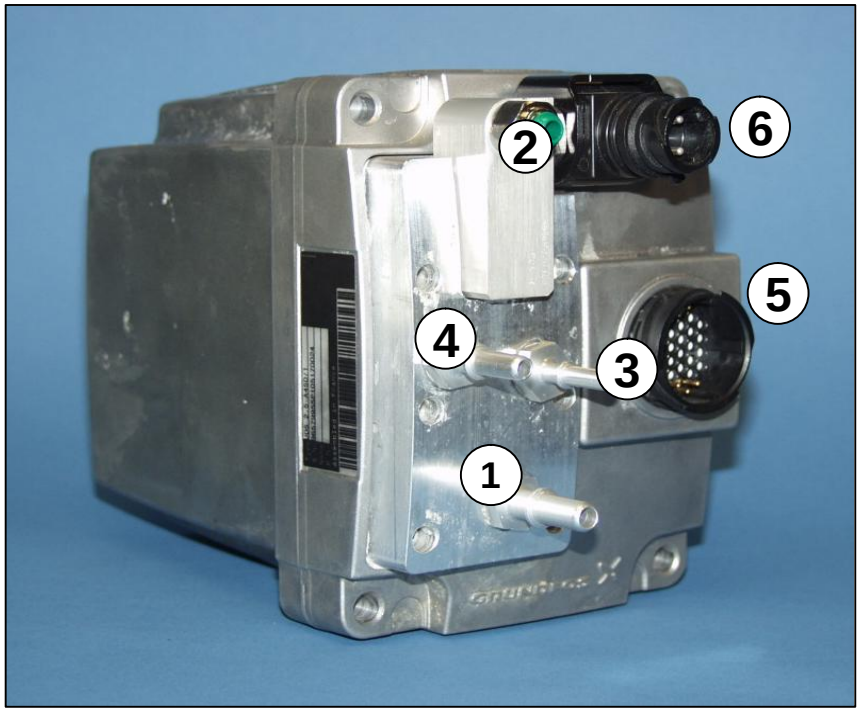
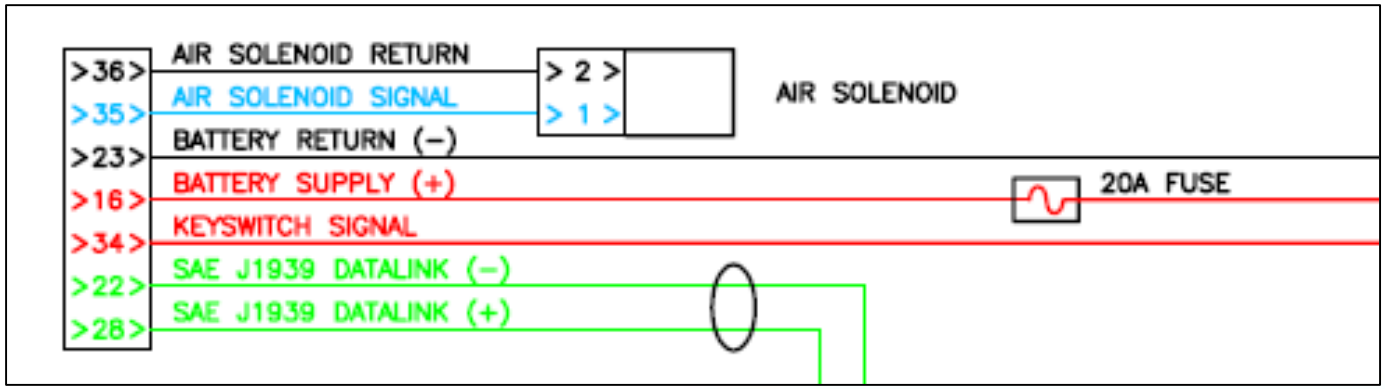
Air assist system

Dosing Pump Connections



1. DEF in from tank (Urea)
2. Air supply in (vehicle)
3. DEF out to Injector nozzle (Urea & Air mix)
4. DEF return to tank (only used during prime)
5. 37 PIN ITT Cannon connector broadcasting on the J1939 OEM supplied Harness
6. Power supply to Solenoid 2 pin connector (from Doser)



DEFDU

- The DEFDU (doser) is designed to deliver a flow of DEF (urea) according to the message sent by the engine ECM.

