

Electronic Throttle Control System- intelligence (ETCS-i)

- Powerpoint presentation of the ETCS-i
- Explains the operation and advantages over mechanical-linked throttle control (e.g. emissions, throttle control)
- Explains the failsafe mechanisms of ETCS-i

Electronic Throttle Control System - intelligence

ETCS-i

AGENDA

- 1. Introduction**
- 2. ETCS-i control modes.**
- 3. Types of ETCS-I.**
- 4. Link type system operation.**
- 5. Linkless type system operation.**

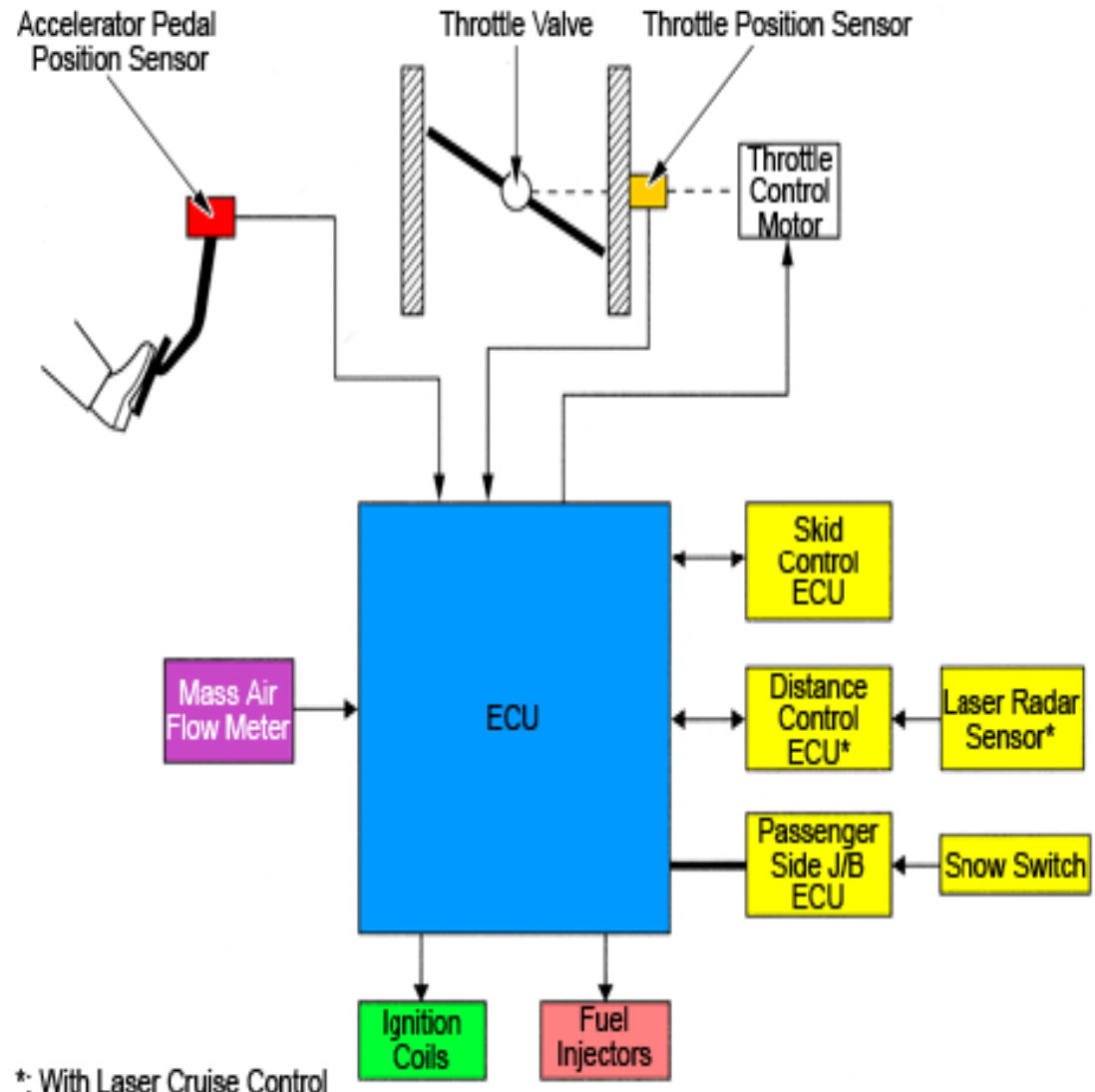
Introduction

The Accelerator Pedal Position Sensor (APPS) detects the accelerator pedal position (driver input) and sends a signal to the ECM. Based on the input from the APPS and other ECUs (ABS, TRAC and VSC), the engine ECM directs the Throttle Control Motor to change throttle valve position. The Throttle Position Sensor (TPS) detects throttle valve angle and confirms to the ECM that the desired throttle valve position has been achieved. Both the APPS and the TPS have two sensing elements.

