



INTERCEPTOR
scan gauge

FOR CAN VEHICLES

by



Aero Force
Technology

USER MANUAL

FIRMWARE VERSION 3.3

www.aeroforcetech.com

Made in the USA!

Patent Pending

WARNING

Vehicle operator should focus primary attention to the road while using the *Interceptor*. The information provided by this device should be observed as part of a normal sequence of observations performed in the operation of the vehicle, as with any gauge or other instrumentation. *Interceptor* settings should be changed only during conditions when it is safe to do so. **Focusing on the road should be the primary concern of the driver.**

Aeroforce Technology Inc. shall not be held liable in any way for any incidental or consequential damages to the vehicle, driver, passengers, and or other involved parties or property occurring while using the *Interceptor* scan gauge.

Aeroforce Technology Inc. shall not be liable for technical or editorial errors or omissions made herein, nor for incidental or consequential damages resulting from the furnishing or use of this manual.

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INSTALLATION

Read these instructions thoroughly before installation. Also, be sure to check for your vehicle specific notes in appendix A at the end of this manual. There could be important information there concerning your gauge and its installation. New parameters are added from time to time, and may not be listed in this manual. For the latest updated manual go to www.aeroforcetech.com/usermanual.html and select the latest release that pertains to your gauge.

1. **Make sure the car's ignition is turned off.**
2. **Run included 5', or optional 9' main cable, and three wire mini cable, from the OBD2 connector (do not plug in yet) to the location of the *Interceptor(s)*.** The *Interceptor* will fit in any 2 1/16" or 52mm gauge pod, or can be mounted in a custom fashion anywhere within 5 (9) feet of the OBD2 connector. The OBD2 connector is located under the dash on either side of the steering column.
3. **Plug both cables into the back of the *Interceptor*.** See figure 1. Press the *Interceptor(s)* into the gauge pod or mounting hardware.

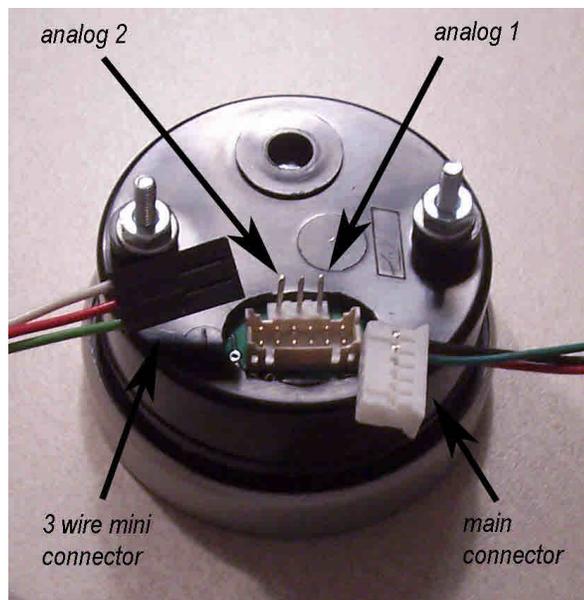


Figure 1

4. **Plug the main cable connector into the OBD2 connector.** See figure 2. The data, ground, and power on most vehicles come from this connector.

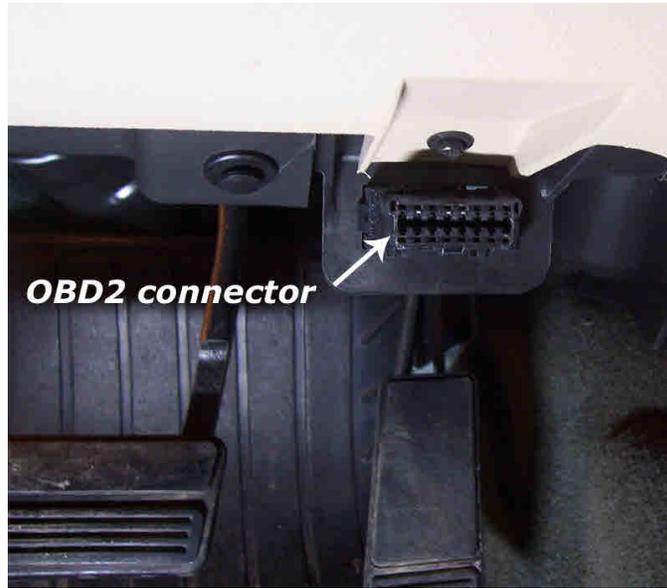


Figure 2

- 5. Connect the 0-5v analog inputs (optional).** You will see 3 pins above the main connector on the back of the gauge as shown in *figure 1*. The 2 outer pins connect to the analog inputs. The center pin is for switched 12v power and is not required for virtually any CAN bus vehicle. The right side pin, when looking at the rear of the gauge, goes to analog input 1. The left pin is for analog input 2. See *figure 1*. Included in the gauge packaging is a 3 wire cable that connects here. Once attached to the gauge, you'll see that the white wire is for analog 1, the green for analog 2. These inputs can be used to read the outputs from pressure senders, A/F ratio analog outputs, 2 or 3 bar MAP sensors, or any voltage up to 5v that you want to monitor and/or record. You can scale these signals with a menu function described below. ***These inputs are rated for 0-5 volts, with an over-voltage protection circuit built in. However, running more than 6v into these inputs for an extended period of time could effect the operation of the entire gauge, and possible damage it.***
- 6. Turn vehicle on.** With the key on and engine off, or engine running, the ***Interceptor*** will power up. While the unit powers up, the "***Interceptor***" and "***AeroForce***" logo will appear on the display. This only takes a few seconds. Please note that dual ***Interceptor*** units may power up sequentially (one at a time) and may take up to 15 seconds. When turned on for the first time the ***Interceptor*** will ask you to enter a list of parameters that will then be available for scan, see "***Setup***" below in the **Operation** section for more details on this. See page **A1** of these instructions for the list of parameters supported by the ***Interceptor***. Remember that not all parameters are supported by every vehicle, so don't expect to be able to view them all on the ***Interceptor*** you install in your vehicle. If the vehicle **and** the ***Interceptor*** support the parameter, you will have access to it.

