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# HOLDEN ALDL PCM SIMULATOR VT – VX – VY – VZ

This module is designed to maintain standard vehicle functionality when the factory Delco PCM has been replaced with an aftermarket ECU or is no longer used.

It simulates the PCM data transmitted on the ALDL data bus, similar to how the factory PIM (Powertrain Interface Module) used in some models works – except it provides discrete inputs and outputs, rather than data conversion from a different serial bus type (such as J1850 VPW or CAN).

Features include:

- **VATS output**, which is triggered when the BCM has successfully read the ignition key and is signalling the PCM it is OK to start. This can be used to retain the factory anti-theft system.
- **AC Request output**, which is triggered when the BCM or climate control module are requesting the PCM to engage the air conditioning compressor. This can be used to retain the factory AC control switch.
- **Oil Pressure input** – used to trigger the oil light or check oil warning on the factory instrument cluster.
- **MIL Lamp input** – used to trigger the MIL light or check engine warning on the factory instrument cluster.
- **Power / Econ input** (auto trans applications) – used to trigger the power shift pattern indicator on the factory instrument cluster.
- **Low Speed Fan request** input – used to signal the BCM that the PCM is requesting the low-speed cooling fan (which is switched by the BCM).
- **Coolant Temperature Input** – to keep the factory coolant gauge operational, using either an LS1 style coolant sensor connected directly to this module, a custom coolant sensor and pullup resistor using the configurable voltage lookup table, or back-probing off an existing sensor.
- **Gear Position input** – to keep the factory gear position indicator in the instrument cluster, using either direct connection to the 4x PRND A/B/C/P connections on a 4L60 style range switch, or using an analog voltage input in combination with the configurable lookup table.
- **Automatic ABS/SRS data transmission** – to prevent instrument cluster warnings if the ABS or SRS modules are not present. Data will only be transmitted if an existing ABS or SRS module is not detected.

# INSTALLATION

The simulator has 16 connections, only some of which may be used depending on your application. The essential connections are **7. ALDL data**, **16. Ignition Power** and **8. Earth**.

There are 2 low-side switching outputs (switching to ground, **14. VATS** and **13. AC Request**). Each output is rated to 0.7A, and has integrated overload, short circuit, over voltage and thermal protection. They are suited to driving an automotive relay coil, or a warning light up to 5w.

There is 1 active high input (**12. Oil Pressure**) and 8 active low inputs (**11. MIL Lamp**, **4. Power / Econ Indicator**, **3. Low Speed Fan Request**, **10. PRND A**, **9. PRND B**, **2. PRND C**, **1. PRND P**)

Connector Used: Molex Mini-Fit Jr. 16-way (4.2mm pitch) - Part #: 5557-16R / 39012165

<b>16</b> <b>PINK</b>	<b>15</b> <b>ORANGE</b>	<b>14</b> <b>GREY</b>	<b>13</b> <b>WHITE</b>	<b>12</b> <b>BLUE</b>	<b>11</b> <b>BROWN</b>	<b>10</b> <b>WHITE</b>	<b>9</b> <b>WHITE</b>
12V	5V	VATS	AC Req.	Oil Pres.	MIL	PRND A	PRND B
<b>8</b> <b>BLACK</b>	<b>7</b> <b>RED</b>	<b>6</b> <b>VIOLET</b>	<b>5</b> <b>L/BLUE</b>	<b>4</b> <b>YELLOW</b>	<b>3</b> <b>GREEN</b>	<b>2</b> <b>WHITE</b>	<b>1</b> <b>WHITE</b>
Ground	ALDL	Coolant		PWR	Low Fan	PRND C	PRND P

