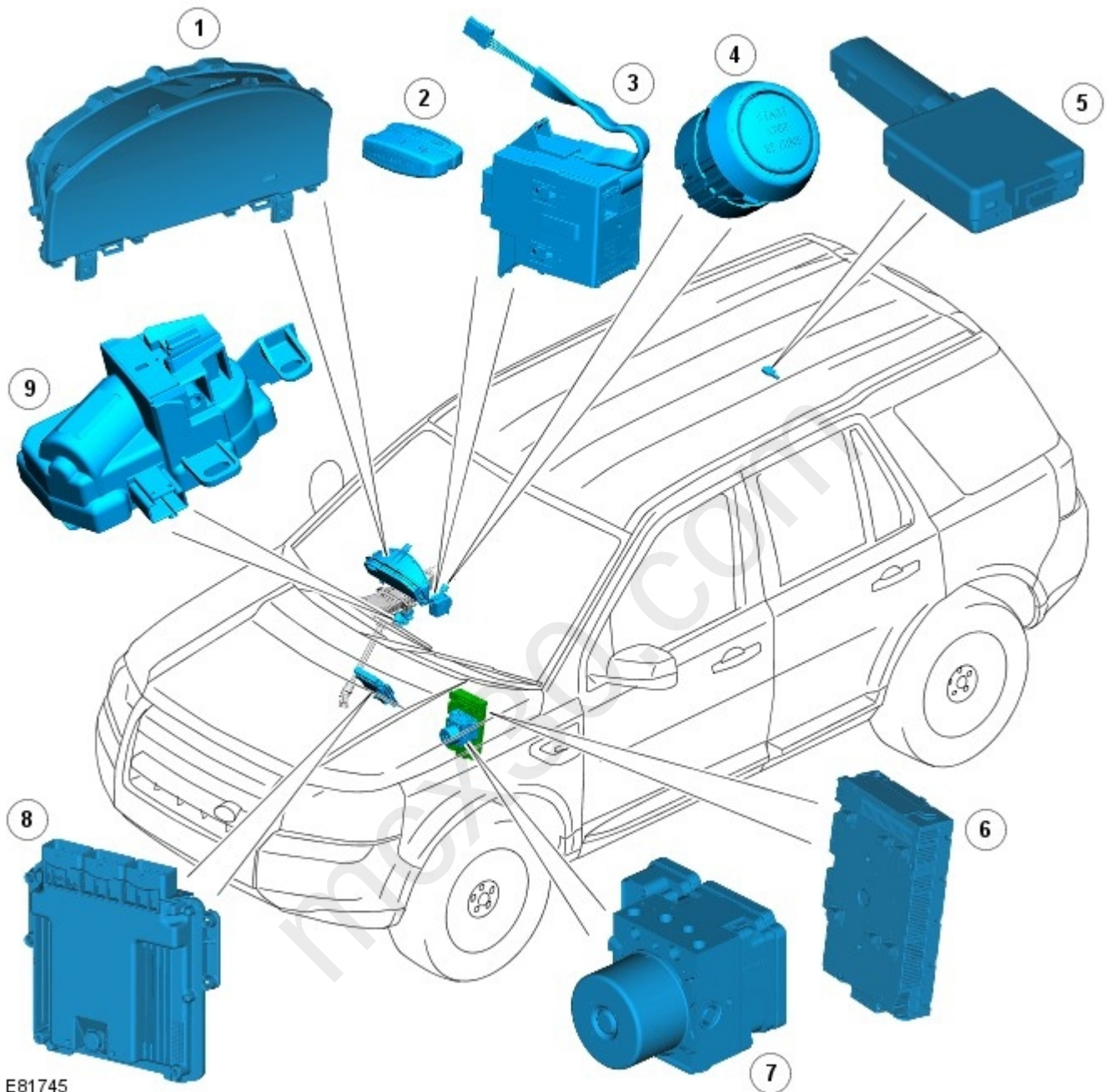


# Anti-Theft - Passive - Anti-Theft - Passive

Description and Operation

## COMPONENT LOCATION



E81745

| Item | Part Number | Description                         |
|------|-------------|-------------------------------------|
| 1    | -           | Instrument cluster                  |
| 2    | -           | Remote handset                      |
| 3    | -           | Start control module                |
| 4    | -           | Stop/Start switch                   |
| 5    | -           | Radio Frequency (RF) receiver       |
| 6    | -           | Central Junction Box (CJB)          |
| 7    | -           | Anti-lock Brake System (ABS) module |
| 8    | -           | Engine Control Module (ECM)         |
| 9    | -           | Electric steering column lock       |

