

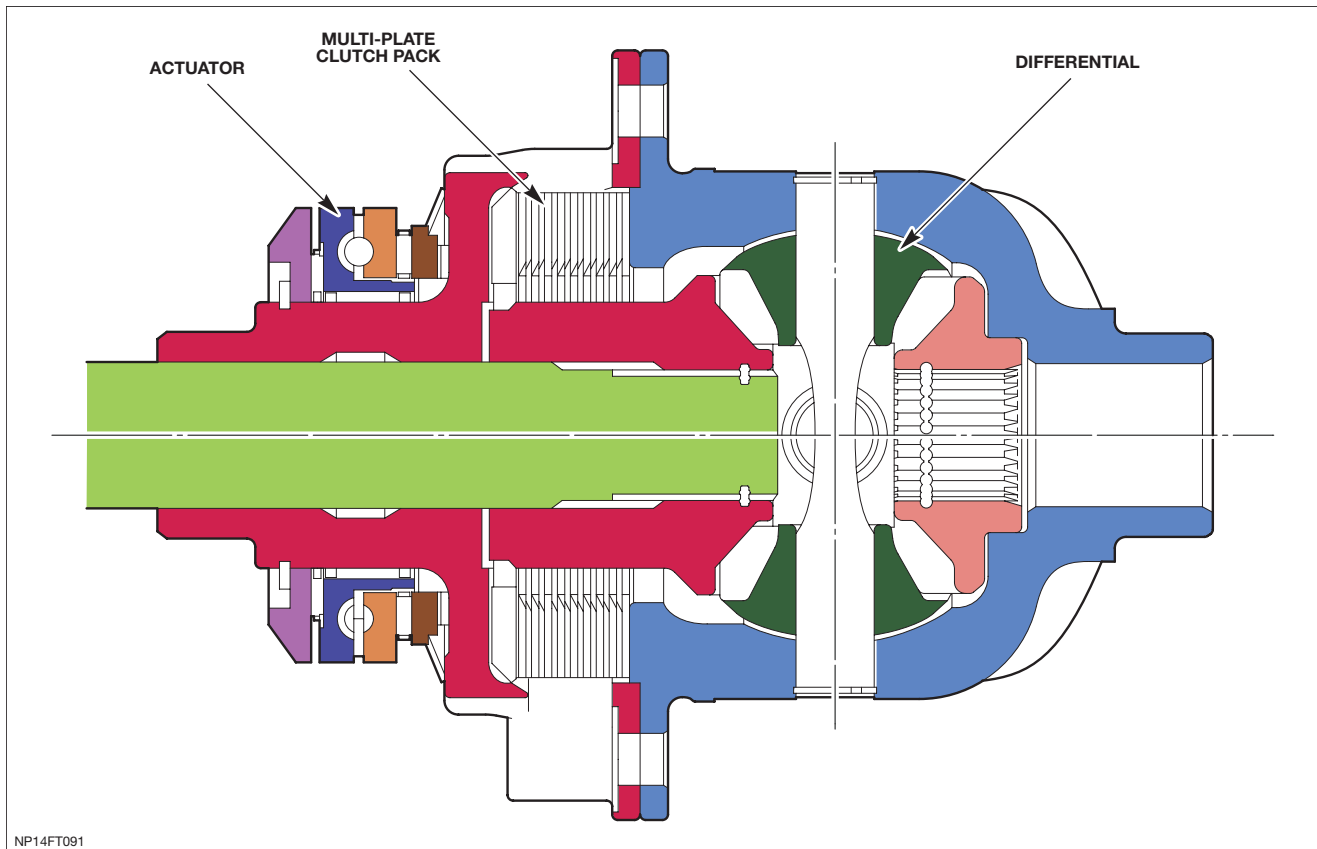
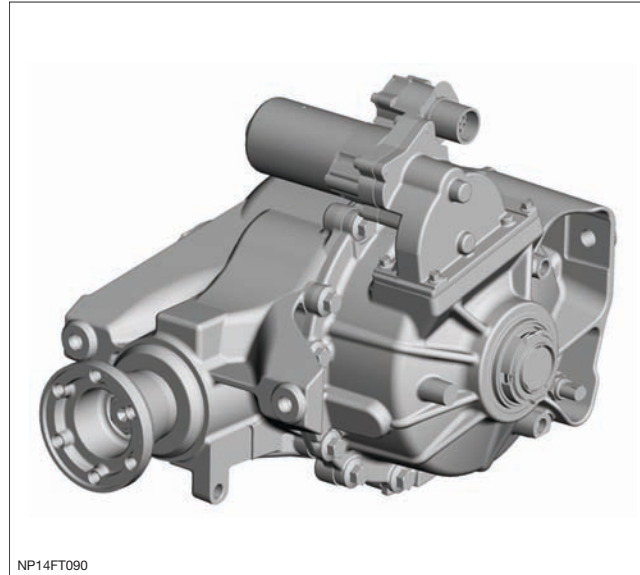
# ELECTRIC DIFFERENTIAL

