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AUXILIARY CLIMATE CONTROL

FUEL FIRED BOOSTER HEATER (G2342528)

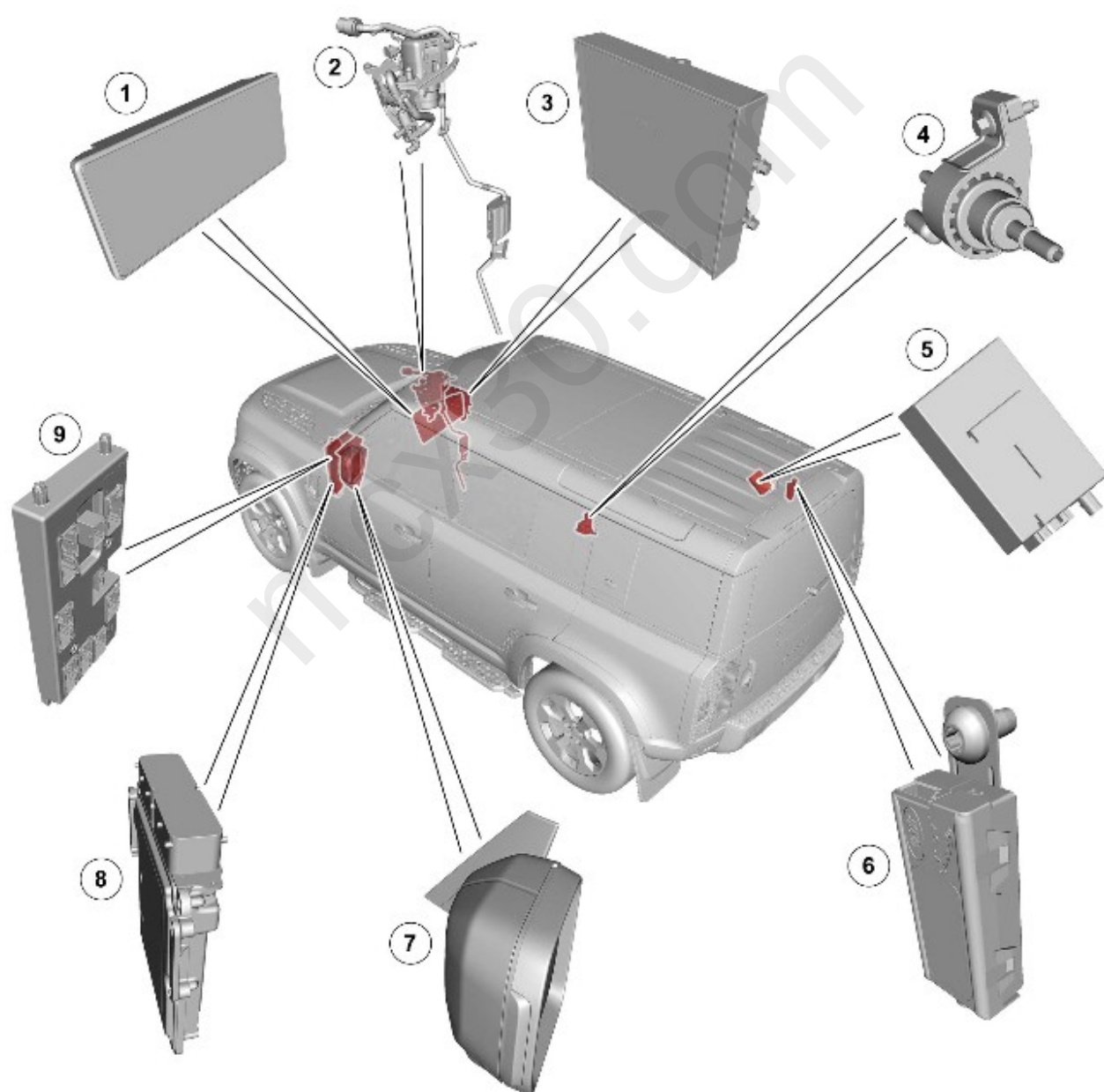
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COMPONENT LOCATION

COMPONENT LOCATION - 1 OF 1

 NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E247935

ITEM	DESCRIPTION
1	Touch Screen (FCDIM)
2	Fuel Fired Booster Heater (FFBH) system
3	Heating, ventilation, and air conditioning (HVAC) control module
4	FFBH fuel pump
5	FFBH receiver (vehicles with remote control)
6	Amplifier - Telestart (vehicles with remote control)
7	Door mirror - Ambient Air Temperature (AAT) sensor
8	Powertrain Control Module (PCM)
9	Body Control Module (BCM)/ Gateway Control Module (GWM)

OVERVIEW

Depending on model specification and market, the vehicle may incorporate auxiliary heating in the form of a FFBH. The FFBH boosts the temperature of the engine coolant supplied to the climate control assembly and, where equipped, the auxiliary climate control assembly.

Fuel for the FFBH is taken from the vehicle fuel tank, through a fuel line attached to the fuel pump module. A FFBH fuel pump supplies the fuel at low pressure to the FFBH. In the FFBH, the fuel is burned and the resultant heat output is used to heat the engine coolant. The engine coolant is circulated through the FFBH, the climate control assembly and, where equipped, the auxiliary climate control assembly, by the FFBH coolant pump.

FFBH operation is automatic while the engine is running (Power Mode 7). When equipped with timed climate control, the FFBH can be operated (depending on the AAT while the engine is OFF (Power Mode 6 or less) and the vehicle is parked) using:

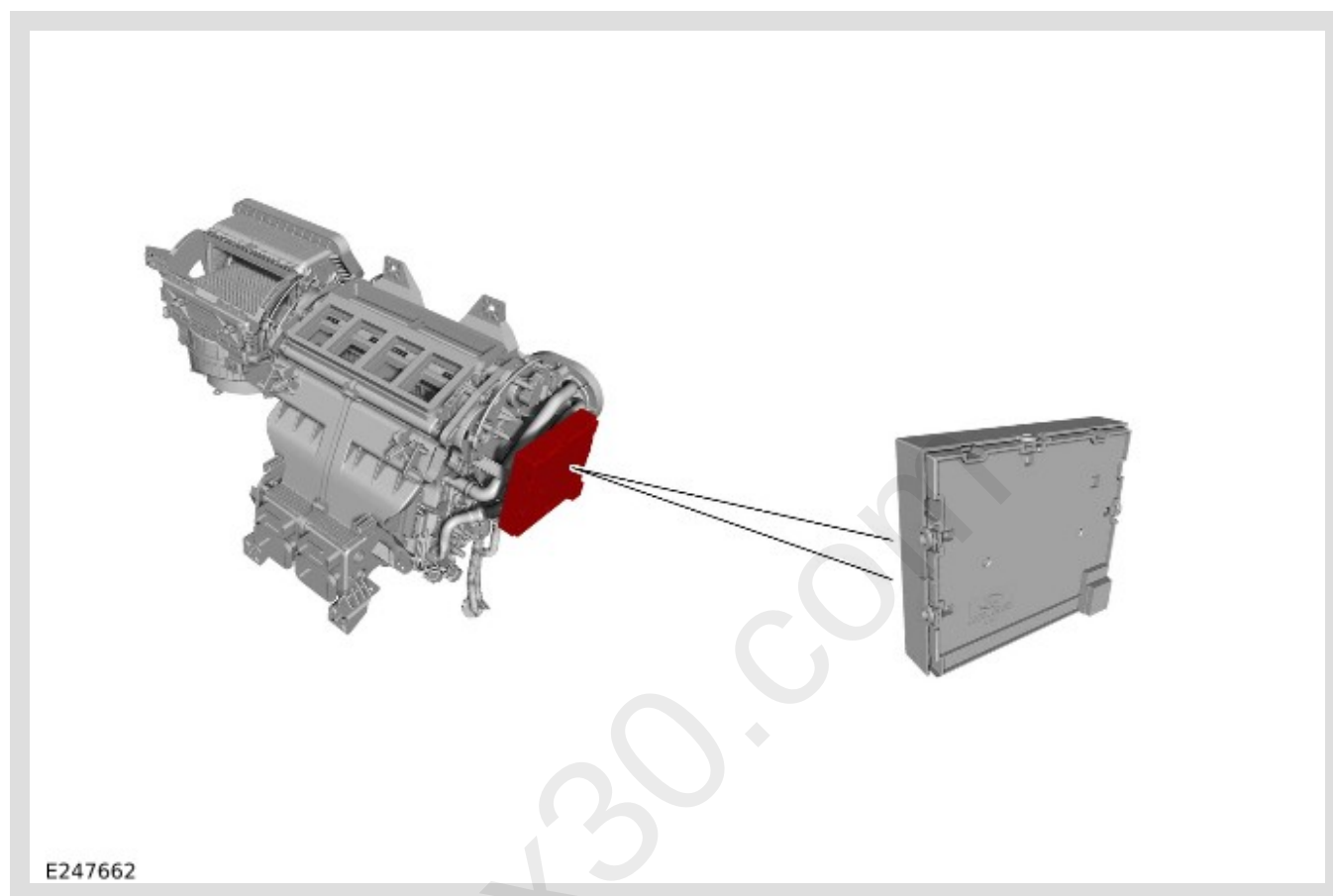
- The FCDIM
- A remote control (market dependant)
- A mobile phone App.

