ScanGauge^{II}

A User's Manual

ScanGauge^{II}, by Linear Logic (http://www.scangauge.com/) does come with an "Installation and Operation" manual, with detailed information in small print. However, this "User's Manual" is meant to be a useful and readable summary of the parts of the Installation and Operation manual that are more commonly needed, along with some outside information. See the Installation and Operation manual for ScanGauge^{II} copyrights, warnings and detailed information.

A couple important warnings: **Do not place the ScanGauge^{II} on top of an airbag cover**. Only use the ScanGauge^{II} at temperatures between 0˚F (-18˚C) and 160˚F (71˚C). **At temperatures below -22˚F (-30˚C) or above 176˚F (80˚C) the display may become damaged.**

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ScanGauge^{II} User's Manual was produced by user nerfer of http://priuschat.com/

Relevant useful websites:
http://www.scangauge.com/support/pdfs/XGAUGE.pdf
http://www.obd-codes.com/
http://www.troublecodes.net/

Welcome to ScanGauge^{II}, the tool to complete your vehicle's dashboard display. It has three main display functions, selected from the main menu:

1) SCAN menu to report and clear any DTC (Diagnostic Trouble Codes) that cause the Check Engine light to appear. Obviously anything serious should be resolved to keep the vehicle running properly. It does not turn off the Maintenance Required light (the vehicle owner's manual usually describes that process).
2) GAUGE menu to show real-time information for the engine, such as RPM, coolant temperature, MPG, etc.
3) TRIP menu to show averaged information for the current trip, today, yesterday or the tank for fuel consumption, speed, max coolant temperature, etc.

1. Installing the ScanGauge^{II}

The ScanGauge^{II} will attach to the OBD II port (OBD is the On-Board Diagnostics, the computer interface/communication bus on any passenger vehicle built and sold in the U.S. since 1996 by federal law). The OBD II port is generally located above the driver's footwell, somewhere near the steering column. You have to get down near the floor and look up. The other end of the cable plugs into the ScanGauge^{II}. Small stick-on Velcro strips are supplied so that the ScanGauge^{II} can be mounted at a place of the driver's choosing (but not on an airbag).

1.1. Menu Navigation

There are 5 buttons, one on each corner of the display, plus the Home button (with the red circle). The Home button returns the user to the top level menu. The corner buttons either enter submenus or otherwise take the action indicated at that corner of the display (an arrow will point to active buttons, not all buttons are active in every menu). The terms Menu and Screen are used interchangeably in this manual.

In the text to follow, TLB will mean Top Left Button, TRB is Top Right Button, BLB and BRB are for the bottom left and right buttons.

1.2. Setup

From the Home menu, choose MORE>SETUP. Values that are changed will be retained as long as the ScanGauge^{II} is left connected to the vehicle's battery (thru the OBDII port). To store it indefinitely use the SAVE feature.

In normal usage, save the settings for car A in memory and use it for car A. But for taking a trip in another vehicle, simply take the ScanGauge^{II} to car B and change the setup, but do not save the new setup. This setup will remain active, even if the car is turned off – until the ScanGauge^{II} is unplugged. When it is disconnected and moved

back to car A the saved settings will again become active. New setup values can be saved at any time for a more permanent change to a new vehicle.

Necessary setup changes are underlined:

MORE>SETUP>ENGINE (important for accurate MPG readings):
- TLB, TRB: Choose engine size in liters
- BRB: Save value to stored memory

MORE>SETUP>UNITS (optional, defaults to U.S. traditional units):
- TLB: Toggle between MILES and KM
- TRB: Toggle between GALLONS and LITERS
- BLB: Toggle between F and C (Fahrenheit/Celsius)
- BRB: Toggle between PSI and KPA (pounds/sq. inch, kilo-pascals)

MORE>SETUP>SPEED (adjust if vehicle's reported speed is not accurate):
- TLB, TRB: Choose % offset for speed adjustment, such as when a different tire size is used. The Installation and Operation manual has more on pp.17-18.
- BRB: Save value to stored memory

MORE>SETUP>FUEL>TYPE (important for hybrids or non-gas vehicles):
- TLB, TRB: Choose fuel type: Gas, Diesel A, Diesel B (not diesel grades but computer reporting type), Hybrid and LPG
- BRB: Save value to stored memory

MORE>SETUP>FUEL>TANK SIZE (useful for trip information showing miles left):
- TLB, TRB: Choose tank size (round down for partial gallons)
- BRB: Save value to stored memory

MORE>FILLUP (on each refueling, select DONE if not making adjustments):
- TLB, TRB: Adjust gallons added to tank. Some cars may take 30 seconds or so to completely register the new value. The Installation and Operation manual has detailed instructions on pp.18-19 on calibrating the fuel fill-ups, but basically don't adjust the number of gallons added to the tank on the first fillup after connecting the ScanGauge^{II}. Subsequent tanks can be adjusted.
- BRB: Fill-up done, resets Tank trip information, restarts the "to empty" gauges, and moves to Fuel Cost screen.

