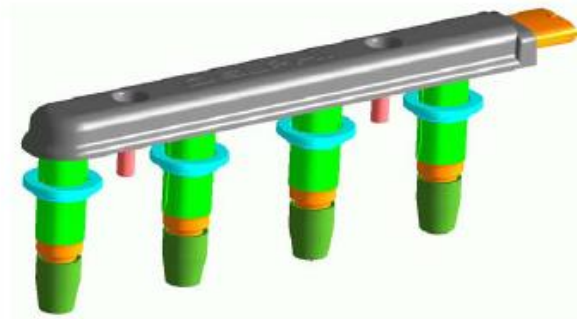
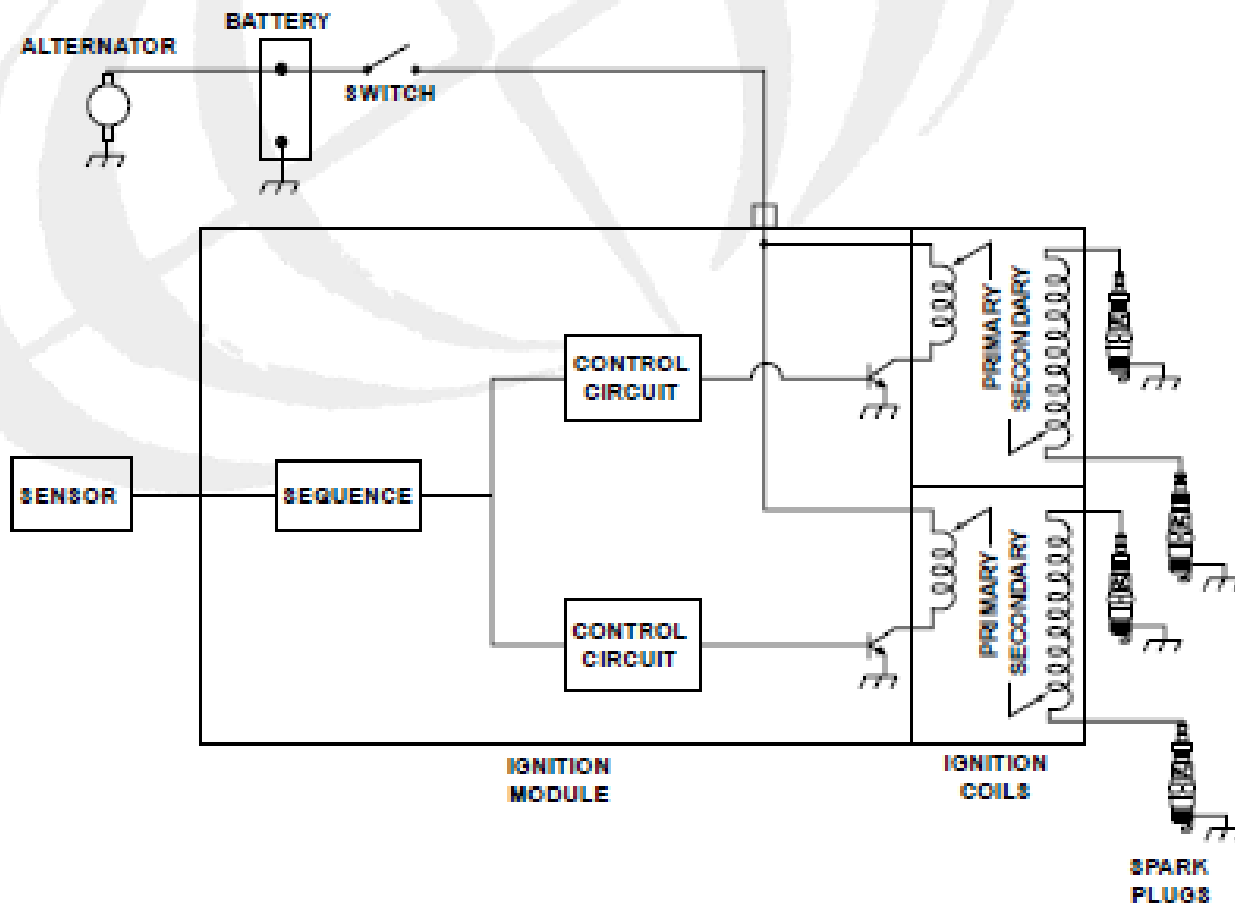


# SISTEMA DE IGNIÇÃO



Ignition Systems  
Delphi Energy and Chassis Systems



**FULL FUNCTION DIRECT IGNITION SYSTEM**

### EFFECT OF AIR-FUEL RATIO ON EMISSION

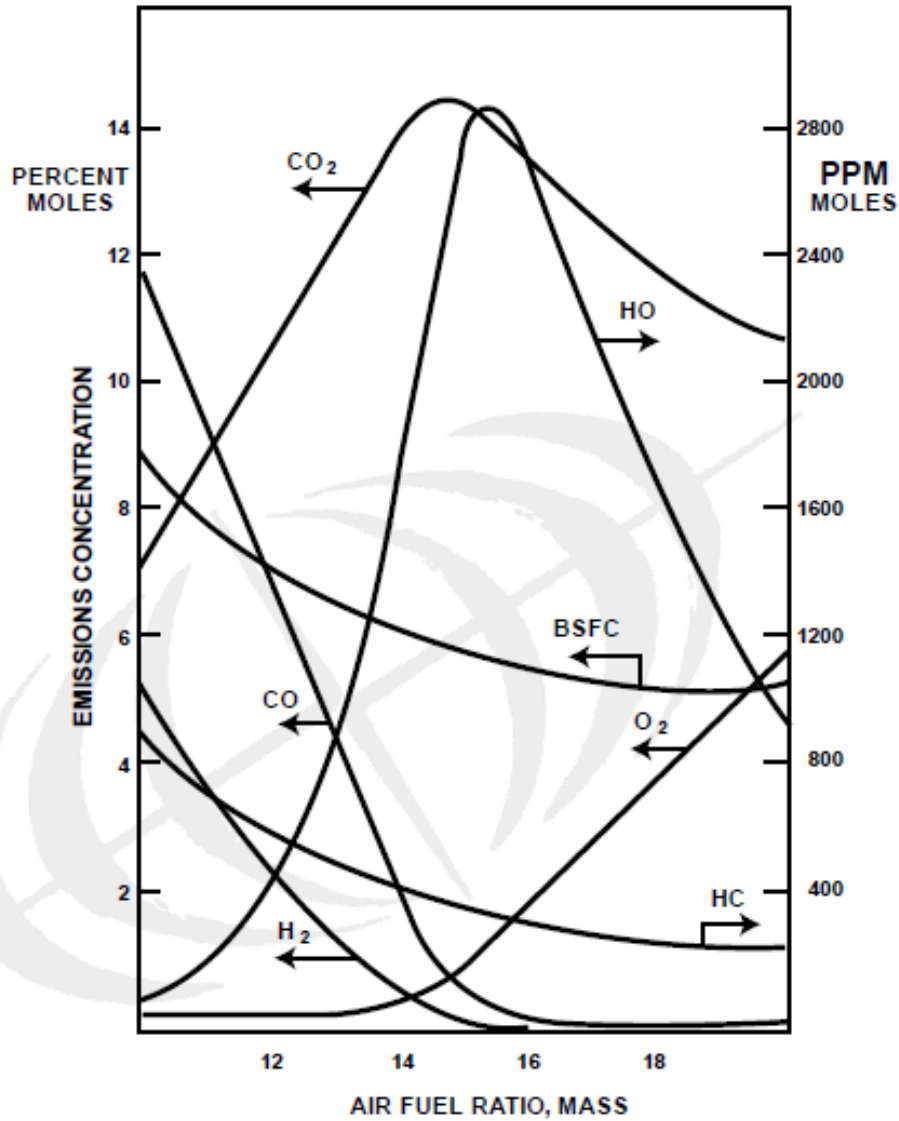


Figure 2-2. Engine out emissions vs. air/fuel ratio.



