

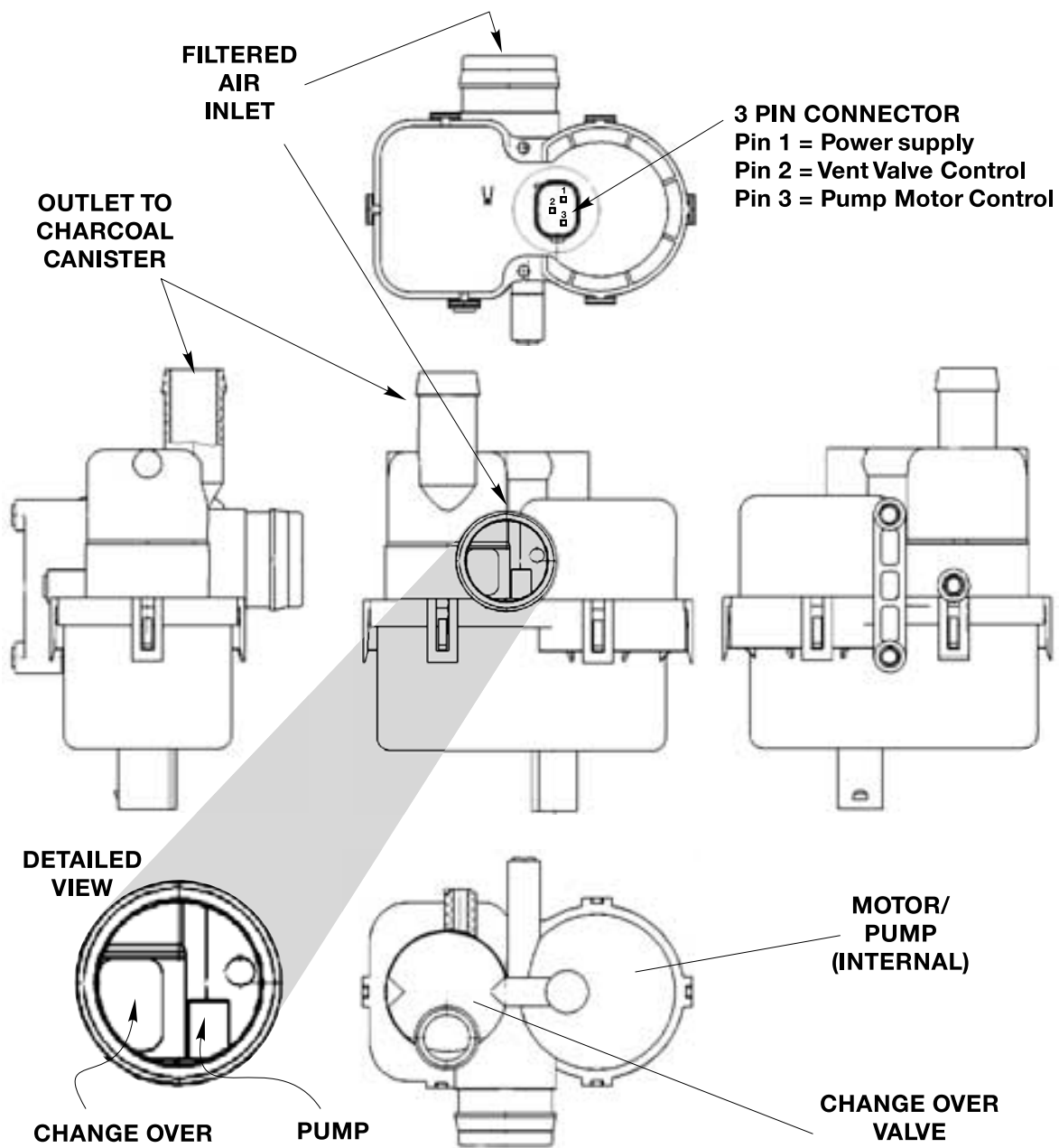
DM-TL (DIAGNOSIS MODULE - TANK LEAKAGE)

INTRODUCTION

A new Fuel System Leak Diagnosis Pump is equipped on the X5. The pump will eventually replace the current vacuum LDP on all vehicles.

