1104D and 1106D Electrical and Electronic Installation Guide

Draft 3.2

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Engine Component Overview

Engine Control Module

The A4E2 ECM is located on the left rear side of the engine. The ECM has 2 connectors, one for the engine harness and the other for the machine OEM harness functionality

The ECM is fuel cooled (see mechanical installation guide for details of fuel connection requirements)

Sensor Details

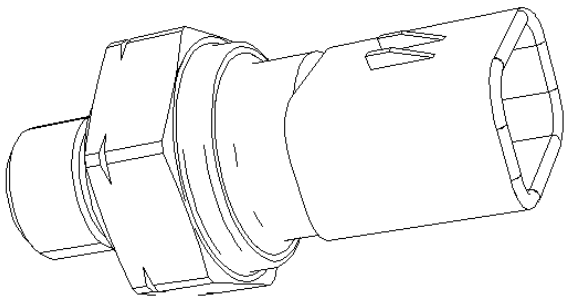
Intake manifold Pressure Sensor purpose

The intake manifold pressure signal monitors the air pressure inside the intake manifold, after the turbo, if fitted. The range is 0-339 Kpa absolute.
The sensor is used to limit fuel preventing black smoke during transient engine conditions, mainly during acceleration or upon sudden load application. i.e. If intake manifold pressure is too low for the requested fuel, then the fuel is limited to prevent the overfuel condition.

Intake manifold pressure is also used to control the smart turbo wastegate, if fitted. The smart wastegate control system regulates intake manifold pressure to the desired value, calibrated in the software. In order to do this, the software needs to know the actual value of intake manifold pressure, hence the need for the sensor.

Intake manifold pressure is also used to calculate atmospheric (barometric) pressure. Atmospheric pressure is used to limit fuel/torque at low atmospheric conditions e.g. at high altitude fuel may be limited to prevent turbo over-speed.

If the intake manifold pressure sensor/circuit fails, then a low default value is used in the software. The smart wastegate control (if fitted) will go to open loop, whereby the resultant intake manifold pressure will be low (as determined by the wastegate hardware chosen) and hence fuel will be limited under certain engine conditions, effectively providing a fuel/torque derate.