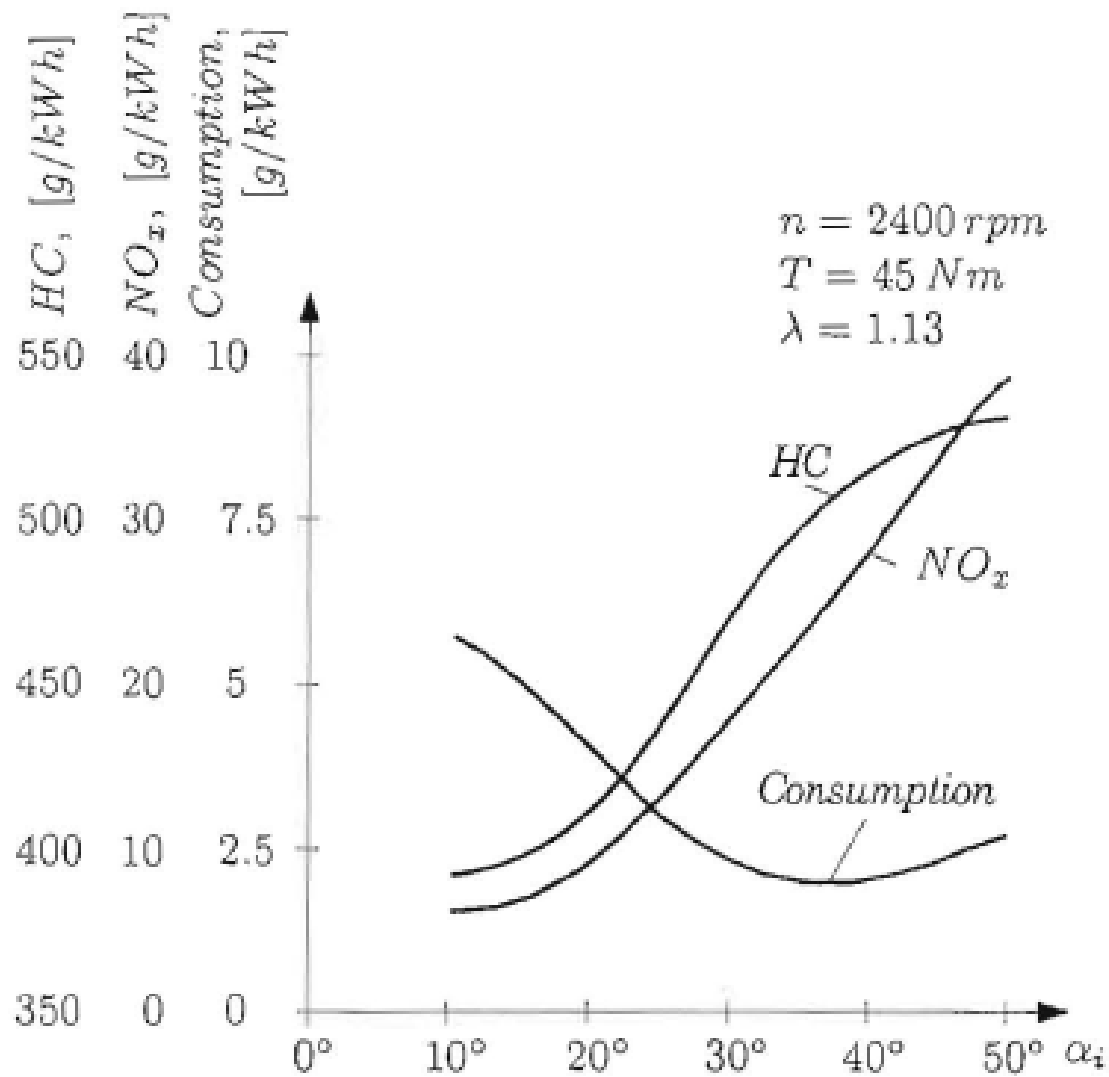


Figure 3.22 Fuel consumption and emission levels over ignition angle  $\alpha_i$ .

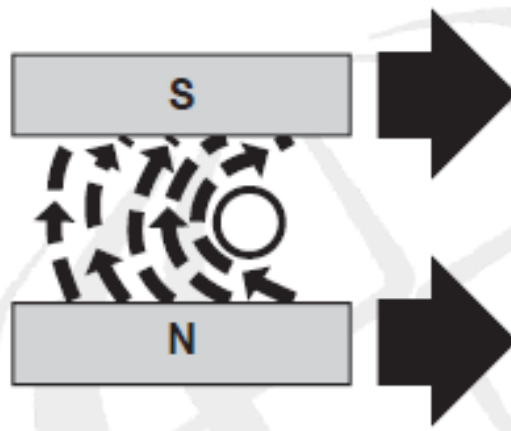


Figure 2-3. Electromagnetic induction.

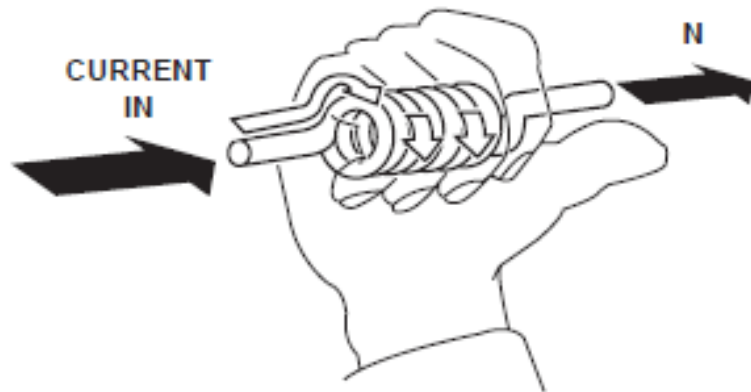


Figure 2-4. Right Hand Rule.

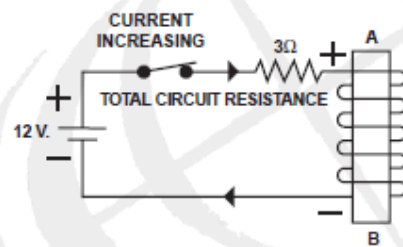


Figure 2-5. Self-induction.



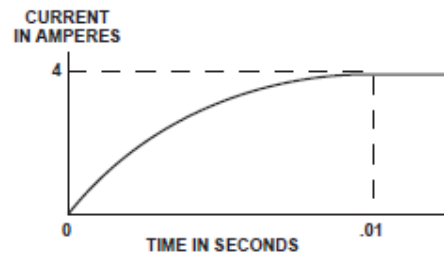


Figure 2-6. Current time lag.

