

## SECTION CONTENTS

### Electronic Engine Controls -- JDEC (4.5 L / 6.8 L); DE10

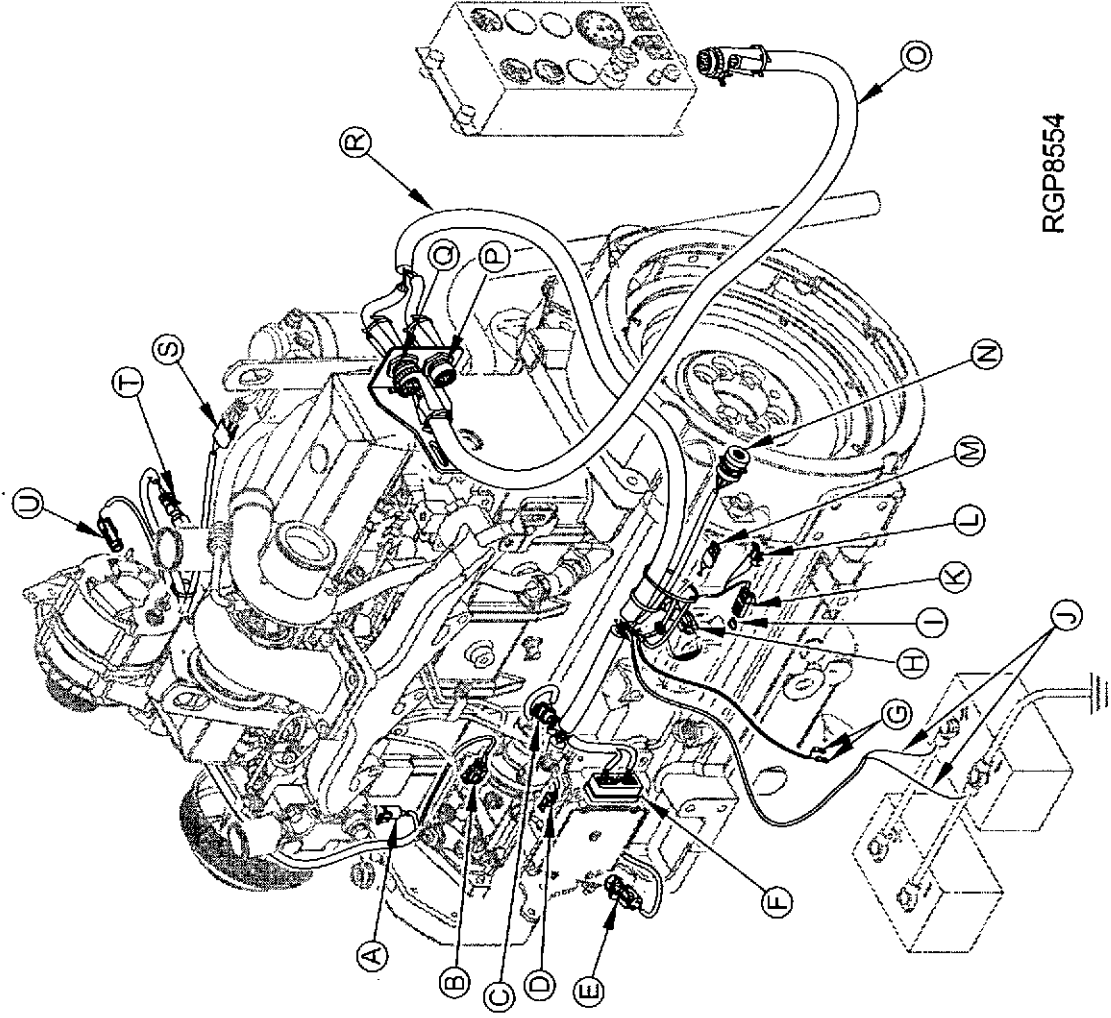
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JOHN DEERE

John Deere Electronic Control System (4.5 L / 6.8 L; DE10)

## INTRODUCTION

The John Deere Electronic Control system used on 4.5 L/6.8 L Tier-2 engines with Stanadyne DE10 fuel injection systems is different than the systems used on 8.1 L and 12.5 L, and 6.8 L engines with VP44 fuel system.

Two levels of DE10 ECU and wiring harness will be available, the standard version and the full-featured version. Both versions will share the same 21-pin instrumentation and controls connector with the larger engines, but not all features will be available with the standard system.

A separate 23-pin optional feature connector will be provided with the full-featured system to provide optional features such as cruise control, selectable isochronus governing, and customer shutdown/warning inputs.

There is no separate performance programming connector on the DE10 wiring harness. Torque curves will not be user-selectable. However, on full-featured ECUs without cruise-control, isochronus governing will be user-selectable. A pin will be provided in the 23-pin optional feature connector that can be connected to battery power to select isochronus governing.

The auxiliary Warning/Stop-Engine lamp driver is also different on the DE10 control systems. On 8.1 L, 12.5 L, and VP44-equipped 6.8 L engines, there are separate auxiliary Warning and Stop-Engine lamp drivers intended for use with separate orange and red lamps. On the DE10 control systems (standard and full-featured), there is only one Warning/Stop-Engine lamp driver. It operates a single lamp that flashes for Warning-type faults, and glows steadily for Stop-Engine type faults.

The orange Warning and red Stop-Engine LEDs on the RE68155 diagnostic gauge will still function normally when used with either DE10 control system. The single-lamp system only applies to the auxiliary warning lamp, if used.

The oil pressure sensor, which is standard on 8.1 L and 12.5 L engines, is optional on the DE10 system. The oil pressure sensor must be specified on ECUs with automatic shutdown protection.

## Standard DE10 Control System

The following features are active on the standard DE10 control system:

- 2-position throttle switch
- Shutdown system with override switch
- Intake heater activation system with wait-lamp
- CAN-based instrumentation system
- Blink-code diagnostic system
- Single auxiliary Warning/Stop-Engine lamp driver
- Analog tachometer drive

The standard DE10 control system will not have:

- Analog throttle capability
- Adjustable 2-state throttle capability
- Switchable isochronus governing
- Cruise control capability
- Remote on/off control plug
- Separate Warning and Stop Engine lamp drivers
- Customer warning or stop engine inputs
- Loss of coolant input.

## Extended-feature DE10 Control System

The optional extended-feature DE10 control system will have all of the same features as the control systems used on 8.1 L, 12.5 L, or VP44-equipped 6.8 L engines, except:

- No separate loss of coolant input
- No remote cruise control station capability
- External derate input and switchable isochronus governor will not be available on ECUs with cruise control
- No separate Warning and Stop Engine lamp drivers

### **Instrument Panels**

Like the VP44 system used on higher powered 6.8 L engines, the standard DE10 system can be used with or without CAN-based instrumentation.

The DE10 control system can be used with the same RE508625 instrument panel and RE508625 instrumentation and wiring kit used on the larger engines. However, with the standard system the fixed 2-state throttle switch will be the only functional speed control. The analog throttle, bump switch and bump-enable switches will not be active on the standard system. All instrument panel features will work with the extended-feature DE10 system.

A less expensive CAN-based control panel, without bump or bump-enable switches or analog throttle wiring will also be made available. The less expensive panel will include the diagnostic gauge with digital display of all engine operating parameters, but it will not include separate analog tach, oil pressure, and coolant temperature displays.

### **Engine-mounted ECUs and Wiring Harness**

All DE10 ECUs will be engine-mounted. The wiring harness for the standard system and for the extended-feature system will both be terminated on the engine.

### **FEATURES**

#### **Engine Diagnostics and Engine Protection**

The ECU can detect abnormal engine operating conditions or faults in several engine systems. Faults are stored in the ECU for later use by service personnel, and are reported to the operator with a Fault Lamp.

The ECU can detect several types of engine problems and may take actions to minimize engine damage that may result if these problems are not corrected. There are two levels of engine problems, "Warning" and "Shutdown."

"Warning" faults are engine problems that may lead to engine failures if not corrected. "Warning" faults include higher-than-normal coolant temperatures and higher-than-normal charge air temperatures. The amber "warning" LED on the standard instrument panel illuminates when a "Warning" problem is detected. On installations that use the separate warning/stop-engine lamp driver instead of CAN-based instrumentation, a flashing light indicates a "Warning" fault.

"Shutdown" faults are engine problems that indicate imminent engine failure. "Shutdown" problems include extremely low oil pressure, extremely high coolant temperatures, loss of coolant, and extremely high fuel temperature. The red "stop-engine" LED on the standard instrument panel illuminates when a "Shutdown" problem is detected. On installations that use the separate warning/stop-engine lamp driver instead of CAN-based instrumentation, a solid light indicates a "Shutdown" fault.

### ENGINE PROTECTION

Four levels of engine protection are available; no protection, engine derate, engine shutdown, and both engine derate and engine shutdown.

The desired level of protection is selected by option code when the engine is ordered. All levels may not be offered at every power rating. To determine which injection pump / ECU options include engine protection or shutdown features, see the 8300 option group descriptions and Engine Performance Curves.

#### No Protection

Engine ECU's with "No Protection" do not derate the engine when coolant temperature, oil pressure, or charge-air temperature "Warning" faults are detected, and do not shutdown the engine if a "Shutdown" fault occurs. The "warning" lamp will illuminate (or the warning/stop-engine lamp will flash) when a "Warning" fault is detected by the ECU. The "stop-engine" lamp will illuminate (or the warning/stop-engine lamp will be solid) when a "Shutdown" fault is detected. The engine operator is responsible for reducing engine speed and power when a "Warning" fault exists and for shutting down the engine when a "Shutdown" fault exists.

#### Engine Derate Protection

The Engine derate feature is only in ECU's with Engine derate programmed into the ECU. All engine protection sensors including fuel temperature, coolant temperature, and oil pressure must be installed if engine derate is specified. Otherwise, a fault will be detected, and the fault lamp will light.

The warning LED will be on (or warning/stop engine lamp will be flashing) when a "Warning" fault is detected by the ECU and the engine will be derated by the ECU. For specific derates, see the following sections. The Engine Protection feature is only in ECU's with Engine Protection programmed into the ECU. Otherwise, a fault will be detected, and the fault lamp will light.

### Engine Shutdown Protection

The Engine Shutdown feature is only in ECU's with Engine Shutdown programmed into the ECU. All engine protection sensors, including coolant temperature and oil pressure must be installed if engine protection is specified. Otherwise, a fault will be detected, and the fault lamp will light.

The engine will shut down in 30 seconds if a "Shutdown" fault is detected. The stop-engine LED will be "ON" (or warning/stop engine lamp will be solid) for 30 seconds before shutting down when a "Shutdown" fault is detected.

#### Shutdown Override Control

The operator may delay a shutdown for 30 seconds by pushing the "Shutdown Override" button. The "Shutdown Override" switch resets the shutdown timer to 30 seconds, and may be used repeatedly. However, continuously holding down the "Shutdown Override" switch will not reset the 30-second timer.

On an ECU with the Shutdown feature, shutting down the engine by turning the key switch "Off" will reset the engine Shutdown feature and will allow at least 30 seconds of running after restart. After 30 seconds, the engine will again shutdown unless the "Shutdown" fault condition has cleared.

### LOW OIL PRESSURE

The optional oil pressure sensor must be installed for oil pressure protection to function.

There are two low oil protection features, Low Oil Pressure WARNING and Low Oil Pressure SHUTDOWN. The set-points for Low Oil Pressure WARNING and SHUTDOWN are variable based on engine speed, and are preset at the factory.

At the Low Oil Pressure WARNING set-point, the warning LED will illuminate (or warning/stop-engine lamp will flash). On systems with the protection option enabled a slow power derate begins. If the oil pressure goes above the Low Oil Pressure WARNING set point, power slowly increases until the power is back to full power. The fault lamp will continue until the power returns to normal even if the fault condition has gone away and the recovery is in process.

At the Low Oil Pressure SHUTDOWN set-point, the stop-engine LED will illuminate (or warning/stop-engine lamp will be solid). On systems with the protection option enabled, a faster power derate begins. On systems with the shutdown option enabled, if the oil pressure does not go above the SHUTDOWN set-point within 30 seconds, the engine will shutdown. If oil pressure goes above Low Oil Pressure SHUTDOWN set point within 30 seconds, power derate reverts to the Low Oil Pressure WARNING curve.

### COOLANT TEMPERATURE

There are two standard coolant temperature features, High Coolant Temperature WARNING, and High Coolant Temperature SHUTDOWN.

At the High Coolant Temperature WARNING set-point, the warning LED will illuminate (or warning/stop-engine lamp will flash). On systems with the protection option enabled a slow power derate begins. If the coolant temperature goes below the High Coolant Temperature WARNING set point, power increases slowly until the power is back to full power. The fault lamp will continue until the power returns to normal even if the fault condition has gone away and the recovery is in process.

At the High Coolant Temperature SHUTDOWN set-point, the stop-engine LED will illuminate (or warning/stop-engine lamp will be solid). On systems with the protection option enabled a faster power derate begins. If the coolant temperature does not go below the SHUTDOWN set-point within 30 seconds, the engine will shutdown. If coolant temperature goes below High Coolant Temperature SHUTDOWN set point within 30 seconds, power derate reverts to the High Coolant Temperature WARNING curve.

### HIGH CHARGE AIR TEMPERATURE

If the air temperature in the intake manifold rises above the maximum allowable temperature, the "warning" lamp will illuminate (or warning/stop-engine lamp will flash). On systems with the protection option enabled, a slow power derate begins. If the temperature drops below the allowable maximum while derated, power slowly increases until the power is back to full power. The fault lamp will continue until the power returns to normal even if the fault condition has gone away and the recovery is in process. There is no shutdown function for High Charge Air Temperature. The maximum derate is 20%.

### HIGH FUEL TEMPERATURE

Excessive fuel temperature can cause fuel injection system damage. If the fuel temperature rises above a preset "warning" temperature, the warning LED will illuminate (or warning/stop-engine lamp will flash) and the engine will begin to derate. If fuel temperature continues to rise past a preset "shutdown" level, the "stop-engine" lamp will illuminate (or warning/stop-engine lamp will be solid) and derate continues. On ECU's with the shutdown option enabled the engine will shut down in 30 seconds unless temperature returns to normal.

### EXTERNAL DERATE AND SHUTDOWN INPUTS (Extended-feature Systems Only)

Two inputs are provided for external derates and shutdown. These inputs can be used to allow the OEM to trigger a 20% reduction in engine power or an engine shutdown from external switches, such as a loss-of-prime switch or hydraulic over-temperature switch. These circuits are active on all ECUs, even if "No Protection" is specified. They derate or shut down the engine immediately. There is no 30-second delay. If the user doesn't wish to use this feature, the wires should be left disconnected.

### BLINK-CODE DIAGNOSTICS

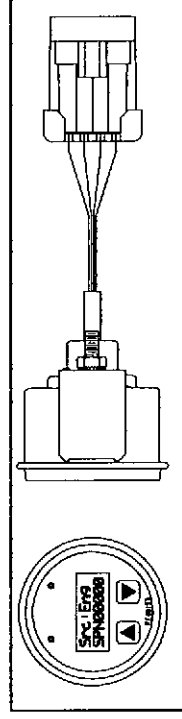
Blink-code diagnostics are a standard feature of the JDEC controls for the 4.5 L / 6.8 L Tier-2 engines. All active and stored diagnostic codes can be read through the blink-code system.

Blink code diagnostics are required if an SAE J1939 CAN-based fault code reader such as the John Deere RE68155 diagnostic gauge is not used. If the RE68155 diagnostic gauge or equivalent fault code reader is not provided, the OEM must provide an auxiliary warning/stop-engine lamp and a shutdown override switch, even if he does not intend to use the shutdown override feature.

To activate the blink-code diagnostic system, press the shutdown override switch while turning the key switch ("On"). The customer-installed warning/stop-engine lamp acts as the blink-code display. Instructions for interpreting the blink-code diagnostics are in the operator's manual or component technical manual.

## RE68155 DIAGNOSTIC GAUGE

The blink-code diagnostics provide only limited diagnostic information. We strongly recommend the RE68155 Diagnostic Gauge for all applications. The RE68155 Diagnostic Gauge is a complete on-board engine diagnostic and display system. It includes built-in "Warning" and "Stop-engine" lights to alert the operator of problems, and it digitally displays diagnostic codes, rpm, hours, oil pressure, coolant temperature, voltage, engine load, fuel consumption, manifold temperature and other engine parameters.



**Diagnostic Gauge, RE68155**

It can also be used to drive analog gauge displays for rpm, oil pressure, coolant temperature, and many other parameters available on the digital display. The RE68155 diagnostic gauge works with all JDEC control systems. It fits in a standard 2-inch SAE instrument panel opening. It is pre-installed in the RE162429 instrument panel, and included with the RE508625 instrument panel kit.

You can also provide your own SAE J1939-based onboard diagnostic system using the information provided over the SAE J1939 Controller Area Network (CAN) described later in this document.

## Remote On / Off Control (Extended-feature Systems Only)

A remote on/off connection has been added to the engine wiring harness that allows the system to be turned on and off with a relay, for use with modem-based computer control systems or remote operator stations. It can also be used for an emergency or remote "kill-switch." This connection is designed to be used in combination with an RE162429 (or equivalent) instrument panel. When the ignition switch on the RE162429 instrument panel is in the "run" position, the remote on/off connection can be used to turn the engine on or off remotely. The key switch in the panel acts as a "lockout." The remote on/off connection only turns the system on and off. It does not activate the starter. A separate remote starter relay control with speed cut-out is required by the OEM if remote-start capability is required.

## Intake Heater Controls

The 4.5 L / 6.8 L DE10 JDEC system can be used to automatically turn on an electric intake heater. The ECU can turn on the intake heater whenever the ignition switch is in the "Run" position and the temperature is low enough to require intake heat. The ECU can also operate a "Wait" light. The wait light illuminates at the same time as the intake heater, and stays on until the intake heater has had enough time to heat the intake air adequately to begin cranking.

## Throttle Options

Five throttle input options are available on the 4.5 L / 6.8 L DE10 engine. Two are analog (potentiometer) throttles and three are digital throttles. All throttle inputs are additive, which is to say all throttle inputs must be at low idle for the system to operate at low idle, but in most cases any single throttle input can put the system at fast idle.

## ANALOG (POTENTIOMETER) THROTTLES (Extended-feature Systems Only)

The two available throttle inputs both can use any 2000-15,000 Ohm potentiometer. Foot and hand throttle assemblies are available from various suppliers including Morse Controls. When both analog throttles are used, the throttle signals are additive, up to the factory preset fast-idle setting. There is no "dead band" in either throttle. When you move the foot throttle, speed immediately increases regardless of where the hand throttle is set.

The secondary analog throttle feature is not intended for use with two throttles located remotely from each other. Since the throttle signal is additive, if either throttle is at the full speed position, the other throttle will have no control. Both throttles must be in the slow-idle position for the engine to operate at slow idle.

Normally, the analog throttles operate between slow idle and fast idle. However, when the adjustable 3-state throttle is used, the analog throttle range is between the adjustable low idle and the adjustable intermediate speed setting.

### DIGITAL RAMP THROTTLE (Standard and Extended-feature Systems)

A new "Ramp" throttle option is available on all systems. An engine that is equipped with only the Ramp throttle will always start at the factory preset slow idle. After starting, a single rocker switch can be used to bump the speed to any desired operating speed between the factory preset slow idle and fast idle. Each "bump" on the rocker switch results in a 1.6% change in engine speed (in either direction). The actual RPM change will vary depending on the full throttle speed range and may be impacted by the load the engine is carrying at the time of the desired speed adjustment. A "bump" of the rocker switch is defined as pressing the switch for less than 0.2 seconds. When the ramp throttle switch is depressed and held for longer than 0.2 seconds, the throttle will change exponentially until it reaches the end of the speed range in either direction. From low idle, the engine will reach fast idle in approximately 4.5 seconds. When the engine is switched off, the Ramp throttle will return to low idle.