- The system uses air supplied by the compressor to bring the dosed volume of DEF (urea) to the injection nozzle.

- The DEFDU has a built in heating device that allows the doser to operate with outside temperatures lower than –11C, if the vehicle also has heated DEF lines and DEF tank.
It will also function in a working temp of up to 80 C, but DEF above 50deg C for extended periods will damage the doser Unit.

- The DEFDU has an integrated its self-diagnostic procedure, informing the Engine ECM about its status by sending messages via the J1939 CAN link.

- The Air assisted DEFDU can accommodate both 12 VDC & 24 VDC supply voltages.

The electronic control arrangement makes the DEFDU very fast and accurate. The desired flow rate is delivered with a repeatability of 1%, at the steady state conditions at which the pump is calibrated. (20°C ambient and liquid temperature)

System Principle and Operation

The SCR system operates on the principle of selective catalytic reduction (SCR). The SCR system converts the Nitrogen Oxides produced by the engine (exhaust) into Nitrogen and Water.

Liquid reagent is injected upstream of a catalyst in the exhaust system using a very accurate dosing pump. The amount of DEF injected by the pump is controlled by the **Engine ECM.**

Under normal operation the Dosing unit has separate control Phases:-

- **Initialisation**
- **Priming**
- **Dosing mode – standby / DEF injection**
- **Purging**
- **Release**

System Priming

Initialisation. At Key on the Doser begins initialisation, the motor is operated to position the pump and self test internal components such as the pressure switch and temperature sensor.

When the Engine is started an instruction is sent to the dosing pump, from the Engine ECM, to go into the PRIMING phase. DEF is circulated from the tank, through the pump and back to the tank to purge air from the system. The pump runs at 100% flow for 30 seconds. If the PRIMING phase is successful you will then hear the air solenoid operate and air will flow continuously through the doser and into the nozzle.

If the PRIMING phase is not successful first time, the air solenoid will de-energize and the priming sequence as described above will repeat. This sequence can be repeated up to 20 times before ERROR 1682 SCR Pump State Control Doser Error is displayed. (10 -12 mins)

NOTE: The 1682 fault code has been expanded to help pinpoint the problem.

UREA DOSER RETURN LINE ERROR = FC3575

- Aftertreatment Diesel Exhaust Fluid Pressure Sensor - Data Valid But Above Normal Operating Range - Moderately Severe Level

UREA DOSER LOW AIR UREA ERROR = FC3738

- Air Supply Actuator - Data Valid But Below Normal Operating Range - Moderately Severe Level

