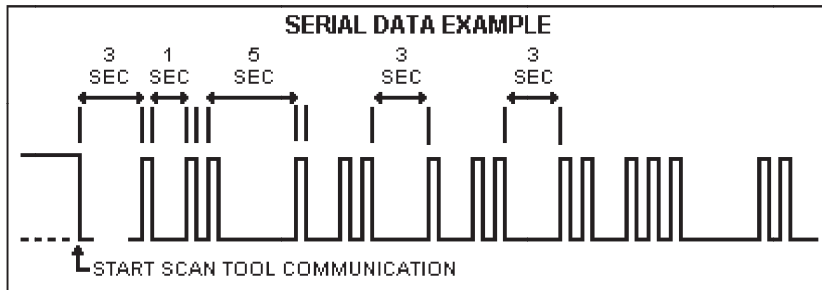


Serial & PID Data**Introduction**

Serial data is a series of computer digital signals pulsed from a high voltage to a low voltage as shown in the Graphic below. These digital signals can change from a low value (0v) to a higher value (5, 7 or 12 volts). The signals are transmitted over a common serial data line.

Serial Data Graphic

Each digital signal is called a "bit" and represents a number. The computer strings together a series of these "bits" in 8-bit segments. An 8-bit segment makes up a word, and the computer reads these words as a series of data entries (i.e., these entries are the serial data). A typical serial data stream may have 20 words. Scan Tools read serial data by interfacing with the PCM through a test connector. The Scan Tool contains a CPU that decodes the PCM serial data.

Baud Rate

A serial data stream contains segments of on and off signals that are read as words. The segments represent a message being sent. The segments could also be a separation signature between various messages going to and from the computer. These bits are sent at precise time intervals. The speed at which bits are transmitted is known as the computer *baud rate*.

For example, a PCM baud rate of 8192 indicates that the computer transmitted 8,192 bits of data per second. Baud rates of computers have increased rapidly from their introduction in the early 1980's. For example, a late model GM computer may have a baud rate of 8192. This is a much faster rate than the baud rate of 160 bits per second of the early General Motors automotive computers.

Unidirectional and Bi-directional Microprocessors

The computer can transmit serial data *in one direction only* or it can receive and transmit data from a Scan Tool. Serial data that goes in two directions is referred to as bi-directional. Some vehicles can use Scan Tool programs to access a send and receive bi-directional program to turn on and turn off solenoids and relays. Each vehicle manufacturer controls the amount of bi-directional functionality.

Terminology

The terms Data Stream, Scan Data and Serial Data are all used to identify Powertrain Control Module (PCM) serial data items on various Original Equipment Manufacturer (OEM) and Aftermarket Scan Tools.

The Scan Data, Serial Data or Data Stream inputs that are typically displayed on a Scan Tool include the following signals:

- Engine Coolant Temperature (ECT)
- EGR Sensor
- Intake Air Temperature (IAT)
- Manifold Air Pressure (MAP)
- Throttle Position (TP) Sensors
- Clutch Switch
- Power Steering Pressure (PSP) Switch
- Park Neutral (PN) Switch

The Scan Data, Serial Data or Data Stream output signals available for display on a Scan Tool include:

- Canister Purge (CP) Solenoid
- EGR Solenoid
- Idle Air Control (IAC) Motor Position
- Malfunction Indicator Lamp (MIL) Control

What is Serial Data?

The terms Data Stream, Scan Data and Serial Data are used to identify Powertrain Control Module (PCM) items on both OEM and aftermarket Scan Tools. OBD I system Data Stream, Scan Data or Serial Data items available for display on a Scan Tool include:

- PCM analog input signals (ECT, EGR, IAT, MAP & TP Sensors)
- PCM analog & digital output signals (EGR, IAC & MIL)
- PCM calculated values (LOAD, LONGFT, MISF & SHRTFT)

What is PID Data?

