



ODY-13-2 AIR/FUEL MIXTURE GAUGE

Introduction:

The Odyssey gauge series from Dakota Digital, Inc. incorporates the reliability and quality of our standard gauges, along with several unique features and easy mounting. These features include:

- A warning feature that flashes the gauge readout when outside operating limits.
- A connection for an external warning indicator that is activated when the gauge flashes.
- User adjustable warning points.
- Microprocessor stabilized readings.
- Quick-Start feature to provide accurate readings quickly after being powered up.
- Night dimming with lens label lighting.
- High Visibility VFD display for sunlight readability.

The air/fuel mixture gauge will display the exhaust gas oxygen sensor output in mV. An output voltage of 450mV – 500mV from the sensor is considered the $\lambda=1$ area. This is the ideal air/fuel mixture for reduced exhaust emissions and general engine operation. Best fuel economy will be slightly leaner than this and best power will be found with a richer mixture. A fuel injection computer monitors the oxygen sensor to maintain an average fuel mixture in this ideal range.

An output voltage that is higher (800 mV – 995mV) indicates a rich fuel mixture ($\lambda < 1$). An output voltage that is lower (50mV – 200mV) indicates a lean fuel mixture ($\lambda > 1$). A standard 1-wire, 2-wire, or 3-wire EGO sensor will only indicate 3 states; lean, rich, or $\lambda=1$. The transition area of the sensor is very sharp and does not convert into an exact air/fuel ratio except at $\lambda=1$; which is 14.7:1 for gasoline, 6.5:1 for alcohol, and 15.6:1 for propane. **The use of leaded fuel will seriously shorten sensor life.** If leaded fuel is being used, the sensor should only be installed during tuning and then removed and a plug placed into the hole.

On a carbureted engine, the engine will not automatically adjust the air/fuel mixture. This must be adjusted manually and can be optimized for economy or performance. The air/fuel mixture gauge will provide the information required for proper fuel mixture adjustment.

Operation:

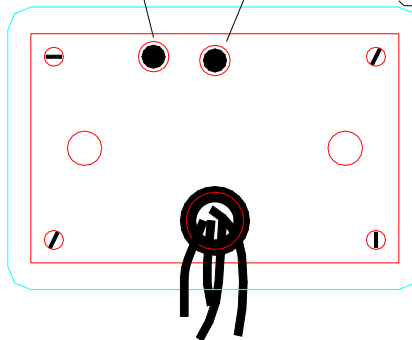
The gauge needs only the red and black wires connected to light up. The 4-pin connector attaches to the sensor amplifier. The 2-pin connector from the sensor cable connects to the amplifier. The red and black wires from the sensor cable connect to power and ground for the sensor heater. The 3-pin Weatherpack connector plugs into the heated EGO sensor. The black wire with a ring terminal connects to an engine block bolt for ground. When the blue wire has 12 volts, it will dim the display for night viewing. The yellow wire will provide a ground output when the gauge reading is outside the high warning limit.

Setting the warning limit:

The high warning limit can be set to different values. Once it has been set, it is stored internally so that the gauge will retain the values even when the gauge does not have any power. This value can be set and reset as many times as desired. The procedure for setting the warning limit is as follows:

1. Make sure the key is off so the gauge is not powered.
2. Press and hold the 'SET' button. This is located behind the hole located on the back side of the gauge as shown in figure 1.
3. Turn the key on while the 'SET' button is being held.
4. Release the button. The gauge should show 'LO' and then switch to a reading between 050 and 680.
5. Turn the warning adjustment pot until the desired low limit is showing. The adjustment will then 3/4 rotation from stop to stop. Do not force it past either stop.
6. Press and release the 'SET' button. The gauge should show 'HI' and then switch to a reading between 210 and 840.
7. Turn the warning adjustment pot until the desired high limit is showing.
8. Press and release the 'SET' button. The gauge should show '--'. The new warning limits is now stored.
9. Turn the key off. The gauge will now operate normally when powered up again.

'SET' button warning adj. pot



Using external warning indicators:

The yellow wire provides a ground trigger whenever the gauge is outside its set limits. Low current indicators (less than 1/4 A) can be activated directly by connecting their power wire to 12 volts and connecting their ground wire to the yellow output wire. Many gauges can share the same indicator by connecting their yellow warning wires together. In this way, when any one or more gauges are outside their limits the warning indicator will be activated.

For higher current buzzers or lights, a relay will need to be used to switch the indicator on. Dakota Digital's RLY-1 30A relay may be used for this. One of the coil wires should be connected to 12 volts and the other coil wire connected to the yellow warning wire. When the gauge is outside its limits, the relay will turn on. The relay contact wires can be used to switch the higher current.