OPERATION

1. **SCANNING.** Once the *Interceptor* has been installed and set up as described below, you will see an upper and lower field containing a description and parameter value when the ignition is turned on. The right button will change the upper parameter field, the left button the lower. One quick push of the button will toggle to the next parameter. Included in the list of parameters is instantaneous fuel economy, calculated horsepower, and both the analog 1 and analog 2 inputs. Fuel economy and horsepower will be available on only those cars using a Mass Air Flow sensor or a calculated air flow.
2. **MENU.** The menu and its operation have been designed to be intuitive and easy to use. The following is a list of all the menu selections and their functions. Pressing both buttons at the same time will take you to a menu screen. Once here you will see many choices. Use the left button to toggle down to the desired choice. The current selection will be highlighted. Push the right button to select this choice and proceed to the associated screen. **Pressing both buttons while in a menu selection will exit and save your entries and take you back to the main menu.** Remember this when in “Setup” or “Cyclic Scan Setup”, this prevents you from having to scroll all the way to the end of long lists of parameters. Once in the menu, you will initially see four menu selections, continuing to scroll down will bring up a new list of 4 more options, and so on. Continuing beyond the fifth group of selections will bring you back to the beginning.

Choices are:

- a) **SCAN.** This is the standard mode of operation for the unit and the default mode when powered up. In this mode the unit is scanning and displaying data.
- b) **SETUP.** When powered for the first time, the *Interceptor* will ask you to edit a list of parameters that will then be available for scan. At any later time you can return to the menu function called “**Setup**” and edit this. Once in this mode, you may or may not be asked to choose your vehicle type. You’ll then see a list of parameters that you can select for display that apply to your vehicle. See appendix A at the back of this manual for assistance in parameter selection based on manufacturer. Use the left button to scroll down through the list, and the right button to select a parameter. Once selected, that parameter will have an “*” next to it. You can deselect a selected parameter the same way. You’ll be able to choose any parameter on the list, but be aware that not all vehicles will support all parameters. Once in **Scan** mode, if an unsupported one is chosen, typically the gauge will display a black screen or show the unchanging value of the previous parameter selected.
- c) **CYCLIC SCAN.** This selection will activate the cyclic scan mode that you set up in “**Cyclic Setup**” described below. Cyclic scan is an optional function and does not need to be used or set up. If one of the two front buttons is pushed while in **Cyclic Scan** the gauge will go to normal **Scan** mode.
- d) **CYCLIC SETUP.** This menu option will allow you to choose certain parameters from the main list you choose in the **Setup** routine to display on a pre-determined rotation. For example, you may choose to view knock retard

and ignition advance (screen 1) for a certain amount of time, then intake air temperature and coolant temperature (screen 2) for a period, and so on for up to 4 combinations or 8 parameters. When you first enter this selection, the list of parameters you chose in **Setup** will be shown, under the heading “**Screen 1 Field 1**”. The parameter you select, by scrolling down with the left button and selecting with the right, will be displayed in the top field of screen 1 during **Cyclic Scan** mode. To deselect the parameter, simply select a different one. Once selected the parameter will have an “*” next to it on the list. After the parameter is selected you will go to the bottom of the list and select “**Next**”, or hit both buttons simultaneously to move on to the next selection. Selecting “**Next**” or pushing both buttons performs the same function. You will then go to “**Screen 1 Field 2**”. Repeat these steps for the bottom parameter field of screen 1. You must repeat these steps for all four screens. After the fourth screen is configured and exited you will return to the main menu. Each screen will now be displayed for 10 scans before the next screen comes up. You can change this time frame by selecting “**cyclic time**”, which is the next menu option after “**cyclic setup**”. This selection will allow you to enter a number of scans between each screen change. For data rates 1 or 2 figure about 15-20 scans per second, so 20 scans will result in each screen staying up for 1 second. You may have to go back and adjust this value a second time after you get a feel for this value. Different vehicles will respond at different speeds, and the data rate you choose will also effect this outcome. If a screen is not configured, that screen will default to the factory setting of **Intake Air Temp.** for its turn in the cycle.

Example: Display **knock retard** and **fuel pressure** for 20 scans (~4 seconds), **knock retard** and **ignition advance** for 10 scans (~2 seconds), and **intake air temp.** and **oil pressure** for 10 scans (~2 seconds).

Procedure: Enter **Cyclic Setup**. In **Screen 1 Field 1** select **knock retard**, hit both buttons or select “**Exit**”, then for “**Screen 1 Field 2**” select **fuel pressure**, hit both buttons or select “**Exit**”, on “**Screen 2 Field 1**” select **knock retard**, hit both buttons or select “**Exit**”, for “**Screen 2 Field 2**” select **fuel pressure**, hit both buttons or select “**Exit**”, for “**Screen 3 Field 1**” select **knock retard**, hit both buttons or select “**Exit**”, for “**Screen 3 Field 2**” select **ignition advance**, hit both buttons or select “**Exit**”, for “**Screen 4 Field 1**” select **intake air temp**, hit both buttons or select “**Exit**”, for “**Screen 4 Field 2**” select **oil pressure**, hit both buttons or select “**Exit**”. After leaving “**Screen 4 Field 2**” you will be taken back to the main menu. Since the default cyclic time is 10 scans you don’t need to do any other programming. However, if you wanted to change this time frame you would go to the “**Cyclic Time**” menu option and enter a number other than 10. The higher the value the longer each screen will be displayed before changing to the next. You will then go back to the main menu where you will select “**Cyclic Scan**”. You’ll then enter a scan mode where the parameters you selected will cycle in their predetermined amounts of time. You’ll need to experiment with the number of scans because scan rate, and the vehicle itself will effect how long each scan takes. *If the parameter list in Setup is changed, the Cyclic Setup must be completed again.*

- e) **Cyclic Time.** Choosing this will allow you to enter a number of scans (time) between screen (parameter) changes in **cyclic scan** mode.
- f) **RECORD.** Upon selecting **record**, you will return to the selected scan mode except the first letter of each field description will be replaced with a square

block to indicate that **record** is active. You may notice that the gauge is scanning much faster in this mode. Once the throttle position reaches 50% or higher the unit will automatically start recording the displayed data for approximately 45-60+ seconds. When recording begins, the display colors will invert as an alert. The recorded file will be saved for replay until **record** is selected again and the proper record conditions are met. The new file will overwrite the old. The *Interceptor* will maintain the file even when powered down. If in **record** mode, you wish to return to normal **scan** mode, access the menu screen and select **record** again. This will disable it until selected again via the menu. Recording fuel economy will slow down the data rate as is not recommended if speed is important.

