

The Daytona “Twin-Scan 88”

Hi, it's Dave Bickford here, with a piece of information that will hopefully help some of you out there with late model “electronic” Harley's. This article will be along the lines of a product review, as well as provide some reasons for owners of late model HD's to consider adding this item to their electronic toolbox. As we all are painfully aware, today's modern bikes are becoming more and more computer controlled. Harley's are going the way that the automotive scene has been heading for quite a few years now. If you're like me, and do virtually all of your own maintenance on your bike, then you've been grumbling at these “modern” changes, which require you to not only learn some new tricks, but add a laptop and a few other tools that formerly had no place in the garage.



The Twin Scan 88 is one of those tools you need to seriously look at. With the pending Legislation regarding the “Right to repair” act, this tool is a huge step in the right direction for those of us shade tree wrenches out there.

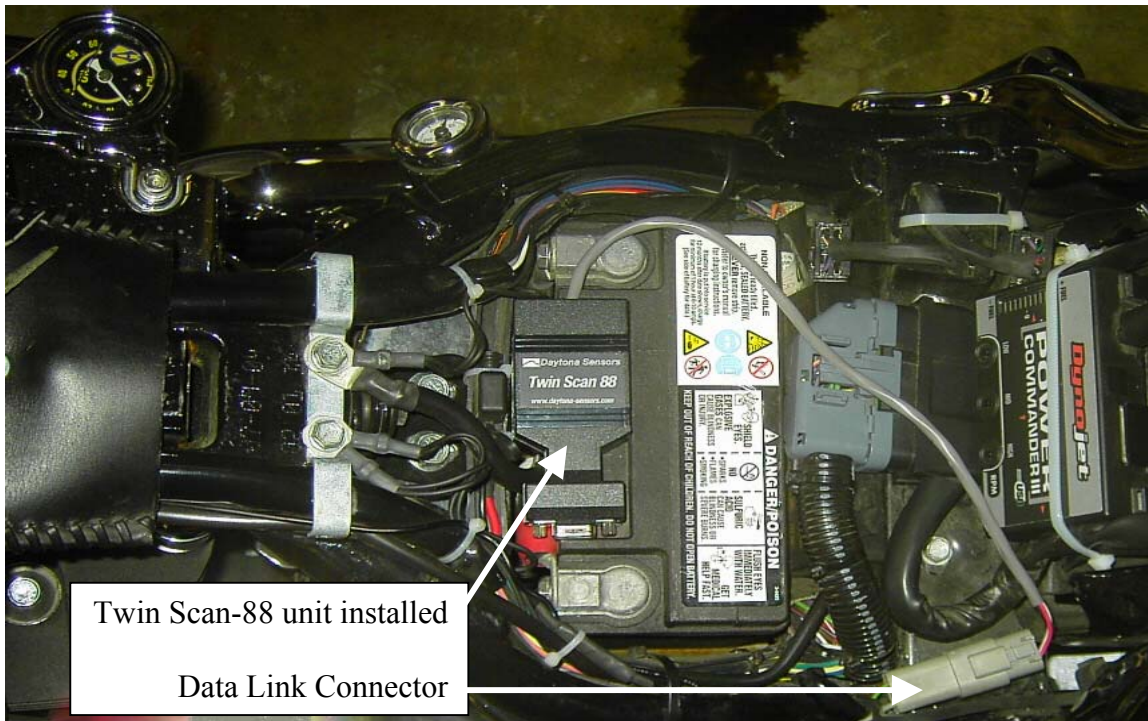
The Twin Scan 88 provides diagnostic capabilities not found in any other available tool, and is especially useful for diagnosing hard to find or intermittent trouble codes. The motorcycle is operated while the unit is installed, recording all sorts of useful data. Under normal conditions (no trouble code), the unit will store data for up to about an hour of operation. You can record 17 different parameters, 1600 times! And, you have the ability to adjust the time between the 1600 points from .25 to 2 seconds. If you set up the recording interval to 2 seconds, for example, you can record a “ride” a little over 53 minutes long. ($1600 \times 2 \text{ sec.} = 3200 \text{ sec.} / 60 = 53.33 \text{ min.}$) If a trouble code is set, the unit automatically stops logging data 30 minutes after the code is set. (If you have the recording interval set to 2 seconds) This allows you to examine data before and after the code was set, even days later. You have a range of capabilities for analyzing and printing out logged data that is displayed in a chart recorder format. Note that if you keep on riding, new data will overwrite the old, except when a trouble code (DTC) is set. The unit is compatible with 2001-06 H-D fuel injected models using the Delphi system (including V-Rod) and 2003-06 carbureted models with the 12-pin ignition module. Basically, bikes that use the J1850 data buss.