Vehicles with timed climate control also incorporate:

- A FFBH receiver for communication with the remote control (market dependant).
- A FFBH coolant changeover valve that allows the climate control coolant circuit to be isolated from the engine coolant circuit. The isolation of the engine coolant circuit reduces the warmup time of the passenger compartment.

DESCRIPTION

HVAC CONTROL MODULE



The HVAC control module is located behind the driver side of the instrument panel. The HVAC control module then outputs the appropriate control signals to the Air Conditioning (A/C) system and the climate control system.

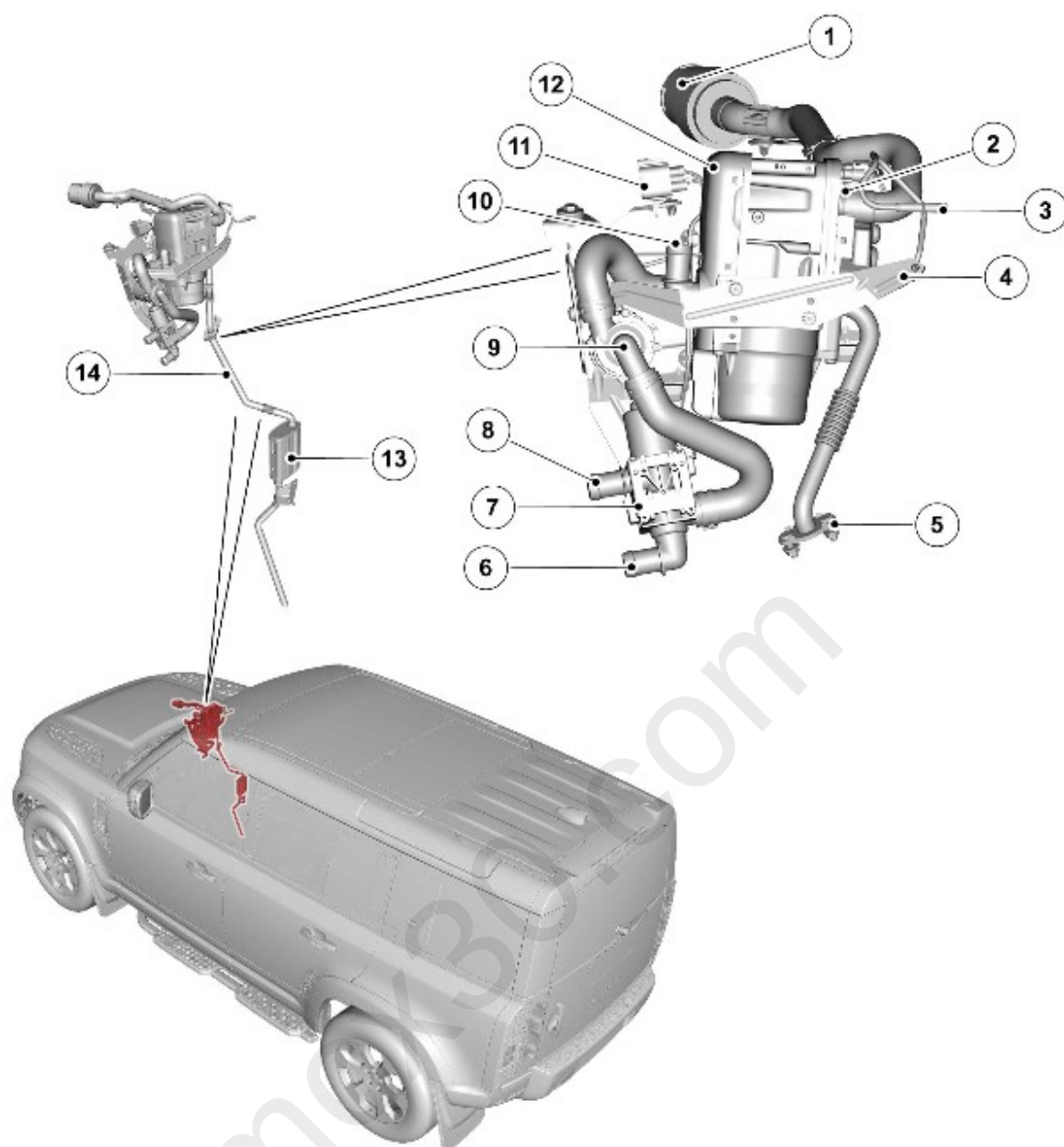
For additional information, refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

FFBH – VEHICLES WITH TIMED CLIMATE CONTROL ONLY



NOTES:

- Vehicle with 5 doors is shown, vehicle with 3 doors is similar.
- Diesel illustration is shown, petrol illustration is similar.

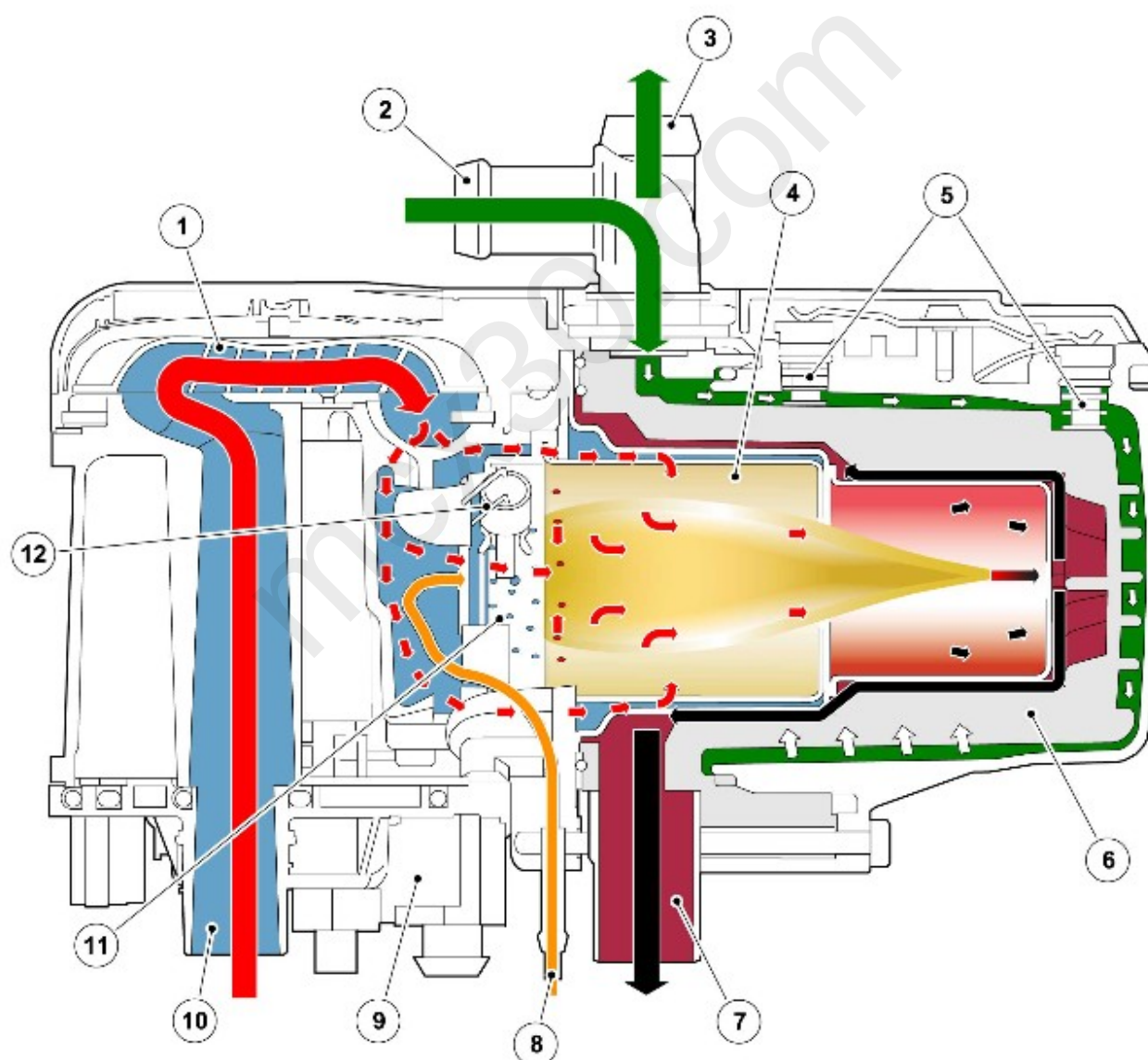


E247936

ITEM	DESCRIPTION
1	Air intake hose (a canister type acoustic silencer is incorporated into the air intake hose)
2	Air intake
3	Fuel inlet
4	FFBH bracket
5	Exhaust outlet pipe
6	Engine coolant inlet
7	Engine coolant changeover valve
8	Engine coolant inlet

