Inline Enrichment Device (FL-AF XiED®-10) w/AFR Display

FL-AF-XIED-10 Prototype

Fits many 2010 and Later Harley-Davidson®

All Twin Cam and V-Rod models with OEM 12mm Delphi 4-wire O2 sensors

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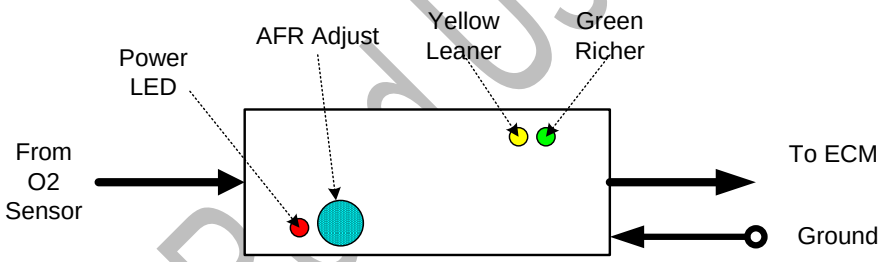
Made in the USA

An experimental 'plug-n-play' upgrade designed to let the engine equipped with OEM oxygen sensors to externally alter ECM closed loop bias value creating a variable air fuel ratio in closed loop mode approximating richer mixtures of 14.5:1-13.6:1, depending upon exhaust temperatures. An improved air fuel mixture has generally shown one of more of the following positive results:

- Improved Throttle Response
- Less Engine Surge
- Reduced Engine Ping
- Lower Engine Temperature
- Decreased Exhaust Heat

A small two LED AFR display has been added to standard IED technology to assist in monitoring closed loop fuel ratios by indicating 4 general fuel ratio areas: Normal Lean, Normal, Normal Rich, Very Rich.



Installation Instructions

- Locate Front/Rear O2 sensors connectors
- Touring bike behind right side body panel below seat
  - One Black (rear), one White (front) connector
  - Cut any tie wraps holding the connectors in place
- Unplug HD weather-tight connectors.
- Plug the FL-AF-XIED-10 Harness Adapter **between** O2 sensor and wiring harness. Plug FL-AF-XIED-10 Control unit into Harness Adapter.
- Make sure the connectors lock into each other
- Tie wrap the control unit in place to prevent it from moving around

Advanced Installation Instructions

- Recommended Settings for Twin Cam Engines are 7 to 9

Ground Wire (BLACK) Installation all bikes

- Ground wires to chassis bolt or negative battery terminal

Touring Bike Installation

AFR Adjustment Instructions

- The FL-AF-XIED-10 has an adjustable mixture control
- Use a Jeweler's screwdriver to make adjustments to the AF-XIED
- Do not force the variable dial adjustment
- Making adjustments while the engine is running might cause a temporary Check Engine light. This is not harmful. Restarting the engine should clear the CE light if it is O2 sensor related.
- Set the initial value based on the table of known working AFRs
- If you get transient Check Engine lights, set the AFR approximately .1 AFR leaner

AFR LEDs Display Pattern

Startup

Green/Yellow LED's will go on indicating startup sequence for 2 seconds.

The AFR Display module will then check the current mixture setting by reading the dial, providing a "blink" indicator from 1 to 11 blinks indicating the target AFR. Count the blinks on startup to verify the dial settings are correct.

Percent	BIAS	LAMBDA	AFR	Blink
100%	500	0.993	14.6	1
90%	556	0.986	14.5	2
80%	625	0.980	14.4	3
72%	694	0.973	14.3	4
67%	746	0.966	14.2	5
65%	769	0.959	14.1	6
63%	**794**	**0.952**	**14.0**	**7**
62%	**806**	**0.946**	**13.9**	**8**
61%	**820**	**0.939**	**13.8**	**9**
60%	833	0.932	13.7	10
59%	847	0.925	13.6	11

After the mixture setting is displayed, the display will wait until voltage sensed from O2 sensor. This will usually occur in 120-180 seconds cold and almost immediately on a warm/hot bike.