The pump is manufactured by Bosch to BMW specifications.

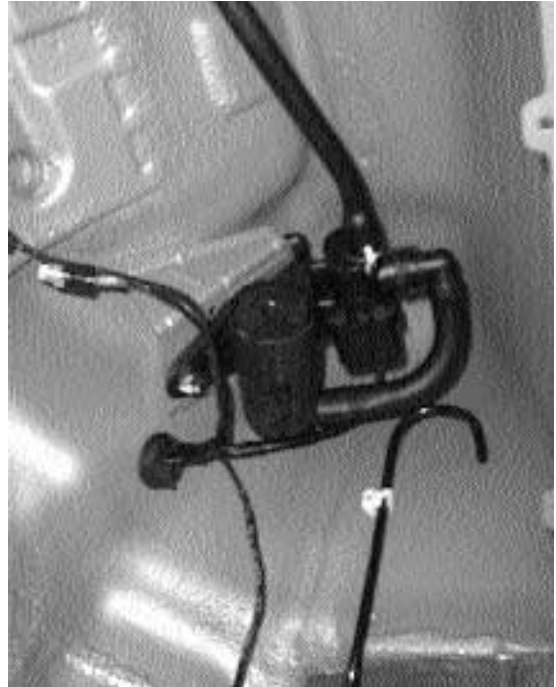
- Bosch ECMs identify the electrical function of the pump as DM-TL.



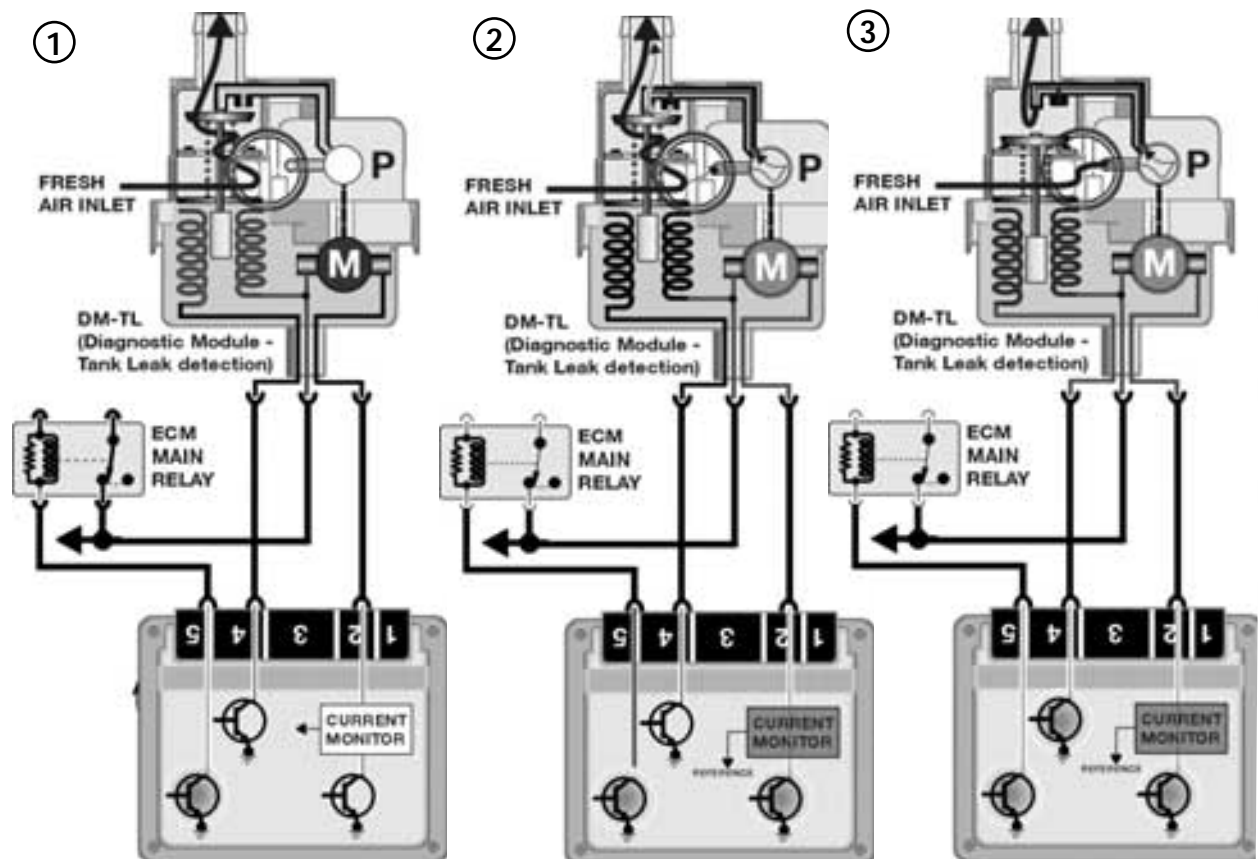
Functional Overview:

