STAND-ALONE AIR/FUEL RATIO GAUGE AND CONTROLLER

PN 534-201

Congratulations on your purchase of a Holley Air/Fuel Ratio Gauge and Controller. Holley Performance Products has written this manual for the installation of the Holley Stand-Alone Wideband O_2 Controller and Gauge. Please read all the **WARNINGS** and **NOTES**. They contain valuable information that can save you time and money. Should you need information or parts assistance, please do not return the unit to the store without first contacting technical service at 1-270-781-9741, Monday - Friday, 7 a.m. to 5 p.m. CST. By using this number, you may obtain any information and/or parts assistance that you may require. Please have the part number on hand of the product you purchased when you call technical service.

Sensor & Controller Mounting:

The controller can be mounted inside the vehicle or in the engine compartment. Keep it away from direct heat, direct road debris, or direct water spray. A good place to mount it is on a firewall or fenderwell.

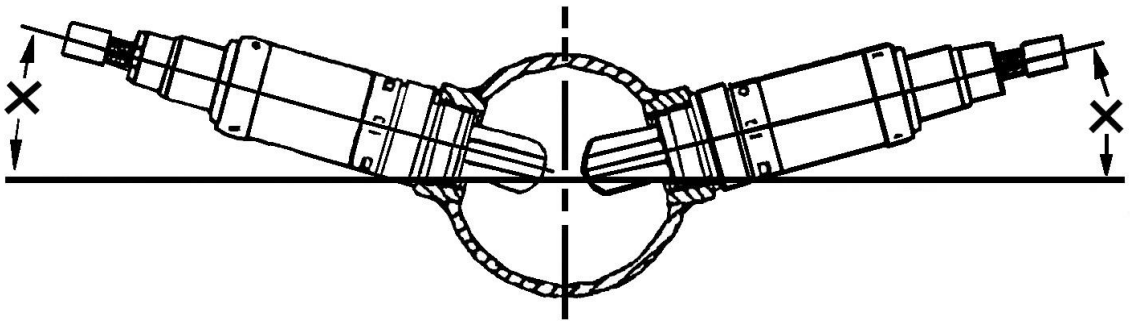
Sensor Placement & Installation:

The sensor should be mounted in the exhaust system at a point in which it reads at least one bank of cylinders, such as in the header collector or just after it. The sensor can also be mounted in an individual header tube for engines that have a particular cylinder that is known to be lean, and the air/fuel ratio of that cylinder needs to be monitored.

NOTE: **Someone with experience in welding exhaust systems should install the oxygen sensor boss. Any competent exhaust shop should be able to perform this task at a minimum cost.**

WARNING! **Use of some RTV silicone sealers will destroy the oxygen sensor. Ensure the RTV silicone sealant you use is compatible with oxygen sensor vehicles. This information should be found on the oxygen sensor package.**

1. Locate a position for the oxygen sensor. The header collector makes a good location for mounting. It is recommended that you have at least 2 to 3 feet of pipe after the sensor or it may not read accurately at light loads. If your vehicle has catalytic converters, the oxygen sensor MUST be located between the engine and the catalytic converters.



NOTE: **The oxygen sensor should be mounted in such a way that the condensation in the exhaust tubing will not enter the sensor. Mount the O_2 sensor in the upper half of the exhaust tubing, with the angle "x", shown above, being greater than 10°. The picture above indicates that the sensor can be mounted on either side of the exhaust tubing.**

NOTE: **The oxygen sensor should be able to be threaded in by hand. If it cannot you must chase the threads in the boss with a spark plug chaser or it will result in damage to the sensor threads.**

2. Drill a 7/8" hole in the location picked for the sensor. Weld the threaded boss into the 7/8" hole. Weld all the way around the boss to insure a leak proof connection. Install the oxygen sensor into the threaded boss and tighten securely. It is a good idea to add anti-seize to the threads to aid in removal.

3. On vehicles equipped with an AIR pump, the oxygen sensor must be mounted before the AIR injection into the exhaust, or the AIR pump must be disconnected. Holley recommends that if the AIR is injected into both exhaust manifolds; mount the oxygen sensor into the pipe immediately after the exhaust manifold. Disconnect the AIR pump tube from the exhaust manifold and plug both ends. Check with local ordinances for the legality of this procedure in your area.

WARNING! **Failure to disconnect the AIR pump or locating the oxygen sensor downstream from AIR injection will result in an extremely rich mixture, which could cause drivability problems and could result in severe engine damage.**

WARNING! **Make sure the sensor is not powered without the engine running or damage to the sensor may occur.**

Controller & Sensor Wiring:

Controller Wiring:

The controller has 4 connectors. They are to be connected as follows:

8 pin weatherpack connector - Plug directly into the Bosch LMU4 sensor. (If a extension harness is needed, it can be purchased under Holley PN 534-199)

3 pin weatherpack connector – Plug the included 6ft power harness in here.

