control a GoPro HERO2 HD or ReplayXD 1080 video camera. This unit can be switched for COIL or ELECTRONIC ranges with a microswitch on the circuit board inside the connector cover.

TraqData (original) - gray 15 pin connector with 8 screw-down terminals. This device is used to connect a tach input, 4 analog inputs, and 2 digital inputs / outputs. It came in either COIL or ELECTRONIC voltage ranges.

TraqData II – 2.5” square box with removable terminal strip. This device is used to connect a tach input, 4 analog inputs, and 2 digital inputs / outputs, and control a ChaseCam PDR-100 video recorder. This unit can be switched for COIL or ELECTRONIC ranges with a microswitch on the circuit board inside the housing.

TraqData HD – 2.5” square box with removable terminal strip. This device is used to connect a tach input, 4 analog inputs, and 2 digital inputs / outputs, and control a Sony HD video recorder. This unit can be switched for COIL or ELECTRONIC ranges with a microswitch on the circuit board inside the housing.

TraqData PRO – 2.5” square box with removable terminal strip. This device is used to connect a tach input, 4 analog inputs, and 2 digital inputs / outputs, and control a GoPro HERO2 HD video camera. This unit can be switched for COIL or ELECTRONIC ranges with a microswitch on the circuit board inside the housing.

TraqData HD2 – 2.5” square box with removable terminal strip. This device is used to connect a tach input, 4 analog inputs, and 2 digital inputs / outputs, and control a GoPro HERO2 HD or ReplayXD 1080 video camera. It will also charge a ReplayXD camera. This unit can be switched for COIL or ELECTRONIC ranges with a microswitch on the circuit board inside the housing.

Adding Data Inputs and Video Cameras

Connecting a Tach Input (TraqData, TraqTach, TraqSync)

This requires a TraqData, TraqTach, or TraqSync interface module. The instructions are similar for each unit. The connections are the same for a TraqData, TraqData II, TraqData HD, TraqData PRO, or TraqData HD2 interface module.



The original gray-case TraqData and TraqTach devices came in two voltage ranges, 'Electronic' and 'Coil'. Later black-case TraqTachs, TraqSyncs, TraqData II and the TraqData HD, TraqData PRO, and TraqData HD2 are switchable but come set for 'Electronic'.

The 'Electronic' setting works with most modern cars with either a 5V or 12V tach signal. 'Coil' works with older cars with a 12V signal or by attaching directly to the negative coil terminal.

Changing Voltage Range of TraqTach, TraqSync, TraqData II, TraqData HD, TraqData PRO, and TraqData HD2

To open a TraqTach or TraqSync (black case), gently pry open the cover of the 15 pin connector. Be careful not to lose the thumbscrews.

To open a TraqData II, TraqData HD, TraqData PRO, or TraqData HD2 device, remove the two screws on the bottom of the unit and lift off the top cover.

For all devices, there is a very small dip switch on the circuit board that is covered in transparent tape. Use a sharp instrument to flip it to the other position.

Selecting the Tach Signal

First you must find a signal that pulses at least once per engine revolution. You will need to attach a wire to this signal using either a wire tap or a hard contact such as a spade lug. If you use a wire tap, take special care not to cut the source wire. There are several places where a signal may be located on your car.



Figure 1 - Tapping ECU Signal

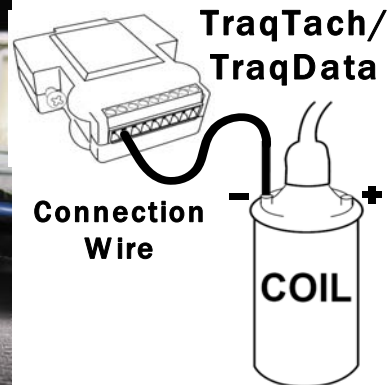


Figure 2 - Connecting to Ignition Coil

- **If using an MSD or similar capacitive discharge ignition use the supplied TACH signal. DO NOT CONNECT TO THE COIL.** Set switch to 'ELECTRONIC'.
- For older vehicles (generally 1976 and earlier), locate the ignition coil. Connect to the terminal labeled '- '. Set switch to 'COIL'.
- For many modern cars, there is a 5V or 12V ECU signal labeled TACH or IGN that is a single or double pulse per engine revolution. Set switch to 'ELECTRONIC'.
- For many vehicles, you can tap the wire going to the tachometer in the instrument cluster. Set switch to 'ELECTRONIC'.
- For fuel-injected vehicles, you can use a fuel injector signal. Set switch to 'COIL'.
- For distributor-less ignition, you can use a low voltage coil-on-plug signal. Set switch to 'COIL'.