The DM-TL is located in the drivers side rear wheel well in the X5.

1. In it's inactive state, filtered fresh air enters the evaporative system through the sprung open valve of the DM-TL.
2. When the DME activates the DM-TL for leak testing, it first activates only the pump motor. This pumps air through a restrictor orifice (1.0 or 0.5 mm) which causes the electric motor to draw a specific amperage value. This value is equivalent to the size of the restrictor.
3. The solenoid valve is then energized which seals the evap system and directs the pump output to pressurize the evap system.



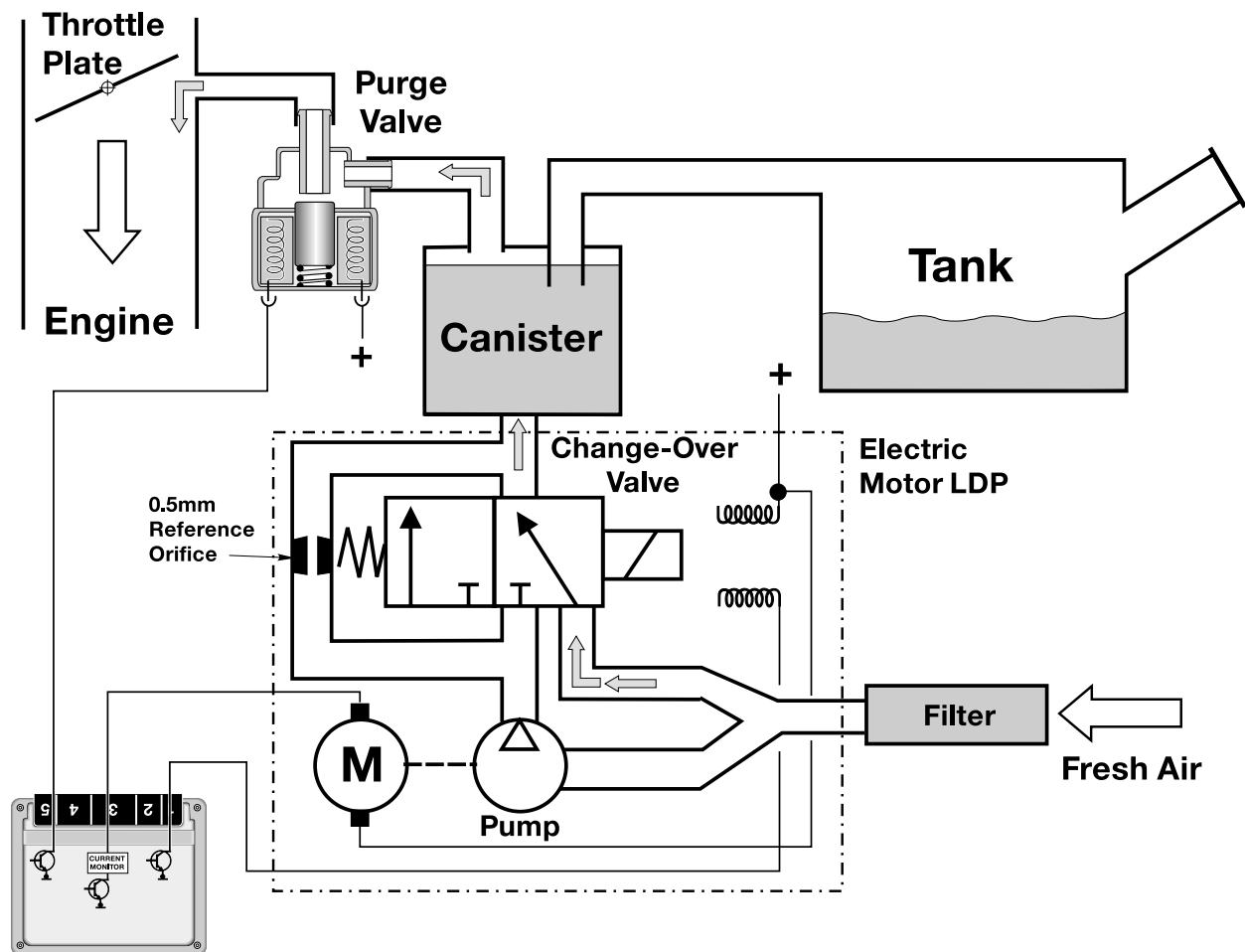
The evap system is detected as having a large leak if the amperage value is not realized, a small leak if the same reference amperage is realized or no leak if the amperage value is