- g) **PLAY.** Once **Play** is selected the *Interceptor* will return to the normal **scan** screen but will show the first frame of a recorded log. You will notice the field descriptions flickering to indicate playback mode is in effect. Pushing the right button will toggle forward to the next frame in chronological order, the left button will toggle backwards, or to the very last frame if done at the beginning of the file. Holding either button down will quickly scroll through the data until the button is released. The backlight will flash every time a new frame is displayed. In other words, push a button once and the light will blink once. Hold a button down and the light will blink quickly as each new frame is displayed. If **Record** was selected using **Cyclic Scan**, the headings and data will cycle in the manner that was programmed by the user. **Play** will not be selectable if the record buffer is empty.
- h) **MISFIRES.** Selecting this option will bring you directly to a display where cylinder misfires are displayed in real time and reset about once per minute. There will be fields for 8 cylinders irregardless of how many your particular vehicle has. If you have a 4 cylinder only pay attention to the top 4 misfire fields, for a 6 cylinder, the top 6. This option is not available on Fords as it is not supported. **For those with dual units, this function will not work properly while the other gauge is in scan mode. Therefore, place the other gauge in its menu mode before activating the Misfire mode.**
- i) **DISPLAY DTC's.** Selecting this mode will instruct the *Interceptor* to acquire and display any diagnostic trouble codes stored in the vehicle's computer memory. See page **A2** for a list and explanation of these codes.
- j) **CLEAR DTC's.** This selection will instruct the *Interceptor* to clear the vehicle computer of its stored trouble codes. Be sure to make note of any code before clearing it.
- k) **INVERT.** This menu option inverts the colors on the display. If the display currently has a black background with blue characters for example, inverting will make it blue with black characters. A dark background is called a negative image, and is ideal for low light situations such as driving at night. A light colored or white background is called a positive image, and is easier to read in bright sunlight.
- l) **DIMMER.** Selecting "Dimmer" will take you to a new screen with a brightness value displayed, between 1-3. 1 is the dimmest, 3 the brightest. Using the left button you can raise this value until you reach 3 after which it will restart back at 1. Once the desired brightness is reached press the right button to return to the menu screen.
- m) **DATA RATE.** Choosing scan rate allows you to adjust the speed in which the display will update. When selected, a number from 1 to 6 will appear, the higher the value the slower the scan rate. The left button can be used to alter

this value. Select the new value by hitting the right button, which will send you back to the main menu.

- n) **PERFORMANCE.** This selection will allow you to measure 0-60 mph (100 Km/hr in the metric version), 1/8 mile and ¼ mile performance with speed. Selecting this option will take you to a screen saying “vehicle must be at 0 mph before starting”. This indicates that the timer will not start until the vehicle is fully stopped, and starts moving. Once the vehicle starts moving, the screen colors will invert and the timing will commence. Once the ¼ mile mark is reached a summary screen will appear, showing ¼ time and speed, 1/8 mile time and speed, and 0-60 time. If you do not run a full ¼ mile, the measurement will eventually time out and indicate the 1/8 mile stats as well as 0-60 once the timeout occurs. This timeout may take several minutes so it’s best to coast a full ¼ mile even if all you want is 0-60 or 1/8 mile times. When finished viewing the results hit the right button to return to the main menu. These statistics can be viewed again by choosing the “**Statistics**” menu option described below. Please note that this measurement’s accuracy is dependent upon the accuracy of the speed signal. If the vehicle has non-stock sized wheels or the rear axel ratio has been changed, and the vehicle’s speed sensor has not been recalibrated or the PCM reflashed accordingly, the accuracy of these measurements will be effected. Another way of stating this is that if your speedometer is inaccurate, so will be these measurements. In addition, wheel spin will effect 1/8 and ¼ mile e.t.’s, giving inaccurately lower times.
- o) **STATISTICS.** This menu option, once selected, will display the results of the previous performance measurement run. Only the last run will be stored, and the data overwritten once another run is made. Make a note of this data if it is needed for permanent reference.
- p) **ANNUNCIATOR/SHIFT LIGHTS.** This selection will allow you to enter an RPM value that once reached will turn on the bright LED shift lights. Or, you can choose any previously selected parameter to monitor and once an entered threshold is reached activate these lights. The only exceptions are **fuel economy** (MPG) or **consumption**, and **injector duty cycle**. These are calculations that require more than one parameter to determine and will not work in the compare algorithm. First you will select the parameter you wish to monitor, including the analog inputs. Once selected you’ll enter a 4 digit value, starting from left to right. Hitting the left button will cause the digit above the cursor to change from 1-9. Only positive whole numbers (no decimals) can be entered. Once the correct digit is entered, hit the right button to move to the next digit and repeat until all 5 digits are correct. For example, to set 6000 RPM and use these lights as shift lights enter 06000. After entering the last digit hit the right button to take you to the next screen where you will select “above” or “below” depending on if you want the warning light to activate above or below the set point you entered. Again, right button puts the star next the selection, left button scrolls down. To exit select “Exit” at the bottom of the screen. You will then go back to the main menu. The higher the “**data rate**”, the more accurate the warning light will be. This is especially true if using them as a shift light. Because of the nature of some data buses, you may see a false, occasional blink of these lights when driving with the light activated. This is due to an erroneous parameter signal received by the gauge. These will be infrequent and random, and are not an indication of a faulty gauge. To activate the annunciator function you must then activate

it as shown below. If the list of parameters is changed in **Setup**, the annunciator parameter will also need to be reset.