Terminating Wire at Input Device

Attach a wire to your tach signal source. For original TraqTach and either TraqData input modules, run a wire to the module and terminate it securely in the screwdown terminal labeled 'RPM'.

For black-case TraqTach and TraqSync modules, connect the tach signal to the TraqSync blue wire using the supplied crimpless connector.

Plug the input module into the Traqmate Sensor Unit.

If you are operating Traqmate on vehicle power, there is only one connection required. If you are operating on battery power (not recommended for TraqTach or TraqData), you must connect the terminal labeled 'GND' to vehicle ground or ground the Traqmate Sensor Unit case.

Refer to the applicable Traqview or TraqDash User Manuals to set up Traqmate so that the proper RPM is displayed on the unit and in Traqview.

Connecting Data Inputs and Outputs

Traqmate can deliver amazing results with just the internal GPS and accelerometers but sometimes you want to monitor other external points in the car such as air/fuel mixture for tuning the vehicle or perhaps steering angle to better evaluate driver and setup. For this purpose, Track Systems offers the TraqData analog and digital input device.

TraqData contains screwdown terminals for 4 Analog, 2 Digital, and 1 RPM connections. It also contains a 5V reference line for resistive sensors. TraqData II and HD also have a 12V power line that can be used to power a sensor up to 100mA. TraqData is a convenient way to monitor external sensors for temperature, pressure, deflection, or just about anything else. However, connecting electrical components requires some knowledge of voltage, current, and wiring. If you hook up something wrong, you risk damage to yourself, your vehicle, and your Traqmate.



If you do not have electrical knowledge, get help from your Traqmate dealer or a friend with the proper experience.

Digitals

Inputs

Digital Inputs are straightforward. Tie them to a signal that measures between 0V and 0.5V in one state and between 3V and 20V in the other state. An example is the brake light. Tap the wire going to the brakes and attach it to either the D4 or D5 terminal.

0V is a logic 0, 3V+ is a logic 1. If input is not connected it will read as a 1. You can change the definitions of the digital points to define "ON" and "OFF" using Traqview.

If a ChaseCam PDR or Sony camcorder is connected, D4 cannot be used as an input.

NEVER CONNECT A DIGITAL INPUT TO THE COIL OR OTHER HIGH VOLTAGE SOURCE.

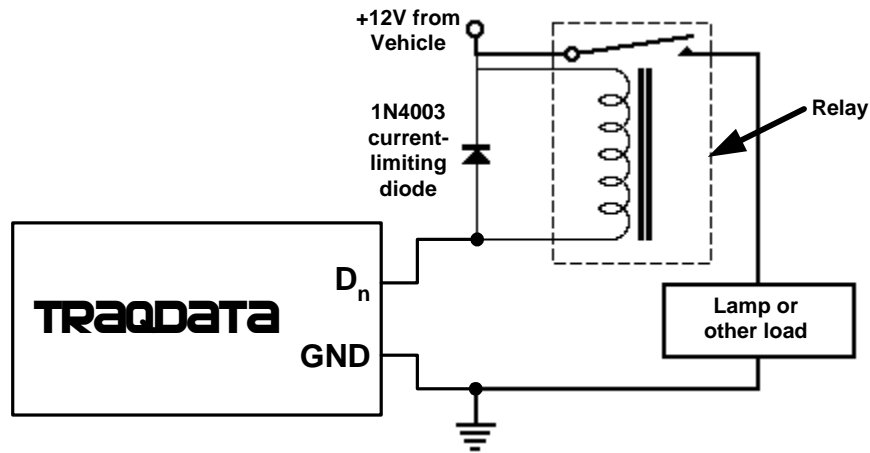
Do not configure the Digitals as Outputs in Traqview if they are connected as Inputs. This could damage Traqmate and/or the vehicle.

