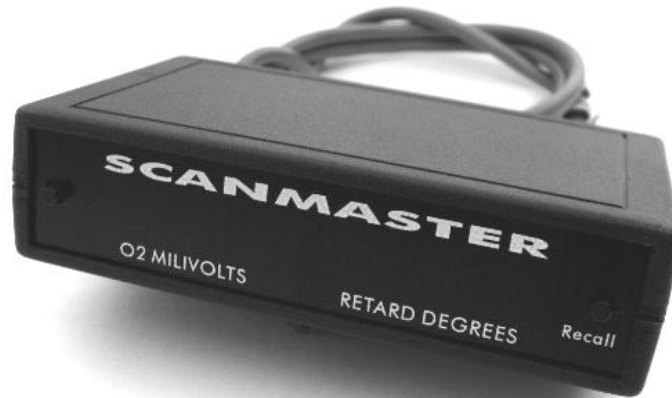


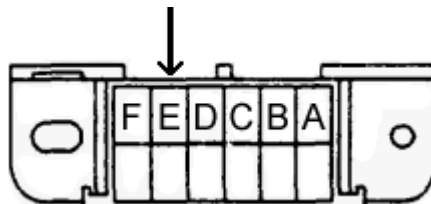
# SCANMASTER 2.1



## Portable Scantool for '86/87 Turbo Buick and '89 Turbo TA

### Installing the Scanmaster

1. Disconnect the battery negative cable under the hood.
2. Mount the Scanmaster inside the car on the dashboard, radio pod, or other convenient location.
3. Connect the black wire to a good ground.
4. Connect the red wire to a fused power source. One of the empty IGN terminals in the fuse box works well. You can install a male spade connector, which will push into an IGN terminal.
5. Connect the white wire to the serial data signal at the ALDL connector under the radio. The signal is pin E, top row, second from the left. You can either splice into the orange wire going to pin E behind the plug, or you can use a .125 blade male spade connector to push into the plug.
6. Reconnect the battery and test the Scanmaster.



ALDL Connector

## Scanmaster Instructions

### Power Up

On initial key-on, the right-most decimal point will flash quickly to indicate that data is being received. The Scanmaster version number will be displayed at this time. If no data is received the Scanmaster will turn itself back off. Once it has synchronized with the car's computer, the display will change to " --- ---" while waiting for the engine to be started.

### Run Mode

When the engine is started, the Scanmaster will enter Run mode. On the left side of the display you will see O2 millivolt readings from the engine's oxygen sensor. On the right side it will display degrees of knock retard, which correlates with how bad the car is knocking (detonating).



Pressing the Mode button (to the left of the display digits) selects other data from various engine sensors. Each time you press Mode, it will scroll through data until you get back to O2 and knock retard again. You can also press Recall to return to O2 and knock.

### Record Mode

While in Run mode, if the TPS (Throttle Position Sensor) voltage exceeds 3.00 for 1-2 seconds the Scanmaster will monitor O2 and knock retard. It will keep in its memory the highest knock retard reading and lowest O2 reading along with the MPH that they occurred. The third decimal point (to the right of the millivolt digits) will be lit during recording. The stored readings can be recalled anytime before the engine is turned off.

Pressing the Recall button while in Record mode will erase any readings stored, and could be used to delete any captured false knock readings while racing.

### Recall Mode

While in Run mode, pressing the Recall button (on the right of the knock retard display) changes the Scanmaster to Recall mode. In this mode, any previously recorded O2 millivolt and retard readings will be displayed. The third decimal point will blink quickly.

Pressing the Mode button and Recall at the same time displays the MPH values associated with the stored O2 and retard values.

Turning the engine off will erase all stored data.

## Information Displayed on Scanmaster

Display	Description	Note	Range
O2	Oxygen Sensor	O2 reading in millivolts	.000-.999
KR	Knock Retard	Timing retard in degrees due to knock	0.0-25.6
AF	Airflow	Airflow from MAF sensor in grams/sec	0-255
L8	Load	Calculated load factor	0-255
bat	Battery Volts	Voltage from ignition	0.0-25.6
Int	Integrator	Short term fuel trim	90-150
bL	Block Learn (BLM)	Long term fuel trim	90-150
MPH	Miles per hour	Vehicle speed	0-255
CLt	Coolant Temp	Current coolant temperature	-40° to 300°
AtS	Air Intake Temp	Current air intake temperature	-13° to 150°
r	Engine RPM	RPM	0-6400
tPS	Throttle Position Sensor	Voltage reading from TPS	0.0-5.0
IAC	Idle Air Control	Commanded position of IAC motor	0-255
CC	Cross Counts	Activity of oxygen sensor	0-255
NAL	Malfunction Code	Stored malfunction codes	
	Open or Closed Loop Status	Decimal point in Retard reading will blink for open loop, or remain solid for closed loop.	

## Scanmaster Readings Explained

Here are some short definitions for the Scanmaster readings. Not every detail is covered, but this is a good starting point.

### O2

Oxygen sensor reading in millivolts. Gives an indication of air/fuel mixture, but not terribly accurate. Take readings with the engine warm.

At full throttle we're usually looking for anywhere in the 750-850 area. Leaner (lower) typically makes more power, but may cause knock. The typical target is 780-800.

When cruising, the numbers should jump up and down anywhere from 000-800.

During idle, depending on the chip, it may jump up and down, or it might stabilize around 700-850 if the chip utilizes open loop idle.

### Knock Retard (KR on Scanmaster)

Knock retard in degrees. When the computer senses knock, it retards the timing to help eliminate it. This reading tells you how much the computer retarded the timing, giving you an indication of how bad the knock event was.

