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Oct
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2004

OBD-II

ODB II

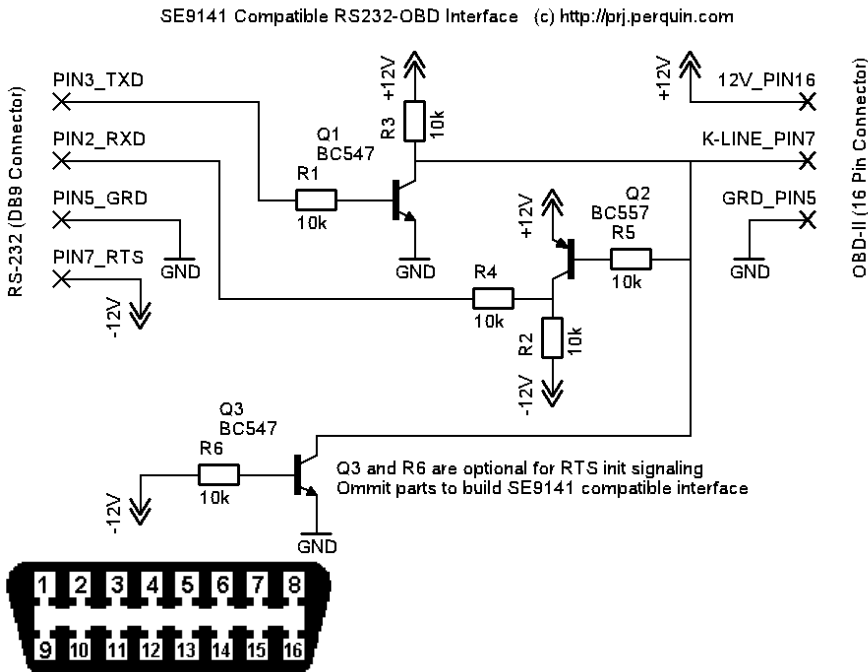
1 Response »

OBD is a diagnostic interface a found on many build in 1996 or later. A description of the OBD protocol can be found below.

RS-232 Serial Cable

The interface depicted below can be used build a serial cable to connect the serial port of the computer to the 16-pin OBD-II connector found in many cars build in 1996 or later. This interface only supports the ISO 9141-2 / ISO 14230-2 K-line tranfer mode. If in your ODB connector pin 7 (K-Line) is present and pin 15 (L-Line) is missing then this interface will most likely work for your vehicle.

The interface has been tested to work with GPL Linux scantool program freeddiag. A pre-compiled version can be downloaded here.



OBD-II 16 Pin Connector

Alternative ISO interface design: Opto-Coupler Schematic PDF | Jeff Noxon Website

OBD-Microcontroller Interface

This interface can be used to connect a microcontroller (AVR ATmega8 for example) to the OBD connector in your car.

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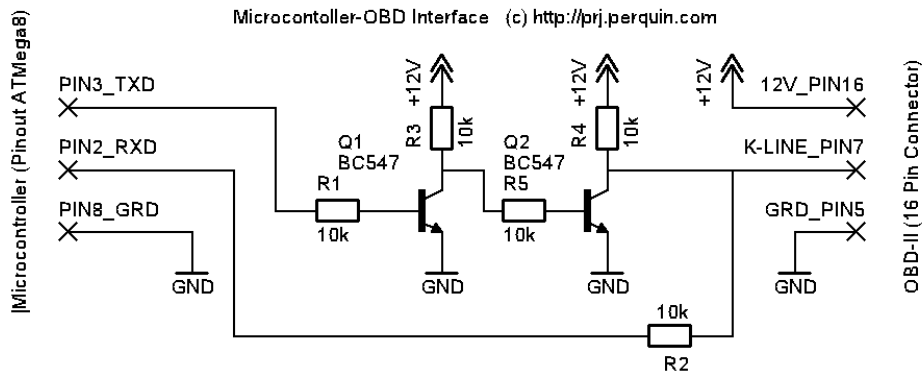
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OBD-II ISO 14230-2 Protocol Specification

This document describes the OBD-II ISO 14230-2 serial interface protocol. It has various public internet sources. I have been successful building an ODB interface but no guarantee can be given that this information is correct. Use at your own r

Timing

(in ms)

- 0-20 Inter byte timing in ECU response
- 25-50 Time between end of tester request and start of ECU response or between E
- 25-5000 Extended mode for "rspPending"
- 55-5000 Time between end of ECU response and start of new tester request, or time request and start of new request if ECU doesn't respond */
- 5-20 Inter byte time in tester request