- Red Wire - Connect to 12 volt switched ignition power
- Black Wire - Connect to good chassis ground
- The third pin is not used

2 wire weatherpack connector (black wires) – Connects to the gauge as outlined below

2 wire weatherpack connector (Orange wires) – This is for NOSBUS or HOLLEYBUS communications that is not used at this time.

Gauge Wiring:

The gauge has 4 wires. They are to be connected as follows:

White – Connect to 12 volt switched ignition power.

Black – Connect to good chassis ground

Pink – Night Dimmer – Connect to low current 12 volt supply that is active when the lights are turned on. This will dim the display when the lights are turned on. This is optional.

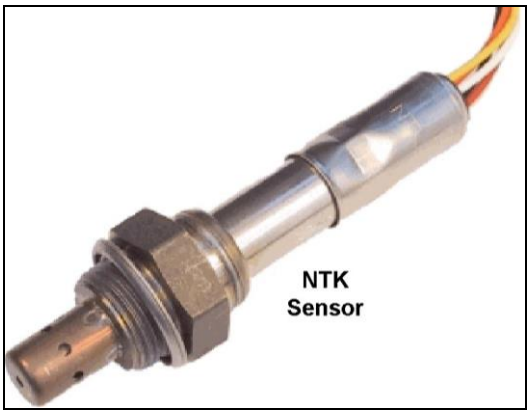
White/Green – This connects directly to the wide-band controller. The gauge has one wire with a 2 pin connector. Connect it to the mating 2 pin connector on the wide-band controller (2 black wires).

Sensor Information and selection:

The 534-201 Holley Stand-Alone Wideband O_2 controller with gauge comes with a Bosch LSU4 sensor. This controller is designed to work with either the Bosh LSU4 sensor or a NTK sensor. Both of these sensors will provide an accurate measurement of the air/fuel ratio of an engine; however the Bosch sensor has some limitations. They are:

1. Although neither sensor is recommended for use with leaded fuels, the life of the Bosch sensor is much shorter than that of the NTK sensor. Therefore, it is never recommended to use the Bosch sensor with any type of leaded fuel. The life expectancy varies and is based on the lead content and other additives of a particular fuel.

2. The Bosch sensor should not be used in a high EGT (exhaust gas temperature) environment. The maximum exhaust gas temperature the probe tip should see is 1560°F. The maximum the external case of the sensor should see is 1050°F. Unless the sensor is very close to the cylinder head, or turbo, this should not be an issue for most applications. If the Bosch sensor is used in a turbo application, it is recommended that the sensor is at least 18" downstream of the turbo. It should be a minimum of 18" from the outlet of the exhaust to ensure an accurate reading. For applications above 10 PSI of boost, the NTK sensor is recommended due to typical temperatures seen. Holley offers a NTK sensor separately under part number 534-194.



IMPORTANT: If using a NTK sensor the controller must be configured for the particular sensor. This is simply done with the two brown wires that are external to the unit. As shipped, the brown wires will have each end shrink wrapped. This indicates that the controller is configured for the Bosch LSU4 sensor that is included in the kit. If an NTK sensor is to be used in place of the Bosch, the brown wires must be reconnected therefore restoring the loop. If this is not done, the unit will read incorrectly and damage may result.

Gauge Settings:

The gauge comes pre-programmed with base settings. You can plug it in, and use it as-received. However, the gauge can be configured for different brightnesses, and different LED set points and strategies. The information below shows how to change these settings if desired. It is best to try it as programmed out of the box.

Changing the Gauge Configurations:

If configuration changes are desired, perform the following steps. You must scroll through all of them from beginning to end each time you want to change some or all of the settings.

1. There are 5 main parameters that can be adjusted. The daytime brightness, the nighttime brightness, the bar/dot mode of the LED's, the stoichiometric fuel value, and the LED ranges for different A/F ratio points (which are several settings).

2. Push and hold both buttons on the gauge. After a few seconds, "Pro" will appear on the gauge and go directly to "1 9" with the 9 flashing (**Figure 1**).

   - The **right button** is always used to change/increment the value of the specific setting.
   - The **left button** is used to either move through each digit if there are multiple digits to change, or move to the next setting.

3. **SETTING 1 –** This is the first setting and will appear as **Figure 1** with a "1 9" This indicates setting 1 with a value of 9. This setting is used for the intensity of the LED lights on the gauge with NO headlights on (0 = dim and 9 = bright). If you wish to leave this value alone, push the left button. If you wish to change this value, push the right button until it changes to the desired value. Once changed push the left button to move to the next setting.

