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## Gateway<sup>AI</sup> (GTWY401-B1) - Installation Instructions

**Ford Econoline Gas/Diesel 2005-2010**  
**Ford F-Series 5.4L, 6.4L, 6.8L 2008-2010**  
**Chevy 610 6.0 Gas 2008-2010**  
**Chevy 610 6.6L Diesel 2006-2010**  
**GMT 560 6.6L Diesel 2006-2010**

It is not necessary to cut any OEM wires during the installation of the wire harnesses. Always disconnect the battery before installing any electrical devices.

*It is imperative that each harness be installed into the correct module connector, or damage to the module will result. The connections are color coded to assist with proper installation.*

### Gateway module installation

- Ensure that the ignition is in the OFF position.
- Determine if the ambient temperature in the area of the module is at or above 150 °F during system operation. If so, determine the external heat source. This will typically be caused by engine heat if the module is mounted near the engine cover or hot air being supplied by the heater ducts. Locate the module in an area away from the external heat sources.
- Identify each harness connector before installation into the Gateway module.
- **Do not** simply match up the number of pins in a harness connector with the number of pins in a module connector receptacle. There are several 6-pin connections on the harness and module that, if swapped, may cause permanent module damage.
- The harness will have a colored tape on the module connector end that will identify which module receptacle to plug it into. The color of the tape on the harness should be matched up to the color of the lettering that identifies the connector receptacles on the module.

## Gateway Module Suggested Mounting – 2009 Ford Econoline



- Mount the Gateway module above the foam knee bolster which is attached to the lower dash panel.
- Secure the control module using 2-sided foam tape.
- Verify that the harnesses are routed such that the tilt steering column will not contact them in the full down position.
- When installing the harnesses, leave several inches of take out such that the lower dash panel can be removed if necessary.

## Gateway Module Suggested Mounting – 2007-2008 Ford Econoline



- Mount the Gateway module above the foam knee bolster which is attached to the lower dash panel.
- Secure the control module using 2-sided foam tape.
- Verify that the harnesses are routed such that the tilt steering column will not contact them in the full down position.

## Module Suggested Mounting – 2005-2006 Ford Econoline



- Mount the Gateway module on the left side of driver knee bolster bracket.
- Secure the control module behind the lower dash panel using 2-sided foam tape, self tapping screws, or wire ties.

## GM/Chevy Applications Suggested Mounting

- There are several mounting options, however, the module must not be installed in the direct flow of heater ducts, or too close to the engine compartment, as excessive heat can cause the module to reset.
- Secure the control module in its mounting location using 2-sided foam tape or screws.

## **DATA LINK HARNESS (6-Pin Connector - Red)**

- Locate the vehicle Data Link Connector. It will be mounted below the lower dash panel on the driver's side. (See photo).
- Ensure the connection is fully seated and secure with the supplied nylon wire tie.
- Check to see that the mounting for the black connector from the Gateway<sup>AI</sup> Data Link Harness is where the vehicle OEM Data Link Connector originally was.
- Secure the Data Link Harness such that it does not hang below the lower dash panel.
- Plug the 6 pin connector from the Data Link Harness (red tape) into the connector labeled in red, "Data Link" on the Control Module.
- Attach the ground eyelet from the Data Link Harness to a known good ground.
- The white two pin connector in this harness is only used when installing lift interlock kit ILIS501-H5 for 2009 Ford Econoline.



## **CONTROL/LED DISPLAY PANEL (6-Pin Connector - Blue)**

- Locate a suitable position on the dashboard, within view of the driver for the mounting of the Control/LED Display Panel. The length of the display harness is 40".
- This is the maximum distance the display can be from the Control Module.
- Drill a 3/4" hole in the dashboard where you wish the center of the display to be.
- Attach the blue taped end of the LED harness to the Control Module in the connector labeled in blue, "AFIS LED". Run the other end of the harness under the dash and out through the 3/4" hole.
- Attach the end of the display harness to the Control/LED Display Panel.
- Ensure panel is level, and secure using the supplied screws.

