

## Sensors

## ELECTRONIC CONTROL SYSTEM DIAGNOSTICS

International® MAXXFORCE™ DT, 9 and 10  
Beginning with 2007 Model Year**MAXXFORCE**  
INTERNATIONAL DIESEL POWER®

To prevent personal injury or death, read all safety instructions in the "Safety Information" section of *Engine Diagnostics Manual* EGES-370 before doing any diagnostic procedures.

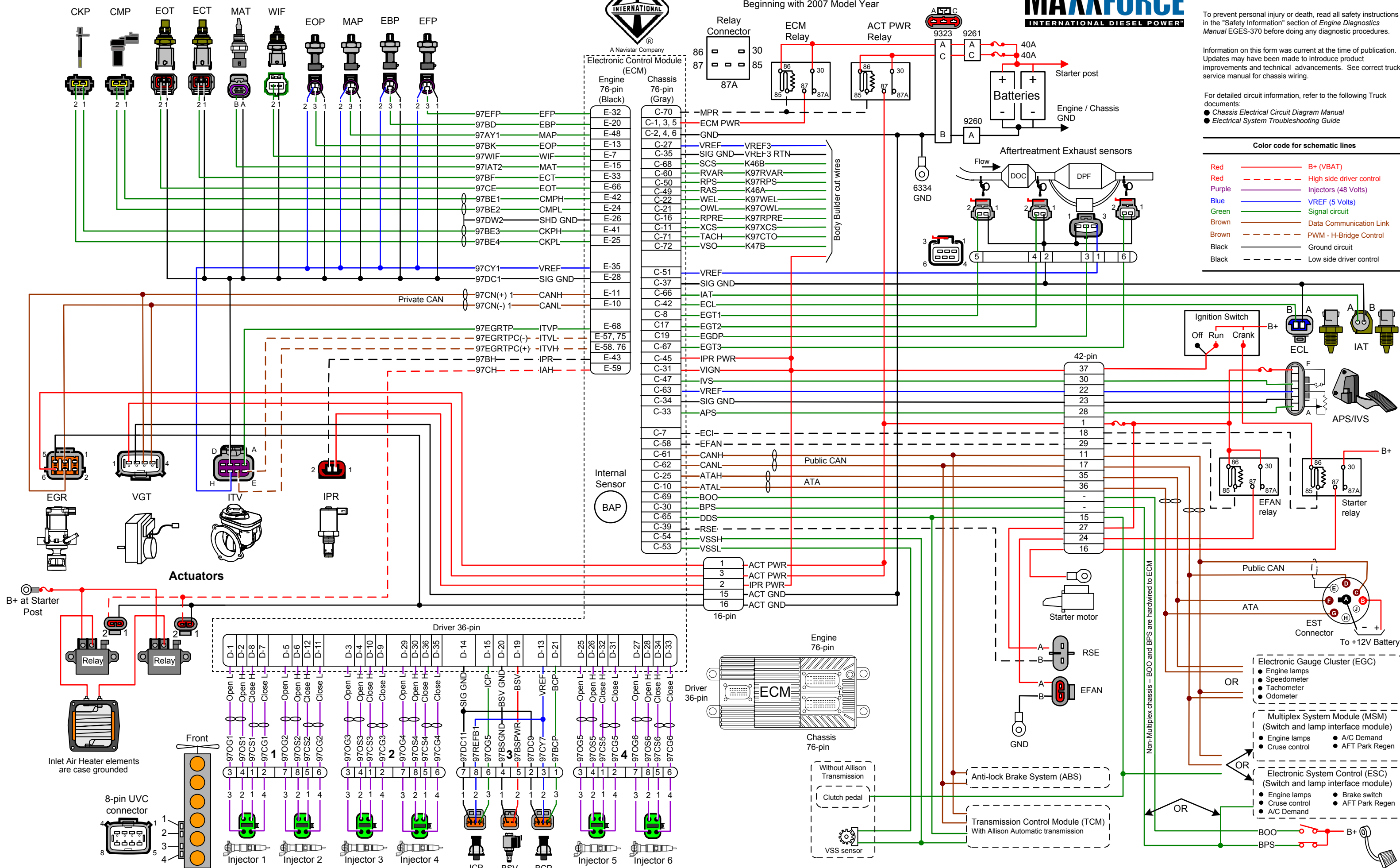
Information on this form was current at the time of publication. Updates may have been made to introduce product improvements and technical advancements. See correct truck service manual for chassis wiring.