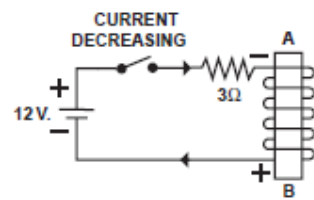


Figure 2-7. Reduction of self-induction.

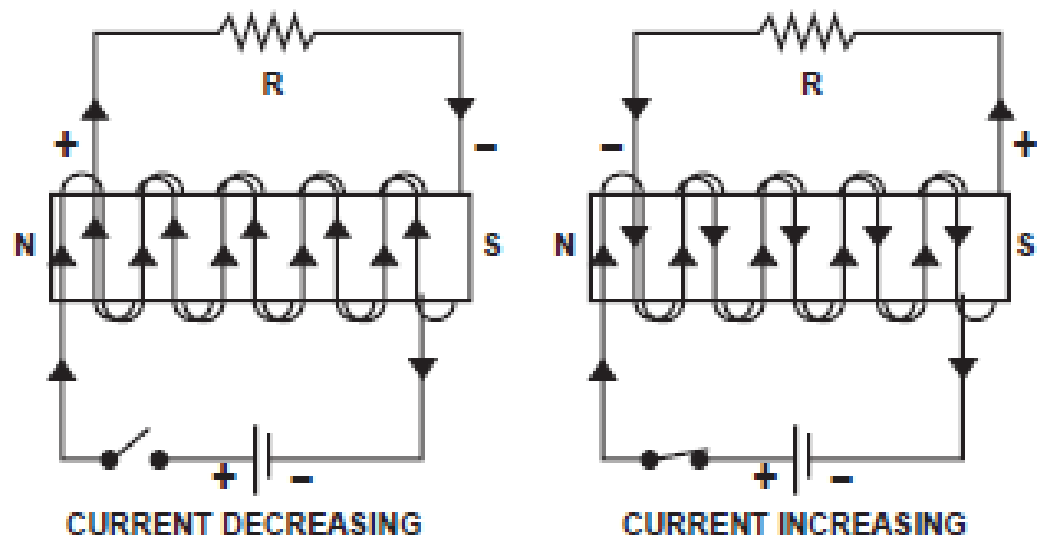


Figure 2-8. Mutual induction.

| <b>Parameter</b>                         | <b>Compression Pressure</b> | <b>Spark Plug Gap</b> | <b>A/F Ratio</b> | <b>Ignition Polarity</b> | <b>Electrode Shape</b> | <b>Operating Temperature</b> |
|--|-----------------------------|-----------------------|------------------|--------------------------|------------------------|------------------------------|
| <b>Higher Required Secondary Voltage</b> | High                        | Wide                  | Lean or Rich     | Positive                 | Rounded<br>Massive     | Cold                         |
| <b>Lower Required Secondary Voltage</b>  | Low                         | Narrow                | Stoichiometric   | Negative                 | Sharp                  | Hot                          |

Table 2-1 — System Parameters

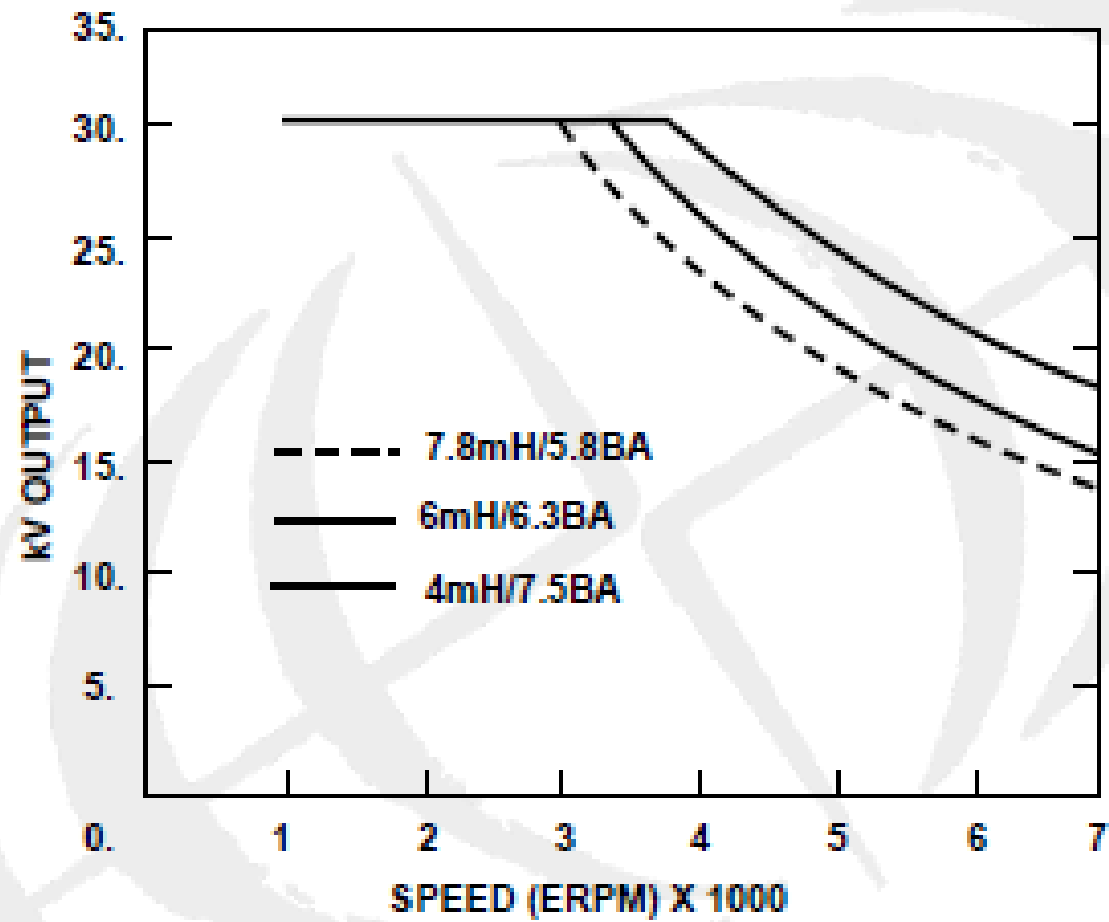


Figure 2-9. Available kV output vs. ERPM.

