

# JACKAROO TIPS

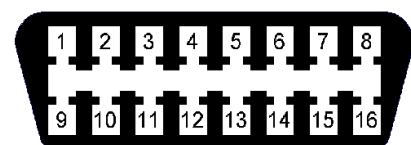
## Understanding the MIL fault codes on a Jackaroo Turbo Diesel

The Jackaroo, as with all vehicles intended to be supplied to the USA market, (as the Isuzu Trooper) is fitted with OnBoard Diagnostics (OBD) to enable rudimentary servicing of the vehicle by non dealer mechanics. It was introduced in the USA as a mandatory requirement in 1996 to ensure that air pollution standards could be maintained. The MIL (Malfunction Indicator Lamp) or commonly labelled *Check Engine* light is located in the instrument cluster. The intention was that all vehicles would have the MIL, the same electrical interface and use the same fault codes so that the same diagnostic test instrument could be used. As with all standards, some manufacturers argued that their vehicles were different and that they had developed their own codes to best analyse their vehicles. So what has now happened is that there are a number of "standard interfaces" across vehicles although the major manufacturers are generally consistent throughout their product range. General Motors and their affiliates eg. Isuzu use a form of the SAEJ1850 VPWM (Variable Pulse Width Modulation) data transmission scheme. But note that one company in the family - our local GMH had its own particular version MIL that has changed over time with successive models. Let us now focus on the Jackaroo.

On the Jackaroo, the Check Engine light is in the Tachometer display and is illuminated each time the ignition is switched on (along with sundry other indicator lights such as brake warning etc.) The OBD interface socket was mandated by the USA to be readily accessible and generally it is found on the driver's side near the steering column. On the Jackaroo it is a socket with a soft black plastic cover on a flying lead that hides beside your left knee over the transmission tunnel. From time to time you may note that the MIL illuminates, either as a flash or stays on permanently while driving. Whatever, it indicates the need to check the engine for a fault. These faults are stored in the ECU (Engine Control Unit) or more specifically called the ECM (Engine Control Module) in the Jackaroo. Some faults are deemed to be not immediately critical and if the fault is not detected after a number of runs, the fault is erased from memory. The critical faults are maintained and the MIL will remain illuminated. Non critical faults are stored but may not operate the MIL. There is a very large range of DTCs (Diagnostic Trouble Codes) to cover all types and sizes of engines eg. 4 cylinder diesels to larger V series petrol engines. The codes also include transmission, braking and other service operation faults.

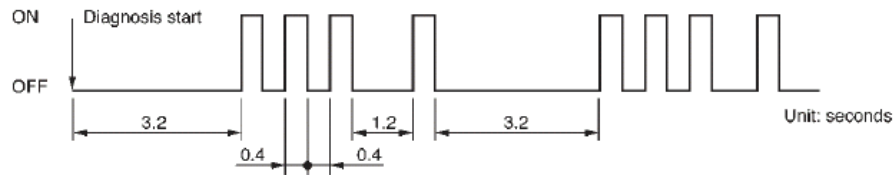
Authorised GMH dealers are equipped with a Tech 2 Scan Tester that enables them to read the fault codes and clear the fault indicator after repairing the fault. But what if you are "out in the bush" and you note the Check Engine light illuminated? Where is the fault? Is it in the engine or say the transmission? Is the fault critical or can the vehicle be driven (with care!)? Fortunately, the standards also require that the OBD system can be interrogated without a test instrument and, using a list of published codes determine the general nature of the fault.

How to read the Jackaroo fault codes? Firstly find the OBD interface socket. Then with the ignition off, link terminals 4 and 6 of the socket using a small piece of wire - a paper clip is ideal. Next step is to turn on the ignition (but don't start the engine) and note the number of flashes

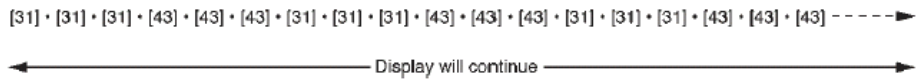


that the Check Engine light makes. The light will flash in a cadence to indicate the number of the code(s). If more than one DTC is stored then each code will be displayed in sequence until the ignition is switched off or the memory is cleared. If there is no flashing of the MIL then no code is currently stored. The following example has been extracted from the Isuzu Workshop Manual and shows the timing for the display of DTC 31. Where more than one code is stored then each code will be displayed three times followed by the next code three times and the sequence is then repeated. In this case, DTC 31 points to a fault in the EGR (Exhaust Gas Reticulation) VSV (Vacuum Switching Valve) circuit.