PIN	COLOR	CONNECTION	DESCRIPTION
<b>16</b>	<b>Pink</b>	<b>Ignition +12v</b>	Supply voltage for simulator
15	Orange	5v Output	5v reference voltage output, for use with analog inputs
14	Grey	VATS Output	Switches low when BCM signals key has been read
13	White	AC Request	Switches low when BCM or Climate Control request AC compressor be engaged
12	Blue	Oil Pressure	Apply voltage to switch on oil pressure light or warning in instrument cluster
11	Brown	MIL Lamp	Connect to ground to switch on engine malfunction warning / MIL Lamp in instrument cluster
10	White	PRND A	See "Gear Position" section
9	White	PRND B	See "Gear Position" section.
<b>8</b>	<b>Black</b>	<b>Ground</b>	Ground connection for simulator
<b>7</b>	<b>Red</b>	<b>ALDL</b>	ALDL data connection to vehicle
6	Violet	Coolant Input	Analog voltage input for coolant temperature, see "Coolant Input" section.
5	L/Blue		
4	Yellow	Power / Econ	Connect to ground to switch on "Power" indicator in instrument cluster
3	Green	Low Speed Fan	Connect to ground to signal BCM engage low speed fan
2	White	PRND C	See "Gear Position" section
1	White	PRND P	See "Gear Position" section

# CONFIGURATION

The simulator has 4x on/off DIP switches on the PCB for basic settings. They are in the ON position when pushed towards the centre of the PCB (the side of the switch labelled ON).

Advanced settings are stored in the simulators internal EEPROM memory, and can be configured via the ALDL data bus. Items such as look-up tables for coolant temperature or gear position must be configured this way. See the “ALDL Configuration” section at the end of these instructions.

OFF	Switch		ON
See “Coolant Input” section. Default look-up table and 330 ohm pullup resistor	<b>1</b>	Coolant Input Type	See “Coolant Input” section. Custom look-up table and custom pullup resistor
See “Gear Position” section. Analog input (variable voltage into pin 9 with lookup table)	<b>2</b>	Gear Position Input Type	See “Gear Position” section. Digital input (using the 4x A/B/C/P connections)
	<b>3</b>		
VT or VX	<b>4</b>	Vehicle Type	VY or VZ

The most basic configuration would use the default coolant pullup and lookup table (switch 1 OFF), and digital gear position inputs (switch 2 ON).

## VEHICLE TYPE

This switch configures the format of PCM data that is transmitted by the simulator. It must be set correctly to match the instrument cluster.

It does not necessarily need to match the type of BCM. EG. It is possible to use a VY/VZ instrument cluster and VT/VX BCM together with the switch set ON. However, if this is done the low-speed fan cannot be used (and may trigger unexpectedly, so should be disconnected from BCM).

# OUTPUTS

VATS Output	Pin 14 - Grey
<p>The factory VATS anti-theft system uses a unique code that is stored in the PCM during the BCM/PCM linking procedure. When the BCM successfully reads and verifies an ignition key that has been programmed into that BCM, it will reveal the unique code to the PCM via the ALDL data bus. If the code matches the one stored in the PCM, the PCM will allow the engine to run.</p> <p>When the simulator sees the BCM reveal its unique code, it means the BCM has read and verified the ignition key, and the simulator will trigger this output (switch it to ground). This output can be used to retain the factory anti-theft system. An example would be using it as the earth side for the starter relay coil, so that the engine will not crank until the key is verified.</p>	

AC Request	Pin 13 - White
<p>The factory AC compressor is controlled by the PCM. The BCM or climate control module request the PCM to engage the compressor when the AC dash switch is on. The PCM uses this and its refrigerant pressure sensor as an input, and along with other variables (engine speed/load), decides when to engage and disengage the compressor.</p> <p>When the simulator sees the request to the PCM to engage the AC compressor, this output will be triggered (switched to ground). This can be used to trigger a relay to power the AC compressor clutch, and retain the factory dash switch.</p> <p><b>IMPORTANT:</b> Wire the relay along with a refrigerant pressure switch, otherwise the compressor will run whenever the dash switch is on (even if the refrigerant pressure is excessively high or low). This could cause damage or catastrophic failure of the AC system.</p>	