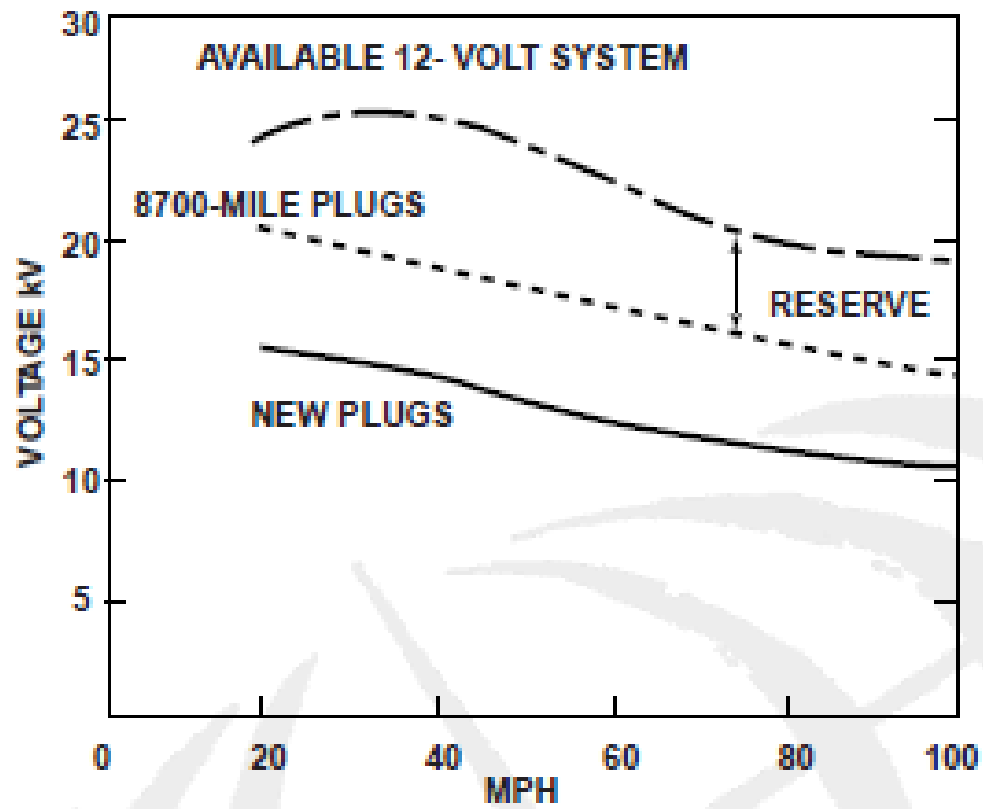


Figure 2-10. Ignition performance on a 10:1 compression ratio engine.

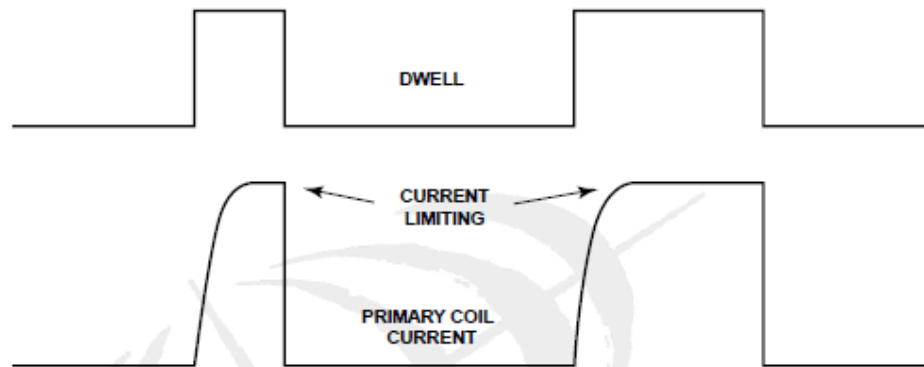


Figure 2-11. Coil Primary Current Controlled By Current Limiting Circuitry.

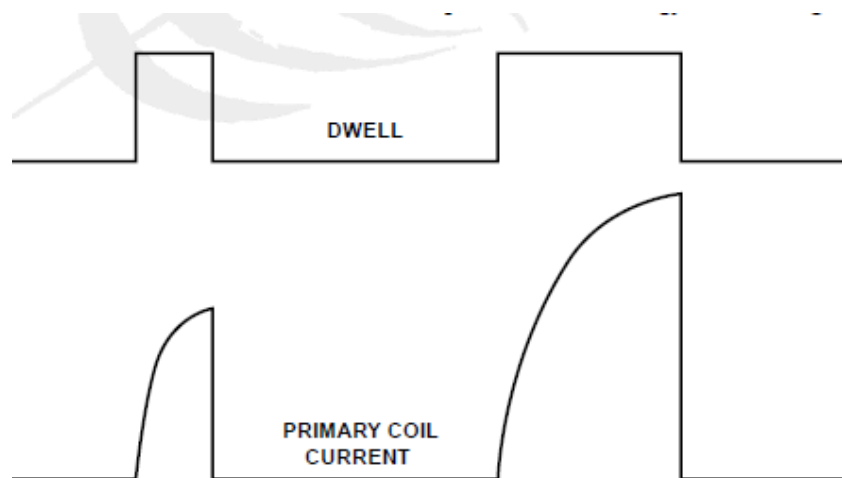
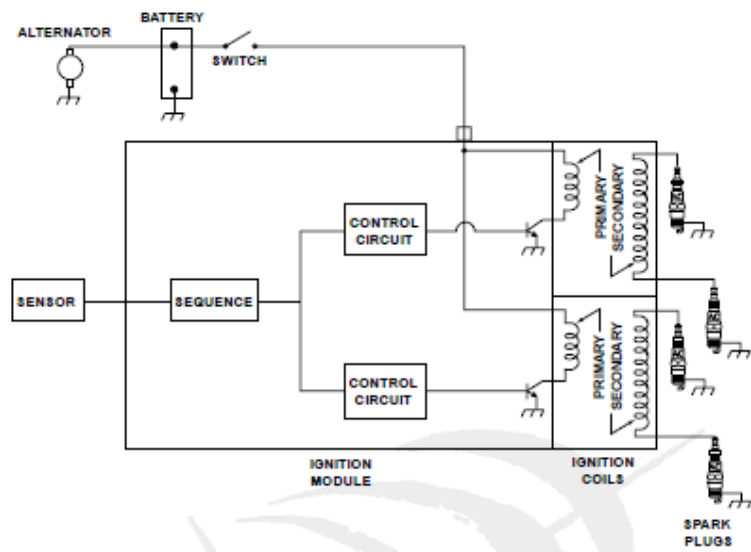


Figure 2-12. Coil Current Controlled By Dwell "Ramp and Fire".





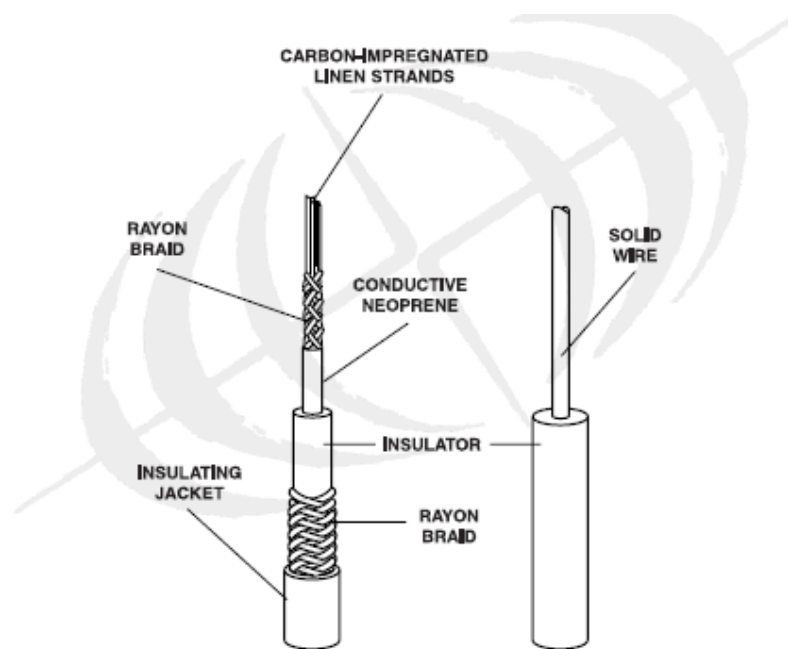


Figure 2-14. TVRS cable and solid conductor cable.