For detailed circuit information, refer to the following Truck documents:

- Chassis Electrical Circuit Diagram Manual
- Electrical System Troubleshooting Guide

## Color code for schematic lines

|        |       |                          |
|--------|-------|--------------------------|
| Red    | —     | B+ (VBAT)                |
| Red    | - - - | High side driver control |
| Purple | —     | Injectors (48 Volts)     |
| Blue   | —     | VREF (5 Volts)           |
| Green  | —     | Signal circuit           |
| Brown  | —     | Data Communication Link  |
| Brown  | - - - | PWM - H-Bridge Control   |
| Black  | —     | Ground circuit           |
| Black  | - - - | Low side driver control  |





ELECTRONIC CONTROL  
SYSTEM DIAGNOSTICS

International® MAXXFORCE™ DT, 9 and 10

SIGNAL VALUES (All values with the breakout box installed on the ECM and harness)

**WARNING:** Read Safety Instructions in EGES-370 *Diagnostic Manual*, before starting diagnostic procedures.



| Pin                   | Item        | Circuit                           | Key ON                   |              | Low Idle              |           |              | High Idle             |           |              | Operating Range     | Comments                                                 |
|-----------------------|-------------|-----------------------------------|--------------------------|--------------|-----------------------|-----------|--------------|-----------------------|-----------|--------------|---------------------|----------------------------------------------------------|
|                       |             |                                   | Signal                   | Actual value | Signal                | Data List | Actual value | Signal                | Data List | Actual value |                     |                                                          |
| (E) ENGINE CONNECTOR  |             |                                   |                          |              |                       |           |              |                       |           |              |                     |                                                          |
| 7                     | WIF         | Water In Fuel sensor              | 0 - 5V                   |              | 0 - 5V                | No / Yes  |              | 0 - 5V                | No / Yes  |              | 0 V - 5V            | 4.6 V = No water , below 4 V = water in fuel             |
| 10                    | CANL        | CAN (private) Low                 | 1 V – 4 V                |              | 1 V – 4 V             |           |              | 1 V – 4 V             |           |              | 1 V - 4 V           | Digital signal communications (VGT and EGR control)      |
| 11                    | CANH        | CAN (private) High                | 1 V – 4 V                |              | 1 V – 4 V             |           |              | 1 V – 4 V             |           |              | 1 V - 4 V           | Digital signal communications (VGT and EGR control)      |
| 13                    | EOP         | Engine Oil Pressure               | 0.62 V at 0 PSIG         |              | Performance Specs     |           |              | Performance Specs     |           |              | 0 psi – 100 psi     | 0.62 V = 0 psi     3.61 V = 60 psi                       |
| 15                    | MAT         | Manifold Air Temperature          | Temp depend              |              | Temp depend           |           |              | Temp depend           |           |              | 0 V - 5V            | See Performance Specifications – Sensor specs            |
| 20                    | EBP         | Exhaust Back Pressure             | 0.73 V                   |              | Performance Specs     |           |              | Performance Specs     |           |              | 0 V - 5V            | See Performance Specifications                           |
| 24                    | CMPL        | Camshaft Position                 |                          |              |                       |           |              |                       |           |              |                     | CMP Ground                                               |
| 25                    | CKPL        | Crankshaft Position               |                          |              |                       |           |              |                       |           |              |                     | CKP Ground                                               |
| 26                    | CMP/CKP SHD | CMP/CKP Shield GND                | 0 V                      |              | 0 V                   |           |              | 0 V                   |           |              | 0 V                 | Ground shield for CMP/CKP sensors                        |
| 28                    | SIG GND     | Signal Ground                     | 0 V                      |              | 0 V                   |           |              | 0 V                   |           |              | 0 V                 | Signal ground for engine sensors                         |