# INPUTS

<b>Oil Pressure</b>	<b>Pin 12 - Blue</b>
<p>Apply voltage to this input to trigger the oil pressure light or warning message in the instrument cluster. This does not need to be a high current source, a 5v signal will work. A conventional oil pressure switch with the opposite side connected to 12v will also work.</p>	

<b>MIL Lamp Power / Econ Lamp</b>	<b>Pin 11 – Brown Pin 4 - Yellow</b>
<p>Connect these inputs to ground to trigger the associated light or warning in the instrument cluster. If they are connected to 5v (or a higher voltage), or left floating, the associated light or warning will be off.</p>	

<b>Low Speed Fan</b>	<b>Pin 3 - Green</b>
<p>The factory cooling system uses a 2-speed cooling fan. The PCM controls the high-speed fan directly, and the BCM controls the low-speed fan. The PCM sends a request to the BCM via the ALDL data bus, asking it to engage the low-speed fan (EG. when coolant temperature reaches the low-speed threshold, or when AC compressor is engaged and refrigerant pressure is high enough).</p> <p>When this input is connected to ground, the simulator will send the request to the BCM to engage the low-speed fan. This allows the 2-speed cooling fan system to be retained, without having to rewire the low-speed cooling fan.</p>	

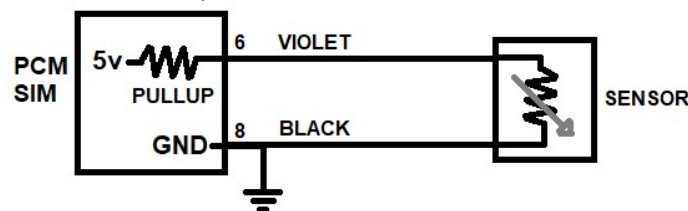
## Coolant Input

## Pin 6 - Violet

The factory instrument cluster does not use a dedicated coolant temperature sensor. It receives coolant temperature information from the PCM. This input measures an analog voltage (0 to 5v), and interprets it as a coolant temperature to transmit to the instrument cluster. This allows the factory coolant temperature gauge to be retained.

A coolant temperature sensor is a thermistor (it changes resistance based on temperature). Using a second resistor (a “pull-up” resistor, inside this simulator) connected to a known reference voltage (5v), a voltage divider can be created by connecting the pull-up and thermistor in series. The voltage at the pullup / thermistor connection will change as the thermistor’s temperature changes. This voltage can be measured and a calculation performed to determine the temperature.

A coolant sensor should be connected to this input, with the other terminal of the sensor / thermistor earthed as close as possible to the earth wire of this module – ideally the earth wire should run back and connect directly to the earth wire of this module.



The simulator has 2 options for pull-up resistor:

- Default on-board 330 ohm
- Custom resistor which can be soldered into the “COOLANT RES.” location on the PCB (near the 4x configuration DIP switches).

There are also 2 options for voltage/temperature lookup table:

- Default table designed to work with LS1 style sensors (eg. Part # 12608814 / 15326388) and the default 330 ohm pullup.
- Custom table that can be configured via ALDL.

With configuration switch 1 OFF, assuming no other ALDL configuration has been done, the default resistor and lookup table will be used. This allows plug and play connection of an LS1 coolant sensor.

With configuration switch 1 ON, the custom pullup and lookup table will be used.

The lookup table consists of 26 points, each representing 0.2v (ranging 0v to 5v inclusive). The temperature value can be defined for each of these 26 voltage points via ALDL, see the “ALDL Configuration” section at the end of these instructions.

It’s also possible to splice into an existing 0-5v coolant signal, by selecting the custom pullup without actually fitting a custom pullup resistor. The existing ECU must use a single pullup value (not switch between multiple like some OEM ECU’s do), and the voltage / temperature relationship needs to be known and configured in the custom lookup table.