- Electronic Throttle Control System-intelligence (ETCS-i) provides several advantages over a mechanical linked throttle valve system as the ECM can position the throttle valve for optimum performance under a variety of conditions.
- The ETCS-i system gives the ECM precise control over the opening and closing of the throttle valve, based upon the driver's input (accelerator pedal).
- And in conjunction with input from chassis control ECUs, such as those for Traction Control and Vehicle Stability Control (Skid Control ECU).
- This system not only enhances drive line control, but also assists in reducing tailpipe emissions and improving fuel economy.

Introduction

The ETCS-i system allows the ECM to precisely control the opening and closing of the throttle valve based on drivers input and is also interrelated with chassis control ECUs such as Traction Control and Vehicle Stability Control (Skid Control ECU).

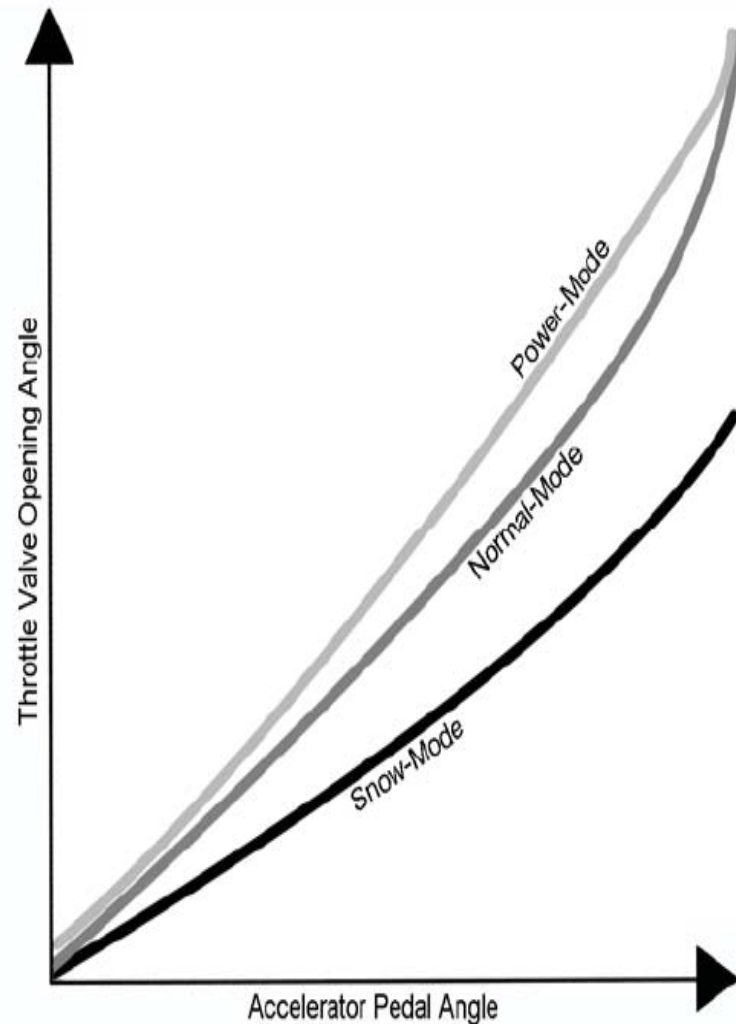


ETCS-I Control modes

- The ECM drives the throttle valve to a specified angle as determined by operating conditions.
- Different throttle valve angles in relation to the accelerator pedal position are used to achieve different engine output characteristics.
- The following describes the different modes that affect throttle valve angles.

