13/14CU AND 14CUX SYSTEMS

Introduction

Three variations of similar Lucas engine management systems have been used on Land Rover vehicles from 1987 to selected 1995 models. Operation of each of these systems is fundamentally the same, the differences between each being enhancements to self diagnostics, improved adaptability to operating conditions, and additional input/output capability. All of these systems utilize a Engine Control Module, and all are tied to vehicle inputs and outputs through a similar 40 pin connector.

The systems used are:

- 13 CU (1987-88)
- 14 CU (1989)
- 14 CUX (1990-95)

The system control modules are mounted under the passenger seat on 1987-1994 vehicles. The module is moved to a position just behind the glove box on 1995 models.

The ECM works with system inputs and outputs to deliver the best possible combination of engine performance and economy while minimizing vehicle emissions.

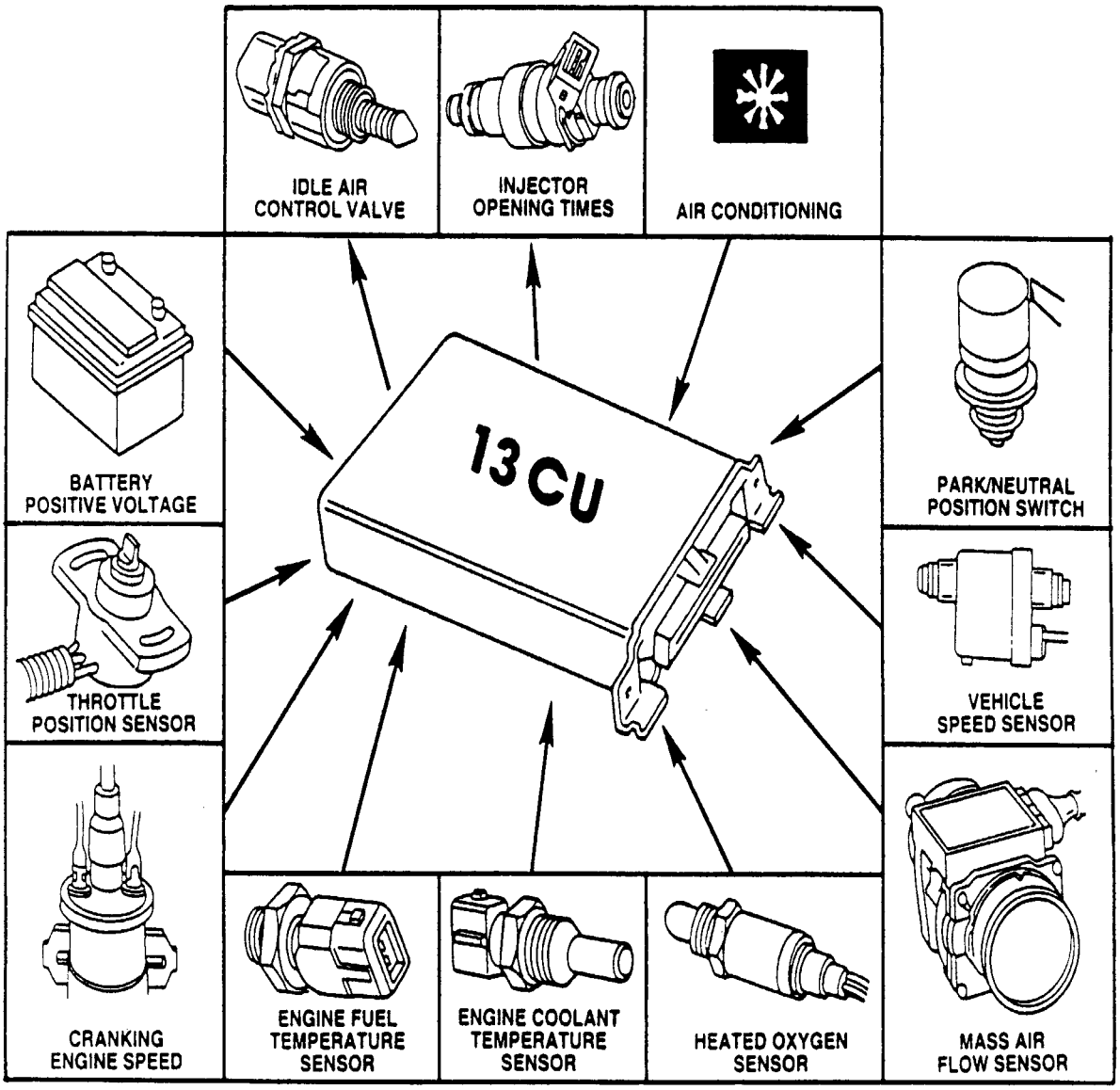
13 CU

The 13 CU module receives the following inputs:

- Key on
- Battery voltage
- Throttle Position Sensor (TPS)
- Engine speed
- Engine Fuel Temperature (EFT) sensor
- Engine Coolant Temperature Sensor (ECT)
- Heated Oxygen Sensor (HO2S)
- Mass Air Flow Sensor (MAF)
- Vehicle Speed Sensor (VSS)
- Park/Neutral Position Switch (PNPS)
- Air Conditioning Fan and Mode Switch
- Heated Rear screen load (1987 only)

The following are 13 CU outputs:

- Fuel Injectors
- Idle Air Control Valve (IACV)
- Malfunction Indicator Lamp (MIL)
- Fuel Pump/ Oxygen Sensor Heaters Relay
- Main relay