## Electric Differential Overview

The rear electric differential has the same functionality as an open rear differential but incorporates a locking feature.

An electrically controlled multi-plate clutch provides a rear differential lock and torque biasing function to give improved traction performance and vehicle dynamic stability. A strategy for electrical control of the multi-plate clutch assembly provides the following functions:

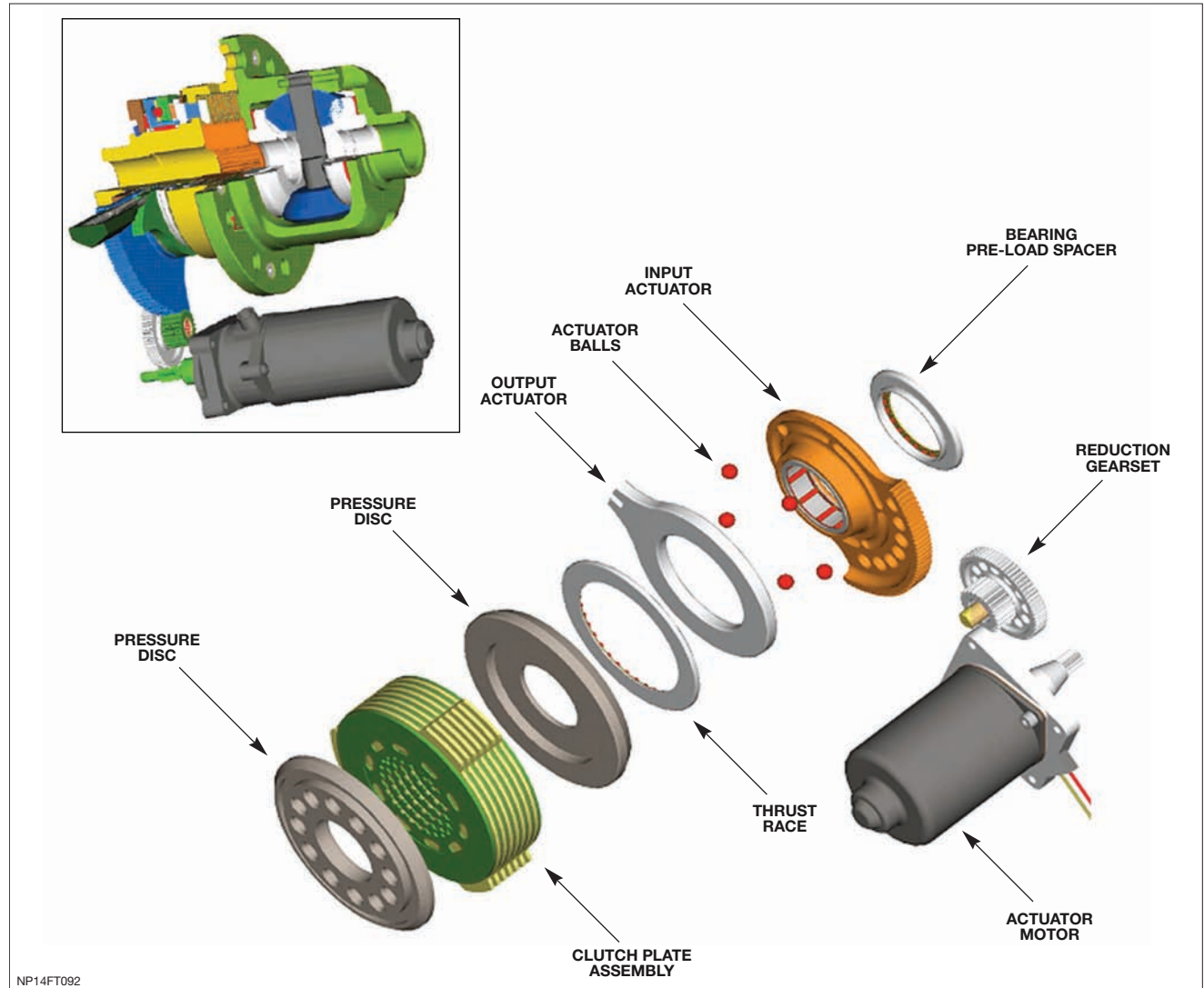
- A pre-loading function, increasing locking and driving torque
- A slip controller increases locking torque under slip conditions to increase vehicle handling characteristics while decreasing locking torque for optimum comfort (when cornering, for example).