Example: DTC 31 is stored



Example: DTC 31 and 43 are stored

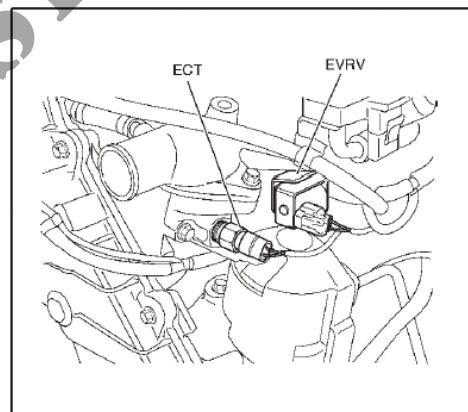


Once you have determined the DTC you may choose to clear the codes from memory but before you do, CAUTION. The ECM also records some freeze frame and failure record data that might be of use in tracking through a fault. When the memory is cleared this other information is also lost!

To clear the DTC memory without using a Tech 2 (or other code reader) the power to the ECM must be removed for at least 30 seconds. To disconnect power there are a number of options: disconnecting the fuse to the ECM, disconnecting the LH side connector feeding power to the ECM or disconnecting the main battery supply to the vehicle. Note that this last option will probably lose the radio presets etc. The main fuse to the ECM is located in the engine bay fuse and relay panel on the driver's side. Its position is labelled as ECM on the cover.

Once the memory is cleared it will take many start and run sequences for the ECM to build up its memory of operational parameters and the performance may be poor but gradually improve. Ideally, vehicle should be run through a specified run sequence eg. cold start, run at specified speeds for a certain time to confirm that the fault has been correctly rectified.

If your Jackaroo is running OK with no DTC recorded then you might wish to familiarise yourself with reading the codes. A simple DTC to simulate is the ECT (Engine Coolant Temperature) Sensor failure. With the ignition off, disconnect the plug to the ECT below the thermostat housing as shown. Start the engine and note the Check Engine light remains illuminated. Switch off the engine. Link terminals 4 and 6. Turn on the ignition only and note that the MIL flashes DTC 14 which is ECT failure. Turn off the ignition and refit the ECT connector. Before erasing the DTC note the cautionary comments above.



The above description is a much simplified summary of the functions of the ECM monitoring and data storage feature. The ECM is able to provide far more information on the operation of your Diesel Jackaroo eg. a freeze frame of the operating conditions at the instant the MIL was turned on, plus some real time performance parameters. These details are beyond the scope of this document and the Isuzu Workshop Manual should be consulted for further detail. Similar information is presented on the petrol Jackaroo.

The Jackaroo is highly dependent on many electrical sensors for its correct operation. Therefore it is essential that all connectors and their moisture seals are kept in good condition. Also, all cables should be neatly located using the correct mounting points and clips to minimise sheath damage and any fatigue from vibration.

Finally, slip a paper clip onto a copy of these fault codes and put them in your glove box. Your knowledge of reading the codes may save you much time and frustration as your Jackaroo gracefully ages into the future.