Intake Pressure Sensor

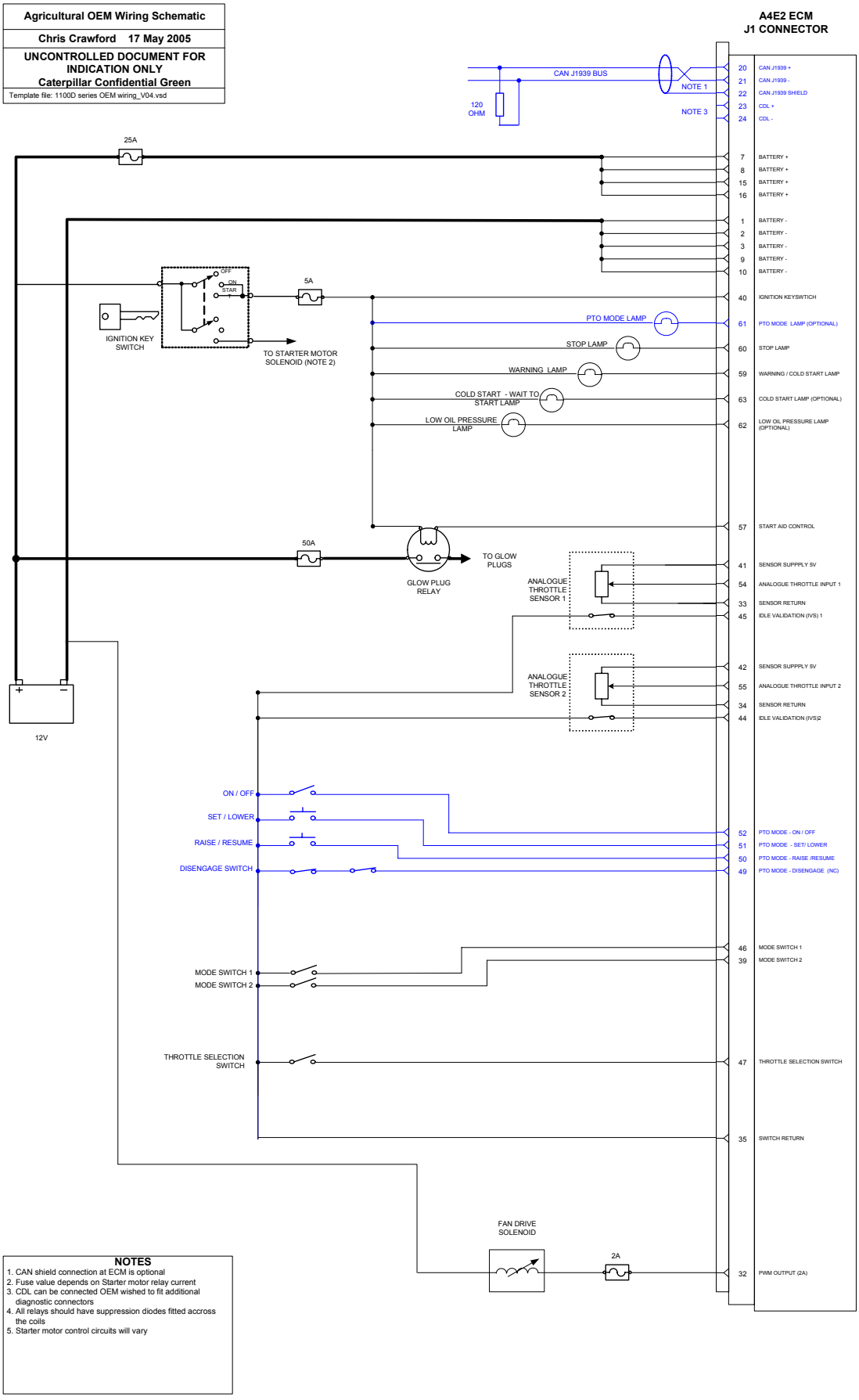
Intake Manifold Temperature Sensor

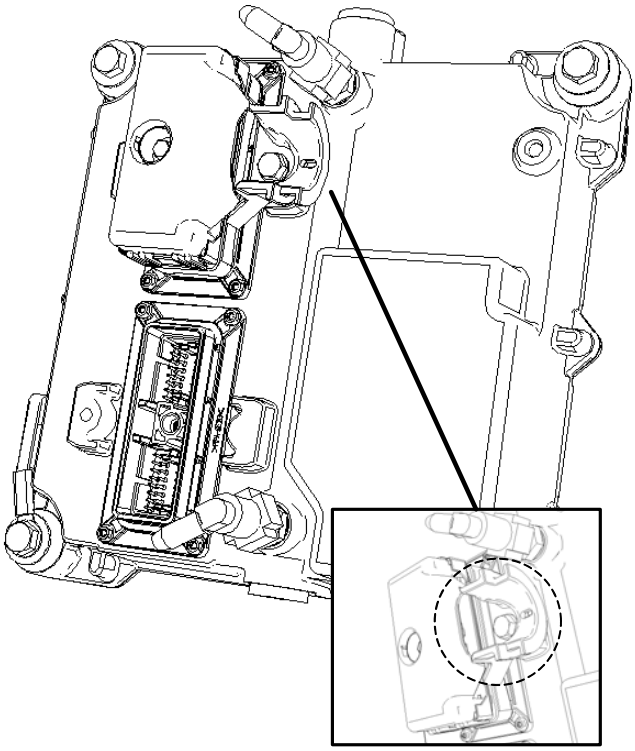
This sensor measure the temperature in the inlet air manifold in the range –40C to +120C.

Note that this is the sensor to which the engine is calibrated. Intake air temperature measurement is very sensitive to location. If the OEM adds additional inlet air temperature monitoring, for example during prototype evaluation, it should be anticipated that there may be a difference of several degrees Celsius between the engine sensor and the OEM sensor.

Intake manifold temperature is used primarily to determine the cold start strategy.