ALDL configuration also includes flags to force use of a particular pullup or lookup table, regardless of switch position. This allows use of the on-board 330-ohm pullup with a custom lookup table, or a custom pullup with the default lookup table.

## Gear Position (Auto Transmission Applications)

**Pin 10 – White**  
**Pin 9 – White**  
**Pin 2 – White**  
**Pin 1 - White**

The factory instrument cluster can display selector position in auto transmission models. The simulator signals the instrument cluster transmission type (auto or manual), which is automatically determined at ignition on. If configuration switch 2 is ON (digital mode) and any of the A/B/C/P inputs are active, or configuration switch 2 is OFF (analog mode), then the cluster will be signalled this is an auto transmission vehicle. If an auto transmission is determined, selector position will be sent to the cluster, as calculated by one of 2 possible methods:

### **DIGITAL** (Configuration Switch 2 ON)

This works the same as the factory PCM on some models. The range switch has 4 switches (A/B/C/P) that are either open circuit or connected to earth, depending on selector position. These switches originally ran to the factory PCM. These can be connected directly to the simulator (or connected to the simulator in parallel with another ECU).

	<b>A</b> Pin 10	<b>B</b> Pin 9	<b>C</b> Pin 2	<b>P</b> Pin 1
<b>PARK</b>	Earthed	Open	Open	Earthed
<b>REVERSE</b>	Earthed	Earthed	Open	Open
<b>NEUTRAL</b>	Open	Earthed	Open	Earthed
<b>D4</b>	Open	Earthed	Earthed	Open
<b>D3</b>	Earthed	Earthed	Earthed	Earthed
<b>D2</b>	Earthed	Open	Earthed	Open
<b>D1</b>	Open	Open	Earthed	Earthed
<b>Factory Wire Colour</b>	Blue + White	Yellow	Grey	White

### **ANALOG** (Configuration Switch 2 OFF)

The simulator can also receive an analog voltage signal (0 to 5v) into pin 9 (PRND B input), such as from a sensor or potentiometer mounted on the selector.

This voltage is compared against a lookup table to determine current gear selector position. The lookup table is configured over ALDL, with min and max voltages for each gear position. See the "ALDL Configuration" section at the end of these instructions.

To determine values to configure each gear position in the lookup table, measure the voltage signal at each gear position. Find the voltage mid-point between each gear position, this will be the min of one and max of the other. If the voltage input is not in range of any of the lookup table points, no gear will be displayed.

Gear positions can be disabled by setting both min and max voltage to zero. By default, all gear positions are disabled, so no gears will display until they are configured in the lookup table.

# ALDL CONFIGURATION

Advanced settings can be configured via communicating with the simulator via ALDL.

The simulator uses device ID 0xF3. All frames have an initial data byte of 0xAA, to differentiate them from any factory ECU or scan tool functions.

All modes will return a response of the following format, if another is not specified:

F3	57	AA	MD	ER	CS
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MD	Mode that was requested	
ER	Error Code	
	00	No error. Task completed successfully.
	01	Unknown mode
	02	Invalid parameter count
	03	Parameter out of range
CS	Checksum	

0x00	REBOOT				
Send:					
F3	57	AA	00	0C	
Restarts PCM simulator as if ignition was switched OFF/ON.					

0x01	DATA FRAME								
Send:									
F3	58	AA	01	ID	0C				
Receive:									
F3	xx	AA	01	ID	D1	D2	...	Dx	CS
Get a data frame from the simulator.									
ID is a data frame ID, and D1,D2...Dx are data bytes:									

ID	Data Bytes		
01	Firmware Version		
	D1	Build Year	
	D2	Build Month	
	D3	Build Day	
	D4	Build Hour	
	D5	Build Minute	
02	Input Status		
	D1	Bitflags	
		0 (LSB)	Dipswitch 1 (Coolant type)
		1	Dipswitch 2 (Gear Position Type)
		2	Dipswitch 3
		3	Dipswitch 4 (Vehicle Type)
		4	Oil Pressure (Pin 12 – Blue)