Philip Johnstone

### ISUZU - ECM DIAGNOSTIC TROUBLE CODES - 4JX1 DIESEL

DTC using a Tech 2	Flash DTC	Description	MIL
P0107	34	MAP Sensor Low Voltage	ON
P0108	34	MAP Sensor High Voltage	ON
P0112	23	Intake Air temp Sensor Low Voltage	ON
P0113	23	Intake Air temp Sensor High Voltage	ON
P0117	14	Engine Coolant Temp Sensor Low Voltage	ON
P0118	14	Engine Coolant Temp Sensor High Voltage	ON
P0121	33	Accel Position Sensor Rationality	ON
P0122	21	Accel Position Sensor Low Voltage	ON
P0123	21	Accel Position Sensor High Voltage	ON
P0182	15	Fuel Temp Sensor Low Voltage	ON
P0183	15	Fuel Temp Sensor High Voltage	ON
P0192	63	Rail Pressure Sensor Low Voltage	ON
P0193	63	Rail Pressure Sensor High Voltage	ON
P1193	64	RPCV Circuit Open/Short	--
P1194	61	Rail Pressure System Low Voltage	ON
P1195	61	Rail Pressure System High Voltage	ON
P1196	62	Rail Pressure System High Warning	ON
P0197	16	Oil Temp sensor Low Voltage	ON
P0198	16	Oil Temp sensor High Voltage	ON
P0201	51	Injector #1 Circuit Fault	ON
P0202	52	Injector #2 Circuit Fault	ON
P0203	53	Injector #3 Circuit Fault	ON
P0204	54	Injector #4 Circuit Fault	ON
P0217	22	High Coolant Temp Warning	ON
P1217	36	High Oil Temp Warning	ON
P0219	11	Engine Over Speed Warning	ON
P0336	43	Crank Position Sensor Out of Syncro	ON
P0337	43	Crank Position Sensor No Signal	ON
P0341	41	Cam Position Sensor Out of Syncro	ON
P0342	41	Cam Position Sensor No Signal	ON
P0380	66	Glow Relay Circuit Open/Short	—

DTC using a Tech 2	Flash DTC	Description	MIL
P0381	67	Glow Lamp Circuit Open/Short	—
P1403	32	EGR EVRV Fault	—
P1404	31	EGR VSV Circuit	—
P0405	26	EGR Pressure Sensor Low Voltage	ON
P1405	37	EGR EVRV Circuit Open/Short	—
P0406	26	EGR Pressure Sensor High Voltage	ON
P0475	71	EXH #1 VSV Circuit Open/Short	—
P1475	71	EXH #2 VSV Circuit Open/Short	—
P1485	74	Intake Throttle Position Sensor Low Voltage	ON
P1486	74	Intake Throttle Position Sensor High Voltage	ON
P1487	73	Intake Throttle System Circuit Open/Short	ON
P1488	72	Intake Throttle Motor Control Circuit Signal Gap	—
P0502	24	Vehicle Speed Sensor No Signal	ON
P0510	75	Idle SW Malfunction, Open Circuit	ON
P1510	75	Idle SW Malfunction, Short Circuit	ON
P0562	35	System Voltage Too Low	ON
P1562	35	System Voltage Too Low at Cranking	ON
P1587	25	Brake SW Malfunction [B]	—
P1588	25	Brake SW Malfunction [A]	ON
P0601	55	ECM Checksum Error	ON
P1626	56	Immobilizer No Signal	ON
P1631	56	Immobilizer Wrong Signal	ON
P1648	56	No Security Code Entered	ON
P1649	56	Immobilizer Function not Programmed	ON
P0650	77	Check Engine Lamp Circuit Open/Short	—
P0654	27	Tachometer Circuit Open/Short	—
P1655	17	Thermo Relay Circuit Open/Short	—
P1657	76	ECM Main Relay Circuit Open/Short	—
P1589	47	Transmission SW Circuit Open/Short	—

A similar group of codes apply to the petrol engine Isuzu.