## **Reconnect vehicle battery.**

## **Check system for proper operation** (see Post-Installation Instructions).

**Technical inquiries** – InterMotive Technical Support (530) 823-1048



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## Gateway – OEM Input / Output Plug

The Gateway<sup>AI</sup> has an optional I/O Port. This port is available to send or receive data with the vehicle body. Provided is a four pin connector (green) and 5 terminals (1 extra). The available Input/Outputs can be specified by Bus OEM's. If a custom configuration is not specified, the Gateway<sup>AI</sup> comes with a standard configuration. The actual Input/Outputs will be denoted on a label on the side of the module. The standard configuration is as follows:

P1: 2.2Hz/mph - Connector Pin #1. This output is the vehicle speed reported in the same format as Ford's OEM vehicle speed signal. (2.2 Hz Per/MPH).

P2: VSS<2 – Connector Pin #2. This output will provide a ground whenever vehicle speed is less than 2 mph.

P3: Vbat<12 – Connector Pin #3. This output will provide a ground whenever battery voltage is less than 12Volts.

P4: F/I input – Connector Pin #4. This will allow fast idle activation from a location other than the standard AFIS LED Panel. This is accomplished by providing an external ground signal to this Pin.

To install, crimp the OEM circuits to the provided terminals and install them into the correct Pin location. The largest allowable wire that can be used with these terminals is 16GA. The pin #'s are located on the back of the 4 pin connector. Finally, snap the connector into the port labeled in green, "I/O Port". It is imperative that this harness be installed into the correct module connector, or damage to the module will result. Check for proper operation.

**Note: These circuits are designed for low current usage. The outputs can drive one standard automotive relay coil, but any current draw above 500 milliamps will result in damage to the Gateway<sup>AI</sup> module.**



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## Gateway<sup>AI</sup> (GTWY401-B1) – Post Installation Testing

### **THE FOLLOWING PROCEDURE MUST BE PERFORMED TO VERIFY PROPER INSTALLATION:**

1. Place transmission in the “Park” position and start engine.
2. Verify LED prove-out on AFIS LED Status Panel. Both upper LEDs should illuminate for approximately two (2) seconds upon initial power on and then automatically turn off. (Check vehicle voltage if the Red “LOW VOLTAGE” LED remains illuminated. Vehicle voltage is being read as less than the minimum voltage.) This voltage varies based on the requested configuration of each bus manufacturer. Contact the bus manufacturer to determine your minimum voltage setting. Vehicle voltage must remain above the minimum setting for the remaining steps.
3. Manually engage fast idle by pressing the Engage button on the LED display panel. If currently in automatic fast idle mode, press on service brake pedal while simultaneously pressing the manual engage switch. This will end the automatic fast idle. Then shift vehicle out of park and back into park and press the Engage button to enter manual fast idle mode.
4. Engine speed should increase and the Green LED should automatically illuminate. If this does not occur, check for loose connections at the Gateway<sup>AI</sup> Control Module or the vehicle Data Link Connector.
5. Depress the service brake for 1 second. Fast idle will temporarily stop anytime the brake pedal is depressed, but will automatically reengage after approximately 2 seconds once the brake pedal is released. Exit fast idle by depressing the service brake pedal while simultaneously pressing the manual engage switch. Fast idle should cancel and the Green LED should turn off.
6. Place wheel chocks at front and rear of one tire and set the Park Brake. Place transmission shift lever in the “Neutral” position. Attempt to manually engage fast idle. The system should not activate.
7. Place transmission shift lever in the “Park” position and turn off the engine.
8. Verify that all active LED’s turn off after several minutes.
9. The AFIS option of Gateway<sup>AI</sup> is properly installed only if it passes all of the above steps.
10. Fill out online warranty registration card at [www.intermotive.net](http://www.intermotive.net) and return to InterMotive Vehicle Controls.

*If any irregular operational issues persist, contact InterMotive Vehicle Controls at 530-346-1801 for technical assistance.*



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## Gateway<sup>AI</sup> (GTWY401-B1) – Operating Instructions

### GATEWAY<sup>AI</sup>

The Gateway<sup>AI</sup> is a sophisticated module designed to obtain real-time data from the onboard vehicle data port and use the received information for intelligent control applications. Ford/GM specific chassis data is obtained by communicating across the Ford/GM onboard Controller Area Network (CAN) data network.

The Gateway<sup>AI</sup> is designed for both fixed and custom control applications. The fixed control applications included in all Gateway<sup>AI</sup> modules are options for an Advanced Fast Idle System (AFIS) and an Intelligent Lift Interlock System (ILIS). Customization is available by way of an external 4-pin Input/Output port that is configured to meet each user's requirements.