## OVERVIEW

The Passive Anti-Theft System (PATS - immobilization) provides a secure interface between the CJB , ECM and ABS module to prevent unauthorized starting of the vehicle. This is achieved by having uniquely coded remote handset and encoded data exchange between modules.

Unauthorized starting prevention is achieved by immobilization of the engine crank system, fuel system and ignition system.

The passive anti-theft system uses the following components:

- Remote handset transponder
- CJB
- ECM
- Start control module
- Instrument cluster
- ABS module
- Electric steering column lock (if enabled).

• NOTE: On North American Specification (NAS) vehicles, a running change was introduced during 2008 Model Year (MY) to disable the electric steering column lock. Under the change, the internal electronics (printed circuit board (PCB), motor, etc.) of the lock have been removed and the lock has been disabled in the car configuration file. The change is incorporated on VIN (vehicle identification number) 082896, 085531, 085622, 085685, 085832, 085891, 085942, 085987, 086049, 086081, 086123, 086178, 086276, 086287, 086309, 086363, 086383, 086389, 086398, 086403 and 091770 onwards.

The system is automatic and requires no input from the driver. The engine management system will only allow engine crank when an authorization data message is received from the CJB. The engine start system is initiated when the start/stop switch and the brake pedal (automatic transmission) or the clutch pedal (manual transmission) are pressed simultaneously.

The engine management system (ECM) will only allow engine crank, spark (petrol models only) and injector functions when the following conditions are met:

- A hardwired Park/Neutral signal is received from the Transmission Control Module (TCM) (automatic transmission only)
- A hardwired ignition signal is received from the CJB
- A hardwired crank request signal is received from the CJB
- Encrypted data exchange between the instrument cluster and the ECM is verified.

Before the CJB will send the hardwired ignition signal, it must satisfactorily complete the following:

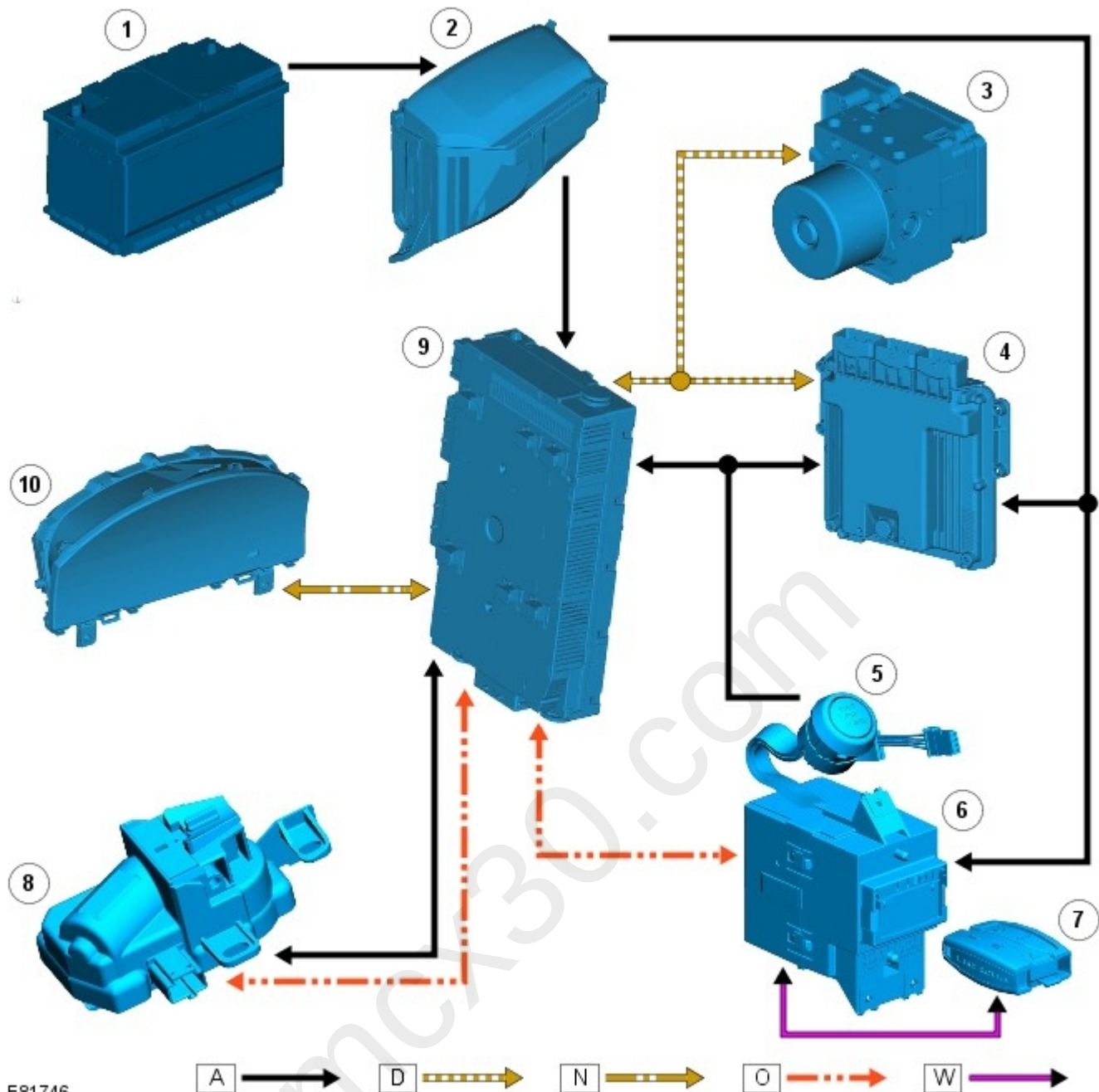
- Exchanged encrypted data with the start control module to validate the remote handset.

Additionally, before the CJB will send the hardwired crank request signal it must receive the following signals:

- Brake signal from the brake switch (automatic transmission) or clutch signal from the clutch switch (manual transmission)
- Hardwired transmission in Park (P) signal from the selector lever assembly (automatic transmission only).

## CONTROL DIAGRAM

• NOTE: **A** = Hardwired; **D** = High speed CAN bus; **N** = Medium speed CAN bus; **O** = LIN bus; **W** = LF transmission



| Item | Part Number | Description                                |
|------|-------------|--------------------------------------------|
| 1    | -           | Battery                                    |
| 2    | -           | Battery Junction Box (BJB)                 |
| 3    | -           | ABS module                                 |
| 4    | -           | ECM                                        |
| 5    | -           | Stop/Start switch                          |
| 6    | -           | Start control module                       |
| 7    | -           | Remote handset                             |
| 8    | -           | Electric steering column lock (if enabled) |
| 9    | -           | CJB                                        |
| 10   | -           | Instrument cluster                         |

## START CONTROL MODULE

The start control module is located in the instrument panel, adjacent to the steering column. The start control module is used as a primary method to authorize the remote handset.

The remote handset is inserted into the start control module slot with the key fob loop trailing. The start control module is motorized and will draw the remote handset into the slot once inserted.

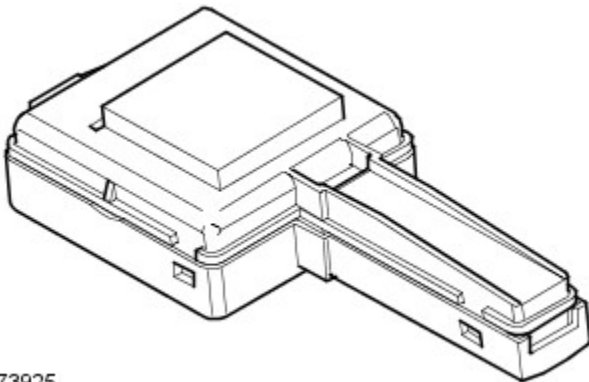
The start control module will then read the transponder within the remote handset and, if the transponder identification is valid, pass the identification data to the CJB to be processed.