## Component Description

### Multi-Plate Clutch

The multi-plate clutch assembly actively controls the torque flow through the rear differential, optimizing the torque distribution in the driveline. As the clutch assembly locks the differential, torque is transferred to both rear wheels. This ensures that whichever wheel has traction has the maximum available torque supplied to it, while any slipping wheel continues to spin at a similar speed to the driving wheel.



Driving the input actuator disc, via the motor shaft, rotates the output actuator. This movement acts on five balls in a ramp mechanism between the input and output actuators producing a defined axial movement. The movement forces the pressure disc to induce friction between the sun gear and differential case, via the clutch plates supported by the sun gear and the plates supported by the clutch basket on the differential case. This frictional force inhibits the differential rotation; the differential case and left hand differential side gear are locked together.

## Rear Differential Control Module

The RDCM is connected on the HS CAN bus. The primary function of the module is controlling the rear differential multi-plate clutch actuation and locking torque biasing function using information from other control modules on the CAN bus.



The module controls the closed loop position sensing system within the motor, regulates the power supply to the motor and memorizes the position of the motor when the ignition is switched off.

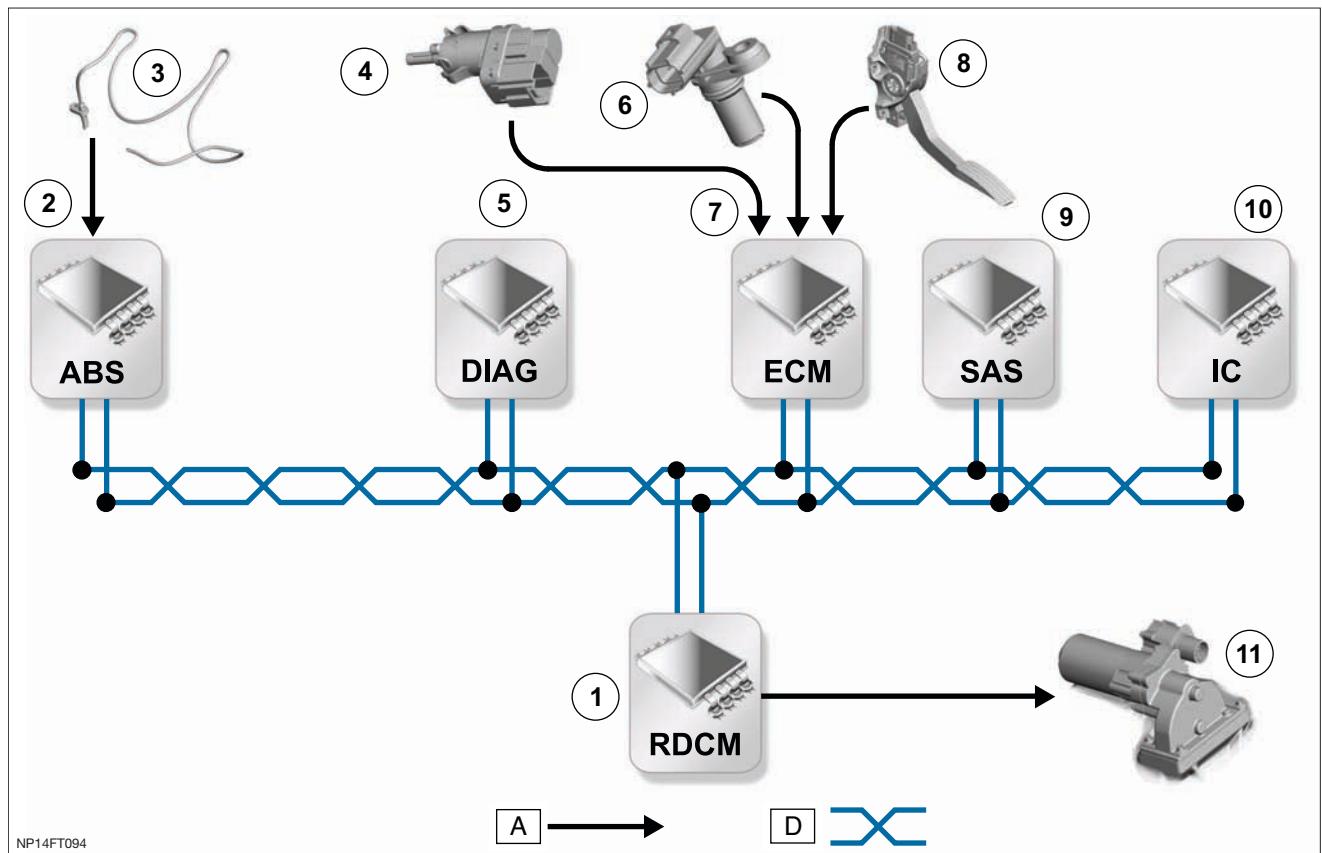
## Principles of Operation

The Rear Differential Control Module (RDCM) receives wheel slip information, locking the differential according to the prevailing conditions. The locking and biasing feature is actuated via a DC motor. The RDCM outputs a PWM signal controlling the motor functionality.

The function of the multi-plate clutch assembly is to prevent excessive differential slip and therefore maximize the traction performance of the vehicle. This is fundamentally different from the 'braked' traction control operation, which can only counteract differential slip when it occurs.

