Bendix

Service Data

SD-13-4815

Bendix® EC-30™ ABS / ATC Controller

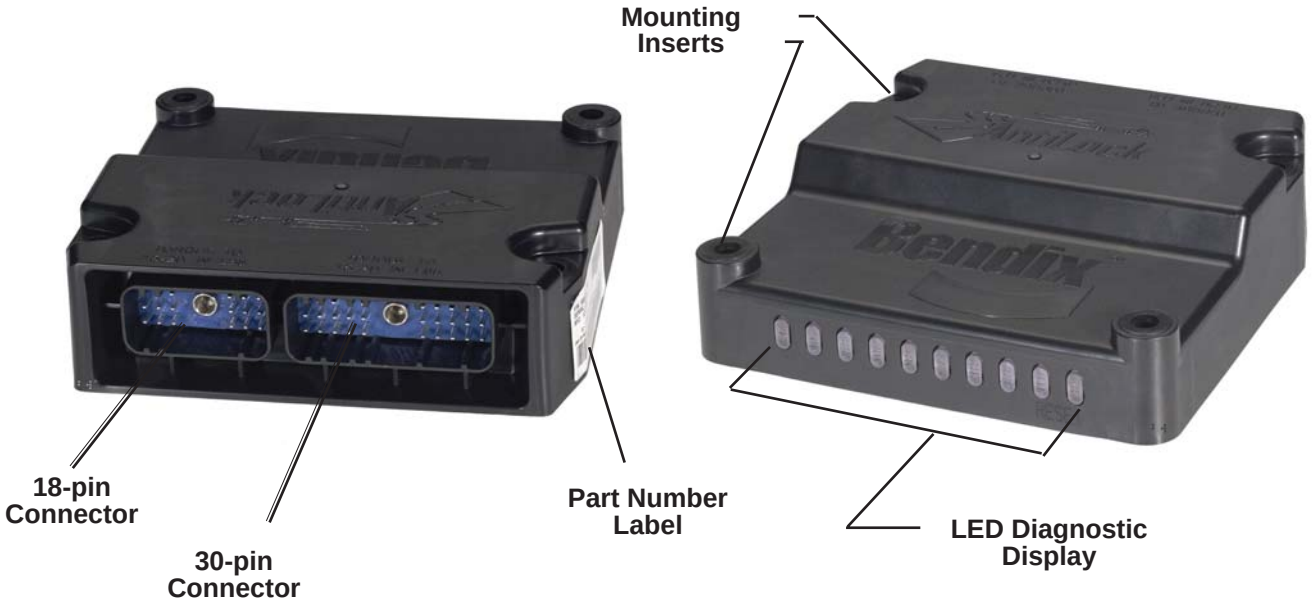

FIGURE 1 - EC-30™ CONTROLLER

INTRODUCTION

The Bendix® EC-30™ is an electronic ABS (antilock braking system) controller. It is the base component in a family of ABS assemblies for heavy and medium duty buses, trucks and tractors utilizing pneumatic braking systems.

The ABS function of the EC-30™ controller is designed to optimize slip on all vehicle wheels. The EC-30™ controller provides the vehicle with improved stability and steerability during braking. The EC-30™ controller will also reduce vehicle stopping distance on most surfaces.

In addition to the ABS function, the EC-30™ controller can be configured to provide an ATC (automatic traction control) feature. Bendix ATC can improve vehicle traction during acceleration on adverse road conditions. ATC can utilize engine torque limiting and/or differential braking to improve vehicle traction.

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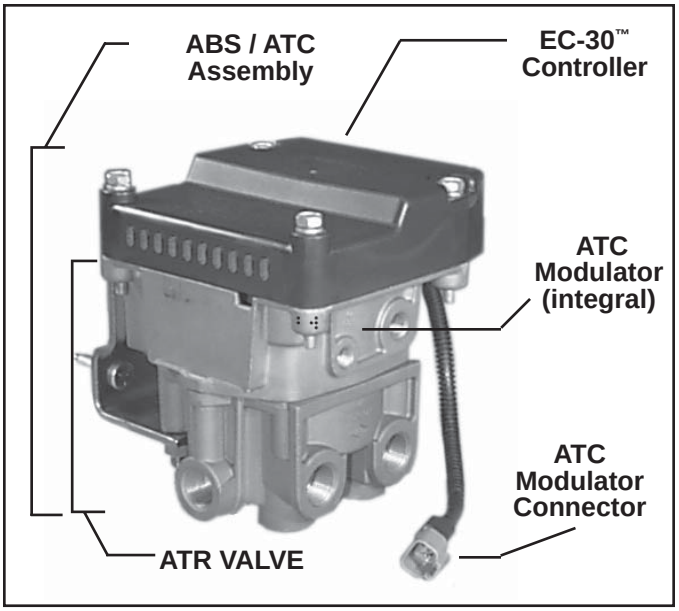


FIGURE 2 - EC-30™ CONTROLLER WITH ATR VALVE

COMPONENTS

The EC-30™ controller ABS function utilizes the following components:

- Wheel speed sensors (4 or 6, depending on configuration)
- Electro-pneumatic ABS modulator valves (4)
- Dash mounted tractor ABS warning lamp (relay controlled)
- Service brake relay valve
- Dash mounted trailer ABS warning lamp (towing vehicles manufactured after March 1, 2001)
- Blink code activation switch (optional)

The EC-30™ controller ATC function utilizes the following additional components:

- ATC modulator - Integral to the ATR (antilock/traction relay) valve assembly
- Dash mounted ATC active/warning lamp
- Serial communication to engine control module (interfaces with throttle input and engine torque)
- ATC enable/disable switch

ENCLOSURE

The EC-30™ controller electronics are contained in a non-metallic housing and are environmentally protected by a hard epoxy potting compound. The design of the EC-30™ controller electronics is robust against radio, electro-magnetic and environmental interference.

A patented LED (light emitting diode) diagnostic display and magnetic reset switch are incorporated in the housing for simple, self-contained diagnostics.

The EC-30™ controller utilizes a 30-pin and an 18-pin wire harness to interface with ABS, ATC and vehicle system components.

EC-30™ Controller Comparison to EC-16™ and EC-17™ Controllers

The EC-30™ controller has been designed to replace the EC-17™ and the EC-16™ controllers as the standard Bendix ABS controller for OEM and aftermarket installations. The EC-30™ controller has a black plastic enclosure similar to the EC-17™ controller. However, the EC-30™ controller utilizes plastic mounting inserts to reduce mounting bolt corrosion, where the EC-17™ controller utilizes metal mounting inserts. The EC-16™ controller utilizes a totally metal enclosure.

The EC-30™ controller ABS warning lamp power-up sequence has been simplified compared to the EC-17™ and EC-16™ controllers.

The EC-30™ controller ABS warning lamp, at power-up without faults, will illuminate for 2.5 seconds and then turn off.

The ABS warning lamp for EC-17™ and EC-16™ controllers, at power-up without faults, will illuminate for approximately 8 seconds and flash twice before turning off.

ECU Model	Enclosure	ABS Warning Lamp Power-Up Sequence
EC-30™ Controller	Plastic with Plastic Mounting Inserts	2.5 seconds on, then off
EC-17™ Controller	Plastic with Metal Mounting Inserts	8 seconds on, two flashes, then off
EC-16™ Controller	Metal Enclosure	8 seconds on, two flashes, then off

CHART 1 - ECU DIFFERENCES (EC-30™, EC-17™, EC-16™ CONTROLLERS)

MOUNTING

ECU Only

The EC-30™ controller can be bracket mounted to the vehicle cab or chassis as a stand alone ECU. See figure 1.

Valve Mounted EC-30™ Controller

The EC-30™ controller can be assembled on one of four different valve models. The controller valve assembly is then mounted in place of the standard service brake relay valve on the vehicle. An assembly model designation is assigned when the EC-30™ controller is mounted on an AR (antilock relay) valve or an ATR (antilock/traction relay) valve. See figure 2. Some models include bobtail proportioning and/or ATC functions. See chart 2.

EC-30™ Controller/Valve Assembly Models	ABS / ATR Valve	Added Function Provided	Vehicle Application
CR-30	AR-1™ Valve	None	All
CR-30BP	AR-2™ Valve	Bobtail Brake Proportioning	Tractors Only
AT-30	ATR-1™ Valve	ATC	All
AT-30BP	ATR-2™ Valve	ATC & Bobtail Brake Proportioning	Tractors Only

CHART 2 - EC-30™ CONTROLLER / VALVE ASSEMBLIES

EC-30™ CONTROLLER HARDWARE CONFIGURATIONS

The EC-30™ controller ABS ECU is available in different hardware configurations in order to support various ABS, ATC and power line carrier (PLC) features. See chart 3.

EC-30™ controller premium PLC hardware can be configured for four or six sensors, with or without ATC, and PLC can be disabled.

EC-30™ controller basic models can not be configured for six sensors or ATC.

PLC hardware is needed to support PLC communication.

Always verify that you are working with the correct EC-30™ controller by referring to the part number label on the ECU.

EC-30™ CONTROLLER WITH PLC

Effective March 1, 2001, all towing vehicles must control an in-cab trailer ABS warning lamp. Trailers built after this date will transmit the status of the trailer ABS unit over the power line (blue wire of the J560 connector) to the tractor using PLC communications.

The PLC signal is usually broadcasted by the trailer ABS ECU. The application of PLC technology for the heavy vehicle industry is known as PLC4Trucks. The Bendix® EC-30™ controller premium with PLC, and basic with PLC, will support PLC communication in accordance with SAE J2497.

Identifying an EC-30™ Controller with PLC

An EC-30™ controller with or without PLC can be identified by the individual part number label on the ECU. Also, an EC-30™ controller may have one of the following labels applied:

White Label:

ECU does not support an in-cab Trailer ABS warning lamp.

Orange Label:

ECU supports IN-CAB Trailer ABS warning lamp.

Measuring / Identifying the PLC Signal

An oscilloscope can be used to verify the presence of a PLC signal on the power line. The PLC signal is an amplitude and frequency modulated signal. Depending on the filtering and load on the power line, the PLC signal amplitude can range from 5.0 mVp-p to 7.0 Vp-p. Suggested oscilloscope settings are (AC coupling, 1 volt/div, 100 μsec/div). The signal should be measured at the power leads of the EC-30™ controller. See figures 3 & 4.

The EC-30™ controller will not broadcast PLC messages unless it is specially programmed to do so. With this standard configuration, an ABS trailer equipped with PLC or a PLC diagnostic tool will need to be attached to the vehicle in order to generate a PLC signal on the power line.

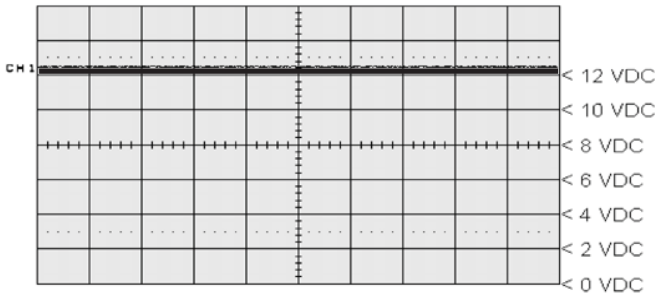


FIGURE 3 - POWER LINE WITHOUT PLC SIGNAL

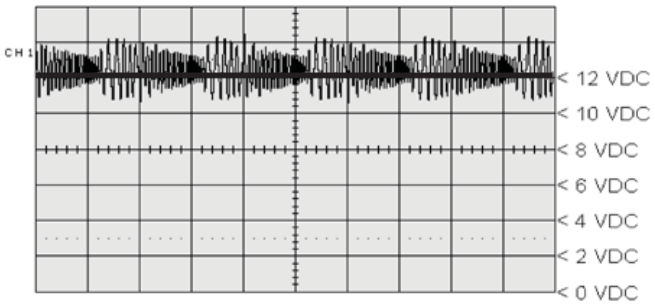


FIGURE 4 - POWER LINE WITH PLC SIGNAL

			Diagnostics			Engine Communication			
EC-30 Hardware Configurations	**Sensors**	**ATC**	**J1587**	**J1939**	**Blink Codes**	**J1922**	**J1939**	**PLC**	**Trailer ABS WL[1]**
Basic	4		X	X	X		X		
Premium	4, 6	X	X	X	X		X		
Basic PLC	4		X	X	X		X	X	X
Premium PLC	4, 6	X	X	X	X		X	X	X
EC-17/EC-16 Service Replacement	4, 6	X	X	X	X	X	X		

[1] Required for all towing vehicles built after March 1, 2001.

CHART 3 - EC-30™ CONTROLLER HARDWARE CONFIGURATIONS

EC-30™ CONTROLLER INPUTS

Power and Ground

Power is supplied to the EC-30™ controller from the ignition circuit through a 30 Amp fuse. The EC-30™ controller is grounded to the vehicle chassis. For EC-30™ controller power and ground connector pin locations, see EC-30™ controller system schematic, Figure 14.

Wheel Speed Sensors

Wheel speed data is provided to the EC-30™ controller from the Bendix® WS-20™ or WS-24™ wheel speed sensors. See figure 5 for wheel speed sensor illustrations. Working with an exciter ring, wheel speed sensors provide the EC-30™ controller with an AC signal, which varies in voltage and frequency in relation to the speed of the wheel. The EC-30™ controller can be configured to receive wheel speed information from 100 or 86 tooth exciter rings. Vehicle axle configurations and ATC features determine the number of speed sensors that must be used. A vehicle with a single rear drive axle (4x2, 4x4 or 6x2) requires four speed sensors for both ABS and ATC operation. A vehicle with two rear drive axles (6x4) can utilize six speed sensors for optimal ABS and ATC performance. For wheel speed sensor connector pin locations, see the EC-30™ controller system schematic, Figure 14.