FUNCTION

The DC Motor LDP ensures accurate fuel system leak detection for leaks as small as 0.5mm (.020"). The pump contains an integral DC motor which is activated directly by the engine control module. The ECM monitors the pump motor operating current as the measurement for detecting leaks.

The pump also contains an ECM controlled change over valve that is energized closed during a Leak Diagnosis test. The change over valve is open during all other periods of operation allowing the fuel system to "breathe" through the inlet filter (similar to the full down stroke of the current vacuum operated LDP).



DC MOTOR LDP INACTIVE -- NORMAL PURGE VALVE OPERATION

In its inactive state the pump motor and the change over valve of the DC Motor LDP are not energized. When purge valve operation occurs filtered air enters the fuel system compensating for engine vacuum drawing on the hydrocarbon vapors stored in the charcoal canister.

LEAK DIAGNOSIS TEST PRECONDITIONS

The DME only initiates a leak diagnosis test every second time the criteria are met. The criteria is as follows:

- Engine **OFF** with ignition switched **OFF**.
- Engine Control Module still in active state or what is known as “follow up mode” (Main Relay energized, control module and DME components online for extended period after key off).
- Prior to Engine/Ignition switch OFF condition, vehicle must have been driven for a minimum of 20 minutes.
- Prior to minimum 20 minute drive, the vehicle must have been OFF for a minimum of 5 hours.
- Fuel Tank Capacity must be between **15 and 85%** (safe approximation between 1/4 - 3/4 of a tank).
- Ambient Air Temperature between **-7°C & 35°C** (20°F & 95°F)
- Altitude < **2500m** (8,202 feet).
- Battery Voltage between **11.5 and 14.5 Volts**