13CU System Inputs and Outputs

14CU and 14CUX

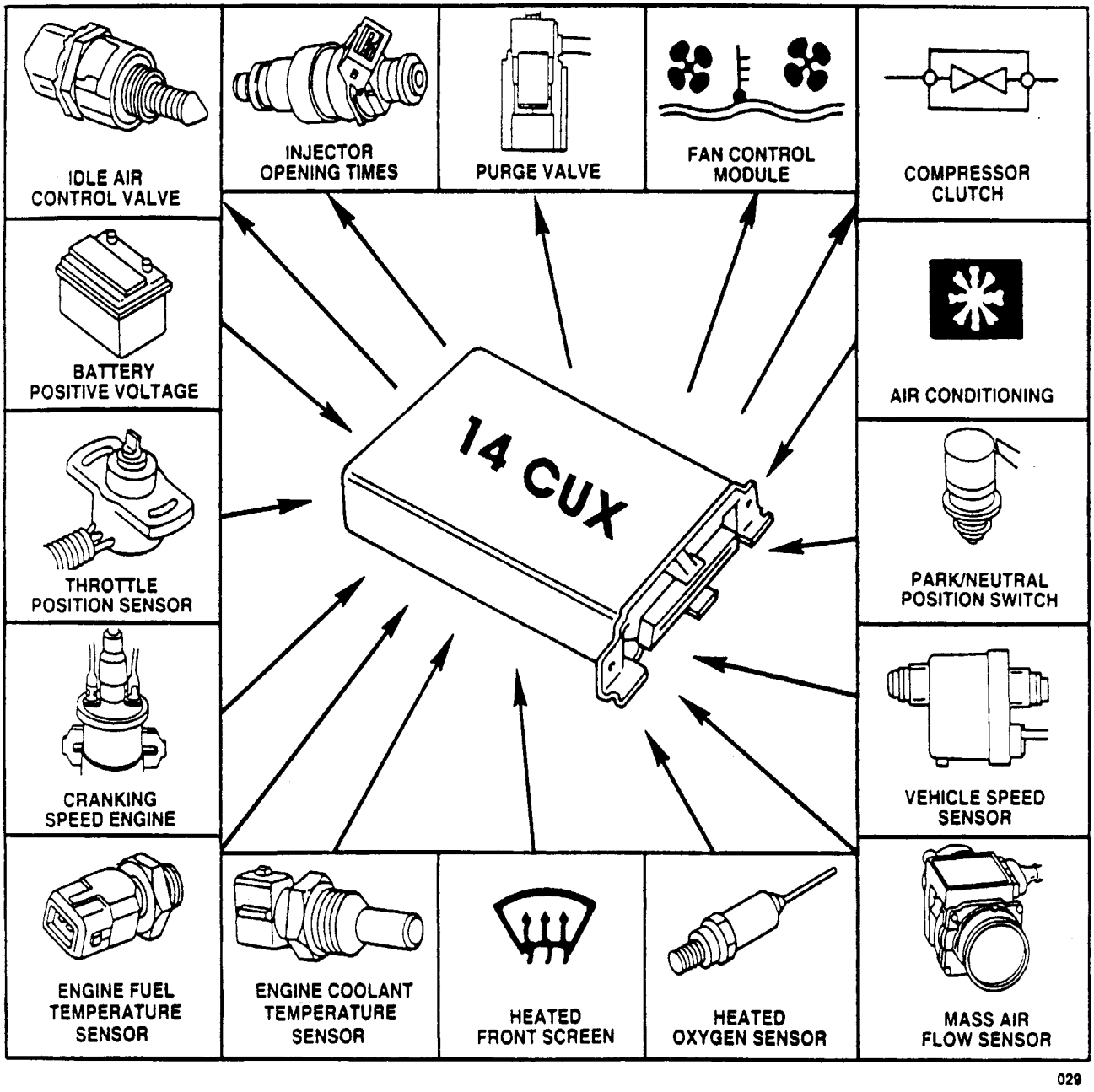
The 14CU and 14CUX modules include additional inputs and output controls for more precise control of the air-fuel mixture and enhanced self-diagnostic capabilities.

The following are ECM inputs:

- Key on
- Battery voltage
- Throttle Position Sensor (TPS)
- Engine speed
- Engine Fuel Temperature (EFT) sensor
- Engine Coolant Temperature Sensor (ECT)
- Heated Front Screen
- Heated Oxygen Sensor (HO2S)
- Mass Air Flow Sensor (MAF)
- Vehicle Speed Sensor (VSS)
- Park/Neutral Position Switch (PNPS)
- Air Conditioning Fan Switch (14CU only)
- Air Conditioning Thermostat

The ECM outputs are as follows:

- Fuel Injectors
- Idle Air Control Valve (IACV)
- Purge Valve (CANPV)
- A/C Compressor Clutch
- A/C Condenser Fan Control Module (FCM)
- Malfunction Indicator Lamp (MIL)
- Fuel Pump/ Oxygen Sensor Heaters Relay
- Main relay
- Fault Code Display Unit (14CUX only)



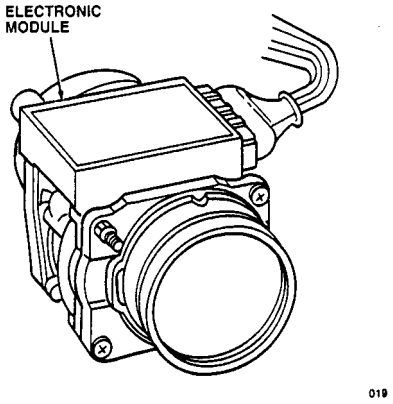
14CUX Inputs and Outputs

SYSTEM INPUTS

Mass Air Flow Sensor (MAF)
The Mass Air Flow (MAF) sensor is a hot-wire type. It contains two wires, one heated to a known value of 100° C (212° F) above the other. As air flow increases, the current required to maintain this difference in temperature increases. The air flow meter's circuitry converts this current requirement into a signal the ECM uses to determine the amount of air entering the intake manifold.

Typical MAF output voltage at idle is between 1.3 and 1.5 VDC. A diagnostic trouble code (12) is produced if MAF voltage is:

- less than 122 mV with RPM in excess of crank speed.
- greater than 4.96 V with RPM less than 976 for more than 160 milliseconds.



Mass Air Flow Sensor

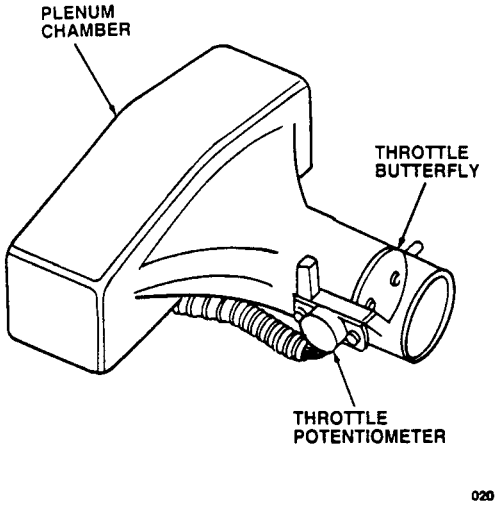
Throttle Position Sensor (TPS)
This potentiometer is mechanically linked to the throttle butterfly and provides an output voltage proportional to the butterfly position. This information allows the ECM to determine throttle position and is used for ECM strategies like the following:

- Acceleration Enhancement - The ECM increases the amount of fuel normally provided for a given throttle position during periods of peak acceleration. This allows the system to anticipate fuel needs.
- Deceleration Fuel Shut-off - During throttle closed deceleration, the ECM does not activate fuel injectors (zero pulse-width) to prevent unneeded fuel from entering the cylinders. This strategy protects against catalytic converter overheating and reduces fuel consumption.

13 CU throttle position sensors must be set to an initial output reading of 290-360 mV when installed. Gradual loosening of the TPS or damage to the throttle stop could cause the sensor to move out of range.

14 CU and CUX throttle circuitry is adaptable within a range of 80 to 500 mV. Within this range, the PCM will adapt to the initial setting and use it as a reference. There is no need to adjust the TPS following installation on these models. If the TPS should fail, the ECM will use a default value of 576 mV and the MIL will be illuminated.

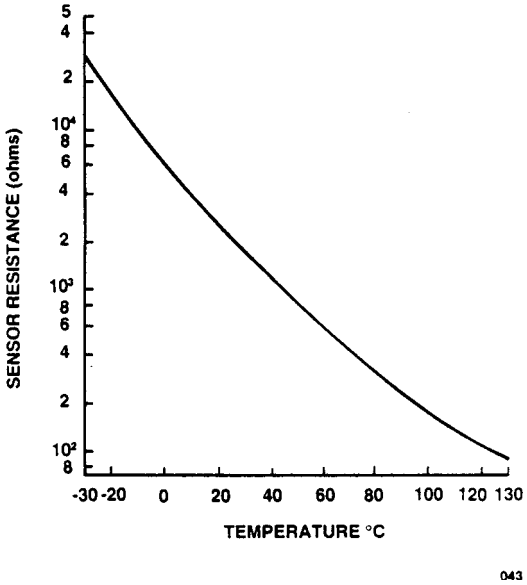
A diagnostic trouble code (17) is set when sensor output is less than 78 mV for longer than 160 milliseconds.