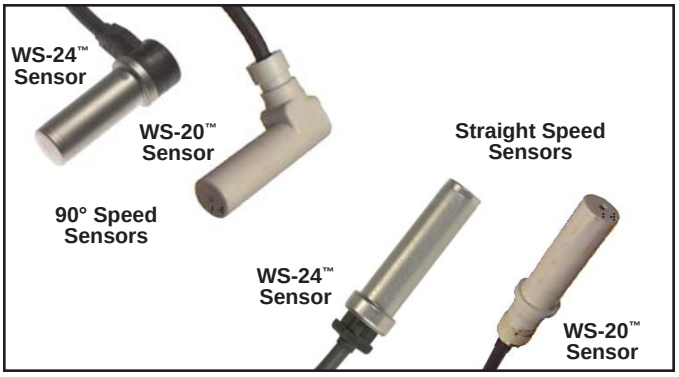


FIGURE 5 - BENDIX® WS-20™ AND WS-24™ WHEEL SPEED SENSORS

ATC Enable/Disable Switch

Premium EC-30™ controller models, configured for ATC, monitor an ATC enable/disable switch to +12 VDC, which allows ATC to be manually deactivated. The ATC active/warning lamp will be on while the ATC is disabled. Pin F2, of the 30-pin connector is the ATC enable/disable switch input.

J1939 - ATC Enable/Disable Switch

The EC-30™ controller can be configured to receive the status of the ATC enable/disable switch over the SAE J1939 serial communications link. A vehicle controller will monitor the position of the ATC enable/disable switch directly, and broadcast a J1939 message indicating its status. When configured in this manner, there will be no wire installed in pin F2 of the 30-pin ECU connector. In the event that J1939 communications is lost between the EC-30™ controller and the vehicle controller, the EC-30™ controller will disable the ATC function.

Blink Code Switch

The EC-30™ controller can be configured to support an optional diagnostic blink code switch to ground, which can be used to activate several functions available through blink code diagnostics. Pin F3, of the 30-pin connector, is the blink code switch input.

Three Position Switch for ATC and Blink Codes

The EC-30™ controller can be configured to receive both the ATC enable/disable signal and the blink code activation signal from a single three-position switch. In this case, the common position of the switch is connected to pin F2 of the 30-pin connector. The normally-open switch position is connected to +12 VDC to disable ATC. The normally-open (momentary) switch position is connected to ground to activate blink codes. When configured in this manner, there is no wire installed in pin F3 of the 30-pin connector, which is normally used for the blink code switch input.

Brake Switch Input

The EC-30™ controller can be configured to support an optional brake switch input. The brake switch input can be used in accordance with ABS and ATC performance. Pin A2, of the 18-pin connector, is the brake switch input.

EC-30™ CONTROLLER OUTPUTS

ABS Modulators

Bendix® ABS modulators (M-21™, M-22™, M-30™ or M-32™) are controlled by the EC-30™ controller to modify driver applied air pressure to the service brakes during ABS or ATC activation. See figure 6 for illustration. The ABS modulator, an electro-pneumatic control valve, is the last valve that air passes through on its way to the brake chamber. The modulator hold and exhaust solenoids are activated to precisely modify the brake pressure during ABS. The hold solenoid is normally open and the exhaust solenoid is normally closed. The EC-30™ controller is able to control four individual modulator assemblies. For ABS modulator connector pin locations see the EC-30™ controller system schematic, figure 13.

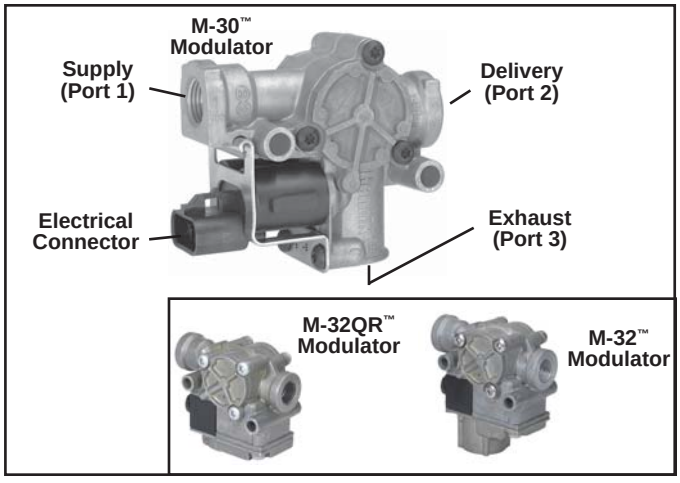


FIGURE 6 - M-30™, M-32™, AND M-32QR™ MODULATORS

ATC Modulator

Premium EC-30™ controller models configured for differential braking ATC will activate the ATC modulator during ATC situations. The ATC modulator is an electrically controlled air valve integral to the ATR valve. Pins D2 and D3, of the 18-pin connector, control the ATC modulator. A connection to the ATC modulator is provided via a two-pin Deutsch connector from the ATR valve. See figure 2.

ABS Warning Lamp

The EC-30™ controller controls an ABS warning lamp to indicate the ABS unit status. The EC-30™ controller provides a ground signal to activate an ABS warning lamp relay and turn the ABS lamp off. The actual ABS warning lamp is connected to the normally-closed contacts of the relay in order to illuminate in a fail-safe manner during an ABS ECU failure. Pin E3, of the 30-pin connector, is the ABS warning lamp output.

J1939 ABS Warning Lamp

The EC-30™ controller can be configured to broadcast the ABS status over the SAE J1939 serial communications link. A vehicle dash controller directly controls the ABS warning lamp. When configured in this manner, there is no wire installed in pin E3 of the 30-pin connector. If J1939 communications is lost between the EC-30™ controller and the vehicle dash controller, the dash controller will activate the ABS warning lamp.

Retarder Disable Relay

The EC-30™ controller controls an engine or transmission retarder disable relay. The retarder activation wire is routed through the normally-closed contacts of the relay. The EC-30™ controller provides a ground path to activate the relay and interrupt power to the retarder during ABS operation. This output may also connect directly to a transmission ECU. Pin K1, of the 30-pin connector, is the retarder disable relay output.

J1939/J1922 Retarder Disable

The EC-30™ controller can be configured to interrupt the engine or transmission retarder over the SAE J1939 serial communications link. (J1922 for some service replacement models). The retarder will be disabled during ABS via the serial communications. When configured in this manner, there is no wire installed in pin K1 of the 30-pin connector. Use of the retarder disable function via the serial link may be essential to ABS performance and is highly recommended for vehicles equipped with a capable retarder.

J1939/J1922 Torque Converter Lock Disable

The EC-30™ controller can be configured to interrupt the automatic transmission torque converter lock function, over the SAE J1939 serial communications link. (J1922 for some service replacement models). The converter lock will be disabled during ABS via the serial communications. Use of the torque converter lock disable function may be essential to ABS performance and is highly recommended for vehicles equipped with a capable transmission.

Trailer ABS Warning Lamp

EC-30™ controller models with PLC can be configured to control a trailer ABS warning lamp (located in the dash) that indicates the status of the trailer ABS unit of one or more trailers or dollies. The EC-30™ controller directly controls the trailer ABS warning lamp by providing a ground path when the lamp is to be activated. Pin E2, of the 30-pin connector, is the trailer ABS warning lamp output.

J1939/J1587 Trailer ABS Warning Lamp

The EC-30™ controller can be configured to broadcast the trailer ABS status over the SAE J1939 or the SAE J1587 serial communications links. In this case, a vehicle controller will directly operate the trailer ABS warning lamp. When configured in this manner, there is no wire installed in pin E2 of the 30-pin connector. In the event that communications is lost between the EC-30™ controller and the vehicle controller, the dash controller will activate the trailer ABS warning lamp.

J1708/J1587 Diagnostic Link (J1939)

The EC-30™ controller provides a J1708/J1587 diagnostic link to communicate with the vehicle and various diagnostic tools. Diagnostics, system configuration, data uploading and downloading and other functions can be performed using this link. The EC-30™ controller is supported by tools such as Bendix® ABS Diagnostic Software, the Bendix® DCI hand held tool and the MPSI ProLink. The EC-30™ controller may also provide diagnostics using the SAE J1939 serial communications link.

J1939/1922 Engine Torque Reduction - ATC

The EC-30™ controller can be configured to reduce engine torque over the SAE J1939 (J1922 for some service replacement models) serial communications link. The EC-30™ controller will send a J1939 message to reduce engine torque during ATC operation.

ATC Active/Warning Lamp

Premium EC-30™ controller models configured for ATC can control an ATC active/warning lamp to indicate the status of the ATC system. The ATC active/warning lamp flashes when ATC is active and stays on if an ATC system fault is detected or ATC is disabled by the ATC enable/disable switch. The EC-30™ controller directly controls the ATC active/warning lamp by providing a ground path when the lamp is to be activated. Pin C2, of the 30-pin connector, is the ATC active/warning lamp output.

J1939 ATC Active/Warning Lamp

Premium EC-30™ controller models configured for ATC can be configured to broadcast the status of the ATC active/warning lamp over the SAE J1939 serial communications link. In this case a vehicle dash controller directly operates the ATC active/warning lamp. When configured in this manner, there is no wire installed in pin C2 of the 30-pin connector. In the event that J1939 communications are lost between the EC-30™ controller and the vehicle dash controller, the dash controller will activate the ATC active/warning lamp.

POWER-UP SEQUENCE

ABS Warning Lamp at Power-Up

At power-up without detected faults, the ABS warning lamp turns on for 2.5 seconds and then turns off. See figure 7.

ATC Active / Warning Lamp at Power-Up

At power-up, the ATC active/warning lamp displays the ATC control configuration and then turns off. A series of blinks indicates if the ATC is configured for engine torque limiting and differential braking, engine torque limiting only, or differential braking only. See figure 7.

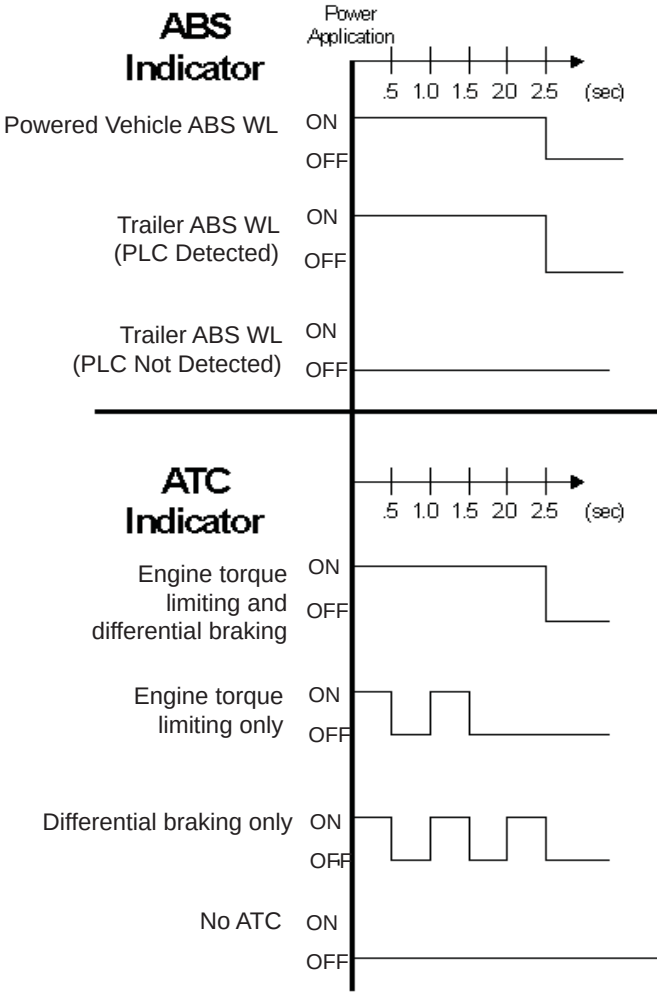


FIGURE 7 - EC-30™ CONTROLLER POWER-UP LAMP SEQUENCE

Trailer ABS Warning Lamp

At power-up, the trailer ABS warning lamp turns on for 2.5 seconds and then turns off. This only occurs if a PLC trailer or PLC diagnostic tool is connected to the tractor at the time ignition power is applied. Only an EC-30™ controller with PLC installed on a towing vehicle will support the trailer ABS lamp.

Diagnostic LEDs at Power-Up

At power-up, the diagnostic LEDs all turn on, then display the configuration for sensors and the ATC. After showing the configuration, only the green VLT LED will stay on. However, if a fault is detected, the faulted component will be identified by the red LEDs. See chart 4.

LED Power-Up Sequence		LEDs
1st	When power is applied	All LEDs Illuminate
Then the LEDs indicate one of the following:		
2nd	4 Sensors	SEN-RER-FRT
	6 Sensors	SEN-RER-MID-FRT
Then the LEDs indicate one of the following:		
3rd	ATC Engine Limiting	TRC
	ATC Differential Braking	TRC-MOD
	No ATC	N/A
The LEDs will then indicate system status:		
4th	Normal Operation (if no faults)	VLT

CHART 4 - LED POWER-UP DISPLAY OF EC-30™ CONTROLLER CONFIGURATION

Retarder Disable Relay at Power-Up

At power-up, the EC-30™ controller may toggle the retarder disable relay. If the relay is located in the cab it is usually audible to the operator.

Modulator Chuff Test at Power-Up

At power-up, the EC-30™ controller activates a patented modulator chuff test. The modulator chuff test is an electrical and pneumatic ABS modulator test, that can assist the technician in verifying proper modulator wiring and installation. With brake pressure applied, a properly installed modulator causes a single sharp audible chuff of air pressure by activating the hold solenoid two times and the exhaust solenoid once. If the modulator is wired incorrectly, the modulator will produce a double chuff, or no chuff at all. The EC-30™ controller activates a chuff at each modulator in the following sequence:

Right-Front, Left-Front, Right-Rear, Left-Rear. See figure 8.

The chuff sequence is then repeated for a total of 8 chuffs. If an issue is detected during the modulator chuff test, look for faults and compare the modulator wiring and plumbing to the EC-30™ controller system schematic shown in figure 13.