A few words about the J1850 data buss:

As a rule of thumb, GM cars and light trucks use SAE J1850 VPW (Variable Pulse Width Modulation). Chrysler products and all European and most Asian imports use ISO 9141 circuitry. Fords use SAE J1850 PWM (Pulse Width Modulation) communication patterns. As the Harley-Davidson system is Delphi, it's basically the GM OBDII system. The Twin Scan uses your laptop PC for display, and includes Windows software. It reads and clears diagnostic trouble codes from the ECU (engine control unit), TSSM (turn signal/security module), Speedometer, and Tach. You can also get real time

display of engine data on the instrument panel type display. Minimum PC requirement is a 300 MHz Pentium running Windows 98/ME/XP with SVGA display (1024 x 768 pixels) and an available RS-232 serial port (9 pin D-sub connector).

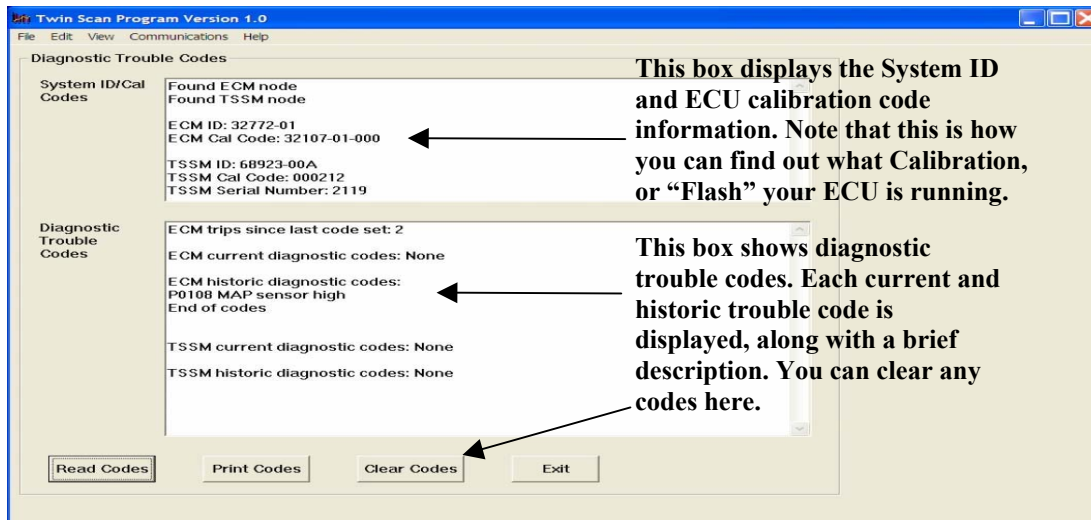
The unit is about the size of a pack of cigarettes, and simply plugs into the data link connector under the seat. On my Softail, the unit wedges in nicely on top of the battery. With the unit plugged in to the data link connector, the Twin Scan receives power (and starts recording) as soon as you turn the ignition on. The Data Link connector is a 4-pin Deutsch type connector with 4 wires. The bike side of the connector is wired: Pin 1 (LGN/R) to Pin 1 on the ECU, and is called ALDL (assembly line diagnostic link) and "Flash" pin. (This pin is not wired on the Twin Scan) Pin 2 (black) goes to ground. Pin 3 (LGN/V) is the serial data, and Pin 4 (GY) is +12V power from the ignition fuse. The Twin scan side of the connector is wired: Pin 1, no connection, Pin 2 (Black) Pin 3 (white) and Pin 4 (red) I made a small modification on my bike, running the Twin-Scan wire going to pin 4 through a toggle switch, so that I can start or stop recording when desired.