Throttle Position Sensor

Engine Coolant Temperature Sensor (ECTS)
The ECTS is a resistor based sensor. As coolant temperature increases, sensor resistance decreases. The ECM uses this information for hot- and cold-start strategies that require additional fuel delivery. It also uses this information to help determine when to enter closed loop operation.

A diagnostic trouble code (14) is stored when the signal is out of range (0.15V to 4.9V) for longer than 160 milliseconds. The MIL will illuminate and the ECM will substitute a default value of 36° C (97° F).



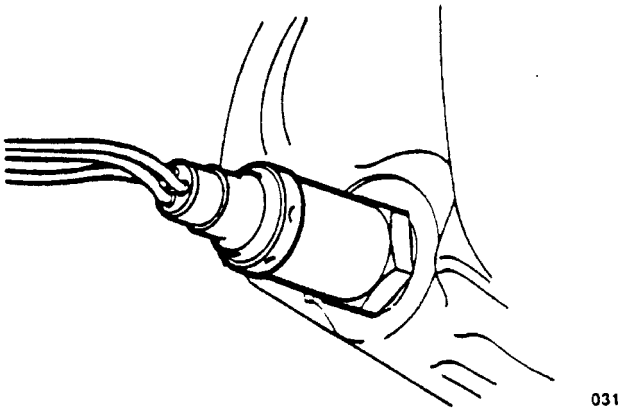
Coolant Temerature Sensor Response

Engine Fuel Temperature Sensor (EFTS)
The fuel temperature sensor, mounted on the fuel rail, operates in the same manner as the ECTS. When the ECM receives a high fuel temperature input, it increases injector pulse during hot restarts. When fuel is hot, vaporization occurs in the fuel rail and bubbles may be found in the injectors. This can lead to hard starting. Increasing injector pulse time flushes the bubbles away and cools the fuel rail with fresh fuel from the tank. Since 1989, the EFTS has also been used by ECM to trigger operation of the radiator fans when under-hood temperatures become extreme.

As with the engine coolant temperature sensor, a diagnostic trouble code (15 [14CUX only]) is stored when the signal is out of range (0.08V to 4.9V) for longer than 160 milliseconds. No default value is provided by the ECM, however the MIL will illuminate.

Heated Oxygen Sensor (HO2S)

The heated oxygen sensor is mounted in each exhaust downpipe and is used by the ECM to determine whether the engine is operating rich or lean. The ECM uses this information to increase or decrease injector pulse width to bring the air/fuel ratio as close to Stoichiometric as possible. The ECM monitors each sensor separately and makes fuel trim adjustments to each cylinder bank independent of the other.



Typical Heated Oxygen Sensor

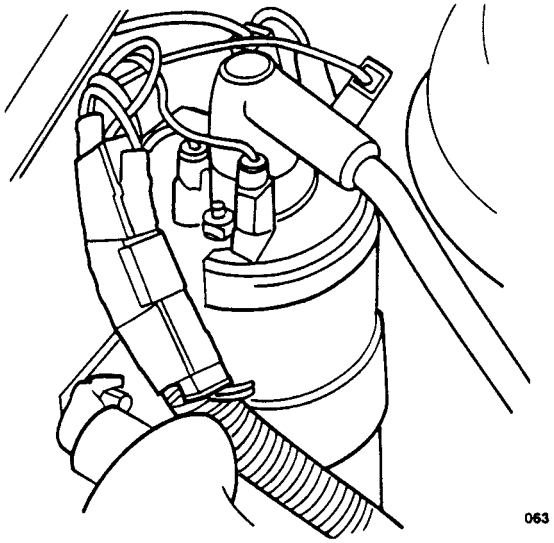
Oxygen sensors operate efficiently only when warm. Heated sensors reach operating temperatures quickly to provide accurate information to the ECM soon after start-up and allow closed loop operation to occur sooner. This helps provide an efficient fuel mixture during engine warm-up and guards against catalytic converter overheating.

The sensors operate in a range of 0 to 1.1 VDC. To avoid the possibility of interference in this narrow range of operation, each input wire is shielded against RF interference.

Diagnostic trouble codes (44/45) are produced if either HO2S will not switch after the ECM has radically altered fueling on that bank of injectors. The test is performed when the engine is at normal operating temperature, TPS input is above 2 volts, and a road speed input is received.

Park/Neutral Position Switch (PNPS)
The ECM uses this information on transmission gear selection to determine correct positioning of the Idle Air Control (IACV) valve. A diagnostic trouble code (69 [14CUX only]) is set when sensor voltage is 5 V during cranking or 0 V with RPM above 2663 and MAFS voltage above 3 V.

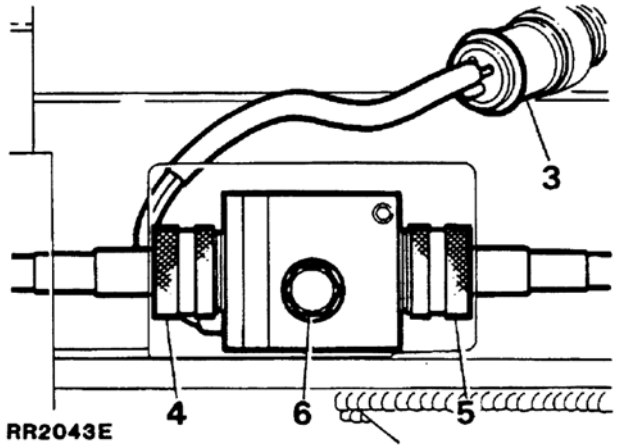
Engine Speed
The ECM determines engine speed from data received through the negative coil lead. A dropper resistor (6800 ohms) reduces the voltage at the ECM to approximately 7 volts. The ECM requires a pulse from the ignition system before energizing injectors.