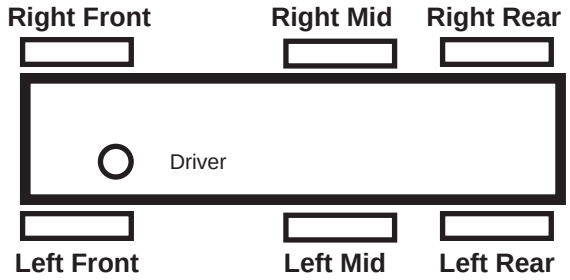


FIGURE 8 - VEHICLE ORIENTATION

ABS OPERATION

Bendix ABS uses wheel speed sensors, ABS modulators and an ECU to control either four or six wheels. By monitoring the wheel slip during braking, and adjusting the brake pressure at each wheel, the EC-30™ controller is able to optimize slip between the tire and the road surface. When excessive wheel slip is detected, the EC-30™ controller will activate ABS. The EC-30™ controller controls the ABS modulators to simulate a driver pumping the brakes. However, the EC-30™ controller is able to pump each brake on the vehicle independently, and with greater speed and accuracy than a driver.

Front Axle Control

Although both steering-axle wheels are controlled by individual ABS modulators, the EC-30™ controller does not control them completely independently. The EC-30™ controller uses a Modified Individual Regulation (MIR) philosophy which blends the applied braking force between the two steering axle brakes. MIR is used to minimize steering wheel pull while ABS is active on an uneven road surface (e.g. ice and asphalt).

Single Rear Axle Control

On vehicles with a single rear axle (4x2), the rear axle wheels are controlled independently. Therefore, brake application pressure at each wheel is adjusted according to the wheel behavior on the road surface.

Dual Rear Axle Control

For vehicles with dual rear axles (6x2 or 6x4), one ABS modulator controls both right wheels and the other modulator controls both left wheels. Both wheels on each side receive equal brake pressure during an ABS stop. In the case of only four wheel speed sensors, the two rear sensors are located on the lighter rear axle.

Normal Braking

During normal braking, brake pressure is delivered through the ABS modulator and into the brake actuator. If the wheel speed sensors do not detect an excessive slip, the EC-30™ controller does not activate ABS control and the vehicle stops with normal braking.

ATC OPERATION

Just as ABS improves vehicle stability during braking, ATC improves vehicle stability and traction during vehicle acceleration. By adding an ATC modulator and/or engine communication, the EC-30™ controller ATC function uses the same wheel speed information and modulator control as the ABS function. The EC-30™ controller detects excessive drive wheel speed, compares the speed of the front, non-driven, wheels, and reacts to bring the wheel spin under control. The EC-30™ controller can be configured to use engine torque limiting and/or differential braking to control wheel spin. For optimal ATC performance, both methods are recommended.

During ATC activation, the EC-30™ controller will blink the ATC active/warning lamp to advise the driver that drive-wheel spin is occurring. When ATC is no longer active, the ATC active/warning lamp turns off.

Engine Torque Limiting ATC

The engine torque limiting feature allows the EC-30™ controller to reduce engine torque to a suitable level, in relation to the amount of available traction. When the engine torque is controlled, wheel slip can be optimized, producing more traction between the wheel and road surface. Engine torque limiting is especially beneficial in avoidance of a power jackknife and when all drive wheels are on an equally slippery surface. The EC-30™ controller will verify that the driver is pressing the accelerator (using J1939 or J1922) prior to initiating an ATC event.

In order for the engine torque limiting ATC feature to be used, the vehicle must be equipped with an electronically controlled engine and throttle. When configured for engine torque limiting ATC, the EC-30™ controller must be connected to an electronic engine via the SAE J1939 or J1922 serial communications links.

Differential Braking ATC

Differential braking ATC allows the EC-30™ controller to gradually apply the brake on a spinning drive wheel. Since the vehicle's differential tends to drive the wheel that presents the least resistance (the wheel on the most slippery surface), a slight brake application to this wheel forces the differential to drive the wheel on the opposite side. The EC-30™ controller applies brake pressure to both rear-axle ABS modulators by energizing the ATC modulator. The EC-30™ controller can then apply pressure only to the spinning wheel by controlling the ABS modulators.

Differential braking ATC can be activated only when vehicle speed is under 25 mph and one drive wheel is spinning faster than the others.

In the event that differential braking, ATC is active for an excessive time period, the EC-30™ controller will disable ATC to prevent overheating and fading of brakes. The EC-30™ controller will re-enable ATC after a short period of time. The ATC active/warning lamp will be on while the ATC is disabled.

In order for the differential braking control to be used, the vehicle must be equipped with an antilock/traction relay (ATR) valve (ATR-1 or ATR-2). The vehicle also must have an electronically controlled engine throttle.

ATC Enable/Disable Switch

The ATC enable/disable switch allows the operator to enable or disable the ATC feature as necessary. ATC can be disabled while the vehicle is stationary or in motion. However, ATC will not re-enable until the vehicle comes to a complete stop, even with the switch in the enable position. The ATC active/warning lamp will be on while the ATC is disabled.

AUTO-CALIBRATION

Auto-calibration is a feature that allows the EC-30™ controller to compensate for tire size changes throughout the life of the vehicle. Auto-calibration is needed for proper ATC performance. The EC-30™ controller will perform an auto-calibration when the tire size difference exceeds approximately 4 percent.

Tire size (rolling radius) setting information can be retrieved or adjusted by using Bendix ABS Diagnostics Software or MPSI.

If issues occur with the ATC function following a tire size change, contact Bendix or refer to your local authorized Bendix dealer.

EC-30™ CONTROLLER CONFIGURABLE PARAMETERS

The EC-30™ controller has various configurable function parameters that can be enabled to provide the user with additional or customized features. The default settings for these parameters are chosen by the vehicle OEM. The configurable features include serial communications message broadcasts, alternative lamp control, various I/O recognition, ABS control settings and others. To ensure that the unit you are working with has the correct default settings, use only the correct replacement part number. However, most of these settings can be altered using the Bendix ABS Diagnostic Software program. For further information, contact Bendix or refer to your local authorized Bendix dealer.

EC-30™ CONTROLLER SELF-CONFIGURATION

The self-configuration feature allows wheel speed sensor and ATC configurations to be altered when activated with a magnet or diagnostic tool. This is generally performed shortly after installing or replacing an EC-30™ controller.

Self-Configuration of Wheel Speed Sensors

The number of speed sensors connected to the EC-30™ controller will be detected during the self-configuration process. The EC-30™ controller will configure for six sensors if it detects one or both Mid sensors. If only one Mid sensor is detected, the ABS warning lamp and appropriate diagnostic LEDs will illuminate following the self-configure. If no Mid sensors are detected, the EC-30™ controller will configure for four sensors.

Self-Configuration of ATC

In order to self-configure for engine torque limiting ATC, the following must be connected to the EC-30™ controller and be operational:

- J1939 or J1922 communication link to the engine
- ATC active/warning lamp
- ATC enable/disable switch (must be toggled prior to self-configuration)

In order to self-configure for differential braking ATC, the ATC modulator must also be connected to the EC-30™ controller and be operational.

Some EC-30™ controller part numbers will not support six wheel speed sensors or ATC. To ensure that the EC-30™ controller you are working with has the correct hardware capability, use only the correct replacement part number.

EC-30™ Controller Self-Configuration Procedure

Verify that all ECU, communication, sensor, ABS modulator and ATC modulator connectors are in place and then turn the ignition power on. Toggle the ATC enable/disable switch, if equipped.

Activate an EC-30™ controller self-configuration by one of the following actions:

- Hold a magnet on the reset location of the diagnostic display for about 20 seconds (until the LEDs begin to rapidly roll), then remove the magnet.
- Press the DCI reset switch for about 20 seconds (until the LEDs begin to rapidly roll), then release the switch.
- Use the self-configuration menu selection on Bendix ABS Diagnostic Software or the MPSI tool.

When the self-configuration process is complete, the EC-30™ controller will automatically go through the power-up sequence and show the new configuration on the diagnostic display. If the EC-30™ controller was properly configured for ATC, the ATC active/warning lamp will also show the ATC configuration. Refer to the EC-30™ controller Power-Up Sequence section.

FAULT DETECTION

The EC-30™ controller contains self-testing diagnostic circuitry that continuously checks for proper operation of the ABS/ATC components and wiring. The EC-30™ controller controls dash mounted warning lamps to advise the driver of the status of the system.

When the EC-30™ controller senses an erroneous system condition, it stores the fault code in memory, activates the appropriate warning lamp and disables all or part of the effected ABS or ATC functions. The faulted component is also identified on the diagnostic display on the EC-30™ controller.

In most cases, the EC-30™ controller will automatically reset (self-heal) the active fault code when the fault is corrected. However, repeated occurrences of a given fault will cause the fault code to latch. Once the fault code is latched, a manual reset is required. Latching of faults can assist in the troubleshooting of intermittent faults. The fault code is stored in the EC-30™ controller memory, even when power is removed.

After repair, latched fault codes can be reset by briefly holding a magnet on the reset location of the EC-30™ controller diagnostic display. Fault codes can also be reset with the blink code switch or with a diagnostic tool.

When a fault self-heals or is manually reset, the fault code remains in fault history. Fault history can be retrieved by using blink code diagnostics or a diagnostic tool.

ABS PARTIAL SHUTDOWN

Depending which component the fault is detected on, the ABS and ATC functions may be fully or partially disabled. Even with the ABS warning lamp on, the EC-30™ controller may still provide ABS function on wheels that are not affected by the fault. The EC-30™ controller should be serviced as soon as possible.

Front ABS Modulator Fault

ABS on the affected wheel is disabled. ABS and ATC on all other wheels remains active.

Rear ABS Modulator Fault

ATC is disabled. ABS on the affected wheel is disabled. ABS on all other wheels remains active.

Front Wheel Speed Sensor Fault

The faulted wheel is still controlled by using input from the remaining wheel speed sensor on the front axle. ABS remains active on the rear wheels. ATC is disabled.

Mid or Rear Wheel Speed Sensor Fault

ATC is disabled. In a four sensor system, ABS on the affected wheel is disabled, but ABS on all other wheels remains active.

In a six sensor system, ABS remains active by using input from the remaining rear wheel speed sensor on the same side.

ATC Modulator Fault

ATC is disabled. ABS remains active.

J1939/J1922 Communication Fault

ATC is disabled. ABS remains active.

ECU Fault

ABS and ATC are disabled. The system reverts to normal braking.

Voltage Fault

While voltage is out of range, ABS and ATC are disabled. The system reverts to normal braking. When the correct voltage level is restored, full ABS and ATC function is available. Operating voltage range is 9.0 to 16.0 VDC.

EC-30™ CONTROLLER DIAGNOSTIC DISPLAY

The EC-30™ controller diagnostic display consists of nine red fault LEDs, one green power LED and an internal, magnetic reset switch. See figure 9 for illustration.

No tools are needed to read the EC-30™ controller diagnostic display. A fault displayed on the LEDs will always be accompanied by the illumination of the ABS warning lamp and/or the ATC active/warning lamp.

Reading a Fault

When a fault is detected, the EC-30™ controller identifies the faulted component with the diagnostic LEDs. When a wheel speed sensor fault, or an ABS modulator fault is detected, the SEN or MOD LED will be accompanied by two location LEDs. An example is FRT-RHT-SEN. When these three LEDs are on, this is an indication of a fault on the front axle(FRT), right side(RHT), wheel speed sensor(SEN). For a complete explanation and troubleshooting of faults displayed by the LEDs, go to section F, Troubleshooting.

The red diagnostic LEDs only indicate active system faults. When a fault self-heals or is manually reset, the fault code remains in fault history. Fault history can be retrieved by using blink code diagnostics or a diagnostic tool.

If faults occur on multiple components, the diagnostic LEDs will display one fault at a time. When the first fault is repaired and the EC-30™ controller is reset, the next fault will be displayed on the LEDs.

Fault Reset

After the fault is corrected, the active fault code and LEDs can be reset by briefly holding a magnet in place at the RESET location of the diagnostic display. All of the LEDs will be on while the magnet is held in place. If one or more LEDs do not go on when the magnet is in place, replace the EC-30™ controller. When the magnet is removed from the reset location, only the green VLT diagnostic LED should remain on. If red LEDs are still on, active faults are still present in the system.

Note: An EC-30™ controller self-configuration will occur if a magnet is held at the reset location for greater than 20 seconds.

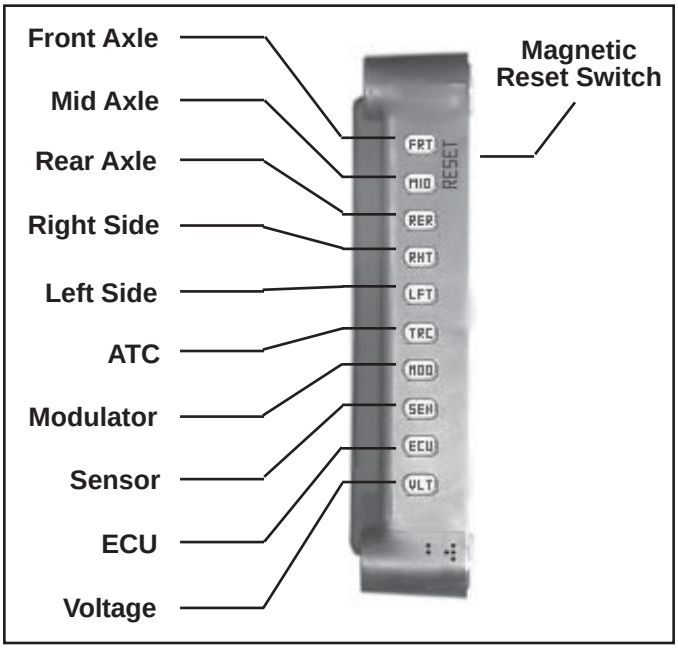


FIGURE 9 - EC-30™ CONTROLLER LED DIAGNOSTIC DISPLAY

BLINK CODE DIAGNOSTICS

The EC-30™ controller provides diagnostic and configuration functions using blink code diagnostics. When the blink code mode is activated, the EC-30™ controller flashes the ABS warning lamp to communicate active fault codes, fault code history or, ABS and ATC configurations. The blink code diagnostics mode can also be used to reset active fault codes. See chart 5.