| 32                    | EFP         | Engine Fuel Pressure              | 0.62 V at 0 PSIG         |              | Performance Specs     |           |              | Performance Specs     |           |              | 0 psi – 100 psi     | 0.62 V = 0 psi     3.61 V = 60 psi                       |
| 33                    | ECT         | Engine Coolant Temperature        | Temp depend              |              | Temp depend           |           |              | Temp depend           |           |              | 0 V – 5 V           | DMM set to V , EST – Continuous Monitor Session          |
| 35                    | VREF        | Voltage Reference                 | 5 V ± 0.5 V              |              | 5 V ± 0.5 V           |           |              | 5 V ± 0.5 V           |           |              | 5 V ± 0.5 V         | VREF for engine sensors                                  |
| 41                    | CKPH        | Crankshaft Position               | Min 130 Hz at crank      |              | 650 Hz – 700 Hz       | 700 rpm   |              | 2600 – 2750 Hz        |           |              | 0 – Governed speed  | DMM set to ACV – Hz, EST - PID Engine Speed              |
| 42                    | CMPH        | Camshaft Position                 | Min 130 RPM② at crank    |              | 700 RPM②              | 700 rpm   |              | 2700 RPM②             | 2700 rpm  |              | 0 – Governed speed  | DMM set to ACV – RPM ② , EST – PID Engine Speed          |
| 43                    | IPR         | Injection Pressure Regulator      |                          |              |                       |           |              |                       |           |              | 0 – 100% Duty Cycle | Duty Cycle controlled, High side driver                  |
| 48                    | MAP         | Manifold Absolute Pressure        | 0.73 V                   |              | Performance Specs     |           |              | Performance Specs     |           |              | 0 V – 5 V           | See Performance Specifications                           |
| 57 & 75               | ITVL        | Intake Throttle Valve Low         | Performance Specs        |              | Performance Specs     |           |              | Performance Specs     |           |              | 0 V / B+            | Monitor ITVP and run Output State test high and low      |
| 58 & 76               | ITVH        | Intake Throttle Valve High        | Performance Specs        |              | Performance Specs     |           |              | Performance Specs     |           |              | 0 V / B+            | Monitor ITVP and run Output State test high and low      |
| 59                    | IAH         | Intake Air Heater                 | 0 V Off / B+ On          |              | 0 V Off / B+ On       |           |              | 0 V Off / B+ On       |           |              | 0 V / B+            | 0V = IAHC off, B+ = IAHC on, EST - Output State test     |
| 66                    | EOT         | Engine Oil Temperature            | Temp depend              |              | Temp depend           |           |              | Temp depend           |           |              | 0 V – 5 V           | See Performance Specifications – Sensor specs            |
| 68                    | ITVP        | Intake Throttle Valve Position    | 1.30 V                   |              | DPF Regen device      |           |              | DPF Regen device      |           |              | 0 – 100%            | See Performance Specifications                           |
| (C) CHASSIS CONNECTOR |             |                                   |                          |              |                       |           |              |                       |           |              |                     |                                                          |
| 1, 3, 5               | ECM PWR     | ECM Power from Relay              | B+                       |              | B+                    |           |              | B+                    |           |              | 0 V / B+            | B+ from ECM power relay                                  |
| 2, 4, 6               | ECM GND     | ECM Ground from Battery           | 0 V                      |              | 0 V                   |           |              | 0 V                   |           |              | 0 V                 | ECM ground from Battery Negative                         |
| 7                     | ECI         | Engine Crank Inhibit              | GND                      |              | Open circuit          |           |              | Open circuit          |           |              | GND to Open         | GND allows cranking, OPEN inhibits cranking              |
| 8                     | EGT1        | Exhaust Gas Temperature 1         | Temp depend              |              | Temp depend           |           |              | Temp depend           |           |              | 0 V – 5 V           | See Performance Specifications – Sensor specs            |