Another thing I should mention is that normally you need to have the unit on the bike with the ignition on to download and view the information on your laptop. As this is not always convenient, I made up a little rig with a 9V battery, and a couple of wires. This way you can take the unit off the bike, and download at your desktop computer by simply plugging the 9V battery into the Twin Scan connector, Positive to pin 4 and negative to pin 2. One other thing to note is that the Twin Scan is not waterproof, so you need to put the unit in a plastic bag if rain is in the forecast, or remove the Twin Scan if you are going to wash the bike.

Set-Up and Installation

Unfortunately, the unit does not come with the serial cable needed to interface it to your laptop. Daytona recommends a Belkin F2N209-06T male to female extension cable, available at most office supply stores. This same cable is also sold at Office Depot as P/N 825851. If your computer does not have a serial port, you can use a USB or PC card serial adapter. Twin Scan recommends the Belkin F5U103 USB serial adapter. The Twin Scan software comes on a CDROM, or the latest version can be downloaded from www.daytona-sensors.com. Following software installation, connect the Twin Scan to the data link connector on the bike, and using the serial cable you purchased, connect the Twin Scan to your laptop serial port. (COM 1 –5) Turn the ignition on. Test the communications using the “Read Firmware ID.” on the help menu. Click on the “Read Codes” box, and you should get a screen like this:



What kind of Data can I record and display?

The Twin Scan can record and display the following set of parameters:

RPM – Engine crankshaft RPM

VSS – Vehicle speed in MPH

BAT – Battery Voltage

MAP – Manifold pressure in In-Hg

TPS – Throttle Position, 0 to 100%

FRONT ADV & REAR ADV – Ignition advance in degrees BTDC

FRONT INJ PW & REAR INJ PW – Injector pulse width in milliseconds (1/1000th second)

FRONT KNOCK & REAR KNOCK – Knock retard value in degrees

AFR – Air/Fuel Ratio Command. The target A/F ratio the system is attempting to maintain.

IAC – Idle Air control stepper motor position (Higher number means more air)

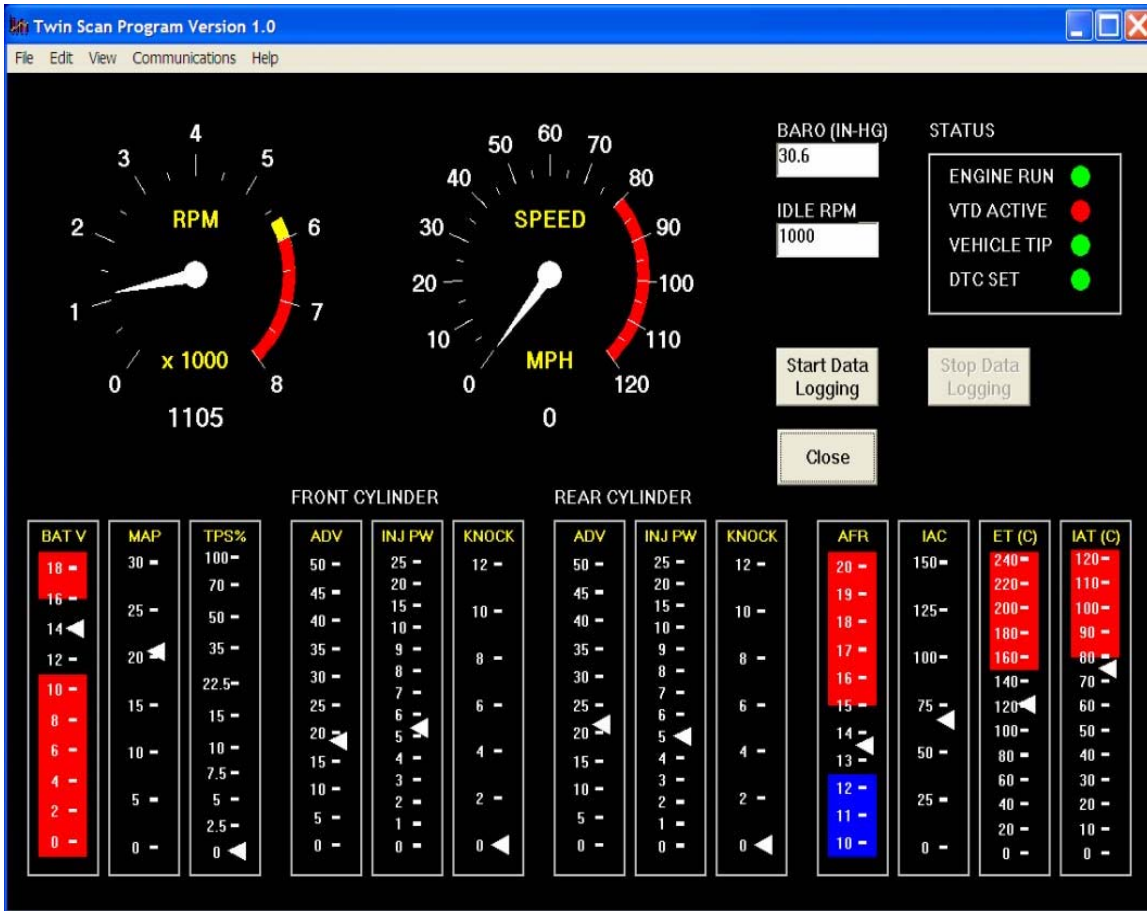
ET – Engine temperature from front cylinder head in degrees Centigrade