The ABS warning lamp illuminates while the blink code switch is pressed. The lamp turns off when the blink code switch is released. The blink code switch is optional and may not be installed on some vehicles (pin F3 of the 30-pin connector).

Following a single display of all available messages, the ABS warning lamp remains on for five seconds and then returns to the normal operating mode. Fault occurrence count information is not displayed with blink code diagnostics.

If wheel speeds are detected during the blink code diagnostics mode, the EC-30™ controller exits the blink code diagnostics and returns to the normal operating mode. The blink code diagnostics mode can only be activated following a power-up, where wheel speeds have not been detected.

Press the Blink Code Switch	Blink Code Action
1 time	Display Active Fault Codes
2 times	Display Fault Code History
3 times	Reset Active Fault Codes
4 times	Display EC-30 Configuration

CHART 5 - BLINK CODE ACTIVATION

Display Active Fault Codes

To display active fault codes, press the blink code switch one time. Following activation, there will be a three second delay, followed by a blink code display of all active fault codes. See chart 7 for fault code definitions.

Display Fault Code History

To display history fault codes, press the blink code switch two times. Following activation, there will be a three second delay, followed by a blink code display of all history fault codes. See chart 7 for fault code definitions.

Reset Active Fault Codes

To reset active fault codes, press the blink code switch three times. Following activation, there will be a three second delay, followed by a blink code message of:

1-1, (System Fully Operational - No Faults Detected)

or

A blink code display of all active fault codes.

The ABS warning lamp will stay on if active faults are still present. See chart 7 for fault code definitions.

Resetting active fault codes with blink code diagnostics does not clear information from the fault history. Fault history can be retrieved by using blink code diagnostics or a diagnostic tool.

Display EC-30™ Controller Configuration

To check the ECU configuration, press the blink code switch four times. Following activation, there will be a three second delay, followed by a blink code display of the EC-30™ controller configuration. See chart 6.

1st Digit	Sensors
2	4 Sensors
3	6 Sensors
2nd Digit	Modulators
2	4 Modulators
3rd Digit	ATC
2	Not ATC
3	ATC Engine Torque Limiting Only
4	ATC Differential Brake Only
5	Full ATC (Engine Torque Limiting and Differential Braking)

CHART 6 - BLINK CODES FOR EC-30™ CONTROLLER CONFIGURATION

1st Digit	2nd Digit	Fault Description	Repair Information	J1587 (SID)	J1587 (FMI)
1	1	No Faults	System Fully Operational - No Faults Detected		
Power / ABS Controller					
1	2	Battery Voltage Too High	Check for corrosion or damaged power wiring and connectors. Verify that ABS unit is powered by a 12-volt supply.	251	3
1	3	Battery Voltage Too Low	Check for corrosion or damaged power wiring and connectors. Measure voltage under load to insure proper levels.	251	4
1	4	ABS Controller Fault (2)	Check for corrosion or damaged power wiring and connectors. Clear/reset faults. If fault returns, replace ECU.	254	2
1	5	ABS Controller Fault (6)		254	6
1	6	ABS Controller Fault (7)		254	7
1	7	ABS Controller Fault (9)		254	9
1	8	ABS Controller Fault (10)		254	10
1	9	ABS Controller Fault (11)		254	11
1	10	ABS Controller Fault (12)		254	12
1	11	ABS Controller Fault (13)		254	13
1	12	ABS Controller Fault (14)		254	14
1	13	ABS Controller Fault (1)		254	1
1	14	ABS Controller Fault (3)		254	3
1	15	ABS Controller Fault (8)		254	8
Wheel Speed Sensors					
2	1	LF Sensor Start	Sensor output low during low-speed vehicle operation. Adjust speed sensor to contact tone ring. Rotate wheel and verify minimum 0.8 volts AC sensor output @ 1 RPS. Verify condition and retention force of sensor clip. Verify proper sensor lead routing and clamping.	1	1
3	1	RF Sensor Start		2	1
4	1	LR Sensor Start		3	1
5	1	RR Sensor Start		4	1
6	1	LM Sensor Start		5	1
7	1	RM Sensor Start		6	1
2	2	LF Sensor Intermittent	Intermittent sensor output. Adjust speed sensor to contact tone ring. Verify condition of tone ring mounting and teeth. Rotate wheel and verify minimum 0.8 volts AC sensor output @ 1 RPS. Verify condition and retention force of sensor clip. Verify proper sensor lead routing and clamping.	1	2
3	2	RF Sensor Intermittent		2	2
4	2	LR Sensor Intermittent		3	2
5	2	RR Sensor Intermittent		4	2
6	2	LM Sensor Intermittent		5	2
7	2	RM Sensor Intermittent		6	2
2	3	LF Sensor Shorted to VBAT	Check for corroded or damaged sensor and ECU wiring and connectors. Verify +12V is not measured at either sensor lead.	1	3
3	3	RF Sensor Shorted to VBAT		2	3
4	3	LR Sensor Shorted to VBAT		3	3
5	3	RR Sensor Shorted to VBAT		4	3
6	3	LM Sensor Shorted to VBAT		5	3
7	3	RM Sensor Shorted to VBAT		6	3
2	4	LF Sensor Shorted to Ground	Check for corroded or damaged sensor and ECU wiring and connectors. Verify no continuity from sensor leads to ground.	1	4
3	4	RF Sensor Shorted to Ground		2	4
4	4	LR Sensor Shorted to Ground		3	4
5	4	RR Sensor Shorted to Ground		4	4
6	4	LM Sensor Shorted to Ground		5	4
7	4	RM Sensor Shorted to Ground		6	4
2	5	LF Sensor Open	Check for corroded or damaged sensor and ECU wiring and connectors. Verify 1500-2500 OHMS across sensor leads.	1	5
3	5	RF Sensor Open		2	5
4	5	LR Sensor Open		3	5
5	5	RR Sensor Open		4	5
6	5	LM Sensor Open		5	5
7	5	RM Sensor Open		6	5

CHART 7 - EC-30™ CONTROLLER BLINK CODE DEFINITIONS (1 of 3)

1st Digit	2nd Digit	Fault Description	Repair Information	J1587 (SID)	J1587 (FMI)
Wheel Speed Sensors					
2	6	LF Sensor Shorted Across Sensor	Check for corroded or damaged sensor and ECU wiring and connectors. Verify 1500-2500 OHMS across sensor leads.	1	6
3	6	RF Sensor Shorted Across Sensor		2	6
4	6	LR Sensor Shorted Across Sensor		3	6
5	6	RR Sensor Shorted Across Sensor		4	6
6	6	LM Sensor Shorted Across Sensor		5	6
7	6	RM Sensor Shorted Across Sensor		6	6
2	7	LF Sensor Lock Time Out	Sensor output low or missing during vehicle operation above 10 mph. Verify condition of tone ring mounting. Adjust speed sensor to contact tone ring. Rotate wheel and verify: (a) for WS-20 speed sensor that output is minimally 0.8 VAC @ 1 RPS or (b) for WS-24 speed sensor that output is minimally 0.250 VAC @ 0.5 RPS. Verify condition and retention force of sensor clips. Verify proper sensor lead routing and clamping.	1	7
3	7	RF Sensor Lock Time Out		2	7
4	7	LR Sensor Lock Time Out		3	7
5	7	RR Sensor Lock Time Out		4	7
6	7	LM Sensor Lock Time Out		5	7
7	7	RM Sensor Lock Time Out		6	7
2	8	LF Sensor Frequency Doubling	Verify condition and retention force of sensor clips. Check for corroded or damaged sensor and ECU wiring and connectors. Verify no continuity from sensor leads to ground. Verify sensor leads are a twisted pair.	1	8
3	8	RF Sensor Frequency Doubling		2	8
4	8	LR Sensor Frequency Doubling		3	8
5	8	RR Sensor Frequency Doubling		4	8
6	8	LM Sensor Frequency Doubling		5	8
7	8	RM Sensor Frequency Doubling		6	8
2	9	LF Sensor High Frequency Noise	Verify condition and retention force of sensor clips. Check for corroded or damaged sensor and ECU wiring and connectors. Verify no continuity from sensor leads to ground. Verify sensor leads are a twisted pair.	1	9
3	9	RF Sensor High Frequency Noise		2	9
4	9	LR Sensor High Frequency Noise		3	9
5	9	RR Sensor High Frequency Noise		4	9
6	9	LM Sensor High Frequency Noise		5	9
7	9	RM Sensor High Frequency Noise		6	9
2	10	LF Sensor Wobble Run	Sensor output intermittent or excessive wobble in exciter ring. Verify condition of tone ring mounting and teeth. Verify proper adjustment of wheel bearings. Adjust speed sensor to contact tone ring. Rotate wheel and verify: (a) for WS-20 speed sensor that output is minimally 0.8 VAC @ 1 RPS or (b) for WS-24 speed sensor that output is minimally 0.250 VAC @ 0.5 RPS. Verify condition and retention force of sensor clips. Verify proper sensor lead routing and clamping.	1	10
3	10	RF Sensor Wobble Run		2	10
4	10	LR Sensor Wobble Run		3	10
5	10	RR Sensor Wobble Run		4	10
6	10	LM Sensor Wobble Run		5	10
7	10	RM Sensor Wobble Run		6	10
4	11	LR Sensor Gross Mismatch	Tire Size Mismatch. Verify correct tire size as desired. Verify proper tire inflation. Verify proper number of tone ring teeth per sensed wheel. Verify proper wheel rolling radius setting in ECU.	3	13
5	11	RR Sensor Gross Mismatch		4	13
6	11	LM Sensor Gross Mismatch		5	13
7	11	RM Sensor Gross Mismatch		6	13
2	12	LF Sensor Abnormal Speed	Adjust speed sensor to contact tone ring. Verify proper number of tone ring teeth per sensed wheel. Rotate wheel and verify: (a) for WS-20 speed sensor that output is minimally 0.8 VAC @ 1 RPS or (b) for WS-24 speed sensor that output is minimally 0.250 VAC @ 0.5 RPS. Verify condition and retention force of sensor clips. Verify proper sensor lead routing and clamping. Verify condition of tone ring mounting and teeth.	1	12
3	12	RF Sensor Abnormal Speed		2	12
4	12	LR Sensor Abnormal Speed		3	12
5	12	RR Sensor Abnormal Speed		4	12
6	12	LM Sensor Abnormal Speed		5	12
7	12	RM Sensor Abnormal Speed		6	12

