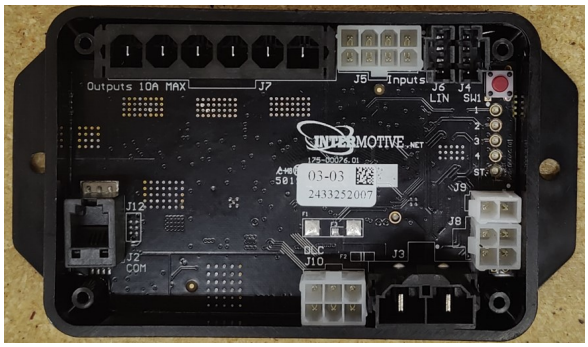
SBF401-A
School Bus Flasher Module

This product is not vehicle specific

Introduction

The Bus Flasher is designed to indicate a bus approaching a stop to other drivers on the road. The module will control flashing function of Amber warning and red stop lights. The module will also control the operation of Stop Arm and Cross Guard systems as required by application specific installation.



SBF401 Enclosure

The SBF401-A is housed in a low profile enclosure that gives backing support and insulation to the board while allowing air flow over the board.

Modes of Operation

The module can be used as a peripheral device to the Intermotive FlexTech system with a proprietary LIN protocol; or can be used as a stand-alone system that uses discrete inputs to monitor vehicle status.

FlexFlash Operation

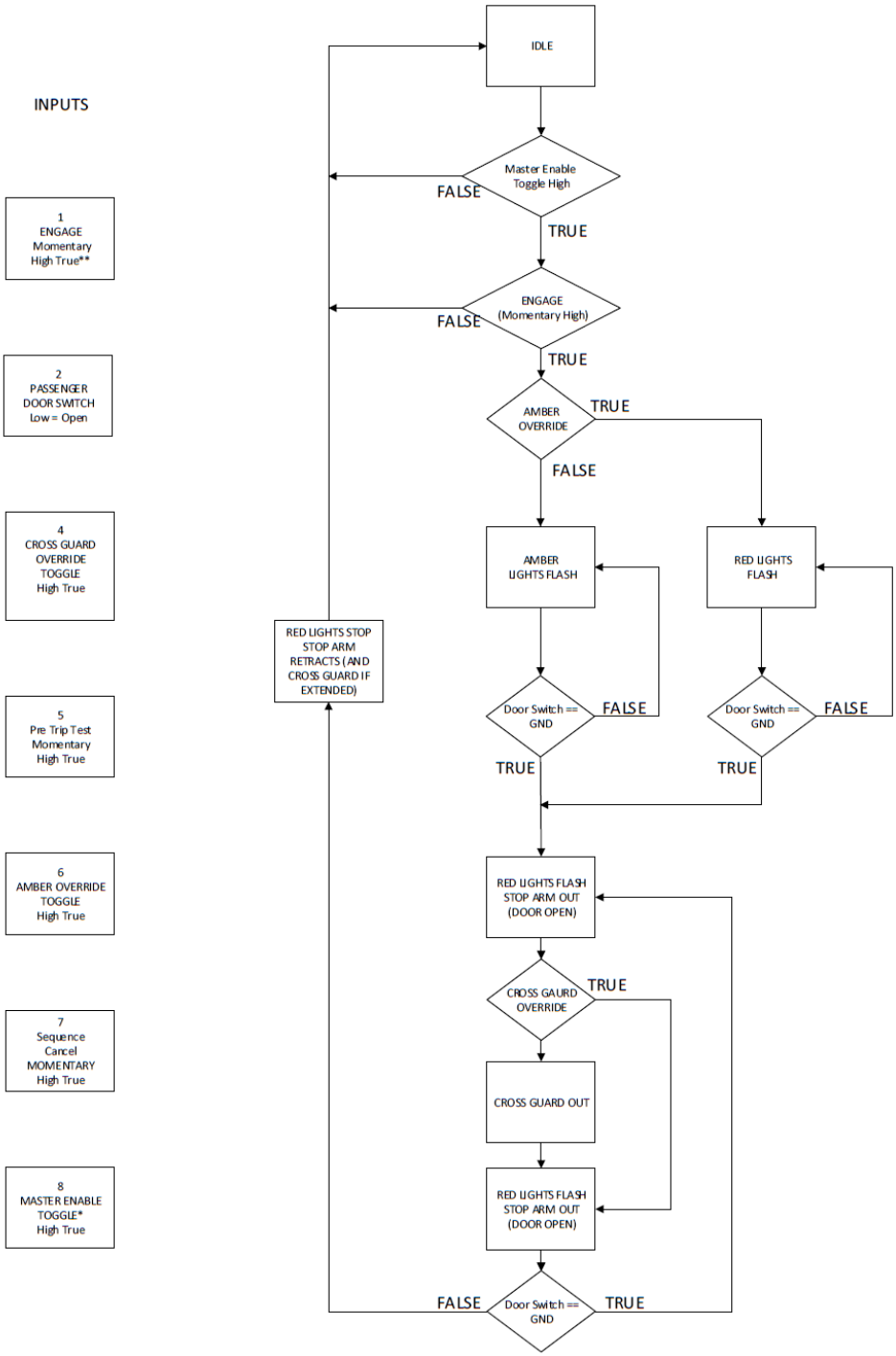
Using the SBF401 in conjunction with a FlexTech system provides the additional capability of using existing vehicle information, such as factory door status, as input/triggers to the bus flasher module functions via the FlexTech Programming Utility.