### DIGITAL 2-STATE (Non-adjustable) THROTTLE (Standard and Extended-feature Systems)

A non-adjustable 2-state throttle switch is available on all 4.5 L / 6.8 L DE10 JDEC Systems. The non-adjustable 2-state throttle allows operation at the preset rated speed, or at low idle using a single switch. The 2-state throttle must be set in the "Low Speed" position for the analog throttle to work.

### DIGITAL 3-STATE (Adjustable) THROTTLE (Extended-feature Systems Only)

An adjustable 3-state throttle feature is available on the extended feature 4.5 L/6.8 L DE10 JDEC System on systems that do not specify cruise control. The adjustable 3-state throttle consists of a three-position rocker switch that can be used to select slow idle, fast idle, or an adjustable intermediate speed. Slow idle is also adjustable up to a preset maximum of 1400 rpm.

If an analog (foot or hand) throttle is desired, you can add up to two throttle potentiometers that would operate between the preset intermediate and low operating speeds. The adjustable 3-state throttle must be set in the "Low Speed" position for the analog throttle to work.

Three switches make up the Adjustable 3-State Throttle:

- Throttle Switch
- Bump Enable Switch
- Bump Switch

### The Throttle Switch

The Throttle switch allows you to choose between three operating speeds, fast idle, slow idle, and an intermediate speed. Slow idle is adjustable up to a preset maximum of 1400 rpm. The intermediate speed can be adjusted and locked to any desired speed between 1400 rpm and the factory preset fast idle. These speeds can be adjusted and locked by using the Bump Enable and Bump switches.

### The Bump Enable Switch

The Bump Enable switch serves as a lock for the Bump switch to make sure the operating speed is not changed accidentally or as a result of a Bump circuit failure. The Bump Enable switch must be "On" for the Bump switch to work.

### The Bump Switch

The Bump switch for the digital 3-state throttle allows you to adjust either the "Intermediate" or slow idle speeds. When the Throttle Switch is on "Intermediate" and the Bump Enable switch is "On," moving the Bump switch to the "-" (minus) position decreases the intermediate speed setting slightly. Moving the Bump switch to the "+" (plus) position increases the pre-selected intermediate speed slightly (but not past fast idle). When the Throttle Switch is on "Low," and the Bump Enable switch is "On," moving the Bump switch adjusts the slow idle speed.

The bump switch works like the "Accel" and "Coast" buttons on a cruise control. A momentary tap on the switch will bump the speed up or down about 10 rpm (or 0.25 rpm at "High" speed on gen sets). However, if you hold the switch down, speed will continue to ramp up or down continuously until the switch is released, then it will remain at whatever rpm it has reached at that point.

To permanently set intermediate and slow idle speeds, press the Bump Enable button three times after adjustment. The preset speeds will be remembered, even if the ignition is turned off or the battery is disconnected.

### Cruise Control (Extended-feature Systems Only)

Engine ECU's are available with and without the Cruise Control function. The Cruise Control is an off-road type that maintains a constant engine RPM under varying load conditions. By comparison, an automotive type cruise control maintains a constant road speed.

The Cruise Cancel/Resume function is a one-button, cancel-then-resume function. The first time button contact is made, with Cruise Control active, the Cruise Control disengages and the engine speed drops to idle. If button contact is made again within one minute and with the engine speed above 1300 RPM, the Cruise Control will "Resume." This feature allows the placement of the Cancel/Resume button in a convenient location in the vehicle cab and does not require the use of the normal Cruise controls for momentary interruptions in cruise operation.

The Cancel/Resume function is intended for applications like agricultural tractors and sprayers that turn around at the end of each row in a field. This allows the operator to use the throttle and/or brake to turn the vehicle around. When ready to resume field operations, the operator brings the engine speed above 1300 RPM and activates the Cancel/Resume function again to resume cruise speed. An internal timer gives the operator one minute to complete the turnaround maneuver.

The Cruise Control has the normal functions of:

- Cruise Control power "ON" or "OFF"
- "Set" or "Bump Up" Engine Speed
- "Resume" or "Bump Down" Engine Speed
- Vehicle brake or clutch pedal to disengage Cruise Control

These feature generally function similar to an automotive cruise control. Refer to the cruise control wiring instructions later in this document for more details.

Only one cruise control station can be used with the DE10 system. There is no secondary ("remote") cruise station feature.

For option codes with cruise control, see the 8300 option group descriptions and Engine Performance Curves. For cruise cruise control wiring details, see "Application Feature Wiring" section.

### Selectable Governor Regulation (Extended-feature Systems Only)

There is no separate performance program connector on DE10 systems. On full-featured ECUs without cruise control, Pin E in the 23-pin optional feature connector is used to choose between isochronous governing and droop governing. When Pin E is not connected to anything, normal droop governing is selected. When Pin E is connected to battery voltage, isochronous governing is selected.

Normal droop gives a drop in engine speed with an increase in load or an increase in engine speed with a decrease in load. The normal % droop for the engine (usually 5-10%) is listed in the option group descriptions and on the engine performance curve. When isochronous governing is selected, the droop is set to 0%, and there is no change in engine speed as the load changes until the engines torque limit is reached.

On standard ECUs, or ECUs with cruise control, governing is fixed at the factory at either droop or isochronous, and is not changeable by the user. To determine if your particular engine configuration has isochronous or droop governing, refer to the engine performance curve.

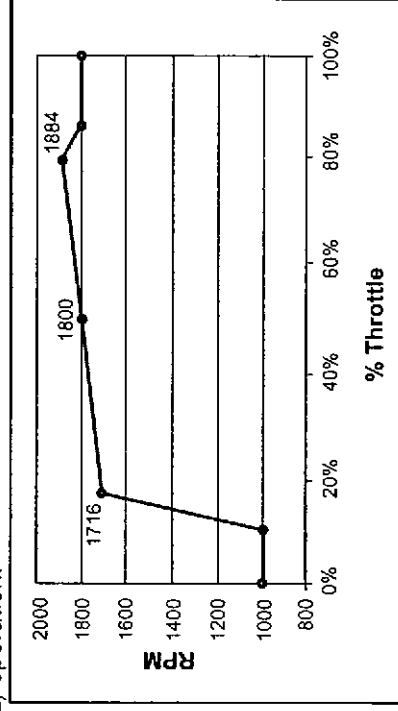
## GOVERNOR SETTINGS FOR GEN-SETS

### Isochronous Governing

Most gen-sets are normally operated with the isochronous governor selected. Isochronous governing is intended for use with either stand-alone gen-sets, or gen-sets that are paralleled using a commercial load sharing module.

For stand-alone gen-sets, either prime or standby, the throttle switch can be left in the fast-idle position and/or the analog (adjustable) throttle should be turned all the way up to the maximum speed position. With the throttle in the fast idle position, the governor will try to maintain exactly 1800 rpm (or 1500 rpm for 50-Hz units).

The isochronous governor programmed into gen-set ECUs is non-linear. It does not increase speed evenly as the throttle is turned up. For an 1800-rpm gen-set, it follows the curve shown below. ECUs programmed for 1800 rpm operation are not suitable for 1500 rpm (50 Hz) operation.



### Governing, Isochronous

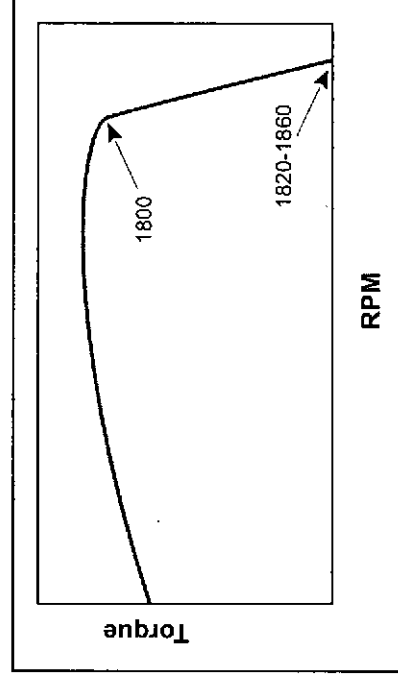
The 1500-rpm ECU (if available) behaves similarly. Most of the throttle travel is used to adjust speed within plus or minus 84 rpm of rated speed. This allows very fine adjustment of speed in that range if needed, and it meets the requirements of commercially available load sharing modules. If throttle travel exceeds 82%, speed reduces until it reaches rated speed at 87.5% travel. Because of this feature, the gen-set operates at rated speed (1800 or 1500 rpm) when the throttle switch is in the "fast idle" position, or if the analog throttle is turned all the way up, or in the event of a throttle wiring failure, or if no analog or adjustable 2-state throttle is connected.

This isochronous governor can be used directly with commercially available load sharing modules. When two or more engines are being controlled by a load sharing module, the load sharing module output can be connected directly to the analog throttle input to the ECU, as shown in the analog throttle wiring section below.

### Standard Droop Governing

Standard Droop governing is intended for use when sharing load between two John Deere electronically controlled engines without the aid of a commercial load sharing module, or for paralleling with the utility grid.

With a gen-set engine in standard droop mode and the throttle control at fast idle, the engine operates with breakaway at exactly 1800 rpm as shown below (or 1500 rpm on 50 Hz units). Fast idle speed is 20-60 rpm above rated speed, depending on governor droop for your particular engine. Governor droop for each engine is listed on the certified Performance Curve.



### Governing, Standard Droop

Multiple John Deere engines with JDEC controls operated in this mode and wired directly in parallel will automatically share load, although frequency will vary with load. This mode is intended for use with other electronically controlled John Deere engines in the same operating mode. It is not intended to be used to parallel with other models of engines. To share load at exactly 1800 rpm (60 Hz), a commercial load sharing module must be used.

## Controller Area Network (CAN)

The CAN bus is a high speed open interconnect network for electronic systems on on-highway and off-road vehicles and stationary equipment. It allows electronic systems to communicate with each other through a standard architecture of electronic signals over shielded twisted-pair wires. Engines can communicate with throttles, transmissions and brakes. Vehicles can communicate with trailers. Agricultural and construction equipment can communicate with implements and accessories. Stationary equipment can communicate with controllers or other networked equipment. Information on the network can be displayed to the operator on a virtual terminal (instrument panel) or relayed to another location via telemetry. Up to 30 Electronic Control Units or modules can be connected together through a single CAN network segment.

A CAN connection (SAE J1939) is provided in two different locations on the Engine wiring harness. A round Deutsch 9-pin CAN connector is provided primarily for service/diagnostic purposes. A Deutsch 3-pin wedge connector, intended for customer computer interface, has also been provided.

The pins in the Deutsch connectors are:

### Deutsch 9-pin Round Connector

|                                | Function                        |
|--------------------------------|---------------------------------|
| Pin A, Wire #050C (black)      | Ground                          |
| Pin B, Wire #012B (red)        | Power Supply (+12 or +24 volts) |
| Pin C, Wire #904D (yellow)     | CAN_H                           |
| Pin D, Wire #905D (dark green) | CAN_L                           |
| Pin E, Wire #020E (black)      | Shield                          |
| Pins F through J               | Spare (unused)                  |

### Deutsch 3-pin Wedge Connector

|                                | Function |
|--------------------------------|----------|
| Pin A, Wire #904A (yellow)     | CAN_H    |
| Pin B, Wire #905A (dark green) | CAN_L    |
| Pin C, Wire #020A (black)      | Shield   |

The CAN bus is also accessible through the 21-pin instrumentation and controls connector which is described in the "Instrumentation and Controls Wiring" section of this document.

Standard CAN bus messages are listed in the Component Technical Manual. Special CAN messages are required for use with electronically controlled Allison transmissions.

For details to use this system, refer to SAE J1939/11 published by:

The Society of Automotive Engineers  
400 Commonwealth Drive  
Warrendale PA 15097-0001.

## BASIC INSTALLATION

### Welding Precautions

Welding causes high currents or electrostatic discharge in electronic components that can cause permanent damage to the ECU. We recommend that "No Welding" signs be prominently displayed on the vehicle chassis.

The following steps should be used to protect from damage when welding on the vehicle chassis:

1. Disconnect the connectors from the ECU.
2. Connect the welder ground close to the welding point and be sure ECU or other electronic components are not in the ground path.

For applications that require routine or daily welding (i. e. for bucket tooth resurfacing, etc.), contact OEM Application Engineering.

## Power and Ground Connections

After all other wiring is completed, and immediately before operating the system for the first time, the main power and ground connections to the battery should be made. Unterminated system power and ground wires are provided in the engine wiring harness for this purpose. These wires should be connected directly to the battery if possible. The battery can be located up to 10 feet (3 M) from the engine. Connect as follows:

- Battery Power (Wire #002C, red, 10 gauge)  
Should be connected directly to the positive terminal of the battery.
- Ground (Wire #050F, black, 10 gauge)  
Should be connected directly to the negative terminal of the battery.

If a battery disconnect switch is used on the negative battery terminal, wire #050E must be connected to the disconnectable side of the switch instead of the battery terminal.

When ordering the engine, 12-volt or 24-volt operation must be specified. The engine ECU has the following voltage requirements:

| 12-volt          | 24-volt          | Function                                                                                        |
|------------------|------------------|-------------------------------------------------------------------------------------------------|
| 0 to 6 volts     | 0 to 10.6 volts  | System does not operate - No damage                                                             |
| 6 to 9 volts     | 10.6 to 18 volts | Cranking Voltage Range - Some features "inactive"                                               |
| 9 to 16 volts    | 18 to 32 volts   | Normal Operation - All features "active"                                                        |
| 16 to 26.5 volts | 32 to 36 volts   | Over-voltage - System can operate for up to 5 minutes without damage - Some features "inactive" |
| >26.5 volts      | >36 volts        | System damage                                                                                   |

#### TRANSIENT VOLTAGE PROTECTION

There are two different Transient Voltage Protection (TVP) modules; 12-volt and 24-volt. The 12-volt TVP module protects the engine ECU from transient voltage spikes (such as alternator load dump) greater than 24 volts. The 24-volt TVP module protects against voltage spikes greater than 36 volts. The TVP module can be wrapped in the wiring harness or mounted in the vehicle. If the TVP module is mounted in the vehicle, it should be mounted vertically with the pigtail wires exiting from the bottom of the module. The mounting location should be away from battery fumes, engine heat and vibration, such as in a control cabinet, vehicle chassis, or cab. Mounting ears of the TVP module may not withstand overtightening of mounting bolts. The TVP module does not protect against sustained over-voltage to the ECU.

The TVP Module mates with the TVP Connector in the engine wiring harness. The TVP module is not always required. Some alternators have internal TVP protection. A TVP module will be provided if needed, depending on the alternator option specified. If you provide your own alternator, a TVP module must be used.

#### REVERSE CURRENT PROTECTION

The system has limited protection against the battery or battery boosters being connected in reverse. The fuel injection pump should never be operated except when plugged in to the standard engine wiring harness with pump power relay and fuse, or equivalent.

#### Starter Relay

The standard engine wiring harness is designed for use with a starter relay located within 2 feet (600 mm) of the starter. Under no circumstances should the starter solenoid be operated directly from the key switch without a relay.

## INSTRUMENTATION AND CONTROLS WIRING

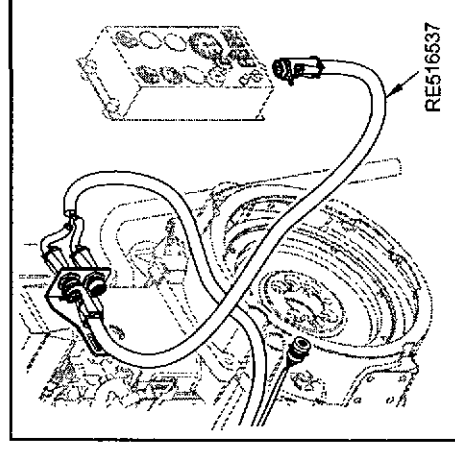
To complete a runnable engine, instrumentation and operator controls must be added. There are three ways to add basic instrumentation and operator controls to the system:

1. Use one of the John Deere pre-packaged instrument panels.
2. Use the RE508625 instrumentation and wiring kit to build your own instrument panel.
3. Design your own instrumentation and controls (without the RE508625 kit).

### Using a Prepackaged John Deere Instrument Panel

Two complete prepackaged instrument panels are available from John Deere. The full-featured RE162429 instrument panel is a large panel designed to accommodate the needs of applications that require extensive and varied instrumentation and controls. The Basic RE516508 panel is a smaller panel, designed to meet the needs of applications that require minimal instrumentation and controls.

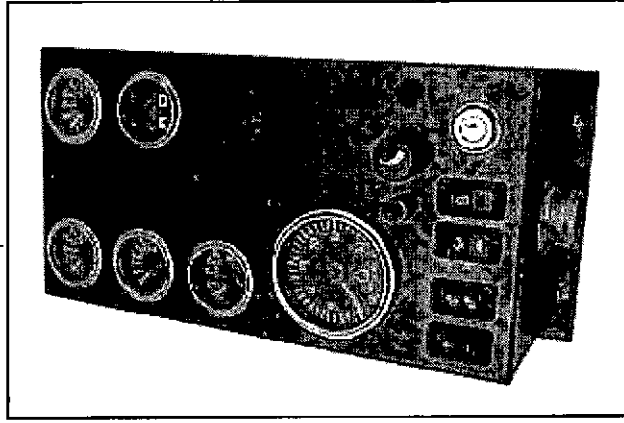
A RE516537 adapter harness is used to attach either panel to the 21-pin instrumentation and controls connector on the engine. No other connection is required.



Adapter Harness (21-pin) - RE516537

### Full-featured Instrument Panel - RE162429

The full-featured RE162429 instrument panel is a large panel designed to accommodate the needs of applications that require extensive and varied instrumentation and controls. It operates on 12 or 24 volts.



Instrument Panel, RE162429

The following features are standard on the RE162429 instrument panel:

#### STANDARD RE162429 INSTRUMENT PANEL FEATURES

- Ignition switch
- Panel mounted fuse
- Adjustable 2-state throttle switches\*
- Shutdown override switch
- RE68155 Diagnostic Gauge
- Tachometer
- Oil pressure analog gauge
- Coolant temperature analog gauge.

\* Bump switch and bump-enable switch are not functional with the Standard ECU.

The following optional features are available for the RE162429 panel. To use the optional features, order the parts and plug them in. Connectors and panel cutouts are provided in the panel:

#### OPTIONAL RE162429 INSTRUMENT PANEL FEATURES

- RE192470 Ramp throttle switch
- RE69667 Analog throttle potentiometer
- RE163436 Percent load gauge
- RE162422 12-volt voltage gauge
- RE163277 24-volt voltage gauge
- RE162427 Audible warning alarm
- RE162449 Backlight dimmer control
- RE162448 Converter for 24-volt backlighting
- RE67334 Glow-plug wait-lamp assembly
- RE516537 Instrument panel adapter harness
- RE516542 12-foot extension harness (plugs into adapter harness)

\* The analog throttle feature is not functional with the Standard ECU.

### Using the RE162429 Instrument Panel with Extended-feature ECUs

When using the RE162429 instrument panel, 4.5 L and 6.8 L engines with DE10 fuel systems and Extended-feature ECUs operate identically to the 8.1 L, 12.5 L, or VP44-equipped 6.8 L engines.