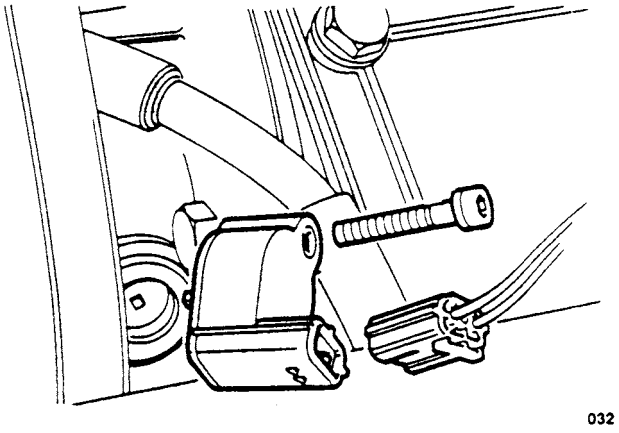
Coil Leads

Vehicle Speed Sensor (VSS)

The Vehicle Speed Sensor is located on the left hand side of the frame on early models, and on the left hand side of the transfer case on later models. It informs the ECM when vehicle speed is above or below 3 mph. This information is used by the ECM to ensure that the idle air control valve (IACV) is moved to a position to prevent a stall when the vehicle comes to a stop. DTC 68 will be displayed if the MAF is greater than 3V at 2000-3000 RPM's



Vehicle Speed Sensor 1987-1995



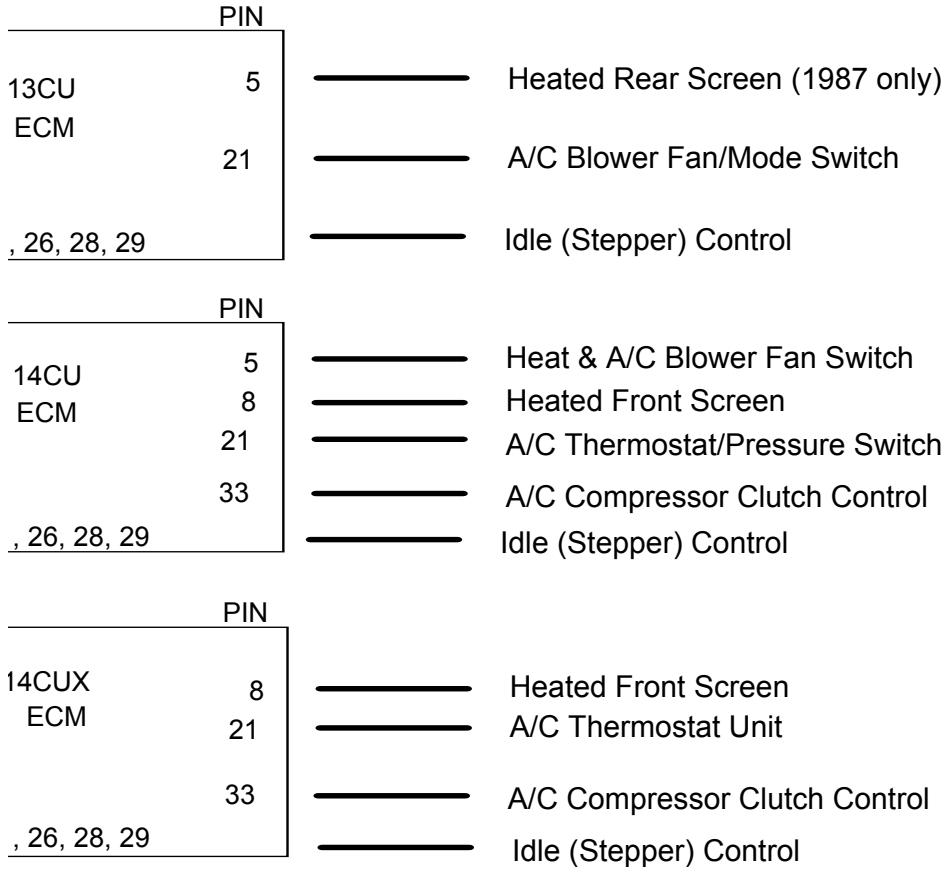
Vehicle Speed Sensor 1995- Onward

A/C Fan Switch Input (13CU and 14CU only)
This indicates that heater or A/C blower motor operation has been requested via the dash control panel. On 13CU systems, this is the only Air Conditioning system input signal. The ECM will compensate for the additional engine load and adjust idle speed accordingly. On 14CU systems, this signal is used in combination with the A/C thermostat input signal.

A/C Thermostat Input (14CU and 14CUX only)
By indicating when the A/C compressor is operating, the ECM can compensate for the additional engine load and adjust idle speed accordingly. On 14CU systems this signal comes from the A/C thermostat, through the A/C high pressure switch. On 14CUX, this signal comes from the A/C thermostat control unit.

Heated Rear Screen (1987 M.Y. 13 CU only)
By indicating when the heated rear screen is in use, the ECM can compensate for the additional load the generator produces on the engine by adjusting the idle speed.

Heated Front Screen (14 CU and 14 CUX only)
By indicating when the heated front screen is in use, the ECM can compensate for the additional load the generator produces on the engine. The ECM will then adjust the idle speed accordingly.



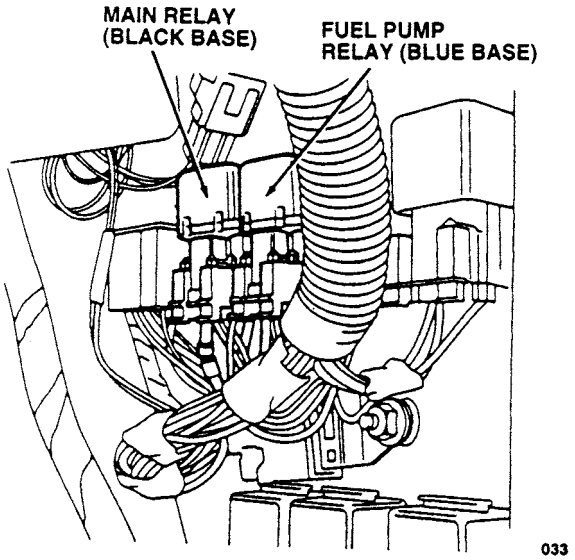
OUTPUTS

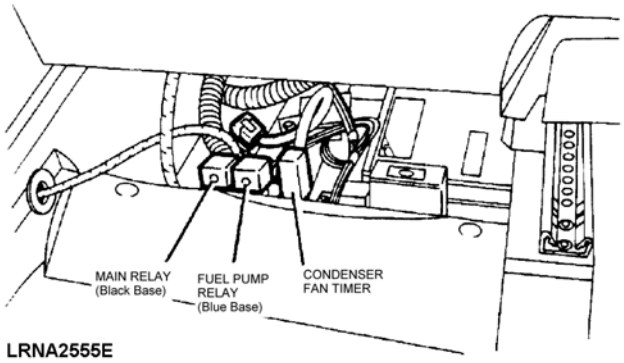
Main relay

The ECM provides power to both fuel injector banks, MAFS, the fan module, and fault display via the main relay. The relay is located under the passenger seat on most models. For 1995, the relay has been moved to the engine compartment where it is mounted on the passenger side fender wall. On Defender, the relay is mounted on the passenger side of the bulkhead.

Fuel Pump Relay

The fuel pump relay is located next to the main relay. The ECM provides power to the fuel pump, HO2S heaters and purge valve through the fuel pump relay. The ECM operates the fuel pump for one second at key on and then when it senses a crank/run signal from the ignition system.





Relay Locations 1987-1995Relay Locations 1995

Fuel Injectors
The ECM provides ground side switching to both A (pin 13) and B (pin 11) injector banks. Banks are operated alternately except at start-up when simultaneous operation is used to provide additional fuel to the system. Injectors are shut off during deceleration.