		5	MIL Lamp (Pin 11 – Brown)
		6	Power / Econ (Pin 4 – Yellow)
		7 (MSB)	Low Speed Fan Request (Pin 3 – Green)
	D2	Bitflags	
		0 (LSB)	PRND A – Pin 10
		1	PRND B – Pin 9
		2	PRND C – Pin 2
		3	PRND P – Pin 1
		4	
		5	
		6	Pad L1 (currently unused)
		7 (MSB)	Pad L2 (currently unused)
	D3	Gear Position	
		7	Park
		6	Reverse
		5	Neutral
		4	D4
		3	D3
		2	D2
		1	D1
		0	Invalid / unknown gear
	D4	Coolant Temperature (0 to 215 degrees C)	
	D5	Coolant ADC value (8-bit representation)	
	D6	PRND ADC value (8-bit representation)	
03	Output Status (1 = ON, 0 = OFF)		
	D1	VATS	
	D2	AC Request	
04	Configuration		
	D1	Bitflags	
		0 (LSB)	Vehicle Type (0 = VT/VX, 1 = VY/VZ)
		1	Transmission (0 = Manual, 1 = Auto)
		2	Force Manual Trans
		3	Force Auto Trans
		4	Gear Position Type (0 = Analog, 1 = Digital)
		5	Force Gear Position Digital
		6	Force Gear Position Analog
		7 (MSB)	
	D2	Bitflags	
		0 (LSB)	Coolant Pullup (0 = 330R Default, 1 = Custom)
		1	Coolant Table (0 = Default, 1 = Custom)
		2	Force Default Coolant Pullup

		3	Force Custom Coolant Pullup
		4	Force Default Coolant Table
		5	Force Custom Coolant Table
		6	
		7 (MSB)	
	D3	Bitflags	
		0 (LSB)	Disable ABS Auto Response
		1	Disable SRS Auto Response
		2	
		3	
		4	
		5	
		6	
		7 (MSB)	
	05	Coolant Table 26 Data bytes. Table ranges 0-5v, 0.2v per cell. Each cell contains a temperature value from 0 to 215 degrees C. EG. D6: (0.2v * 6 <sup>th</sup> cell) = Temperature value at 1.2v position.	
	06	Gear Position Table 28 Data bytes. 7 x 2 Table, 16-bit/2-byte values at each location. Each location contains a millivolt value (0 – 5000).	
		D1	Drive 1, minimum voltage, high byte
		D2	Drive 1, minimum voltage, low byte
		D3	Drive 1, maximum voltage, high byte
		D4	Drive 1, maximum voltage, low byte
		D5, D6, D7, D8 repeats for Drive 2	
		D9, D10, D11, D12 repeats for Drive 3	
		D13, D14, D15, D16 repeats for Drive 4	
		D17, D18, D19, D20 repeats for Neutral	
		D21, D22, D23, D24 repeats for Reverse	
		D25, D26, D27, D28 repeats for Park	

## 0x02 OUTPUT CONTROL

Send:

F3	59	AA	02	ID	ST	CS
----	----	----	----	----	----	----

Control an output. This will only persist until something else triggers it to change state again (such as receiving a new data request from the BCM).

ID is the output ID, and ST is the state (0 = OFF, 1 = ON)

ID	Output
01	VATS
02	AC Request
03	Select custom coolant pullup
04	Select default 330 ohm coolant pullup

## 0x10 SAVE SETTINGS

Send:

F3	57	AA	10	FC
----	----	----	----	----

Save all current configuration settings and tables to EEPROM. This must be done after anything is changed (a configuration flag, or any table values) or they will not persist after the next ignition cycle.

## 0x11 LOAD SETTINGS

Send:

F3	57	AA	11	FC
----	----	----	----	----

Load all current configuration settings from EEPROM. This is automatically done at ignition on. If the EEPROM values are found to be invalid, default values are loaded in and the EEPROM re-written.