Outputs

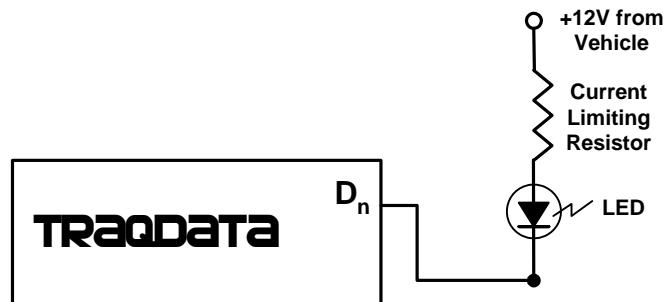
Digital Outputs are used to signal when a pre-programmed event occurs. When activated, they form a connection to ground. Each Digital Output is an open-collector signal and will normally read approximately 2 Volts when not "activated".

IF ANY CAMERA IS CONNECTED, D4 SHOULD NOT BE USED. Otherwise, Digital Output D4 may be used as an alarm notification for RPM or the A0 Analog input. D5 may be used as an alarm notification for RPM or the A1 Analog input. When used as an alarm, these outputs can be used to trigger a relay to an external warning light or directly drive a low-current indicator such as an LED.

The figure below shows the connections required to connect an external light or LED to a digital output. The max sink current on each digital output is 250mA. If you use a relay, you must have a current limiting diode for the flyback current as shown below.



Connection to Warning Lamp or High Current Load



Connection to LED or Low Current Load

Figure 3 - Digital Output Connections

Analogs

Analogs are a little trickier. There are many ways they can be attached depending on the electrical characteristics of the sensor.

Rules

1. The resistance on the 5V reference must be greater than 470Ω. You must have a series resistor if you hook it to a variable resistance sensor.
2. Do not use the vehicle's 12V power as a reference voltage as it changes depending on charging status. Use the supplied 5V source instead.
3. The maximum voltage you can monitor is 20V. Do not exceed this or you can damage the Traqmate.
4. If you are using batteries (not recommended for TraqData), you must connect the sensor ground to the TraqData GND terminal.
5. If you are operating off vehicle power (recommended), your sensor circuit must be grounded to the vehicle or attached to the TraqData GND terminal.
6. If you place sensors near high voltage sources you may corrupt your signal with electromagnetic interference.

Requirements

To setup and use TraqData you will need the following:

- Traqmate Complete, Traqmate Basic, or TraqDash System
- TraqData input device
- PC with Traqview installed
- 20 gauge or smaller wire (the higher the gauge the smaller the wire)
 - This is a size issue not an electrical issue. Larger wire will not fit into the screwdown terminals on the TraqData or TraqTach device.
- Means to terminate wires (spade lugs, wire taps, solder, ring lugs, etc.)
- Very small screwdriver for screwdown terminals (blade < 0.08" or 2 mm)
- Crimper tool
- Wire cutters
- Wire strippers
- Volt-Ohm Meter (VOM)
- Sensors and series resistors as desired

Analog Input Installation Overview

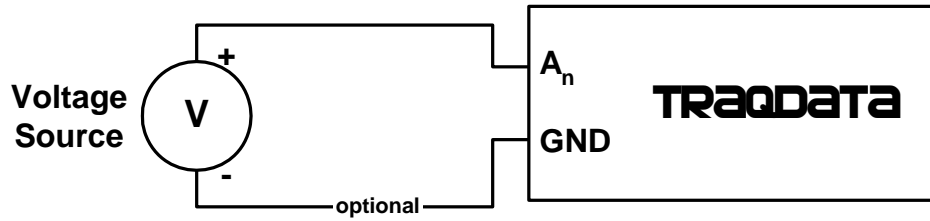
See detailed instructions for these steps in subsequent pages.