- q) **ANNUNCIATOR ON**. Select this to activate the annunciator function you set up as described above. When the gauge first powers up it will indicate the status of the annunciator (“on” or “off”).
- r) **ANNUNCIATOR OFF**. Select this to disable the annunciator function.
- s) **HORSEPOWER ADJUSTMENT**. This choice allows you to enter a correction factor for the horsepower parameter **and the MPG parameter**. This one correction factor applies to both. These parameters are available on those cars using a factory Mass Air Flow sensor. Net horsepower and fuel mileage can be closely calculated by knowing the mass air flow value. However, since each car is slightly different in efficiency, this calculation can be adjusted if the exact peak hp is known after being run on a dyno, or the MPG reading needs adjustment. For example, if the gauge indicates 300 hp, and the net hp (not rear wheel hp) is determined to be 315, you can enter a correction factor of 1.05 (adding 5%). This is done by selecting this menu option and entering this factor. There is no decimal shown, so you will be entering this value as a three digit number. For example, 1.05 will be entered as 105, 0.95 will be entered as 095 (subtracting 5%). Likewise, if fuel mileage reading is known to be off by 5%, say the gauge is reading 5% low, enter a correction the same way (105). As with the shift light entry field, you will use the left button to change the digit above the cursor. Hitting the right button will move the cursor to the next digit. After the last digit is entered you will return to the main menu. The factory default value is 100, representing 1.00, or no correction factor. Also, if the MAF sensor has been recalibrated or replaced with one sized differently, this correction factor, which is based on the new sensor’s scalar, can be used to compensate for this change. For Example, an SCT BA2400 MAF sensor commonly used on Fords, has a scalar of 0.47. To correct for this you’ll need to enter 213 (representing 2.13) which is the same as dividing the MAF reading by 0.47. An SCT BA2800 has a scalar of 0.40, so 250 would be entered in this situation (same as dividing MAF by 0.40).
- t) **Altitude**. Enter your altitude (elevation) in feet as a 4 digit number. For example, 700’ above sea level would be entered as 0700, 2500’ would be entered as 2500. This entry is used in some of the calculations to improve their accuracy. *This entry is not required on most vehicles as the barometric pressure parameter performs this function automatically.*
- u) **Average Fuel Economy**. Selecting this will display the average calculated fuel economy since the last reset. Average is only calculated when instantaneous fuel economy is displayed on the gauge.
- v) **Fuel Economy Reset**. Resets the running average of fuel economy and starts the calculation over again.
- w) **Analog 1**. This selection allows the user to enter a conversion for this 0-5v input, which uses the right pin of the three pin connector. To read raw volts, enter “001.0” for slope, and “000.0” for intercept. This is the default setting as well. For example, say you want to input the analog output of a wide band O2 sensor kit. You know from the kit’s documentation that the output is scaled such that 0v=10 A/F ratio, and 5v = 20 A/F ratio. The conversion would then be a slope of 002.0, with an intercept of 010.0. In other words, voltage multiplied by 2 plus 10 would equal A/F ratio. In this example, a voltage of 5 would result in $5*2+10$ equals 20 A/F ratio. Another common

use for these analog inputs are for MAP sensors. The GM 3 bar MAP is a common sensor used to measure high levels of boost. The conversion for this sensor would be $V \times 9.2 - 14.7$, or a slope of 009.2, intercept of -14.7. The intercept can be tweaked if the sensor does not read "0" with the key on, engine off. Our personal 3 bar MAP had a slight zero offset that we adjusted by changing the intercept value. These inputs use a 10 bit A/D device, and are highly accurate to .01 volts. You will only see a resolution of 0.1 volt displayed, but the calculations are based on the full 10 bit conversion and are not rounded off for higher accuracy. **Note that the negative symbol, if required, needs to be in the far left digit.** For example, -9.7 should be entered as "-09.7". Aeroforce sells a line of OEM sensors that are compatible with these inputs included oil pressure, fuel pressure, temperature, boost (2 and 3 bar MAP's), EGT, and in the future we'll have wideband O2 kits for air/fuel ratio.

Note for Temperature sensor kits: If your gauge has firmware 3.3 or higher, you do not need to enter a conversion for these kits. Simply skip past the conversion entry screens and select either "Air Temp" or "Fluid Temp" at the analog input description screen which follows immediately after the conversion input screen. If you select one of these descriptions, the proper polynomial conversion will be entered for the temp sensor. If you have firmware version 3.2 or lower, enter the conversion coefficients included in the instructions with the kit using the method described above.

- x) **Analog 2.** Same as Analog 1. Uses the left pin of the three pin connector.
- y) **Logo.** Gives the ability to display a graphic upon gauge power up to replace the "Interceptor" logo with one more specific to your vehicle. This will identify the gauge as being programmed for your vehicle. There is a limited number of options so this will not apply to every vehicle.
- z) **Controls.** On GM and Chrysler vehicles this option will take you to another submenu where you will have bi-directional controls. On the Chrysler a low and high speed fan control function is available. On GM, fan control, fuel trim reset, and CASE (Crank Angle Sensor Error) re-learn is available. This last function is needed when a new PCM is installed in a vehicle. In order to execute any of these controls, you first select the process, which places an asterisk next to it. Then exit the screen either by scrolling to and selecting "Exit" or hitting both buttons simultaneously. This last step will execute the command. In most cases you'll then go to another screen where you will find further steps if necessary to complete or exit the process.

!!!BE SURE TO CHECK OUT OUR COMPLETE LINE OF COMPATIBLE SENSOR KITS, INCLUDING OIL AND FUEL PRESSURE, TEMPERATURE, EGT, MANIFOLD PRESSURE (BOOST), AND SOON WIDE BAND O2, AT WWW.AEROFORCETECH.COM!!!

OBD2 powered versions only: If the gauge is not returned to scan mode after 10 minutes the menu will time out and return to normal scan mode on its own. If the vehicle is shut off while the menu is displayed, or with both scan field set for analog inputs, the unit will stay on for the remaining 10 minutes before timing out, returning to scan, and then turning itself off.

Powering down

The *Interceptor* will automatically shut itself off within seconds of the ignition being turned off. OBD2 powered dual units may not power down at the exact same time. If both display fields are showing analog inputs, the gauge may take up to 10 minutes to time out and turn off since it is not connected to the vehicle's data bus in this situation.

Non-Volatile Memory

The *Interceptor* does not require batteries or a continuous power source to maintain its memory. This means that your data will not be lost if you disconnect the vehicle battery or disconnect the cable from the OBD2 port.

Precautions

Unplug the *Interceptor* before disconnecting the battery or performing engine work to prevent damage to the unit.