UREA DOSER MOTOR ERROR = FC3569

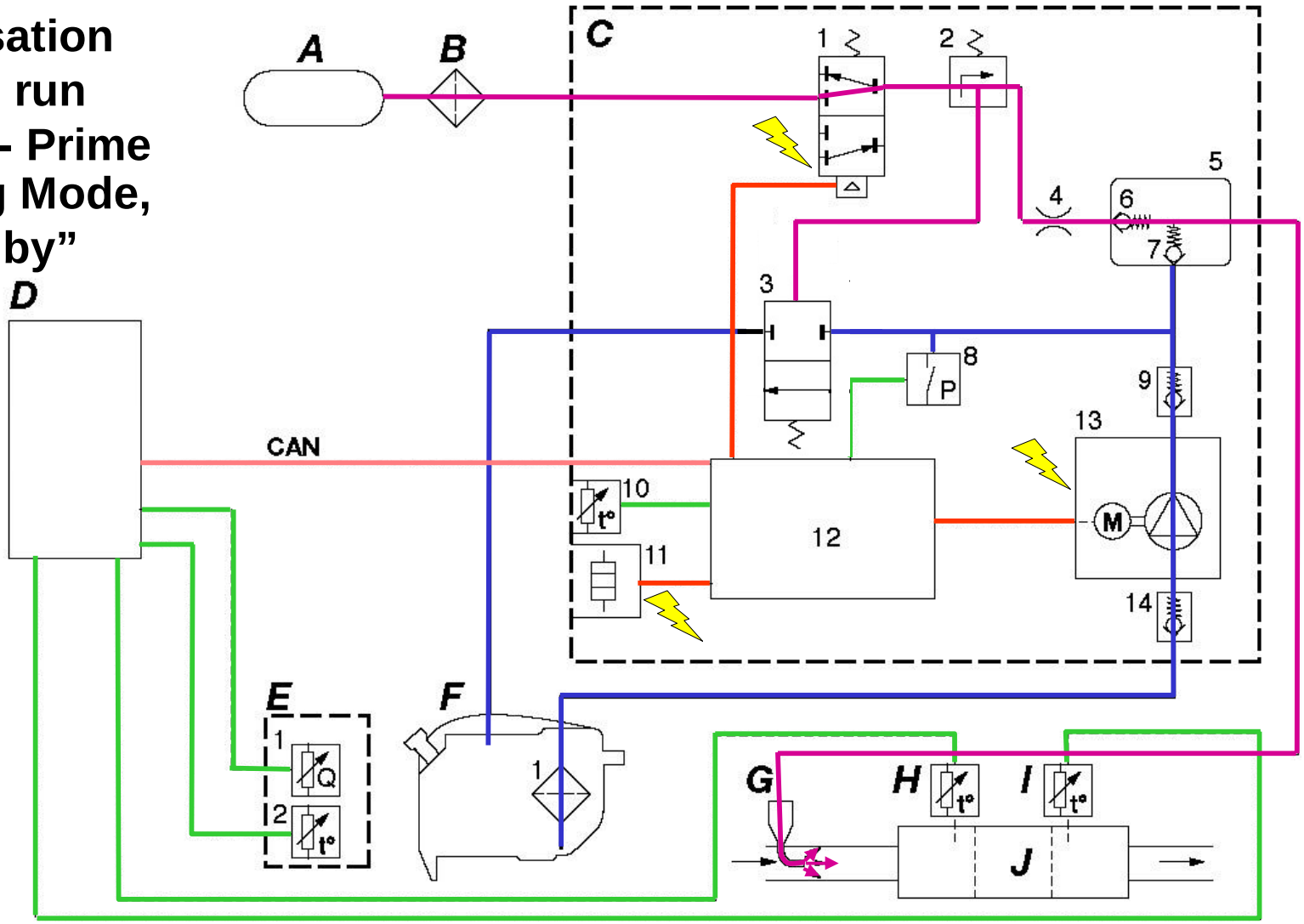
- Aftertreatment Diesel Exhaust Fluid Dosing Unit Input Lines - Mechanical system not responding or out of adjustment

UREA DOSER PRIME TIMEOUT ERROR = FC3548

- Aftertreatment Diesel Exhaust Fluid Dosing Unit Loss of Prime - Condition Exists

PRIMING PHASE

Initialisation
Engine run
Signal - Prime
Dosing Mode,
“Standby”



A: Air Tank

B: Air filter

C: Doser unit

D: Engine ECM

E: Wema Sensor

F: Urea Tank

G: Nozzle

H: EGP Inlet Temp

I:EGP Outlet Temp

J: EGP

Emission Solutions

Workshop task.