A certain amount of differential slip is required, allowing the vehicle to turn corners smoothly and remain stable during stability control system intervention. The Integrated Suspension Control Module (ISCM) monitors the driver's demands through primary vehicle controls and automatically sets the torque slip at the rear differential, via the RDCM. The system is completely automatic and does not require any driver input.

## Rear Electric Differential Control Diagram



NP14FT094

- A Hardwired
- D HS CAN
- 1 Rear Differential Control Module
- 2 ABS Control Module
- 3 Wheel Speed Sensor

- 4 Brake Pedal Switch
- 5 Diagnostic Connector
- 6 Crankshaft Sensor
- 7 Engine Control Module

- 8 Accelerator Pedal Position Sensor
- 9 Steering Angle Sensor Module
- 10 Instrument Cluster
- 11 Rear Differential Actuator Motor

## Service Notes

The oil used in the electric differential contains unique additives and friction modifiers, which enhance the differential operation. No other oil may be used.

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**NOTE:** Refer to the Workshop Manual for the correct oil specification.

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The following differential components are serviceable:

- Half-shaft seals
- Actuator motor
- Temperature sensor
- Control module

## Electric Differential Calibration

In order for the system to function correctly, the Rear Differential Control Module must be calibrated using the Jaguar Approved Diagnostic Equipment if the following components are replaced:

- Differential
- Differential control module
- Drive motor

## Diagnostics

If a fault occurs with the electric rear differential control system or an input signal, (road speed signal, for example) the control module records an error code. An Instrument Cluster warning indicator lamp illuminates permanently. On some variants a warning message is displayed in the message center.