Example 4 - Agricultural Schematic OEM Harness





Harness Wiring Standards

General Recommendations for Machine Wiring harnesses

The following are general “good practice” for wire harnesses. It is the responsibility of the machine designer to follow standards appropriate to the application type and to the geographical territory where the machine will be operated. These recommendations do not replace in any way any industrial standards or legislative requirements:

Connectors

It is strongly recommended that high quality, sealed connectors are used throughout. Automotive standard components are not necessarily suitable as they are often only designed for a very low number of disconnect/reconnect cycles.

Connectors should be horizontally mounted rather than vertically mounted to prevent ingress of water/chemicals. Whenever possible, connectors should be mounted such that they are protected from direct exposure to extreme cold. Connectors can be damaged by frost if water does penetrate the seals.

Cables should not bend close to the connector seals, as the seal quality can be compromised.

The correct wire seal must be selected for the diameter of wire used.

Cables should be selected of an appropriate cross section for the current and voltage drop requirements

Where large numbers of wires go to the same connector, it is essential that no single wire is significantly shorter than the others, such that it placed under exceptional strain.

Cable routing.

Cables should be routed such that bend radii are not too tight. A cable should not be either in compression or tension, nor should it be excessively long or loose, such that sections may

The disadvantage of controlling speed via PTO mode is that it takes some time to ramp up or down to the required speed.

ON/OFF switch

When this switch input is open then the PTO mode cannot be engaged, and none of the other buttons will have any effect. When the switch is turned off, the memorized speed will be

Set/lower Button

When the PTO mode is on but not engaged, the first time that the set button is pressed it will save the current engine speed as the memorized speed, and the engine will try to run at this speed.

Once that a PTO speed has been engaged, if the pressed again, or if it is held down, then the engine speed will be lowered.

Raise/ Resume Button

If the resume button, is pressed before the set button, immediately after start or after switching ON the cruise control ON/OFF switch then the engine will go to the preset speed as described below.

If a the PTO mode has already been engaged by the set button, then the resume raise button can be pressed or held down to increase the speed.

After the PTO mode has been disengaged using the disengage switch described below, then pressing the Resume/Raise button will set the engine speed to the last memorized speed.

Disengage Switch

The disengage switch input is opened the engine speed will not follow the memorised speed, but will return to the next highest engine speed demand

The disengage switch may be a operator panel switch, or may be a micro switch on the brake, clutch, or other component of the application

Preset Speed

The preset speed is programmed via the service tool. A speed may be selected such that if the resume button is pressed, before the set button has been pressed, then the engine speed will jump straight to this speed.

Note: this feature will not be fully supported in the ECM or in the service tool by July 2005

PTO mode lamp

An optional lamp may be fitted. The positive terminal of the lamp is connected to the battery positive after the ignition keyswitch. The negative terminal of the lamp should be connected to pin 61 of the ECM J1 Connector

The lamp will FLASH when PTO mode is switched ON but is NOT ENGAGED. When the PTO mode is engaged then the lamp will be on SOLID when the PTO mode is ON and ENGAGED.

Engine Oil Pressure

Parameter	Engine Speed (rpm)	Trigger Pressure (kPa)
Warning	700	100
	900	150
	1000	175
	1200	200
Shutdown	700	100
	1200	100
	1800	100
	2400	100

* Derate thresholds will be released Jan 2005 for oil pressure.

Intake Manifold Temperature

Parameter	Temp	De-rate %
Warning	82	N/A
De-rate	86	10
	87	20
	88	30
	89	40
	90	50

Monitored Inputs for Customer Fitted Sensors

Configurable options will be available that enable the use of discrete ECM inputs to function as operator warnings and engine protection. The three options to be offered include:

	Input	State	De bounce Time (secs)	Warning/Shutdown	J1 Pin Assignment
Air Intake Restriction	SWG	Normally Open	30	Disabled or Warning	J1-47
Engine Coolant Level Low	SWG	Normally Closed	30	Disabled, Warning or Shutdown	J1-38
Water in Fuel	SWG	Normally Open	30	Disabled or Warning	44

Configurable States

The ECM may be configured to take the following action when the monitored element has reached or exceeded the predetermined limit (switched).