WARNING!
CONNECTING A HIGH CURRENT
INDICATOR DIRECTLY TO THE
WARNING OUTPUT WILL DAMAGE
THE UNIT.

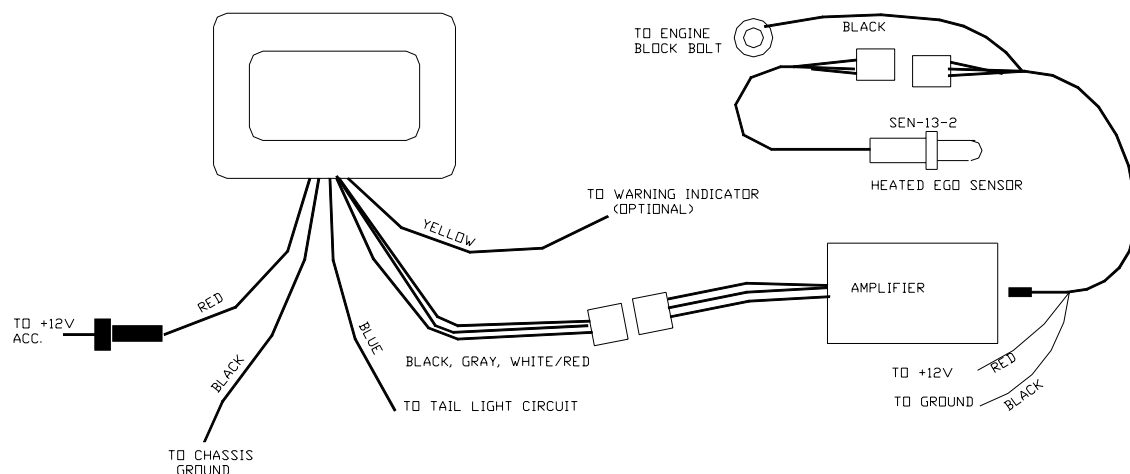
Wiring:

Gauge:

- BLACK - connect to a good ground point in the vehicle.
- RED - connect to 12V accessory power.
- 4-wire connector - connect to mating connector from sensor amplifier.
- BLUE - connect to the tail light circuit.
- YELLOW - (optional) connect to warning indicator.

Sensor cable:

- 2-wire connector - plug into the end of the sensor amplifier.
- 3-wire connector - plug into heated EGO sensor
- Black wire with ring terminal - Engine block bolt for ground



Wiring the ODY-13-2 Air/Fuel Mixture gauge to an existing EGO sensor.

If an EGO sensor is currently being used in the vehicle, then the gauge can tap into the signal wire. This will allow both the existing unit and the Dakota Digital gauge to read the same sensor. Since the amplifier harness will tap into the current wiring, the 3-pin weather-pack connector can be cut off.

1-wire EGO sensors:

These sensors are not heated and have just a single sensor wire. Splice the white wire from the amplifier harness into the EGO wire. Connect the black wire with a ring terminal to an engine block ground. Do not use the red wire or the single black wire. These are only for heated sensors.

2-wire EGO sensors:

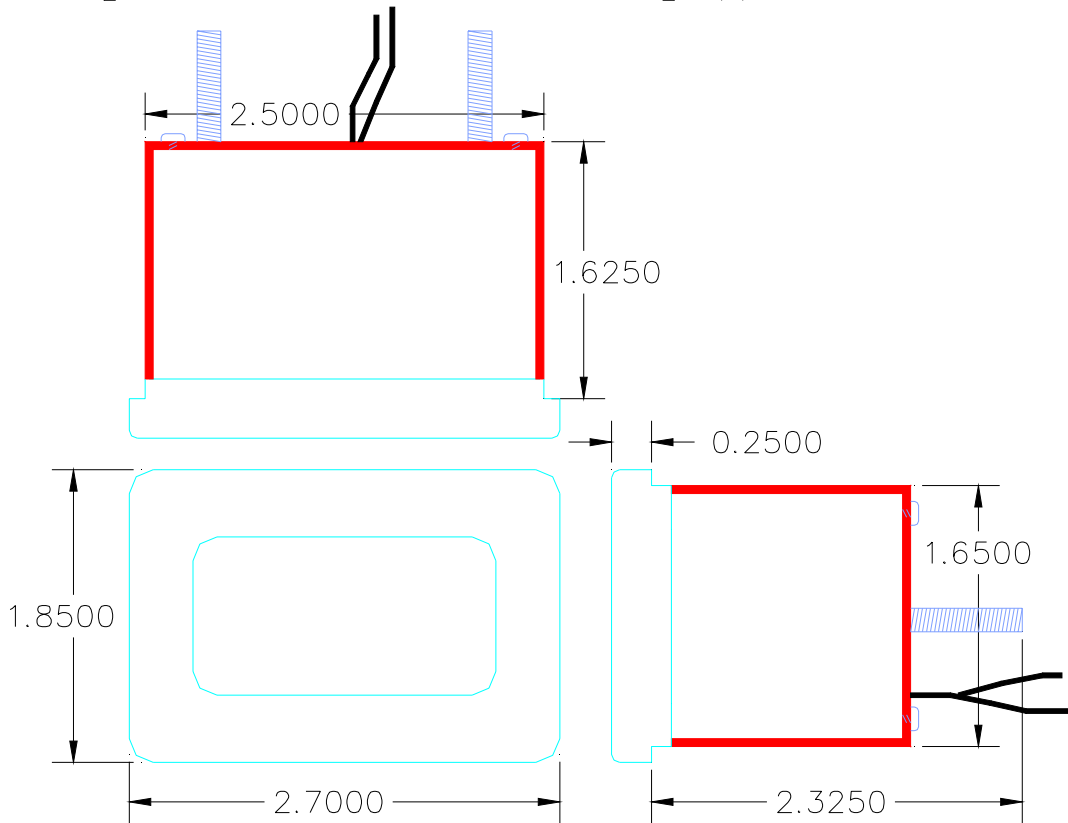
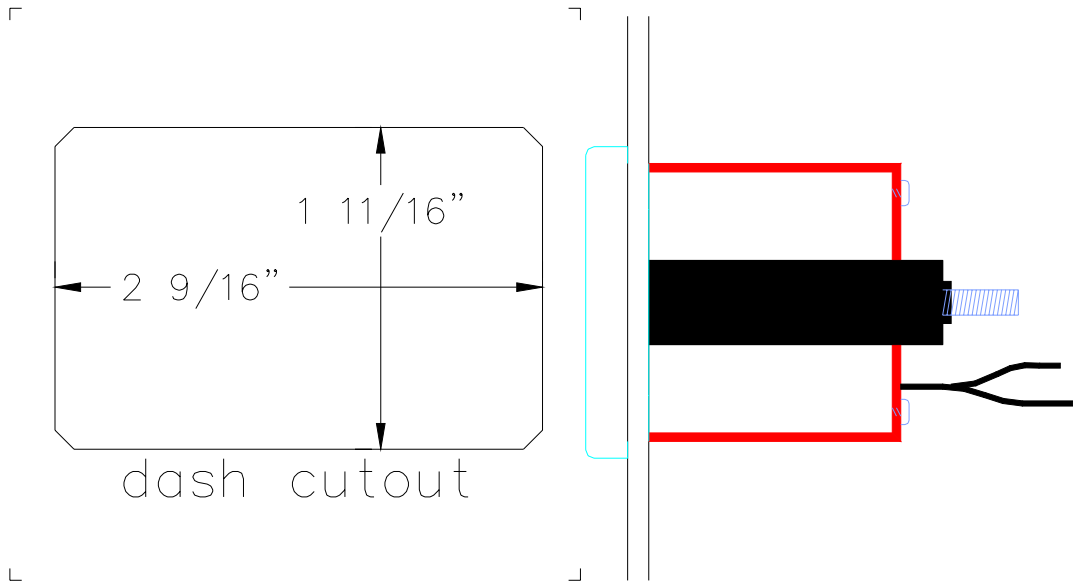
These sensors are not heated and have a signal wire and a ground wire. Splice the white wire from the amplifier harness into the wire coming out of the center of the EGO sensor. Splice the black wire with the ring terminal into the wire coming off the side of the sensor. The ring terminal can be cut off and not used. Do not use the red wire or the single black wire. These are only for heated sensors.

3-wire EGO sensors:

These sensors are heated. They have a signal wire (usually black) and two heater wires (usually white). Only the signal wire and engine block ground need to be connected from the amplifier harness since the heater will be powered from the other unit the sensor is connected to. Splice the white wire from the amplifier harness into the signal wire from the sensor (usually black). Connect the black wire with a ring terminal to an engine block ground. Do not use the red wire or the single black wire.

Mounting:

The gauge requires a rectangular cut out that is about 2 9/16" x 1 11/16". It should be inserted into the opening from the front and the U-clamp will be installed from the back. Tighten the two nuts on the U-clamp so that the gauge is secure. Figure 2 shows the required cut out for the gauge. Figure 3 shows how the gauge mounts.



Troubleshooting guide.