IAT – Intake air temperature in degrees Centigrade

BARO – Barometric Pressure in In-Hg

IDLE RPM – Target value that the system is trying to maintain

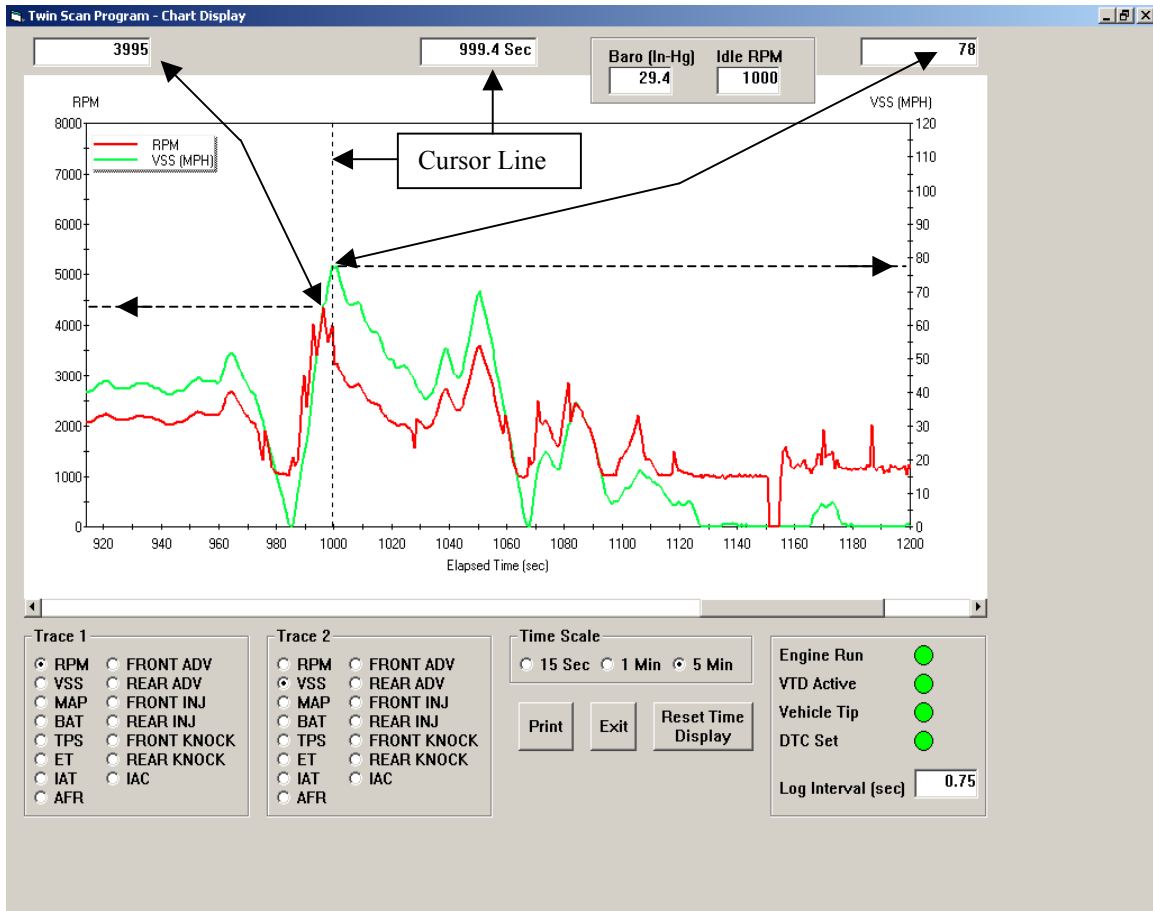
Additionally, status lights on the display indicate engine running, VDT Active, Vehicle Tip, and DTC Set. Here's a shot of the "Real-Time display"



