

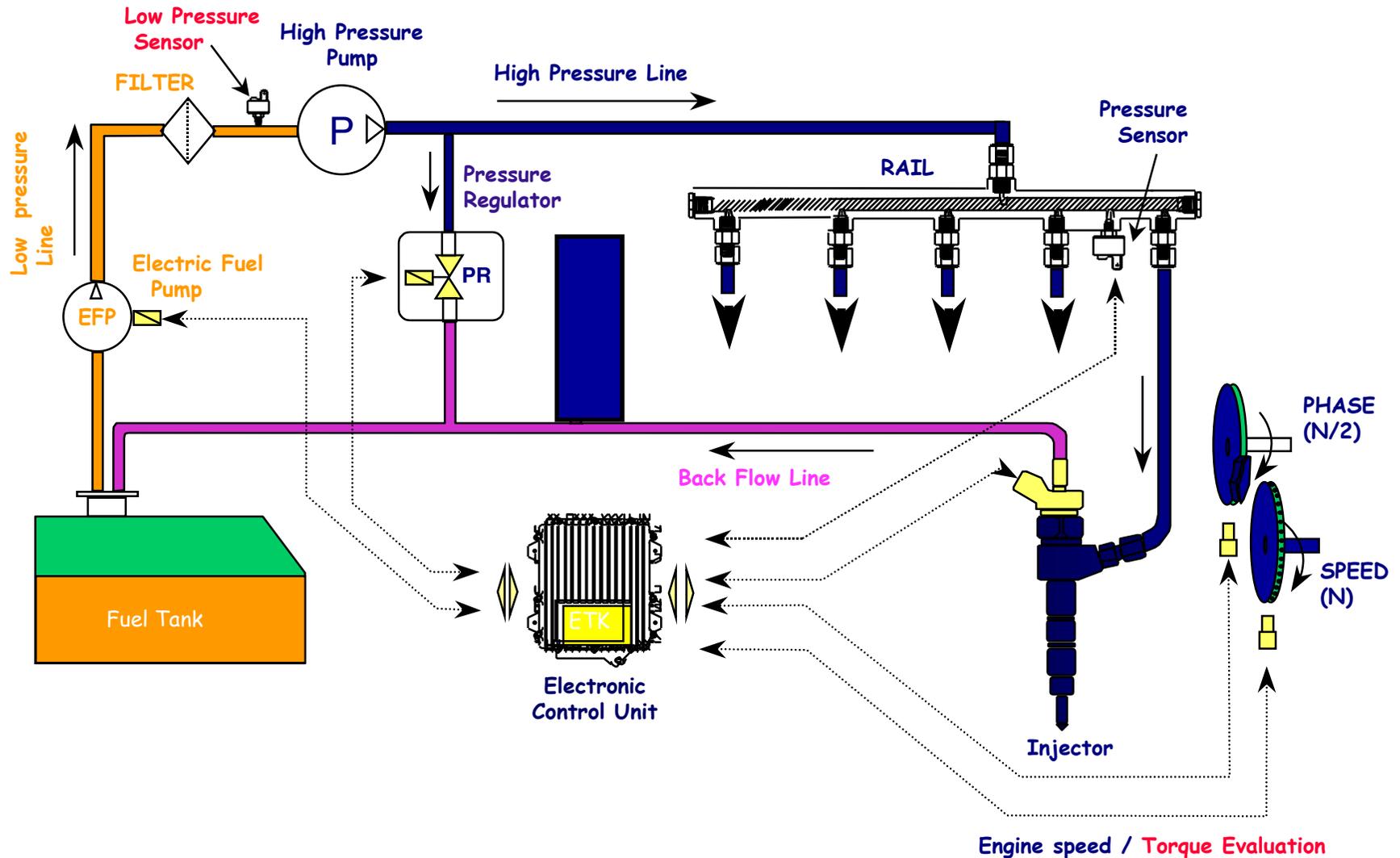
# Fiat/Unito: Generation of Diagnostic Trees for On-board Diagnosis

Goals for on-board diagnosis:

- **(Quick) selection of the correct recovery action** in order to:
  - Guarantee passenger safety
  - Avoid damage
  - Avoid vehicle stop if possible
- Example: stop engine
  - if “injector blocked open” is suspected
  - but try to rule out this hypothesis
  - to avoid unnecessarily restrictive action
- Provide good starting point for off-board diagnosis