FUEL COST (from FILLUP menu):
- TLB, TRB: Select fuel price
- BRB: Save value to stored memory

MORE>DISPLAY (options for setting the backlight brightness and color, see pp. 12-13 of the Installation and Operation manual.)

MORE>MORE (less commonly used features, see section 5)

2. Gauges

From the Home menu, choose Gauge. A screen with four gauges will be displayed. These gauges are updated (about every two seconds by default) as you drive with real-time information from the vehicle computers. Pressing the button by each gauge will cycle thru the available gauges. All gauges are available at each location:

CLSD LP/OPEN LP	fuel system O2 sensor loop status (normally closed except when engine is cold or under heavy acceleration)
CPM	cost per mile, based on fuel price and MPG.
FIA (CIA for Celsius)	temperature of intake air (slightly warmer than outside air temperature)
FWT (CWT for Celsius)	water (engine coolant) temperature
FPR	fuel pressure
GPH (LPH for liters)	Gallons (liters) per hour
IGN	Ignition timing (advance or retarding of ignition spark) More advance is better for fuel economy and power, but is retarded as needed to prevent knocking (depends on octane, load, etc.)
LOD	Engine load – percent of maximum power currently being generated. Typically a load around 80% has most horsepower for fuel consumption, resulting in efficient acceleration
MPG (KPG, MPL, LHK)	Fuel economy in the units selected. LHK = liters/100km
MPH (KPH)	Miles (kilometers) per hour
MAP	Manifold absolute pressure – pressure in the intake manifold, reported in PSI (by default) or KPA
RPM	Revolutions per minute of the engine
TPS	Throttle position setting – throttle position on scale of 0 to 100 (some vehicles have closed throttle at 0, others at 100)
VLT	Battery voltage

In addition, more gauges are available for specific vehicles such as transmission temperature, O2 sensor information or state-of-charge of a hybrid's main battery, but these must be manually programmed in. Also, any of the trip information displays can be set up as a gauge. For instructions to program these options, see the Installation and Operation manual, pp. 24-29 or section 5.

3. Trip

Information can be displayed about the current trip, today's trips, yesterday's trips and totals for the tank. From the Home menu, choose the Trip menu. This menu allows you to choose what information to display and the time period (current trip, today, yesterday, tank). Tank options are slightly different:

Information available for current trip, today, yesterday:

Maximum speed, max coolant temperature, max RPM, average speed, average fuel economy, trip miles, elapsed time, fuel used, fuel cost.

Information available for tank (since last fill-up):

Average speed, average fuel economy, trip miles, elapsed time, fuel used, fuel remaining*, distance remaining on tank (estimated*), time remaining on tank (estimated*).

* Estimated values depend on fuel tank size being set correctly, and selecting MORE >FILLUP>DONE after each fill-up. See the setup section for more information.

Current trip information can be cleared with the RESET menu option, for measuring purposes. It is automatically cleared when the vehicle is off for more than 3 minutes. Today's information is cleared and copied to Yesterday when the car is off for 8 to 10 hours.

4. Trouble Codes (Scan)

Choose SCAN from the Home menu. If codes are present (normally indicated by a check-engine light on the dash – but not the maintenance required light), a message will indicate how many codes are present. If no trouble codes are found, it will display that and nothing more can be done.

When at least one DTC (Diagnostic Trouble Code) is found, there are two options: display the code(s), or display frozen data associated with the codes, listed by PID, with the value displayed in hexadecimal (numbers 0-9 plus A-F). This information can be used online to determine what the general cause of the problem is. It might be a good idea to print the list of codes for your particular vehicle and keep that in the glove compartment with the vehicle's user manual.

Existing codes can be cleared. Keep in mind that this cannot be used to circumvent state or local emissions testing, as it can take several days of driving for enough cycles to complete before the OBD test will indicate tests are successful. When it is ready, "No Codes Found, --Ready--" will be displayed in the initial SCAN screen.

5. Other

By entering the MORE>MORE menu, less commonly used or advanced functions can be accessed. For instance, MORE>MORE>MODE>PIDS will toggle the PID mode (needed for 1995-1999 Subarus). MORE>MORE>RATE adjusts the update rate. MORE>MORE>CMDS allows for sending hexadecimal commands to the vehicle. See the Installation and Operation manual for more information (pp.20-29). But something more widely used is the XGauge feature.