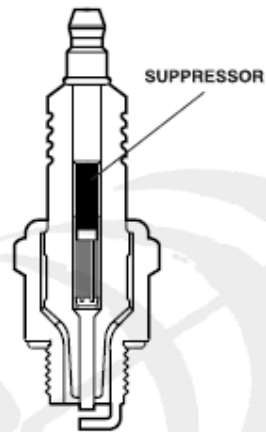


Figure 2-15. A one-piece integral suppressor reduces RF interference.

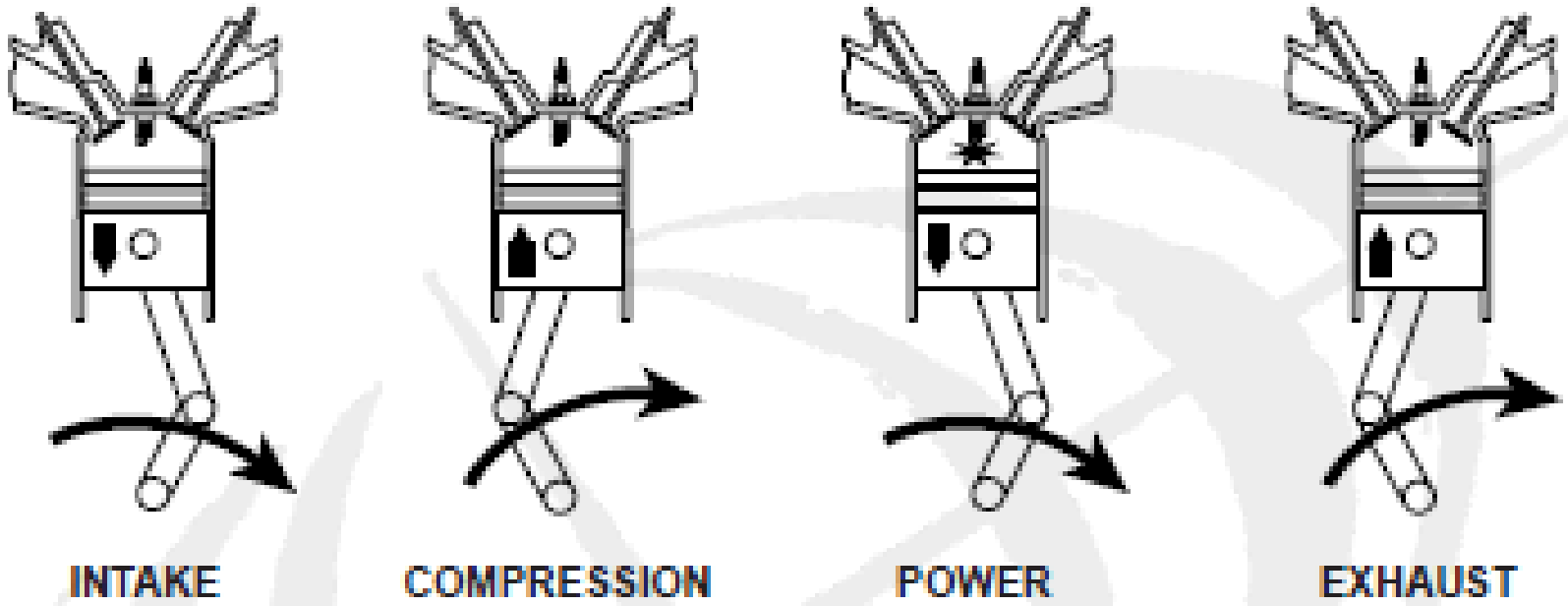


Figure 2-15. Four Stroke Combustion Process.

### 3.5.2.2 High Value Ignition Performance

| Measurement Description          | Typical Value |   |
|----------------------------------|---------------|---|
| Energy (mJ)                      | 70            | # |
| Peak secondary current (mA)      | 74            | # |
| Secondary voltage available (kV) | 32.0          | * |
| Spark duration (mS)              | 2.6           | # |
| Secondary resistance (Ohm)       | 5800          |   |
| Primary resistance (Ohm)         | 0.20          |   |
| Primary charge time @ 14V (mS)   | 2.50          |   |
| Weight (gr)                      | 600           |   |
| Primary Current (A)              | 9.20          |   |
| Sample Availability              | production    |   |

# = 800 Volt Zenor test, no secondary load.

\* = with 50 PF Secondary Load

Table 3-1. High Voltage Ignition System Specifications.

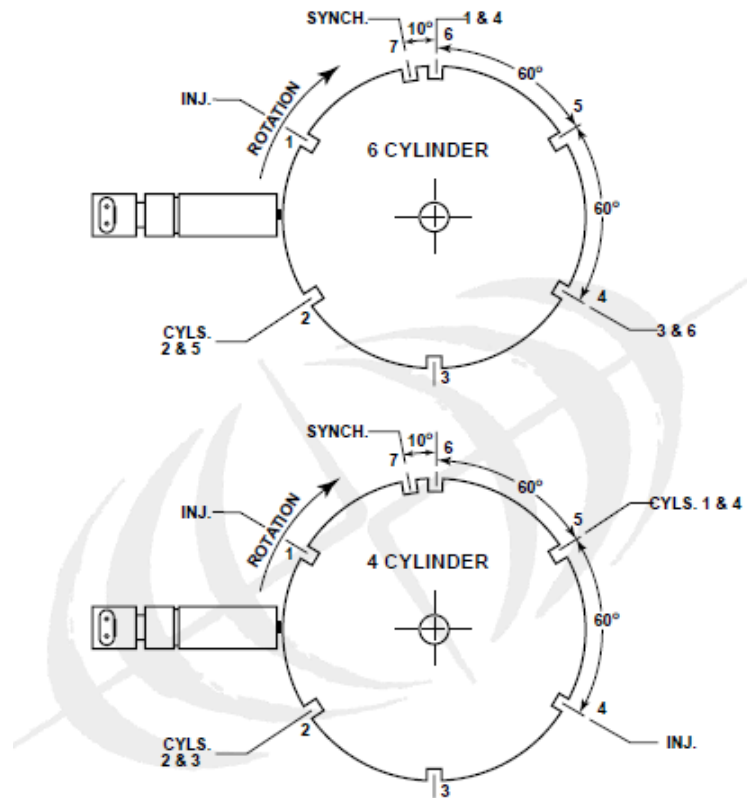


Figure 3-3. Firing order.

#### 3.5.3.4 Gen II Integrated Coil and Electronics and Dual Coil Pack Features

- Half the number of coil drivers compared to coil near plug
- Size and mass reduction
- Reduced RFI emissions
- Fully encapsulated composite iron core
- Mount anywhere in engine compartment
- One coil per two engine cylinders, using a double-ended coil
- Voltage routed to spark plugs with secondary cables

| Measurement Description          | Typical Value |
|----------------------------------|---------------|
| Energy (mJ)                      | 69            |
| Peak secondary current (mA)      | 97            |
| Secondary voltage available (kV) | 37 *          |
| Spark duration (mS)              | 1.1           |
| Secondary resistance (Ohm)       | 5100          |
| Primary resistance (Ohm)         | 0.50          |
| Primary charge time @ 14V (mS)   | 2.6           |
| Weight (gr)                      | 950           |
| Primary Current (A)              | 9.5           |
| Sample Availability              | current       |

# = 1500 Volt Zener test with no secondary load.

\* = with 50 PF Secondary Load

Table 3-2. I.C.E. Specifications.