ITEM	DESCRIPTION
9	FFBH coolant pump
10	Engine coolant outlet
11	Wiring harness connector
12	FFBH
13	Exhaust Silencer
14	Exhaust pipe

Sectioned View of FFBH



ITEM	DESCRIPTION
1	Combustion air fan
2	Engine coolant inlet
3	Engine coolant outlet
4	Combustion chamber
5	Engine Coolant Temperature (ECT) sensor (quantity 2)
6	Heat exchanger
7	Exhaust gas outlet
8	Fuel inlet
9	Fuel Fired Booster Heater Control Module (AHCM)
10	Air inlet
11	Circular metallic mesh evaporator
12	Combustion chamber glow plug/flame sensor

The FFBH assembly is installed in the engine compartment, on a bracket attached to the rear of the right suspension housing. The FFBH is connected in series with the coolant supply to the climate control assembly. An electrical connector on the FFBH assembly connects it to the vehicle wiring.

The FFBH assembly consists of the following:

- A FFBH
 - A AHCM
 - A combustion air fan
 - A combustion chamber and heat exchanger
 - A combustion chamber glow plug/heat sensor
- A FFBH coolant changeover valve, controlled by the HVAC Control Module (vehicles with timed climate control only.)
- A FFBH coolant pump.
- An air intake hose and silencer.
- An exhaust pipe and silencer.

AHCM

The AHCM controls and monitors the operation of the FFBH system. Power for the AHCM is provided by a permanent 12V from the quiescent current relay in the Passenger Junction Box (PJB). A Local Interconnect Network (LIN) connection provides the communication link between the AHCM and the HVAC Control Module.

The AHCM has the following electrical connections:

- A power supply from the PJB.
- A power feed and ground connections to the FFBH coolant pump.
- A power feed connection to the FFBH fuel pump.
- A LIN connection with the HVAC.
- A ground connection.

Combustion Air Fan

The combustion air fan regulates the supply of air to the combustion chamber to start and continue combustion. The combustion air fan speed is increased during the start procedure to start the combustion process. The combustion air fan speed is controlled depending on heat output requirements when combustion has started.

The combustion air fan continues to operate after the combustion process has stopped. This allows the combustion chamber to cool ready for the next requested start. The combustion air fan will stop after approximately 2 minutes. This is normal operation.

Combustion Chamber and Heat Exchanger

The combustion chamber is located in the heat exchanger casing and combustion air fan casing. An integral fuel line delivers fuel from the FFBH fuel line to the combustion chamber. The fuel is delivered to a circular metallic mesh evaporator.

The heat exchanger surrounds the combustion chamber and allows the heat from the combustion process to be transferred to the engine coolant.

There are 2 coolant temperature sensors and 1 surface temperature sensor in the heat exchanger. The 3 temperature sensors are connected to the AHCM. The AHCM uses the data from the temperature sensors to control the FFBH operation.

Combustion Chamber Glow Plug/Flame Sensor

The combustion chamber glow plug/flame sensor is installed in the combustion chamber downstream of the evaporator. The glow plug provides the heat source to start the combustion of the fuel in the combustion chamber. When the flame in the combustion chamber is stable the glow plug monitors the flame temperature and provides feedback to the AHCM.

Fuel Fired Booster Heater Coolant Pump

The FFBH coolant pump is an electric pump attached to the FFBH support bracket. The FFBH coolant pump operation is controlled by the AHCM. The AHCM provides the power supply and the ground for the FFBH coolant pump. The FFBH coolant pump circulates the engine coolant through the cooling system including the FFBH. The FFBH coolant pump is connected to these:

- For vehicles without timed climate:
 - The engine coolant supply from the engine for the heater core of the climate control assembly.
- For vehicles with timed climate:
 - To the FFBH coolant changeover valve.

A hose, connects the outlet of the FFBH coolant pump to the coolant inlet of the FFBH.

The FFBH coolant pump runs continuously while the FFBH is in idle or active operating modes. The FFBH coolant pump stops operating approximately 2 minutes after the FFBH has stopped, this is to cool the FFBH combustion chamber.

The FFBH coolant pump can also operate when stop/start is operational to provide hot engine coolant flow through the heater system to heat the passenger compartment.

Air Intake Hose and Silencer

A canister type silencer and filter is incorporated into the air intake hose.

A canister type acoustic silencer is incorporated into the air intake hose, to reduce the air flow noise during the startup and shut down processes. The silencer does not filter the air entering the FFBH.

Exhaust Pipe and Silencer

The exhaust pipe and silencer directs exhaust combustion gases to atmosphere below the vehicle through a hole in the underfloor aero tray molding. The exhaust pipe exits to the rear of the front right wheel and directs the exhaust gases rearward and to the center of the vehicle.

When certain atmospheric conditions exist, exhaust vapor may be visible when the FFBH combustion process is started. The vapor may be water vapor and not waste products from the combustion process. Under normal operating conditions, the exhaust vapor will subside when the FFBH has achieved 'Power status' and the exhaust pipe has reached normal operating temperature.

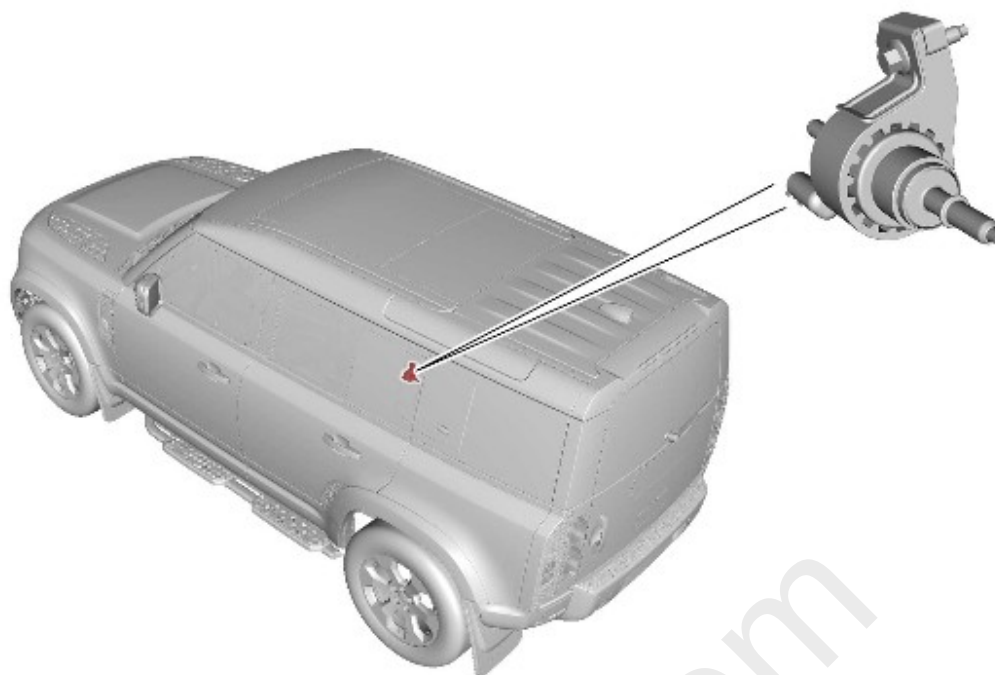
Under certain conditions, smoke may be visible from around the FFBH rather than the exhaust outlet. This smoke may be present for a period of time. This smoke may be as a result of residual fuel or engine coolant on the exhaust or FFBH body as a result of the service procedure. Under these circumstances, the heater must be run continually for 15 - 20 minutes until there are no signs of excessive smoke.