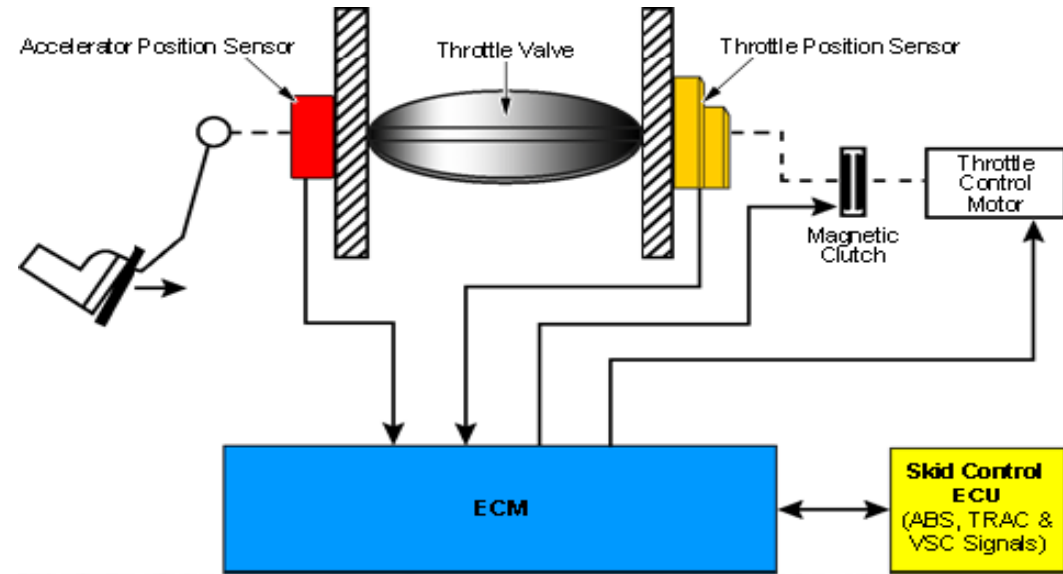
ETCS-I Control modes

- **Non-linear Control**
- **Power mode control**
- **Snow mode control**
- **Shift shock reduction control**
- **Idle speed control**
- **TRAC throttle control**
- **VSC coordination control**
- **Cruise control**

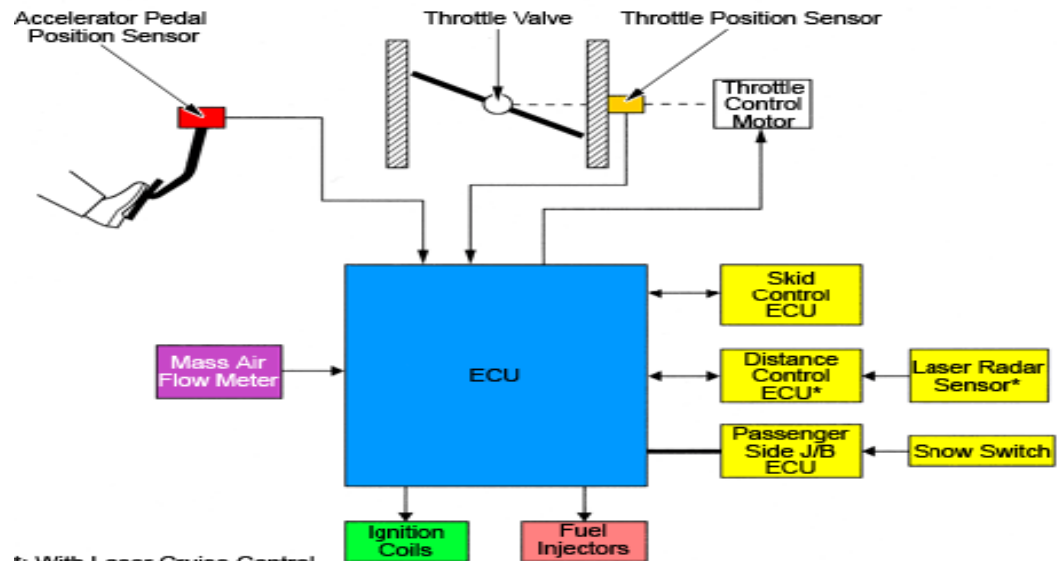


Types of ETCS-i

- Link type system
(1st Generation)