1. Identify which input points are to be monitored. These could be points already available in the vehicle (electric oil pressure gauge) or require new sensors (steering wheel deflection).
2. Give each point a name and identify the units in which to report this input point. (i.e. PSI, Ratio, Deg-C, Degrees, or possibly just Volts). If the value you want is not on the list you can just type it in.
3. Wire up a sensor with an appropriate series resistor (if necessary).
4. Measure the resistance or voltage at either end of the range. For example, if you are using a thermocouple, heat it to the max temperature and cool it to the min temperature and measure the temperature and resistance/voltage at either extreme. You can measure the voltage using the Inputs screen on the Display Unit or with a VOM.
5. Enter the information into Traqview and enable the data point.
6. Turn on data collection (must have GPS signal!) and record some data.
7. Upload into Traqview and verify the results. Tweak as necessary.

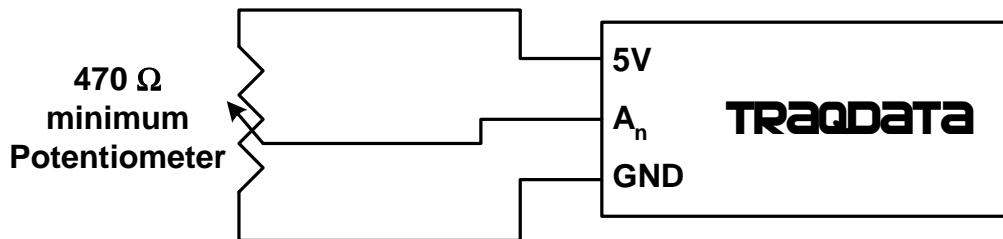
Many customers use sensors purchased from AEM which provide a convenient and accurate linear 5V output that is perfect for the TraqData input device.

The diagrams below show a selection of sensor types and suggestions for connecting them to the TraqData interface.

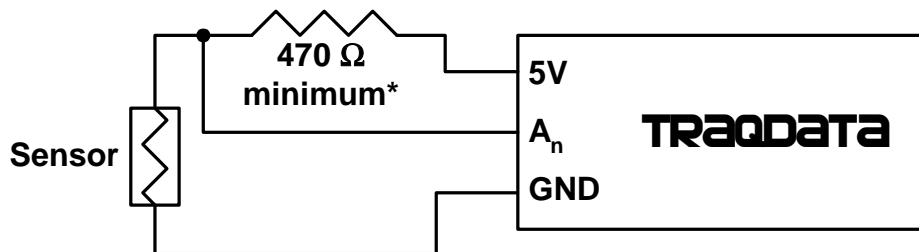
Source supplying scaled voltage (example, Lambda sensor)



Potentiometer (example throttle position sensor, suspension deflection sensor)



Variable resistance sensor (example, thermocouple, pressure sensor)



** Value for resistor should be roughly equal to maximum resistance of sensor.*

Input to existing gauge

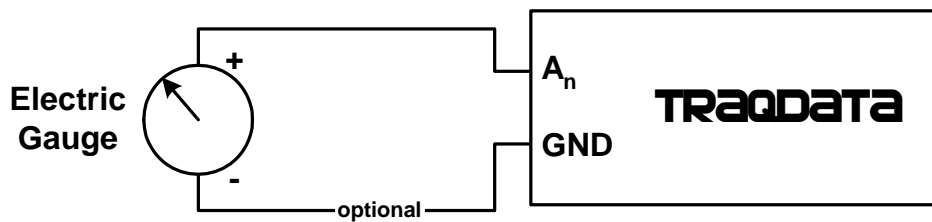


Figure 4 - Analog Sensor Connections

AEM Fluid Pressure Sensor

A recommended sensor for pressure measurement is the AEM 30-2130 series of sensors that come in a variety of pressure ranges and supply a 0-5V output that is perfect for use with the Traqmate. These sensors can be used for measurement of oil pressure, fuel pressure, brake pressure, or any other fluid measurement.

This example shows the installation and calibration of the AEM 30-2130-100 sensor. The sensor comes with an information sheet that lists the appropriate scaling values to enter into the Traqmate or TraqDash.