PID is an acronym for Parameter Identification (Data) used to identify a list of Powertrain Control Module (PCM) items displayed on OEM and aftermarket Scan Tools. PID Data items available for display on an OBD II certified Scan Tool include:

- PCM analog input signals (ECT, EGR, IAT, MAP & TP Sensors)
- PCM analog & digital output signals (EGR, IAC & MIL)
- PCM calculated values (LOAD, LONGFT, MISF & SHRTFT)

How to View Serial Data

To view OBD I Serial Data on a Scan Tool, connect the Scan Tool to the underdash test connector and follow the setup instructions to select Data Stream, Scan Data or Serial Data items from the menu.

Note: *If a Scan Tool does not power up or read data, first verify that the power, ground, and tool cable connections are okay. Another way to determine if a Scan Tool is working properly is to try it on another vehicle.*

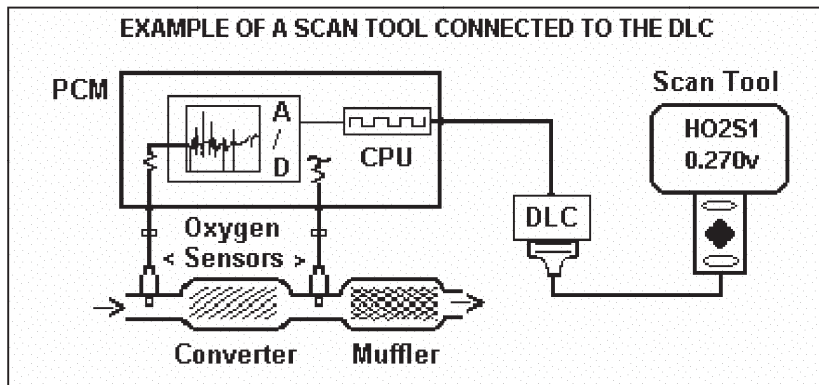
How to View PID Data

To view OBD II PID Data on a certified Scan Tool, connect the tool to the vehicle connector, follow the correct vehicle setup instructions, and then select either the Generic OBD II or Manufacturer Specific Options, then select Parameter ID or PID Data from the main menu.

Note: *If a Scan Tool does not power up or read data, first verify that the power, ground, and tool cable connections are okay. Another way to determine if a Scan Tool is working properly is to try it on another vehicle.*

Scan Tool Connection

The Scan Tool is connected to the DLC to view "live" O2S Serial Data after it has been processed in the PCM. Refer to the Graphic below.



When to Use Serial and PID Data

The Serial and PID Data Lists in this handbook can be used to:

- Validate a previous repair procedure
- Check the operation of a component before or after a repair
- Check the operation of a component or system by viewing "live" data from the vehicle computer data stream
- Diagnose the cause of Trouble Code or No Code Faults

Serial Data Example No. 1

PID and Serial Data examples in this handbook are arranged in table format. Each **table heading** identifies the year, vehicle, engine and the transmission (All, A/T - Automatic or M/T - manual). Tables contain the following information fields:

- PID - Parameter Identification (name and/or acronym)
- PID Value Range (the normal allowable range for the PID)
- PID values at Hot Idle and 30 mph
- Data List Type (the data type used for the Scan Tool display)

1996-97 Century 2.2L I4 VIN 4 (All) - (This is the Table Heading)