Normal Running Light Patterns

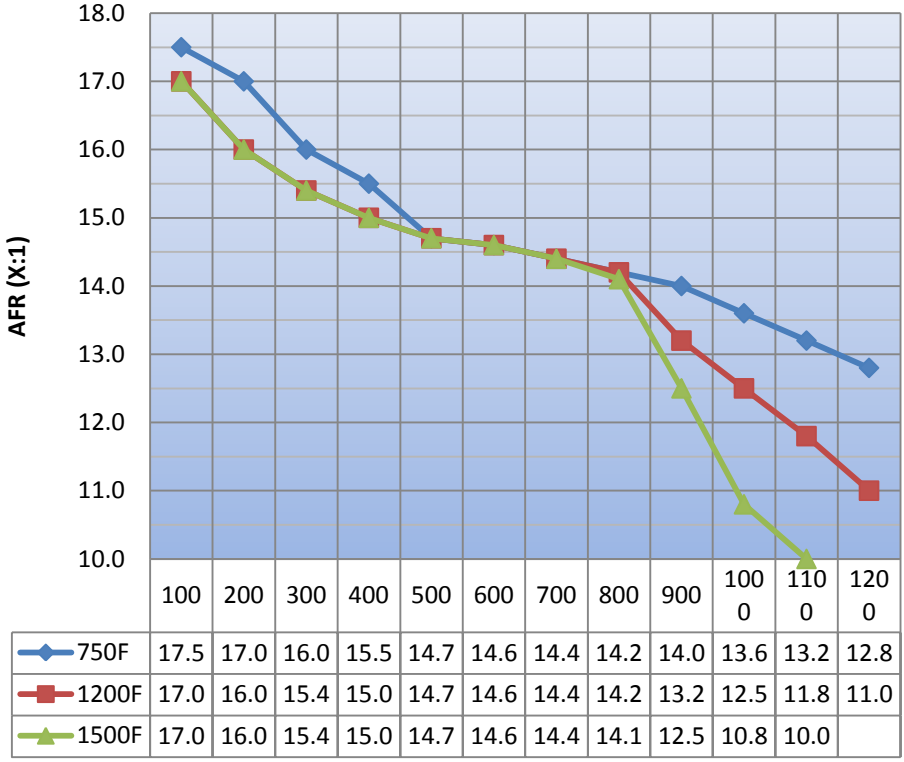
- Yellow – under 400 mV from O2 sensor – Leaner than 14.8:1 AFR
- No Lights – Between 400 and 750 mV from O2 sensor – 14.7-14.2:1 AFR
- Green – over 750 mV, but less than 1100 mV – 14.2-13.8:1 AFR
- Yellow/Green – over 1100 mV – Richer than 13.2:1 AFR

Do not read too much into the light pattern of the AFR gauge. This is intended to be a general indicator of the mixture, not instant reading of the fuel mixture at any point in time. Even with some smoothing, it is not uncommon for the pattern to constantly change from blink yellow-no lights-green. This is a normal cycling of the closed loop ECM. The pattern should tend to stabilize more on “no lights” to “green” light.
You will normally only see both lights on during startup or during full throttle acceleration.
Normal reversion in the HD Exhaust system is enough to create yellow light (lean spikes) in the display pattern. This is expected behavior.

The transition from yellow to ‘no color’ and back can create the illusion that the LED’s are staying solid yellow.

Please **DO NOT WATCH the AFR lights WHILE THE BIKE IS IN MOTION**.

NBO2 mVolt at AFR



	100	200	300	400	500	600	700	800	900	1000	1100	1200
750F	17.5	17.0	16.0	15.5	14.7	14.6	14.4	14.2	14.0	13.6	13.2	12.8
1200F	17.0	16.0	15.4	15.0	14.7	14.6	14.4	14.2	13.2	12.5	11.8	11.0
1500F	17.0	16.0	15.4	15.0	14.7	14.6	14.4	14.1	12.5	10.8	10.0	

Notes:

Richer closed loop AFR values cannot be achieved if any exhaust leaks exist. Even the smaller exhaust leak can cause check engine lights to occur. It is common for leaks to occur after slip on muffler or exhaust system upgrades have been done on the bike.