The *Interceptor's* display is designed to operate continuously at temperatures up to 150 deg. F (70 deg. C). The display may appear “washed” out for a minute or so if exposed to direct sunlight in hot climates after the car has been parked for an extended period of time. If the gauge is mounted in such a way that it can be exposed to direct sunlight, such as on top of the dash, you may want to consider a windshield shade, or unplugging the display for a minute or two until it and the car cool off a little. If the vehicle will not be used for more than 5 days it is recommended to unplug the gauge(s) to prevent excessive battery drain.

Care

If the face of the *Interceptor* needs cleaning, use light pressure with a non-scratching material such as a pre-moistened micro-fiber material made for plastic sunglass lenses. The plastic lens will scratch if anything abrasive is used on it.

Limited Warranty

Aeroforce Technology warrants this product and its accessories against defects in material and workmanship for a period of 1 year from the date of purchase. Aeroforce Technology will repair or replace this product with new or refurbished products or parts, at Aeroforce's option, free of charge in the USA.

This warranty extends only to the original purchaser. A purchase receipt or other proof of date of original purchase from and authorized dealer (including Aeroforce Technology) is required on order to have warranty service performed.

Before sending an *Interceptor* back for warranty service, you must obtain a Return Materials Authorization number from Aeroforce Technology. This can be done by emailing service@aeroforcetech.com including a description of the problem and date/place of purchase. An RMA number will be returned to you as well as a return address.

This warranty covers failures due to material or workmanship defects only.

This warranty does not cover cosmetic damage or damage due to accident, misuse, abuse, negligence, commercial use, acts of God, or modifications of, or any part of the product, including accessories.

A1A-GM Supported Parameters (PID'S)

1. INTAKE AIR- Intake Air Temperature
2. COOLANT TEMP- Engine Coolant Temperature
3. TRANS TEMP 1- Transmission Temperature for automatic vehicles
4. RPM- engine Revolutions Per Minute
5. MAF SENSOR LB/M- Mass Air Flow (lbs/min)
6. MAF FREQUENCY- raw Mass Air Flow sensor output (frequency)
7. DI FUEL PRESSURE – Direct injection fuel pressure (vehicle must have direct injection)
8. MAP SENSOR- Manifold Air Pressure (kPa)
9. BOOST – Intake vacuum/boost displayed in inHg/PSI. Corrected by altitude entry or barometer
10. THROTTLE POS. PCT- Throttle Position percentage - actual
11. ABSOLUTE THROTTLE POSITION – will read throttle position from 0-100%
12. MILES PER HOUR- Miles Per Hour
13. KNOCK RETARD- Knock Retard (degrees) for most GM vehicles
14. IGNITION ADVANCE- ignition timing advance
15. PULSE WIDTH- injector #1 pulse width
16. SHORT TRIM B1-short term fuel trim bank#1
17. SHORT TRIM B2-short term fuel trim bank#2
18. LONG TRIM B1-long term fuel trim bank#1
19. LONG TRIM B2-long term fuel trim bank#2
20. O2 SENSOR B1S1-O2 bank 1 sensor1 in millivolts
21. O2 SENSOR B2S1-O2 bank 2 sensor1 in millivolts
22. O2 SENSOR B1S2-O2 bank 1 sensor 2 in millivolts
23. O2 SENSOR B2S2-O2 bank 2 sensor 2 in millivolts
24. RUN TIME MINS- engine run time is tenths of seconds since last engine start
25. BATTERY VOLTAGE- Alternator/battery output voltage
26. CURRENT GEAR- The current gear of an automatic transmission.
27. PULSE WIDTH B1-injector Pulse Width for bank 1 (8 cylinder engines)
28. PULSE WIDTH B2-injector Pulse Width for bank 2 (8 cylinder engines)
29. INJECTOR DUTY CYCLE- 0-100%
30. ENGINE LOAD- calculated Engine Load (0-100%)
31. ENGINE OIL PRESSURE (not supported by all vehicles)
32. ENGINE OIL TEMPERATURE – Engine oil temp.
33. INTAKE AIR 2 – Intake Air Temp. downstream of intercooler (some supercharged applications such as the Cobalt SS, Solice GTP, Saturn Sky).
34. TOTAL MISFIRES- Total misfires of all cylinders. Resets every minute
35. Miles Per Gallon 1- instantaneous fuel economy for gas vehicles
36. BAROMETRIC PRESSURE- Displays atmospheric pressure. All vehicles may not support this.
37. HP - Calculated net horsepower
38. TRQ RDCT RTRD – Spark retard due to torque management (automatics trans)
39. DELIVERED TORQUE – Calculated torque delivered from engine to transmission (automatic trans)
40. TRQ TRAC CNTL - Desired torque from traction control system (auto trans)
41. TC SLP SPD RPM – Torque converter slip (RPM) (auto trans)
42. TRANS IN RPM – RPM of input shaft to transmission (auto trans)
43. TRANS OUT RPM – RPM of transmission output shaft (auto trans)
44. NON DRV SPEED – Speed of non-driven wheel (mph)
45. TCC STATUS – Indicates “UL” or “L” (unlocked /locked) depending on the state of the Torque Converter Clutch
46. FUEL STATUS – Displays “Open” or “Closed” to indicate open or closed loop fueling.
47. FUEL LEVEL – Gallons of fuel remaining in tank.
48. Cat Temp1 – Calculated catalytic converter #1 temperature (calc'ed by the car's PCM)
49. Cat Temp2 – Calculated catalytic converter #2 temperature (calc'ed by the car's PCM)
48. Analog 1 – analog input #1.
49. Analog 2 – analog input #2
50. COMMANDED A/F – Commanded air/fuel ratio by PCM.
51. COMMANDED LAMBDA – Commanded Lambda (a different way of measuring A/F ratio. $\text{Lambda} = 14.7/\text{actual A/F ratio}$. Therefore a value greater than 1 is “rich”, less is “lean”.
52. LAMBDA – Actual Lambda (only available on vehicles with factory wideband sensor)
53. A/F RATIO – Actual A/F ratio (only available on vehicles with factory wideband sensor)

54. SENSOR CURRENT – Current draw of wideband O2 sensor (only available on vehicles with factory wideband sensor)

Bi-directional controls:

1. Fan 1-3 control
2. PCM (fuel trim) reset
3. CASE (Crank Angle Sensor Error) Re- Learn

A1B-Duramax Supported Parameters (PID's)