| 10                    | ATAL        | ATA Communication Link (Low)      | 1 V – 4 V                |              | 1 V – 4 V             |           |              | 1 V – 4 V             |           |              | 0 V – 5 V           | Digital signal communications                            |
| 11                    | XCS         | Transfer case                     |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 16                    | RPRE        | Remote Preset PTO                 |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 17                    | EGT2        | Exhaust Gas Temperature 2         | Temp depend              |              | Temp depend           |           |              | Temp depend           |           |              | 0 V – 5 V           | See Performance Specifications – Sensor specs            |
| 19                    | EGDP        | Exhaust Gas Differential Pressure | 0.70 V                   |              | DPF soot level depend |           |              | DPF soot level depend |           |              | 0 V – 5 V           | DMM set to V , EST – Continuous Monitor Session          |
| 21                    | OWL         | Oil Warn Lamp                     |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 22                    | WEL         | Warn Engine Lamp                  |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 25                    | ATAH        | ATA Communication Link (High)     | 1 V – 4 V                |              | 1 V – 4 V             |           |              | 1 V – 4 V             |           |              | 0 V – 5 V           | Digital signal communications                            |
| 27                    | VREF        | Voltage Reference                 |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 30                    | BPS         | Brake Pressure Switch             | B+ Off / 0V On           |              | B+ Off / 0V On        |           |              | B+ Off / 0 V On       |           |              | 0 V / B+            | B+ = Off / 0V On. Applications without ESC module        |
| 31                    | VIGN        | Ignition Voltage                  | B+                       |              | B+                    |           |              | B+                    |           |              | 0 V / B+            | Switched Ignition power B+ = Key On , 0 V = Key Off      |
| 33                    | APS         | Accelerator Position Sensor       | 0.66 V                   |              | 0.66 V                | 0%        |              | 3.83 V                | 100%      |              | 0 % – 100 %         | 0.66V = 0%, 3.83V = 100%                                 |
| 34                    | SIG GND     | Signal Ground                     | 0 V                      |              | 0 V                   |           |              | 0 V                   |           |              | 0 V                 | Signal ground for APS sensor                             |
| 35                    | SIG GND     | Signal Ground                     |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 37                    | SIG GND     | Signal Ground                     | 0 V                      |              | 0 V                   |           |              | 0 V                   |           |              | 0 V                 | Signal ground for chassis sensors                        |
| 39                    | RSE         | Radiator Shutter Enable           | 0 V / B+                 |              | 0 V / B+              |           |              | 0 V / B+              |           |              | 0 V / B+            | 0 V = Shtr Closed, B+ = Shtr Open, Low side driver.      |
| 42                    | ECL         | Engine Coolant Level              | 0 V Low – 5 V Full       |              | 0 V Low – 5 V Full    |           |              | 0 V Low – 5 V Full    |           |              | 0 V / B+            | 0 V = Low coolant     5 V = Full coolant                 |
| 45                    | IPR PWR     | IPR Power                         | B+                       |              | B+                    |           |              | B+                    |           |              | 0 V / B+            | Switched ignition power , B+ = Key On, 0 V = Key Off     |
| 47                    | IVS         | Idle Validation Switch            | 0 V Release / B+ Depress |              | 0 V                   |           |              | B+                    |           |              | 0 V / B+            | 0 V at normal state, B+ Accelerator pedal depressed      |
| 49                    | RAS         | Resume Accel Switch               |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 50                    | RPS         | Remote Pedal Position Sensor      |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 51                    | VREF        | Voltage Reference                 | 5 V ± 0.5 V              |              | 5 V ± 0.5 V           |           |              | 5 V ± 0.5 V           |           |              | 5 V ± 0.5 V         | VREF for chassis sensors                                 |