#### **Gateway Operation:**

The Gateway<sup>AI</sup> initializes when the vehicle ignition is on. On 2009 Model Year vehicles, the Gateway will also initialize with the vehicle ignition off, if the wheelchair lift door is open and the vehicle is equipped with an optional InterMotive Intelligent Lift Interlock System. During initialization, LED display panels connected to the Gateway<sup>AI</sup> perform prove-out for 2 seconds. After the initialization, the Gateway<sup>AI</sup> requests various vehicle data by sending data request messages across the OEM CAN diagnostic data network and all control logic is performed. When the Gateway<sup>AI</sup> module has been running and the vehicle ignition is turned to the off or accessory positions and the wheelchair lift door is closed, the connected LED panels may remain illuminated for up to several minutes before the Gateway<sup>AI</sup> module goes into a low current consumption "sleep" mode. **Note: If installed on 2009 Model Year vehicles and equipped with an InterMotive Intelligent Lift Interlock System, the wheelchair lift doors must be closed in order for the Gateway to return to sleep mode.**

The Gateway<sup>AI</sup> module obtains data from the onboard vehicle data port. In order to not interfere with a possible scan tool communication, the Gateway<sup>AI</sup> will refrain from transmitting CAN messages for 10 seconds if a scan tool CAN communication is detected. If during these 10 seconds another scan tool message is received, an additional 10 seconds will be added to the end of the first 10 second timeout. When no scan tool messages have been received for at least 10 seconds, the Gateway<sup>AI</sup> module will restart communication.

The Gateway<sup>AI</sup> retransmits obtained vehicle data across the SAE J1939-based InterMotive proprietary Merlin Multiplex Network. In this way, vehicle data may be shared with other InterMotive modules attached to the communication network.

### ADVANCED FAST IDLE OPTION

The Advanced Fast-Idle System (AFIS) option of the Gateway<sup>AI</sup> includes Charge-Protect as well as Fully-Automatic and Manual engage modes. Charge-Protect is a feature that maintains vehicle charging system voltage by increasing and controlling vehicle idle speed when necessary. Whenever charging system voltage falls below a minimum voltage (determined by each bus manufacturer) for 2 seconds, this AFIS feature will increase idle speed and maintain fast idle until one of the safety conditions is no longer met or the voltage is raised above the minimum level.. The Fully-Automatic and Manual engage modes also require that all safety conditions are met.

### Safety conditions that must be met to engage or maintain Fast Idle operation

- Vehicle NOT moving (speed = 0 MPH).
- Service Brake NOT pressed.
- Vehicle Transmission Range in Park
- RPM inside of safe operating range.
- Transmission Fluid Temperature below 250° F.
- Engine Coolant Temperature below 230° F.

### **Control/Display Panel:**

The AFIS Control/Display Panel consists of two LED's and a Manual Engage Switch. The red LED will illuminate whenever charging system voltage is less than minimum level. The green LED will illuminate when Fast Idle is in progress. When the vehicle's ignition switch is first turned on, both LED's will illuminate for 2 seconds as a proveout of proper LED operation. The LED's are also used for diagnostic code retrieval by an authorized service technician. The Manual Engage Switch can be used to engage Fast Idle operation if the voltage is above the minimum level and all safety conditions are met.

### **Fast Idle Operation:**

Fast Idle may be initiated by either a manual or automatic Fast Idle trigger. The AFIS strategy can only command elevated idle when certain safety conditions are met (see section above). Fast Idle operation can be terminated by a safety condition violation, a Merlin Multiplex Network Command, or an automatic Fast Idle disengagement trigger. An automatic Fast Idle disengagement trigger will only act if the vehicle is in the particular type of automatic Fast Idle corresponding with the disengagement trigger. If an automatic Fast Idle is in progress and an automatic Fast Idle disengagement trigger occurs that would cause the Fast Idle to cease, yet there is a different pending automatic Fast Idle trigger, Fast Idle operation will NOT cease. In this case, automatic Fast Idle will continue under the new automatic Fast Idle triggering condition. If a Fast Idle Operation terminates due to an automatic Fast Idle disengagement trigger, automatic Fast Idle is available pending another automatic trigger. If a Fast Idle operation terminates due to a safety condition violation, automatic Fast Idle is unavailable until Park is de-asserted and re-asserted. (Shift out of Park and back into Park). If manual Fast Idle is triggered while Fast Idle operation is in progress due to an automatic Fast Idle trigger, the firmware will switch to a manual Fast Idle mode of operation.