FFBH FUEL PUMP



NOTE:

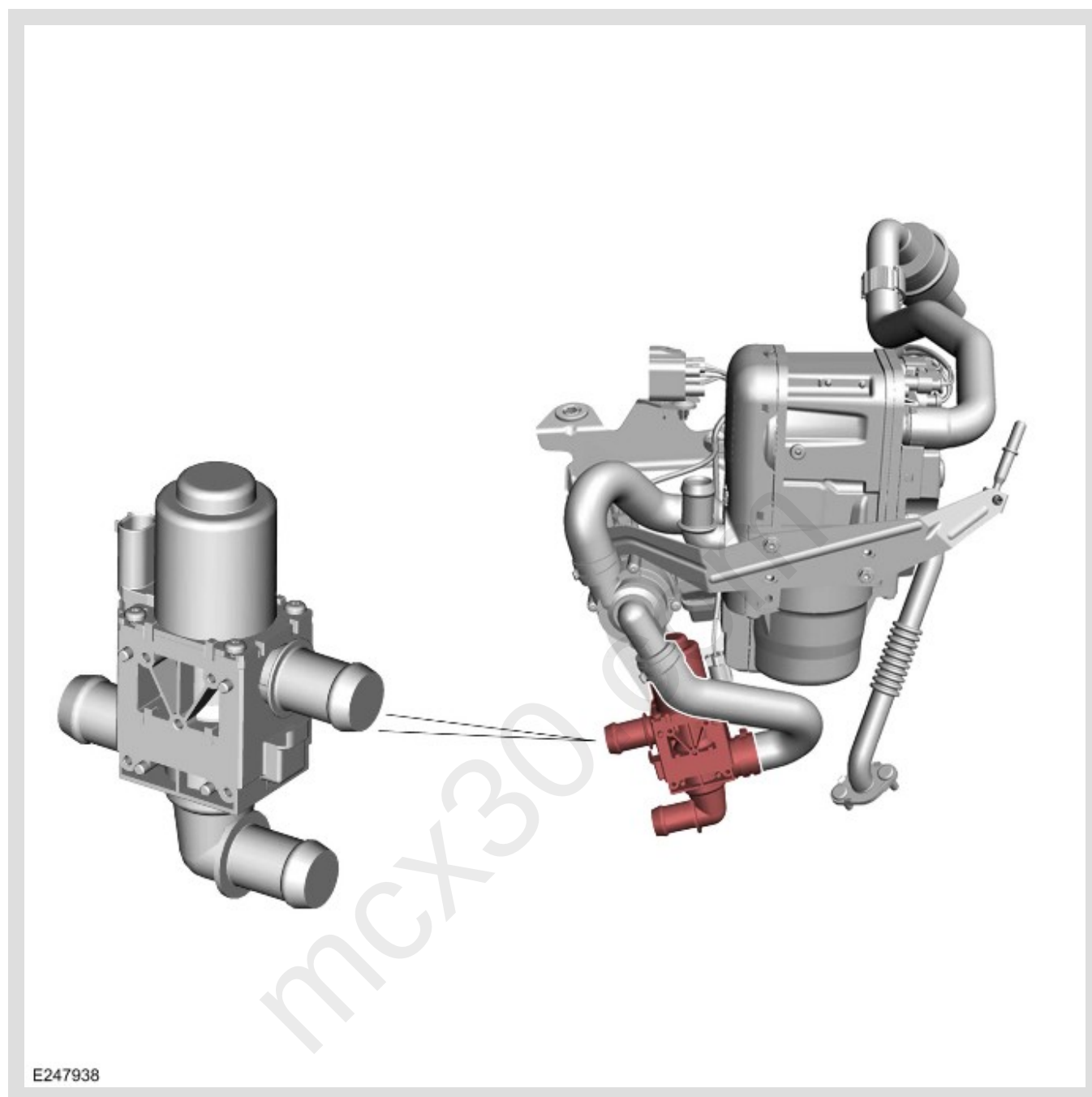
Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



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The FFBH fuel pump is installed in a rubber mounting under the rear floor. The FFBH fuel pump is self priming, its solenoid operates the plunger pump. The AHCM in the FFBH outputs a signal to control the operation of the FFBH pump. When the FFBH fuel pump is not energized, the AHCM stops the signal and shuts OFF the fuel supply to the FFBH.

FFBH COOLANT CHANGEOVER VALVE - VEHICLES WITH TIMED CLIMATE CONTROL ONLY



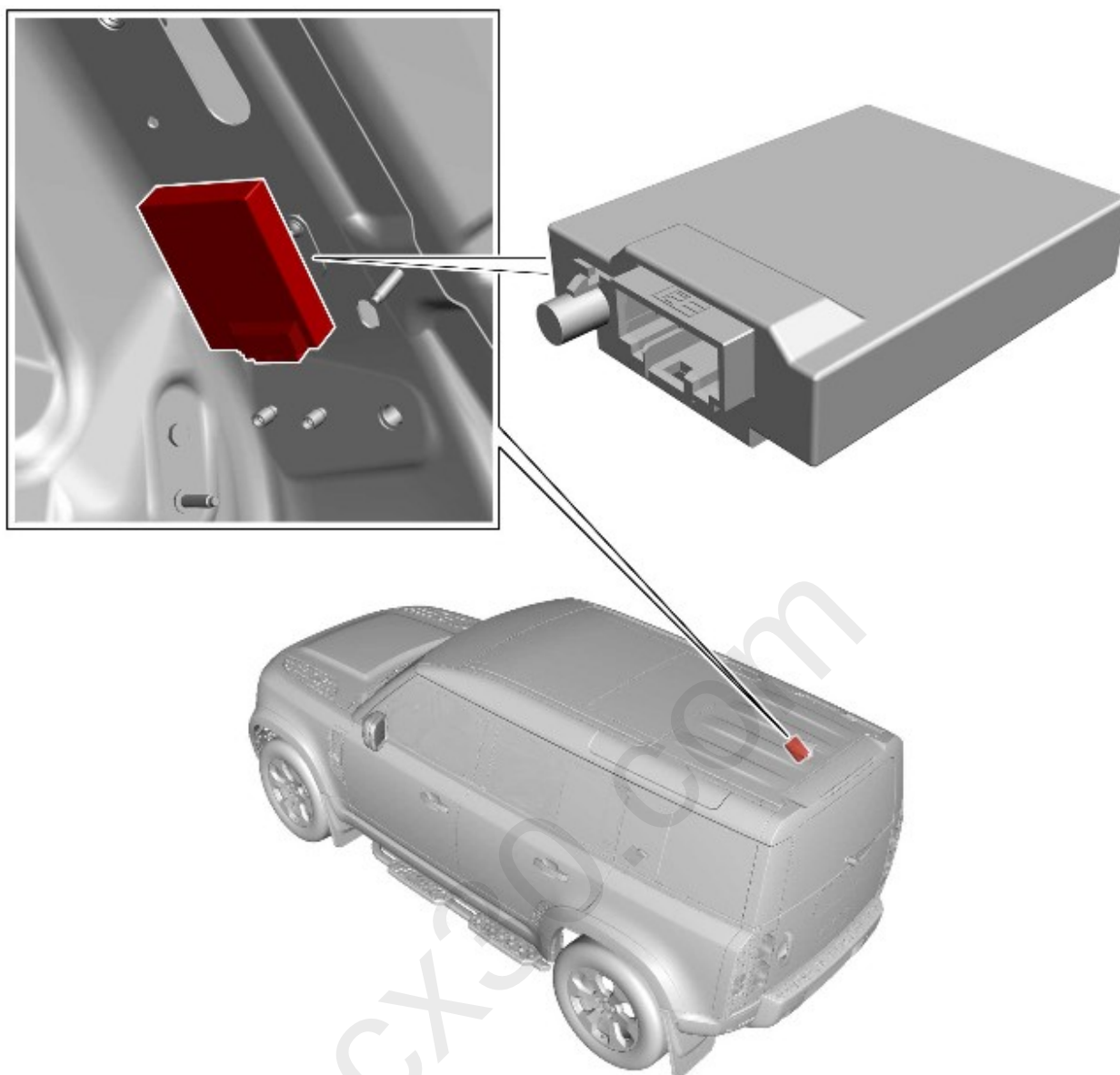
Where equipped, the FFBH coolant changeover valve is attached to a bracket on the underside of the FFBH. The FFBH coolant changeover valve is a normally open solenoid valve installed between the supply and return sides of the heater coolant circuit. When not energized, the FFBH coolant changeover valve connects the heater coolant circuit to the engine coolant circuit. When energized, the FFBH coolant changeover valve isolates the heater coolant circuit from the engine coolant circuit.