The ECM controls fuel volume through injector pulse width. Pulse width varies between approximately 2.4 milliseconds at idle to a maximum of approximately 9.0 milliseconds at full load. Each injector has a resistance of 16 ohms. Resistance value of the complete injector circuit (wired in parallel) will be approximately 4 ohms.

Idle Air Control Valve (IACV)
The idle air control "stepper motor" operates through a range of 180 steps with the 0 position completely open and the 180 position fully closed. The further open the valve is positioned, the higher the idle speed will be. Idle position on a vehicle at normal operating temperature with no engine load is approximately 160. The ECM opens the valve a fixed number of steps in response to input signals from load producing items such as the air conditioning compressor, front defroster, and transmission shifting out of Park/Neutral. Resistance in the IACV coils ranges from 40-60 ohms at room temperature and up to 70 ohms when hot.

Malfunction Indicator Lamp (MIL)
Formerly known as the CHECK ENGINE lamp, the MIL illuminates when the ECM determines an emissions-related component has failed. The MIL also illuminates at key-on and vehicle start-up to test bulb operation.

Purge Valve (CAN PV) 14 CU, 14 CUX only
Land Rover vehicles contain an evaporative emission system designed to capture vapors produced by the vehicle's fuel system. Evaporative emissions from the fuel tank are trapped in a carbon filled canister before they can reach the atmosphere. These vapors are then vented to the plenum chamber through a purge valve during engine operation. The ECM pulses the valve open for short periods below 1700 RPM and holds it open at higher speeds once the engine has achieved operating temperature and is in closed loop. Operating temperature is defined as engine coolant temperature above 54° C (130° F).

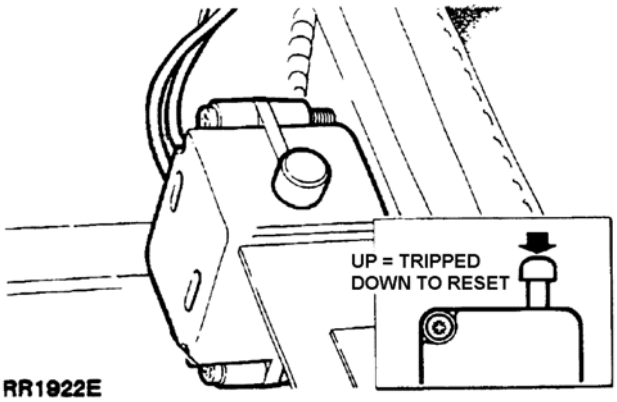
The ECM monitors the need for canister purge by looking at HO2S response when the valve is opened. No change in HO2S response with the valve open indicates that the canister has been purged of fuel vapor and continued valve operation is no longer necessary. Operation of the purge function when no longer required can negatively impact vehicle emissions.

A/C Compressor Relay
The ECM controls operation of the electronic A/C clutch through this relay. The ECM provides a ground path for the relay circuit when it receives a request for A/C operation from the A/C control panel.

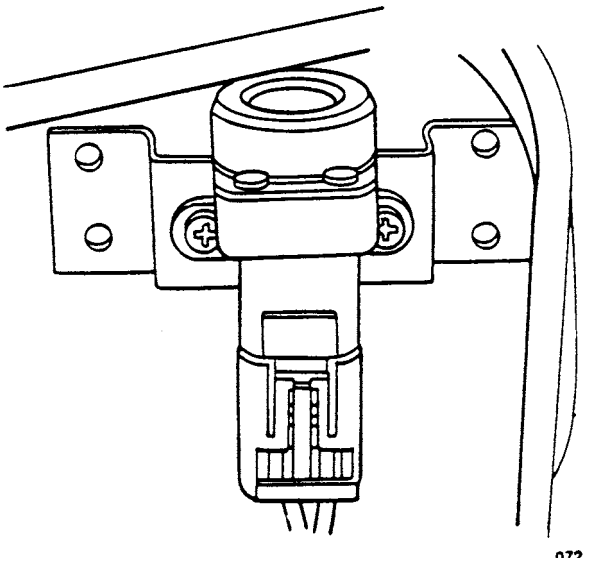
Fan Control Module (FCM)
The ECM remains powered for approximately five seconds after the ignition is switched to OFF. During this time, it monitors under-hood temperature through the engine fuel temperature sensor. If measured temperatures exceed 70° C (150° F), the ECM grounds the fan control module, allowing the condenser fans to run for ten minutes.

Inertia Switch

The inertia switch isolates the power supply to fuel pump in the event of extreme deceleration like that which would occur in a collision. The inertia switch is located under the left front seat on 1987-1994 vehicles, and on the bulkhead at the back of the engine compartment from 1995. It can be reset by pressing the button at the top of the switch.



Inertia Switch 1987-1994

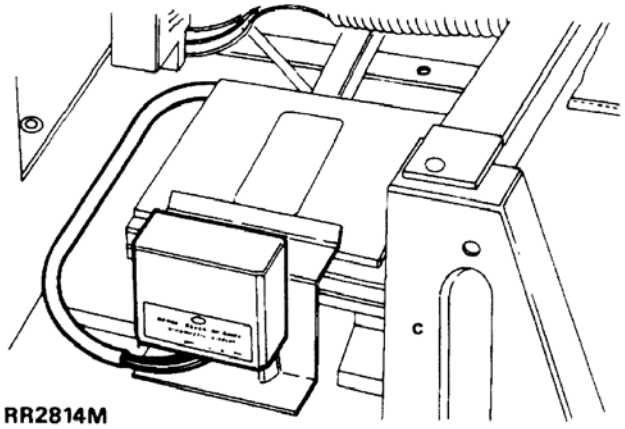


Inertia Switch 1995

Engine On-Board Diagnostic (OBD) System

Much of the new technology introduced on these engine control systems is directed toward improving the quality of exhaust gas emissions and reducing air pollution. Much of this has been mandated by legislation that originated with the California Air Resources Board (CARB). Control system self-diagnostics, or On-Board Diagnostics (OBD) for vehicle emissions are included in the 14 CUX engine control system.

OBD regulations produced by CARB require that vehicles monitor operation of key emissions components such as the oxygen sensor, fuel delivery system, and ECM. Failure of components in these systems is indicated by the illumination of a CHECK ENGINE or Malfunction Indicator Lamp (MIL) on the instrument cluster.



On-board Fault Display Unit

Diagnostic Trouble Codes (DTCs) are provided to help direct the technician to the source of the concern. They can be retrieved with the TestBook or the Lucas HHT.

Codes are also displayed on 1990-1995 models, via the on-board fault display. No additional diagnostic equipment is required and if a system fault exists, it is displayed any time the ignition switch is in the ‘on’ position. Any additional faults are displayed in order of system priority, but only one at a time.

The following procedure displays the codes, and clears the fault memory:

1 Switch On ignition.

2 Disconnect serial link mating plug, wait 5 seconds, reconnect.

3 Switch OFF ignition, wait for main relay to drop out.

4 Switch ON ignition. The display should now reset. If no other faults exist, and the original fault has been rectified, the display will be blank.

5 If multiple faults exist repeat Steps 1 to 4. As each fault is cleared the code will change, until all faults are cleared. The display will now be blank.