## 0x12 READ EEPROM

Send:

F3	59	AA	11	12	AH	AL	CS
----	----	----	----	----	----	----	----

Receive:

F3	69	AA	11	12	AH	AL	D1	D2	...	D16	CS
----	----	----	----	----	----	----	----	----	-----	-----	----

Read and return 16 bytes from EEPROM memory. AH / AL are the address bytes (high and low). D1 to D16 are the returned data bytes.  
Valid address range is 0 to 0x3EF

## 0x13 WRITE EEPROM

Send:

F3	69	AA	11	13	AH	AL	D1	D2	...	D16	CS
----	----	----	----	----	----	----	----	----	-----	-----	----

Write 16 bytes to EEPROM memory. AH / AL are the address bytes (high and low). D1 to D16 are the data bytes. Valid address range is 0 to 0x3EF.  
No verification or correction is done of the contents. The EEPROM contains a header, as well as CRC values for each table and the configuration flags. If at the next ignition cycle the header is missing, the entire EEPROM will be rewritten with default values. If one of the CRC values is invalid, that section will be rewritten with default values.

## 0x20 WRITE CONFIGURATION FLAG

Send:

F3	59	AA	20	ID	ST	CS
----	----	----	----	----	----	----

Write a single configuration option flag.

ID is the configuration item, and ST is the state (0 = disabled, 1 = enabled)

ID	Configuration Item
01	Force Custom Coolant Table
02	Force Default Coolant Table
03	Force Default Coolant Pullup
04	Force Custom Coolant Pullup
05	Force Gear Position Digital

06	Force Gear Position Analog
07	Force Manual Transmission
08	Force Auto Transmission
09	Disable Automatic ABS Data
0A	Disable Automatic SRS Data

### 0x21 CLEAR ALL CONFIGURATION FLAGS

Send:

F3	57	AA	21	EB
----	----	----	----	----

Clear all configuration flags that can be set with mode 0x20 to their default state (disabled).

### 0x22 WRITE COOLANT TABLE

Send:

F3	71	AA	22	D1	D2	..	D26	CS
----	----	----	----	----	----	----	-----	----

26 Data bytes. Table ranges 0-5v, 0.2v per cell.

Each cell contains a temperature value from 0 to 215 degrees C.

EG. D6: (0.2v \* 6<sup>th</sup> cell) = Temperature value at 1.2v position.

### 0x23 WRITE GEAR POSITION TABLE

Send:

F3	73	AA	22	D1	D2	..	D28	CS
----	----	----	----	----	----	----	-----	----

Gear Position Table

28 Data bytes. 7 x 2 Table, 16-bit/2-byte values at each location.

See data frame for further details (Mode 0x01, frame 06)

### 0x30 SET COOLANT TABLE LOOKUP VALUE

Send:

F3	59	AA	30	VT	TP	CS
----	----	----	----	----	----	----

Write a single coolant table voltage point with the corresponding temperature value.

VT is the voltage point (0 to 25, 0.2v per point. EG. point 6 is the 1.2v location).

TP is the temperature value (valid range 0 to 215 degrees C)

### 0x40 SET GEAR POSITION TABLE LOOKUP VALUE

Send:

F3	5C	AA	40	GEAR	MIN-H	MIN-L	MAX-H	MAX-L	CS
----	----	----	----	------	-------	-------	-------	-------	----

Write minimum and maximum voltages values for a single gear position.

GEAR indicates which gear to configure:

07	Park
06	Reverse
05	Neutral
04	D4
03	D3
02	D2
01	D1

MIN-H / MIN- L are the minimum voltage high and low bytes.

MAX-H / MAX-L are the maximum voltage high and low bytes.

Voltage range is 0 – 5000 millivolts.

Setting both min and max to 0 will disable that gear indication completely.