4. **SETTING 2 –** This setting is used for the intensity of the LED lights on the gauge with the headlights on (0 = dim and 9 = bright). This is defaulted to a value of 3 as shown in **Figure 2**.

5. **SETTING 3 –** This setting (**Figure 3**) is used for the LED Bar Mode (BLUE – GREEN – YELLOW – RED). You can choose from 8 options - **0** = Dot mode, **1** = Standard Bar, **2** = Split Bar Type #1, **3** = Split Bar Type #2, **4** = Split Bar Type #3, **5** = Reverse Bar, **6** = Wide Dot, **7** = Bar/Junction Mode #1, **8** = Bar/Junction Mode #2.

   Note that for an A/F ratio gauge, the "Split Bar" type is not typically used. Choices 0, 1, 5, 6, 7, or 8 are typically used. Choice "0" is the default setting.

Figure 1

Figure 2

Figure 3

6. **SETTING 4 -** This is used to set the "stoichiometric" value of the fuel being used. It has a default setting of 14.70 meaning an air/fuel ratio of "14.7:1". This is the typical value used for gasoline. If you are using E-85 or Alcohol, you may want to change this. Unless you know what you are doing, leave this alone.

Note: You will need to push the left button multiple times to scroll through this setting. You will first scroll past the first numbers (the tens and ones position) (**Figure 4**), then move to the next screen (**Figure 5**) which shows the decimal places. Scroll though this until you get to the next screen which will shows "011." with a blue LED lighted up in the lower left corner (**Figure 6**).

Figure 4

Figure 5

7. **SETTING 5 – The remaining settings are used to define the numerical A/F ratio value range for each LED color segment. Five values need to be assigned.**

The LED color bar on this gauge sweeps from blue to green to yellow to red. The first value to set is the minimum value in the first blue segment. This is defaulted to 11.0. You can tell you are setting this value by seeing the left most lower blue LED lit up **(Figure 6).** You will first set the tens and ones values (two numbers to the left of the decimal point, **Figure 6**), then the values to the right of the decimal point (tenths and hundredths, **Figure 7**).

Figure 6

Figure 7

The next position to set is the minimum value for the green LED range. You can tell you are on this setting by seeing the Green LED lit (**Figure 8**). This is defaulted to 12.0. Set it the same way you set the blue segment above.

Figure 8

Figure 9

The next position to set is the minimum value for the yellow LED range. You can tell you are on this setting by seeing the Yellow LED lit (**Figure 10**). This is defaulted to 13.0. Set it the same way you set the blue segment above.

Figure 10

Figure 11

The next position to set is the minimum value for the red LED range. You can tell you are on this setting by seeing the Yellow LED lit (**Figure 12**). This is defaulted to 14.0. Set it the same way you set the blue segment above.

Figure 12

Figure 13

The next position to set is the maximum value for the red LED range. You can tell you are on this setting by seeing the Yellow LED lit (**Figure 14**). This is defaulted to 15.0. Set it the same way you set the blue segment above.

Figure 14

Figure 15

Figure 16

8. After entering the 5th setting, the gauge should read “END”. If for some reason the gauge is not functioning properly, the gauge will read “ERR”.

Tuning Tips:

What is air/fuel ratio?

The air/fuel ratio is the ratio of the amount of air verses the amount of fuel that an engine is taking in. It is a very important to control this properly for many reasons. A specific engine combination requires certain air/fuel ratio’s for best power, longevity, smooth operation, emissions, and fuel economy at different engine speeds and loads. A common term that is heard about air/fuel ratios is Stoichiometric. Stoichiometric is the ideal combustion process during which a fuel is burned completely. In Air/Fuel Ratio (AFR), this equates to a 14.7 to 1 AFR or (14.7:1) for pump gas. Above a 14.7:1 AFR is considered lean. Consequently, below 14.7:1 AFR is considered rich. As seen by the charts below, a performance engine requires a “richer” AFR that a stock engine does to make the best power. Good baseline AFR’s are given below.

NOTE: The following are typical A/F ratio ranges for various engines that should result in good performance. These are suggestions based on Holley’s experience. Your engine may require a leaner or richer mixture than those suggested below.

Stock and Moderate Performance Engines
Idle and Cruise: 14:1 to 15.5:1
Moderate Load: 13:1 to 14:1
Wide-Open Throttle: 12.2:1 to13:1

Large Cams and Race Engines
Idle and Cruise: 13:1 to 14:1
Moderate Load: 12.5:1 to 13.5:1
Wide-Open Throttle: Typically 12.5:1 to 12.7:1 at peak torque and 13 to 13.2:1 at peak HP

NOTE: Large overlap camshafts can give a false lean reading at idle.

Supercharged/Turbo-charged Applications
Boost Conditions: 10.8:1 to 11.8:1 for safe operation

Technical Support: 1-270-781-9741

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