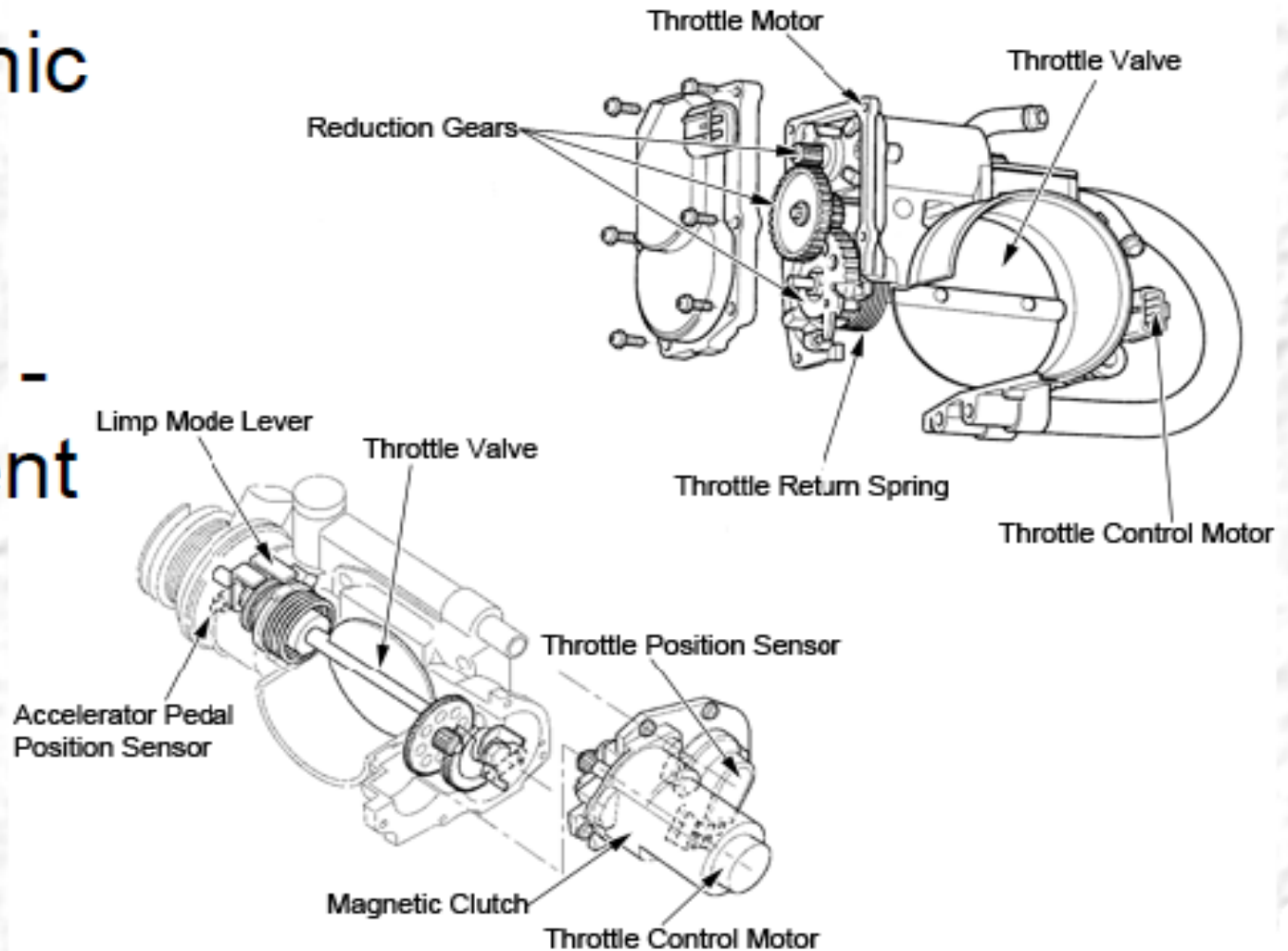
- Linkless type system
(2nd Generation)



*: With Laser Cruise Control

Types of ETCS-i

Electronic
Throttle
Control
System -
intelligent



Link type system operation

Operation:

- The throttle motor operates the throttle valve.
- An electromagnetic clutch connects the throttle motor to the throttle valve.
- The throttle position sensor detects throttle valve angle.
- The Accelerator Pedal Position Sensor (APPS) detects accelerator pedal position.
- The throttle lever is connected by cable to the accelerator pedal.
- As the driver moves the accelerator pedal, the APPS signal voltage changes indicating a new pedal position.
- The ECM then adjusts the throttle angle based on the APPS signals, engine conditions and vehicle conditions.