1st Digit	2nd Digit	Fault Description	Repair Information	J1587 (SID)	J1587 (FMI)
ABS Modulators					
8	1	LF Modulator Lock Time Out	No wheel response to ABS command. Verify proper modulator activation with brake pressure applied, at power-up (Chuff Test) and/or using diagnostic tool. Possible slow brake release. Check for dragging brakes, dry bearings, faulty return springs, parking brake system faults, restricted brake air lines, over adjusted slacks, out-of-round drums or damaged/loose tone rings.	7	7
8	7	RF Modulator Lock Time Out		8	7
9	1	LR Modulator Lock Time Out		9	7
9	7	RR Modulator Lock Time Out		10	7
8	2	LF Modulator Open / Shorted to GND	Check for corroded or damaged modulator wiring and connections. Verify for M-21, M-22, or M-30 that resistance between pins: Hold to Common is 3.5 to 5.0 Ohms, Exhaust to Common is 3.5 to 5.0 Ohms, Exhaust to Hold is 7.0 to 10 Ohms. For M-32 and M-32QR, Verify that resistance between pins: Hold to Common is 4.9 to 5.5 Ohms, Exhaust to Common is 4.9 to 5.5 Ohms, Exhaust to Hold is 9.8 to 11 Ohms. Verify no continuity from modulator leads to ground.	7	5
8	8	RF Modulator Open / Shorted to GND		8	5
9	2	LR Modulator Open / Shorted to GND		9	5
9	8	RR Modulator Open / Shorted to GND		10	5
8	3	LF Modulator Shorted to Ground	Check for corroded or damaged modulator wiring and connections. Verify for M-21, M-22, or M-30 that resistance between pins: Hold to Common is 3.5 to 5.0 Ohms, Exhaust to Common is 3.5 to 5.0 Ohms, Exhaust to Hold is 7.0 to 10 Ohms. For M-32 and M-32QR, Verify that resistance between pins: Hold to Common is 4.9 to 5.5 Ohms, Exhaust to Common is 4.9 to 5.5 Ohms, Exhaust to Hold is 9.8 to 11 Ohms. Verify no continuity from modulator leads to ground.	7	6
8	9	RF Modulator Shorted to Ground		8	6
9	3	LR Modulator Shorted to Ground		9	6
9	9	RR Modulator Shorted to Ground		10	6
8	4	LF Modulator Shorted Solenoid	Check for corroded or damaged modulator wiring and connections. Verify for M-21, M-22, or M-30 that resistance between pins: Hold to Common is 3.5 to 5.0 Ohms, Exhaust to Common is 3.5 to 5.0 Ohms, Exhaust to Hold is 7.0 to 10 Ohms. For M-32 and M-32QR, Verify that resistance between pins: Hold to Common is 4.9 to 5.5 Ohms, Exhaust to Common is 4.9 to 5.5 Ohms, Exhaust to Hold is 9.8 to 11 Ohms. Verify no continuity from modulator leads to ground.	7	14
8	10	RF Modulator Shorted Solenoid		8	14
9	4	LR Modulator Shorted Solenoid		9	14
9	10	RR Modulator Shorted Solenoid		10	14
8	5	LF Modulator Shorted to VBAT	Check for corroded or damaged modulator wiring and connections. Verify for M-21, M-22, or M-30 that resistance between pins: Hold to Common is 3.5 to 5.0 Ohms, Exhaust to Common is 3.5 to 5.0 Ohms, Exhaust to Hold is 7.0 to 10 Ohms. For M-32 and M-32QR, Verify that resistance between pins: Hold to Common is 4.9 to 5.5 Ohms, Exhaust to Common is 4.9 to 5.5 Ohms, Exhaust to Hold is 9.8 to 11 Ohms. Verify no continuity from modulator leads to ground.	7	3
8	11	RF Modulator Shorted to VBAT		8	3
9	5	LR Modulator Shorted to VBAT		9	3
9	11	RR Modulator Shorted to VBAT		10	3
8	6	LF Modulator Shorted Between	Check for corroded or damaged modulator wiring and connections. Verify for M-21, M-22, or M-30 that resistance between pins: Hold to Common is 3.5 to 5.0 Ohms, Exhaust to Common is 3.5 to 5.0 Ohms, Exhaust to Hold is 7.0 to 10 Ohms. For M-32 and M-32QR, Verify that resistance between pins: Hold to Common is 4.9 to 5.5 Ohms, Exhaust to Common is 4.9 to 5.5 Ohms, Exhaust to Hold is 9.8 to 11 Ohms. Verify no continuity from modulator leads to ground.	7	8
8	12	RF Modulator Shorted Between		8	8
9	6	LR Modulator Shorted Between		9	8
9	12	RR Modulator Shorted Between		10	8
Retarder Relay Control					
10	1	Retarder Relay Open	Check ABS retarder control relay wiring and connections. Verify proper activation of ABS retarder control relay at power-up.	13	5
10	2	Retarder Relay Shorted		13	6
ATC - Traction Control					
10	5	Traction Modulator Open	Check for corroded or damaged modulator wiring and connections. Verify 10.0 to 12.0 OHMS across the traction modulator leads.	18	5
10	6	Traction Modulator Shorted to Ground	Check for corroded or damaged modulator wiring and connections. Verify no continuity from traction modulator leads to ground. Verify 10.0 to 12.0 OHMS across the traction modulator leads.	18	6
10	7	Traction Modulator Shorted	Check for corroded or damaged modulator wiring and connections. Verify 10.0 to 12.0 OHMS across the traction modulator leads.	18	14
10	8	Traction Modulator Shorted to VBAT	Check for corroded or damaged modulator wiring and connections. Verify +12V is not measured at any traction modulator lead. Verify 10.0 to 12.0 OHMS across the traction modulator leads.	18	3
Lamps					
10	9	Traction Lamp Open	Check traction lamp wiring and connections. Verify proper illumination of traction lamp at power-up.	24	5
10	10	Traction Lamp Shorted		24	6
10	11	ABS - Warning Lamp Open	Check ABS warning lamp (or ABS warning lamp relay) wiring and connections. Verify proper illumination of warning lamp at power-up.	23	5
10	12	ABS - Warning Lamp Shorted		23	6
11	1	Trailer ABS - Warning Lamp Open (Dash Mounted)	Check ABS warning lamp wiring and connections. Verify proper illumination of warning lamp at power-up.	81	5
11	2	Trailer ABS - Warning Lamp Shorted (Dash Mounted)		81	6
Engine Serial Communications					
11	3	J1939 Data Link Retarder Communication Fault	ECU not communicating with vehicle retarder. Check J1939 wiring and connections to ECU. Verify correct retarder control setting in ECU.	231	12
11	4	J1939 Data Link Engine Communication Fault	ECU not communicating with engine. Check J1939 wiring and connections to ECU. Verify correct engine communications link setting in ECU.	231	5
11	5	J1922 Data Link Engine Communication Fault	ECU not communicating with engine. Check J1922 wiring and connections to ECU. Verify correct engine communications link setting in ECU.	249	5
11	6	J1922 Data Link Retarder Communication Fault	ECU not communicating with vehicle retarder. Check J1922 wiring and connections to ECU. Verify correct retarder control setting in ECU.	249	12

CHART 7 - EC-30™ CONTROLLER BLINK CODE DEFINITIONS (3 of 3)

BENDIX DCI DIAGNOSTIC TOOL

The Bendix Diagnostic Communication Interface (DCI) is a hand held diagnostic tool that was designed for use with the Bendix® EC-17™ controller system and can also be used as a stand alone diagnostic tool for the EC-30™ controller. See figure 10 for illustration. The Bendix DCI has the same 10 diagnostic LEDs as the EC-30™ controller. A reset button on the DCI duplicates the function of the magnetic reset on the EC-30™ controller. There are also two DCI status indicators to indicate power and active communication to the DCI.

To perform diagnostics using the Bendix DCI, plug the DCI into the vehicle's J1587 diagnostic link connector. This connector is generally located on the lower, driver-side portion of the vehicle dash or under the dash panel. See figure 11 for connector location.

Note: The DCI is not RP-1210 compliant and can not be used as the communication link to any diagnostic software intended for use with the EC-30™ controller. An RP-1210 compliant communication link from the computer to the vehicle diagnostic connector will be needed.

For further information on the Bendix DCI, or RP-1210 compliant tools, contact Bendix or refer to your local authorized Bendix dealer.

FIGURE 10 - BENDIX DCI - DIAGNOSTIC COMMUNICATIONS INTERFACE

Reading a Fault with DCI

When a fault is detected, the DCI identifies the faulted component with the diagnostic LEDs. When a wheel speed sensor fault, or an ABS modulator fault, is detected, the SEN or MOD LEDs will be accompanied by two location LEDs. An example is FRT-RHT-SEN. When these three LEDs are on, this is an indication of a fault on the front axle(FRT), right side(RHT), wheel speed sensor(SEN). For a complete explanation of faults displayed by the DCI LEDs, see section F, Troubleshooting.

The DCI will only indicate active system faults. When a fault self-heals or is manually reset, the fault code remains in fault history. Fault history can be retrieved by using blink code diagnostics or a capable diagnostic tool.

If faults occur on multiple components, the DCI will display one fault at a time. When the first fault is fixed and the EC-30™ controller is reset, the next fault will be displayed on the DCI.

A fault displayed on the DCI will always be accompanied by the illumination of the ABS warning lamp and/or the ATC active/warning lamp.

Fault Reset with DCI

After the fault is corrected, the active fault code and LEDs can be reset by briefly pressing the reset button on the DCI. All of the DCI diagnostic LEDs will be on while the reset button is pressed. When the reset button is released, only the green VLT diagnostic LED should be on. If red LEDs remain on, active faults are still present in the system.

The EC-30™ controller self-configuration will occur when the reset button is pressed for greater than 20 seconds.

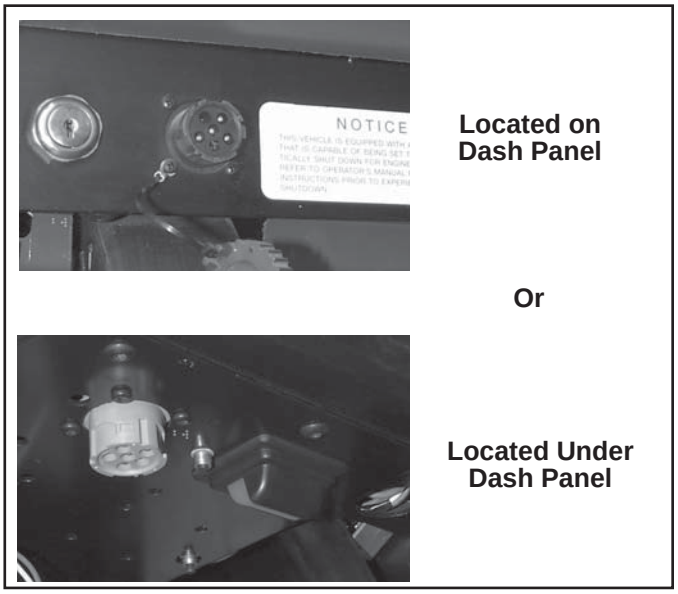


FIGURE 11 - VEHICLE DIAGNOSTIC CONNECTOR LOCATION (J1708/J1587, J1939)

BENDIX ABS DIAGNOSTIC SOFTWARE

Bendix ABS Diagnostic Software is a RP-1210 compliant PC-based program that provides technicians with the highest level of diagnostic information and control of the EC-30™ controller. See figure 12. It can also be used to diagnose the EC-15™, EC-16™, EC-17™ and MC-30™ controllers (Trailer) ABS units. With Bendix ABS Diagnostic Software, the technician can perform the following:

- Full ABS / ATC diagnostics
- Configuration (ABS, ATC, and more)
- Transfer data
- Perform system and component tests
- Update EC-30™ controller software versions (new features)
- Save and print information

When diagnosing the EC-30™ controller using a personal computer and the Bendix ABS Diagnostic Software, the computer's serial or parallel port can be connected to the vehicle's diagnostic connector (J1708/J1587 or J1939) through an RP-1210 compliant communication link.

READ/WRITE (SCRATCHPAD) FUNCTION

Using the Bendix ABS diagnostic software, OEM and fleet service records can be permanently stored in the EC-30™ controller. Data contained in the OEM scratchpad area is protected by a special password and can not be revised in the field. Technician and date information must be entered prior to the fleet scratchpad being updated. Some earlier revisions of the EC-30™ controller do not support the read/write function.

For more information on the Bendix ABS Diagnostic Software program, or RP-1210 compliant tools, contact Bendix or refer to your local authorized Bendix dealer.

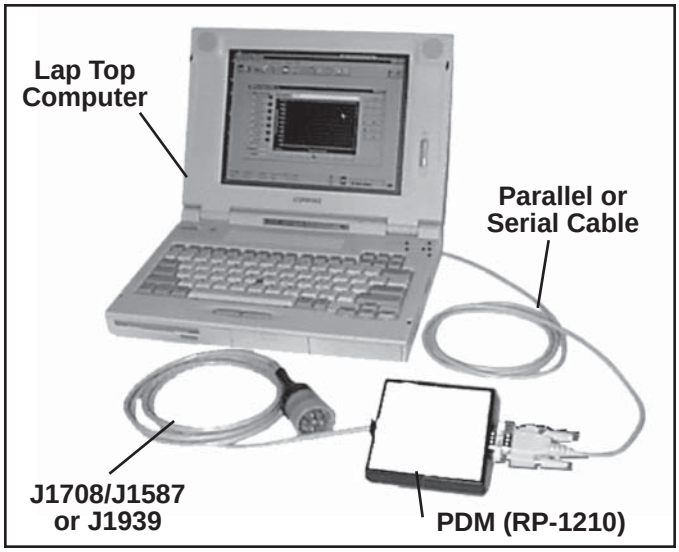


FIGURE 12 - BENDIX ABS DIAGNOSTIC SOFTWARE

NEXIQ (MPSI) BENDIX CARTRIDGE

NEXIQ provides a Bendix cartridge for use with the Pro-Link tool. It can also be used to diagnose the EC-15™, EC-16™, EC-17™ and MC-30™ controller (Trailer) ABS units. See figure 13. For more information on the Bendix diagnostic cartridge from NEXIQ, contact Bendix or refer to your local authorized Bendix dealer. For information on the PLC diagnostic tool, see SD-13-4834.

CONTACTING BENDIX

Bendix.com

The Bendix on-line troubleshooting guide for the EC-30™ controller will help you determine the cause of any conditions that may be preventing 100% performance of your braking system. For additional troubleshooting information on the EC-30™ controller, please refer to our literature request section.

The Bendix on-line contacts guide will make it easy for you to find the Bendix contacts you need. From this page, you can navigate to technical support contacts, service engineers, Bendix account managers, international contacts and more. Bendix.com is your complete Bendix resource.

Bendix Technical Assistance Team

For direct personal technical support, call the Bendix technical assistance team at **1-800-AIR-BRAKE** (1-800-247-2725), Monday through Friday, 8:00 A.M. to 6:00 P.M. EST, and follow the instructions in the recorded message.

Or, you may e-mail the Bendix technical assistance team at: tbs.techteam@bendix.com.

Pro-Link

Heavy Duty Multi Protocol Cartridge

PC Card MPSI Part Number 801013

FIGURE 13 - NEXIQ (MPSI) PRO-LINK TOOL

SAFE MAINTENANCE PRACTICES

WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times:

1. **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses.**
2. **Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components.**
3. **Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.**
4. **If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with an AD-IS® air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.**
5. **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**
6. **Never exceed manufacturer's recommended pressures.**
7. **Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.**
8. **Use only genuine Bendix® replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.**
9. **Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.**
10. **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**
11. **For vehicles with Antilock Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.**

REMOVING THE EC-30™ CONTROLLER ASSEMBLY

1. Turn vehicle ignition off.
2. Remove as much contamination as possible prior to disconnecting air lines and electrical connections.
3. Note the EC-30™ controller assembly mounting position on the vehicle.
4. Disconnect the electrical connectors from the EC-30™ controller.
5. Remove the four, hex head bolts that secure the EC-30™ controller.
6. If the EC-30™ controller is mounted on a valve assembly, it may be necessary to remove all air lines connected to the unit. Remove the EC-30™ controller assembly from the vehicle by removing the mounting bracket or valve.
7. The original mounting hardware can be reused for installation if it is in good condition. If replacement bolts are needed, grade 5 bolts or stronger are required.

INSTALLING A NEW EC-30™ CONTROLLER

CAUTION! When replacing the EC-30™ controller, verify that the unit you are installing has the correct default settings. Failure to do so could result in a loss of features, such as ATC and PLC, or noncompliance with U.S. regulations such as FMVSS 121. It is recommended to use only the correct replacement part number. However, most configuration settings can be altered using the Bendix ABS Diagnostic Software program.

Verify correct operation of the EC-30™ controller system and warning lamps prior to putting the vehicle back into service. Towing vehicles manufactured after March 1, 2001 must support the trailer ABS warning lamp located on the dash.

For further information, contact either the vehicle manufacturer, Bendix or your local authorized Bendix dealer.