Five seconds after the remote handset is inserted in the start control module, the module will start to charge the remote handset battery.

A message 'KEY IN' will be displayed if the remote handset is still in the start control module and the driver's door is

opened. The remote handset is removed from the start control module by gently pushing the remote handset into the start control module and releasing. The start control module motor will then drive the remote handset out from the slot as long as the ignition is off.

## **RF RECEIVER**



E73925

The Radio Frequency (RF) antenna is located in a central position behind the head liner. The receiver is available in two variants; 315 MHz or 433 MHz depending on market requirements. Transmissions are received from the remote handset for key identification and remote lock/unlock requests or requests for operation of the additional driver convenience features.

## **PRINCIPLES OF OPERATION**

The remote handset is validated via the start control module and the CJB. If the remote handset is valid the CJB initiates the unlocking of the electric steering column lock (if enabled). Once the electric steering column lock is unlocked and power has been removed, then the CJB enables the Fuel Pump Driver Module (FPDM) on petrol vehicles or the fuel pump relay on diesel vehicles.

The CJB also controls the engine crank request. On vehicles with automatic transmission, if the transmission selector lever is in the Park 'P' position and the driver presses the brake pedal or on manual transmission vehicles if the driver presses the clutch pedal and simultaneously presses the start/stop switch, the CJB interprets this as an engine crank request. Before the engine crank request is allowed, the CJB checks for the brake or clutch switch signal. If the signal is correct then the CJB sends a crank request signal to the ECM on the high speed Controller Area Network (CAN) bus.

If a replacement remote handset is required, then a Land Rover approved diagnostic system must be used to synchronize the remote handsets. If any module, which is involved in the remote handset authorization process, require replacement, a Land Rover approved diagnostic system procedure is also required to synchronize the replacement module into the system.

# Anti-Theft - Passive - Anti-Theft - Passive

Diagnosis and Testing

## Principles of Operation

For a detailed description of the Passive Anti-Theft System (PATS), refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

## Inspection and Verification

The best method to confirm the correct operation of the Passive Anti-Theft System (PATS) is to check the LED (located in the center of the instrument panel). The LED should illuminate solid for 3 seconds, when the ignition status is set to ON, and then extinguish. This validates all PATS functions (i.e. the key transponder matches a stored key code, the challenge/response sequence between the respective modules was successful resulting in the EMS being enabled).

### Ignition Fails to Operate

Check that the key is correctly inserted into the start control unit (SCU) and that it is the correct key for the vehicle (Key will be ejected from the SCU if it is not programmed or from another vehicle). If the vehicle is an automatic, ensure that the Park position is selected and if manual, ensure it is in the Neutral position.

Check that the start button circuit to the Central Junction Box (CJB) is not open circuit or short to ground.

Check that the CAN network is not malfunctioning, i.e. open circuit or short circuit. This would mean that the CJB, ECM and Instrument Cluster would be unable to communicate. Check these modules for related DTCs and refer to relevant DTC Index.

### Engine Fails to Crank

The immobilizer status indication LED is displayed in the bottom left of the instrument pack. When the key is inserted into the SCU, the LED will be turned on for 3 seconds and then turned off. The LED will flash slowly (once every 2 seconds) if the vehicle is immobilised (transponder not approved). Additionally the diagnostic system should be used to check for Diagnostic Trouble Codes (DTCs) from the CJB, instrument cluster, ECM and the ABS module.

One potential occurrence for the vehicle failing to crank on an Automatic Transmission could be due to the Locked in park switch.

Check the Crank request circuit from the CJB to ECM for short circuit or open circuit.

Check the Starter Relay Circuit.