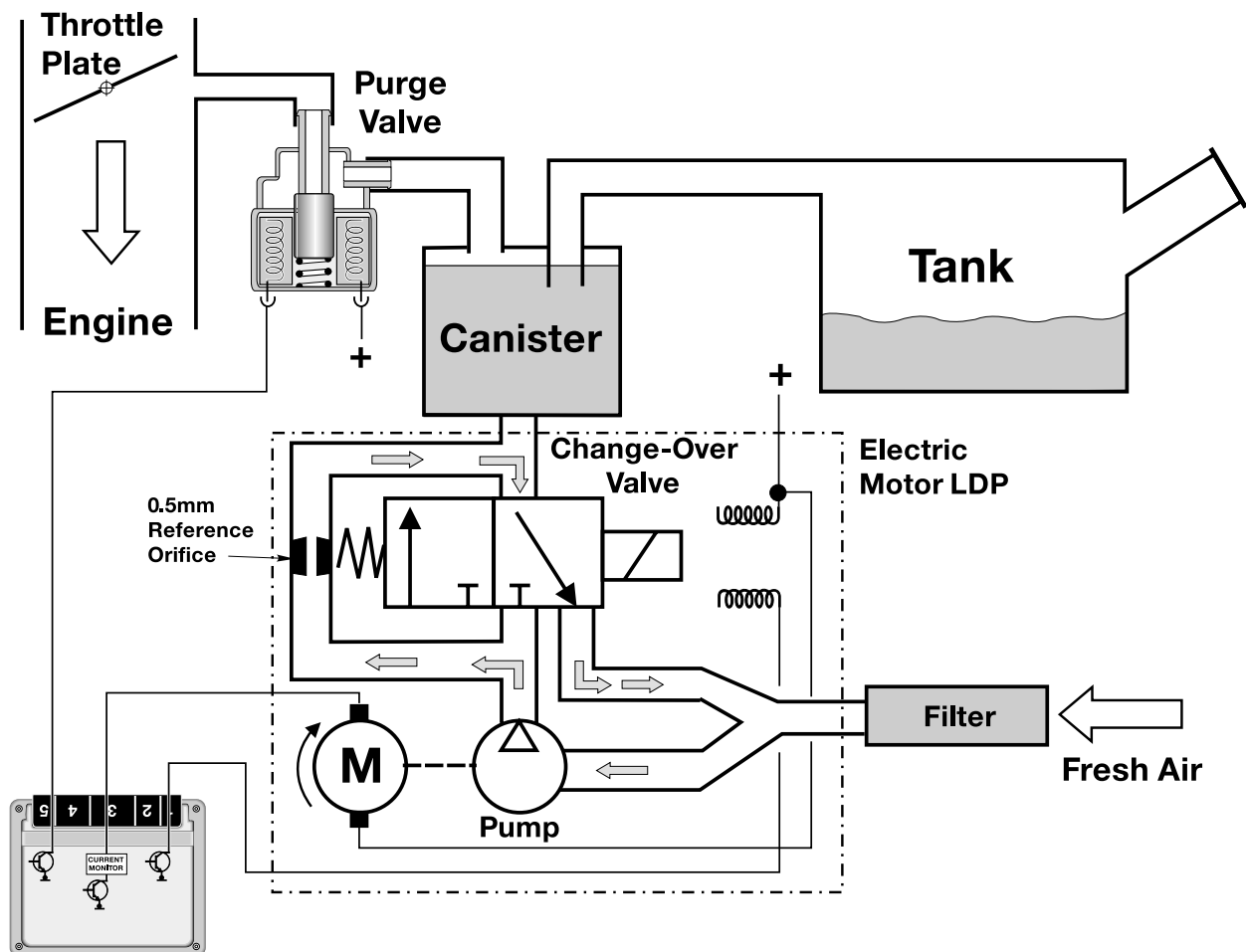
When these criteria are satisfied every second time, the ECM will start the Fuel System Leak Diagnosis Test. The test will typically be carried out once a day i.e. once after driving to work in the morning, when driving home in the evening, the criteria are once again met but the test is not initiated. The following morning, the test will run again.