The extended gauges allows the operator to select trip data from the real-time gauges menu (normally they're in separate menus and trip information can't be seen at the same time as a gauge can be), and to add gauges specific to a vehicle.

5.1. Seeing Trip Data in Gauges Menu

To make a trip information field available to the gauges menu, it must be added to the list of programmed XGauges. Up to 25 XGauges can be used (stored in internal memory slots 0 to 24, selected by TRB in menu MORE>MORE>MORE>XGAUGE).

To add an XGauge, go to MORE>MORE>MORE>XGAUGE>EDIT. The TLB and BLB will let you cycle thru the hexadecimal characters (0-9 and A-F). The TRB will more you to the next character. Hit OK to go to the next screen.

On the first menu screen for adding an XGauge (the TXD screen), enter two characters based on the following lists. For instance, to see average fuel economy for the current trip enter 00. To see estimated distance to empty for the tank, enter 44.

First Character:
- 0 = Average Fuel Economy
- 1 = Fuel Used
- 2 = Max Coolant Temp for Current/Day Trips –or- Fuel Remaining* for Tank Trip
- 3 = Distance
- 4 = Max RPM for Current/Day Trips –or- Distance to Empty* for Tank Trip
- 5 = Time
- 6 = Max Speed for Current/Day Trips –or- Time to Empty* for Tank Trip
- 7 = Average Speed
- 8 = Cost

*estimated values, assumes tank fill-ups are being recorded, see setup section.

Second Character
- 0 = Current Trip
- 1 = Today Trip
- 2 = Yesterday Trip
- 3 = Tank Trip

When the TXD screen is set as desired choose OK at the BRB to move to the RXF screen (don't pause too long while entering data or the ScanGauge^{II} may stop accepting data and you will need to re-edit the XGauge).

In the RXF screen enter 8 for the first character (to look like 800000000000). This indicates it is a Trip-based gauge. Press OK until you see the NAME menu, and enter a 3-character name you will remember. Save the XGauge, and it can now be selected from the main gauge menu.

5.2. Adding Vehicle-Specific Gauges

Gauges specific to a vehicle or a group of vehicles can be added. Examples are readings from oxygen sensors, transmission fluid temperature, and cylinder head temperature.

An example used here is for the Toyota Prius to see the State of Charge (SOC) for the main drive battery. Follow the general instructions for adding an XGauge as in section 5.1, but for the TXD field, enter 07E321CE, for the RXF field enter 056186CE0000, for RXD enter 3008, and for MTH enter 000A00020000. Units are displayed in percent. As seen in this sampler from http://www.scangauge.com/support/pdfs/XGAUGE.pdf with information from http://www.cleanmpg.com/forums/forumdisplay.php?f=86 (thanks Dan!) a chart of XGauges shows this better.

GAUGE(Prius)	TXD	RXF	RXD	MTH	NAM	Notes
% SOC (active)	07E321CE	056186CE0000	3008	000A00020000	SOC	conflicts with BTA
% SOC (passive)	03C3	010382CB0000	2010	000A00020000	soc	OK with BTA
Battery Current	07E321CE	056186CE0000	3810	0001000AF333	BTA	HV Batt. Amps
Battery Voltage	0033	0100023B0000	2010	000100010000	BTV	HV Batt. Volts
Gas Pedal Position	024C	010282440000	4008	000A00020000	Gps	xx.x % depression

To see Horsepower (Gross/Brake) in any car:

GAUGE	TXD	RXF	RXD	MTH	NAM	Notes
HorsePower	00	400080000000	0000	000A00170000	HPR	Gasoline
HorsePower	00	400080000000	0000	000A00240000	HPR	Diesel

Some gauges are specific to the operating mode of the vehicle. This can be checked at MORE>MORE>MODE. For example, reading the cylinder head temperature in a Ford using PWM mode the codes are:

GAUGE (Ford)	TXD	RXF	RXD	MTH	NAM	Notes
Cylinder Head Temperature	C410F1221624	046205160624	3010	000200010000	CHT	DegreesF

But for a Ford using CAN mode they are:

GAUGE (Ford)	TXD	RXF	RXD	MTH	NAM	Notes
Cylinder Head Temperature	07E0221624	046205160624	3010	000200010000	CHT	DegreesF

Note: More XGauges can be set, some undocumented, such as measuring G-forces on a Prius. The list of XGauges shown above is just a sampler of what can be found online. Some codes may only work on specific versions of the ScanGauge^{II} *such as some passive codes work on version 3.15 but not 3.15*.*