Parameter Identification (PID)	PID Value Range	PID Value at Hot Idle	PID Value at 30 mph	Data List Type
BARO Sensor (V)	0-5.1 volts	3.5-4.5	3.5-4.5	ENG Data 1
Calculated Airflow	0-512 g/sec	3-7	Varies	ENG Data 1
CKP Active Counter	0-255 counts	Increments	Increments	ENG Data 1
CMP Active Counter	0-255 counts	Increments	Increments	ENG Data 1
CMP Resync Counter	0-255 counts	0	0	ENG Data 1
Desired Idle Speed	0-3187	PCM control	---	ENG Data 1
ECT Sensor (°F)	-40 to 419°F	185-239	185-239	ENG Data 1
Engine Load	0-100%	22-26	Varies	ENG Data 1
Engine Run Time	Hr: Min: Sec	00:00:00	00:00:00	ENG Data 1
Engine Speed	0-9999 rpm	±50 Desired	---	ENG Data 1
EVAP Purge Solenoid	0-100%	0	0-100	ENG Data 1
EVAP Vent Solenoid	ON/OFF	OFF	OFF	ENG Data 1
Fuel Pump Relay	ON/OFF	ON	ON	ENG Data 1
Fuel Trim Cell	Cell #0-21	18-21	Varies	ENG Data 1
Generator F-Terminal	0-100%	0-100	0-100	ENG Data 1
Generator L-Terminal	ACT/Inactive	INACTIVE	INACTIVE	ENG Data 1
HO2S-12 (B1 S2)	0-1132 mv	10-1000	10-1000	ENG Data 1
IAC Motor	0-255 counts	5-60	---	ENG Data 1
IAT Sensor (°F)	-40 to 304°F	50-176	50-176	ENG Data 1
Knock Retard (°)	0-128°	0	0	ENG Data 1
Knock Signal	YES/NO	NO	NO	ENG Data 1
Long Term Fuel Trim	-10% to 10%	0 (± 5%)	0 (± 5%)	ENG Data 1
Long Term F/T Avg.	-10% to 10%	0 (± 5%)	0 (± 5%)	ENG Data 1
Loop Status	CL or OL	CL	CL	ENG Data 1
MAP Sensor (kPa)	10-110 kPa	25-48	Varies	ENG Data 1
Number of DTC(s)	0-255 counts	0	0	ENG Data 1
O2S-11 (B1 S1)	0-1132 mv	10-1000	10-1000	ENG Data 1
Purge Learn Memory	0-100%	0	0-100	ENG Data 1
Short Term Fuel Trim	-10% to 10%	0 (± 5%)	0 (± 5%)	ENG Data 1
Short Term F/T Avg.	-10% to 10%	0 (± 5%)	0 (± 5%)	ENG Data 1
Spark Advance (°)	-64° to 64°	Varies	Varies	ENG Data 1
TCC Brake Switch	ON/OFF	OFF	OFF	ENG Data 1
TP Angle (%)	0-100%	0%	0-100%	ENG Data 1
TP Sensor (V)	0-5.1 volts	0.20-0.90	Varies	ENG Data 1
Vehicle Speed	0-155 mph	0	30	ENG Data 1

Serial Data Example No. 2

PID and Serial Data examples in this handbook are arranged in table format. Each **table heading** identifies the year, vehicle, engine and transmission (All, A/T - Automatic or M/T - manual). Tables contain the following information fields:

- PID - Parameter Identification (name and/or acronym)
- PID Value Range (the normal allowable range for the PID)
- PID values at Hot Idle and 30 mph
- Data List Type (the data type used for the Scan Tool display)

2000-03 Century 3.1L V6 VIN J (A/T) - (This is the Table Heading)