| 53                    | VSSL        | Vehicle Speed Signal (Low)        | 0 V                      |              | 2 – 14 VAC            |           |              | 2 – 14 VAC            |           |              | 2 – 14 VAC          | VSSL is used on applications without an Allison Trans    |
| 54                    | VSSH        | Vehicle Speed Signal (High)       | 0 V                      |              | 2 – 14 VAC            |           |              | 2 – 14 VAC            |           |              | 2 – 14 VAC          | VSSH is an input signal from the TCM or VSS sensor       |
| 58                    | EFAN        | Engine Fan                        | 0 V On / B+ Off          |              | 0V On / B+ Off        |           |              | 0V On / B+ Off        |           |              | 0 V / B+            | B+ at normal state, 0 V enables relay, Low side driver   |
| 60                    | RVAR        | Remote Variable PTO               |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 61                    | CANH        | CAN (public) High                 | 1 V – 4 V                |              | 1 V – 4 V             |           |              | 1 V – 4 V             |           |              | 1 V – 4 V           | Digital signal communications                            |
| 62                    | CANL        | CAN (public) Low                  | 1 V – 4 V                |              | 1 V – 4 V             |           |              | 1 V – 4 V             |           |              | 1 V – 4 V           | Digital signal communications                            |
| 63                    | VREF        | Voltage Reference                 | 5 V ± 0.5 V              |              | 5 V ± 0.5 V           |           |              | 5 V ± 0.5 V           |           |              | 5 V ± 0.5 V         | VREF for APS sensor                                      |
| 65                    | DDS         | Drive Line Disengagement Switch   | 0 V – B+                 |              | B+                    |           |              | B+                    |           |              | 0 V / B+            | 0 V = In gear , B+ = Park , Neutral or clutch pedal down |
| 66                    | IAT         | Intake Air Temperature            | Temp depend              |              | Temp depend           |           |              | Temp depend           |           |              | 0 V – 5 V           | See Performance Specifications – Sensor specs            |
| 67                    | EGT3        | Exhaust Gas Temperature 3         | Temp depend              |              | Temp depend           |           |              | Temp depend           |           |              | 0 V – 5 V           | See Performance Specifications – Sensor specs            |
| 68                    | SCS         | Speed Control Switch              |                          |              |                       |           |              |                       |           |              |                     | Chassis body builder option only                         |
| 69                    | BOO         | Brake On / Off switch             | 0 V Off / B+ On          |              | 0 V Off / B+ On       |           |              | 0 V Off / B+ On       |           |              | 0 V / B+            | 0 V = Off / B+ On. Applications without ESC module       |
| 70                    | MPR         | Main Power Relay enable           | 0 V                      |              | 0 V                   |           |              | 0 V                   |           |              | 0 V / B+            | 0 V = enable, B+ = disable, Low side driver              |
| 71                    | TACH        | Tachometer Output signal          |                          |              |                       |           |              |                       |           |              |                     | 0 Hz = 0 rpm, 140 Hz = 700 rpm, 540 Hz = 2700 rpm        |
| 72                    | VSO         | Vehicle Speed Output signal       |                          |              |                       |           |              |                       |           |              |                     | 0 Hz = 0 mph, 124 Hz = 15 mph                            |
| EST only              | ICP         | Injection Control Pressure        | 0.2 V                    |              | Performance Specs     |           |              | Performance Specs     |           |              | 0 psi – 4061 psi    | See Performance Specifications                           |
| EST only              | BCP         | Engine Brake Control Pressure     | 0.2 V                    |              | 0 V                   |           |              | 0 V                   |           |              | 0 psi – 4061 psi    | See Performance Specifications                           |
| EST only              | BSV         | Brake Shutoff Valve               | 0 %                      |              | 0 V                   |           |              | 0 V                   |           |              | 0 V / B+            | 0 V = BSV Off, B+ = BSV On, EST Output State Test.       |