ABS Component	Connector	Wire Terminal	Wire Seal/ Plug	Terminal Lock	Terminal Crimp Tool
EC-30™ Controller Harness 30-pin Packard Metri-Pack 150 Series	12034398 	12103881 (18-16 GA) 	Plug 12065266 	N/A	12094429 
EC-30™ Controller Harness 18-pin Packard Metri-Pack 150 Series	12040921 			N/A	12155975 
ABS Modulator Harness 3-Pin Packard Metri-Pack 280 Series	12040977 	12077411 (18-16 GA) 	12015323 (18-16 GA) 	12034145 	
Wheel Speed Sensor 2-Pin Packard Metri-Pack 280 Series	15300027 			15300014 	
Wheel Speed Sensor 2-Pin Packard Metri-Pack 280 Series	15300002 	12048159 (18-16 GA) 			
ATC Modulator or Wheel Speed Sensor 2-Pin Deutsch DT Series	DT04-2P 	0460-215-16141 (14-16 GA) 0460-202-16141 (16-18 GA) 	N/A	W2P 	HDT-48-00 
ATC Modulator Harness or Wheel Speed Sensor 2-Pin Deutsch DT Series	DT06-2S 	0462-209-16141 (14-16 GA) 0462-201-16141 (16-18 GA) 	N/A	W2S 	
Wheel Speed Sensor or ATC Modulator 2-Pin Deutsch DTM Series	DTM06-2S-E007 	462-201-20141 (16-18 GA) 	N/A	WM-2S 	
Wheel Speed Sensor 2-Pin Deutsch DTM Series	DTM04-2P 	460-202-20141 (16-18 GA) 	N/A	WM-2P 	

CHART 8 - EC-30™ CONTROLLER COMPONENT CONNECTORS

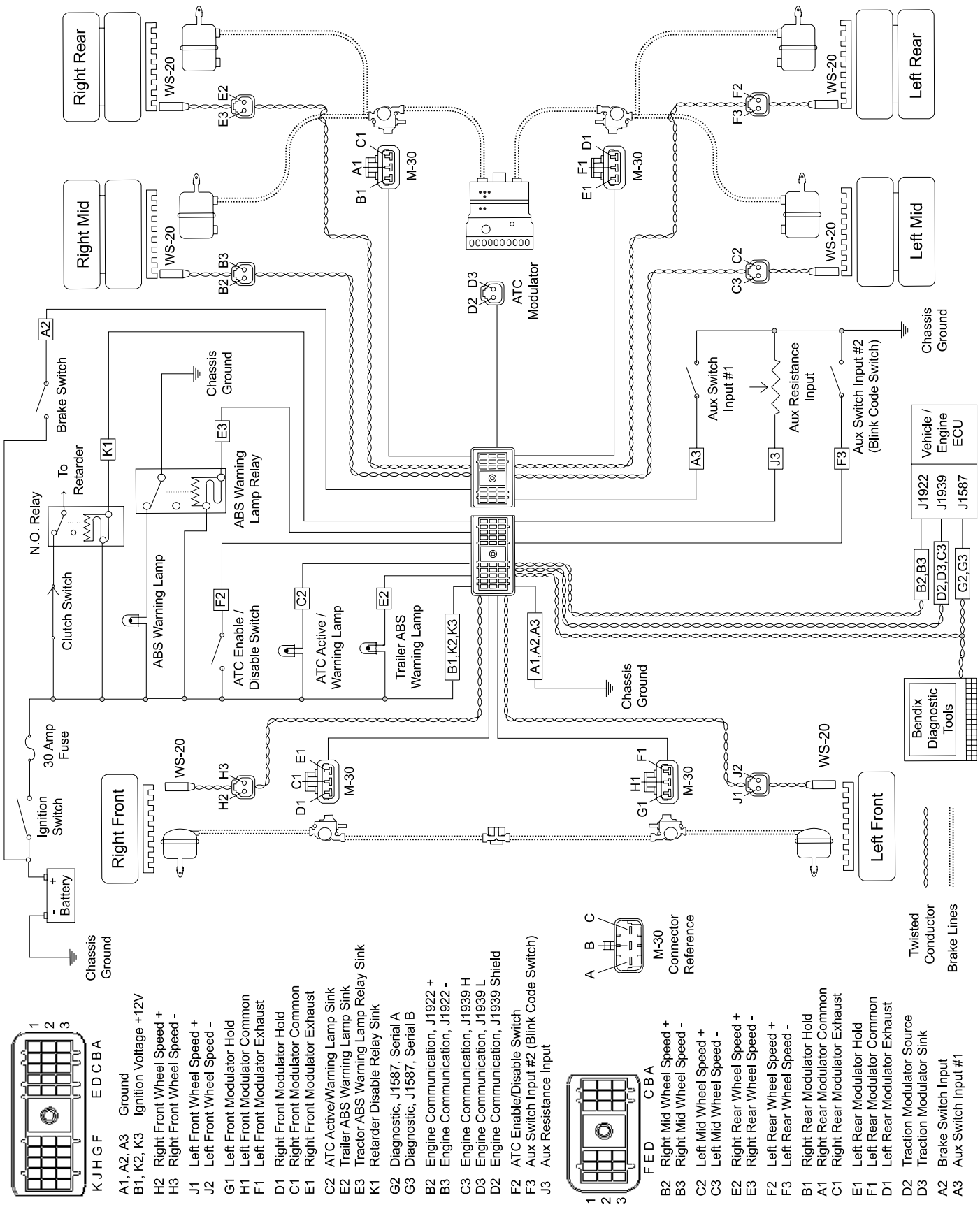


FIGURE 13 - EC-30™ CONTROLLER SYSTEM SCHEMATIC

1. Position and secure the EC-30™ controller in the original mounting orientation using the four hex head bolts. **Torque the hex head EC-30™ controller mounting bolts to 98 in. lbs. Over-tightening the ECU bolts can cause damage to the EC-30™ controller.**
2. For a valve-mounted EC-30™ controller, position and secure the EC-30™ controller assembly to the vehicle, in the original mounting orientation. Reconnect all air lines to the EC-30™ controller assembly. All air lines and fittings should be checked for leaks prior to returning the vehicle to service.
3. Reconnect the electrical connectors to the EC-30™ controller and **torque the connector retaining jack-screws to 15-20 in. lbs. Over-tightening the ECU connector jack-screw(s) can cause damage to the EC-30™ controller.**
4. Apply power and monitor the EC-30™ controller power-up sequence to verify proper system operation.
5. When necessary, it is possible to road test the ABS function by making an abrupt stop from a vehicle speed of about 20 mph to check for proper function. The wheels should not enter a prolonged lock condition and ABS function should be audible. It is the responsibility of the technician to perform the tests in a safe location.
6. When necessary, it is possible to road test the ATC function by accelerating on a road surface with reduced traction. The drive wheels should not sustain substantial spin. Audible bursts of air or engine throttle-down should be noticed. It is the responsibility of the technician to perform the tests in a safe location.

ABS AND ATC WIRING

The vehicle manufacturer designs and supplies the vehicle harnesses for the EC-30™ controller. However, Bendix specifies all component connectors. See chart 8 for components. The wiring harness and connectors are weather resistant and sealed at the connector interface. The wire gauge and insulation type used in the wire harnesses is specific to the circuit function, but 16 gauge GXL is most common. Refer to BW-106-A, Bendix ABS Application Guideline, for specific wire harness application information.

When troubleshooting ABS wiring, some general rules should be followed where applicable.

1. Check all wiring and connectors to ensure they are secure and free from visible damage. Check for evidence of wire chafing due to poor routing or poor securing of wires. Check connectors for proper insertion and locking. Verify that the connector leads are properly greased with a nonconductive electrical grease compound and do not show signs of corrosion or exposure to the environment.
2. During wiring repair, a splice must be properly soldered and made waterproof.
3. Do not pierce wire insulation when checking for continuity.
4. Do not deform individual pins or sockets during probing with a volt/ohm meter.
5. Only use the correct crimping tool when replacing wire terminals and connectors.
6. Properly resecure all wiring harness and sensor leads when repairs are made.

TROUBLESHOOTING

Fault information can be retrieved from the EC-30™ controller by using the diagnostic LED display, blink code diagnostics or a diagnostic tool. However, the technician must confirm whether the fault resides in the component, wiring or connectors. The following troubleshooting flow charts will assist the technician in isolating the cause of the fault.

Troubleshooting should always begin by observing the ABS warning lamp and the ATC active/warning lamp during the EC-30™ controller power-up sequence.

If it is necessary to make electrical measurements, always begin by taking voltage and resistance measurements at the 30-pin and 18-pin wire harness connectors.

Once the circuit fault is found, isolate the area needing repair by repeating the measurements at all connections in the affected circuit (modulator, wheel speed sensor, etc.).

No voltage or resistance measurements are to be made on the bulkhead connector pins of the EC-30™ controller.

When repairs are made, reconnect the electrical connectors to the EC-30™ controller and **torque the connector retaining jack-screws to 15-20 in. lbs. Over-tightening the ECU connector jack-screw(s) can cause damage to the EC-30™ controller.**