The "Real Time" Display above is what you can examine with your laptop hooked up, and the bike running. Neat looking display, but other than being able to see everything at a glance, the bike is, after all just sitting there stationary. Of course, you could put it into record mode, (Data Logging) pack the laptop on the bike, and record to the laptop.

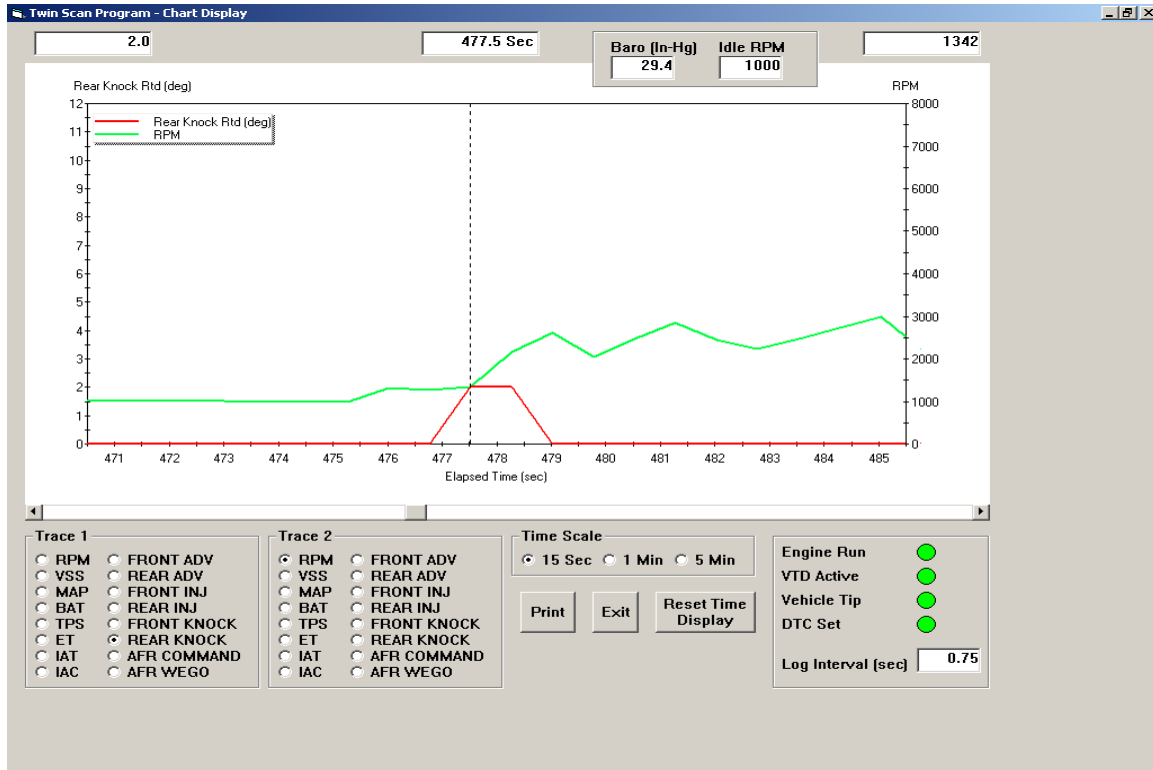
Data Logging and Chart Display

The ability to record data during a ride (without having to pack the laptop) and save it for later analysis is a real boon to troubleshooting all sorts of problems. Using the chart display, you can only select any two parameters for display at a time. Trace 1 is shown in Red, with its Y-axis legend on the left side, and Trace 2 in Green, with its Y-axis on the right side. The X-axis is always elapsed time. You can select from one of three time scales. Use the scroll bar to move the chart display window in relation to time. Left click on the display, and a dotted line appears (cursor) with the exact values at that cursor point displayed in the boxes above the chart. Here's an example.



In this example, I have VSS (speed) in green and RPM in red. The dotted cursor line is positioned at about 1000 seconds into the ride. Note that the box says it's actually 999.4 seconds. At this point, my RPM was 3995 and speed 78 MPH. Wonder if Big Brother could ticket you from that data? You'll see that my speed dropped to zero at about 1065 seconds (that's the stop sign at the entrance to my parking lot). At 1125 seconds or so, I pulled into my parking spot, backed in, and turned the Ignition off. Some time later that morning, it started raining, and I fired up (the recording starts again) and rode the bike into the shop. You can easily switch displays around to show any two data sets out of the 15 available for trace 1 and 2. This can also get you in trouble to, as my wife was easily able to figure out that I was doing 78 in a 35, and looking backwards, zero to 78 MPH was done in about 9 seconds. Gee, now I guess I'll have to do a full throttle run to time 0 to 60, just for grins.

Here's a screen shot from another run:



In this shot, you can see that my rear cylinder retarded itself 2 degrees at 477 seconds into the ride. (Red trace) I have RPM displayed on the Green trace, and you can see I was increasing RPM from 1350 or so to 3000 when the retard occurred.

Exporting Data

Hey, wouldn't it be nice to be able to put all of the data on one chart? You can, if you export the run file to Excel. Data files saved from the Twin Scan are in comma delimited ASCII format, so they are easily exported into Excel, where you can format and display the data in just about any way you choose. Just start Excel, and in the Open File box, select all files (*.*) then select your saved run. In the import wizard, select delimited file type, comma delimiter, general column data, and finish. At that point, you can format the data any way you choose, and save the spreadsheet as an Excel file.