Operation of the FFBH coolant changeover valve is controlled by a voltage from the HVAC control module.

FFBH RECEIVER (IF EQUIPPED)

NOTE:

Vehicle with 5 doors is shown, vehicle with 3 doors is similar.



E247939

The FFBH receiver translates the FFBH remote control radio signals, relayed from the Television (TV) antenna amplifier. When a request for timed climate control is received, the FFBH receiver outputs a LIN signal to the HVAC control module. When a request to switch OFF timed climate control is received, a LIN request to stop timed climate control is sent to the HVAC. The HVAC then shuts OFF the FFBH and stops timed climate from operating.

The FFBH receiver has a permanent voltage from the PJB and is connected to the television antenna amplifier by a coaxial cable.

For additional information, refer to: [Antenna](#) (415-01 Information and Entertainment System, Description and Operation).

FFBH REMOTE CONTROL (IF EQUIPPED)

 NOTE:

Avoid touching the antenna when operating the ON or OFF switch. Covering the antenna has an adverse affect on the transmitting range.



ITEM	DESCRIPTION
1	ON switch
2	Light Emitting Diode (LED) operating indicator
3	Antenna
4	OFF switch

The FFBH remote control enables the timed climate control program to be activated and deactivated from outside the vehicle. The FFBH remote control has an approximate range of 100 m (328 feet). There is no need to point the remote control at the vehicle. Press and hold the ON switch for approximately 2 seconds. The LED illuminates green to confirm that a timed climate program has been initiated. The LED continues to flash for the duration of the timed climate operation.

The timed climate program continues for 30 minutes, after which it switches OFF automatically, to prevent the vehicle's startup battery from discharging. The timed climate program also turns OFF automatically if the engine is started (Power Mode 9).

OPERATION

FUEL FIRED BOOSTER HEATER (NON NORTH AMERICAN SPECIFICATION)

FFBH is controlled by a status message from the HVAC control module to the AHCM.

The vehicle must be in Power Mode 7 (engine running) and these conditions must be active:

	PETROL	DIESEL
AAT	Less than 1°C (34°F)	Less than 7°C (45°F)
ECT	Less than 75°C (167°F)	Less than 75°C (167°F)

Then the HVAC control module transmits a 'supplemental heat' message to the AHCM on the LIN.

The AHCM returns a 'supplemental heat' status message to the HVAC control module which initiates the FFBH start sequence.

If the engine is started and the FFBH is requested, the HVAC control module closes the recirculation flap when 1 of the following occurs:

- For the first 4 minutes.
- Until the vehicle road speed exceeds 16 km/h (10 mph).

Then the HVAC control module opens the recirculation flap to enable the ingress of fresh air. This feature is overridden, if any of the following occur:

- The MAX demist switch on the Integrated Control Panel (FCIM) is selected.
- The HVAC control module detects a risk of fogging of the windshield.

The FFBH does not start, or discontinues operation, if any of the following occur:

- The AHCM is in the error lockout mode.
- The engine stops running for approximately 4 seconds. The time delay is included for stall detection.
- The HVAC control module communicates with the BCM/ GWM through the High Speed (HS) Controller Area Network (CAN) power mode zero system bus. The BCM/ GWM sends a 'fuel cut-off' message to the HVAC control module, when a crash signal is received from the Restraints Control Module (RCM).
 - For additional information, refer to: [Airbag and Safety Belt Pretensioner Supplemental Restraint System - \[+\]](#)
[Vehicles with 2nd / 3rd Row Seats](#) (501-20B Supplementary Restraint System, Description and Operation).

- For additional information, refer to: [Airbag and Safety Belt Pretensioner Supplemental Restraint System - \[+\] Front Row Seats Only](#) (501-20B Supplementary Restraint System, Description and Operation).
- The HVAC control module receives a low fuel level message from the BCM/ GWM on the HS CAN power mode zero system bus.
- The quiescent current relay in the PJB controlled by the BCM/ GWM, disconnects the power supply to the FFBH.
 - For additional information, refer to: [Battery, Mounting and Cables - \[+\] Non-Electric Vehicles](#) (414-01A Battery, Mounting and Cables - Vehicles With: Non-Electric Vehicles, Description and Operation).

During supplementary heating, the HVAC control module STARTS or STOPS the FFBH operation if the HVAC control module detects the following conditions:

- The passenger compartment is warm to meet the individual need.
- The passenger compartment does not require supplementary heating anymore.

If the AHCM does not start the FFBH, or discontinues operation, the status message to the HVAC control module remains at, or changes to, 'heater OFF'.

In Power Mode 7 (engine running) and these conditions must be active:

	PETROL	DIESEL
AAT	Increases to 4°C (40°F)	Increases to 10°C (50°F)
ECT	Increases to 88°C (190°F)	Increases to 88°C (190°F)

The HVAC control module cancels supplemental heating, by changing the status message to the AHCM back to 'heater OFF'. The AHCM then cancels FFBH operation and changes the status message to the HVAC control module to 'heater OFF'.

Start Sequence

At the beginning of a START sequence, the AHCM energizes the FFBH coolant pump. The following is the operation of the preset sequence to start the FFBH:

- The combustion air fan at SLOW speed.
- The glow plug and flame sensor to pre-heat the combustion chamber.
- The FFBH fuel pump.

Combustion Loads

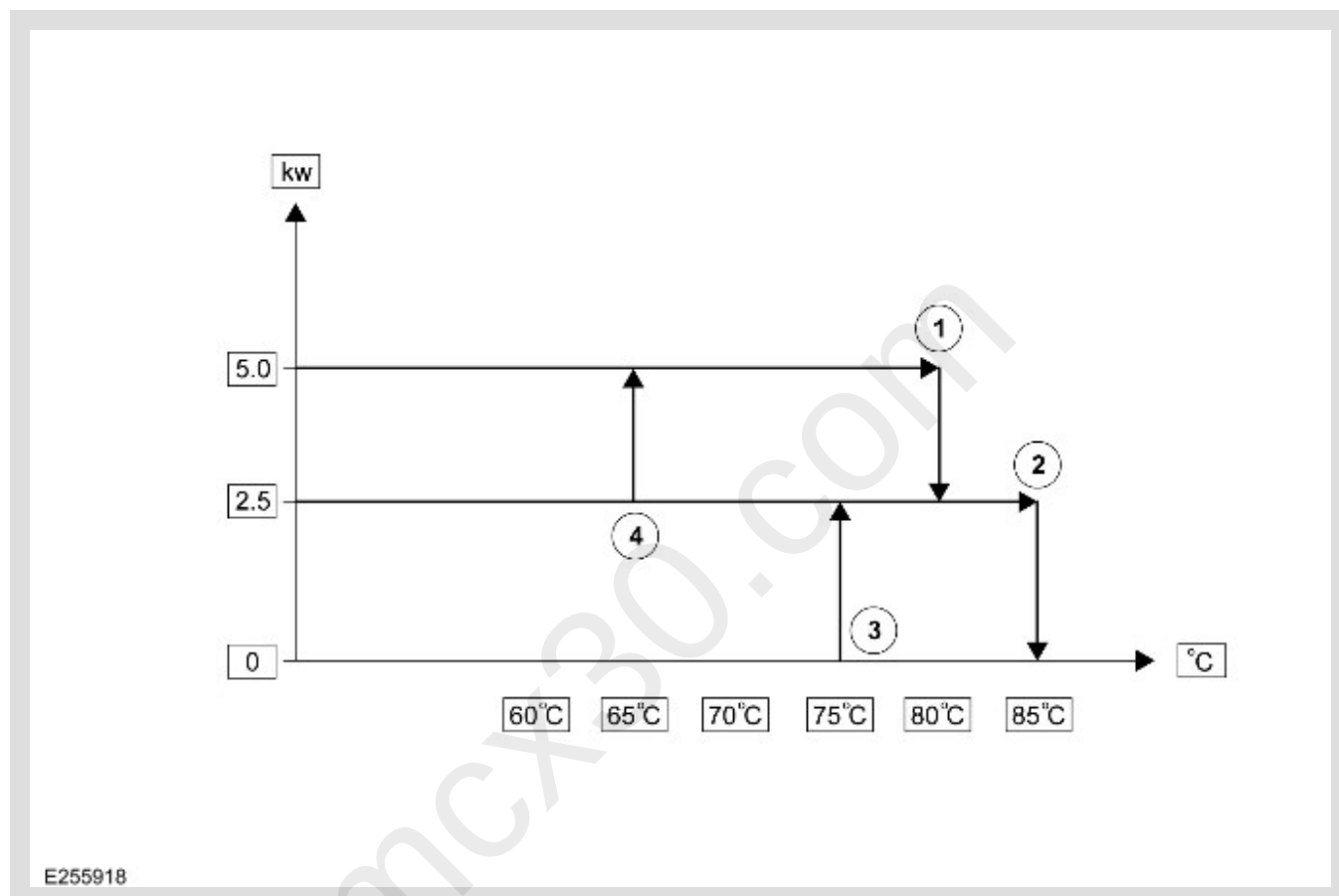
The AHCM receives the signal from the ECT sensor when the FFBH is running. The AHCM changes the circulation of engine coolant flow in the heat exchanger under the following conditions:

- High load combustion

- Low load combustion
- Control idle phase.