Stand alone Operation

The module will detect discrete signals and control light and stop arm(s) motor. Discrete signal and condition data included:

Master Switch on/off (Toggle, High True):	Enable the module and put it in idle mode, ready for operation.
Engage (Momentary, High True):	Starts the flashing light sequence.
Amber Override (Toggle, High True):	On engage move directly to red light flashing mode until the passenger door is opened and closed.
Passenger Door Open (Toggle, Low TRUE):	In amber light flashing mode, opening the passenger door will enable red light flashing mode. In red light flashing mode closing the door will cause the red lights to stop flashing and signal motor control to retract the stop arm (and crossing guard if required), the module will return to the idle state.
Cross Guard Override (Toggle, High True):	When set high the cross guard will not be actuated by red light flashing mode.
Cancel (Momentary, High True):	Cancels current sequence and returns to idle.
Pre Trip Test (Momentary, High True):	Starts the Pre-Trip diagnostic sequence.

SBF401-A
School Bus Flasher Trigger Flow



NOTE: *If at Any time of operation the MASTER ENABLE is toggled low the bus flasher module will return to and remain in the idle state until it is set high again.
**If Sequence cancel is implemented a momentary high true will return the module to the idle state at any point in the sequence.

Installation Instructions

Disconnect the battery before proceeding with the installation.

WARNING
Disconnect the battery to prevent setting a check engine light.

IMPORTANT—READ BEFORE INSTALLATION

It is the installer's responsibility to route and secure all wiring harnesses where they cannot be damaged by sharp objects, mechanical moving parts or high heat sources. Failure to do so could result in damage to the system or vehicle, and create possible safety concerns for the operator and passengers. Avoid placing the module where it could encounter strong magnetic fields from high current cabling connected to motors, solenoids, etc. Avoid radio frequency energy from antennas or inverters next to the module. Avoid high voltage spikes in vehicle wiring by always using diode clamped relays when installing upfitter circuits.

SBF401-A Module

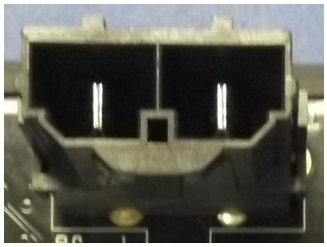
Find a suitable location to mount the SBF401-A module. Do not mount the module where it will be exposed to excessive heat. Do not mount the module until all wire harnesses are routed and secure. The last step of the installation is to mount the module. There is a drawing on the last page of these instructions that shows where each connector is located on the module. Consider this when picking the location and orientation of the module and the wiring harnesses such that connecting and mounting of the module does not stress the wiring harnesses.

Power Connection

Connect a 30A Max fused VBAT source to the 2-pin Molex Mini-Fit Senior connector J3. This connector is designed for a maximum wire size of 8 AWG which will allow over 40A. Smaller wire size can be used if the outputs being driven by the SBF total to a smaller current. The smallest wire size the connector pins can use is 16 AWG which will allow a total of 13A. Use a wire size and in-line fuse that will supply the combined output loads plus about 0.5A. See the table below. The installer ***must*** provide strain relief on the cable outside of the SBF's enclosure. It is recommended that the strain relief is within 6" of the enclosure. The absence of strain relief could result in damage to the module.