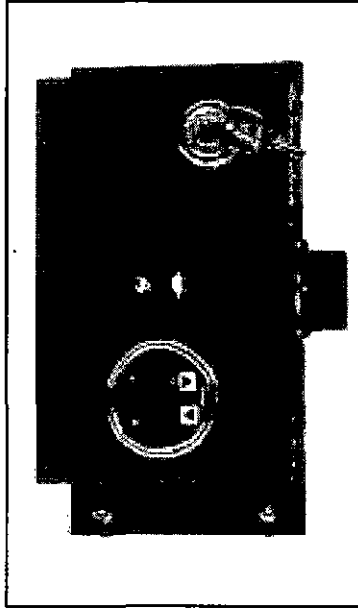
### Using the RE162429 Instrument Panel with Standard ECUs

DE10 engines with Standard ECUs can also use the RE162429 panel, but not all panel features will be active. When using a standard ECU with 2-state throttle, the throttle switch will work. (It will switch between fast idle and slow idle.) However, the bump and bump-enable switches will not function. The 2-state throttle is not adjustable. Optional ramp throttle software is available for the standard ECU, which can be used in conjunction with the optional ramp throttle switch if adjustable speed operation is required. The standard ECU also does not support the optional analog throttle feature. All other standard and optional RE162429 panel features will work with standard ECUs.

### Basic Instrument Panel - RE516508

The Basic RE516508 panel is a smaller panel, designed to meet the needs of applications that require minimal instrumentation and controls, particularly DE10 applications with standard ECUs. The RE162429 panel operates on 12 or 24 volts.

The RE516508 panel comes with a ramp throttle switch and diagnostic gauge. There is no wiring or mounting space for an analog throttle or adjustable 3-state throttle. All engine operating parameters, such as RPM, oil pressure, coolant temperature, etc., can be read through the diagnostic gauge. There is no wiring or mounting space for individual analog gauges.



Basic Instrument Panel, RE516508

The following features are standard on the RE516508 instrument panel:

#### STANDARD RE516508 INSTRUMENT PANEL FEATURES

- Ignition switch
- RE192470 Ramp Throttle Switch
- RE68155 Diagnostic gauge

The following optional features are available. All optional RE516508 panel features will work with either standard or extended-feature ECUs. To use the optional features, just order the parts and plug them in. Connectors and panel cutouts are provided in the standard panel:

#### OPTIONAL RE516508 INSTRUMENT PANEL FEATURES

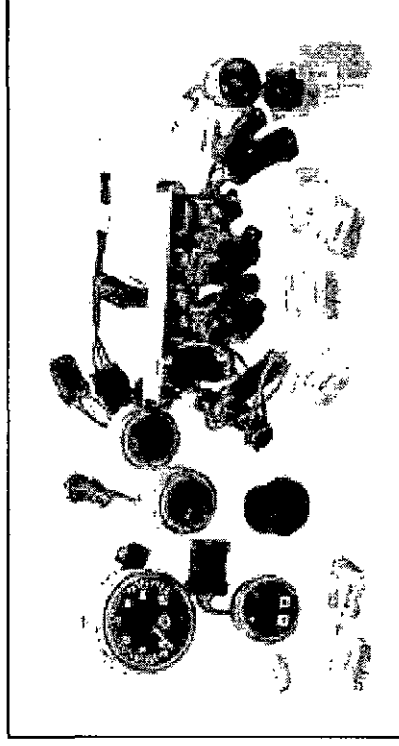
- RE163465 Shutdown override switch
- RE198505 3-State throttle switch (non-adjustable)
- RE67334 Glow-plug wait-lamp assembly
- RE516537 Instrument panel adapter harness
- RE516542 12 foot extension harness (plugs into adapter harness)

### Control Panel Harness Extensions

A 12-foot wiring harness (RE516542) extension is available for the 21-pin control panel connector. Depending on the engine harness, the use of the 3 foot adapter harness (RE516537) with two female ends may be required to connect the control panel to the end of the harness extension. It is recommended that no more than two 12 foot extensions and one adapter harness are linked together in any one application.

### Using the RE508625 Instrumentation and Wiring Kit

The second easiest way to provide all the control system parts that do not come on the engine is to use the John Deere RE508625 instrumentation and wiring kit.



Instrumentation and Wiring Kit, RE508625

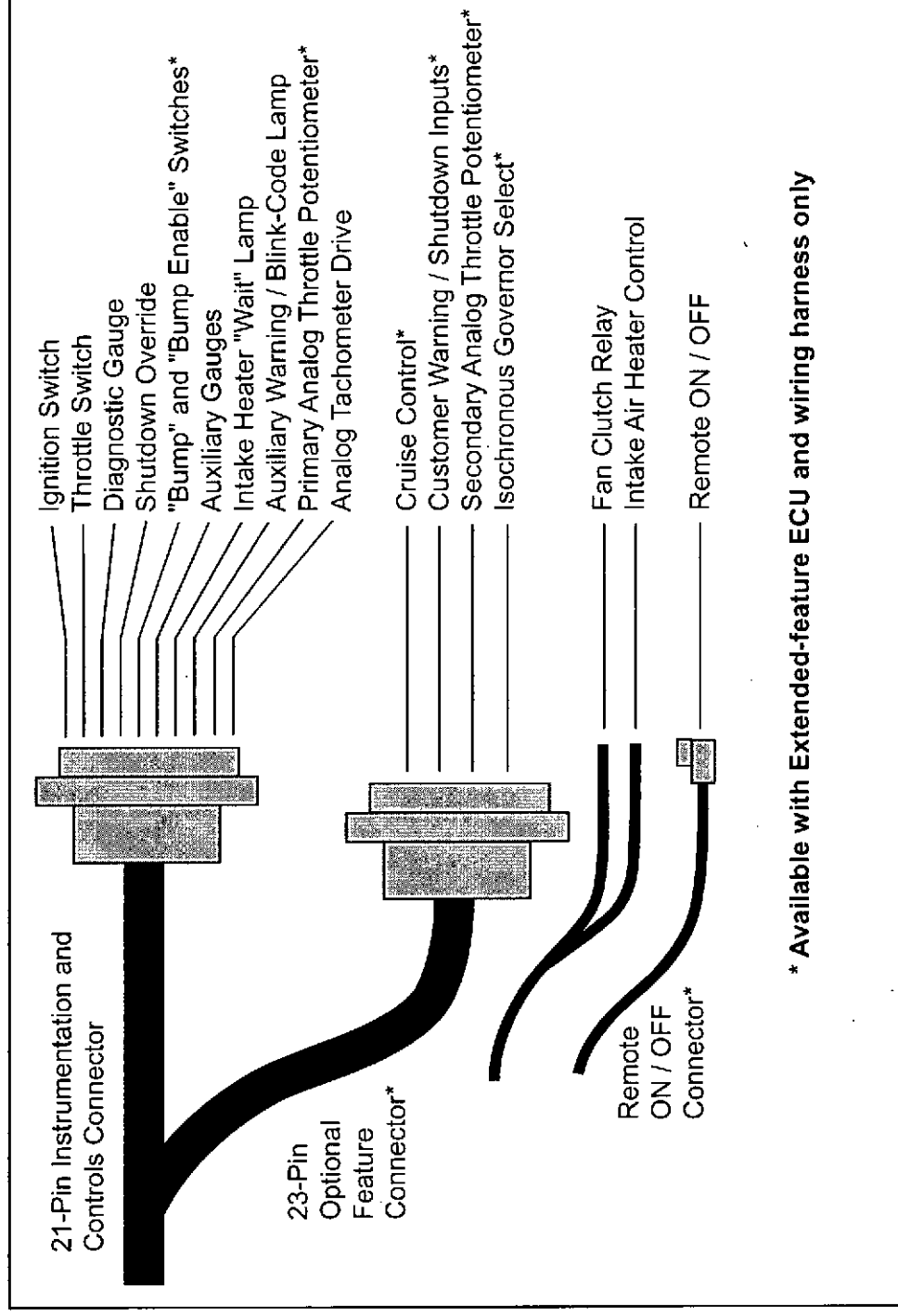
The RE508625 instrumentation and wiring kit includes all the parts that are included in the RE162429 instrument panel except for the adjustable 2-state throttle switches. The RE508625 kit includes ignition switch, shutdown override switch, all needed wiring connectors, and the RE162450 Databus Module which can be used to add up to three additional auxiliary gauge displays (in addition to the included tachometer, coolant temperature, and oil pressure gauges). All you need to add are the actual wires and a throttle control.

All optional features of the RE162429 panel also apply to the RE508625 instrumentation kit.

### Making Your Own Instrumentation and Controls

If you choose not to use one of the John Deere instrument panels or instrumentation kits, you will have to provide your own ignition switch, fuse holder, throttle device, wiring harness, diagnostics, and any other instrumentation and controls you need.

All required electrical connections to the engine, including throttle, instrumentation, key switch, starter, and alternator connections, are made through a single 21-pin Deutsch connector provided on the engine wiring harness. A second optional feature connector and a remote on/off connector is provided with full-featured ECU's. An unterminated wire is provided to drive a relay that operates the intake heater starting aid.



\* Available with Extended-feature ECU and wiring harness only

### Instrumentation Connections

**MINIMUM REQUIRED WIRING**

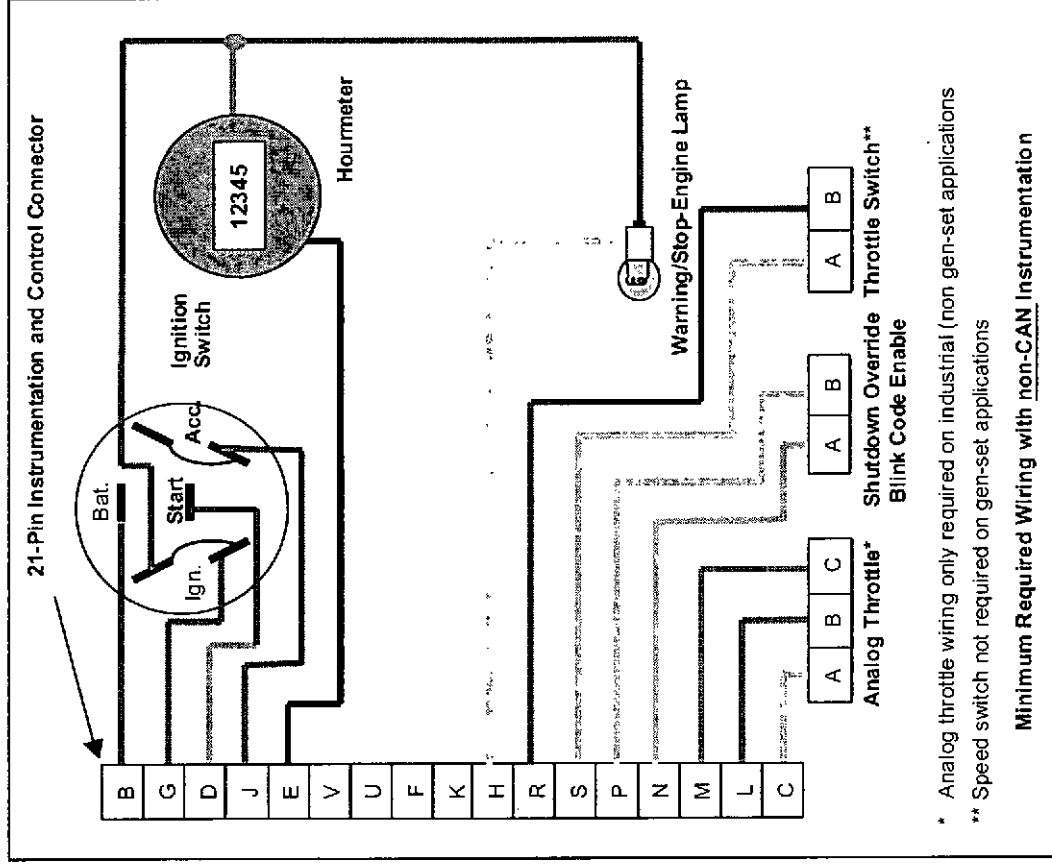
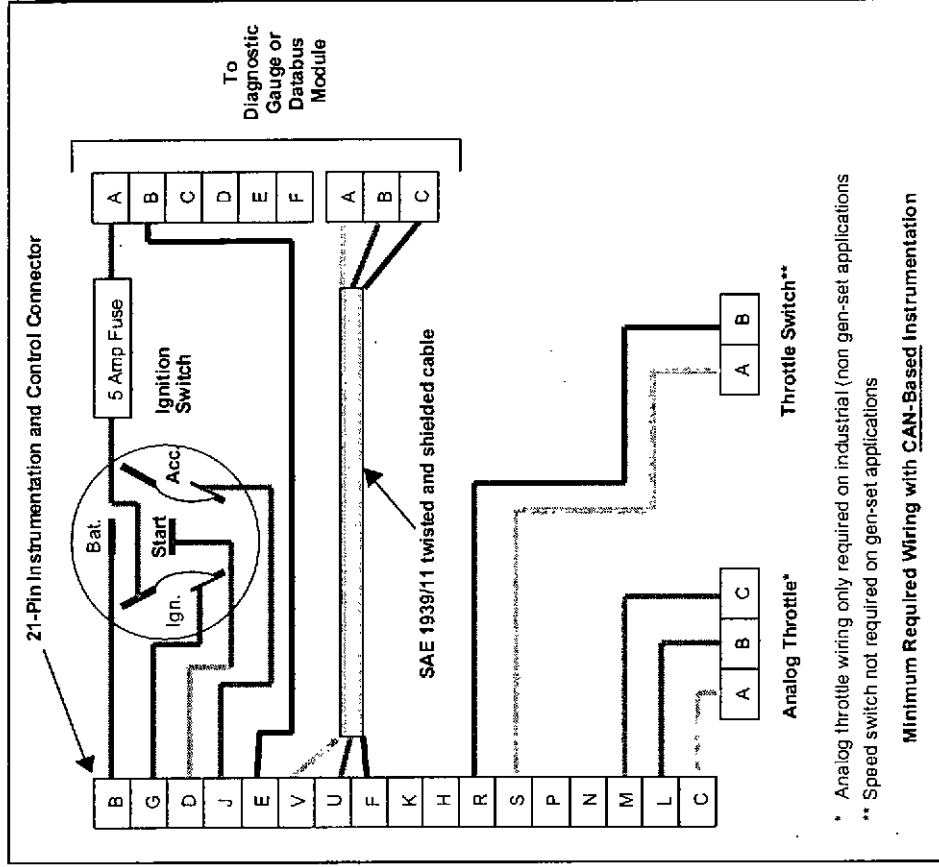
There are two optional types of minimum system wiring: one for use with CAN-based instrumentation and one for use with non-CAN instrumentation.

Both types of minimum required wiring attachments can be made through the 21-pin instrumentation and controls connector. Some kind of ignition switch is always required. Diagnostics are also required. For 8.1 L and 12.5 L engines, you must install the RE68155 Diagnostic Gauge or equivalent CAN-based instrumentation. The CAN-based RE68155 Diagnostic Gauge is not strictly required on 4.5 L and 4.5 L / 6.8 L engines because they can also be specified with blink-code diagnostics. However, it is still highly recommended because it is the easiest way to meet all diagnostic and instrumentation requirements, and to keep wiring common with the larger engines.

If you do not use the RE68155 Diagnostic Gauge or other CAN-based instrumentation on 4.5 L and 6.8 L engines, you must provide a warning lamp, shutdown override switch (which also acts as a blink-enable switch), hourmeter, and any other desired instrumentation such as tachometer, oil pressure gauge, and coolant temperature gauge separately.

For gen-set applications that start and operate at full rated speed only (1500 or 1800 rpm), it is not necessary to connect anything except the key switch and diagnostics.

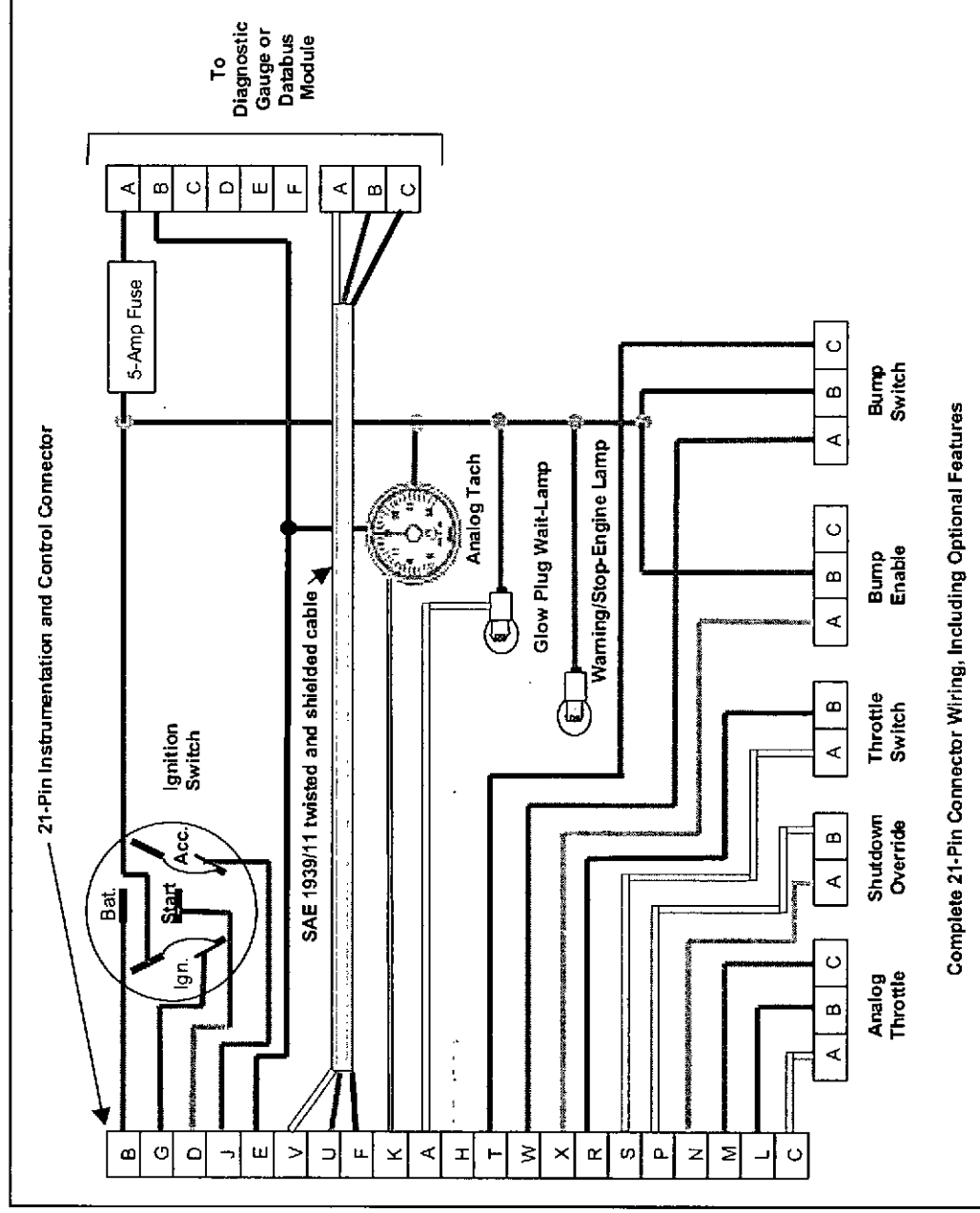
For industrial applications with full-featured ECUs, the analog throttle circuit must also be completed. If you choose to operate without an analog (potentiometer) throttle, you still must install a resistor bridge to terminate the circuit. The high/low speed select switch must also be connected on all industrial (non-gen-set) ECUs. If you choose not to use the high/low select feature, this circuit can be easily terminated with a single resistor.



### Minimum Required Wiring

**BASIC INSTRUMENTATION AND CONTROLS HARNESS**

For all required connections, and for the more common optional connections that are made through the 21-pin connector, refer to the following wiring diagram. This diagram provides a complete wiring harness to interface the 21-pin connector with your instrument panel. The connectors shown fit the recommended John Deere gauges, switches, etc., listed. If you choose to use other components, different connectors may be required.

**Instrumentation and Controls Connections**

For details on wiring all required and optional circuits, refer to the following sections.