The heat output level at low load combustion is 2.5 kW. The heat output level rises to 5 kW at high load combustion. The AHCM transmits the amount of fuel used by the FFBH to the BCM/ GWM. The ECT in the FFBH also sends the signal to the HVAC control module.

Switching Point Temperatures



SWITCHING POINT ITEM NUMBER	SWITCHING POINT DESCRIPTION	TEMPERATURE, °C (°F)
1	High load to low load	80°C (176°F)
2	Low load to control idle	85°C (185°F)
3	Control idle to low load	75°C (167°F)
4	Low load to high load	65°C (149°F)

The AHCM maintains high load combustion until the ECT reaches switching point temperature 1. At this temperature, the AHCM decreases the speed of the FFBH fuel pump and the combustion air fan to enable low load combustion. The AHCM maintains low load combustion while the ECT remains between switching point temperatures 2 and 4.

At low load combustion, the temperature of the engine coolant increases or decreases depending on the amount of heat required to heat the passenger compartment. If the ECT decreases to switching point temperature 4, the AHCM

sets the FFBH fuel pump and the combustion air fan to full speed. If the ECT increases to switching point temperature **2**, the AHCM enters a control idle phase of operation.

On entering the control idle phase, the AHCM immediately switches the FFBH fuel pump OFF to stop combustion, and starts a timer for the combustion air fan. The AHCM switches OFF the combustion air fan after:

- Approximately 90 seconds (diesel vehicles)
- Approximately 120 seconds (petrol vehicles).

The AHCM stays in the control idle phase while the ECT remains above switching point temperature **4**. If the ECT decreases to switching point temperature **3**, the AHCM changes to low load combustion. This low load takes approximately 90 seconds.

The maximum time the FFBH can operate continuously, is 72 minutes in the following phases:

- Low load phase
- High load phase
- Combination of both phase.

The AHCM also enters the control idle phase to limit the build up of carbon deposits on the glow plug and flame sensor.

After the cool down period, if the engine coolant is still in the temperature range that requires additional heat, the AHCM restarts the FFBH.

Shutdown

To stop combustion in the FFBH, the AHCM switches OFF the FFBH fuel pump. The combustion air fan and the FFBH coolant pump continue operation for a time, to cool down the FFBH. The cool down time is approximately 90 seconds (diesel vehicles), or 120 seconds (petrol vehicles).

AHCM

The AHCM also incorporates an error lockout mode of operation that inhibits operation to prevent serious faults from causing further damage to the FFBH system.

In the error lockout mode, the AHCM immediately STOPS the following components operation after the cool down time:

- The FFBH fuel pump
- The combustion air fan
- The FFBH coolant pump.

Error lockout occurs for:

- **START failure and flameout:**
 - If a START sequence fails to establish combustion, or a flameout occurs after combustion is established, the AHCM immediately initiates another START sequence. The START failure or flameout is also recorded by an event timer in the AHCM. The event timer increases by 1 when a START failure or flameout occurs and decreases by 1 if a subsequent START is successful. If the event timer increases to 3 (over a number of drive cycles), the AHCM enters the error lockout mode.
- **Heat exchanger housing overheat:**
 - To protect the AHCM system from excessive temperatures, the AHCM enters the error lockout mode if the ECT exceeds 125°C (257°F).
- **Startup battery voltage out of limits:**
 - Error lockout occurs if the startup battery voltage is outside the limits of 10.5V to 16.0V.

The error lockout mode can be cleared by 1 of the following:

- Using the JLR approved diagnostic equipment.
- Disconnect the power supply to the AHCM for a minimum of 10 seconds.

TIMED CLIMATE CONTROL – IF EQUIPPED

The timed climate control provides a comfortable temperature in the passenger compartment of a vehicle parked with the engine OFF (Power Mode 4). When timed climate control operates, depending on the AAT, the passenger compartment is either:

- Heated by the AHCM and climate control blower (parked heating).
- Cooled by the climate control blower (parked ventilation).

Timed parked heating occurs if the AAT is less than 15°C (59°F). Timed parked ventilation occurs if the AAT is 15°C (59°F) or more. To prevent excessive drain on the startup battery, both parked heating and parked ventilation are automatically de-activated after 30 minutes.

In very cold conditions timed climate control also warms the engine to aid starting. Engine warming occurs:

- For diesel engine vehicles: If the AAT is -25°C (-13°F) or below.
- For petrol engine vehicles: If the ATT is -20°C (-4°F) or below.

When timed climate control operates, the LED flashes in the 'AUTO' or 'A/C' switch on the FCIM (if equipped).

If the AUTO switch LED flashes, the engine or passenger compartment are being heated. If the A/C switch LED flashes, the passenger compartment is being ventilated.

Timed climate control is controlled using either:

- The FFBH remote control (if equipped)
- The FCDIM.

When the vehicle is moving and FFBH is ON, the HVAC control module automatically closes the recirculation flap in the climate control assembly. The recirculation flap is closed to minimize the potential for odor ingress into the passenger compartment from the FFBH.

FCDIM



NOTE:

- Timed climate control only operates when between engine starts. For example, a timed climate control request from the FFBH remote control does not start if a programmed timed climate control event has already occurred.

Depending on vehicle specification, the FCDIM is used for:

- The direct selection of timed climate control.
- To program 1 or 2 'ON/OFF' cycle start times per day.
- For 1 'ON/OFF' cycle start time further in the future.

The programmed start times are stored in the BCM/ GWM. The direct selection and programmed time modes of operation are selected when the engine is stopped and the smart key is in the vehicle. The smart key can then be removed and the vehicle locked. Any timed event automatically runs without the smart key inside the vehicle.

The BCM/ GWM communicates with the HVAC control module through the HS CAN power mode zero system bus. At a programmed start time or a direct selection on the FCDIM, the BCM/ GWM sends a start signal to the HVAC control module. The HVAC control module then initiates the appropriate mode of timed climate control operation.

To set a timed climate program:

- 1 Touch the 'Timed climate' soft key. This soft key may be set on a personal shortcut or accessed through the 'Extra Features' soft key. Select 7 day timer, or single event, then select the timer soft key. If the 7 day timer is selected, then select the day for which you want to set a program. Alternatively, select 'All week' to select the same start time for every day.
- 2 Touch the 'Timer 1' or 'Timer 2' soft key. The timers can be toggled between ON and OFF using the power soft key.
- 3 Touch the up or down arrows to set the start time. Hours and minutes are adjusted separately.
- 4 Touch 'OK'. The FCDIM displays the activation time. If required, set the time for the other timer using the same process.
- 5 When set, the timer events can be turned ON or OFF as required by selecting the 7 day timer or the single event soft key.

Any programmed timed climate control cycle may be canceled by 1 of the following:

- The relevant power soft key on the timer set up menu.

- The 'Power' soft key on the 'Timed climate' information home menu.

For additional information, refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

REMOTE CONTROL (IF EQUIPPED)

NOTE:

The 'handshake' signal only confirms the FFBH remote control to the FFBH receiver communication was successful. It does not confirm that the request has been actioned.

Timed climate control is selected ON or OFF with the FFBH remote control. Then the request is received by the FFBH receiver through the right television antenna. The FFBH receiver sends the request as a hardwired signal to the AHCM . On receipt of the request, the AHCM sends the request to the HVAC control module on the LIN. The HVAC control module then initiates the appropriate mode of timed climate control operation.

A 'handshake' signal is sent back from the FFBH receiver to the FFBH remote control to confirm a valid ON or OFF request. The 'hand shake' signal then activates the remote control LED accordingly.