1. INTAKE AIR g - Intake Air Temperature
2. COOLANT TEMP g - Engine Coolant Temperature
3. BAROMETRIC PRESSURE
4. RPM g - engine Revolutions Per Minute
5. MAF SENSOR LB/M g - Mass Air Flow (lbs/min)
6. MAP SENSOR g - Manifold Air Pressure (kPa)
7. BOOST g – Intake vacuum/boost displayed in inHg/PSI. Corrected by barometer
8. MILES PER HOUR g - Miles Per Hour
9. RUN TIME MINS - engine run time is tenths of seconds since last engine start
10. BATTERY VOLTAGE- Alternator/battery output voltage
11. ENGINE LOAD g - calculated Engine Load (0-100%)
12. ENGINE OIL PRESSURE
13. INTAKE AIR 2 DM - Intake Air Temp. downstream of intercooler
14. TRANS TEMP AL- Allison transmission temp
15. TORQUE CONVERTER SLIP AL- Allison transmission converter slip
16. TQ TO TRANS AL- Engine torque delivered to trans
17. INJECTOR RAIL PRESSURE DESIRED DM
18. INJECTOR RAIL PRESSURE ACTUAL DM
19. THROTTLE PCT DM- Throttle percentage DM
20. THROTTLE VOLTS DM- Throttle sensor voltage DM
21. FUEL LEVEL DM
22. TURBO VANE POSITION DESIRED DM
23. TURBO VANE POSITION ACTUAL DM
24. MAIN INJECTOR TIMING DM
25. PILOT INJECTOR TIMING DM
26. MAIN INJECTOR PULSE WIDTH DM
27. PILOT INJECTOR PULSE WIDTH DM
28. MAIN INJECTOR FLOW RATE DM
29. PILOT INJECTOR FLOW RATE DM
30. Miles Per Gallon - instantaneous fuel economy for diesel vehicles
31. HP 2- Calculated net horsepower for diesel vehicles
32. Analog 1 – analog input #1.
33. Analog 2 – analog input #2

Duramax diesel specific parameters will have the “DM” after them.

A1C- Ford Supported Parameters (PID'S)

1. INTAKE AIR- Intake Air Temperature
2. INTAKE AIR TEMP. 2 (intercooled applications)
3. COOLANT TEMP- Engine Coolant Temperature
4. TRANS TEMP 1- Transmission Temperature (gas powered automatics)
5. TRANS TEMP 2- Transmission Temperature. Can be used if Trans Temp 1 is not supported.
6. RPM- engine Revolutions Per Minute
7. MAF SENSOR LB/M- Mass Air Flow (lbs/min)
8. MAF COUNTS- Mass Air Flow sensor raw output in counts
9. FUEL LEVEL – 0-100 %
10. MANIFOLD PSI- Manifold Air Pressure (psi)
11. THROTTLE POS PCT- Throttle Position percentage (0-100%). Will typically read around 10-90%.
12. PEDAL POSITION – Similar to Throttle pos. but is rescaled to read the full 0-100 range.
13. MILES PER HOUR- Miles Per Hour
14. KNOCK RETARD- Knock Retard (degrees) 4.6L 4v non-SC'ed
15. IGNITION ADVANCE- ignition timing advance
16. SHORT TRIM B1-short term fuel trim bank#1
17. SHORT TRIM B2-short term fuel trim bank#2
18. LONG TRIM B1-long term fuel trim bank#1
19. LONG TRIM B2-long term fuel trim bank#2
20. OXYGEN SENSOR B1-O2 bank 1 sensor in millivolts
21. OXYGEN SENSOR B2-O2 bank 2 sensor in millivolts
22. BATTERY VOLTAGE- Alternator/battery output voltage
23. ENGINE LOAD-calculated Engine Load (0-100%)
24. FUEL PRESSURE
25. FUEL PUMP DUTY CYCLE
26. CYLINDER HEAD TEMPERATURE
27. OIL TEMPERATURE – not widely supported on Fords.
28. Calculated Engine Torque (Auto trans)
29. TRANS SLIP 1 - Transmission slip for most 2005/2006 vehicles
30. TRANS SLIP 2 – Transmission slip for some 2007+ vehicles
31. TRANS SLIP 3 – Transmission slip for some 2007+ vehicles, mainly trucks.
30. Current Gear – current transmission gear
31. Miles Per Gallon – instantaneous fuel economy
32. Calculated net horsepower
33. FUEL STATUS – Displays “Open” or “Closed” to indicate open or closed loop fueling.
34. Analog 1 – analog input #1
35. Analog 2 – analog input #2

Note that parameters ending in “ps” on the gauge setup screen (not shown on this list) are for Power Stroke diesel only.

A1D- Ford Powerstroke Parameters (PID'S)

1. INTAKE AIR g - Intake Air Temperature
2. INTAKE AIR TEMP. 2 - Post intercooler air temp.
3. COOLANT TEMP g - Engine Coolant Temperature
4. TRANS TEMP 1- Transmission Temperature
5. TRANS TEMP 2- Transmission Temperature. Can be used if Trans Temp 1 is not supported.
6. RPM g - engine Revolutions Per Minute
7. MAF SENSOR g LB/M- Mass Air Flow (lbs/min)
8. MAF COUNTS- Mass Air Flow sensor raw output in counts
9. FUEL LEVEL – 0-100 %
10. BOOST g - turbo boost pressure (psi)
11. THROTTLE POS PCT- Throttle Position percentage (0-100%). Will typically read around 10-90%.
12. PEDAL POSITION – Similar to Throttle pos. but is rescaled to read the full 0-100 range.
13. MILES PER HOUR g - Miles Per Hour
14. AMBIENT AIR – Air temp before the air filter.
15. IGNITION ADVANCE g - ignition timing advance
16. MAP g – Manifold Absolute Pressure.
17. CURRENT GEAR – Current commanded transmission gear
18. EXHAUST BACK PRESSURE ps – Displayed in kPa
19. ICP DC ps – Injector Control Pressure Duty Cycle (2003-2007)
20. ICP PRESSURE ps – Injector Control Pressure (psi) (2003-2007)
21. INJ. PW – Injector pulse width
22. INJ. TIMING ps – Injector Timing in Degrees BTDC
23. ENGINE OIL TEMP ps
24. VGT DC ps – Variable Geometry Turbo Duty Cycle
25. BATTERY VOLTAGE- Alternator/battery output voltage
26. ENGINE LOAD g -calculated Engine Load (0-100%)
27. Transmission Slip (Auto trans)
28. Miles Per Gallon – instantaneous fuel economy
29. Calculated net horsepower
30. EGT1 ps – EGT sensor 1 (2008+ Power Stroke)
31. EGT2 ps – EGT sensor 2 (2008+ Power Stroke)
32. EGT3 ps – EGT sensor 3 (2008+ Power Stroke)
33. FUEL TEMP ps – Fuel temperature (2008+ Power Stroke)
34. FUEL RAIL PRESSURE – Common rail fuel pressure (2008 Power Stroke)
35. Analog 1 – analog input #1
36. Analog 2 – analog input #2

Note that parameters ending in “ps” are Power Stroke specific.