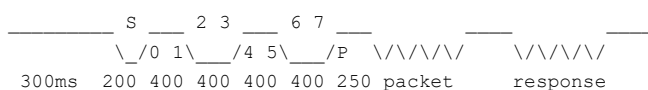
Initialization

Fastinit:



- 1) Wait for 300ms with K line high.
- 2) Pull K line low for 25 +/- 1 ms
- 3) Let K line rise high and wait 25ms
- 4) init serial connection to 10400 baud, 8N1, 1=0Volt 0=12Volt, least significant
- 5) send package c1 33 f1 81 66 33=dest, f1=our tester id, 81=start comms
- 6) wait for response 83 f1 01 c1 e9 8f ae 01=physical address, c1=response ok (

Slowinit:



- 1) Wait for 300ms with K line high.
- 2) send a byte 33 hex at 5 baud. 200ms per bit
 - startbit: 200ms low
 - databit0,1: 400ms high
 - databit2,3: 400ms low
 - databit4,5: 400ms high
 - databit6,7: 400ms low
 - stopbit+pause: 250ms high
- 4) init serial connection to 10400 baud, 8N1, 1=0Volt 0=12Volt, least significant
- 5) send package c1 33 f1 81 66 33=dest, f1=our tester id, 81=start comms
- 6) wait for response 83 f1 01 c1 e9 8f ae 01=physical address, c1=response ok (

Packets

Send command packet:

header: [c0+cmdlen] [destination=33] [source=f1]

data: [cmd0] [cmd1] ... [cmd(cmdlen-1)]

checksum: [sum(header)+sum(data)]

cmd0 = service ID

cmd1 = PID

Received response packet on success:

header: [80+datalen] [destination=f1] [source=01]

data: [40+cmd0] [cmd1] ... [cmd(cmdlen-1)] [result0] [result1] ... [result(datalen-1)]

checksum: [sum(header)+sum(data)]

Received response packet on failure:

header: [80+datalen] [destination=f1] [source=01]

data: [errorcode=7f] [cmd0] [Response Failure Code, see below]

checksum: [sum(header)+sum(data)]

Multibyte data is sent high byte first.

Tester Commands

request and response packet diagram format:

cmd0 cmd1 ... -> result0 result1 ... comment

Note: only the data of the request and only the result of the response are show.

yy 00 -> xx xx xx xx bitmask of capabilities for mode yy, bit7 represents pid 1
data4:bit0 is set then pid 20 contains capabilities for pid 21-40

00-0F: SAE J1979 Diagnostic Test Modes

01 00 -> xx xx xx xx capabilities

01 01 -> [b7: MIL light, b0-6: dtc count] [b4-7: readiness] [b5: o2monitoring] [b

01 03 -> xx xx Fuel System Status bitmap b0:Open, b1:Closed, b2:Op

01 04 -> xx Calculated Load Value % x*100.0/255

01 05 -> xx Engine Coolant Temperature C x-40

01 06 -> xx Short term fuel trim Bank 1 % x*(100.0/128)-100

01 07 -> xx Long term fuel trim Bank 1 % x*(100.0/128)-100

01 08 -> Short term fuel trim Bank 2 % x*(100.0/128)-100

01 09 -> Long term fuel trim Bank 2 % x*(100.0/128)-100

01 0a -> Fuel Pressure kPaG x*3

01 0b -> xx Intake Manifold Pressure kPaA x

01 0c -> xx xx Engine RPM RPM x*0.25

01 0d -> xx Vehicle Speed km/h x

01 0e -> xx Ignition timing advance Cyl #1 deg X*0.5-64

01 0f -> xx Intake Air Temperature C X-40

01 10 -> xx xx Air Flow Rate gm/s X*0.01

01 11 -> xx Absolute Throttle Position % X*(100.0/255)

01 12 -> xx Commanded secondary air status

01 13 -> xx Oxygen sensor locations bitmap b0=sensor1, b1=sensor2, .

01 14 -> xx yy Bank 1 Sensor 1 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 15 -> xx yy Bank 1 Sensor 2 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 16 -> Bank 1 Sensor 3 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 17 -> Bank 1 Sensor 4 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 18 -> Bank 2 Sensor 1 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 19 -> Bank 2 Sensor 2 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 1a -> Bank 2 Sensor 3 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 1b -> Bank 2 Sensor 4 Voltage/Trim V, % x*0.005, if y!=ff then y*