Press and hold the ON or OFF switch for approximately 2 seconds. When the switch is pressed, the LED indicator illuminates green and then indicates the following status:

NOTE:

- * When the ON switch has been pressed on the FFBH remote control and the timed climate control is in operation.
- ** Slow flashes are at 4 Hz (8 flashes in 2 seconds). Fast flashes are at 10 Hz (20 flashes in 2 seconds).

SWITCH OPERATED	LIGHT EMITTING DIODE COLOR AND SEQUENCE	REMOTE CONTROL BATTERY CONDITION	DESCRIPTION
ON	Green - 2 seconds solid	Good	■ Wireless link is operational. ■ The timed climate control is started.
None (*)	Green - Flashes every 2 seconds	Good	■ Wireless link is operational. ■ The timed climate control is in operation.
OFF	Red - 2 seconds solid	Good	■ Wireless link is operational. ■ The timed climate control is stopped.
ON	Green - 2 second period of slow flashes (**)	Good	■ Wireless link no response. ■ No action has been taken.

SWITCH OPERATED	LIGHT EMITTING DIODE COLOR AND SEQUENCE	REMOTE CONTROL BATTERY CONDITION	DESCRIPTION
OFF	Red - 2 second period of slow flashes (**)	Good	- Wireless link no response. - No action has been taken.
ON	Green - 2 second period of fast flashes (**)	Good	- Receiver is disabled. - No action has been taken.
ON	- Orange - 2 seconds solid - Followed by green - 2 seconds solid	Low	- Wireless link is operational. - The timed climate control is started.
OFF	- Orange - 2 seconds solid - Followed by red - 2 second period of slow flashes (**)	Low	- Wireless link is operational. - The timed climate control is stopped.
ON	- Orange - 2 seconds solid - Followed by green - 2 second period of slow flashes (**)	Low	- Wireless link no response. - No action has been taken.
OFF	- Orange - 2 seconds solid - Followed by red - 2 second period of slow flashes (**)	Low	- Wireless link no response. - No action has been taken.
ON	- Orange - 2 seconds solid - Followed by green - 2 second of fast flashes (**)	Low	- Receiver is disabled. - No action has been taken.
ON or OFF	Orange - 5 seconds fast flashes (**)	Replace remote control battery	- Wireless link no response. - No action has been taken.

The reason for 'Wireless link no response', may be 1 of the following:

- The FFBH remote control not paired to the vehicle.
- The wireless Radio Frequency (RF) signal between the FFBH remote control and the FFBH receiver obstructed.
Possible causes of wireless RF signal obstruction between the FFBH remote control and the antenna are:
 - Vehicles
 - Buildings
 - Walls
 - Metal structures.

- The FFBH remote control battery needs to be replaced.
- The FFBH receiver is in transit mode or disabled mode.

For additional information, refer to: [Antenna](#) (415-01 Information and Entertainment System, Description and Operation).

How to replace the battery in the Fuel Fired Booster Heater Remote Control

ⓘ CAUTION:

Battery disposal: Used batteries must be disposed of correctly, as they contain harmful substances. Seek advice on disposal from a retailer/authorised repairer and/or the local authority.

⚠ NOTE:

Avoid touching the new battery. Moisture or oil from fingers can reduce battery life and corrode the contacts.



With the back of the remote control facing upwards, use a coin, or a similar implement, to rotate the battery cover. Lift the cover off to reveal the battery compartment. Remove the old battery and, making sure the correct polarity is maintained, insert a replacement 3.3 volt, CR1/3N battery. Replace the cover and rotate it to lock.

How to pair the Fuel Fired Booster Heater Remote Control

⚠ NOTE:

For successful pairing the ignition switch must be in Power Mode 6 (ignition ON).

Each FFBH remote control must be 'paired' to the FFBH receiver to enable communications. Each remote control has a unique identification number which is stored by the receiver. The receiver can store up to 4 remote control identification numbers. If a fifth remote control is paired to the receiver, the receiver overwrites the first paired remote control number.

Pair a remote control to the vehicle, as follows:

- 1** Remove fuse 31P (5A) from the PJB.
- 2** Wait for a minimum of 5 seconds.
- 3** Replace fuse 31P (5A) in the PJB then, within 5 seconds, press and hold the remote control 'OFF' switch.
- 4** A successful pairing is indicated by the remote control LED illuminating red for 2 seconds.

TIMED CLIMATE CONTROL OPERATION

When the HVAC control module receives a timed climate control start request, its response depends on the AAT:

- If the AAT is 15°C (59°F) or more, the HVAC control module initiates parked ventilation and:
 - Operates the blower, depending on the ambient temperature, between 35% and 50% of the maximum speed.
 - Operates the distribution flaps in the climate control assembly to direct the air to the face vents.
- If the AAT is less than 15°C (59°F), and more than -25°C (-13°F) (diesel engine), or -20°C (-4°F) (petrol engine). The HVAC control module initiates parked heating and:
 - Sends a LIN message to activate the FFBH.
 - Operates the blower, depending on the ambient temperature, between 35% and 50% of the maximum speed.
 - Operates the distribution flaps in the climate control assembly to either only the windshield, or to both the footwell air ducts and the windshield. The distribution of the air in the passenger compartment by the HVAC control module, depends on the AAT.
- If the AAT is -25°C (-13°F) or below, the HVAC control module sends a LIN message to activate the FFBH.
 - Heated engine coolant is circulated around the engine and heater core(s) to heat the engine and improve engine starting.
 - When the ECT in the FFBH is above a suitable threshold the blower is switched ON and passenger compartment heating starts.

The FFBH only activates in timed climate control if the following threshold conditions are met:

- Pre-burn startup battery voltage check: Greater than 11.5V (at the FFBH terminals).
- Pre-burn ECT check: Less than 15°C (59°F) (internal FFBH measurement).
- Pre-burn fuel level check: Greater than 7.5 liters (1.98 (US) gallons) (value stored in the FFBH at ignition OFF).

The fuel level value stored within the FFBH is only updated when the engine is running (Power Mode 7). When starting the FFBH in timed climate control, the stored fuel level value used to calculate, at the last ignition OFF (Power Mode 4) event. It is therefore possible for the FFBH to fail to operate in timed climate control if the engine was stopped with a low fuel level. If the fuel tank is subsequently refuelled, the FFBH stored fuel level still reads low if the engine has not been started since refueling.

The HVAC control module discontinues timed climate control operation if the following precondition is met:

- The timed climate control is selected OFF with the FCDIM (if equipped).

- The timed climate control is selected OFF with the remote control greater than 30 minutes (if equipped).

The HVAC control module discontinues timed climate control operation:

- If parked ventilation is active, the HVAC control module:
 - Switches OFF the blower.
 - Returns the distribution flaps to the previous settings.
- If parked heating is active, the HVAC control module:
 - Sends a LIN message to deactivate the FFBH.
 - Switches OFF the blower.
 - Returns the distribution flaps to the previous settings.

For additional information, refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