**21-Pin Deutsch Instrument Panel Connector**

The 21-pin Deutsch connector makes the main connection between the engine and your instrumentation and controls. The RE508625 instrumentation and wiring kit includes this connector. If you provide your own harness, you will have to provide this connector with pin assignments per the following chart. Wire colors should be as shown in the chart and illustration. These colors are used in all John Deere instrument panels and kits, and all John Deere service publications identify the wires by the colors and circuit numbers shown.

| Pin | Circuit No. |      | Color  | Wire Gauge | Description                           | Function                                                                                                     |
|-----|-------------|------|--------|------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------|
|     | Std.        | Ext. |        |            |                                       |                                                                                                              |
| A   | 474         |      | yellow | 18         | Intake heater wait lamp               | To ground side of intake air heater wait lamp                                                                |
| B   | 022         | 032  | red    | 12         | Fused unswitched battery power        | To "B" terminal of your ignition switch                                                                      |
| C   | Plug        | 914  | yellow | 18         | Sensor return                         | To the primary analog throttle potentiometer or emulator                                                     |
| D   | 422         | 422  | red    | 12         | Starter relay                         | To "Start" terminal on your ignition switch                                                                  |
| E   | 050         | 050  | black  | 18         | Ground                                | Grounded on the engine side to the battery and ECU. Use for any non-sensor ground (lights, gauge power, etc) |
| F   | 020         | 020  | black  | 18         | CAN shield                            | To any CAN connectors including the diagnostic gauge                                                         |
| G   | 012         | 012  | red    | 12         | Battery power to ECU (switched)       | Must be wired to the "Ignition" terminal of key switch.                                                      |
| H   | 473         | 473  | orange | 18         | Warning lamp driver                   | To ground side of the warning lamp                                                                           |
| J   | 412         | 412  | red    | 18         | Alternator ignition                   | Should be wired to the "Acc'y." or "Ignition" terminal of the ignition switch.                               |
| K   | 439         | 439  | white  | 16         | Tachometer output                     | A synthesized frequency signal that can be used to drive a non-CAN electronic tachometer                     |
| L   | Plug        | 915  | green  | 18         | Primary analog throttle input voltage | To center (sensing) terminal of the primary analog throttle potentiometer (or throttle emulator)             |
| M   | Plug        | 911  | brown  | 18         | +5 Volts (sensor power)               | To the throttle potentiometer                                                                                |
| N   | 918         | 918  | gray   | 18         | Shutdown override                     | To shutdown override switch                                                                                  |
| P   | 911         | 911  | brown  | 18         | Shutdown override return              | To shutdown override switch                                                                                  |
| R   | 947         | 947  | violet | 18         | Throttle switch                       | Throttle switch (2-state or Ramp)                                                                            |
| S   | 914         | 914  | yellow | 18         | Sensor return                         | Sensor return                                                                                                |
| T   | Plug        | 936  | blue   | 18         | Resume / Coast / Bump Speed Down      | To the 2-state throttle speed select switch and/or the cruise resume/coast switch                            |
| U   | 905         | 905  | green  | 18         | CAN low                               | To any SAE J1939 CAN-based devices including the diagnostic gauge                                            |
| V   | 904         | 904  | yellow | 18         | CAN high                              | To any SAE J1939 CAN-based devices including the diagnostic gauge                                            |
| W   | Plug        | 955  | green  | 18         | Set/Accelerate/Bump Speed Up          | For adjustable 3-state throttle option.                                                                      |
| X   | Plug        | 923  | orange | 18         | Bump enable and brake enable          | For adjustable 3-state throttle option.                                                                      |

Wire colors should be as shown in the chart and illustration. These colors are used in all John Deere instrument panels and kits, and all John Deere service publications identify the wires by the colors and circuit numbers shown. Specifications for the mating connector are as follows:

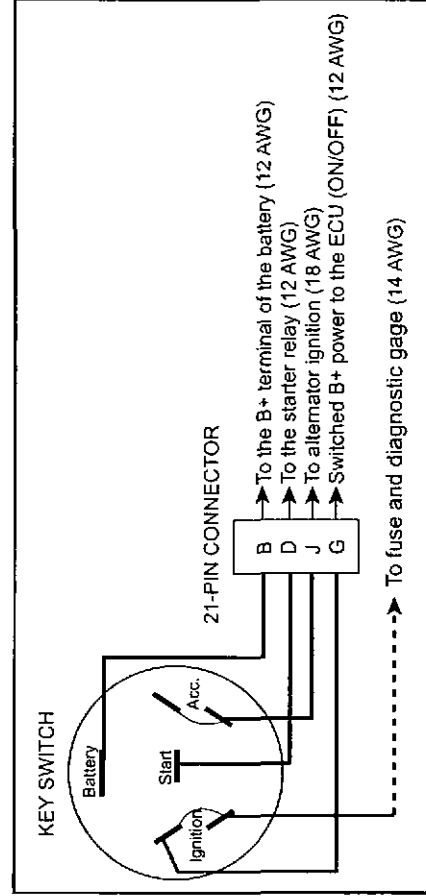
| Deutsch Part Number | John Deere Part Number | Cavities | Description                                    | Material      | Plug | Seal |
|---------------------|------------------------|----------|------------------------------------------------|---------------|------|------|
| HDP26-24-21SE       | 57M8112                | 21       | HD30 Receptacle (Plastic) Multi Size Terminals | Black Plastic | Yes  | No   |

| Deutsch Part Number | John Deere Part Number | Gauge   | Description               | Material     | Plating | Seal |
|---------------------|------------------------|---------|---------------------------|--------------|---------|------|
| 1062-16-0622        | 57M8165                | 20      | Stamped And Formed Socket | Copper Alloy | Nickel  | No   |
| 1062-16-0122        | 57M7546                | 18 - 16 | Stamped And Formed Socket | Copper       | Nickel  | No   |
| 1062-12-0166        |                        | 14 - 12 | Stamped And Formed Socket | Copper Alloy | Nickel  | No   |
| 114017              | R78069                 |         | Deutsch Cavity Plug       | Plastic      |         |      |

### Ignition Switch

The **ignition switch must be connected on all applications**. All ignition switch connections can be made through the 21-pin connector. Pin J on the 21-pin connector is the alternator ignition circuit. If your ignition switch does not have an "Accessory" terminal, the wire from Pin J can be connected to the "Ignition" terminal, along with the ECU power and all other switched accessories.

If necessary to support heavy accessory loads through the key switch (flood lights, electric motors, etc.), battery power to the "BAT" terminal of the key switch can be taken from a separate heavy-duty source instead of Pin B in the 21-pin connector. Pin B is provided for your convenience to simplify wiring on simple power unit installations. However, the fuse and wire gauges are sized for engine fuel system power requirements only. It should not be used if additional loads of more than a few amps are carried through the key switch. The starter relay and alternator ignition connections can also be made through separate circuits instead of Pins J and D. Only switched power to the ECU must be connected through the 21-pin connector.



### Ignition Switch Connections

### Analog Throttle Potentiometer

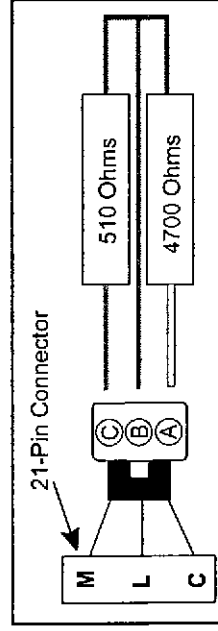
This circuit does not function on standard DE10 systems, so it does not have to be connected. No throttle emulator is required for the primary or secondary analog throttle for extended-feature DE10 systems.

The connector shown below fits the RE69667 analog throttle or the RE503681 throttle emulator. The harness connection is a Packard Weather Pack 3-cavity, female connector, #12020829, with male terminals, #12124582, and cable seals installed. Note that these are the opposite terminals usually used with this connector.

| Pin | Circuit | Color  | Size   | Destination                  |
|-----|---------|--------|--------|------------------------------|
| C   | 911     | Brown  | 18 AWG | to Pin M on 21-Pin Connector |
| B   | 915     | Orange | 18 AWG | to Pin L on 21-Pin Connector |
| A   | 414     | Yellow | 18 AWG | to Pin C on 21-Pin Connector |

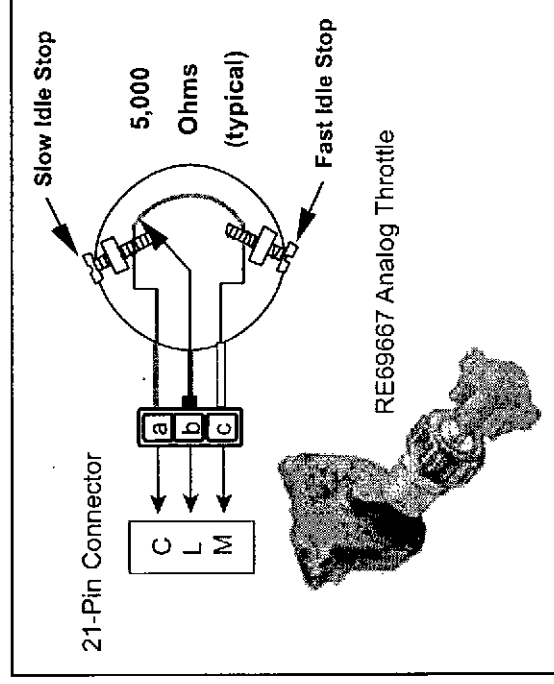
### Analog Throttle Potentiometer

If an analog potentiometer is not used, a resistor bridge that sets the throttle in the low idle range must be installed. Either the RE503681 throttle emulator with the connector shown above can be used, or you can wire your own equivalent resistor bridge into the appropriate pins on the 21-pin connector as shown below. The exact size of the resistors is not important, as long as total resistance is 2,000-15,000 Ohms, and the small resistor is 6% to 20% of the large resistor size.



Throttle Emulator, RE503681 (or Equivalent)

The RE69667 analog throttle is a multi-turn 5,000-Ohm potentiometer designed for stationary applications. Many other throttle styles, including various foot pedal throttles, are available from Morse, Williams Controls, and other suppliers. Any potentiometer-style analog throttle will work, as long as total resistance is in the 2,000- to 15,000-Ohm range.



Analog Throttle, RE69667

**THROTTLE POTENTIOMETER PRE-ADJUSTMENT PROCEDURE**

The analog throttle circuit is designed to operate with a potentiometer. Pin C (Circuit 911) is a 5-volt reference signal from the ECU. Pin A (Circuit 414) is sensor return (an isolated ground just for the throttle). The voltage on Pin B (Circuit 915) is the actual throttle signal. The ECU responds to the voltage on Circuit 915 as shown below:

| Signal on Circuit 915                           |                                                   |                                                 |                                                   | ECU Response                                                                                                                            |
|-------------------------------------------------|---------------------------------------------------|-------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Industrial                                      |                                                   | Gen Set                                         |                                                   |                                                                                                                                         |
| Voltage Ratio<br>(referenced to<br>circuit 911) | Approximate<br>Volts<br>(assuming<br>5-volt ref.) | Voltage Ratio<br>(referenced to<br>circuit 911) | Approximate<br>Volts<br>(assuming<br>5-volt ref.) |                                                                                                                                         |
| < .05                                           | < .25 V                                           | < .05                                           | < .25 V                                           | "Throttle Signal Low" fault code generated and warning lamp lit; Engine defaults to any other throttle inputs present, or to low idle.  |
| .05 - .20                                       | .25 - 1.0 V                                       | .05 - .10                                       | .25 - .50 V                                       | Normal low idle range (also Auto-Cal range, see below); No fault generated.                                                             |
| .20 - .80                                       | 1.0 - 4.0 V                                       | .10 - .90                                       | .50 - 4.5 V                                       | Normal variable speed range; Speed demand proportional to voltage.                                                                      |
| .80 - .95                                       | 4.0 - 4.75 V                                      | .90 - .95                                       | 4.5 - 4.75 V                                      | Normal fast idle range (also Auto-Cal range, see below); No fault generated.                                                            |
| > .95                                           | > 4.75 V                                          | > .95                                           | > 4.75 V                                          | "Throttle Signal High" fault code generated and warning lamp lit; Engine defaults to any other throttle inputs present, or to low idle. |

To prevent error codes and unexpected changes in speed, the fast and slow idle stops on the throttle potentiometer must be adjusted so that the voltage on Pin L cannot go below 0.25 volts or above 4.75 volts.

**Auto-Cal Feature (Analog Throttle #1 Only):**

Industrial (non-gen-set) applications also have an Auto-Cal feature that automatically adjusts the analog throttle range to match your sensor. Once the stops are adjusted to limit low and fast idle voltage, the "Auto-Cal" feature of the ECU will check the exact range of your throttle potentiometer and adjust the ECU to that range. However, your initial installation must be within certain resistance limits for the Auto-Cal feature to work.

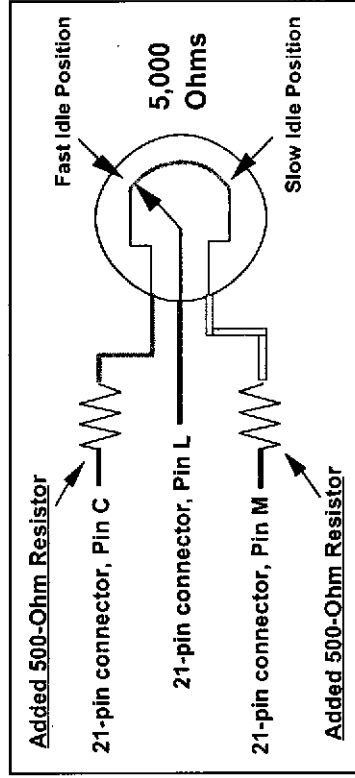
Before plugging it into the wiring harness, adjust the throttle potentiometer using the following procedure:

1. With the potentiometer against the slow idle stop, adjust the stop so that the resistance measured between the ground and wiper connections of the potentiometer (21-pin connector Pins C and L) is between 6% and 20% of overall potentiometer resistance.
2. With the potentiometer against the fast idle stop, adjust the stop so that the resistance measured between the power and wiper connections of the potentiometer (21-pin connector Pins M and L) is also between 6% and 20% of overall potentiometer resistance.

This does not have to be a precise adjustment. The Auto-Cal feature makes a precise adjustment automatically. Once it has been done a few times, you will probably find that adjusting each throttle stop screw a predetermined number of turns is accurate enough. Throttles from John Deere, such as RE68667, are pre-adjusted at the factory.

### POTENTIOMETER WITHOUT MECHANICAL ADJUSTMENT STOPS

If a potentiometer without fast and slow idle stops is used, additional fixed resistors can be wired in series with 21-pin connector Pins C and M as shown below to prevent the analog throttle voltage from going outside the upper and lower limits and generating a fault code.



### Potentiometer Without Mechanical Adjustment Stops

For the Auto-Cal system to work properly, each added resistor should be between 9-39% of the nominal throttle potentiometer resistance. Total resistance of the potentiometer and both resistors should be in the range of 2000 to 15,000 Ohms.

For gen-set applications, connection of this circuit is not required. Gen-set ECUs default to rated speed (1800 or 1500 rpm), and do not generate a fault code if the throttle is not connected. If the analog throttle is not connected, the engine runs at rated speed (1800 or 1500) only, with no adjustment.

### Digital Throttles

Three types of digital throttles are available: a new digital "Ramp" throttle (available on all ECUs), a non-adjustable 2-state throttle (available on all ECUs), and an adjustable 3-state throttle (available on extended-feature ECUs only). They replace the 2-state adjustable throttle used on the 8.1 L and 12.5 L engines.

If this circuit is not connected on industrial applications, a fault code will be generated. The warning lamp will light and the system will revert to the secondary analog throttle and/or 2-state throttle inputs. If no throttle input is present on industrial applications, the system will revert to low idle. No connection is required on gen-set applications that are intended to run at rated speed only, with no adjustability.

### Ramp Throttle:

The Ramp throttle allows you to start at low idle, then adjust operating speed as desired using a single rocker switch.

### 2-State Throttle (non-adjustable):

The 2-state throttle switches between the factory pre-set slow idle setting and the factory pre-set fast idle setting. Neither setting is digitally adjustable with this feature.

### Adjustable 3-state Throttle:

With the adjustable 3-state throttle, the slow idle setting is adjustable up to 1400 rpm and an intermediate speed is adjustable between 1400 rpm and the factory pre-set fast idle speed, using bump switches. The adjustable 3-state throttle works exactly like the old adjustable 2-state throttle, except for an additional switch position that puts the engine at the factory pre-set fast idle setting. If the adjustable 3-state throttle is used with an old instrument panel set up for the adjustable 2-state throttle, it will function as an adjustable 2-state throttle.

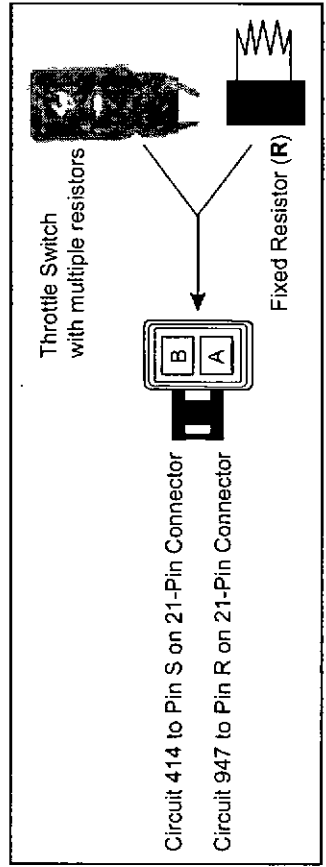
Any of the three digital throttles can be used with the analog throttle feature for variable speed operation on extended-feature ECUs.

The new throttle switches plug into the same circuit (identified as "Throttle Switch" on the wiring diagram) as the old adjustable 2-state throttle switch, using the same connector. The new throttle switches are very similar to the old adjustable 2-state throttle switch. They are slightly larger to allow room for an extra resistor. They differ mainly in which switch positions are detented (snap into place), and which are momentary (spring returned). It's mainly the software that makes them perform differently.

The mating connector for all John Deere throttle switches is a Packard Metri-Pack 150 Series two-cavity female connector, #12052641, with #12048074 sealed female terminals, cable seals and a #12052634 TPA or secondary lock. If you provide your own instrument panel and use a fixed resistor instead of a switch, you may choose to hard wire the resistor directly into the main 21-pin instrumentation and controls connector.

**The Throttle switch circuit must be connected on all industrial (non-gen-set) applications, even if you do not intend to use the feature.**

The switch must be in the low speed position for the analog (potentiometer) throttle to work. You must either provide a throttle switch or you must terminate the circuit through a resistor as shown below. On gen-set applications only, if you wish to start and operate at 1800 (or 1500) rpm only with no adjustability, this circuit can be left unconnected.



### Throttle Switch

The value of the fixed resistor (**R**) depends on what you want to accomplish:

**R = 200-400 Ohms**

Engine starts and operates at slow idle (fixed for 2-state or ramp throttle or adjustable for adjustable 3-state throttle). The analog throttle inputs are active in this mode. The fixed 200-400-Ohm resistor must be used in conjunction with an analog throttle to allow operation at speeds other than low idle.

**R = 900-1400 Ohms**

Engine starts and operates at the intermediate speed setting (adjustable 3-state throttle only). This speed can be adjusted using the bump switches, but not with the analog throttle. If this resistance range is used with the 2-state throttle (non-adjustable), the engine will start and run at the factory preset rated speed only.

**R = 2500-5000 Ohms**

Engine starts and operates locked at the factory pre-set fast idle setting only.

If this circuit is not connected on industrial applications, a fault code will be generated, the warning lamp will light, and the system will revert to the analog throttle inputs. If no throttle signal is present on industrial applications, the system will revert to low idle. No connection is required on gen-set applications that are intended to run at rated speed only with no adjustability.