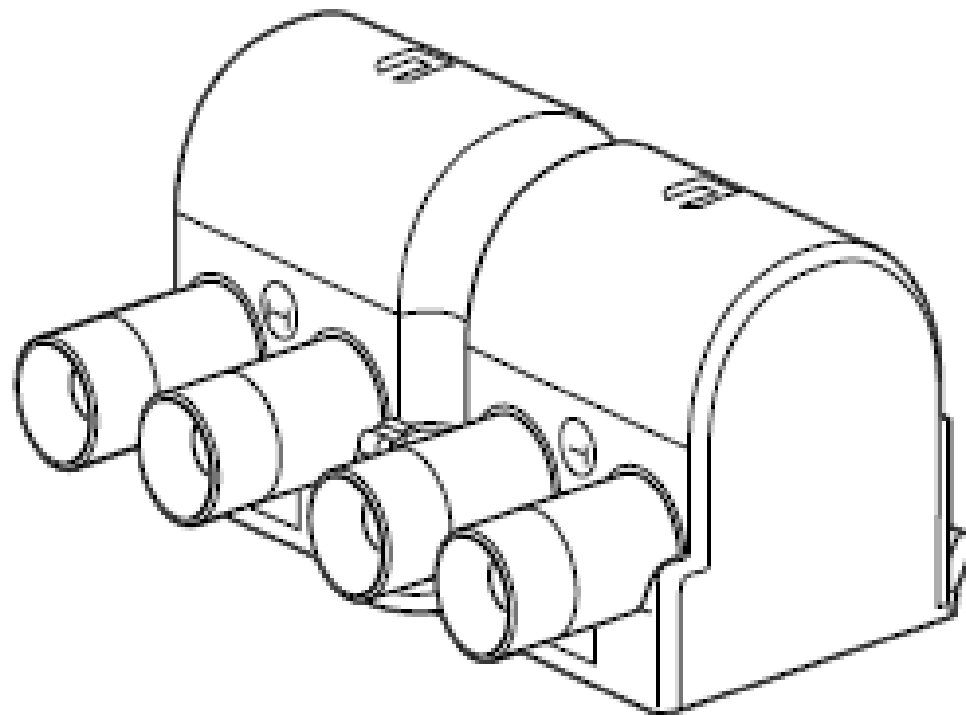
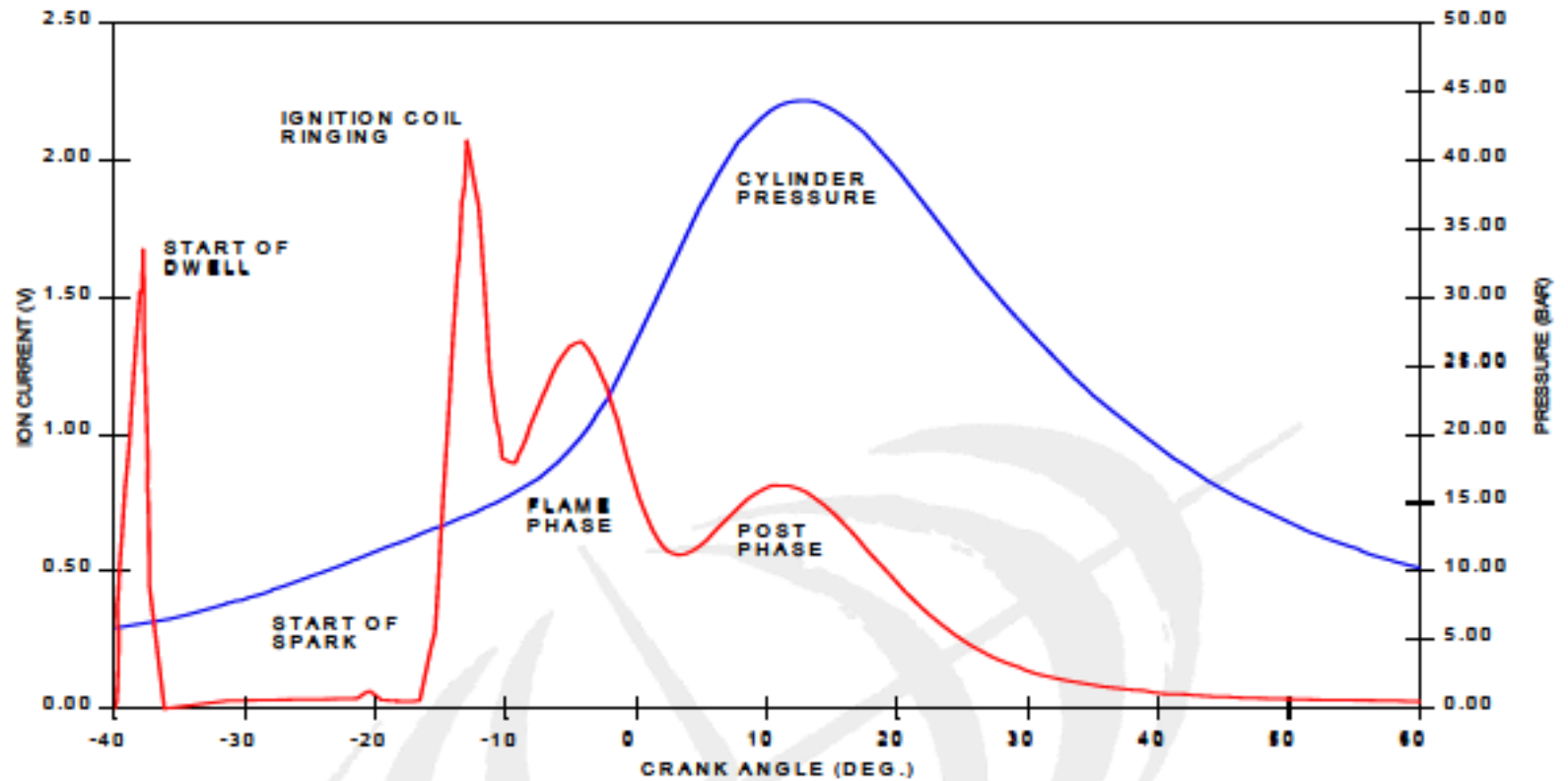


Figure 3-4. Integrated Coil and Electronics Assembly.