The base Fast Idle RPM level is determined by the type of engine (Gas or Diesel) in the vehicle. For Gas engine vehicles, the idle speed is 1500 RPM and may be increased in increments of 100 RPM by subsequent presses of the manual engage button up to a maximum of 2000 RPM. Diesel applications remain fixed at 1200 RPM.

### Manual Fast Idle Start Triggers:

- Manual Engage Switch.
- Merlin Multiplex Network Command.
- Fast Idle Input – ground applied to I/O Pin 4 of the Gateway<sup>AI</sup> Module, such as an input from Coach AC (OPTIONAL)

### Automatic Fast Idle Start Triggers:

- Charge Protection - Battery voltage stays below minimum voltage for 2 seconds and engine running for 5 seconds.
- Chassis A/C Boost - OEM A/C commanded on with ambient temperature above 70° F and engine running for at least 5 seconds.
- Heater Boost – Ambient air temperature below 70° F and Engine Coolant Temperature below 170° F.

### Fast Idle Disengagement Triggers:

- Safety Condition Violation.
- Merlin Multiplex Network Command.
- Battery Voltage > 0.5 volts above minimum voltage setting. (Automatic Fast Idle Disengagement Trigger – Active only in Charge Protect mode).
- Cab A/C Commanded Off (Automatic Fast Idle Disengagement Trigger – Active only in Cab A/C Boost mode).

- Coach A/C Commanded Off (Automatic Fast Idle Disengagement Trigger – Active only in Coach A/C Boost mode).
- Engine Coolant Temperature > 190° F (Automatic Fast Idle Disengagement Trigger – Active only in Heater Boost mode).
- Open or battery voltage on I/O pin 4 while in Fast Idle caused by I/O Pin 4 fast idle input. (OPTIONAL)
- Transmission Fluid Temperature above 250° F.

**Note: Fast idle will temporarily stop anytime the brake pedal is depressed, but will automatically reengage after approximately 2 seconds once the brake pedal is released. Fast idle may be manually cancelled by depressing the service brake pedal while simultaneously pressing the manual engage switch.**

Manual Operation:

To manually engage Fast Idle, the manual engagement switch must be pressed for at least a quarter second and released. The Fast Idle operation will begin when the button is released, not when first pressed. Holding the switch for more than five seconds will initiate a diagnostic routine that displays stored status codes from previous operations. If the driver accidentally enters this routine, it can be exited by cycling the vehicle's ignition off and then back on. To exit Fast Idle operation, the driver can simply depress the service brake pedal while simultaneously pressing the manual engage switch.

*Note: When additional electrical or A/C loads are in use, engine RPM may drop. The AFIS Dynamic Load Response feature will then raise the RPM back up to the fast idle speed. When the load is removed, engine RPM will increase. AFIS will then lower the RPM back to the fast idle speed. This may be more noticeable on cold engine startup.*





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## Gateway<sup>AI</sup> (GTWY401-B1) – Diagnostics for AFIS Option

Before beginning diagnostics make sure the technician has thoroughly reviewed the Gateway<sup>AI</sup> installation instructions as well as the Gateway<sup>AI</sup> operating instructions. Both are available on [www.intermotive.net](http://www.intermotive.net) or by contacting InterMotive at 530-823-1048.

### LED's don't proveout on initial start-up.

- Ensure LED harness is fully seated in Gateway<sup>AI</sup> module.
- Ensure 6-Pin Data Link Connector is fully seated in the Gateway<sup>AI</sup> module.
- Ensure Data Link Harness Connector is fully seated to the vehicle Data Link (below dash panel).

### LED's flash alternately and fast idle does not operate.

- No CAN communication with vehicle. Ensure 6-Pin Data Link Connector is fully seated in the Gateway<sup>AI</sup> module. Ensure Data Link Harness Connector is fully seated to the vehicle Data Link (below dash panel).
- Vehicle does not have a valid VIN # in the powertrain control module (PCM). PCM must have proper VIN programmed in by OEM Dealer.

### LED's proveout but vehicle will not enter, or does not complete Fast Idle mode

- Verify all safety conditions are met.
- Check for Diagnostic Trouble Codes.