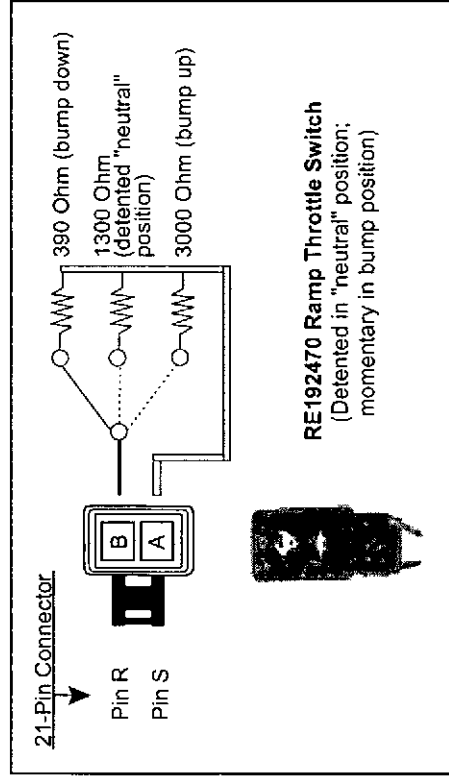
There are three types of throttle switches that can be used. Each type is intended for use with a corresponding unique 8300 software code.

### Ramp Throttle Switch

The ramp throttle software (specified by 8300 option code) is designed to work with the new RE192470 rocker switch, as shown in the illustration below. The RE192470 switch is detented (snaps into position) in the center 'neutral' position only. It is momentary (spring loaded back to neutral) in the bump-up and bump-down positions. Any switch that is designed per the illustration with spring return to the neutral position can be used.

When using the ramp throttle feature, the engine will always start at the factory pre-set low idle. When the switch goes momentarily to the 3000-Ohm position, speed will bump up approximately 25 rpm. If the switch is held in place, the engine speed command will continue to increase. The ramp throttle works in a similar manner to a throttle lever. The speed command will continue to increase as long as the switch is held down, regardless of the engine speed actually achieved. Holding the switch down steadily for several seconds has the same effect as advancing a manual throttle lever to the fast idle position. The engine speed target will reach high idle even if the engine is too heavily loaded to reach fast idle. The engine will accelerate to fast idle as soon as the load is reduced or removed.

If the operator sets the throttle at the high idle rpm, lugs the machine to below rated rpm, then presses the accelerate switch, the target speed will remain at fast idle. It does not reset to the actual engine speed like the cruise functions do.



### Ramp Throttle Switch

The mating connector to this switch is a Packard Metri-Pack 150 Series two-cavity female connector, #12052641, with #12048074 sealed female terminals, cable seals and a #12052634 TPA or secondary lock.

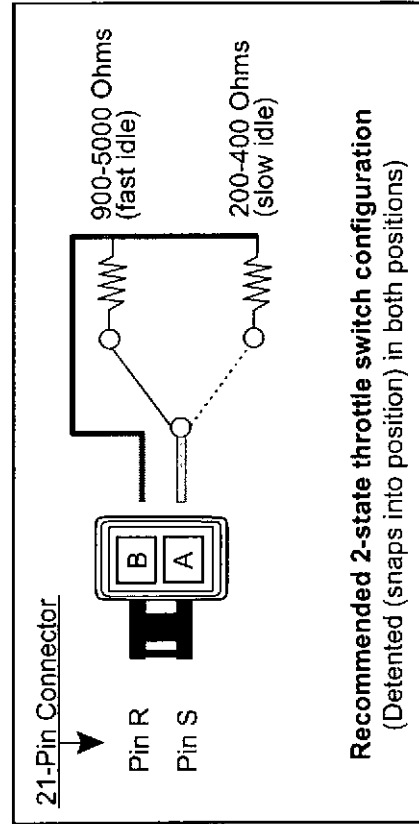
The resistors do not have to be exactly as shown. Any resistors in the following range would work:

|           |                |
|-----------|----------------|
| Bump Down | 200-400 Ohms   |
| Neutral   | 900-1400 Ohms  |
| Bump Up   | 2500-5000 Ohms |

## 2-State (non-adjustable) Throttle Switch

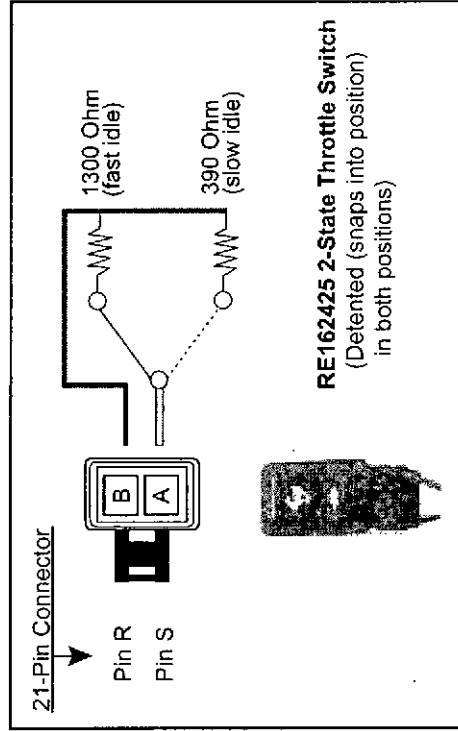
The 2-state throttle system is non-adjustable. When set in the fast idle position, the engine will start and operate at the factory pre-set fast idle (rated) speed. With the switch set at the slow idle position, the engine will start and operate at the factory preset slow idle speed, unless an analog throttle signal greater than slow idle is present. The analog throttle is active in the slow idle position, but not the fast idle position.

The **non-adjustable** 2-state throttle can either use the old RE162425 adjustable 2-state throttle switch, or the new RE198505 adjustable 3-state throttle switch, or you can make your own switch using the diagram below. The mating connector for all John Deere throttle switches is a Packard Metri-Pack 150 Series two-cavity female connector, #12052641, with #12048074 sealed female terminals, cable seals and a #12052634 TPA or secondary lock.



## 2-state Throttle Switch Configuration

Two different John Deere switches can be used to operate the 2-state (non-adjustable) throttle. One is the original switch designed for use with the two-state throttle, part number RE162425. The other is the switch designed for use with the adjustable 3-state throttle, part number RE198505.



## 2-state Throttle Switch, RE162425

If the RE162425 2-state throttle switch is used with software configured for the 2-state (non-adjustable) throttle, it will switch between the factory pre-set slow idle speed and the factory pre-set fast idle speed. If the RE162425 2-state throttle switch is used with software configured for the adjustable 3-state throttle, it will function just like the old adjustable 2-state throttle. Which is to say it will switch between low idle and the adjustable intermediate speed.

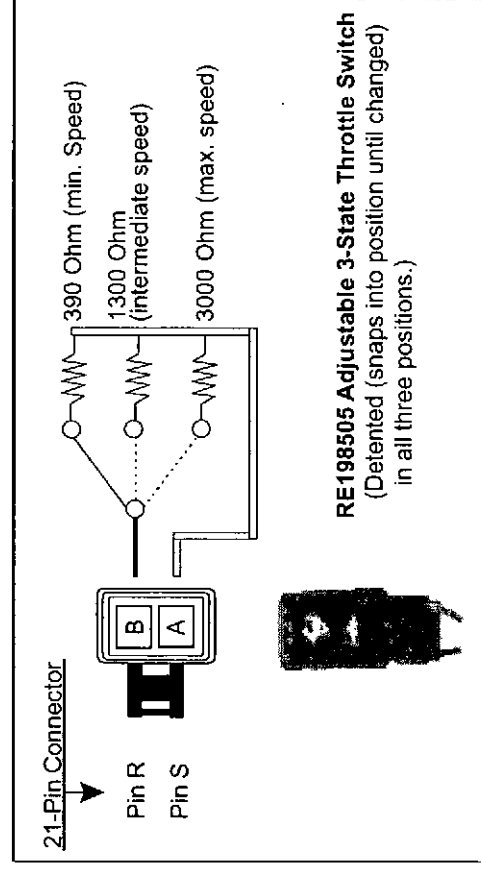
The RE198505 adjustable 3-state throttle switch described below can also be used with the 2-state throttle. When the RE198505 adjustable 3-state throttle switch is used with software configured for the 2-state (non-adjustable) throttle software, the engine will start and operate at the factory pre-set fast idle setting in either the maximum speed or the intermediate speed position.

The mating connector for all John Deere throttle switches is a Packard Metri-Pack 150 Series two-cavity female connector, #12052641, with #12048074 sealed female terminals, cable seals and a #12052634 TPA or secondary lock.

**Adjustable 3-state Throttle**

The adjustable 3-state throttle software requires three switches to operate as intended:

- 3-state Throttle Switch
- Bump Switch
- Bump-enable Switch

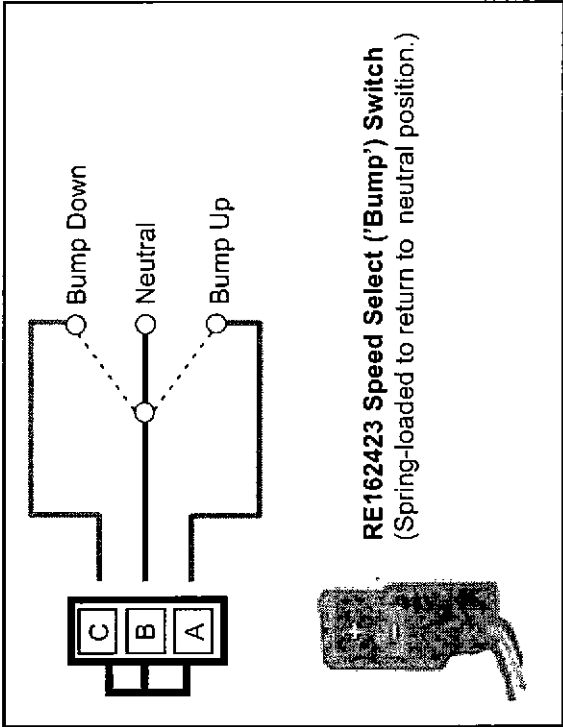
**3-State Throttle Switch****Adjustable 3-state Throttle Switch, RE198505**

The John Deere RE198505 3-state throttle switch is a three-position switch, designed to be used with the adjustable 3-state throttle software. Any three-position switch, detented (snaps into place) in all three positions and equipped with resistors in the following range would work:

|                   |                                                                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| R = 200-400 Ohms  | Engine starts and operates at slow idle. This speed can be adjusted using the bump switches, and the analog throttle inputs are active in this mode. |
| R = 900-1400 Ohms | Engine starts and operates at the intermediate speed setting. This speed can be adjusted using the bump switches, but not with the analog throttle.  |
| R=2500-5000 Ohms  | Engine starts and operates locked at the factory preset fast idle setting.                                                                           |

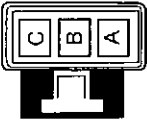
Bump Switch

The bump switch, is used to increase and decrease the minimum and intermediate operating speeds. It must be used with the bump-enable switch. If you do not intend to use this feature, then this circuit does not need to be connected. The bump switch works like the "Accel" and "Coast" buttons on an automotive cruise control system. A momentary tap on the switch bumps the speed up or down about 10 rpm. However, if you hold the switch down, speed will continue to ramp up or down continuously until the switch is released. Then it will lock in at whatever rpm it has reached at that point. If you intend to use this feature, you can use the John Deere RE162423 bump switch shown below, or any single-pole, double-throw, momentary switch with a detented center "off" position.



Speed Select ('Bump') Switch, RE162423

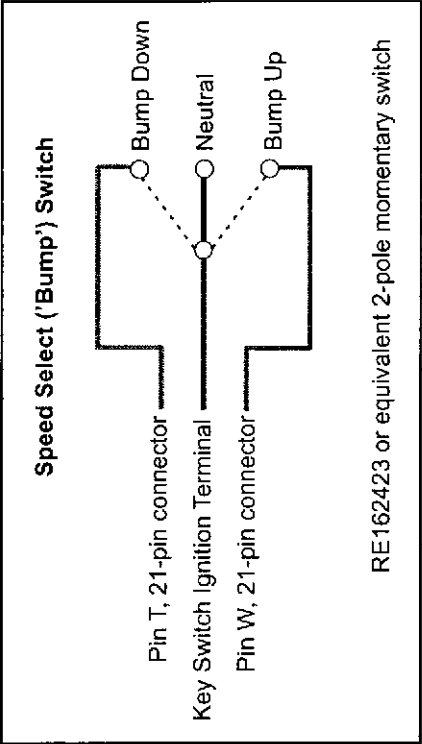
The mating connector for the RE162423 switch is shown below. It is a Packard Metri-Pack 150 Series three-cavity male connector, #12129615, with #12045773 sealed male terminals, #12048086 cable seals, and #12052845 TPA or secondary locks.



| Pin | Circuit | Color | Size   | Destination                    |
|-----|---------|-------|--------|--------------------------------|
| C   | 936     | Blue  | 18 AWG | To Pin T on 21-Pin Connector   |
| B   | 012     | Red   | 18 AWG | To IGN circuit from key switch |
| A   | 955     | Green | 18 AWG | To Pin W on 21-Pin Connector   |

Mating Connector for RE162423

If you choose not to use the RE162423 switch, you can use any single-pole, double-throw, momentary switch with a detented center "off" position, wired as shown below.



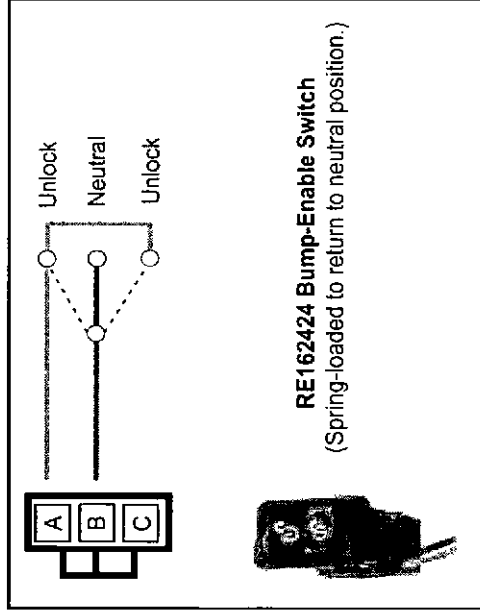
Speed Select ('Bump') Switch Wiring Diagram

### Bump-Enable Switch

The bump-enable switch serves two functions in the adjustable 3-state throttle system. It serves as a safety interlock for the bump switch, and it is used to lock the speed settings in ECU memory.

The bump-enable switch enables the bump switch to be read by the ECU. To adjust the minimum or intermediate operating speeds, the bump-enable switch and bump switch must be operated simultaneously. This prevents unexpected operating speed changes in the event of a failure of the bump circuit.

To permanently set high and low speeds in memory, press the bump-enable button three times after adjustment. Both pre-set speeds (high and low) will be remembered, even if the ignition is turned off or the battery is disconnected.



### Bump-Enable Switch, RE162424

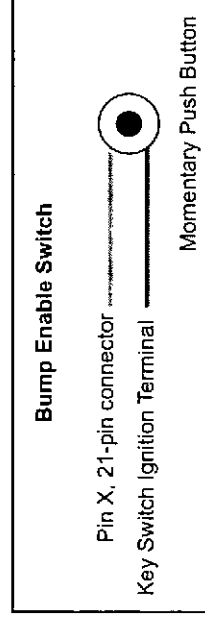
As a convenience for the operator, we offer the RE162424 bump-enable switch with two enabling positions, up or down, with the center off. That way, when placed next to the RE162423 bump switch, both switches can be pressed simultaneously by laying your finger across them. The switch is a single-pole, double-throw, momentary with a detented center "off" position. Both active positions are wired to connect the same two-wire circuit when pressed.

The mating connector on the RE162424 bump-enable switch is shown below. It is a Packard Metri-Pack 150 Series three-cavity female connector, #12110293, with #12048074 sealed female terminals, #12048086 cable seals, and #12052845 TPA or secondary locks. The unused cavity has a #12059168 cavity plug installed.

| Pin | Circuit | Color  | Size   | Destination                    |
|-----|---------|--------|--------|--------------------------------|
| A   | 923     | Orange | 18 AWG | To Pin X on 21-Pin Connector   |
| B   | 012     | Red    | 18 AWG | To IGN circuit from key switch |
| C   | Plug    |        |        | Unused                         |

### Mating Connector for RE162424

If the RE162424 switch is not used, a simple single-pole momentary switch can be wired as shown below to provide the bump-enable function.

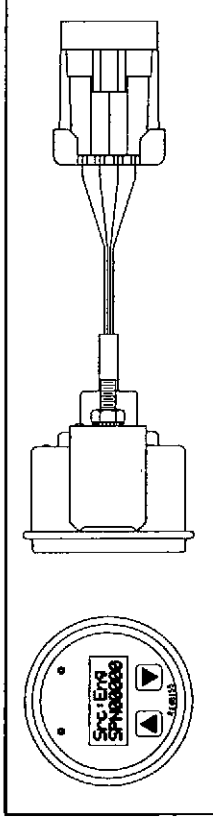


### Bump-Enable Switch

If the speed bump feature is not used, this circuit does not have to be connected.

**Diagnostic Gauge - RE68155**

We strongly recommend the RE68155 or equivalent SAE J1949 CAN based onboard diagnostic system for all applications. The RE68155 Diagnostic Gauge is a complete on-board engine diagnostic and display system. It includes built-in "Warning" and "Stop Engine" lights to alert the operator of any problems, and it digitally displays diagnostic codes, rpm, hours, oil pressure, coolant temperature, voltage, engine load, fuel consumption, manifold temperature and other engine parameters.

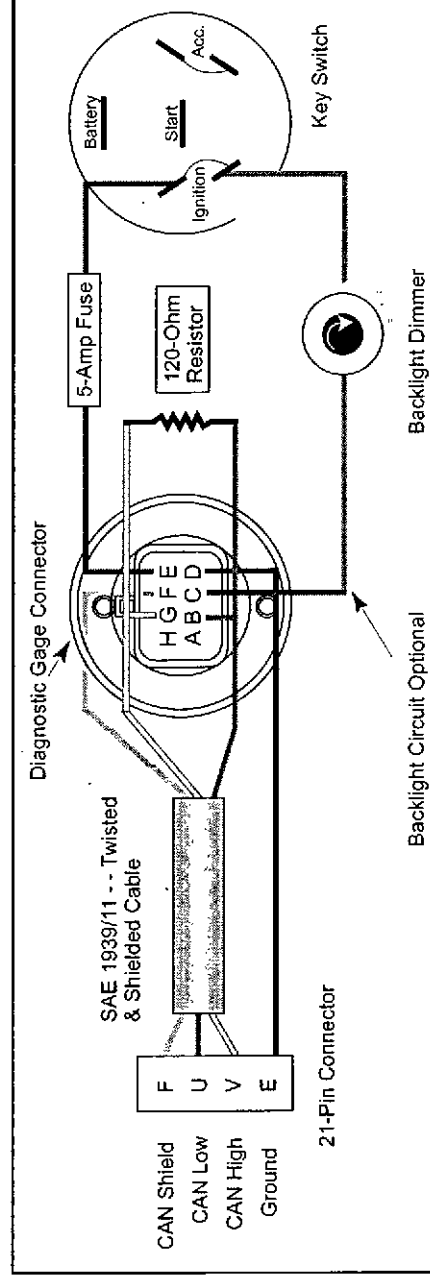
**Diagnostic Gauge, RE68155**

There are three ways to connect the RE68155 Diagnostic Gauge to your system:

1. Wire the RE68155 Diagnostic Gauge directly to the 21-pin instrumentation and controls connector.
2. Use the RE507276 adapter harness to connect the Diagnostic Gauge to the 9-pin diagnostic connector.
3. Use the RE162450 Databus Module to connect the RE68155 Diagnostic Gauge and up to six auxiliary gauges, plus backlighting, to the 21-pin instrumentation and controls connector.