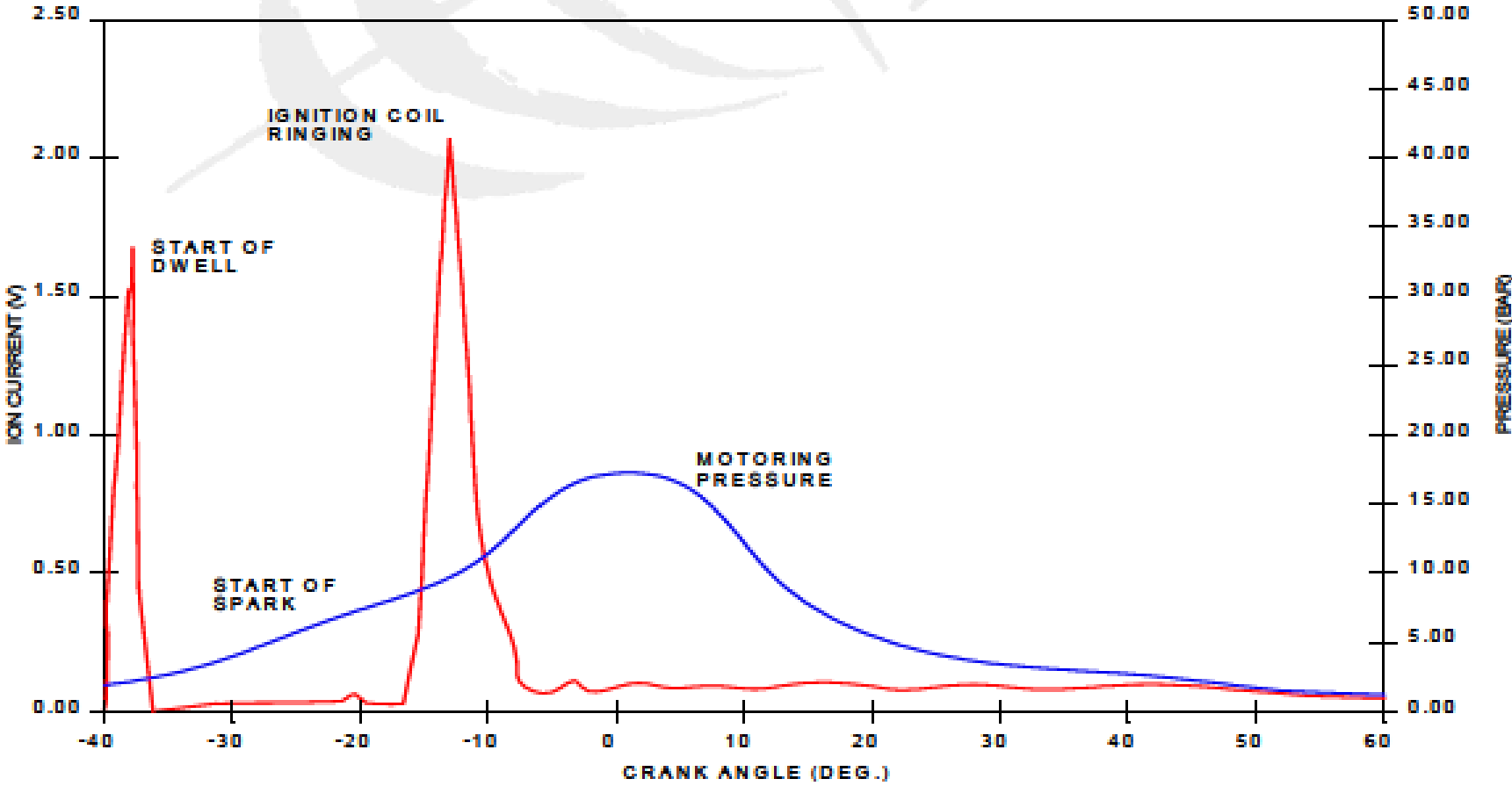
Typical Ion Current Waveforms

Figure 3-11.

# Normal Combustion



# Misfire



Knock control can be calibrated to use information immediately. Knock control is capable of global or individual cylinder control

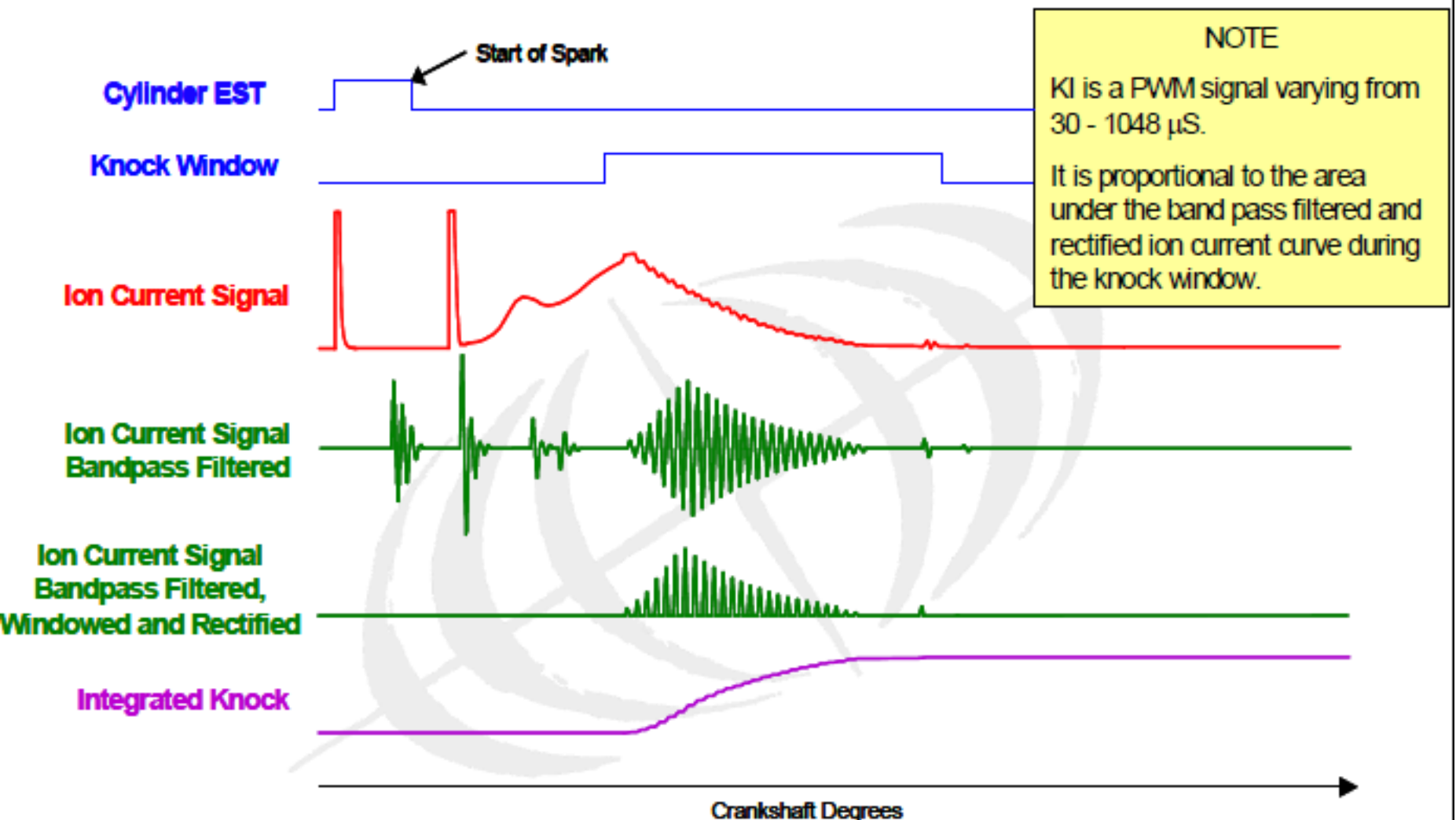


Figure 3-12.