01 1c -> xx Auxiliary Input Status bitmap b0:PTO Active

01 20 -> xx xx xx xx capabilities

01 21 -> xx xx

02 00 00 -> xx xx xx xx capabilities SMART: 2 3 4 5 6 7 b c d

02 02 00 -> [dtc1h] [dtc1l] DTC that caused freeze/frame

03 -> [dtc1h] [dtc1l] 00 00 00 00

05 00 00 -> xx xx xx xx capabilities

06 00 -> xx xx xx xx capabilities

06 yy -> [max=01,min=81] [valH] [valL] [limitH] [limitL] example 01 00 23 01 2c
with limit maximum 12c (=300 dec)

06 01 -> xx xx xx xx xx ncms
06 02 -> xx xx xx xx xx ncms
06 09 -> 01 xx xx xx xx -> 81 xx xx xx xx ncms

07 -> 00 00 00 00 00 00 cms

08 00 00 00 00 00 00 -> xx xx xx xx capabilites SMART: none

09 00 -> 01 30 00 00 00 capabilites 5 bytes???

10 Start Diagnostic Session
11 ECU Reset
12 Read Freeze Frame Data
13 Read Diagnostic Trouble Codes
14 Clear Diagnostic Information
17 Read Status Of Diagnostic Trouble Codes
18 Read Diagnostic Trouble Codes By Status
1A Read Ecu Id
20 Stop Diagnostic Session
21 Read Data By Local Id
22 Read Data By Common Id
23 Read Memory By Address
25 Stop Repeated Data Transmission
26 Set Data Rates
27 Security Access
2C Dynamically Define Local Id
2E Write Data By Common Id
2F Input Output Control By Common Id
30 Input Output Control By Local Id
31 Start Routine By Local ID
32 Stop Routine By Local ID
33 Request Routine Results By Local Id
34 Request Download
35 Request Upload
36 Transfer data
37 Request transfer exit
38 Start Routine By Address
39 Stop Routine By Address
3A Request Routine Results By Address
3B Write Data By Local Id
3D Write Memory By Address
3E Tester Present
81 -> xx xx Start Communication
82 Stop Communication
83 Access Timing Parameters
85 Start Programming Mode

Response Failure Codes

10 General Reject
11 Service Not Supported
12 Sub Function Not Supported - Invalid Format
21 Busy - repeat Request
22 Conditions Not Correct Or Request Sequence Error
23 Routine Not Complete Or Service In Progress
31 Request Out Of Range
33 Security Access Denied - security Access Requested
35 Invalid Key
36 Exceed Number Of Attempts
37 Required Time Delay Not Expired
40 Download Not Accepted
41 Improper Download Type
42 Can Not Download To Specified Address
43 Can Not Download Number Of Bytes Requested
50 Upload Not Accepted
51 Improper Upload Type

52 Can Not Upload From Specified Address
53 Can Not Upload Number Of Bytes Requested
71 Transfer Suspended
72 Transfer Aborted
74 Illegal Address In Block Transfer
75 Illegal Byte Count In Block Transfer
76 Illegal Block Transfer Type
77 Block Transfer Data Checksum Error
78 Request Correctly Rcvd - Rsp Pending
79 Incorrect Byte Count During Block Transfer
80 Service Not Supported In Active Diagnostic Mode
C1 Start Comms +ve response
C2 Stop Comms +ve response
C3 Access Timing Params +ve response
81-8F Reserved
90-F9 Vehicle manufacturer specific
FA-FE System supplier specific
FF Reserved by document

Sample scan obtained of a SMART FOR TWO car

```
--wakeup
81 -> e9 8f
--get capabilities
01 00 -> b2 3f f8 11      capabilities service 1: 1 3 4 5 6 7 b v d e f 10 11 12 1
01 20 -> 80 00 00 00      capabilities service 1: 21
02 00 00 -> 7e 38 00 00    capabilities service 2: 2 3 4 5 6 7 b c d
05 00 00 -> 7f 05 11      capabilities service 5: none
06 00 -> ff c0 80 00      capabilities service 6: 1 2 3 4 5 6 7 8 9 a 11
08 00 00 00 00 00 00 -> 7f 08 11      capabilities service 8: none
09 00 -> 01 30 00 00 00    ??? expected 4 byte response...
--get status
01 01 -> 01 07 69 00      MIL light off, 1 dtc, ready, no 02monotoring
--get dtc's
03 -> 07 02 00 00 00 00    dtc P0702
--scan sensors
01 03
01 04
01 05 -> 3a engine coolant temp = 18C (3a=58 dec - 40 dec)
01 06
01 07
01 0b
01 0c
01 0d
01 0e
01 0f
01 10
01 11
01 12
01 13 -> 03 2 sensors
01 14
01 15
01 1c
01 20 -> 80 00 00 00      (always same: capabilities 21-40)
01 21 -> 00 37
```

Posted by hugo at 00:00