**WIRING THE DIAGNOSTIC GAUGE DIRECTLY TO THE 21-PIN CONNECTOR**

Refer to the following illustration to connect the RE68155 Diagnostic Gauge to the 21-pin instrumentation and control connector.



Pin "E" is the battery connection, and has an allowable voltage range of 9 to 32 volts with respect to Pin D, or ground, for proper operation. 18-gauge wires are recommended for all circuits. Wire colors should be as shown in the illustration. These colors are used in all John Deere instrument panels and instrumentation kits, and all John Deere service publications identify the wires by the colors shown.

The mating connector for the diagnostic gauge is a Packard Metri-Pack, 150 Series, 8-way female connector.

| <b>Part</b>                                  | <b>Packard No.</b> | <b>Deere No.</b> |
|----------------------------------------------|--------------------|------------------|
| Female connector assembly                    | 12047937           | 57M7261          |
| TPA                                          | 12066304           | 57M7296          |
| Sealed terminals,<br>16-18 AWG(1.0-.8 sq mm) | 12048074           | R104846          |
| Sealed terminals,<br>20-22 AWG(.5-.35 sq mm) | 12084200           | 57M7494          |
| Cable seals, 2.85-2.03 mm dia                | 12048086           | 57M7258          |
| Cable seals, 2.15-1.60 mm dia                | 12089678           | 57M7493          |
| Cable seals, 1.70-1.29 mm dia                | 12048087           | 57M7377          |

The terminal and cable seals listed are for 16-18 gauge wire. 18-gauge wire is recommended for everything. All of the terminal positions on the diagnostic gauge connector are used. If the mating connector does not use a position for a particular application, it should be filled with a cavity plug, part number 12059168, to ensure sealing of the entire connector assembly.

All the needed connecting wires are in the 21-pin instrument panel connector. If backlighting or auxiliary gauges are not used, then only CAN H, CAN L, CAN Shield, power, and ground must be hooked up to the gauge. Power must come from the ignition terminal of the key switch through a 5-amp fuse.

SAE 1939/11-type shielded cable should be used to connect the CAN H, CAN L and CAN Shield wires from the 21-pin connector to the gauge. SAE 1939/11-type shielded cable is available from many commercial sources including Champplain Cable. To make your own cable, the CAN H and CAN L wires need to be twisted together along their entire length, and shielded with a metal cover. The CAN Shield wire should be a bare copper wire running inside (and contacting) the metal shield alongside the twisted CAN H and CAN L wires. It is recommended to switch to an insulated wire where the wire exits the shield so it does not ground out against anything.

The CAN H and CAN L wires must be connected through a 120-Ohm resistor on the end of the harness where they are connect to the diag-

nistic gauge. If more than one CAN-based device is used, only one 120-Ohm resistor should be connected. It must be connected at the end of the CAN bus, where the furthest device from the 21-pin connector is connected.

If backlighting is desired, refer to the schematic and find the corresponding pins in the 21-pin connector. If dimming is desired, normally a dimmer (RE162449) is used. This reduces the voltage to the backlighting from full voltage (about 14 volts for a 12-volt system) for full brightness to about 2 volts for the lowest brightness. If a 24-volt system is used, the voltage regulator (RE162448) should be used to provide 12 volts for the backlighting.

The backlight system is an LED. LEDs require about 2 volts to turn on. The voltage range for the backlighting is about 2 volts to 16 volts.

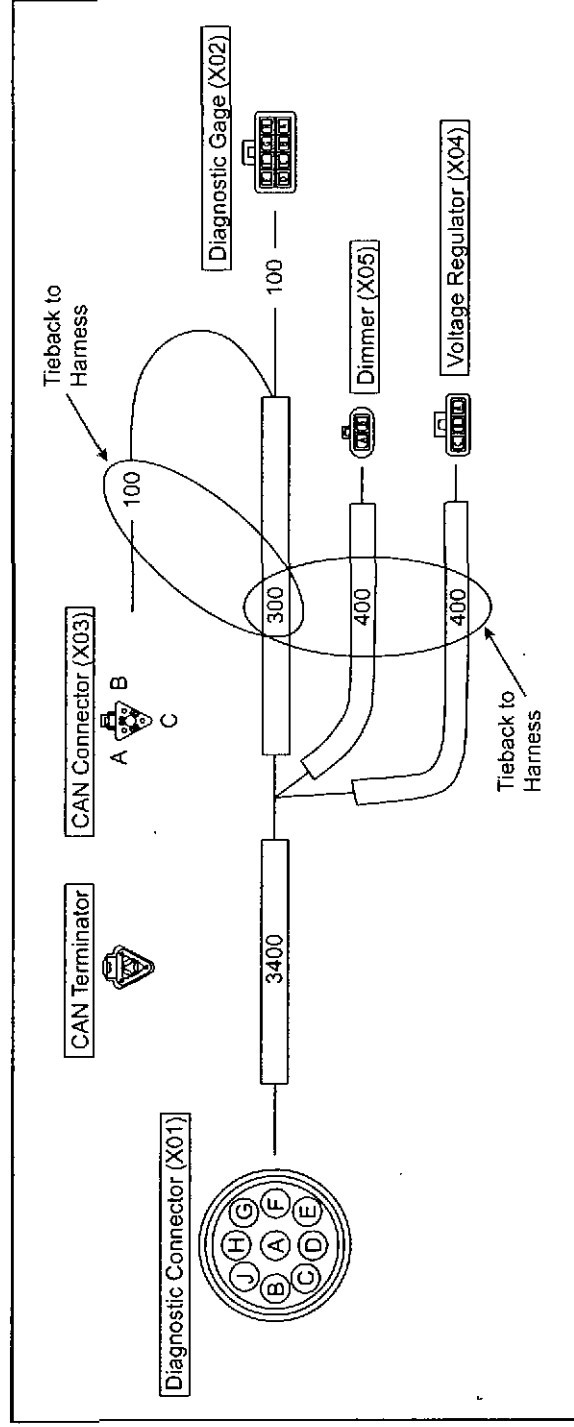
A 5-Amp fuse with the following characteristics (per SAE J1284) is required:

| <b>Rating</b> | <b>Blow Time</b>      |
|---------------|-----------------------|
| 110%          | 100 hours, minimum    |
| 135%          | 1500 seconds, maximum |
| 200%          | 5 seconds, maximum    |
| 350%          | 0.08 seconds, minimum |

#### USING THE RE507276 DIAGNOSTIC GAUGE ADAPTER HARNESS

An easier way to connect the RE68155 Diagnostic Gauge is to use

the RE507276 adapter harness, available through service parts. The RE507276 adapter harness connects with the 9-pin Deutsch diagnostic connector, which is present on every engine wiring harness. It includes connectors for the RE162449 backlight dimmer and the RE162448, 24-volt-to-12-volt converter, which is required to operate the 12-volt backlight system with a 24-volt engine electric system. It can also be used with the available RE508492 and RE508493 jumper wires for fixed (constant and non-dimmable) backlighting on 12-volt systems. The RE507276 adapter harness is approximately 12 feet long from the diagnostic port connector to the gauge connector. It includes a standard 3-pin Deutsch CAN connector with 120-Ohm terminator that can be used to transmit the SAE J1939 CAN signal to other devices.



**Diagnostic Gauge Adapter Harness, RE507276**

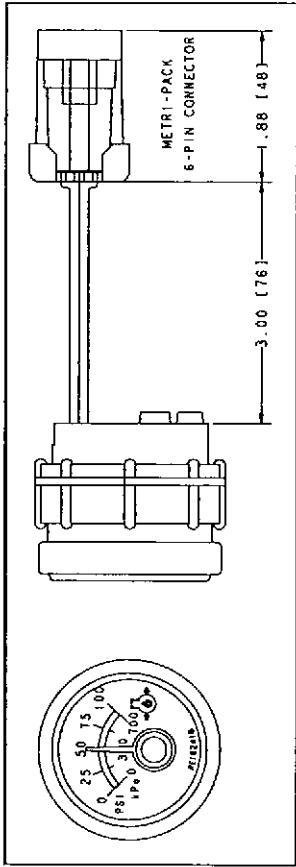
The RE507276 adapter harness does not connect to any wires in the 21-pin instrumentation and control connector or any unterminated wires. It connects to the 9-pin diagnostic connector that is normally used only for service. It leaves 21-pin connector and unterminated wires free. It does not include wiring for any auxiliary gauges.

### Auxiliary Gauge Wiring

The RE68155 Diagnostic Gauge can drive the following optional auxiliary gauges:

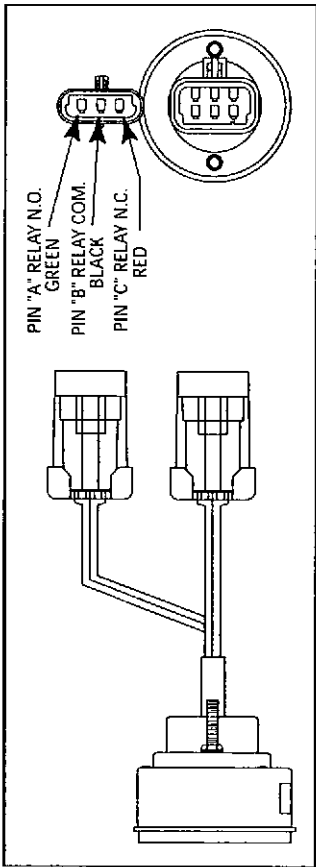
|          |                       |
|----------|-----------------------|
| RE163436 | Percent load gauge    |
| RE162422 | 12-volt voltage gauge |
| RE163277 | 24-volt voltage gauge |
| RE162419 | Tachometer            |
| RE162418 | Gauge, Oil Pressure   |
| RE162416 | Gauge, Coolant Temp   |
| RE162427 | Audible warning alarm |

These are simple display gauges that operate from a second proprietary RS485 bus from the diagnostic gauge.



Typical Auxiliary Gauge

The RE162427 audible alarm module is applied in the same way as the analog gauges. The audible alarm module is also prewired for a single-pole, double-throw relay output (normally open / normally closed). The relay output can drive 0.5 Amps at 125 VAC max, 1 Amp at 24 VDC max, or 62.5 VA, 30 Watts max. To connect to the relay, the RE162427 audible alarm module has a second Metri-Pack connector as shown below. The connector mates with a Metri-Pack 150-series, 3-way connector, part number 12110293.

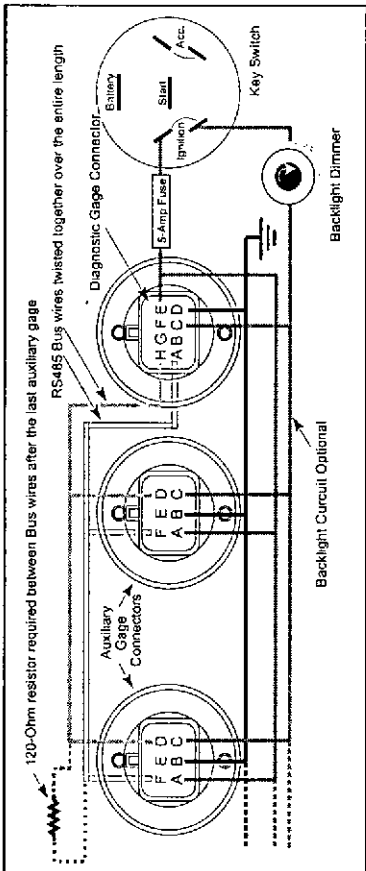


Audible Alarm Module, RE162427

There are two ways to connect the auxiliary gauges, a direct wiring connection, and the RE162450 databus module.

Direct Auxiliary Gauge Wiring

Refer to the following diagram to directly wire auxiliary gauges.



Direct Auxiliary Gauge Wiring Diagram

The diagram is for 12-volt only. Wiring for 24-volt systems is identical, except for the optional backlighting. The backlights in the gauges are 12-volt only. To use backlighting with 24-volt systems, voltage must be converted to 12 volts.

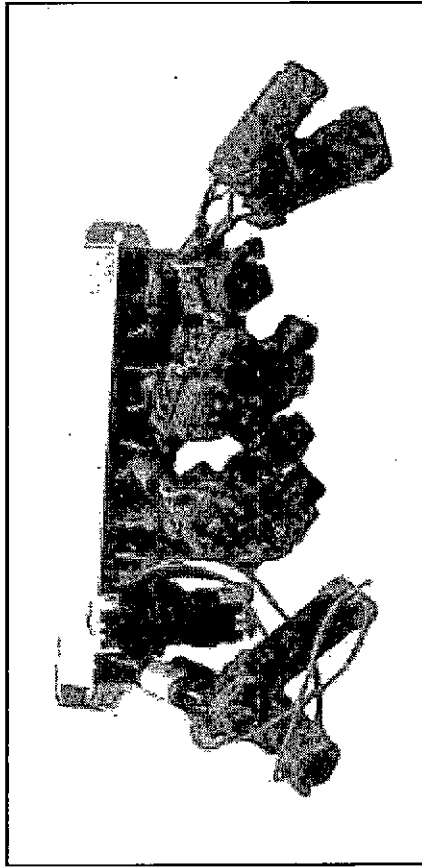
As many auxiliary gauges as desired can be connected in parallel from the diagnostic gauge as shown. Use the wire colors shown to conform to John Deere service publications for ease of trouble shooting and service. The RS485 positive (+) wire is white. The RS485 negative (-) wire is orange. The RS485 + and RS485 - wires must be connected through a 120-ohm resistor after the last auxiliary gauge. The two RS485 buss wires should be twisted together along their entire length for EMI resistance.

The mating connector for the auxiliary gauges is a Packard Metri-Pack, 150-Series, 6-way female connector. The Packard part numbers for the connector are as follows:

| Part (for each aux. gauge)    | Packard No. | Deere No. |
|-------------------------------|-------------|-----------|
| (1) Female connector assembly | 12052848    | 57M7260   |
| (1) TPA                       | 12052850    | 57M7291   |
| (5) Terminals, female         | 12084200    | 57M7494   |
| (5) Cable seals               | 12048086    | 57M7258   |
| (1) Cavity plug               | 12059168    | 57M7259   |

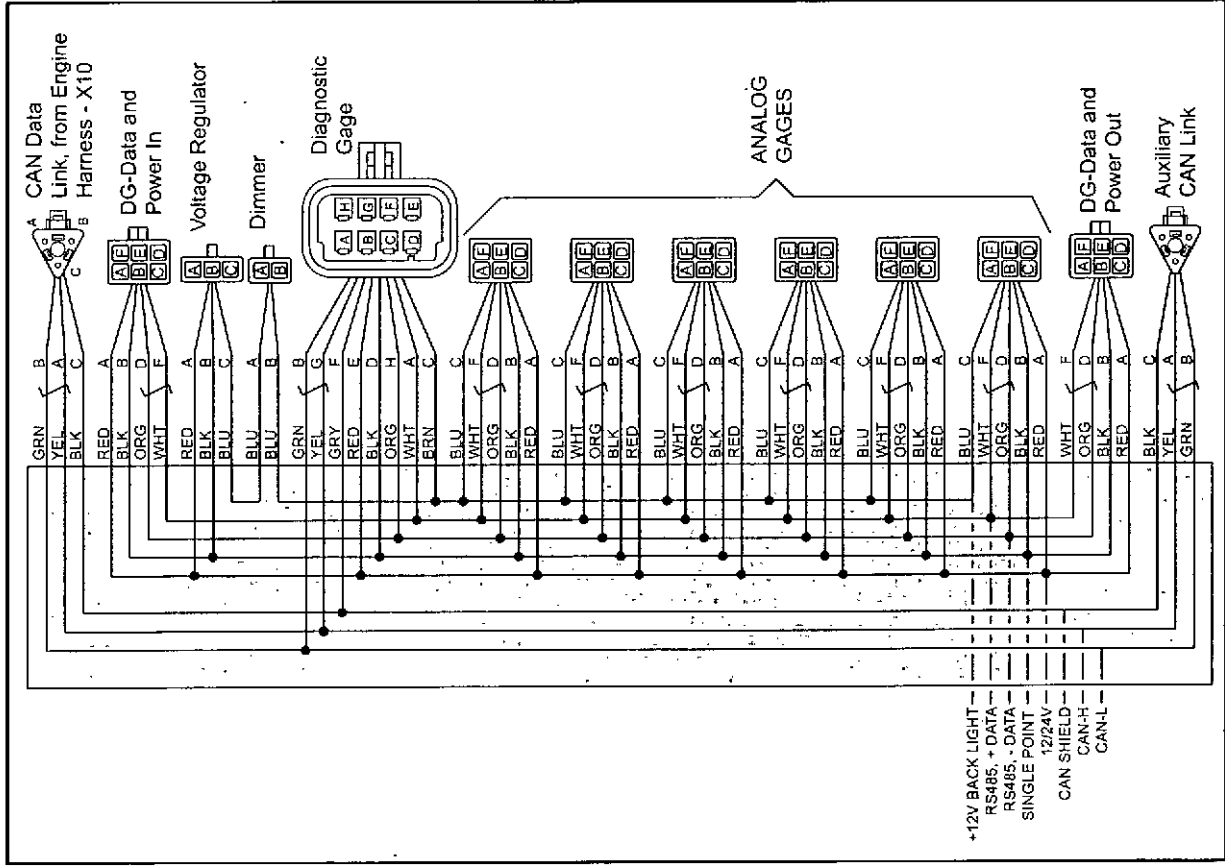
### Using the RE162450 Databus Module

By far the easiest way to wire the diagnostic gauge and multiple auxiliary gauges is to use the RE162450 Databus Module. It includes shielded wiring and connectors for the diagnostic gauge and up to 6 auxiliary gauges. It also includes plugs for all backlighting accessories and 120-Ohm terminators for the SAE J1939 CAN buss and the proprietary auxiliary gauge buss. It is included with RE162429 panel and the RE508625 kit or available separately from parts.



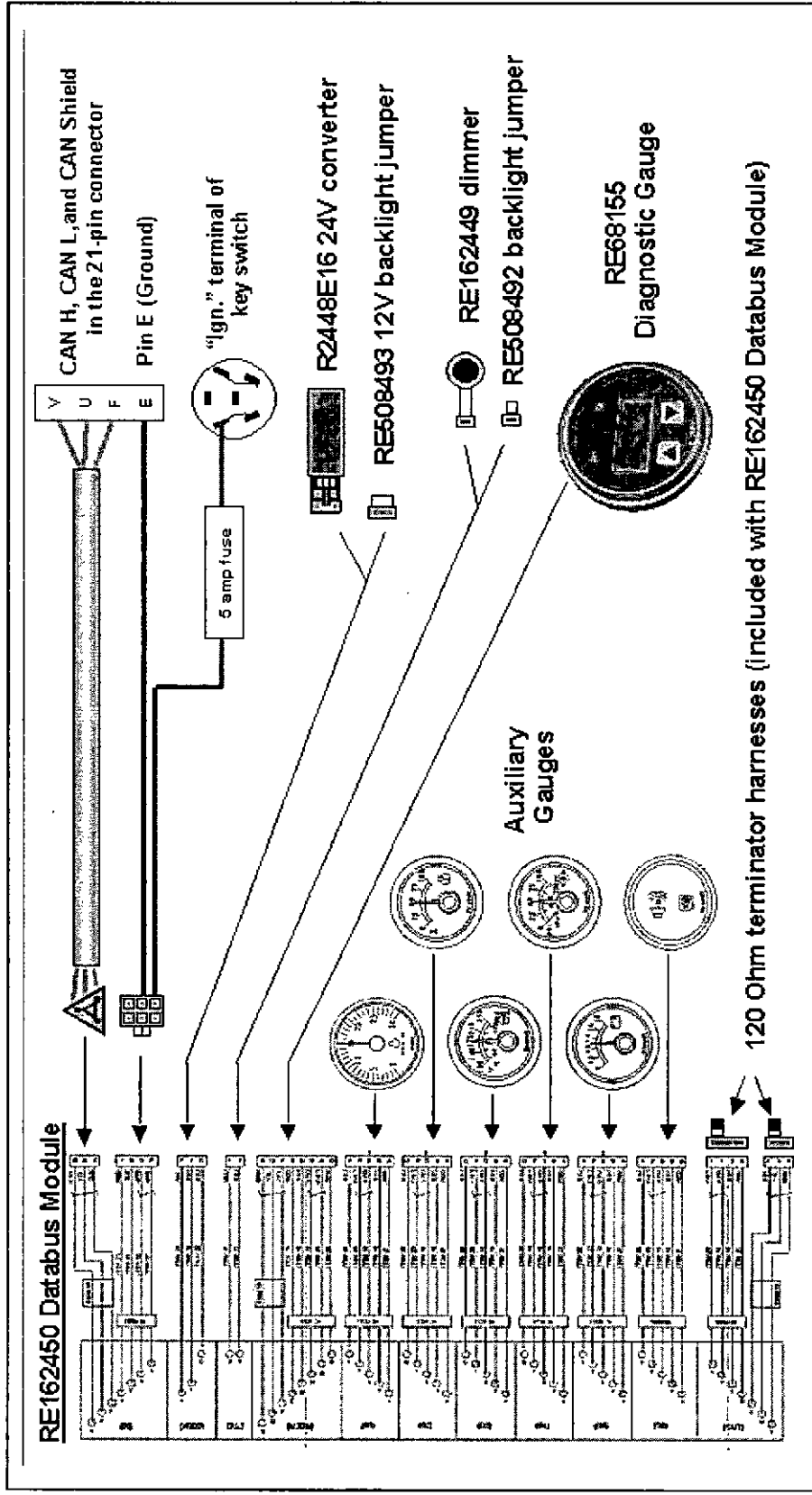
### Databus Module, RE162450

The diagnostic gauge, all backlighting accessories, and all six auxiliary gauges plug right into the databus module. Only the CAN link and power and ground connectors have to be provided by the user.