Check that the Steering Column Lock (SCL) is operating correctly. Inserting the key should drive the SCL to un-lock and steering wheel should move freely.

Check the CAN network is not malfunctioning, i.e. the CAN circuit is open or short circuit. This would mean that the CJB, instrument cluster, ECM or ABS module would not be able to communicate resulting in no challenge being made from the modules for the Immobilisation data.

Also on an Automatic, check the CAN network between the CJB and the Transmission Control Module (TCM). The CJB uses the "LockedInP" signal transmitted by the TCM to determine if the transmission is in Park before allowing crank, the CJB uses a value of 0x01, if the CJB sees a value less than this it will not allow crank, and key will not be ejected from SCU.

For a manual gearbox the clutch pedal has to be de-pressed, hence check the CAN network between the CJB and the ECM to ensure the clutch is depressed, ClutchPedalSwitch75pct = TRUE and ClutchPedalPressed2 = True. The Vehicle will not crank until these signals are set.

On an Automatic vehicle, check the CAN network between the ABS module and the CJB. The CJB uses a signal "BrakePedalActive" to determine if the brake pedal has been depressed in order to allow the engine to crank. The CJB uses a value = TRUE if the CJB does not receive this signal, it will not allow the crank request output.

### Engine Cranks But Will Not Start

If the engine is cranking it means that the EMS has passed the authorisation required with the CJB. If this authorisation failed, the ECM would not engage the starter relay. This could be confirmed by verifying the LED in the left of the Instrument pack being illuminated for 3 seconds on Key insertion, or by reading DTCs from the CJB or the ECM.

In all cases of suspected non-start issues, the most logical failure modes should be eliminated first. i.e.

- 1. Check all relevant supplies and grounds to the relevant modules are ok.
- 2. Note any unusual behaviour from other systems/functionality.
- 3. Note any functions that are not operating as expected.

## Fault Codes/DTCs

For the various PATS modes of operation/failures listed in the table, the CJB will store a DTC which will not be shown to the customer.

When the Key is inserted and ignition status ON is achieved, if the start authorisation passes, the LED in the bottom left of the instrument cluster will illuminate for 3 seconds then go off. If start authorisation fails, the LED will continue to flash every 2 seconds. Please see table below for a list of fault codes that will be stored under certain conditions. For additional information.

REFER to: [Starting System](#) (303-06A Starting System - I6 3.2L Petrol, Diagnosis and Testing) /

[Electronic Engine Controls](#) (303-14A Electronic Engine Controls - I6 3.2L Petrol, Diagnosis and Testing) /  
[Electronic Engine Controls](#) (303-14B Electronic Engine Controls - TD4 2.2L Diesel, Diagnosis and Testing).

| Mode of Operation/ Failure                    | When Logged         | Ignition Status           | DTC     | Indication                    |
|-----------------------------------------------|---------------------|---------------------------|---------|-------------------------------|
| Prove out                                     | N/A                 | Transition from OFF to ON | N/A     | 3 Seconds of LED illumination |
| SCU internal failure                          | Key insert          | Any                       | B102496 | Warning message displayed     |
| Lost communication with SCU (SCU no response) | Key insert          | Any                       | B102487 | Warning message displayed     |
| SCU incorrect response                        | Key insert          | Any                       | B102481 | Warning message displayed     |
| SCU not programmed                            | Key insert          | Any                       | B102451 | Warning message displayed     |
| Key transponder no response                   | Key insert          | Any                       | B102408 | Warning message displayed     |
| Transponder incorrect response                | Key insert          | Any                       | B102581 | Warning message displayed     |
| TP communication error                        | Key insert          | Any                       | B102408 | Warning message displayed     |
| Number of keys programmed below minimum       | Manufacturer/Dealer | Any                       | B10D800 | No indication                 |
| Key not programmed                            | Manufacturer/Dealer | Any                       | B10D751 | No indication                 |
| SCL not programmed                            | Manufacturer/Dealer | Transition from OFF to ON | B102651 | Warning message displayed     |
| Lost communication with ECM                   | N/A                 | Any                       | U010000 | Warning message displayed     |