Connect as shown:

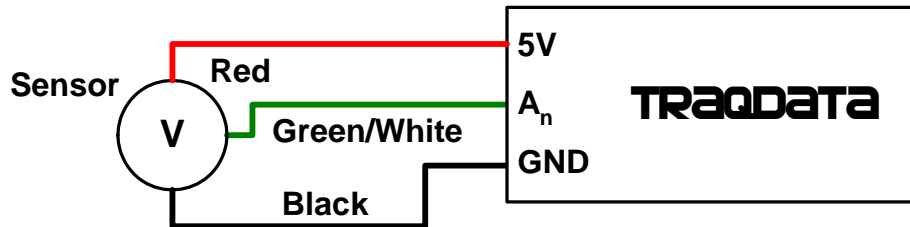


Figure 5 – AEM 30-2130 Pressure Sensor Connection

Using the AEM-supplied chart, choose the appropriate voltage range and enter into Traqview (for Traqmate Classic) or into the TraqDash.

For a water temperature application from 100 degrees F to 250 degrees F, enter the following:

Voltage range: LOW = 0.5, HIGH = 4.5V
 Value range: LOW = 0, HIGH = 100
 Input Name = Oil Press
 Input Units = PSI

VOLTAGE OUTPUT	
Voltage	30-2130-100
Output	0-100 PSIG
0.5	0
0.75	6.25
1	12.5
1.25	18.75
1.5	25
1.75	31.25
2	37.5
2.25	43.75
2.5	50
2.75	56.25
3	62.5
3.25	68.75
3.5	75
3.75	81.25
4	87.5
4.25	93.75
4.5	100

AEM Fluid Temperature Sensor

A recommended sensor for temperature measurement is the AEM 30-2012. This is a resistive sensor that can be used for water or oil temperature measurement. You will need to source a ½ watt 2.2K Ohm resistor.

This example shows the installation and calibration of the AEM 30-2012 sensor. The sensor comes with an information sheet that lists the appropriate scaling values to enter into the Traqmate or TraqDash.

Connect the sensor as shown:

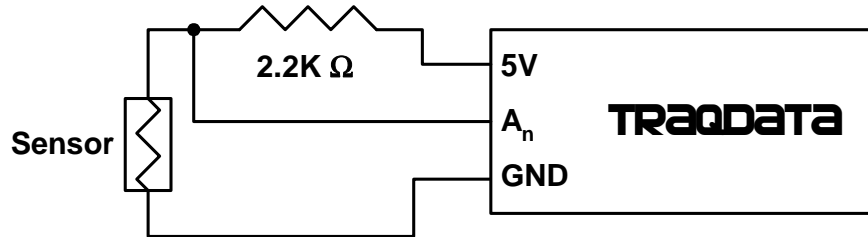


Figure 6 – AEM 30-2012 Temperature Sensor Connection

Using the AEM-supplied chart, choose the appropriate voltage range and enter into Traqview (for Traqmate Classic) or into the TraqDash.

Temp degC	Temp degF	Res Ohms	Voltage 2.2K pullup Volts
-40	-40	402K	4.97
-35	-31	289K	4.96
-30	-22	210K	4.95
-25	-13	154K	4.93
-20	-4	114K	4.91
-15	5	85.0K	4.87
-10	14	64.3K	4.83
-5	23	48.9K	4.78
0	32	37.5K	4.72
5	41	29.0K	4.65
10	50	22.5K	4.56
15	59	17.7K	4.45
20	68	14.0K	4.32
25	77	11.1K	4.18
30	86	8.9K	4.01
35	95	7.2K	3.83
40	104	5.8K	3.63
45	113	4.7K	3.42
50	122	3.9K	3.20
55	131	3.2K	2.97

Temp degC	Temp degF	Res Ohms	Voltage 2.2K pullup Volts
60	140	2.7K	2.74
65	149	2.2K	2.52
70	158	1.9K	2.30
75	167	1.5K	2.09
80	176	1.3K	1.88
85	185	1.1K	1.70
90	194	965	1.52
95	203	826	1.37
100	212	710	1.22
105	221	613	1.09
110	230	531	0.97
115	239	462	0.87
120	248	403	0.77
125	257	352	0.69
130	266	309	0.62
135	275	272	0.55
140	284	241	0.49
145	293	213	0.44
150	302	189	0.40