System Fault Codes

13CU and 14CU systems have a limited number of self-diagnostic fault codes, however all of the basic system areas such as Oxygen Sensors, Throttle Potentiometer, Air Flow Sensor, and Coolant Sensor are monitored.

14CUX sytems are OBD (I) compliant, and will display the following faults, which are listed in order of display priority:

Code	Description
02	ECM Power Disconnected (displays only until first key on/key off cycle)
29	ECM Memory Check
44	Lambda Sensor A
45	Lambda Sensor B
25	Ignition Misfire
40	Misfire Bank A
50	Misfire Bank B
12	Airflow Meter
21	ECM Tune Select
34	Injector Bank A
36	Injector Bank B
14	Coolant temperature Sensor
17	Throttle Potentiometer
18	Throttle Potentiometer high while Airflow Meter low
19	Throttle Potentiometer low while Airflow Meter high
88	Purge Valve
28	Intake System Air Leak
23	Fuel Supply
48	Stepper Motor
68	Road Speed Sensor
69	Automatic Transmission Gear Switch
59	Fuel Supply or Air Leak Group fault
15	Fuel Temperature Sensor

SYSTEM DIAGNOSTICS

A technician's approach to diagnostics of any vehicle system should include the following steps:

- Verify the customer concern
- Determine related symptoms
- Isolate the source of the concern
- Perform the required repair
- Verify system operation

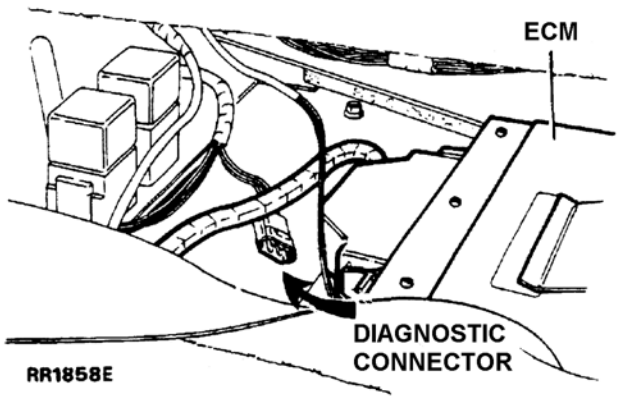
As indicated, the first step in vehicle diagnosis is verification of the customer's concern. This can eliminate time spent unnecessarily searching for the cause of a normal operating condition. An example of this might be changes in engine idle during times of high accessory load.

The next step in diagnosing the concern is to determine related symptoms and narrow them down to a specific vehicle system. Retrieving diagnostic trouble codes (DTCs) is recommended at this stage of diagnosis. Vehicles using the 13 through 14 CUX series controllers allow limited self-diagnostics, including code retrieval, using the TestBook or Hand Held Tester.

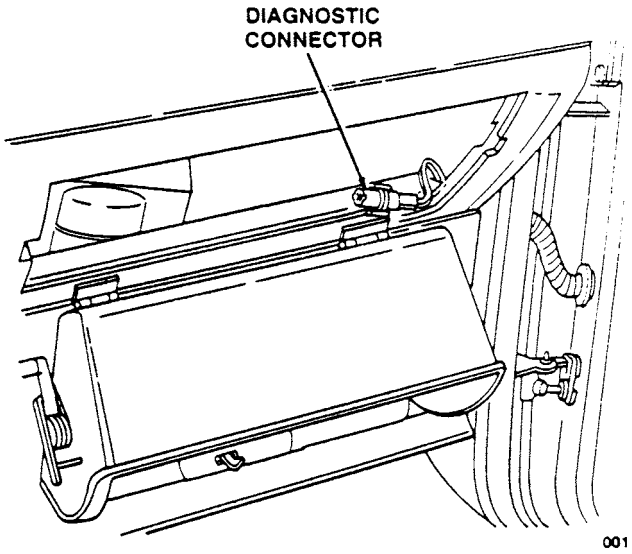
Diagnostic Connector

The 14 CUX communicates with diagnostic test equipment (TestBook) through connector pins 18 and 9. These pins can be accessed through a harness located under the passenger seat on most models. For the 1995 model year, the harness is located behind the glove box. Search for the harness carefully as it may be tucked in among other wiring.

Using this diagnostic connector allows you to perform system diagnostics without removing the harness connector from the ECM and clear codes without diagnostic equipment.



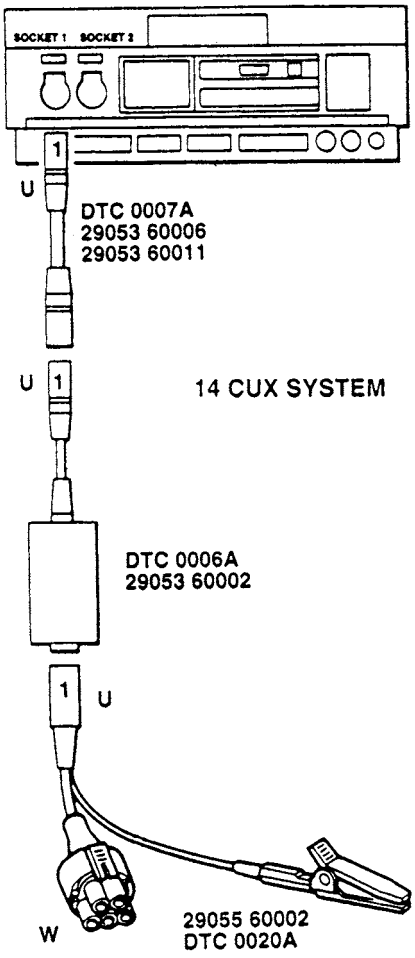
Diagnostic Connector Locations



TestBook Connections

Selecting the correct accessory cables is critical when using the TestBook for system diagnosis. Cables can vary for each application.

Once you have selected the proper cables, ensure that they are securely connected and plugged into Socket 1 at the back of the TestBook unit. Next, connect the clip on the power lead to the positive (B+) post of the vehicle's battery. You are now ready to enter TestBook diagnostics.



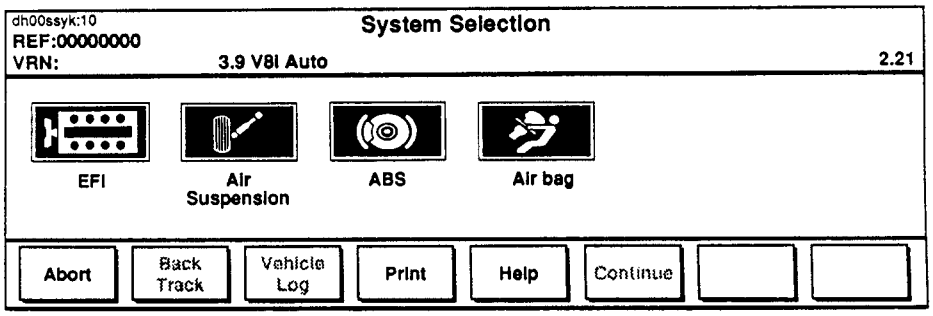
TestBook Diagnostic Connector Hook-up

Once past the main menu, TestBook offers a selection of vehicle systems that can be tested. These include:

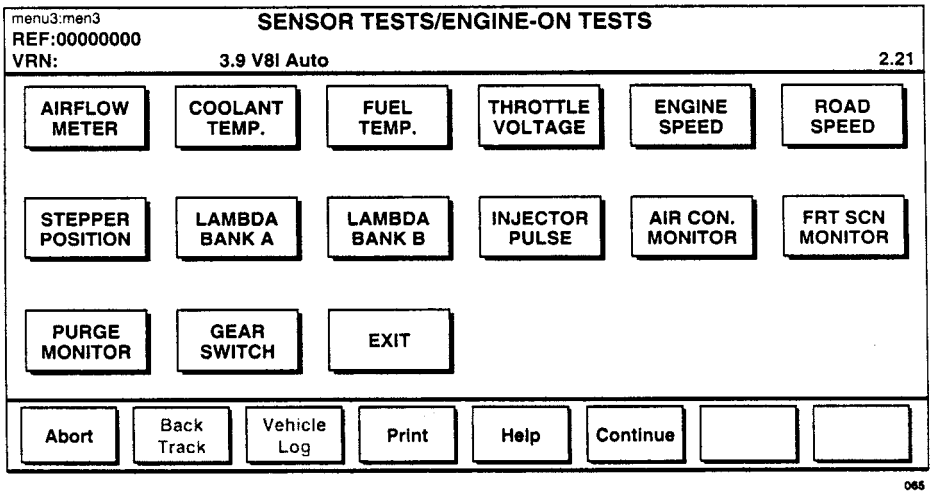
- EFI
- Air Suspension
- ABS
- Airbag

The air suspension selection is available only on Range Rover Classic.

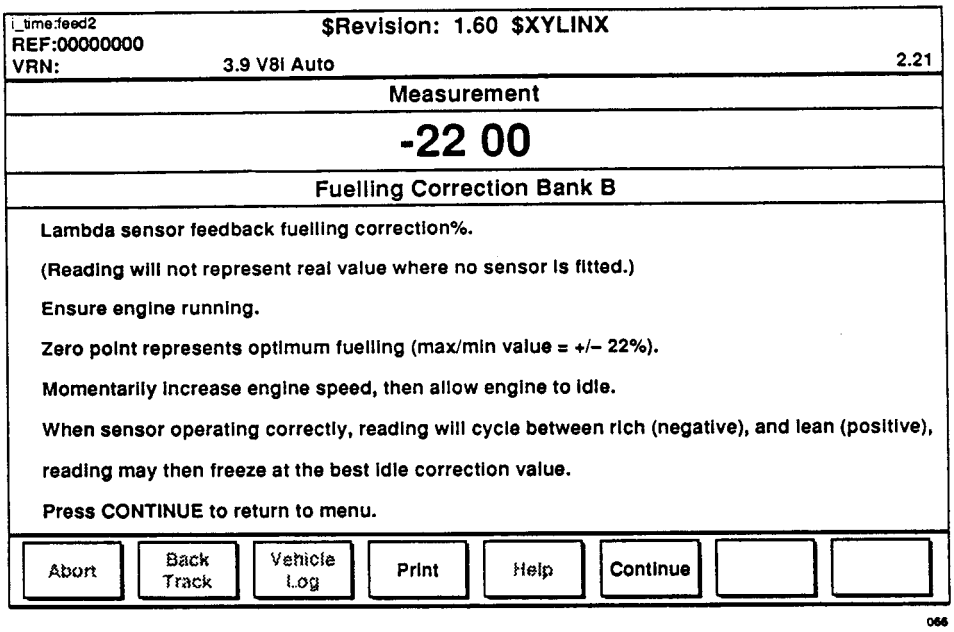
Touch the system icon to move on to the next selection screen.



TestBook provides you with the opportunity to monitor the function of the system inputs listed on the screen below.



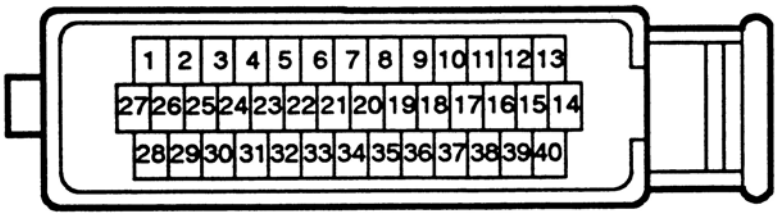
The screen below provides you with an example of the information available under the icon LAMBDA BANK B. (Lambda is another term for oxygen sensor.) This is an example of how TestBook allows you to monitor sensor operation as the engine is operating.



Information is provided on the screen to help you determine if the component is operating within specified parameters. This screen is also helpful in verifying operation following a repair.

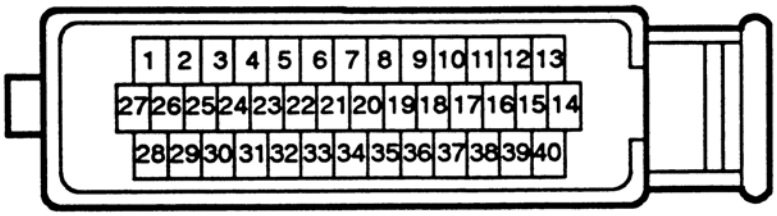
13/14CU and 14CUX ECM Connector Pin-Outs

1987-88 Lucas 13 CU ECM



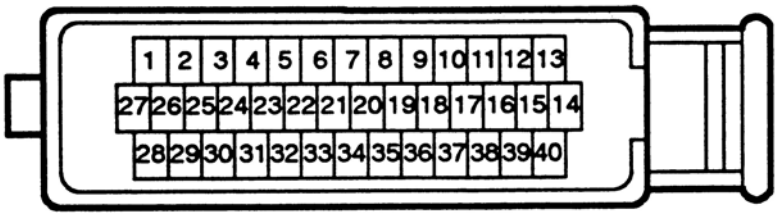
PIN	WIRE COLOR	FUNCTION	PIN	WIRE COL-OR	FUNCTION
1	RG	Stepper “D”	21	YU	A/C clutch input
2	NO	Battery + Main Relay	22	UR	AFM Idle trim
3	Y	TPS Reference voltage	23	U	Lambda Bank “A”
4	B	Lambda ground	24	U	Lambda Bank “B”
5	NP	(1987) Rear Screen input (1988) N.C.	25	RB	Sensor “VE”
6	Y	Vehicle Speed input	26	GW	Stepper “C”
7	GU	Water Temperature input	27	BS	Signal Ground
8	-		28	US	Stepper “B”
9	WLG	Serial Link	29	O	Stepper “A”
10	BY	“EFI” Light (MIL)	30	-	
11	YW	Bank “B” injector ground	31	-	
12	UR	Main Relay Request	32	SW	Fuel Temperature input
13	YU	Bank “A” injector ground	33	-	
14	B	ECM Ground	34	OB	Park/Neutral input
15	N	Battery +	35	UG	AFM input
16	UP	Fuel Pump Relay Request	36	-	
17	-		37	WY	Serial Link
18	WK	Serial Link	38	-	
19	WS	Ignition “ON” input	39	WB	Tachometer input
20	R	TPS input	40	B	ECM ground