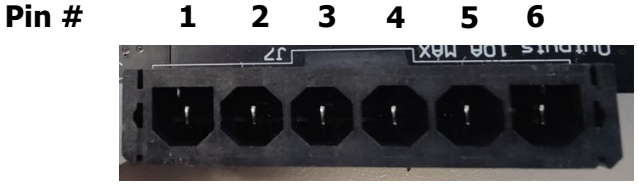
Wire Size AWG	Female Pin Molex Part #	Maximum Current (A)
16	42815-0042	13
14	42815-0042	17
12	42815-0012	23
10	42815-0012	33
8	42815-0032	45

Pin # **1** **2**
Ground **Power**



6-Pin SBF401-High Current Output Connector Pin-Out Definition

Connector J7 contains the 6 SBF401-A HCO output pins. These 6 HCO pins are connected to MOSFET outputs to drive Flashing Lights and Stop Arm/Crossing guard safety equipment. Each output is capable of 10A maximum. **The SBF401-A module has an absolute maximum current rating of 30A across these 6 outputs.**



6 Pin Output Connector

The 6 MOSFET output pins on connector J7 are defined as follows:

- Pin #1 - SBF Amber Left
- Pin #2 - SBF Amber Right
- Pin #3 - SBF Red Left
- Pin #4 - SBF Red Right
- Pin #5 - Stop Arm
- Pin #6 - Crossing Guard

Connect the desired outputs to vehicle equipment as needed.

4-Pin & 2-Pin SBF401-A LCO Connector Pin-Out Definition

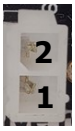
Connectors J8 & J9 contain the SBF401-A's 6 low current output (LCO) pins. Each output is rated at 1A, and is intended to drive relay coils or other low current loads. **Note: when driving relays, a diode-protected type must be used. InterMotive recommends Digi-Key #PB682-ND Relay.**

J8

4 Pin Output

- Pin #1 - SBF Amber Indicator
- Pin #2 - SBF Stop Arm Relay
- Pin #3 - SBF Red Indicator
- Pin #4 - Configurable LCO Output 4, Active High

J9



2 Pin Output

- Pin #1 - Configurable LCO Output 5, Active High
- Pin #2 - Configurable LCO Output 6, Active High

Connect the desired outputs to vehicle equipment as needed. When connecting to relays, use relays with appropriate kick-back suppression, such as Digi-Key #PB682-ND. Unsuppressed relays will induce very high voltage spikes throughout modern vehicles sensitive computer electronics and should not be used, per Ford, GM, SAE, etc.

8-Pin SBF401-A Input Connector Definition

Connector J5 contains the SBF401-A's 8 discrete general purpose wire inputs. These inputs have their own internal pull resistors so they can be left floating when not used or not active.

8 Pin Input

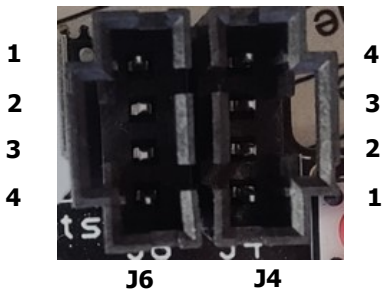
- Pin #1 - Engage, Active High
- Pin #2 - Passenger Door Open, Active Low
- Pin #3 - Diagnostic PnR Input, Active High
- Pin #4 - Cross Guard Override, Active High
- Pin #5 - Pre-Trip Test, Active High
- Pin #6 - Amber Override, Active High
- Pin #7 - Sequence Cancel, Active High
- Pin #8 - Master Enable, Active High

Connect inputs as needed.

Connecting the SBF401-A to the PRPC and Other Modules:

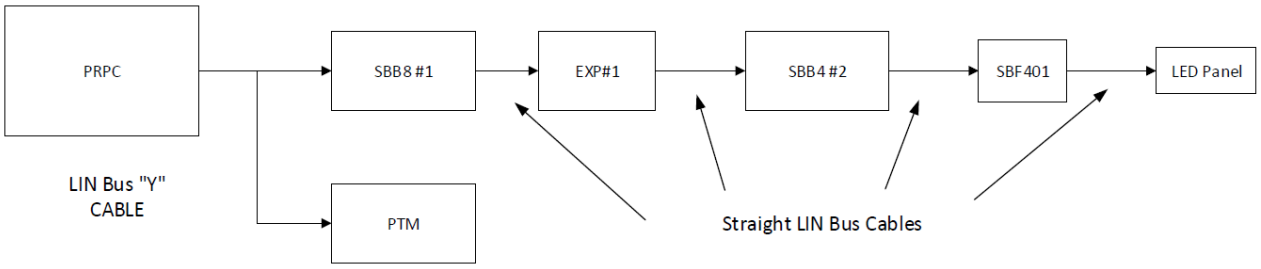
In order to use in conjunction with a FlexTech System, the SBF401 must be connected with the optional LIN Bus cable. In the simplest system, with a PRPC and 1 SBF module, connect one end of the LIN Bus cable to J5 on the PRPC and the other end to J4 or J6 on the SBF module.