LEAK DIAGNOSIS TEST

PHASE 1 - REFERENCE MEASUREMENT

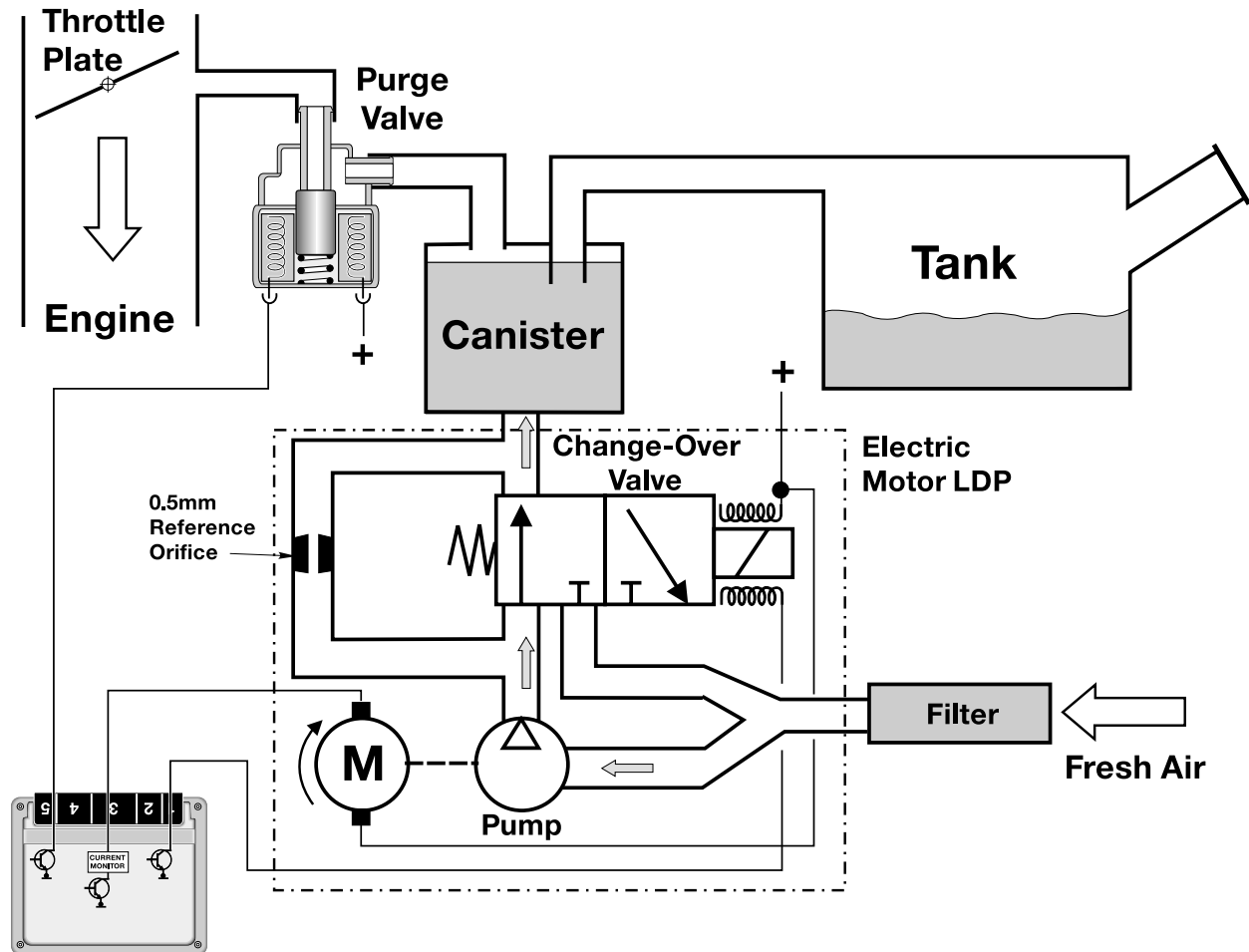
The ECM activates the pump motor. The pump pulls air from the filtered air inlet and passes it through a precise 0.5mm reference orifice in the pump assembly.

The ECM simultaneously monitors the pump motor current flow. The motor current rises quickly and levels off (stabilizes) due to the orifice restriction. The ECM stores the stabilized amperage value in memory. The stored amperage value is the electrical equivalent of a 0.5 mm (0.020") leak.



PHASE 2 - LEAK DETECTION

The ECM energizes the Change Over Valve allowing the pressurized air to enter the fuel system through the Charcoal Canister. The ECM monitors the current flow and compares it with the stored reference measurement over a duration of time.



Once the test is concluded, the ECM stops the pump motor and immediately de-energizes the change over valve. This allows the stored pressure to vent thorough the charcoal canister trapping hydrocarbon vapor and venting air to atmosphere through the filter.

TEST RESULTS

The time duration varies between 45 & 270 seconds depending on the resulting leak diagnosis test results (developed tank pressure “amperage” / within a specific time period). However the chart below depicts the logic used to determine fuel system leaks.