Here's an Excel example of that with the rest of the data from the Rear Cylinder retard info shown a few seconds before and after that event. I found it pretty interesting and informative to say the least.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Engine Control System	Fuel Inj.																	
2	Data Logging Interval	BaroPres																	
3		0.75	29.4																
4	Elapsed Time (seconds)	Engine RPM	BatV	MAP	ET	IAT	TPS	Front Adv	Rear Adv	F.Ret	R.Ret	IAC	F.PW	R.PW	VSS	AFR			
628	469.25	1038	13.4	11.4	113	39	0	12	12	0	0	48	3.625	3.125	16.2	13.9			
629	470	1024	13.4	11.7	113	39	0	12	12	0	0	49	3.625	3.125	13.7	13.9			
630	470.75	1005	13.4	11.7	113	39	0	12	12	0	0	49	3.5	3	11.2	13.9			
631	471.5	1005	13.4	11.9	113	39	0	12	12	0	0	49	3.625	3.125	9.9	13.9			
632	472.26	1045	13.5	11.5	113	39	0	12	12	0	0	49	3.5	3	8.1	13.9			
633	473.01	1018	13.5	11.6	113	39	0	12	12	0	0	49	3.5	3	6.2	13.9			
634	473.76	982	13.4	11.9	113	39	0	12	12	0	0	49	3.625	3.125	4.3	13.9			
635	474.51	1016	13.4	11.6	113	39	0	12	12	0	0	48	3.5	3	1.2	13.9			
636	475.26	991	13.5	11.8	114	40	0	12	12	0	0	49	3.5	3.125	0	13.9			
637	476.02	1315	13.9	15.4	114	39	4.5	15.5	15.5	0	0	55	5.25	4.375	0	14.2			
638	476.77	1262	14	20.7	114	38	10	16	16	0	0	64	6.5	6.375	4.3	14.4			
639	477.52	1342	14	20.2	114	37	10.5	20	16.5	0	2	64	6.5	6.125	9.9	14.3			
640	478.27	2169	14	18.8	114	36	15	31.5	29.5	0	2	71	6.25	6	15.5	14.5			
641	479.02	2618	14	7.6	114	36	0	30.5	30.5	0	0	67	2.375	2.25	19.9	13.9			
642	479.78	2048	14	18.6	114	37	14.1	30.5	30.5	0	0	70	6.125	5.875	21.7	14.5			
643	480.53	2464	14	18.7	114	36	16.8	35	34.5	0	0	74	6.375	6.125	26.1	14.7			
644	481.28	2853	14	17.2	114	35	16.8	41	40	0	0	74	6	5.75	30.4	14.7			
645	482.03	2437	14	7.8	114	36	0	28.5	28.5	0	0	64	2.625	2.375	31.1	14.3			
646	482.78	2228	14	19.6	114	35	17.7	30	30.5	0	0	75	6.75	6.875	33.6	14.7			
647	483.54	2464	14	21.7	114	34	21.4	29.5	30	0	0	79	7.375	7.5	37.3	14.5			
648	484.29	2736	13.9	23.3	114	33	27.7	28	27.5	0	0	79	8.5	9.125	41	13.5			
649	485.04	2986	14	22.9	114	33	28.2	30	30	0	0	79	8.25	8.75	44.7	13.8			
650	485.79	2219	13.9	9.9	114	35	1.8	26.5	26.5	0	0	65	3.25	3.125	44.1	14.7			
651	486.54	2330	14	15.3	114	35	11.8	35.5	36.5	0	0	66	5.375	5.125	44.7	14.7			
652	487.3	2386	14	15.3	114	34	11.4	37.5	39.5	0	0	66	5.125	4.625	46	14.7			
653	488.05	2409	14	12.4	114	34	7.3	38.5	41	0	0	60	4.25	3.625	46.6	14.7			
654	488.8	2408	14	11.9	114	35	6.8	38.5	41	0	0	59	4	3.625	46.6	14.7			
655	489.55	2415	14	11.7	114	35	6.8	37.5	40	0	0	59	4	3.5	46.6	14.7			
656	490.3	2424	14	12.8	114	35	8.6	38.5	41.5	0	0	62	4.375	3.875	46.6	14.7			
657	491.06	2446	14	13.2	114	35	9.1	39.5	42.5	0	0	62	4.625	4.125	47.2	14.7			

Summing it up, the Daytona Twin Scan 88 is an inexpensive, very valuable tool, which allows you see exactly what's happening to your bike at any given moment. For those of us who do all their own maintenance work, it's a must! Daytona Sensors have just released an upgraded version of the Twin Scan, the Twin Scan 88 Plus. The "Plus" unit includes all the features of the standard Twin Scan 88, plus an analog input for logging air/fuel ratio (AFR) data along with engine data. The analog input can be attached to a WEGO II wide-band O2 sensor. It becomes an ideal tuning aid for the Screamin Eagle Race Tuner (SERT). The Twin Scan software analyzes the engine logged data and then displays AFR and the required VE correction in percent, with the same RPM rows and TPS columns used in SERT tables.

Of course, the logged data with the real-time AFR values could just as easily be used to tune your F.I. bike with a Power Commander, or one of the many other F.I. devices on the market today, although not as easily as the SERT perhaps. I just sent my Twin Scan back to Daytona Sensors for the upgrade, and I'll be sure to let you know how it works!

Till next time, keep the shiny side up, ride safe, ride free, and most of all, enjoy!

Dave

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