Troubleshooting Flowcharts

Section A - Power-up sequence - ABS warning lamp and ATC active/warning lamp

Section B - Power-up sequence - Trailer ABS warning lamp

Section C - ABS warning lamp

Section D - ATC active/warning lamp

Section E - Trailer ABS warning lamp

Section F - Diagnostic LED quick reference

Section G - Power to the EC-30™ controller

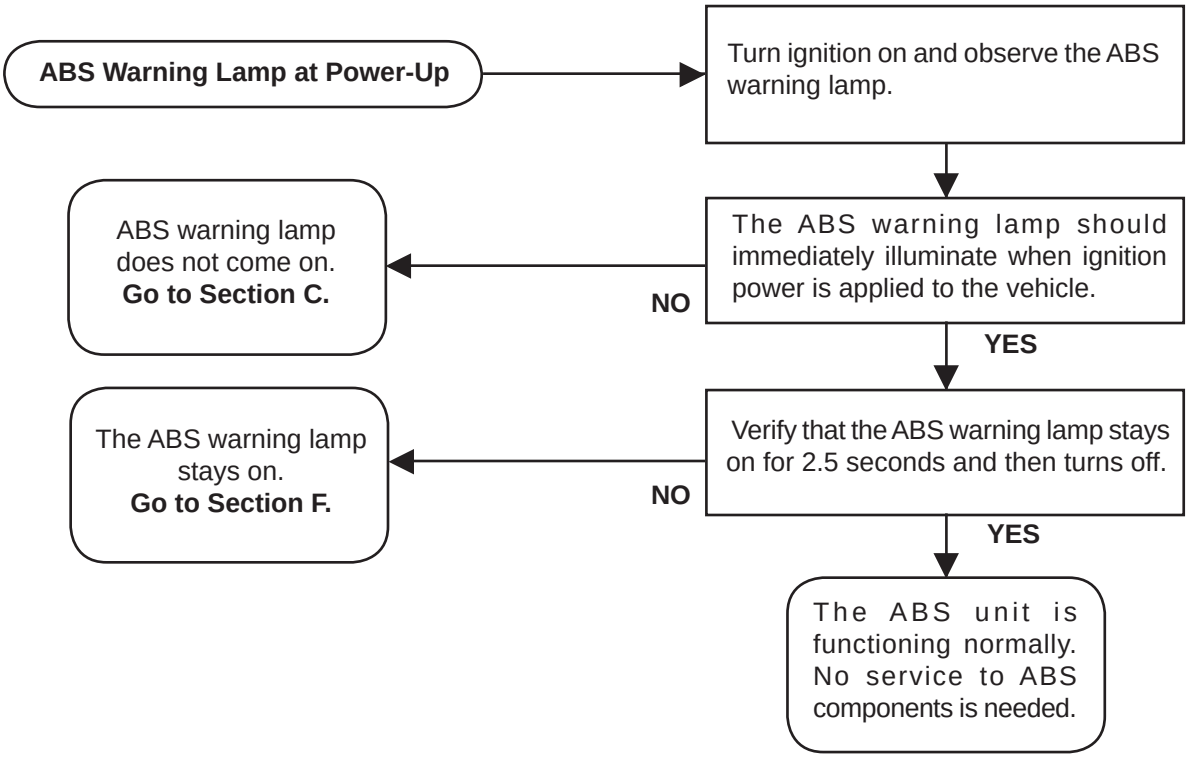
Section H - Wheel speed sensors

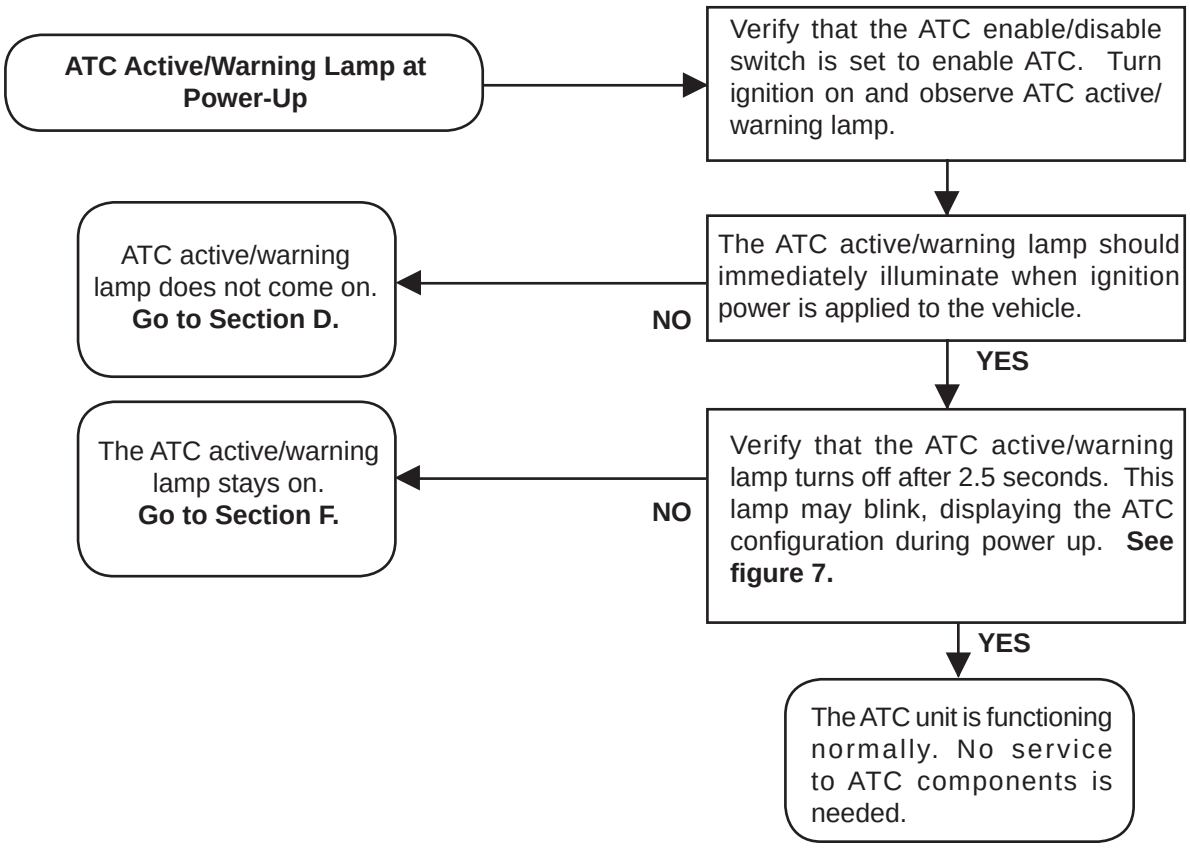
Section I - ABS modulators

Section J - ATC modulator

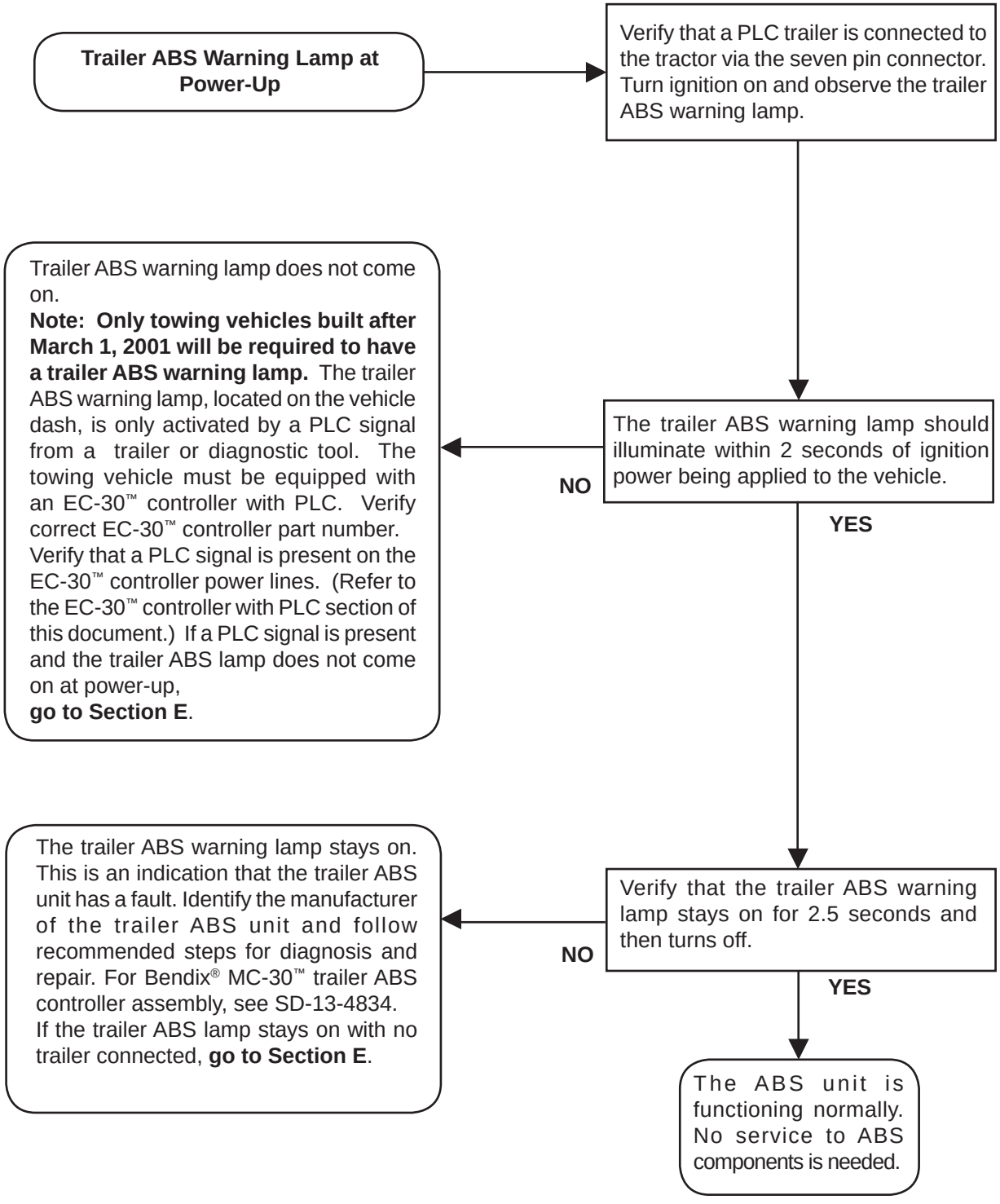
Section K - Serial communication

SECTION A - EC-30™ CONTROLLER POWER-UP SEQUENCE - ABS WARNING LAMP AND ATC ACTIVE/WARNING LAMP





SECTION B - EC-30™ CONTROLLER POWER-UP SEQUENCE - TRAILER ABS WARNING LAMP



SECTION C - TROUBLESHOOTING THE ABS WARNING LAMP

ABS Warning lamp did not illuminate during the EC-30™ controller power-up sequence.

Turn the ignition off and disconnect the 30-pin connector from the EC-30™ controller.

Turn the ignition on and verify that the ABS warning lamp turns on.

YES → If having the EC-30™ controller connected was preventing the ABS warning lamp from doing a power-up lamp check, verify that power at the EC-30™ controller is getting cycled with the ignition switch, by observing the green VLT LED. Check for corrosion or damage on the 30-pin connector and wiring. If none is found, replace the EC-30™ controller.

NO

See Note this page

With ignition on, measure voltage between pin E3 and ground (pins A1, A2 or A3). Verify a measurement equal to battery voltage. (About 12.0 VDC)

NO → With a volt/ohm meter, check the wiring, relay, and fuse. **Refer to figure 13**. When repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power up sequence.
Go to Section A.

YES

With a volt/ohm meter, check the ABS warning lamp, wiring, relay and fuse. **Refer to figure 13.** When repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power up sequence.
Go to Section A.

Note: If there is no wire in pin E3 of the 30-pin connector, the EC-30™ controller is commanding the ABS warning lamp, using the J1939 serial communications link.

In this configuration, the actual lamp is driven by a vehicle dash controller. Obtain the vehicle manual and verify the wiring and function of the ABS warning lamp.

To verify proper EC-30™ controller communication, **go to Section K**.

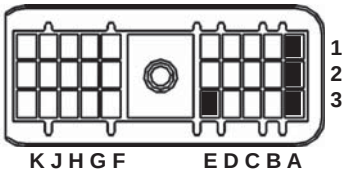
ABS Warning lamp stays on with no red LEDs on.

See Note this page

Turn the ignition off and disconnect the 30-pin connector from the EC-30™ controller.

With a volt/ohm meter, check the wiring, relay and fuse. **Refer to figure 13**. When repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power up sequence. If the condition still exists, replace the EC-30™ controller. Go to Section A.

30-Pin Connector



E3 — ABS Warning Lamp
A1,A2,A3 — Ground

SECTION D - TROUBLESHOOTING THE ATC ACTIVE/WARNING LAMP

ATC Active/Warning lamp did not illuminate during the EC-30™ controller power-up sequence.

Verify that the EC-30™ controller is configured for ATC by observing the LEDs at power-up, blink code diagnostics or using a diagnostic tool.

With ignition off, remove the 30-pin connector from the EC-30™ controller.

See Note this page

Turn ignition on and measure voltage between pin C2 and ground (pins A1, A2 or A3). Verify a measurement equal to battery voltage. (About 12.0 VDC)

YES

NO

With a volt/ohm meter, check wiring, ATC active/warning lamp and fuse. When repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power-up sequence. **Go to Section A**.

ATC active/warning lamp stays on with no red LEDs on.

Verify that the ATC enable/disable switch is in the enable position.

See Note this page

If ATC active/warning lamp remains on, turn ignition off and remove the 30-pin connector from EC-30™ controller.

With a volt/ohm meter, check the ATC active/warning lamp circuit and the ATC enable/disable switch wiring. **Refer to figure 13**. When repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power-up sequence. If the condition still exists, replace the EC-30™ controller.

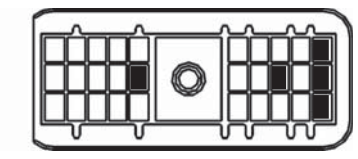
Check for corrosion or damage on the 30-pin connector and wiring. If none is found, replace the EC-30™ controller.

Note: If there is no wire in pin C2 of the 30-pin connector, the EC-30™ controller is commanding the ATC active/warning lamp, using the J1939 serial communications link.

In this configuration, the actual ATC lamp is driven by a vehicle dash controller. Obtain the vehicle manual and verify the wiring and function of the ATC active/warning lamp.

To verify proper EC-30™ controller communication, **go to Section K**.

30-Pin Connector



C2	ATC Active/Warning Lamp
A1,A2,A3	Ground
F2	ATC Enable/Disable Switch

SECTION E - TROUBLESHOOTING THE TRAILER ABS WARNING LAMP

Trailer ABS Warning lamp did not illuminate during the EC-30™ controller power-up sequence.

With ignition off, remove the 30-pin connector from the EC-30™ controller.

See Note this page

Turn ignition on and measure voltage between pin E2 and ground (pins A1, A2 or A3). Verify a measurement equal to battery voltage. (About 12.0 VDC)

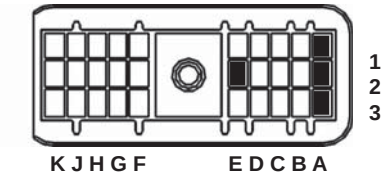
NO

YES

Only towing vehicles built after March 1, 2001 will be required to have a trailer ABS warning lamp. The trailer ABS warning lamp, located on the vehicle dash, is only activated by a PLC signal from a trailer or diagnostic tool. The towing vehicle must be equipped with an EC-30™ controller with PLC. Refer to the part number and configuration to ensure that the EC-30™ controller supports PLC communications.

Check for corrosion or damage on the 30-pin connector and wiring. If none is found, replace the EC-30™ controller.

30-Pin Connector



E2	Trailer ABS Warning Lamp
A1,A2,A3	Ground

Trailer ABS lamp stays on with no trailer connected to towing vehicle.

See Note this page

With ignition off, remove the 30-pin connector from EC-30™ controller.

With a volt/ohm meter, verify no continuity from trailer ABS warning lamp connector pin to ground. **Refer to figure 13**. Check for corrosion or damage on the 30-pin connector and wiring. If no issues are found, replace the EC-30™ controller.

With a volt/ohm meter, check wiring, trailer ABS warning lamp and fuse. When repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power up sequence. **Go to Section A.**

Note: If there is no wire in pin E2 of the 30-pin connector, the EC-30™ controller is commanding the trailer ABS warning lamp using the J1939 or J1587 serial communications link.

In this configuration, the actual trailer ABS lamp is driven by a vehicle dash controller. Obtain the vehicle manual and verify the wiring and function of the trailer ABS warning lamp.

To verify proper EC-30™ controller communication, **go to Section K.**

SECTION F - DIAGNOSTIC LED QUICK REFERENCE

Comparing your EC-30™ controller to the following images, identify the fault indicated by the diagnostic LEDs and follow the instructions in the related troubleshooting section.

Power

System OK - A solid green VLT LED indicates proper voltage is reaching the EC-30™ controller. If no red LEDs are on, then no faults are detected.

If either the ABS warning lamp or ATC active/warning lamp is on with no red LEDs, **go to Section C or D.**

Voltage Out of Range - A flashing green VLT LED indicates ECU voltage below 9.0 VDC or above 16.0 VDC. The VLT LED will flash until power is brought into normal range. **Go to Section G.**

No Voltage - When the VLT LED is off, the EC-30™ controller is receiving very low or no voltage. The ECU LED may be on in this case. **Go to Section G.**

Wheel Speed Sensor Fault

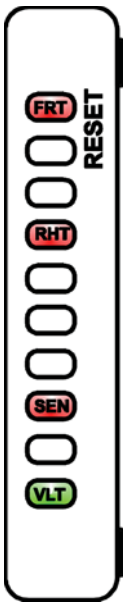
The red SEN LED is on to indicate a fault condition with a wheel speed sensor. The example shown is a front right sensor fault. Troubleshooting and repair are the same for a fault on any wheel speed sensor.

The indicated sensor fault may be a static or dynamic fault.

Static faults are related to wiring or component failures, such as open or short circuits.

Dynamic faults are related to abnormal wheel speed signals or behaviors.

Go to Section H.



ABS Modulator Fault

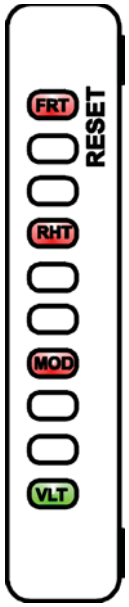
The red MOD LED is on to indicate a fault condition with an ABS modulator. The example shown is a front right modulator fault. Troubleshooting and repair are the same for a fault on any ABS modulator.

The indicated modulator fault may be a static or dynamic fault.