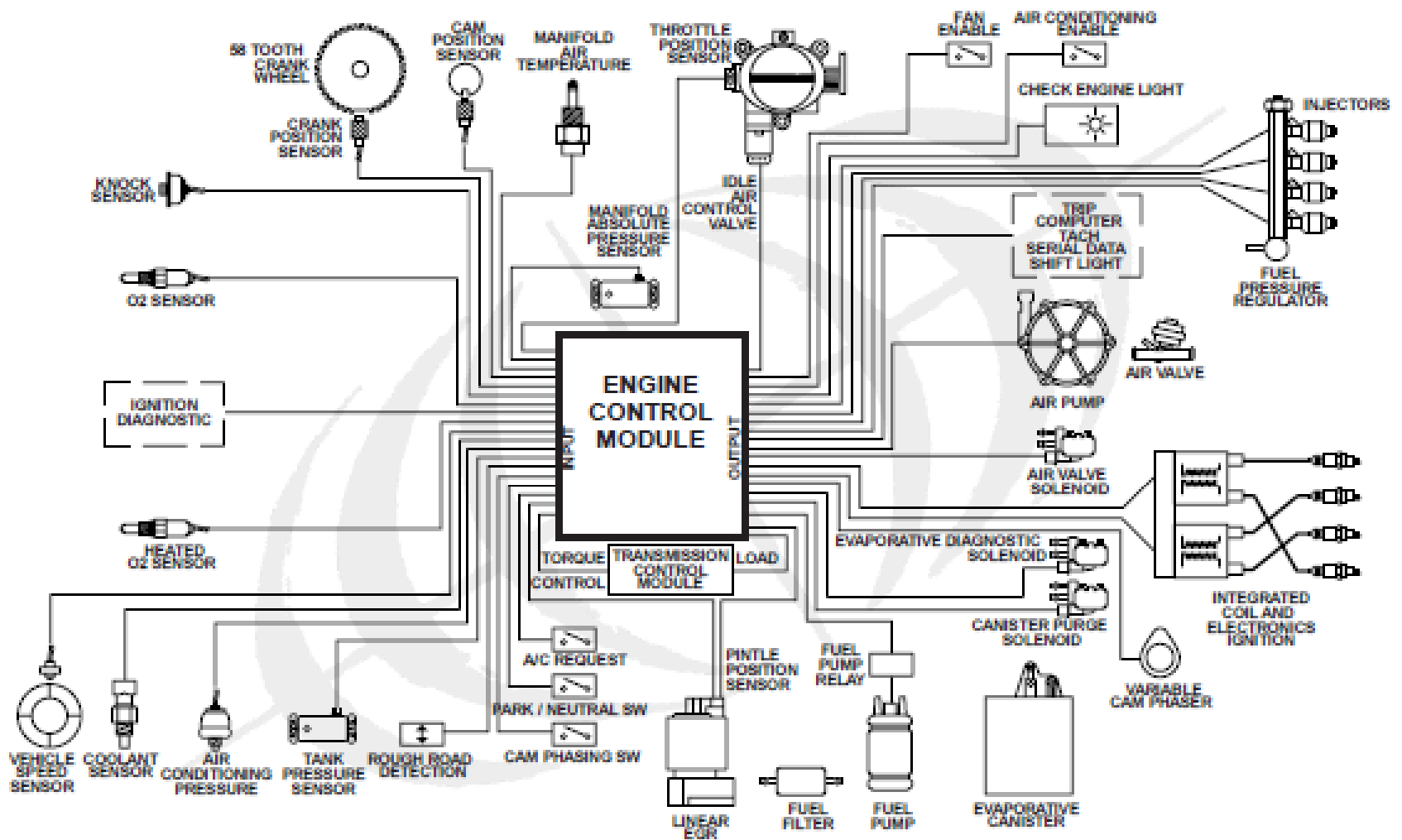


Figure 4-1. Ignition System Interfaces.

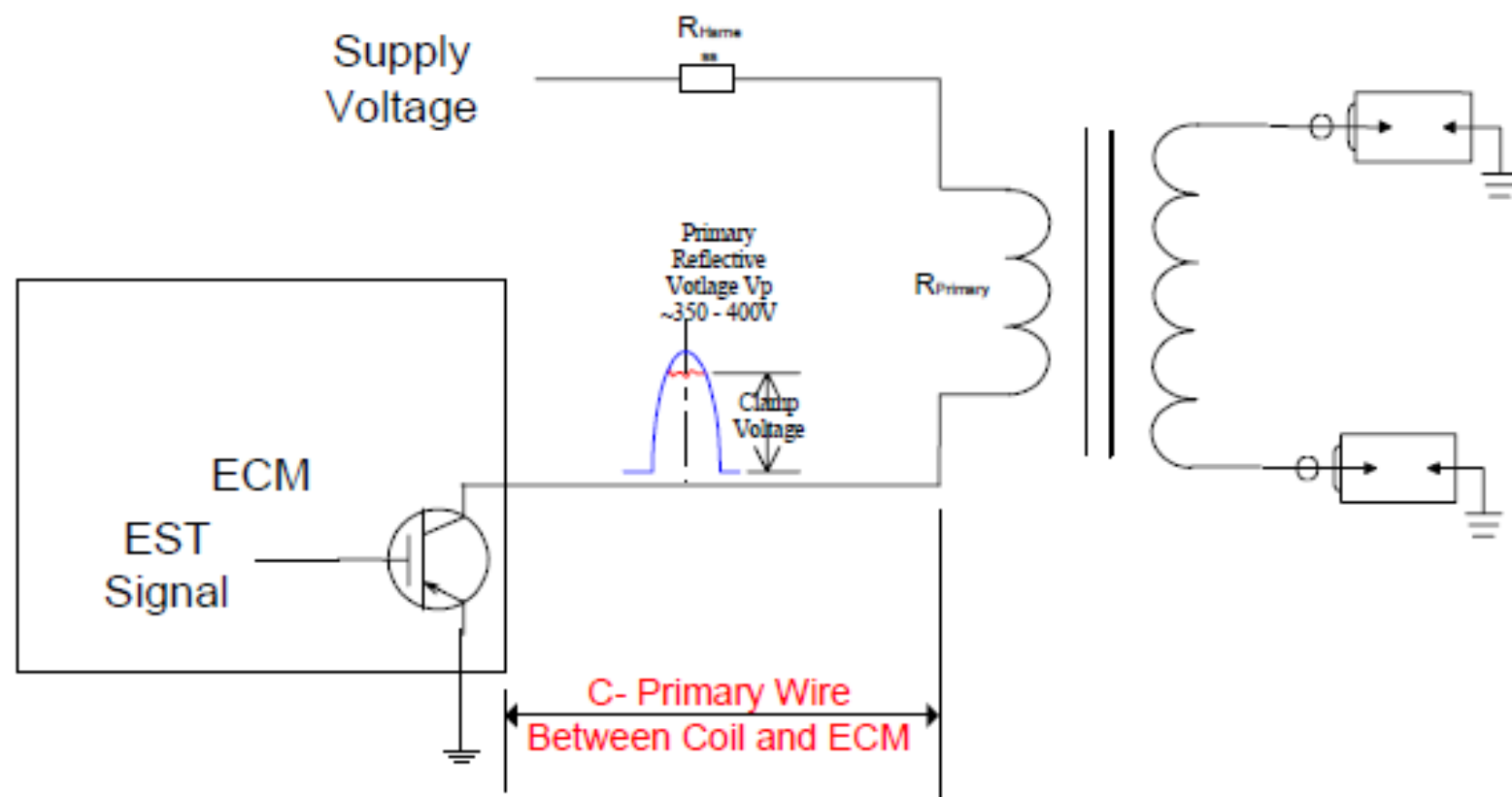


Figure 4-4. A typical reflected primary voltage for a coil where the driver is in the ECM