# The Common Rail System

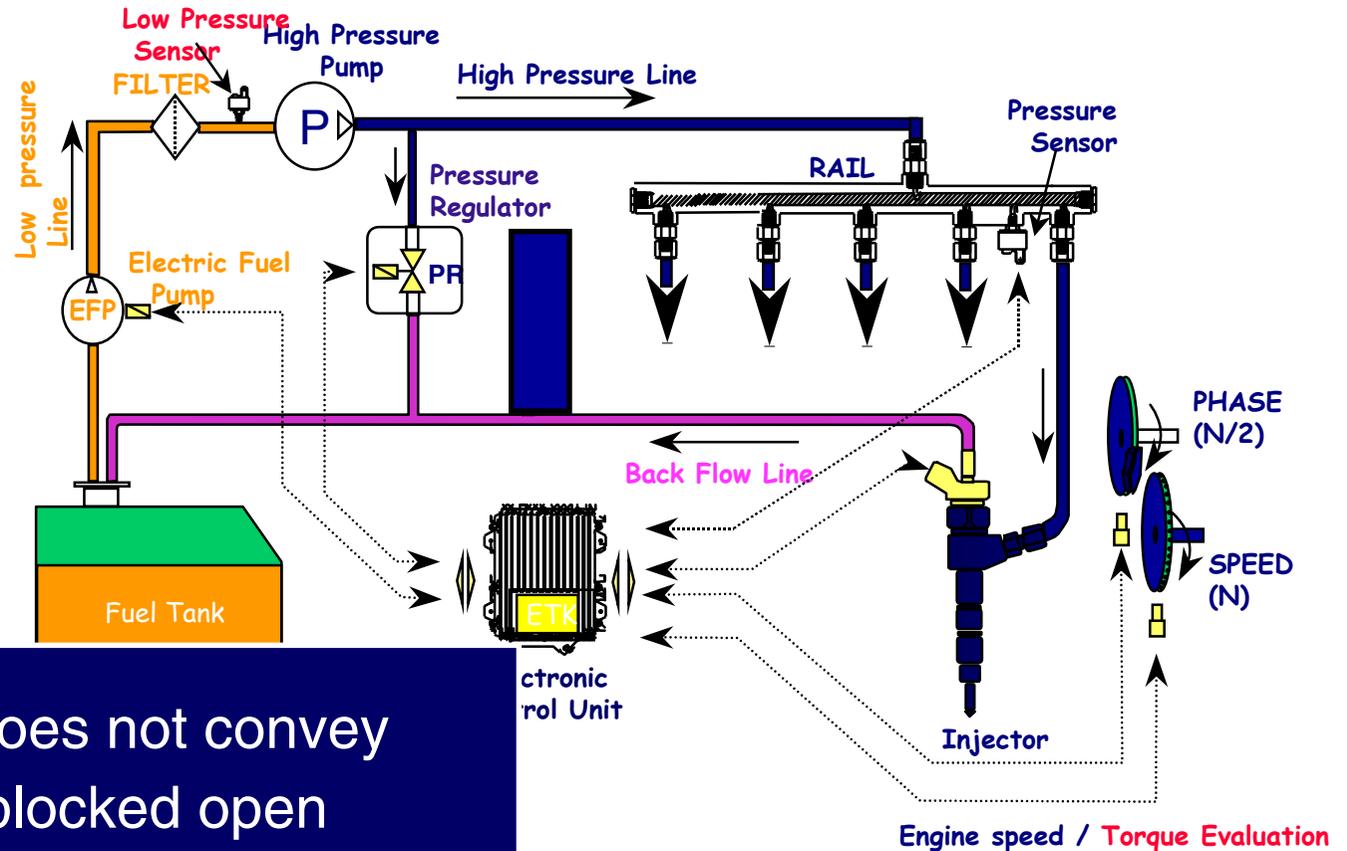


# Faults and Recovery Actions

Component	Fault Mode	Recovery action
Low Pressure Circuit	Insufficient	Performance limitation
Pressure regulator	blocked open	Performance limitation
	blocked closed	Stop
High Pressure pipes and Rail	Leakage	Limp home
High pressure Pump	Blocked	Performance limitation
	insufficient	Performance limitation
Pressure Sensor	Low	Open loop
	Sensor blocked	Open loop
	Blocked	Open loop
Injectors	Recycle high	Performance limitation
	Blocked open	Stop
	Blocked closed	Go
	Sensor low	Open loop
	Recycle low	Go



# Fault Scenarios

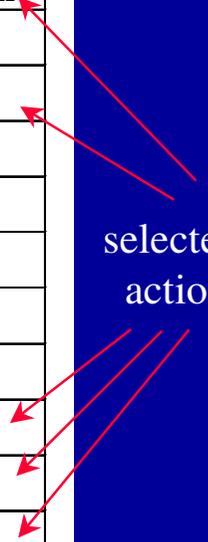


- Electric fuel pump does not convey
- Pressure regulator blocked open
- No injection at one cylinder
- Injector blocked open (permanently injection in one cylinder)