For a water temperature application from 100 degrees F to 250 degrees F, enter the following:

- Voltage range: LOW = 0.69V, HIGH = 3.63V
- Value range: LOW = 257, HIGH = 104 ← **Note inverted scale**
- Input Name = Water Temp
- Input Units = DegF

Appendices

Table of Figures

Figure 1 - Tapping ECU Signal.....	5
Figure 2 - Connecting to Ignition Coil	5
Figure 3 - Digital Output Connections	8
Figure 4 - Analog Sensor Connections	10
Figure 5 – AEM 30-2130 Pressure Sensor Connection	11
Figure 6 – AEM 30-2012 Temperature Sensor Connection.....	12

Warranty Information

Track Systems warrants to the owner of this Traqmate GPS Data Acquisition System that it is free from defects in materials and workmanship for a period of 180 days from the original date of consumer purchase. This warranty does not cover damage to the product as a result of misuse or accident, including but not limited to shock or water damage.

Remedies shall be limited to repair or replacement of the defective unit at Track Systems discretion. IN NO EVENT SHALL TRACK SYSTEMS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow for limitation of incidental or consequential damages, so this limitation may not apply to you.

To arrange for service, check the Traqmate website at <http://traqmate.com> and click the Service and Repair button to create a repair ticket. This applies to both in and out of warranty service.

For technical support, call 1-877-289-0312 (9 AM to 5 PM EST M-F).

Glossary

Accelerometer Analysis	A sensor that measures the G-forces on the vehicle The effort of examining recorded data for useful information or the results of such an examination
Analysis File	File with extension of “.tqs” that contains an analysis. May contain one or more sessions
AutoOn	Feature to allow Traqmate to automatically turn on with power
AutoStart	Feature to designate automatic starting mode for Traqmate
AutoPan	A Traqview feature that causes Vehicle icon to remain in the Track window.
AutoPan Vehicle	The vehicle selected in Traqview menu to be followed during AutoPan
Data Acquisition	Measuring and recording of information
Display Unit	Lap Timer component of the Traqmate Complete System
DU	Display Unit
Firmware	Software that is embedded into the SU and DU that controls their operation
GPS	Global Positioning System, a satellite-based location method
Post Roll	Video recorded after the selected Laps
Predictive Lap Timer	Display Unit timer that compares current lap progress with a stored reference lap
Pre Roll	Video recorded before the selected Laps
Reference Vehicle	In Traqview, first vehicle selected for map display
Segment	portion of the track that is being analyzed in Segment Analysis
Segment Separator	bent line on Track Map that separates segments
Sensor Unit	Silver box containing GPS receiver and accelerometers
Session	One group of continuous recording, typically a single trip or series of laps
Session File	File with extension of “.tqm” that contains one recorded session
Slider	Slide control at bottom of screen for positioning vehicle on track
Start/Finish Line	Place on track where a lap starts
SU	Sensor Unit
Theoretical Best Lap (TBL)	Best combinations of segment times from a session
TraqData	Analog, Digital and RPM input module
TraqData II	Analog, Digital and RPM input module with 4-wire ChaseCam interface
TraqData HD	Analog, Digital and RPM input module with LANC camera interface
TraqData PRO	Analog, Digital and RPM input module with GoPro Camera interface
TraqData HD2	Analog, Digital & RPM input module with GoPro & Replay Camera interface
TraqPaq	Traqmate Battery Pack
Traqmate Basic	GPS Data Acquisition system without a Display Unit (Sensor Unit only)
Traqmate Complete	GPS Data Acquisition system with both Sensor Unit and Display Unit
TraqSync	RPM input module with 4-wire ChaseCam interface
TraqSync PRO	RPM input module with GoPro and Replay Camera interface
TraqTach	RPM input module
Traqview	Windows data playback and analysis program
TraqStudio	Windows data and video playback and analysis program