1989 Lucas 14 CU ECM



PIN	WIRE COLOR	FUNCTION	PIN	WIRE COLOR	FUNCTION
1	RG	Stepper “D”	21	YB	A/C clutch input
2	NO	Battery + Main Relay	22	UR	AFM Idle trim
3	Y	TPS Reference voltage	23	U	Lambda Bank “A”
4	B	Lambda ground	24	U	Lambda Bank “B”
5	BW	A/C Fan Switch Input	25	RB	Sensor Signal Ground
6	Y	Vehicle Speed input	26	GW	Stepper “C”
7	GU	Water Temperature input	27	BS	Ground
8	PY	Heated Front Screen input	28	US	Stepper “B”
9	WLG	Serial Link	29	O	Stepper “A”
10	BY	“EFI” Light (MIL)	30	-	
11	YW	Bank “B” injector ground	31	-	
12	UR	Main Relay Request	32	SW	Fuel Temperature input
13	YU	Bank “A” injector ground	33	BS	A/C clutch output
14	B	ECM Ground	34	OB	Park/Neutral input
15	N	Battery +	35	UG	AFM input
16	UP	Fuel Pump Relay Request	36	BG	Fan Timer Request
17	SY	Purge Control	37	WY	Serial Link
18	WK	Serial Link	38	-	
19	WS	Ignition “ON” input	39	WB	Tachometer input
20	R	TPS input	40	B	ECM ground

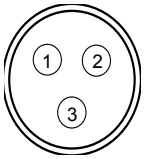
1990-95 Lucas 14 CUX ECM



C243

PIN	WIRE COLOR	FUNCTION	PIN	WIRE COL-OR	FUNCTION
1	RG	Stepper “D”	21	YB	A/C clutch input
2	NO	Battery + Main Relay	22	UR	AFM Idle trim
3	Y	TPS Reference voltage	23	U	Lambda Bank “A”
4	B	Lambda ground	24	U	Lambda Bank “B”
5	BW	Tune Resistor (1990 only)	25	RB	Sensor “VE”
6	Y	Vehicle Speed input	26	GW	Stepper “C”
7	GU	Water Temperature input	27	BS	Signal Ground
8	PY	Heated Front Screen input	28	US	Stepper “B”
9	WLG	Serial Link	29	O	Stepper “A”
10	BY	“Check Engine” Light (MIL)	30	K	Fault Display output
11	YW	Bank “B” injector ground	31	BG	Diagnostic Reset
12	UR	Main Relay Request	32	SW	Fuel Temperature input
13	YU	Bank “A” injector ground	33	BS	A/C Clutch output
14	B	ECM Ground	34	OB	Park/Neutral input
15	N	Battery +	35	UG	AFM input
16	UP	Fuel Pump Relay Request	36	BG	Fan Timer Request
17	SY	Purge control	37	-	
18	WK	Serial Link	38	NK	Fault Clock output
19	WS	Ignition “ON” input	39	WB	Tachometer input
20	R	TPS input	40	B	ECM ground

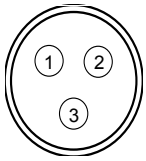
Heated Oxygen Sensor X139, X160



3way-Black

PIN	WIRE COL-OR	FUNCTION
1.00	WO	Heater Power Supply- 12v
2.00	U	Sensor Signal- 0.1v to 1.1v
3.00	B	Ground

Throttle Position Sensor X171



3way-Black

PIN	WIRE COL-OR	FUNCTION
1.00	RB	Signal Ground
2.00	R	Sensor Signal
3.00	Y	TPS Reference voltage- 5v

14CUX ECM Tune Summary

Tune	ACpplication
R3652	3.9 litre ‘93-‘95 MY Range Rover Classic 3.9 litre ‘93-‘95 MY Discovery
R3653	4.2 litre ‘93-‘95 MY Range Rover Classic
R3654	3.9 litre ‘94-‘95 MY Defender 90 3.9 litre ‘93 MY Defender 110
R3362	3.9 litre ‘89-‘92 MY Range Rover Classic Low compression

Note:When using Tune # R3652, R3653, or R3654 to correct cold start complaints, the entire “Cold Start Enhancement” package must also be used (except Defender 110)

See reverse for complete tune listing.

Model	Tune #	Description
Range Rover Classic 3.9 Low CR	R2103	Initial production tune
Range Rover Classic 3.9 Low CR	R2161	Desensitized OBD, IAC refinements
Range Rover Classic 3.9 Low CR	R2306	Fixed A/C glitch @ 65 mph (2250rpm); eliminated tune resistor (Code 21)
Range Rover Classic 3.9 Low CR	R2419	Desensitized OBD, , prinarily Code 48; Service Actioon (Recall CA)
Range Rover Classic 3.9 Low CR	R2665	Improved IAC control, new strategy for IAC OBD; further OBD desensitization
Range Rover Classic 3.9 High CR	R2813	Initial production tune
Range Rover Classic 4.2 High CR	R2926 B	Initial production tune
Defender 3.9 High CR	R3038	Initial production tune
Range Rover Classic 3.9 High CR	R3100	Low Reed Vapor Pressure fuel tune
Range Rover Classic 4.2 High CR	R3102	Low Reed Vapor Pressure fuel tune
Range Rover Classic 3.9 High CR	R3315	MIL on no code fix (interim)
Range Rover Classic 4.2 Low CR	R3316	MIL on no code fix (interim)
Range Rover Classic 3.9 Low CR	R3326	Low Reed Vapor Pressure fuel tune (interim)
Range Rover Classic 3.9 Low CR	R3339	MIL on no code fix (interim)
Defender 3.9 High CR	R3340	MIL on no code fix (interim)
Defender 3.9 High CR	R3341	Low Reed Vapor Pressure fuel tune (interim)
Range Rover Classic 3.9 High CR	R3342 A	MIL on no code fix (interim)
Range Rover Classic 4.2 High CR	R3343 A	MIL on no code fix (interim)
Range Rover Classic/ Discovery 3.9 High CR	R3360	Desensitized OBD 95 MY Tune (‘94 Discovery)
Range Rover Classic 4.2	R3361	Desensitized OBD 95 MY Tune
Range Rover Classic 3.9 Low CR	R3362	Desensitized OBD 95 MY Tune; improvements for Low CR

Defender 3.9 High CR	R3365	Desensitized OBD 95 MY Tune
Range Rover Classic 4.2	R3507	Part # PRM3361A; Interim improved Cold Start, fueling below -22âC (- 10âF)
Range Rover Classic/Discovery 3.9 High CR	R3526	Part # PRM3360A; Note: LR Part numbers are different from Tune numbers
Defender 3.9 High CR	R3529	Part # PRM3365A
Range Rover Classic/Discovery 3.9 High CR	R3652	Operation Pride Tune Current tune with final improved Cold Start fueling below -22âC (-10âF).
Range Rover Classic 4.2 High CR	R3653	Operation Pride Tune Current tune with final improved Cold Start fueling below -22âC (-10âF).
Defender 3.9 High CR	R3654	Operation Pride Tune Current tune with final improved Cold Start fueling below -22âC (-10âF).