Static faults are related to wiring or component failures, such as open or short circuits.

Dynamic modulator faults are related to abnormal wheel speed behaviors during ABS.

Go to Section I.



ATC Fault

Engine Communication Fault

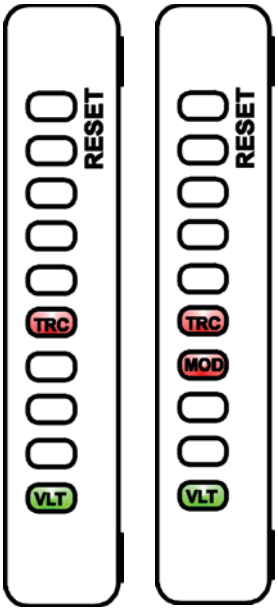
The red TRC LED is on to indicate a communication fault between the EC-30™ controller and the engine controller.

Go to Section K.

ATC Modulator Fault

The red TRC and MOD LEDs are on to indicate a static fault condition with the ATC modulator. Static faults are related to wiring or component failures such as open or short circuits.

Go to Section J.



ECU Fault - The red ECU LED is on to indicate a fault condition internal to the EC-30™ controller. Reset the EC-30™ controller with a magnet. If the fault returns, replace the EC-30™ controller. If the red ECU LED is on and the green VLT LED is off, the EC-30™ controller may have very low voltage.

Magnetic Fault Reset - All LEDs will be on while a magnet is held in place at the RESET location. If one or more LEDs do not come on, replace the EC-30™ controller. Do not reset fault codes until troubleshooting of the indicated component is complete.

SECTION G - TROUBLESHOOTING POWER TO THE EC-30™ CONTROLLER

ABS Warning lamp is on and green VLT LED is off or flashing.

Turn the ignition off and disconnect the 30-pin connector from the EC-30™ controller.

Turn the ignition on and measure voltage between ignition power (pins B1, K2, K3) and ground (pins A1, A2, A3) at the 30-pin connector. It is important to check each power and ground pin combination. The operating range of the EC-30™ controller is 9.0 -16.0 VDC. Verify a measurement equal to battery voltage. (About 12.0 VDC)

YES

Due to corrosion, damage or poor termination, the wiring and/or connectors may be limiting the electrical current flow to the EC-30™ controller. This means that when the EC-30™ controller needs more current, the voltage level may be dropping. In order to measure the voltage under load, place a load, such as a type 1157 stop lamp bulb, between ignition power (pins B1, K2, K3) and ground (pins A1, A2, A3) at the 30-pin connector. While the lamp is in place, measure the voltage across the pins. It is important to check each power and ground pin combination. The operating range of the EC-30 is 9.0-16.0 VDC. Verify a measurement equal to battery voltage. (About 12.0 VDC) The loaded voltage should drop no more than 1.0 VDC from the measured unloaded voltage.

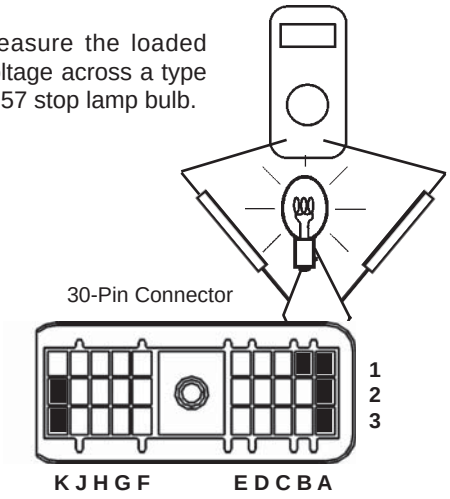
With a volt/ohm meter, check the power and ground wiring. Look for corroded or damaged wires or connectors. If repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power up sequence.
Go to Section A.

If proper loaded and unloaded voltage is measured at the 30-pin connector and no corrosion or damage is found on the EC-30™ controller connector, replace the EC-30™ controller.

NO

With a volt/ohm meter, check the power wiring, ground wiring and fuse. Look for corroded or damaged wires or connectors. When repair is made, reconnect the 30-pin connector to the EC-30™ controller and rerun the power up sequence.
Go to Section A.

Measure the loaded voltage across a type 1157 stop lamp bulb.



A1,A2,A3 Ground
B1,K2,K3 Power

SECTION H - TROUBLESHOOTING WHEEL SPEED SENSORS

SEN LED and ABS warning lamp are on.

Turn ignition off and remove the 30-pin or 18-pin connector from the EC-30™ controller.

Static Wheel Speed Sensor Faults - Using a volt/ohm meter to measure the connector pins of the faulted sensor, verify 1500-2500 OHMS across sensor connector pins. Verify no continuity from sensor connector pins to ground. Verify ignition power is not measured at either sensor connector pins. Check for corroded or damaged sensor and ECU wiring and connectors. Verify proper sensor lead routing and clamping. If a circuit fault is found, isolate the area needing repair by repeating the measurements at all connections in the wheel speed sensor circuit.
Wheel speed sensor fault identified?

YES

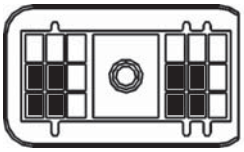
Make repairs to wiring or replace wheel speed sensor. Reconnect all connectors to the EC-30™ controller and sensor. Reset fault codes by briefly holding a magnet in place at the RESET location of the diagnostic display. Then rerun the power up sequence. **Go to Section A.**

NO

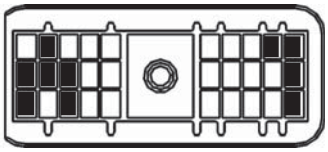
Dynamic Wheel Speed Sensor Faults - Rotate the effected wheel and verify for (a) WS-20 speed sensors, a minimum of 0.8 VAC sensor output @ 1 RPS across the wheel speed sensor pins, or (b) for WS-24 speed sensors, a minimum of 0.250 VAC @ 0.5 RPS. A properly positioned sensor can output more than 2.0 VAC @ 1 RPS. Adjust speed sensors to contact tone ring. Verify condition and retention force of sensor clips. Verify proper sensor lead routing and clamping. Verify sensor leads are twisted pair. Verify condition of tone ring mounting and teeth. Verify proper number of tone ring teeth per sensed wheel. Verify proper adjustment of wheel bearings. Verify condition of foundation brakes.

Make repairs to wheel speed sensor installation. Reconnect all connectors to the EC-30™ controller and sensor. Reset fault codes by briefly holding a magnet in place at the RESET location of the diagnostic display. Then rerun the power up sequence. **Go to Section A.**

18-Pin Connector



30-Pin Connector



B3	Right Mid WS -	H3	Right Front WS -
B2	Right Mid WS +	H2	Right Front WS +
C3	Left Mid WS -	J2	Left Front WS -
C2	Left Mid WS +	J1	Left Front WS +
E3	Right Rear WS -	A1,A2,A3	Ground
E2	Right Rear WS +	B1,K2,K3	Power
F3	Left Rear WS -		
F2	Left Rear WS +		

SECTION I - TROUBLESHOOTING ABS MODULATORS

MOD LED and ABS warning lamp are on.

Turn the ignition off and remove the 30-pin or 18-pin connector from the EC-30™ controller.

Static ABS Modulator Faults. For (a) M-30 modulator verify 3.5 to 5.0 OHMS across Hold to Common connector pins, 3.5 to 5.0 OHMS across Exhaust to Common connector pins, and 7.0 to 10.0 OHMS across Exhaust to Hold connector pins, or for (b) M-32 modulator verify 4.9 to 5.5 OHMS across Hold to Source connector pins, 4.9 to 5.5 OHMS across Exhaust to Source connector pins, and 9.8 to 11.0 OHMS across Exhaust to Hold connector pins. Verify no continuity from modulator connector pins to ground. Verify ignition power is not measured at any modulator connector pins. Check for corroded or damaged modulator wiring and connections. If a circuit fault is found, isolate the area needing repair by repeating the measurements at all connections in the ABS modulator circuit.
ABS modulator fault identified?

YES

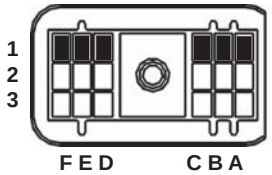
Make repairs to wiring or replace ABS modulator. Reconnect all connectors to the EC-30™ controller and ABS modulator. Reset fault codes by briefly holding a magnet in place at the RESET location of the diagnostic display. Then rerun the power up sequence. **Go to Section A.**

NO

Dynamic ABS Modulator Faults
- Verify proper modulator activation with brake pressure applied at power-up (chuff test) and/or using diagnostic tool. Check for dragging brakes, dry bearings, faulty return springs, parking brake system faults, restricted brake air lines, over adjusted slacks, out-of-round drums or damaged/loose tone rings.

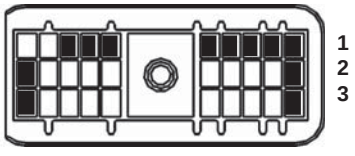
Make repairs to ABS modulator installation or wheel end. Reconnect all connectors to the EC-30™ controller and ABS modulator. Reset fault codes by briefly holding a magnet in place at the RESET location of the diagnostic display. Then rerun the power up sequence.
Go to Section A.

18-Pin Connector



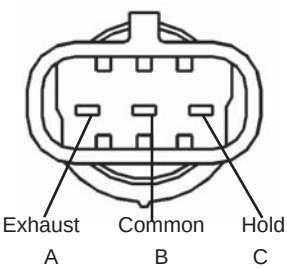
F1	Left Rear Mod Common
D1	Left Rear Mod Exhaust
E1	Left Rear Mod Hold
A1	Right Rear Mod Common
C1	Right Rear Mod Exhaust
B1	Right Rear Mod Hold

30-Pin Connector



H1	Left Front Mod Common
F1	Left Front Mod Exhaust
G1	Left Front Mod Hold
C1	Right Front Mod Common
E1	Right Front Mod Exhaust
D1	Right Front Mod Hold
A1,A2,A3	Ground
B1,K2,K3	Power

Electrical connector on the M-30™, M-22™ or M-22™ Modulator



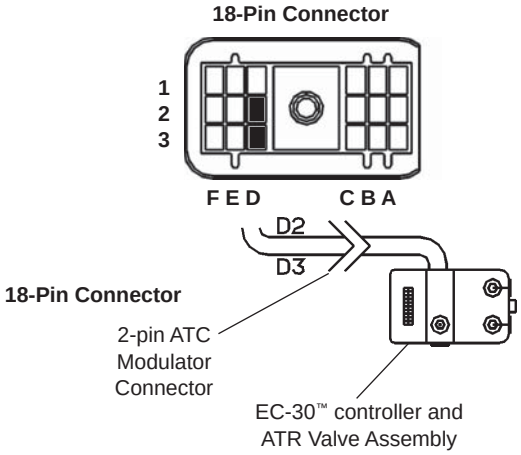
SECTION J - TROUBLESHOOTING THE ATC MODULATOR

TRC and MOD LEDs and ATC active/warning lamp are on.

Turn the ignition off and remove the 18-pin connector from the EC-30™ controller.

Verify 10.0 to 12.0 OHMS across the ATC modulator leads. Verify no continuity from ATC modulator connector pins to ground. Verify +12 VDC is not measured at any ATC modulator connector pins. Check for corroded or damaged ATC modulator wiring and connectors. If a circuit fault is found, isolate the area needing repair by repeating the measurements at all connections in the ATC modulator circuit.

Make repairs to wiring or replace ATC modulator. Reconnect all connectors to the EC-30™ controller and ATC modulator. Reset fault codes by briefly holding a magnet in place at the RESET location of the diagnostic display. Then rerun the power-up sequence. **Go to Section A.**



SECTION K - TROUBLESHOOTING EC-30™ CONTROLLER SERIAL COMMUNICATION

TRC LED and ATC active/warning lamp are on.

Verify proper operation of the electronic engine controller.

Turn ignition off and remove the 30-pin connector from the EC-30™ controller. Also remove the 2- or 3-pin connector at engine controller.

For vehicles using **J1939**, verify continuity between the 30-pin connector (pins C3, D2, D3) and the 3-pin engine or dash controller connector.

For vehicles using **J1922**, verify wire continuity between the 30-pin connector (pins B2, B3) and the 2-pin engine or dash controller connector.

For vehicles using **J1587**, verify wire continuity between the 30-pin connector (pins G2, G3) and the 2-pin dash controller connector.

Verify no continuity from serial communication pins to ground (except pin D2). Verify +12 VDC is not measured at any serial communication pin. Check for corroded or damaged serial communication wiring and connections. If a circuit fault is found, isolate the area needing repair by repeating the measurements at all serial communication link connectors.

Make repairs to serial communication wiring. Reconnect all connectors to the EC-30™ controller and engine. Reset any fault codes by briefly holding a magnet in place at the RESET location of the diagnostic display. Then rerun the power-up sequence. **Go to Sections A and B.**

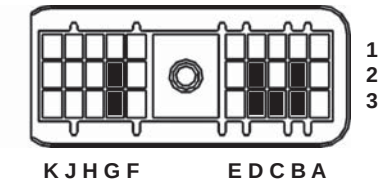
Warning lamp(s) controlled by serial communication link not functioning properly.

If the EC-30™ controller has just been configured or replaced, verify that the EC-30™ controller is configured to operate the warning lamp(s) using the appropriate serial communications link. The Bendix ABS Diagnostic Software program will be needed to verify this level of configuration. If the EC-30™ controller was replaced with the correct replacement part number, this step is not necessary.

If the EC-30™ controller is configured properly, verify proper operation of the vehicle dash controller.

Turn ignition off and remove the 30-pin connector from the EC-30™ controller. Also remove the dash controller connector.

30-Pin Connector



C3 Engine Communication, J1939 H
D3 Engine Communication, J1939 L
D2 Engine Communication, J1939 Shield

B2 Engine Communication, J1922 +
B3 Engine Communication, J1922 -

G2 Diagnostic, J1587, Serial A
G3 Diagnostic, J1587, Serial B

NOTES