Doser Priming

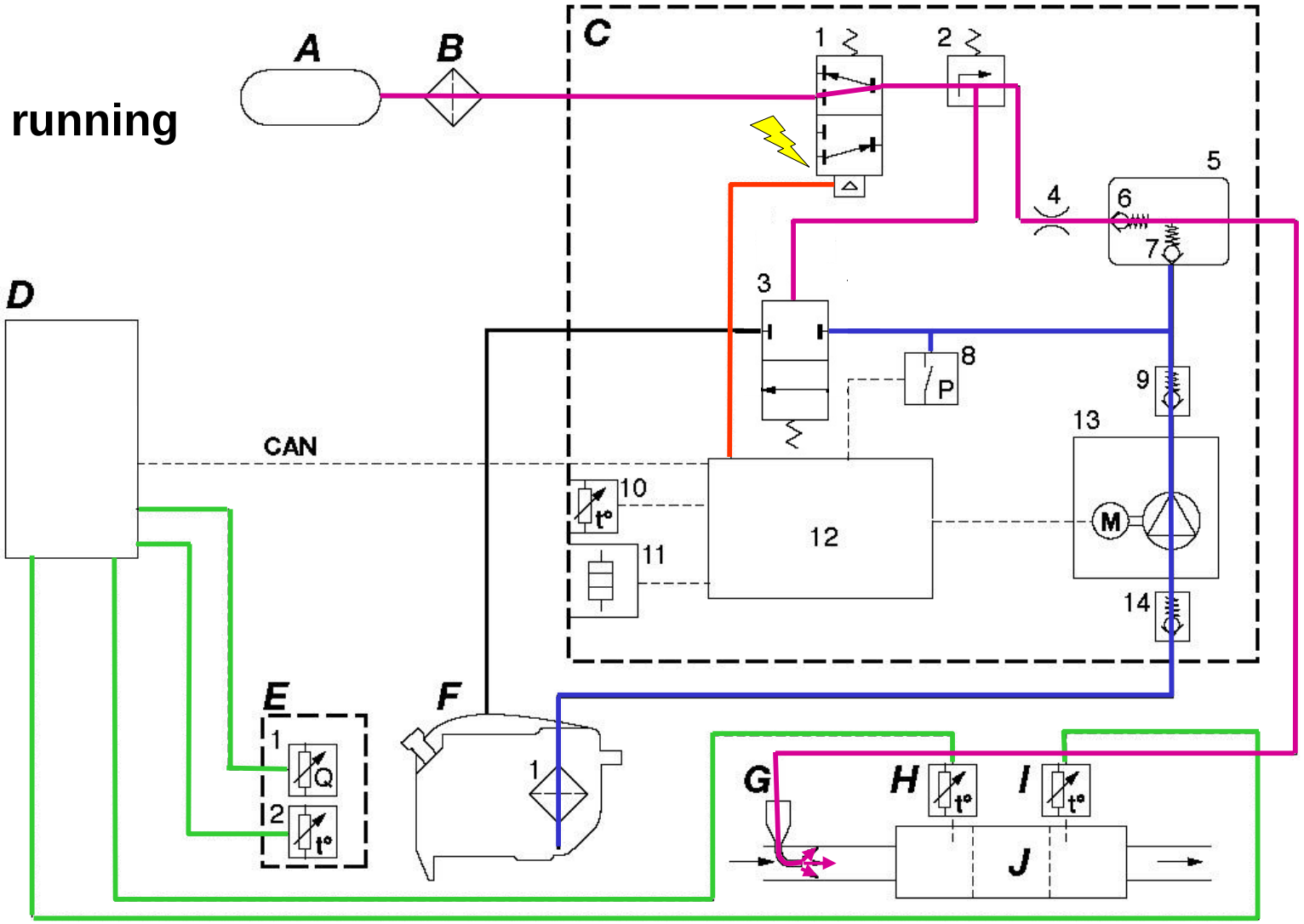
System Dosing

At the end of the PRIMING phase the Air Solenoid Valve opens and the pump motor stops. The pump is now in “standby”, ready to dose urea as requested by the Engine ECM. The quantity and timing of urea being dosed is controlled by the engine ECM depending on the NOx produced by the engine and the exhaust temperature.

The pump will not start dosing DEF unless both exhaust temperature sensors reach 200 degrees, ***however*** air will be continuously passed through the Dosing Pump, Injector Supply line & Injector while the engine is running to prevent the nozzle from becoming blocked and to provide a cooling effect.