Databus Module Wiring Schematic (RE162450)

For installation of gauges and backlighting accessories, refer to the following diagram.

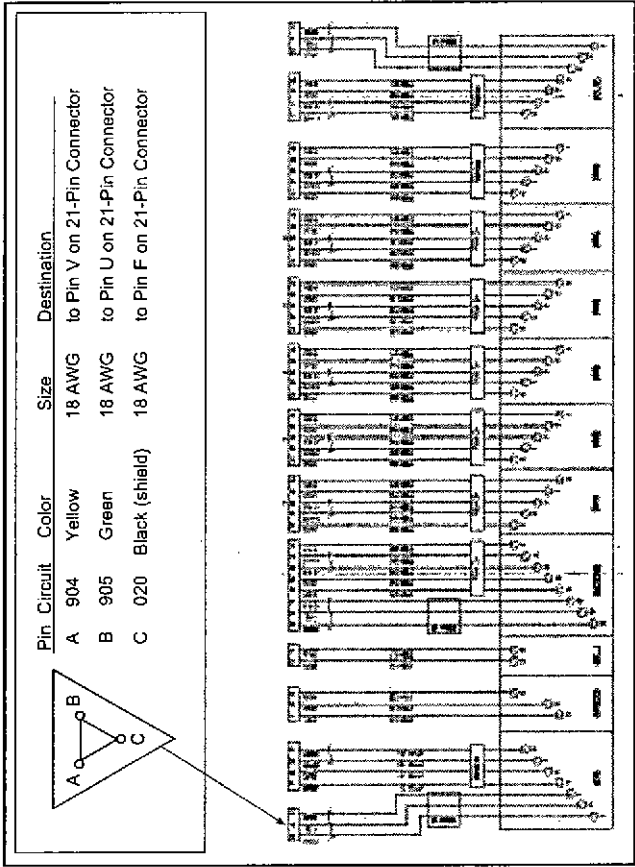


Databus Module (RE162450); Gauges and Backlighting Accessories

For wiring details for CAN Connector, Power Connector and Backlighting Connections, refer to the following three sections.

CAN CONNECTION TO RE162450 DATABUS MODULE

The CAN connection to the databus module is made through SAE J1939 compatible shielded, twisted-pair cable. The mating connector for the databus CAN connection is a Deutsch DT06-3S-E003 connector with W3S-1939 secondary locking wedge, as shown below. It plugs into the databus as shown. The shield is attached to black wires at each end for proper termination in the connectors.

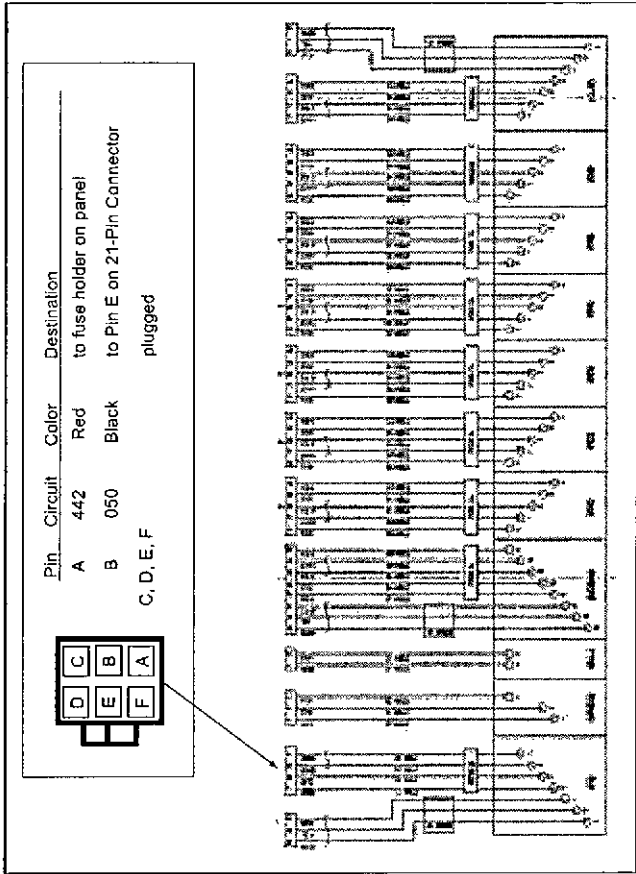


CAN Connection to the Databus Module

SAE 1939/11 shielded cable is available from various suppliers, including Champplain Cable.

POWER CONNECTION TO THE DATABUS MODULE

Power is provided to the databus module through a Packard Metri-Pack 150 Series 6-cavity male connector, #12124107, with #12045773 sealed male terminals, #12048086 cable seals, and #12052845 TPA or secondary locks on the instrument panel harness. The unused cavities are plugged with #12059168 cavity plugs. The mating connector is shown below. It plugs in to the databus as shown.



Power Connection to the Databus Module

**BACKLIGHTING CONNECTIONS TO THE DATABUS MODULE**

For 12-volt operation, the RE508493 12-volt backlight jumper should be installed. This provides 12-volt power directly to the backlight circuit. For 24-volt operation, an RE162448 24-volt-to-12-volt converter must be plugged into the 3-pin connector to reduce 24-volt battery power to 12 volts.

**Do not leave the RE508493 12-volt backlight jumper in place for 24-volt operation.** This provides 24 volts to the 12-volt instrumentation backlights, and will result in failures of the Diagnostic Gauge, tachometer, and all other auxiliary gauges. Always order and install the RE162448 24-volt-to-12-volt converter for 24-volt backlighting. The gauges will operate on either 12 or 24 volts. RE162448 is only required if backlighting is used.

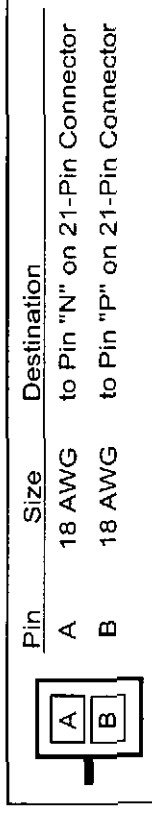
Wiring of the dimmer connector is the same for 12-volt or 24-volt operation. For "no backlighting," do not connect anything to this connector. For backlighting to be fully "on" all the time, install the RE508492 jumper wire. To turn backlighting on and off, a simple on/off toggle switch can be added to the wire between on the RE508492 jumper.

**Shutdown Override Switch**

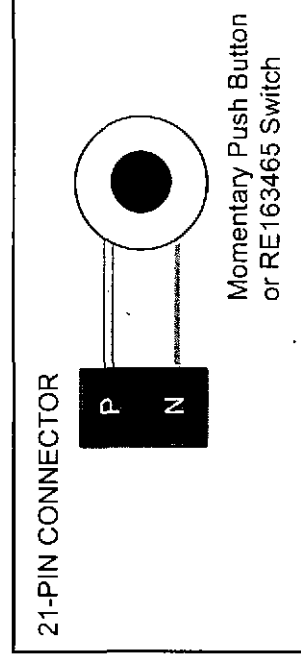
The shutdown override switch is a single-pole, single-throw, normally-open, momentary switch used to temporarily override an engine shutdown.

On Engine ECU's with the Engine Protection Shutdown feature active, the engine protection shutdowns can be overridden for 30 seconds at a time. The Shutdown Override is activated when Pin P on the 21-pin connector is connected to Pin N on the 21-pin connector.

A special RE163465 push-button assembly is available from John Deere for this purpose that plugs directly into the shutdown override connector. The harness connection for the RE163465 shutdown override button assembly is a Packard Metri-Pack 150 Series, two-cavity male connector, #12162000 with #12045773 sealed male terminals, cable seals and a #12052634 TPA or secondary lock.

**Mating Connector for the Shutdown Override Switch**

If you choose not to use the RE163465 push-button assembly, any normally open momentary switch, wired as shown below, can be used.

**Shutdown Override Switch, RE163465**

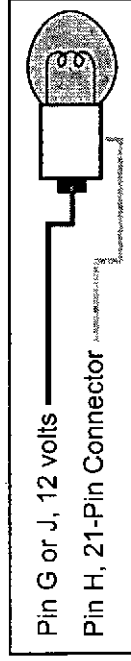
If the circuit is open (button not pushed), the engine will shutdown 30 seconds after an automatic shutdown sequence starts. Each time the circuit is completed (button pushed), the shutdown timer is reset to a full 30 seconds and the engine runs in a derated power mode. Repeated connection of the Shutdown Override circuit each 30 seconds allows for continued engine operation.

Manually shutting down the engine and turning power "Off" to the ECU also resets the 30-second clock. Using the Shutdown Override is not required on engine starts or restarts if the ECU power has been turned "Off."

**Note:** The shutdown override button is also used to activate the Blink-Code diagnostic system. It is required if you do not have the RE68155 diagnostic gauge or other CAN-based diagnostics with their own warning lamp, even if you do not use automatic shutdowns.

**Auxiliary "Warning" Lamp**

Pin H can be used to switch a customer-supplied fault lamp "On" during a system fault condition. It is designed to operate the ground side of a 12-volt or 24-volt indicator light. Pin H should be connected to the ground terminal of a 12-volt or 24-volt light bulb socket. The positive terminal of the light bulb socket should be connected to positive system voltage (Pin G or J). Pin G and J ("ignition" and "accessory") are always "live" with 12 or 24 Volts when the key is on. Pin H acts as the switch to ground.

**Auxiliary "Warning" Lamp Wiring**

The lamp blinks when a "Warning" problem is detected by the ECU, and glows steadily when a "Stop-Engine" fault is detected.

This circuit supports a maximum current of 100 mA. It should not be used to drive any load larger than a 1-Watt bulb. For driving larger loads, such as audible alarms, installation of the RE162427 alarm module that plugs into the databus module in the instrument panel is recommended. It includes a relay for additional loads up to 0.5 Amps at 125 Volts AC, 1 Amp at 12-24 Volts DC, or 62.5 VA, 30 Watts max.

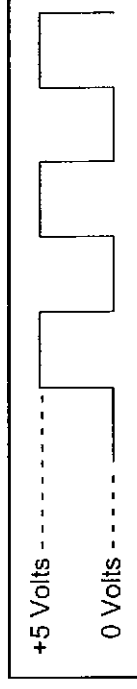
Connecting this terminal is not required if the RE68155 diagnostic gauge is used. The RE68155 diagnostic gauge already has amber and red "Warning" and "Stop Engine" lamps built in.

**Note:** The warning light driver also serves as the "blink light" for blink-code diagnostics. It is required if you do not have the RE68155 diagnostic gauge or other CAN-based diagnostics with their own warning lamp.

**Tachometer Output - Pin K**

Pin K is provided to drive a user-supplied tachometer. It can be used if the OEM prefers a tachometer other than the RE162419 auxiliary analog tachometer used with the RE68155 diagnostic gauge.

Output is a 30-pulse-per-revolution square wave from zero volts to +5 volts for both 12-volt and 24-volt ECUs. Output voltage is the same regardless of RPM. Only frequency changes with RPM.

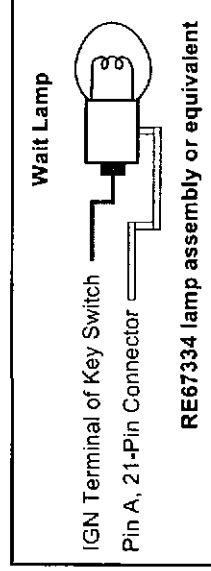
**Tachometer Output**

### Intake Air Heater Wait Lamp

The John Deere Electronic Control system can be used to automatically turn on the electric intake air heater starting aid on 4.5 L / 6.8 L DE10 engines. A "wait lamp" can be added to the instrument panel, which illuminates when the ignition key is switched to the "Run" position and the temperature is low enough to require intake heat. It remains illuminated until the intake heater has had sufficient time to heat the intake air adequately for starting. The operator can then turn the key the rest of the way to the "Start" position.

To use the 12-volt wait lamp feature, you can either order and install one RE67334 wait lamp assembly, or use your own lamp. The RE67334 wait lamp assembly connects with two 0.187-inch insulated female, solderless disconnect terminals, similar to Amp #640919-1. Connect one wire to the ignition terminal of the key switch and the other wire to Pin A of the 21-pin connector. For 24-volt operation, remove the 12-volt light bulb from the RE67334 assembly, and replace with a R132093 (24-volt) bulb.

If you chose to provide your own wait lamp assembly, any 1-Watt or smaller bulb can be used. This circuit supports a maximum current of 100 mA. It should not be used to drive any load larger than a 1-Watt bulb. Connect the bulb as shown below.



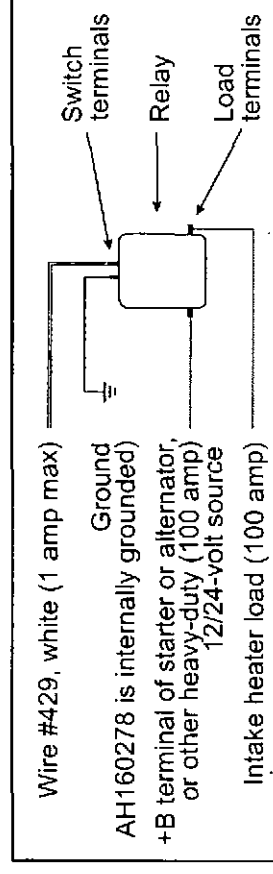
### Intake Air Heater Wait Lamp Wiring

### Intake Heater Control Wire (Standard and Extended-feature Systems)

Wire #429 (white), located inside the plastic wiring harness cover just behind the manifold air temperature sensor, has been provided to operate a relay that turns the intake air heater starting aid on and off. It provides a switched source of +12 or +24 volt battery power to operate the relay. The intake heater is "On" whenever the ignition switch is in the "Run" position and the temperature is low enough to require intake heat. It stays on until shortly after the engine starts. The load side of the relay that is attached to the heater must be rated for at least 100 amps continuous, and the switch side must not draw more than 1 amp. To limit switch current, the coil resistance of the relay should be at least 15 Ohms. We recommend John Deere relay, AH160278.

**Important:** If a relay with less than 15-Ohm coil resistance is used, or if current through Wire #429 exceeds 1 amp for any other reason, the ECU will be damaged.

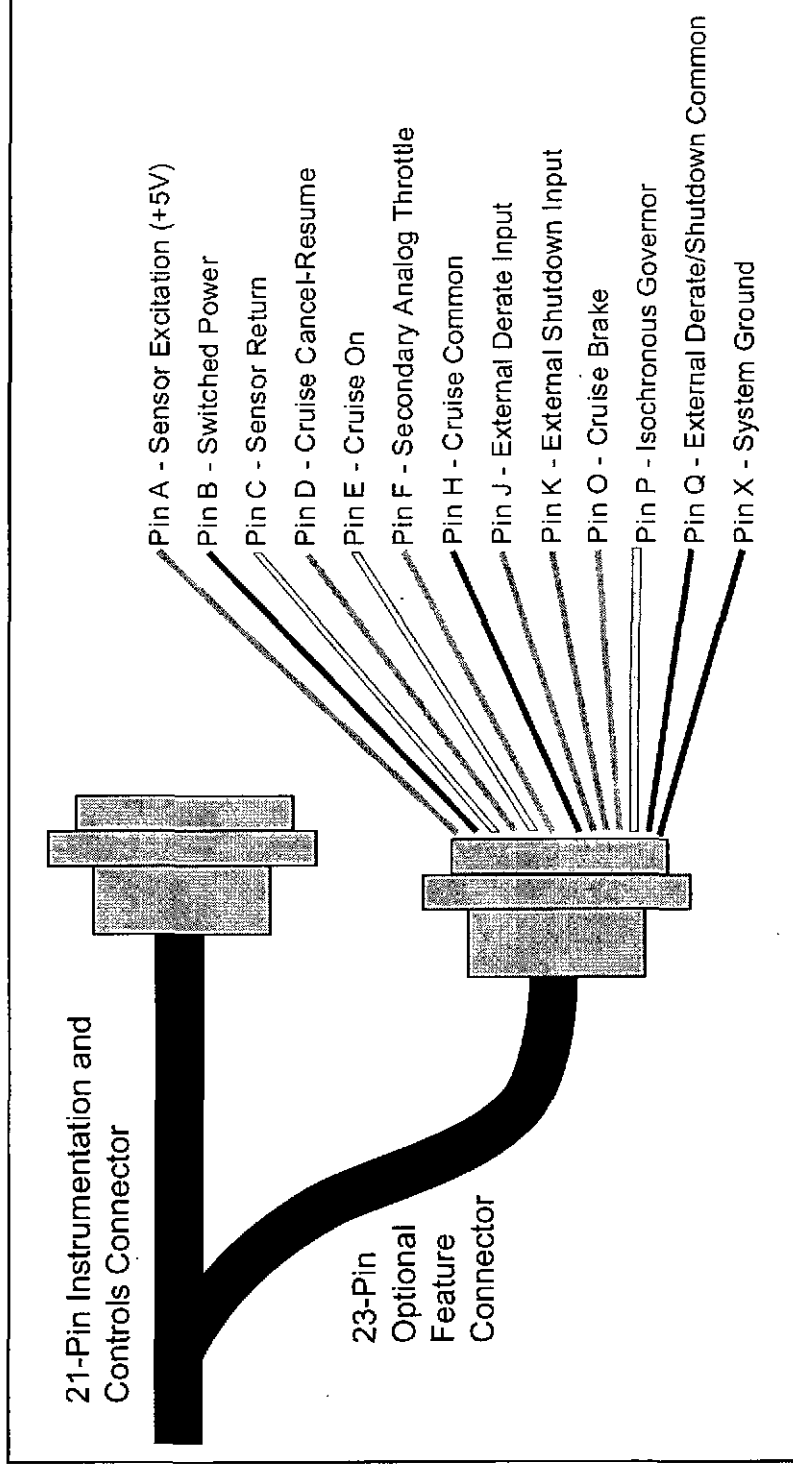
A relay installation such as shown below is normally required.