To display Diagnostic Trouble Codes on the Red LED, the technician must turn off the vehicle ignition, continuously press the manual engage switch while turning the ignition back on. Keep the switch pressed until the red and green LED's turn on and then off. The switch can now be released and codes can be retrieved. A 2-digit code is displayed by flashing the first digit, waiting one second, flashing the second digit, and then waiting four seconds before another code is displayed. For example, if the status code was 2-4, the Red LED would flash two times, be off for one second, flash four times, and then be off for four seconds. Codes in *Italics* are functional only if the associated option is included in the Gateway<sup>AI</sup> configuration. If codes are received check all connections in the Gateway<sup>AI</sup> system. These codes and their meanings are summarized in Table 1 on the next page. These codes are real time codes and may change due to changes on the vehicle.

<b>Code</b>	<b>Meaning</b>
1-1	Safety Conditions Met, Ready for First Fast Idle
1-2	Safety Conditions Met, Fast Idle Complete due to Vehicle Speed
1-3	<i>Safety Conditions Met, Fast Idle Complete due to Timeout</i>
1-4	Safety Conditions Met, Fast Idle Complete due to Transmission Fluid Temperature
1-5	<i>Safety Conditions Met, Fast Idle Complete due to Parking Brake</i>
1-6	Safety Conditions Met, Fast Idle Complete due to RPM
1-7	Safety Conditions Met, Fast Idle Complete due to Gear \ Clutch Position
1-8	Safety Conditions Met, Fast Idle Complete due to Service Brake
1-9	Safety Conditions Met, Fast Idle Complete due to Engine Coolant Temperature
1-10	Safety Conditions Met, Fast Idle Complete due to Battery Voltage > 13 V while in Charge Protection
1-11	Safety Conditions Met, Fast Idle Complete due to Cab A/C Commanded OFF while in Cab A/C Boost
1-12	<i>Safety Conditions Met, Fast Idle Complete due to Coach A/C Commanded OFF while in Coach A/C Boost</i>
1-13	Safety Conditions Met, Fast Idle Complete due to ECT > 190° F while in Heater Boost
1-14	Safety Conditions Met, Fast Idle Complete due to Merlin Command.
1-15	<i>Safety Conditions Met, Fast Idle Complete due to Open or Battery voltage on I/O Pin 4 Fast Idle input</i>
2-1	Fast Idle In Progress Due to Manual Engage Switch
2-2	Fast Idle In Progress Due to Merlin Command
2-3	<i>Fast Idle In Progress Due to PTO Command</i>
2-4	Fast Idle In Progress Due to Charge Protection (Battery Voltage < 11.5 V)
2-5	Fast Idle In Progress Due to Cab A/C Boost (Ford A/C ON with IAT > 70° F)
2-6	<i>Fast Idle In Progress Due to Coach A/C Boost (Coach A/C ON with IAT &gt; 70° F)</i>
2-7	Fast Idle In Progress Due to Heater Boost (ECT < 170° F and IAT < 70° F)
2-8	<i>Fast Idle In Progress Due to grounded input on I/O Pin 4 (IF ENABLED AS A FAST IDLE INPUT)</i>
3-1	RPM too Low for Fast Idle
3-2	RPM too High for Fast Idle
3-3	Gear / Clutch Position Incorrect for Fast Idle
3-4	Vehicle Speed Incorrect for Fast Idle
3-5	Service Brake Incorrect for Fast Idle
3-6	Transmission Fluid Temp too High for Fast Idle
3-7	<i>Park Brake Incorrect for Fast Idle</i>
3-8	Engine Coolant Temperature too High for Fast Idle
5-3	Valid VIN not detected
6-1	Ford CAN Network Communication Failure
9-1	Scan Tool Detected, Module Temporarily Disabled

**Table 1: Diagnostic Trouble Codes**

## Vehicle intermittently drops out of Fast Idle mode, but currently works properly

- Check for Fast Idle Stop Codes.

To aid in troubleshooting intermittent concerns, the Gateway<sup>AI</sup> system stores the last five Fast Idle Stop Codes in non-volatile memory. Thus if a Fast Idle operation terminates unexpectedly, the technician can determine the cause. To initiate this feature, turn on vehicle ignition, wait until LED's proveout, and then press and hold the manual-engage switch continuously for at least five seconds. The red and green LED's will flash after 5 seconds. Release the switch and the five most recent stop codes will be read sequentially from the most recent to the oldest. A code is displayed by flashing the first digit, waiting one second, flashing the second digit, and then waiting four seconds before another code is displayed. For example if the Fast Idle Stop Code was 18, the green LED would flash one time, be turned off for one second, flash eight more times, and then remain off for four seconds. After the codes have been displayed, the LED's flash and normal operation resumes. If codes are received check all connections in the Gateway<sup>AI</sup> system. Codes in *Italics* are functional only if the associated option is included in the Gateway<sup>AI</sup> configuration. The Fast Idle Stop Codes are listed in Table 2.