## ISUZU - ECM DIAGNOSTIC TROUBLE CODES – PETROL (Auto , Manual Trans)

DTC	Flash	Description	A/T	M/T
P0101		MAF system performance	B	B
P0102		MAF sensor circuit low frequency	A	A
P0103		MAF sensor circuit high frequency	A	A
P0107	33	MAP sensor circuit low voltage	A	A
P0108	33	MAP sensor circuit high voltage	A	A
P0112	33	ITA sensor circuit low voltage	A	A
P0113		ITA sensor circuit high voltage	A	A
P0117	14	ETC sensor circuit low voltage	A	A
P0118	14	ETC sensor circuit high voltage	A	A
P0121	22	TP system performance	A	A
P0122	21	TP sensor circuit low voltage	A	A
P0123	21	TP sensor circuit high voltage	A	A
P0131		HO2S circuit low voltage bank 1 sensor	A	A
P0132		HO2S circuit high voltage bank 1 sensor	A	A
P0134		HO2S circuit insufficient activity bank 1 sensor	A	A
P0151		HO2S circuit low voltage bank 2 sensor	X	X
P0152		HO2S circuit high voltage bank 2 sensor	X	X
P0171		Fuel trim system lean bank 1	B	B
P0172		Fuel trim svstem rich bank 1	B	B
P0174		Fuel trim system lean bank 2	K	X
P0175		Fuel trim system rich bank 2	X	X
P0201		Injector 1 control circuit	A	A
P0202		Injector 2 control circuit	A	A
P0203		Injector 3 control circuit	A	A
P0204		Injector 4 control circuit	A	A
P0205		Injector 5 control circuit	A	A
P0206		Injector 6 control circuit	A	A
P0218		T over temp	D	X
P0325	66	KS sensor circuit	B	B
P0327	66	KS sensor circuit	B	B
P0336		58X reference signal circuit	B	B
P0337	43	CKP sensor circuit low frequency	B	B
P0341	41	CMP sensor circuit performance	B	B
P0342	41	CMP sensor circuit low	B	B
P0351		Injector 1 control circuit	A	A
P0352		Injector 2 control circuit	A	A
P0353		Injector 3 control circuit	A	A
P0354		Injector 4 control circuit	A	A
P0355		Injector 5 control circuit	A	A

P0356		Injector 6 control circuit	A	A
P0402	34	EGR pintle crank error	A	A
P0404	34	EGR open stuck	A	A
P0405	34	EGR low voltage	A	A
P0406	34	EGR high voltage	A	A
P0502	24	VSS circuit low input	B	B
P0560		T voltage	C	X
P0562		System voltage low	D	D
P0563		System voltage high	B	B
P0601		PCM memory	A	A
P0705		T range circuit	D	X
P0706		T range rate	D	X
P0712		T temp LO	D	X
P0713		T temp HI	D	X
P0719		T switch B LO	D	X
P0722		T shaft speed no signal	C	X
P0723		T shaft speed rate	C	X
P0730		T gear ratio	C	X
P0748		Press solenoid circuit	C	X
P0753		T solenoid A circuit	C	X
P0758		T solenoid B circuit	C	X
P1127		CO Adjust error	X	X
P1154		H02S circuit transition time ratio bank 2 sensor I	X	X
P1171		Fuel system lean during acceleration	A	A
P1380		ABS rough road ABS system fault	A	A
P1404		EGR Closed stuck	A	A
P1508		IAC system low RPM	B	B
P1509		IAC system high RPM	B	B
P1618		Serial peripheral interface SPI	C	X
PI 625		PCM unexpected reset	D	D
P1626		Immobiliser no response	D	D
P1631		Immobiliser incorrect response	D	D
P1640		Driver 1 input high voltage	D	D
P1648		Immobiliser - wrong key	D	D
P1649		Immobiliser - no key	D	D
P1790		T ROM checksum	C	X
P1792		EEPROM checksum	C	X
P1835		T kick down switch	D	X
P1850		Brake band solenoid	D	X
P1860		TCC PWM circuit	D	X

### **Type of Fault Code**

- A - Emission related P-code, Check Engine Light on as soon as a failure detected.
- B - Emission related P-code, Check Engine Light on if a failure detected in two consecutive trips.
- C - Non emission related P-code, Check Engine Light on if a failure detected in one trip.
- D - Non emission related P-code, no Check Engine Light, but P-code will be set if a failure detected.
- X - Do not check.

### **Abbreviations**

ABS	Antilock Brake System
CKP	Crankshaft Position
CMP	Cam Position
DTC	Diagnostic Trouble Code
ECT	Engine Coolant Temperature
ECM	Engine Control Module (also PCM)
EEPROM	Electrically Erasable Programmable Read Only Memory
EGR	Exhaust Gas Reticulation
EVRV	Electric Vacuum Regulating Valve
IAC	Idle Air Control
IAT	Input Air Temperature
KS	Knock Sensor
HO2S	Heated Oxygen Sensor
MAF	Mass Air Flow
MAP	Manifold Absolute Pressure
MIL	Malfunction Indicator Lamp
PCM	Powertrain Control Module (also ECM)
PCV	Positive Crankcase Ventilation
QOS	Quick On Start
TCC	Torque Converter Clutch
TOSS	Transmission Output Shaft Sensor
TP	Throttle Position
VSS	Vehicle Speed Sensor