Section of SAE J1939 Document	PGN (decimal)	PGN (Hexidecimal)	PGN description	Parameter *(parameters in italics are proposed but may not yet be available / fully validated)*	Receive / Transmit
71	65242	FEDA	**Software Identification**		t
71				*Software Identification*	
71				*Number of software ID fields*	
71	65243	FEDB	**Engine Fluid Level_Pressure_2**		t
71				Injector Metering Rail1 Pressure	
71	65247	FEDF	**EEC3**		t
71				Engine Desired Operating Speed	
71	65251	FEE3	**EngineConfig**		t
71				*Engine Speed At Idle Pt1*	
71				*Percent Torque At Idle Pt1*	
71				*Engine Speed At Pt2*	
71				*Percent Torque At Pt2*	
71				*Engine Speed At Pt3*	
71				*Percent Torque At Pt 3*	
71				*Engine Speed at pt4*	
71				*Percent Torque at pt4*	
71				*Engine Speed at pt5*	
71				*Percen Torque at pt5*	
71				*Engine speed at high idle pt6*	
71				*Reference Engine Torque*	
71	65252	FEE4	**Shutdown**		t
71				Wait To Start Lamp	
71	65253	FEE5	**Engine Hours Revolutions**		t
71				*Total Engine Hours*	
71			**FuelConsumption**		t
71				*Total Fuel Used*	
71	65259	FEEB	**Component Identifier**		t
71				*Make*	
71				*Model*	
71				*Serial Number*	
71				*Unit Number*	
71	65260	FEEC	**Vehicle Identification**		t
71				*Vehicle Identification Number*	
71	65262	FEEE	**Engine Temp**		t
71				Engine Coolant Temperature	
71			**EngineFluidLevel_Pressure**		t
71				Engine Oil Pressure	
71	65264	FEF0	**Power Take Off Info (PTO)**		t
71				*PTO Set Switch*	
71				*PTO resume Swich*	
71				*PTO Enable Switch*	
71				*PTO coast / Decelerate Switch*	
71				*PTO accelerate Switch*	
71	65266	FEF2	**Fuel Economy**		t
71				*Fuel Rate*	

This is not the same as the implementation for tier 2 product but the change has been implemented to make the parameter more relevant to customers who need to determine how far and how rapidly the engine is lugging back. One effect will be that in many applications where there are high parasitic loads, the engine speed will never actually reach it's desired operating speed.

The lowest level (Level 1) is used for “warning” level faults, such as when engine design limits for temperature have been reached, or for a sensor short circuit.

The highest level (Level 3) is used for events where the severity merits the machine and the engine being immediately stopped.

Level 2 is an intermediate level used particularly for events or diagnostic which cause an engine derate

The status lamps in the DM1 message will be switched on according to the following table:

WCI	Protect Lamp	Warning Lamp	Shutdown Lamp
1	ON	OFF	OFF
2	ON	ON	OFF
3	ON	ON	ON

Previously Active Diagnostic Trouble Codes (DM2)

Identifier	Rate (msec)	PGN	Default Priority	R1	DP	Source	Destination
See note A	On Req	FECB	6	0	0	00	-

Send	Receive	Parameter name	Byte	Bit	Length	State	Units	Resolution (unit/bit)	Range		Note
									Min	Max	
		Malfunction indicator lamp									A
		Protect lamp									A
		Stop lamp									A
		Warning lamp									A
X		**SPN**									
X		**FMI**									
X		**Occurrence Count**									
X		**SPN conversion method**									

Note A: Lamp support as per DM1

Diagnostic Data Clear / Reset of Previously Active DTCs (DM3)

Identifier	Rate (msec)	PGN	Default Priority	R1	DP	Source	Destination
See Note A	On req	FECC	6	0	0	-	00

Send	Receive	Parameter name	Byte	Bit	Length	State	Units	Resolution (unit/bit)	Range		Note
									Min	Max	
	X	**Request to clear fault codes**									B

Note A: This message is sent as a request PGN.

Note B: when the ECM receives a DM3 message then it will clear all “diagnostic codes” but not “event” codes. The ECM will send an Acknowledge (ACK) message to say that this action is complete.