AIR DOSING / STAND BY PHASE

Engine running



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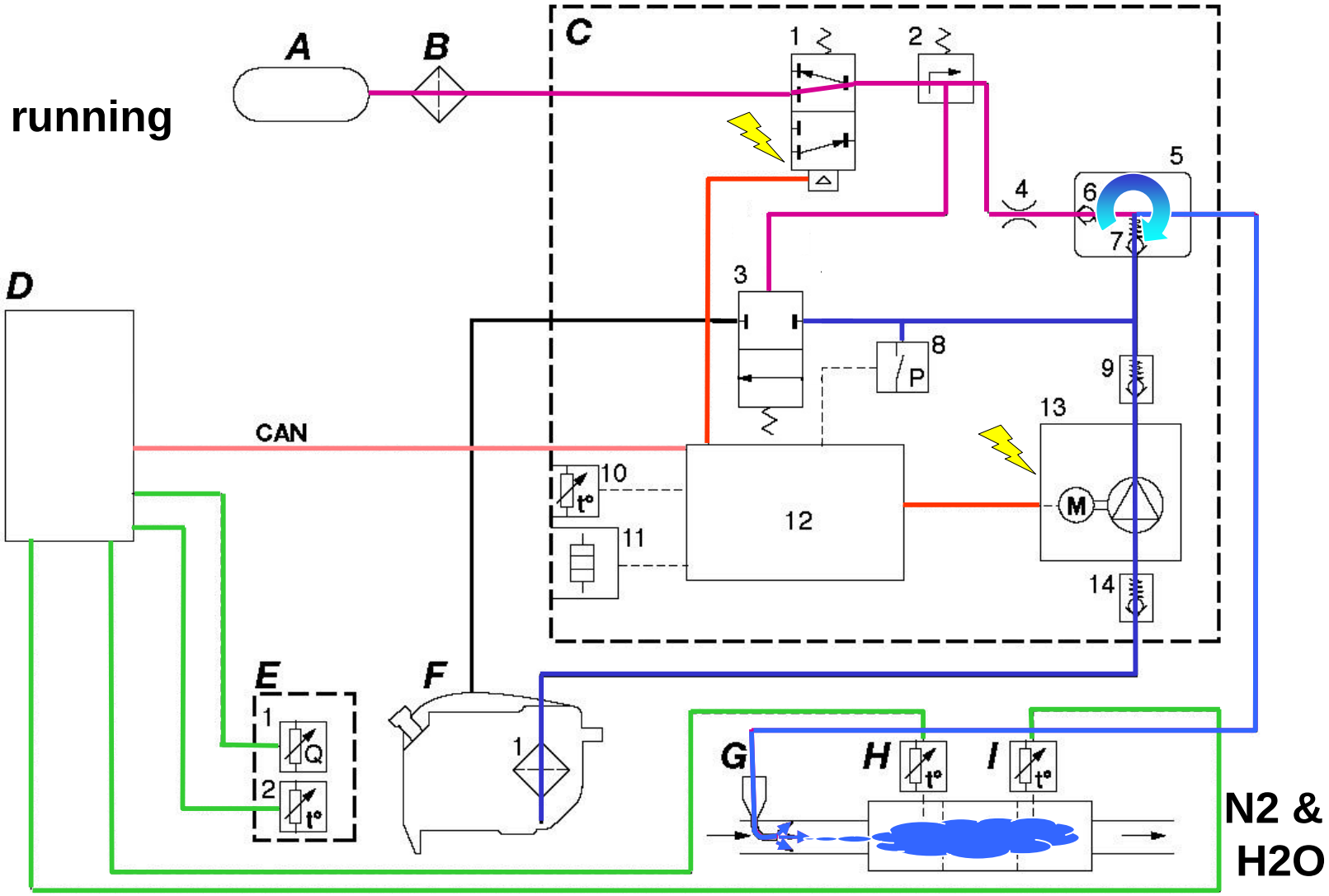
6 Required Conditions for Dosing DEF

1. 200 degrees C @ both Catalyst Inlet and Outlet
   (For Euro 5, inlet above 200 deg C, average of both above 200 deg C)
2. Certain SCR System Fault codes NOT active*
3. DEF Tank Level above 6%
4. Air pressure above 4 bar, and urea pressure 3 bar (Primed!)
5. Above -3 degrees C (DEF temp)
6. Cummins NOx Algorithm (estimator algorithm) calculates NOx production is above a predetermined value

* 1668, 1669, 1673, 1681, 1682, 1697, 1698, 1699, possibly 1712, 2976, 3163, 3231, 3235, 3236,

DOSING PHASE

Engine running



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Workshop task.

“Dosing” phases

System Purging

When the Key Switch is turned to the OFF position the system enters the PURGING phase. Compressed air flows through the injector and the pump.

The air removes any DEF droplets from the system that could otherwise crystallise and block the pump valves, urea lines or the injection nozzle. The phase lasts for 30 seconds then the system switches off, the solenoid can be heard “clicking” off.

Purging is performed with every key off cycle. “Incomplete purge” counts can be read within Insite

If a high count of incomplete purge counts are found, power connections to the doser must be investigated. The OEM installation must provide power for the Doser to purge after key off for sufficient time. This can be an issue with hazardous cargo vehicles – petrol tankers, also some bus fleets.