Link type system operation

Fail Safe Mode:

- If an abnormal condition occurs with the ETCS-i, the MIL will illuminate to alert the driver.
- At the same time, current to the throttle control motor and magnetic clutch are cut off.
- With no power to the motor or magnetic clutch, the return spring closes the throttle valve to the default position.
- In this situation, called limp mode, the accelerator pedal operates the limp mode lever.
- When in limp mode, the throttle can only be partially opened reducing engine power.
- The driver will notice the pedal travel is longer in relation to engine response and that the MIL is on.
- Furthermore, ISC and cruise control systems will not operate.

Linkless type system operation

Operation:

- The linkless ETCS-i uses a compact throttle body.
- No mechanical connection between the accelerator pedal and throttle body.
- The Accelerator Pedal Position Sensor is mounted at the accelerator pedal.
- As the driver moves the accelerator pedal, the APPS signal voltage changes indicating a new pedal position.
- The ECM then adjusts the throttle angle based on the APPS signals, engine conditions and vehicle conditions.
- The throttle position sensor detects throttle valve angle.
- This system does not use a magnetic clutch.
- Operation of this system is nearly identical to the link type

Linkless type system operation

Types of Accelerator and Throttle position sensors:

1. Non contact type sensor.
 2. Contact type sensor
- **While the sensors generate their output signal in a different process, common similarities included:**
 - 1- The Sensor operate at 5.0 volts which is supplied by the ECM's VC power source
 - 2- They utilize the same sensor ground terminals of the ECM, E2.
 - 3- They both output a linear DC voltage

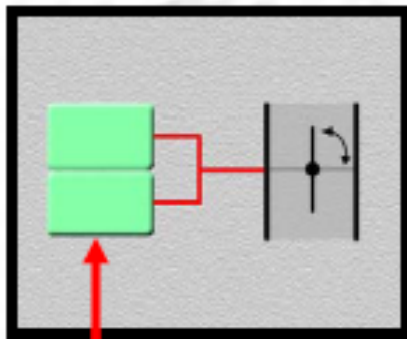
Linkless type system operation

Fail Safe mode:

1- Accelerator position sensor:

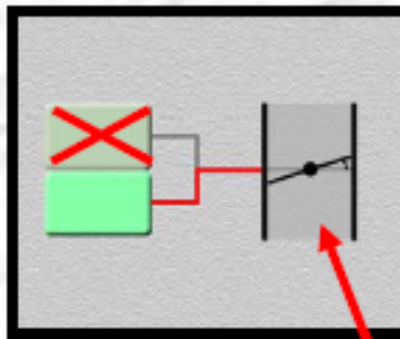
2nd Generation - Fail Safe VPA VPA2

Normal
Operation



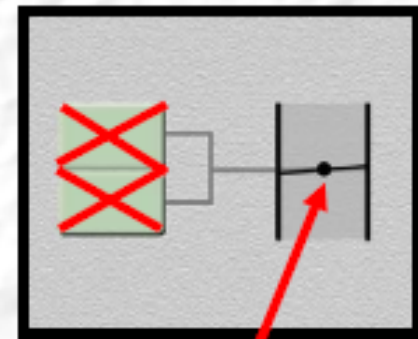
Accelerator
Pedal Sensor

Single Signal
Failure



Opens between Idle
Position and 25% of max.