At full throttle, we would like to see zero. However, sometimes you may see a couple degrees here and there on a downshift, or when you first hit the gas. If you see 2-3 degrees momentarily and it goes away, it's probably ok. If you continuously see more than 2-3 degrees, let off the gas and figure out what's going on.

**Airflow (AF on Scanmaster)**

Airflow reading in grams per second from the mass airflow sensor (MAF).

At full throttle and about 15-17psi boost and higher, this should be at 255, which is the max for all chips except the Extender chip (from Full Throttle Speed). A TurboTweak chip is *not* an Extender chip.

At idle, warmed up, you will typically see 4-6 gr/sec.

Note that just because you may see good readings here, it does not necessarily mean the MAF sensor is good. They can go slightly out of calibration and cause problems, such as bad BLM readings, or cruddy idle, tip-in stumbles, etc.

**LV8 (L8 on Scanmaster)**

Load value in grams per cylinder. The computer calculates this value from RPM and airflow only. It uses the value to determine spark advance, and various other things.

There is no "right" value here. Don't pay too much attention to LV8 as you can't really change it.

**Battery (bat on Scanmaster)**

System voltage as read by the computer from the ignition switch.

It would be ideal to have this above 13.5 volts most of the time, but some cars do drift down closer to 13.0 volts at times. Low voltage can reduce the output of your fuel pump.

**INT (Int on Scanmaster)**

Integrator (Short term fuel trim). Default number is 128 (which is 0%). When higher than 128, the computer is adding fuel, and less than 128, the computer is subtracting fuel. This number changes rapidly when operating in closed loop as the computer is constantly adding or subtracting fuel based on input from the O2 sensor. The computer is trying to keep the air/fuel mixture as close to 14.7:1 as possible for emissions purposes.

This number will be moving around a lot between 118 and 138 or so. Don't pay too much attention to it in most cases. BLM is more important. When in open loop (during cold start, or idle on some chips), this will stay at 128.

**BLM (bL on Scanmaster)**

Block Learn Memory (Long term fuel trim). Works very similar to INT, but this is the computer's way of remembering the fuel trim over a longer period. There are 16 different BLM memory locations (called "cells") that are accessed based on different load conditions. The Scanmaster only displays the value of the currently used BLM cell. Like the Integrator, the default value is 128 (0%).

We would like to see the BLM stay in the 118-138 range. It's not the end of the world if it goes outside this range, but it could indicate there is a problem somewhere.

**MPH**

Vehicle speed in mile per hour.

**Coolant Temp (CLt on Scanmaster)**

Coolant temperature in degrees F.

The stock thermostat was 195°. Most guys change to a 160° stat to keep the engine cooler which helps eliminate knock. This may allow you to run more boost.

**Airtemp (AtS on Scanmaster)**

Air temperature in degrees F. The sensor is located near the air intake by the air filter. If the temp exceeds about 150°, the Scanmaster will just display "HOT".

**RPM (r on Scanmaster)**

Engine speed in revolutions per minute.

Idle speed depends on what is programmed in the chip, but usually somewhere in the 750-850 area.

**TPS (tPS on Scanmaster)**

Throttle position sensor voltage. Take reading with key on, engine off.

Full throttle position should be around 4.40 to 4.60 volts, but 4.20 to 4.80 is still ok. Do not exceed 4.80 as you run the risk of setting a TPS malfunction code which can cause erratic operation. Idle position (foot off gas) should be about .42 to .46.

This is adjusted by loosening the two screws that hold the sensor to the throttle body and moving/rotating the sensor to get the desired results (key on/engine off).

**IAC**

Idle Air Control. Position of the idle air motor in "counts" or "steps" from 00 (00 is closed).

At idle warmed up in park, try to keep it around 10-20. If you have stalling problems, keep it closer to 00 in park. In drive it will jump up higher. This is adjusted using the "min air screw" on the throttle body. To make the IAC number go lower, you would need to open the throttle blade more by turning the screw clockwise. To make the IAC go higher, turn the screw counter-clockwise. Give it some time to change, maybe blip the throttle a couple times. You might need to re-adjust TPS when done.

When you turn the engine off, the IAC resets itself and will return to around 140-150. When you turn the key on the next time, it will be at 140-150 until you start the car. It will then creep down as the engine warms up. Only make adjustments when the engine is warm.

**CC**

Cross Counts. Counter that keeps track of how many times the O2 reading crosses midpoint (.450-.500mv). This counter starts at 0 and climbs until it hits 255, then starts at 0 again. This can give you an idea of the condition of the O2 sensor.

In closed loop, you would typically see this number climb around 10-20 numbers per frame (each time the Scanmaster refreshes). If the number is climbing slowly, then you may need a new O2 sensor.

If you have a chip that uses open loop idle, the cross counts will not change much at idle.

**MAL (NAL on Scanmaster)**

Malfunction code display.

Some chips have a special option that will also display **SP** and **PL** (spark advance and injector pulsewidth). Neither of these have a "correct" setting, as they are mainly for monitoring purposes only.

## Malfunction Codes

Code Number	Description
12	Normal, no crankshaft pulses when engine not running
13	O2 sensor
14	Coolant temp sensor high
15	Coolant temp sensor low
21	TPS sensor high
22	TPS sensor low
23	Air temp sensor low
24	Vehicle speed sensor
25	Air temp sensor high
31	Wastegate solenoid
32	EGR
33	MAF sensor signal high
34	MAF sensor signal low
41	Cam sensor
42	EST circuit failure (ignition module to ECM)
43	ESC circuit failure (knock sensor module)
44	Oxygen sensor lean
45	Oxygen sensor rich
51	Prom error (chip or socket)
52	Cal-pak error (small chip by prom)
55	ADU error (bad ECM)

**The manufacturers and sellers of the Scanmaster cannot be held responsible for any damages resulting from the use or misuse of the Scanmaster or information in this document.**