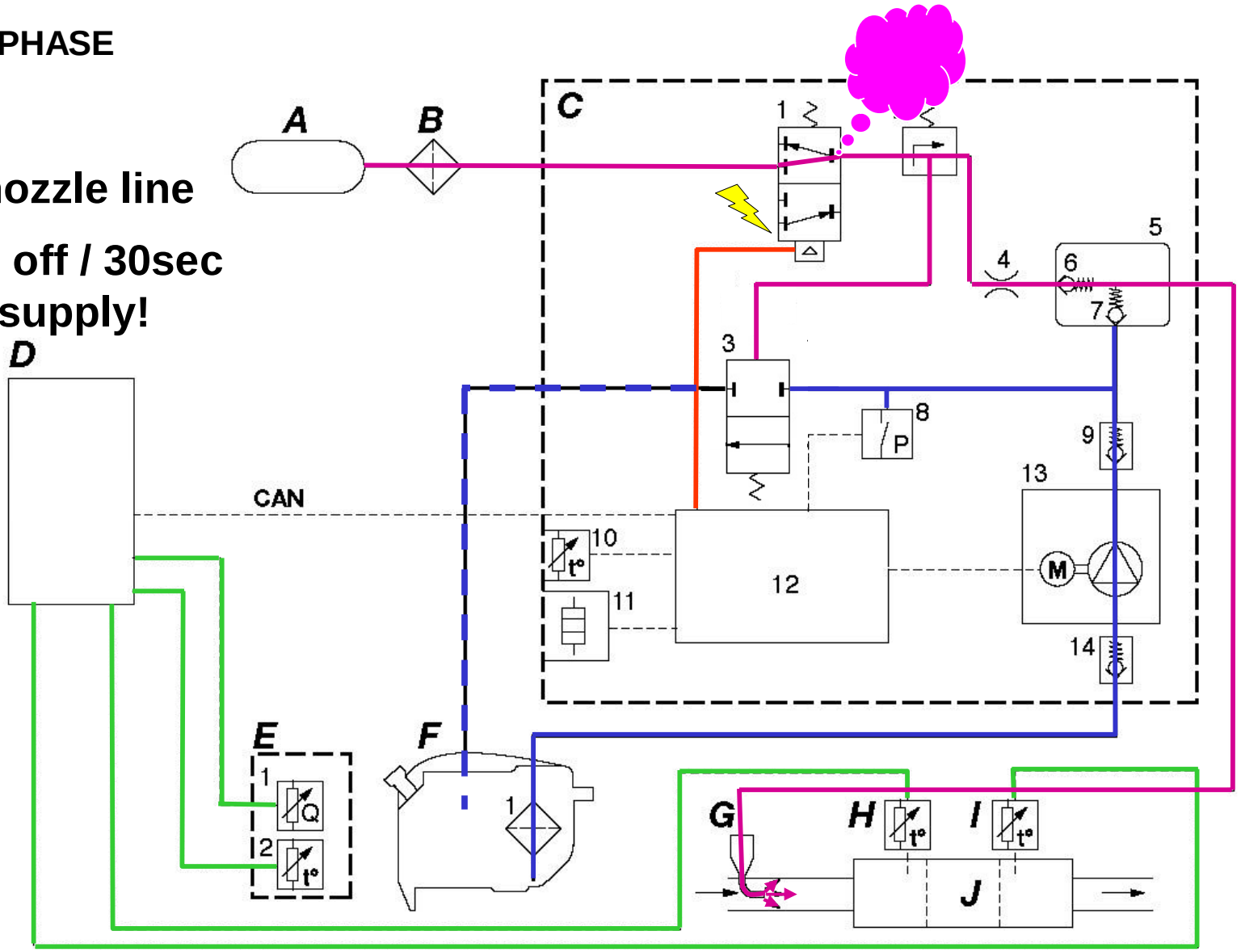
This is followed by the air pressure release phase.

If certain SCR system Faults becomes active, then the SCR system will switch off, but first purge the system of DEF.

PURGING PHASE

Clear nozzle line

Engine off / 30sec power supply!



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Emission Solutions

Workshop task.

Purge phase / check

What have we learnt ?

What questions do you have ?