A1E-Chrysler Supported Parameters (PID'S)

Platforms:

Platform 1: 2004-2006 Durango, 2005-2006 Dakota, 2005-2006.5 300/Charger/Magnum, 2006 PT Cruiser, 2006 Ram (gasoline), 2005/2006 Grand Cherokee, 2006 Liberty, 2006 Commander, 2006 Avenger, 2006 Nitro,

Platform 2: 2007+ Durango, 2007+ Dakota, 2006.5+ 300/Charger/Magnum, 2007+ PT Cruiser, 2007+ Ram (gas), 2007+ Grand Cherokee, 2007+ Liberty, 2007+ Commander, 2007+ Avenger, 2007+ Nitro.

Platform 3: 2006+ Caliber, 2006+ Patriot, 2006+ Compass

1. INTAKE AIR- Intake Air Temperature taken at the throttle body inlet
2. AMBIENT AIR TEMPERATURE – air temperature at the air filter
3. COOLANT TEMP- Engine Coolant Temperature
4. RPM- engine Revolutions Per Minute
5. CALCULATED AIR FLOW RATE- Mass Air Flow (lbs/min) calculated by the PCM
6. BAROMETRIC PRESSURE – ambient (outside) air pressure
7. BOOST - Manifold Absolute air Pressure in psi (reads like a boost/vacuum gauge)
8. MAP kPa – Manifold absolute pressure in kPa.
9. THROTTLE POS PCT- Throttle Position percentage (0-100%)
10. THRTL BLDE - Throttle blade position
11. TPS V 1 – Throttle position sensor voltage 1
12. TPS V 2 - Throttle position sensor voltage 2
13. MILES PER HOUR- Miles Per Hour
14. KNOCK RET 1 - Short Term (current) Knock Retard (degrees) using the 2005 Chrysler conversion
15. KNOCK RET 2 - Short Term (current) Knock Retard (degrees) using the 2006 Chrysler conversion
16. LT KNOCK RETARD – Long Term knock retard ignition advance reduction
17. KNOCK SENSOR RAW VOLTAGE 1 – voltage output of knock sensor 1
18. KNOCK SENSOR RAW VOLTAGE 1 Avg. – voltage output of knock sensor 1 averaged over time
19. KNOCK SENSOR RAW VOLTAGE 2 – voltage output of knock sensor 2
20. KNOCK SENSOR RAW VOLTAGE 2 Avg. – voltage output of knock sensor 2 averaged over time
21. WASTEGATE SOLENOID % DUTY CYCLE – programmed wastegate Duty cycle, 0-100%
22. SHORT TRIM FUEL TRIM- short term fuel trim
23. LONG TRIM FUEL TRIM – long term fuel trim
24. CRNT CELL – Currently fuel trim look-up table cell
25. OXYGEN SENSOR - O2 bank 1 sensor in millivolts
26. FUEL LEVEL % – amount of fuel in the tank in percent.
27. FUEL CAP – Fuel tank capacity in gallons.
28. CAT CON TEMP - Catalytic converter exhaust temp bank 1 and 2 – calculated by the PCM
29. LINE PRS – Transmission line pressure
30. TR OIL TEMP 1- Transmission Temperature (auto transmission only)
31. TR OIL TEMP 2 -
32. TCC SLIP – Torque converter slip
33. CURRENT GEAR 1 – current transmission gear
34. CURRENT GEAR 2 – current transmission gear
35. SHIFT TIME – Time taken to execute last shift
36. LFW/LRW SPEED – non-driven wheel speed (left front or left rear)
37. STEERING ANGLE – Angle in degrees or steering wheel/shaft
38. YAW – output of yaw sensor of ESP system in degrees. Yaw is body roll.
39. BRAKE PSI – Brake boost pressure in psi.
40. LATERAL G – Lateral acceleration as measured by ESP system accelerometer

41. BOOSTER TRV – Brake booster travel
42. BOOSTER VEL – Brake booster actuator velocity. Measurement of speed at which braking is applied. The faster the brake is pushed, the higher this value. This parameters along with BRAKE PSI will give detailed info on how you are applying the brakes.
43. TCC STATE – Indicates the status of the torque converter clutch (unlocked/locked).
44. TCC SLIP – Torque converter slip speed.
45. GEAR ACTUAL – current transmission gear
46. TRANS TEMP – transmission temp
47. TORQUE – calculated torque delivered to the transmsion
48. RUN TIME MINS- engine run time since last engine start. Can be used as a trip timer.
49. BATTERY VOLTAGE- Alternator/battery output voltage
50. BATT TEMP – battery temperature
51. INJ PW- injector pulse width in msec.
52. INJ DC – injector duty cycle
53. FUEL STATUS – Fueling status, open or closed loop
54. CMD A/F – PCM commanded air/fuel ratio
55. BASE SPARK TIMING – timing level commanded by the PCM before adjustments due to temperature, knock, etc.
57. IGNITION ADVANCE- final ignition timing advance after adjustments
58. ENGINE LOAD-calculated Engine Load (0-100%)
60. MPG - Miles Per Gallon- instantaneous fuel economy
61. HP - Calculated net horsepower
62. MISFIRES- Total misfires of all cylinders.
63. P Ratio – Pressure ratio MAP/BAROMETER
64. Analog 1 – analog input #1.
65. Analog 2 – analog input #2

Bi-Directional Controls (may not work on every Chrysler):

1. Low Speed fan control – works on most Chrysler
2. High Speed fan control – works on most Chrysler
3. TCM reset – Transmission reset
4. ESP disable/enable

Transmission parameters in red generally apply to pre 2007 vehicles, but some early 2006 will use these depending on build date. Transmission parameters in blue are generally for late 2006 models and later. Most 2007+ Chryslers only have one fan speed.