Problem	Possible cause	Solution
Gauge will not light up	Red wire does not have power. Black wire is not getting a good ground. Fuse is blown. Gauge is damaged.	Connect to a location that has power. Connect ground to a different location. Replace in line fuse. (2 amp only.) Return gauge for repair. (see instructions)
Gauge lights up, but displays "EE".	Sensor is not connected to amplifier. Wire between amplifier and sensor is broken. Sensor amplifier is not connected to gauge. Gauge is damaged. Amplifier is damaged. Sensor is damaged.	Connect gray wire from gauge to sensor terminal. Inspect and test wire. Plug sensor amplifier connector into mating connector from gauge. Return gauge for repair. (contact factory) Return amplifier for repair. (contact factory) Return sensor for repair. (contact factory)
Gauge lights up, but does not read correctly.	Loose connection on red power wire. Poor ground connection. Incorrect sensor type. Sensor location is incorrect Gauge is not calibrated correctly.	Reconnect red wire. Move engine block bolt ground location Sensor should be an automobile oxygen sensor. Check mounting location of sensor. Gauge must be recalibrated. (contact factory)
Gauge flashes constantly.	Warning limits are not set properly. Temperature is too high.	Reset warning limits. Check fuel and exhaust systems.
External warning indicator does not work.	Indicator not connected properly. Indicator does not work. Gauge output has been damaged.	Check indicator wiring connections. Repair or replace indicator. Return gauge for repair. (see instructions)
Gauge will not dim.	Blue wire is not connected correctly. Gauge is damaged.	Check wiring connections. Return gauge for repair. (contact factory)
Gauge remains dim at all times.	Blue wire is getting power all of the time. Battery is very low. Gauge is damaged.	Connect blue wire to location that only has power when the headlights are on. Recharge or replace vehicle battery. Return gauge for repair. (contact factory)

Technical specifications

Minimum operating voltage	-	7 volts
Maximum operating voltage	-	18 volts
Maximum sensor temperature	-	1700°F for short periods
	-	1550°F for extended periods
(operating at or near maximum rating for an extended time can damage unit)		
Maximum reading	-	995mV
Gauge Resolution	-	5mV
Gauge accuracy	-	±10mV
Typical current draw (@ 13.8V)	-	0.13 A
Warning indicator max current	-	0.3 A

SERVICE AND REPAIR

DAKOTA DIGITAL offers complete service and repair of its product line. In addition, technical consultation is available to help you work through any questions or problems you may be having installing one of our units.

Should you ever need to send the unit back for repairs, please package the product in a good quality box along with plenty of packing material. Ship the product by UPS or insured Parcel Post. Be sure to include a complete description of the problem, your full name and address (street address preferred), and a telephone number where you can be reached during the day. An authorization number for products being returned for repair is not needed. Do not send any money. We will bill you for the repair charges. Any returns for warranty work must include a copy of the dated invoice or bill of sale.

ODYSSEY SERIES DIGITAL GAUGE LIMITED WARRANTY

DAKOTA DIGITAL (the Company) warrants to the ORIGINAL PURCHASER of this product that should it, under normal use and condition, be proven defective in material or workmanship within 24 MONTHS FROM THE DATE OF PURCHASE, such defect(s) will be repaired or replaced (at the Company's option) without charge for parts or labor directly related to repairs of the defect(s).

To obtain repair or replacement within the terms of this Warranty, the product is to be delivered with proof of warranty coverage (e.g. dated bill of sale), name, address, phone number, and specification of defects, transportation prepaid, to the factory. This Warranty is valid for the original purchaser only and may not be transferred.

This warranty does not cover nor extend to damage to vehicle electrical system. This Warranty does not apply to any product or part thereof which in the opinion of the Company has been damaged through alteration, improper installation, mishandling, misuse, neglect, or accident.

This Warranty is in lieu of all other express warranties or liabilities. ANY IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, SHALL BE LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. ANY ACTION FOR BREACH OF ANY WARRANTY HEREUNDER INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY MUST BE BROUGHT WITHIN A PERIOD OF 24 MONTHS FROM DATE OF ORIGINAL PURCHASE. IN NO CASE SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, WHATSOEVER. No person or representative is authorized to assume for the Company any liability other than expressed herein in connection with the sale of this product.

The Company does not warrant that this product cannot be compromised or circumvented. THE EXTENT OF THE COMPANY'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT PROVIDED ABOVE AND, IN NO EVENT, SHALL THE COMPANY'S LIABILITY EXCEED THE PURCHASE PRICE PAID TO THE PURCHASER FOR THE PRODUCT.

Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damage so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

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