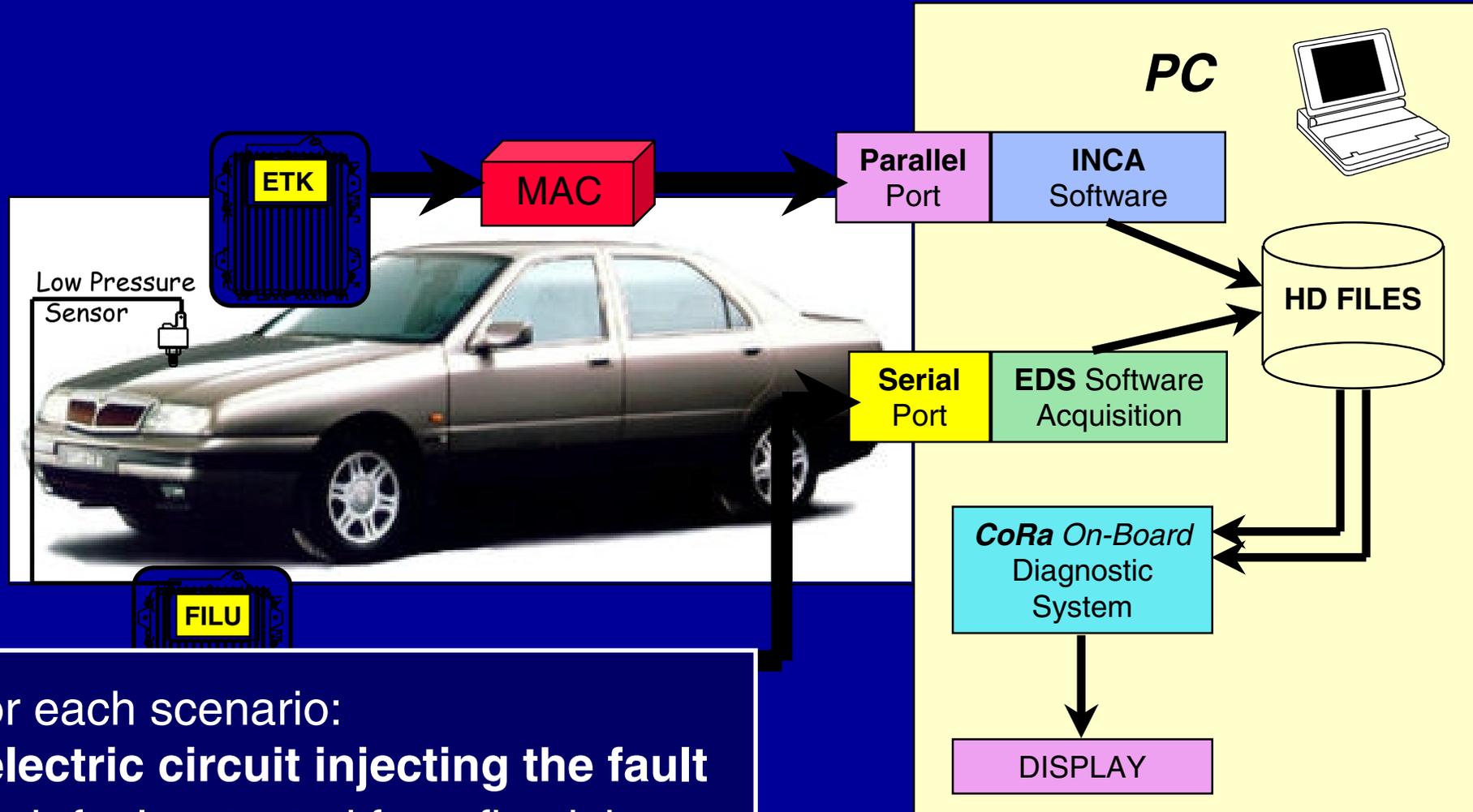
# Diagnosis Results

Observations			Diagnoses	Actions
$\Delta$ lowp_obs	$\Delta$ p_obs	$\Delta$ tm		
-	-	0	lp_system insuff	<b>Performance limitation</b>
0	-	0	Pressure_regulator blocked_open	Performance limitation
			Hp_pipes_and_rail leak	<b>Limp home</b>
			Hp_pump blocked	Performance limitation
			Hp_pump insuff	Performance limitation
			Sensor low	Open loop
			Sensor blocked	Open loop
			Injectors recycle_high	Performance limitation
0	-	+	Injectors blocked_open	<b>Stop</b>
0	0	-	Injectors blocked_closed	<b>Go</b>
0	+	0	Pressure_regulator blocked_closed	<b>Stop</b>
			Sensor high	Open loop
			Sensor blocked	Open loop
			Injectors recycle_low	Go

selected action



# The Demonstrator Architecture



- For each scenario:
  - **electric circuit injecting the fault**
- Each fault actuated for a fixed time (for safety reasons)



# Applying the Diagnostic Trees for Recovery Selection