Double Signal
Failure



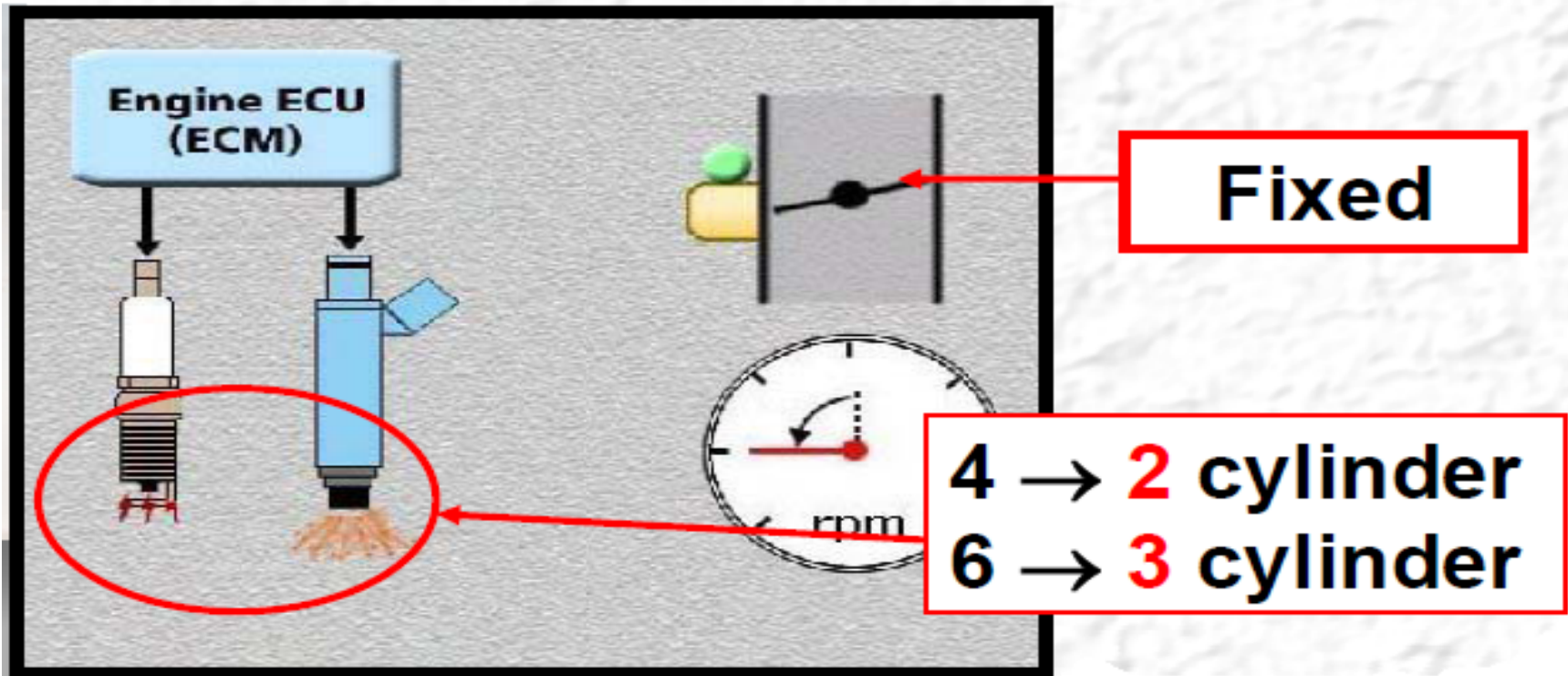
Idle Position
Only

Linkless type system operation

Fail Safe mode:

1- Throttle position sensor:

2nd Generation - Fail Safe VTA ,VTA2,
or Throttle Motor



Electronic Throttle Control System

History

Electronic Throttle Control System Toyota Cars

| Legend | |
|--|--|
| Drive by Cable with contact type throttle position sensor | |
| ETCS-I contact type accelerator pedal and throttle position sensor | |
| ETCS-I & Drive by Cable with contact type accelerator pedal position sensor (mounted on TB) and throttle position sensor | |
| ETCS-I contact type accelerator pedal and non contact type throttle position sensor | |
| ETCS-I Non contact type accelerator pedal and throttle position sensor | |

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|
| Avalon | | | | | | | | | | | |
| Camry | | | | | | | | | | | |
| Camry HV | N/A | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| Celica GTS | | | | | | | N/A | N/A | N/A | N/A | N/A |
| Celica GT | | | | | | | N/A | N/A | N/A | N/A | N/A |
| Corolla | | | | | | | | | | | |
| Corolla XRS | N/A | N/A | N/A | N/A | N/A | | | N/A | N/A | | |
| Echo | | | | | | | N/A | N/A | N/A | N/A | N/A |
| Matrix | N/A | N/A | N/A | | | | | N/A | N/A | | |
| Matrix XRS | N/A | N/A | N/A | | | | | N/A | N/A | | |
| Prius | | | | | | | | | | | |
| Solara | | | | | | | | | | | N/A |
| Solara V6 | | | | | | | | | | | N/A |
| Yaris | N/A | N/A | N/A | N/A | N/A | N/A | | | | | |