Bikes with very free flowing exhaust (read this as loud) may actually work better with slightly leaner AFR settings.

Do not expose the AF-XiED to high pressure water streams.

AF-XiED size is 2.5”L x 0.9”W x 0.7”H.

We have found settings in the 14.3 (4) to 13.9 (8) range tend to work best. Because of the way that the O2 sensors, AF-XiED and ECM actually interact, higher settings do not always result in the best results. The settings are the approximate AFR based on an average bias values in the ECM. The bias value is the “centering” voltage that the ECM uses to determine if it needs to make injector pulses longer or shorter based feedback it receives from the O2 sensor.

The default/recommended setting for the AF-XiED is a “7” or 14.0:1 AFR. Testing indicates this is more than adequate for most normal riding situations.

Recent engineering studies under direction of Nightrider indicate that fuel distribution in stock H-D ECM’s is distributed in favor of the front cylinder. It might be possible to compensate for this by setting the rear cylinder one (1) tenth (or notch) richer than the front.

Estimated Exhaust Gas Temperatures (normal riding):

Bosch 2-Wire Sensor:	1200 F	
Delphi 4-Wire Heated Sensor:	850 F	(2010>Later Touring)

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Approximate AFR's for the adjustment are as follows in the shaded cells:

14.6	14.5	14.4	**14.3**	**14.2**	**14.1**	**14.0**	**13.9**	**13.8**	13.7	13.6
Stock				37%	50%	52%	64%	75%		
1	2	3	**4**	**5**	**6**	**7**	**8**	**9**	10	11

Full Counter Clockwise is 13.6:1

Richer

Full Clockwise is 14.6:1

Leaner

Maximum recommended rich AFR for various model bikes and years

	2010	2011	2012	2013	2014
Touring	13.8	13.8	13.8	13.8	13.8
Softail	N/A	N/A	13.8	13.8	13.8
Dyna	N/A	N/A	13.8	13.8	13.8
Sportster	N/A	N/A	N/A	N/A	13.8
V-Rod	N/A	N/A	13.8	13.8	13.8

READ ME FIRST

Disclaimer

This product is intended for race vehicles used on closed courses, and not for use on roads or vehicles otherwise subject to emission control requirements. In California, this product must not be used on any vehicle that is registered or licensed for use on public roads.

Actual results from the installation of the XIED's may vary between individual bikes. S&P MULLEN Enterprises, Inc warrants Nightrider.com Performance Products against defects in factory workmanship and material for 30 days from the date of purchase with proof of purchase or until ownership in the part is transferred. The manufacturer and seller make no warranties express or implied which extend beyond the description of the goods contained herein. Any description of this product is for the purpose of identifying it and shall not be deemed to create an express warranty. S&P MULLEN Enterprises, Inc. shall not be responsible for any consequential, special or incidental damages of any nature, including but not limited to the loss of use of any vehicle on which the unit may be installed and the cost of obtaining substitute components.

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By opening this package and beginning to install the components of this product on your vehicle, the purchaser agree to abide by the terms of this agreement.

Air Fuel Ratio's (AFR) represented for these products are approximations and based on exhaust gas temperatures (EGT) of 1200-1300 F. Lower EGT during startup, cooler weather or during some Dyno testing with cooling fans can result in .5 to .8 leaner AFR's. This is normal due to the way unheated narrow band O2 sensors react to changing EGT's. The "hotter" the engine gets, the better the XIED's may actually work.

AFR readings observed on the typical chassis Dyno tail pipe probe will seldom provide fuel ratio readings accurate enough to show the results of XIED operation. Improper WBO2 free air calibration, reversion bring fresh air into the exhaust system and the fact that the sensor is not located at the exhaust port all contribute to decreased accuracy on the typical tail pipe probe. Readings need to be taken with a WBO2 sensor in the OEM O2 bung.

Some bikes may have 131/151 historical codes with the XIED's installed. These are not an indication of any problem with the engine or the XIED's.