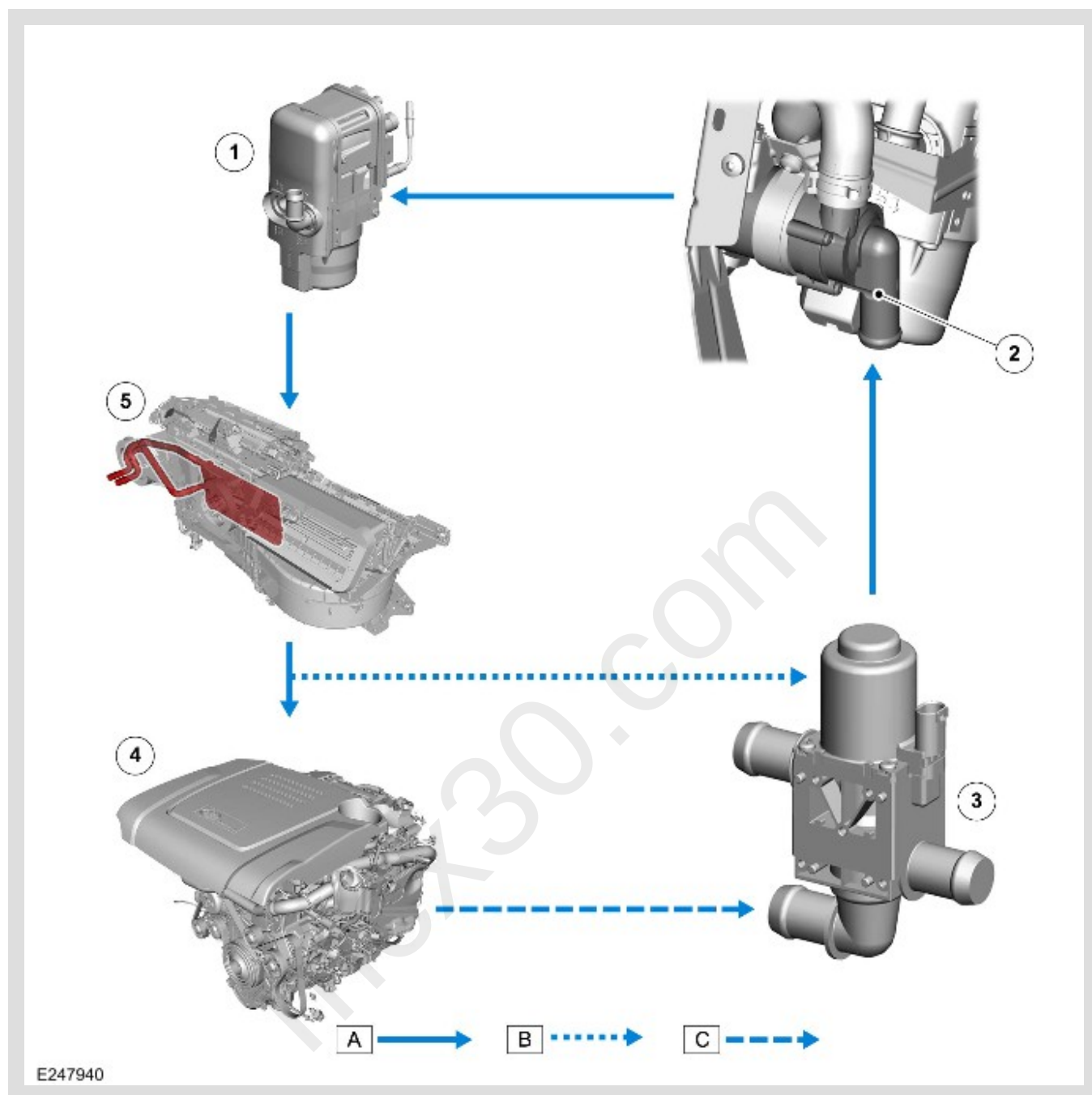
Transition from Timed Climate Control to Engine Running

Parked ventilation is automatically DEACTIVATED when the ignition is switched ON (Power Mode 6).

Parked heating:

- If the ECT is equal to or more than the ECT in the FFBH, the parked heating switches OFF.
- If the ECT is less than the ECT in the FFBH, the parked heating is active and remains ON to warm the passenger compartment.

CLIMATE CONTROL COOLANT FLOW DIAGRAM FOR FFBH WITH TIMED CLIMATE CONTROL



A = MAIN COOLANT FLOW: B = ENGINE COOLANT CIRCULATES AROUND THE HEATER CORE ONLY: C = ENGINE COOLANT CIRCULATES AROUND THE ENGINE AND HEATER CORE.

ITEM	DESCRIPTION
1	FFBH
2	FFBH coolant pump
3	FFBH coolant changeover valve
4	Vehicle engine
5	Heater core in the climate control assembly

When the FFBH coolant changeover valve is de-energized, the engine coolant flows through the following:

- The FFBH coolant pump
- The FFBH
- The heater core in the climate control assembly
- The vehicle engine.

The engine coolant flows through these in normal vehicle operation when the FFBH is not operational. The engine coolant also flow through these when the parking heat timed heating is selected to pre-heat the vehicles engine.

When the FFBH coolant changeover valve is energized, the engine coolant flows through the following:

- The FFBH coolant pump
- The FFBH
- The heater core in the climate control assembly.

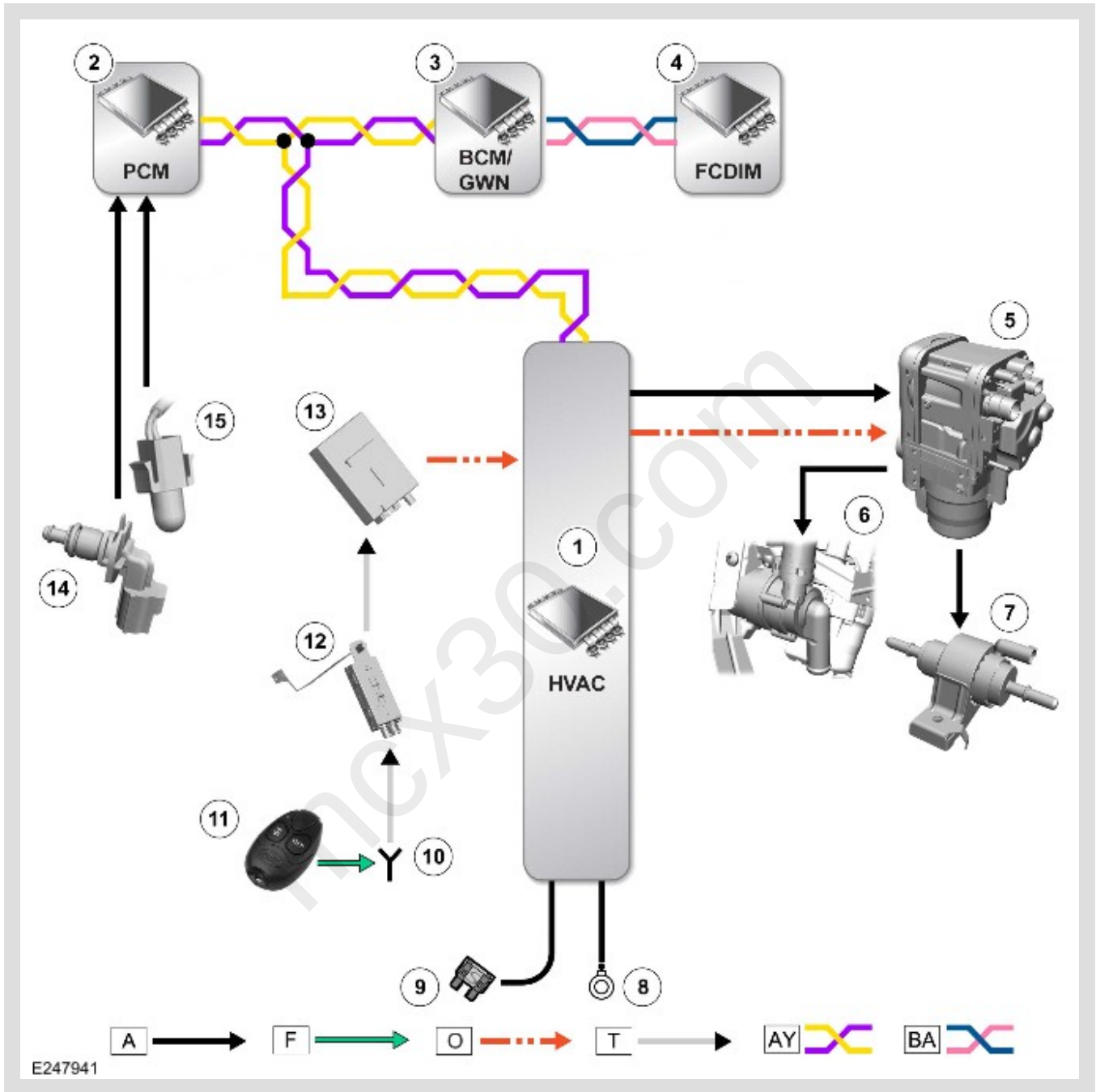
DIAGNOSTICS

The HVAC control module records any Diagnostic Trouble Code(s) (DTC)s and related data. Read the DTCs and related data with the Jaguar Land Rover (JLR) approved diagnostic equipment.

The JLR approved diagnostic equipment enables certain components to be activated and also live data to be read.

CONTROL DIAGRAM

CONTROL DIAGRAM - 1 OF 1



A = HARDWIRED: F = RF TRANSMISSION: O = LIN BUS: T = CO-AXIAL: AY = HS CAN POWER MODE ZERO SYSTEMS
BUS: BA = HS CAN HUMAN MACHINE INTERFACE (HMI)SYSTEM BUS.

ITEM	DESCRIPTION
1	HVAC control module
2	PCM

ITEM	DESCRIPTION
3	BCM/ GWM
4	FCDIM
5	FFBH
6	FFBH coolant pump
7	FFBH fuel pump
8	Ground
9	Power supply
10	Television antenna
11	FFBH remote control
12	Television antenna amplifier
13	FFBH receiver
14	ECT sensor
15	AAT sensor