### Two-stage Relay Installation

**23-Pin (Deutsch) Auxiliary Connector**

A 23-pin Deutsch connector makes the connection for optional features available with the optional full-featured ECU that are not included in the standard 21-pin instrumentation and controls connector. You will have to provide this connector with pin assignments per the following chart.

**23-Pin Auxiliary Connector**

Wire colors should be as shown in the chart and illustration. These colors are used in all John Deere instrument panels and kits, and all John Deere service publications identify the wires by the colors and circuit numbers shown.

| Pin | Circuit No. | Color  | Wire Gauge | Description                              | Comments                                                                                                                                                                                              |
|-----|-------------|--------|------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A   | 911         | brown  | 16         | Sensor excitation (+5v)                  | To the secondary analog throttle                                                                                                                                                                      |
| B   | 012         | red    | 16         | Switched power                           | Power to cruise control circuits                                                                                                                                                                      |
| C   | 914         | yellow | 16         | Sensor return                            | To the secondary analog throttle circuit                                                                                                                                                              |
| D   | 981         | brown  | 16         | Cruise cancel/resume;<br>External Derate | Cancel/Resume. See cruise control wiring instructions.                                                                                                                                                |
| E   | 954         | yellow | 16         | Cruise on                                | Cruise on. See cruise control wiring instructions.                                                                                                                                                    |
| F   | 913         | orange | 16         | Secondary analog throttle                | To the "wiper" terminal of the primary analog throttle potentiometer, or throttle emulator                                                                                                            |
| G   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| H   | 012         | red    | 16         | Cruise Common                            | Must be used to complete Cruise On, Cruise Cancel/Resume, and Cruise Brake circuits.                                                                                                                  |
| J   | 981         | brown  | 16         | External derate input                    | To customer derate control. Connect to Pin Q (derate/shutdown common) to derate.                                                                                                                      |
| K   | 941         | brown  | 16         | External shutdown input                  | To customer shutdown control. Connect to Pin Q (derate/shutdown common) to shutdown.                                                                                                                  |
| L   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| M   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| N   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| O   | 923         | orange | 16         | Cruise brake                             | Cruise brake (when cruise control option is specified), otherwise not normally connected at this point. This circuit is shared with the adjustable 3-state throttle circuits in the 21-pin connector. |
| P   | 954         | yellow | 16         | Isynchronous governor                    | Connect to Pin A (+5-volt reference) to select isochronous governor.                                                                                                                                  |
| Q   | 012         | red    | 16         | External derate/<br>shutdown common      | Must be used to complete the customer derate and shutdown circuits. See Pins J and K.                                                                                                                 |
| R   | 981         | brown  |            | Not used                                 | For future use.                                                                                                                                                                                       |
| S   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| T   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| U   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| V   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| W   | n/a         |        |            | Not used                                 |                                                                                                                                                                                                       |
| X   | 050         | black  | 16         | System ground                            | General system ground. Not for sensor return.                                                                                                                                                         |

Whenever possible, wires should also be identified with the circuit numbers shown. Use one 57M7749 Connector (Deutsch HDP26-24-23SE), eleven 57M7546 16-18 ga sockets (Deutsch 1062-16-0122 41), and twelve R78069 plugs (Deutsch 114017).

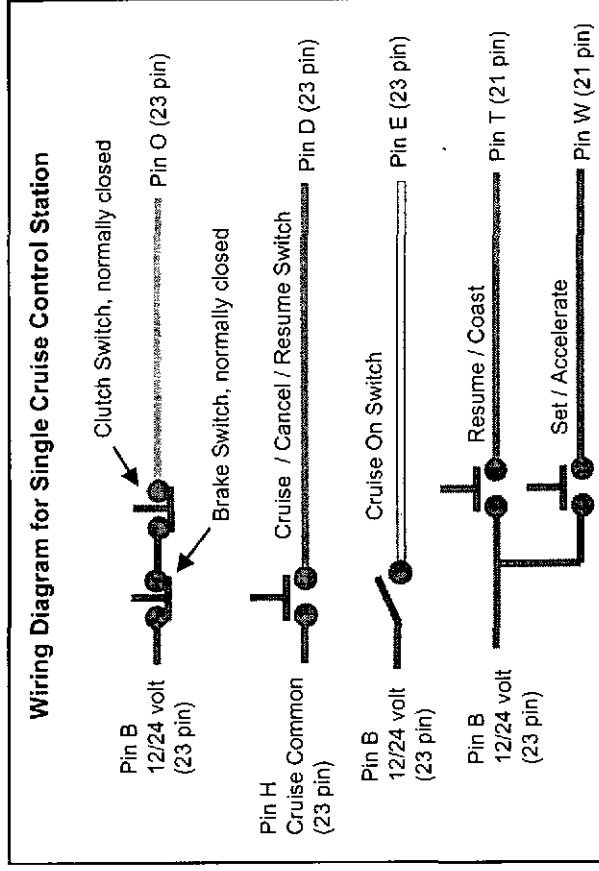
Wire colors and circuit numbers should be as shown in the chart if possible to aid in troubleshooting and service using John Deere service facilities, service publications, and service equipment. Specifications for the mating connector are as follows:

| Deutsch Part Number | Deere Part Number | Cavities | Description               | Material      | Plug    | Seal |
|---------------------|-------------------|----------|---------------------------|---------------|---------|------|
| HDP26-24-23SE       | 57M7749           | 23       | HD30 Plug (Plastic)       | Black Plastic | Yes     | No   |
| Deutsch Part Number | Deere Part Number | Gauge    | Description               | Material      | Plating | Seal |
| 1062-16-0622        | 57M8165           | 20       | Stamped And Formed Socket | Copper Alloy  | Nickel  | No   |
| 1062-16-0122        | 57M7546           | 18 - 16  | Stamped And Formed Socket | Copper        | Nickel  | No   |
| 114017              | R78069            |          | Deutsch Cavity Plug       | Plastic       |         |      |

#### Cruise Control (Extended-feature ECUs Only)

The cruise-control feature is an option that is only available on Extended-feature ECUs without selectable isochronous governing, adjustable 2-state or 3-state throttle, or an external derate input. It is intended for use on mobile applications. Refer to the following diagram when wiring the cruise control feature.

**Note:** The resume/coast and set/accel connections are made in the 21-pin instrumentation and controls connector. All others are in the 23-pin optional feature connector.



**Cruise Control Wiring Diagram, Specific for DE10 Fuel Systems**

The cruise control circuits shown on the chart above are connected to the 23-pin optional feature connector, except for Pins T and W. For details of each circuit and feature, refer to the following individual circuit instructions.

#### Cruise On - Pin E

The cruise control at the operator's station can be turned "ON" by connecting Pin E to 12/24 volts (Pin B) on the 23-pin optional feature connector.

One other condition must exist for the cruise control function to be active. The Cruise Brake Enable - Pin O must be connected to the positive system voltage lead (Pin B).

#### Cruise Resume / Coast - Pin T, 21-pin Cconnector

The cruise resume/coast feature shares an input circuit with the adjustable 3-state throttle bump-down feature. Therefore, Pin T for cruise resume/coast is taken from the 21-pin instrumentation and controls connector, not the 23-pin optional feature connector.

At the cruise control station, a momentary contact switch should be connected from Pin T in the 21-pin instrumentation and controls connector to Pin E in the 23-pin optional feature connector. When the cruise control is "ON," a momentary contact on this circuit will return the engine speed to its previous set speed. When contact is maintained, the engine speed set point will slowly decrease. The Cruise Resume / Coast function has a ramped speed adjustment rate. The engine speed will decrease faster the longer the contact is held "ON."

#### Cruise Brake Enable - Pin O

The Cruise Brake Enable - Pin O should be connected to system voltage (Pin B) through a normally closed switch on the vehicle brake system. When the brakes are engaged, the circuit will be broken and the cruise control will disconnect but will retain the engine set speed in memory. For a transmission with a clutch, normally closed clutch and brake switches in series should be used.

#### Cruise Set / Accelerate Pin W, 21-pin Connector

The cruise set/accel feature shares an input circuit with the adjustable 3-state throttle bump-up feature. Therefore, Pin W for cruise set/accel is taken from the 21-pin instrumentation and controls connector, not the 23-pin optional feature connector.

At the cruise control station, a momentary contact switch should be connected from Pin W in the 21-pin instrumentation and controls connector to Pin E in the 23-pin optional feature connector. When the cruise control is "ON," a momentary contact on this circuit will set the engine speed in memory. When contact is maintained, the engine speed set point will slowly increase. The Cruise Set / Accelerate function has a ramped speed adjustment rate. The engine speed will increase faster the longer the contact is held "ON."

#### Cruise Cancel/Resume - Pin D

The Cruise Cancel/Resume circuit (Pin D) is connected to cruise common (Pin H) with a momentary contact switch. A high quality switch with gold contacts should be used.

The Cancel/Resume function is active for one minute while the operator turns the vehicle around. If the Cancel/Resume contact is not made, the engine reverts to normal cruise control (i.e., resuming speed requires using the "Resume" switch).

Cruise Cancel/Resume will not resume at engine speeds below 1300 RPM.

#### External Stop-Engine Input (Extended-feature ECUs Only)

Pin K on the 23-pin optional feature connector can be connected to a customer-supplied immediate external shutdown input. This allows the OEM to trigger an immediate shutdown from external switches, such as a loss of prime switch, or hydraulic overtemperature switch. When this circuit is open (Pin K not connected to anything), the engine operates normally. When Pin K is connected to shutdown/derate common (Pin Q on the 23-pin connector), the ECU shuts the engine off immediately and triggers a fault code (see the Operator's Manual). Any number of normally open switches that close to Pin Q on the 23-pin connector to trigger the shutdown can be added in parallel.

**Note:** The External Shutdown function is always active, even if an ECU without shutdown is specified. This circuit provides an immediate shutdown, with no delay period and no opportunity to override.

**External Derate Input (Extended-feature ECUs Only)**

Pin J on the 23-pin optional feature connector can be used to allow the OEM to trigger a 20% reduction in engine power from external switches, such as a loss of prime switch, or hydraulic over-temperature switch. When this circuit is open (Pin J not connected to anything), the engine operates normally. When Pin J is connected to shutdown/derate common (Pin Q on the 23-pin connector), the engine derates at a rate of 2% per minute for a total derate of 20% in 10 minutes. A fault code and warning light is also generated. If the circuit opens during that time, the engine increases power at 2% per minute until reaching full power. Once the engine returns to full power the warning light turns off.

**Note:** The External derate function is always active (on extended-feature con-cruise-control ECUs), even if an ECU without derate is specified. If you do not wish to use this feature, do not connect anything to the wires.

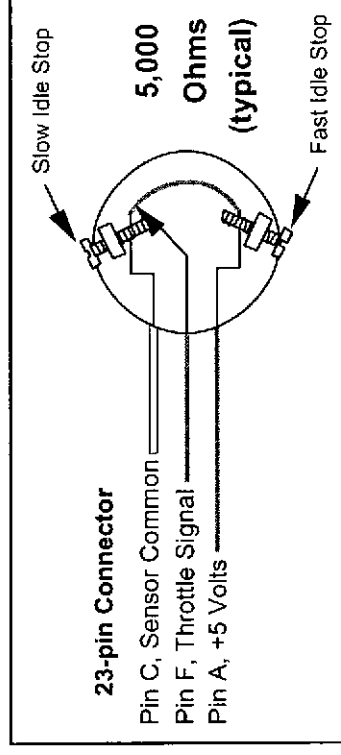
**Isochronous Governor Select**

Pin P in the 23-pin optional feature connector is used to choose between isochronous governing and droop governing. When Pin P is not connected to anything (open circuit), normal droop governing is selected. When Pin P is connected to 12/24 volts (Pin B in the 23-pin optional feature connector), isochronous governing is selected.

Normal droop gives a drop in engine speed with an increase in load or an increase in engine speed with a decrease in load. The normal % droop for your engine (usually 5-10%) will be listed in the 1600 engine option group and on the Engine Performance Curve. When isochronous governing is selected, the droop is set to 0%, and there is no change in engine speed with changing loads until the engine torque limit is reached.

**Secondary Analog Throttle Potentiometer**

The "Secondary" analog throttle can be used with or without the "Primary" analog throttle installed.

**Secondary Analog Throttle Potentiometer**

The secondary analog throttle feature is intended for use when a foot throttle and a hand throttle must both be provided. It can also be used when two throttle inputs are operated by the same lever or pedal for backup purposes. When both analog throttles are used, the throttle signals will be additive, up to the factory pre-set fast idle setting or the maximum speed set with the Adjustable 3-state Throttle. There will be no "dead band" in either throttle. When you move the foot throttle, speed will immediately increase regardless of where the hand throttle is set.

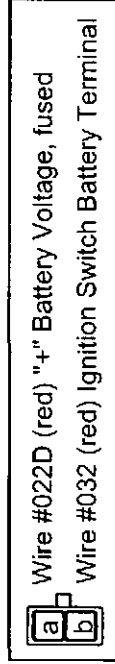
The secondary analog throttle feature is not intended for use with two throttles located remotely from each other. Because the throttle signal is additive, if either throttle is at the full speed position, the other throttle will have no control. Both throttles must be in the slow idle position for the engine to operate at slow idle.

For remote throttle applications, we suggest the use of the cruise control feature instead of the secondary throttle.

**If used, the secondary analog throttle must be wired and adjusted exactly the same as the primary analog throttle.** It can be used with the RE69667 potentiometer throttle or any similar unit.

**Remote On / Off Connector**

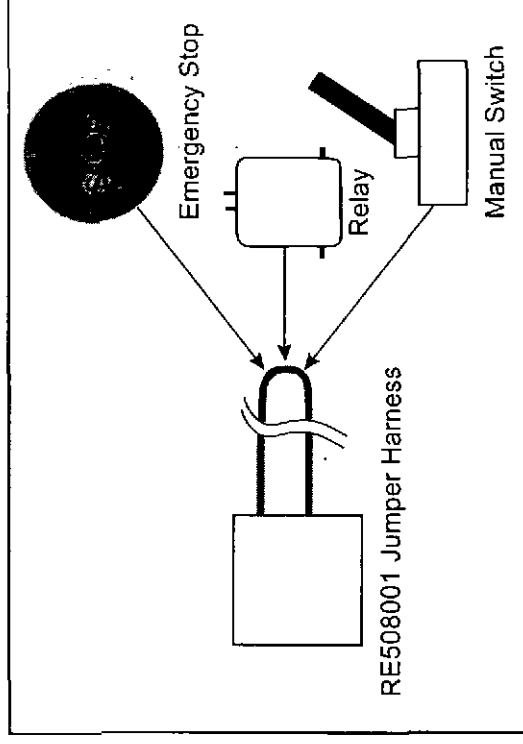
A male, 2-way Metri-Pack 280 connector is provided in the optional extended-feature Engine/ECU wiring harness for an auxiliary on/off switch. This connector is intended for use in applications that need a second on/off control in series with the usual key switch. Typical applications would be modem-based remote dispatch systems that use a single electric relay to turn the engine on and off, or applications that require a second manual "kill" switch.

**Remote On / Off Connector**

An RE508001 jumper harness is installed in the connector at the factory for normal operation. As long as Wires #022D and #032 (Pins A and B) are connected, the system operates normally. When that connection is broken, the engine shuts off normally. No fault codes are generated.

To use the remote on/off feature, cut the jumper wire on the RE508001 connector and install a relay or manual switch in the line.

When used in conjunction with the RE162429 instrument panel, this connector is in series with the key switch. Therefore, both switches must be "On" to operate the engine, but either switch can turn the engine "Off." The key switch in the panel acts as a "lock-out." The remote on/off connection only turns the system on and off. It does not activate the starter. If remote start capability is required, a separate remote starter relay control with speed cut-out must be provided by the OEM.



**Jumper Harness (RE508001) Installation**

### **MANUFACTURING A COMPLETE ENGINE WIRING HARNESS**

The engine wiring harness connects the ECU and all engine-mounted sensors and actuators to the 21-pin instrumentation and controls connector, the 23-pin optional feature connector, and several diagnostic and auxiliary connectors. We strongly recommend that the standard John Deere factory-supplied engine wiring harness be used. The engine wiring harness is critical to proper engine function and reliability. Some of the connectors used are highly specialized and hard to obtain, and some are proprietary to John Deere and not available to the general public.

This document does not provide enough information to manufacture the complete engine wiring harness. In addition to this document, a copy of the RE517140 ECU wiring diagram and the latest manufacturing drawing of the standard John Deere wiring harness for your engine will be required. Only the specified John Deere sensors can be used with the JDEC controller.

We strongly recommend following the John Deere harness drawing as closely as possible, varying only cable lengths as needed to fit your installation. All cable lengths that connect engine-mounted components such as sensors and actuators must be exactly per the print. All connectors shown on the John Deere wiring harness drawing must be provided, including all diagnostic connectors and the CAN terminator connector.

Please use the same wire colors and circuit numbers shown on the print, so service technicians will be able to troubleshoot the system using our standard procedures and manuals. We strongly recommend that you use the same 21-pin instrument panel and 23-pin optional feature connectors used on the John Deere harness. Not only will that facilitate service, but many of our customers find it very useful to be able to plug in one of our standard instrument panels for diagnostic and experimental purposes.

Starter relay connections are included in our harness, but you can operate the starter relay separately from the engine harness if you prefer. You can also bring 12-volt power to your key switch separately from the engine wiring harness if needed, to carry high accessory loads. However, the main engine power connections must be made directly to the battery (not the starter terminal) through the unterminated battery connection circuits shown on the John Deere wiring harness drawing.

Other unterminated wires shown on the John Deere wiring harness drawing and all wires in the 23-pin optional feature connector are optional and can be left out if not used. For operating and wiring details of each circuit, please refer to the Instrumentation and Controls wiring section of this document.

## REFERENCE INFORMATION

"Metri-Pack" and "Weather Pack" connectors are products of the Packard Electronics Division of Delphi Automotive Systems.

Delphi Automotive Systems  
Worldwide Headquarters, United States & Canada Headquarters  
One Pontiac Plaza  
Pontiac, Michigan 48340-2952  
USA  
Toll Free: [1] 888.255.7179  
Tel: [1] 810.857.4323  
Fax: [1] 810.857.4248  
web: <http://www.delphiauto.com/electric/>

Delphi Automotive Systems  
Asia Pacific Headquarters  
1-1-110 Tsutsujigaoka  
Akishima-shi, Tokyo 196  
Japan  
Tel: [81] 425.49.7200  
Fax: [81] 425.42.3018  
Delphi Automotive Systems  
European Headquarters  
117 Avenues des Nations, BP 60059  
Zac Paris Nord II  
95972 Roissy Charles de Gaulle Cedex  
France  
Tel: [33] 1.4990.4990  
Fax: [33] 1.4990.4950

Delphi Automotive Systems  
Mexico & South American Headquarters  
Av. Goiás, 1820  
São Caetano do Sul  
São Paulo 09550-050  
Brasil  
Tel: [55] 11.741.9500  
Fax: [55] 11.741.9599

For information on SAE J1939 CAN standards contact:

Society of Automotive Engineers (SAE)  
400 Commonwealth Drive  
Warrendale PA 15097-0001  
USA  
Tel: 412-776-4841  
Fax: 412-776-5760  
Email: [isales@sae.org](mailto:isales@sae.org)  
web: <http://www.sae.org/>

Electronic Throttle Manufacturers:

Teleflex Morse Electrical Systems  
(formerly Morse Controls)  
6980 Professional Parkway East  
Sarasota, FL 34240  
USA  
Tel: 941-907-1000  
Fax: 941-907-1020  
web: <http://www.tflx.com>  
Technical Support: [techsupport@tflx.com](mailto:techsupport@tflx.com)

SAE 1939 Cable Manufacturer:

Champlain Cable  
175 Hercules Drive  
Colchester, Vermont 05446  
Tel: 800-451-5162  
Fax: 802-654-4224  
web: <http://www.champcable.com>