Code	Meaning
1-2	Fast Idle Complete due to Vehicle Speed
1-4	Fast Idle Complete due to Transmission Fluid Temperature
1-6	Fast Idle Complete due to RPM
1-7	Fast Idle Complete due to Gear \ Clutch Position
1-8	Fast Idle Complete due to Service Brake
1-9	Fast Idle Complete due to Engine Coolant Temperature
1-10	Fast Idle Complete due to Battery Voltage > 13 Volts while in Charge Protection
1-11	Fast Idle Complete due to Cab A/C Commanded OFF while in Cab A/C Boost
1-13	Fast Idle Complete due to ECT > 170° For Air Temp > 70° F while in Heater Boost
1-14	Fast Idle Complete due to Merlin Command.
1-15	<i>Fast Idle Complete due to Open or Battery voltage on I/O Pin 4 Fast Idle input</i>

Table 2: Stop Codes

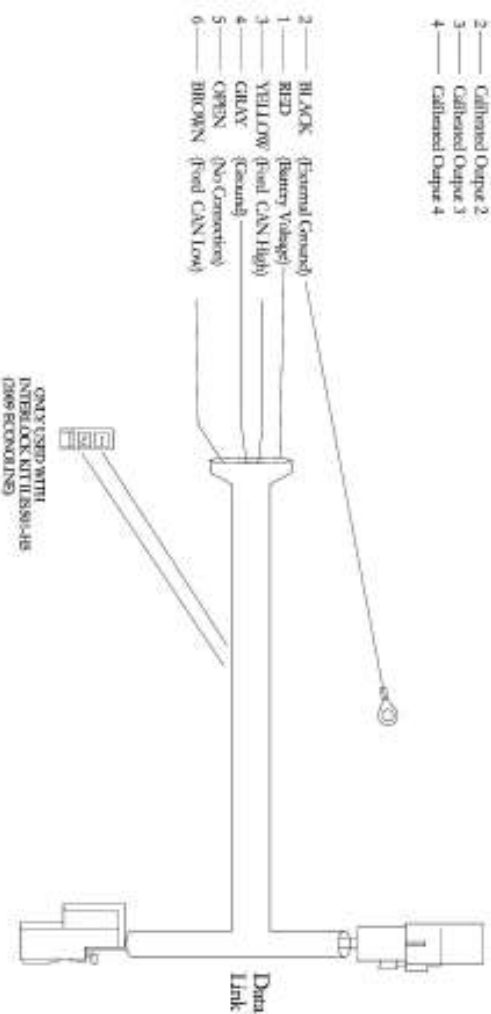
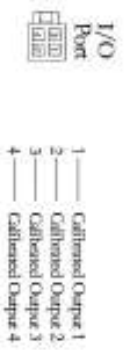
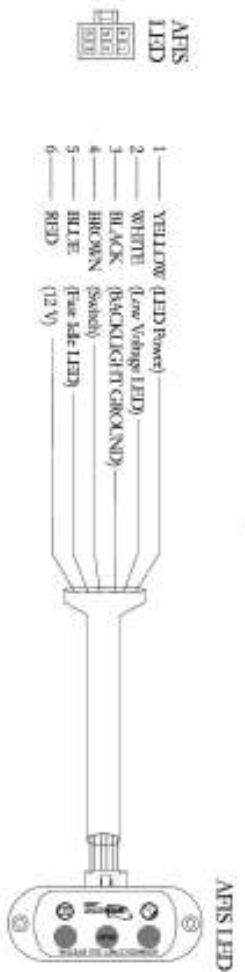
If further assistance is required, contact InterMotive at (530) 823-1048. Be sure to write down any Diagnostic Trouble Codes or Fast Idle Stop Codes received so that you can provide them to the InterMotive Engineer.

A B C D E F G H I J K L M N O P Q R S T U

REVISIONS

DATE: CHANGE:

# Gateway AI



PRODUCT:

# GATEWAY AI

DRAWN BY:	BRUCE HODGE	PART NO.:	GTWY401-B1
DATE DRAWN:	09/29/08	CHECK BY:	K THOMAS
DATE CHECKED:	09/29/08		