Not all vehicles will support nor make all of these parameters available for scan.

A1F- Mazda Supported Parameters (PID'S)

1. INTAKE AIR- Intake Air Temperature
2. BOOST TEMP SENSOR – Calculated actual boost air temp. based on sensor output
3. COOLANT TEMP- Engine Coolant Temperature
4. TRANS TEMP- Transmission Temperature (gas powered automatics)
5. RPM- engine Revolutions Per Minute
6. MAF SENSOR LB/M- Mass Air Flow (lbs/min)
7. DIRECT INJ PRESS – Direct injection fuel pressure
8. INJECTOR PULSE WIDTH
9. INJECTOR DUTY CYCLE – 0-100%
10. MANIFOLD PSI- Manifold Air Pressure (psi)
11. THROTTLE POS PCT- Throttle Position percentage (0-100%)
12. THROTTLE VOLTS- Throttle Position sensor output (0-5 volts)
13. MILES PER HOUR- Miles Per Hour
14. KNOCK RETARD- Knock Retard (degrees)
15. IGNITION ADVANCE- ignition timing advance
16. SHORT TRIM B1-short term fuel trim bank#1
17. SHORT TRIM B2-short term fuel trim bank#2
18. LONG TRIM B1-long term fuel trim bank#1
19. LONG TRIM B2-long term fuel trim bank#2
20. COMMANDED EQ RATIO – Commanded Equivalency ratio
21. LAMDA – Wideband O2 sensor equivalency ratio
22. A/F RATIO – Wideband O2 sensor displayed as Air/Fuel ratio
23. O2 CURRENT – Wideband O2 sensor current
24. BATTERY VOLTAGE- Alternator/battery output voltage
25. ENGINE LOAD-calculated Engine Load (0-100%)
26. Calculated Engine Torque (Auto trans)
27. Miles Per Gallon – instantaneous fuel economy
28. Calculated net horsepower
29. VALVE TIMING – Valve timing in degrees
30. Analog 1 – analog input #1
31. Analog 2 – analog input #2

A2-DIAGNOSTIC TROUBLE CODES (DTC's)

The *Interceptor* will display the code in the hex format of XXXX. See Table 1 below for explanation and interpretation of these *Interceptor* codes.

Replace with this... ↓

If the first hex digit is this →	0	P0	Powertrain codes – SAE defined
	1	P1	“ “ – manufacturer defined
	2	P2	“ “ – SAE defined
	3	P3	“ “ – jointly defined
	4	C0	Chassis Codes – SAE defined
	5	C1	“ “ – manufacturer defined
	6	C2	“ “ – manufacturer defined
	7	C3	“ “ – reserved for future
	8	B0	Body Codes – SAE defined
	9	B1	“ “ – manufacturer defined
	A	B2	“ “ – manufacturer defined
	B	B3	“ “ – reserved for future
	C	U0	Network Codes – SAE defined
	D	U1	“ “ – manufacturer defined
	E	U2	“ “ – manufacturer defined
	F	U3	“ “ – reserved for future

TABLE 1

For example, if code 0107 is returned, replace the first “0” with P0, resulting in code P0107. Looking up this code reveals:

“ P0107-Manifold Absolute Pressure/Barometric Pressure Circuit Low Input”

There are many resources that fully explain these codes including the specific vehicle shop manual, web sites, as well as automotive self-help guides. A list of power train diagnostic trouble code explanations can be found on our web site at http://www.aeroforcetech.com/files/Partial_list_of_diagnostic_trouble_codes.txt. The web site www.troublecodes.net/OBD2/ is another source of explanation for these codes.

For a description of the SRT-4 or Dodge codes, visit http://www.aeroforcetech.com/files/SRT-4_DTC_s.rtf.

A3-TIPS AND VEHICLE SPECIFIC NOTES

- Some parameters are not supported by all vehicles but they may still be displayed as a “dummy” value in place of a real one. Certain manual transmission cars will display a false transmission temperature, and some V8’s will display an erroneous oil pressure for example. These “dummy” values may be obviously incorrect, or may look normal at first but *never* change.
- If both parameters being displayed are analog inputs, the gauge will not turn off immediately when the car is shut off. This is because the gauge is not scanning the car and does not know it is off. After 10 minutes the gauge will check the car’s status, at which time it will see the car is off and turn itself off.
- **Miles per gallon** and **Injector Duty Cycle** cannot be monitored using the annunciator function.
- Our website has a list of Chrysler DTC’s at:
http://www.aeroforcetech.com/files/SRT-4_DTC_s.rtf.
- **Dual Units:** When powering these up for the first time, got through the setup routine with the ignition turned on (engine can be off). This will allow the gauges to sync up together once setup is complete and the vehicle is turned off. If the vehicle ignition is not turned on, the gauges will cycle on/off when setup is exited. Most cars will allow both gauges to be run at a high data rate such as #1. However, if the data rate seems inconsistent you should slow down one gauge to reduce bus traffic. For best accuracy, it is best not to run the performance timer on both gauges at the same time.
- **Analog inputs:** On some vehicles signal ground and chassis ground are at different potentials. Depending on how the source of the analog signal is grounded, a voltage offset can result. For example, in our test vehicle there was a 0.01v difference between the chassis ground which we used for a 3 bar MAP sensor, and the signal ground on the OBD2 port which our Interceptor was connected to. This resulted in an offset of -0.6 psi after the conversion was entered. We saw this with the ignition on, engine off, where we should have seen 0.0 psi but instead saw -0.6 psi. To correct this, we adjusted the intercept value of the analog input by +0.6 to eliminate this error. We have not seen this grounding issue on many cars, but if you see it on yours this is how to correct for it.
- **Chrysler:** Transmission temp will jump to a higher value in Park then in gear. We have no idea why Chrysler does this but the in-gear temperature is the accurate one. The LX cars (300, Charger, Magnum) will have the largest number of supported parameters. “Booster TVL” and “Booster VEL” for example are only supported on the LX platform.