Parameter Identification (PID)	PID Value Range	PID Value at Hot Idle	PID Value at 30 mph	Data List Type
3K Crank Sensor	0-9999 rpm	Varies	Varies	ENG Data 2
24X Crank Sensor	0-1600 rpm	Varies	Varies	ENG Data 2
A/C HI Side Pressure	0-5.1 volts	Varies	Varies	ENG Data 2
A/C Off for WOT	YES/NO	NO	NO	ENG Data 2
A/C Pressure Disable	YES/NO	NO	NO	ENG Data 2
A/C Relay Control Circuit Status	OK/FAULT	OK	OK	Output Driver
A/C Relay Command	ON/OFF	OFF	OFF	ENG Data 1, Data 2, EGR
A/C Request Signal	YES/NO	NO	NO	ENG Data 2
Air Fuel Ratio	0.0-25.5:1	14.7:1	14.7:1	ENG Data 2, Fuel Trim
CMP Sensor Signal	YES/NO	YES	YES	ENG Data 2
Crank Request Signal	YES/NO	NO	NO	ENG Data 2
Cruise Control Active	YES/NO	NO	NO	ENG Data 1
Cruise Control Inhibit	ON/OFF	ON	ON	ENG Data 1
Cruise Inhibit Reason	YES/NO	YES	YES	ENG Data 1
Cycles of Misfire Data	0-99	Varies	Varies	Misfire
Cylinder 1-6 Injector Circuit Status	OK/FAULT	OK	OK	Output Driver
Cylinder 1-6 Injector Circuit History	OK/FAULT	OK	OK	Output Driver
Desired Idle Speed	0-3187 rpm	PCM control	---	ENG Data 2
Decel Fuel Cutoff	ACT/Inactive	Inactive	Inactive	EGR, F/Trim
Desired EGR Position	0-100%	0	Varies	ENG Data 1, EGR, Misfire
Desired Idle Speed	0-3187 rpm	± 50 rpm of Actual Speed	Varies	ENG Data 1, Data 2, EVAP
EGR Flow Test Count	0-255 counts	0	Varies	EGR
EGR Learned Minimum Position	0-5.1 volts	0	Varies	EGR
EGR Position Sensor	0-100%, or 0-5.1volts	0.0	Varies	ENG Data 1, EGR, Misfire
EGR Position Variance	0-5.1 volts	0.0	Varies	EGR
EGR Solenoid Control	0-100%	0	Varies	EGR

OBD II PID Mode

Introduction

Vehicles equipped with On Board Diagnostics (OBD) have a test mode that can be selected to allow access to vehicle Parameter Identification (PID Data) information. Part of the PID Data is generic in nature and can be accessed by any certified Scan Tool in OBD II Generic mode.

Enhanced Data

On General Motor's vehicles, some PID Data can only be accessed using a Scan Tool that allows access to the enhanced proprietary data. A special cartridge is used that allows the Scan Tool to read the complete list of Enhanced Data. To learn more about how to access this type of data, refer to the Scan Tool instruction manual.

PID Data Display

An example of PID Data captured with an aftermarket Scan Tool from a 1996 Corsica with a 3.1L V6 engine is shown in the table below.

PID Acronym	Description	Value at Idle
DTC	DTC Number	P0135
LOAD	Calculated Load	2-5%
LOOP	Engine Loop Status	CLOSED
ECT (°)	ECT Sensor Degrees	195°F
IAT (°)	IAT Sensor Degrees	110°F
LONGFT	Long Term Fuel Trim	+2%
SHRTFT	Short Term Fuel Trim	1%

PID Data Comparison

Once actual PID Data has been captured, it can be compared to PID Data examples in this handbook that were obtained from vehicles with "known good" operating values. An example of how to use PID Data during diagnosis of a "suspect" ECT sensor is shown below.

PID Acronym	"Known Good" Value	"Actual" Value
ECT (°)	0.6v (Hot Idle)	2.1v (Hot Idle)
IAT (°)	125°F	122°F
TP	0.46v	0.49v
LOOP	CLOSED	CLOSED

Note: *In this example, the actual ECT sensor reading of 2.1v is compared to the ECT known good reading of 0.6v. The higher than normal sensor reading indicates that the sensor has moved out of range for a hot engine.*

Diagnosis with Serial and PID Data

Introduction

An example of how to use PID Data records to diagnose a vehicle with a lack of power problem and no codes is shown below. PID Data recorded at cruise speed reveals an irregular SPARK signal that caused ignition timing to spike up and down. When the SPARK signal shorted to ground at the transaxle, the engine would lose power.

Frame & Graphing Views

The information in the table (Frame View) and picture (Graphing View) below shows the spikes occurring in the SPARK signal. Note the series of irregular spikes in the signal as it went to ground.

Vehicle: 1996 Pontiac Grand Am 3.1L VIN M (Frame View)

PID Item	Frame 1	Frame 2	Frame 3	Frame 4	Frame 5	Frame 6
RPM	1780	1800	1785	1902	1980	1810
SPARK	38°	36°	30°	22°	33°	38°
24X CKP	1780	1805	1790	1910	1975	1805

Vehicle: 1996 Pontiac Grand Am 3.1L VIN M (Graphing View)