For more complex FlexTech configurations, the modules are connected in a "daisy chain." The PRPC is always at the "Head End" of the chain and any Gateway or AFIS panel will be at the "Tail End" of the chain. The modules can be connected in any order. This will be decided by their physical location. In some systems there could also be a PTM module. A PTM is frequently added with a LIN Bus "Y" cable as shown in the example below. When connecting the SBF in the daisy chain, it does not matter what order the modules are in, nor does it matter which LIN connector is used.



LIN Bus Connectors

An Example of a Maximum FlexTech Configuration



Finishing the Installation and Testing Operation

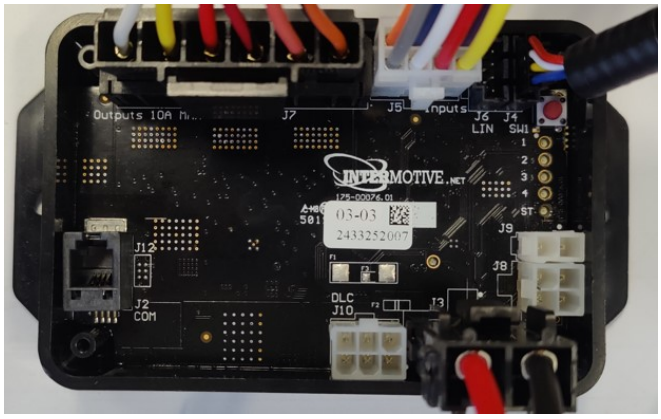
Module Mounting

1. Ensure all the harnesses are properly routed with strain relief where needed.
2. Mount the SBF401-A module as described on page two.
3. Verify that the module is in an area away from any external heat sources (engine heat, heater ducts, etc.).
4. Secure using screws or double sided tape.

Connect the Harnessing:

The following sequence should be performed **prior to** reconnecting the vehicle battery:

1. Connect each of the harness connectors to the corresponding connector on the SBF401-A. Each connector has a different number of pins and will only fit into the connector on the board with the same number of pins. Do not use force to insert a connector. If installing "standalone" proceed to step 4.
2. Ensure that the PRPC has been completely installed.
3. Ensure that the SBF401-A module is connected to the PRPC with the LIN Bus cable.
4. The vehicle battery may now be reconnected.



SBF401-A Post Installation Testing

With power applied to the SBF401 applying a Vbatt level signal to the "Pre-Trip Test" input (Input 5) will initiate a 5 minute pre-trip inspection mode of operation. This will allow for verification of all SBF function and outputs.

Verify that the following conditions are met:

1. Left and Right Amber and Left and Right Red signal controls alternate.
2. Indicator outputs alternate Red/Amber.
3. Stop Arm and Crossing Guard remain extended (if equipped).

Pre-Trip mode may be exited manually by applying a second momentary Vbatt level signal to the Pre-Trip Test input.

Note: Pre-Trip mode is only available if the device is not in master mode (Master Enable low). Asserting the Master Enable at any point will immediately exit pre-trip diagnostic mode.

The SBF401-A is properly installed only if it passes the above tests.

Contact InterMotive at 530-823-1048 for technical assistance.

Operational and Sleep Modes

"Standalone" Installations:

When using the SBF401 as a standalone unit the device will remain fully operational anytime the Master Enable is set high. If the device is disabled by setting the Master Enable low the device will go into an ultra low power sleep mode after 5 seconds.

To wake the device from sleep mode any of the following inputs can be used:

1. Master Enable: Toggling the Master Enable high will automatically wake the unit so that it is ready for operation.
2. Pre-Trip Test: A momentary active signal on the Pre-Trip will automatically wake the module and start the 5 minute pre-trip inspection diagnostic (See Modes of Operation for description).

"FlexTech" Installations:

Turning the vehicle ignition ON will wake up and initialize the attached PRPC. Once the PRPC is on it will turn on the SBF401-A through the LIN Bus. Outputs are controlled based on the module's configuration.

When the key is turned OFF, the attached PRPC will go into a low power sleep mode. This may take up to TEN minutes, and the LED's on the module will go out once in sleep mode. Other vehicle activity such as opening doors, inserting key in the ignition, etc. may delay sleep mode. Once the PCRPC has entered sleep mode the SBF401-A will enter sleep mode after 5 seconds.

Status Displays and Diagnostics

Diagnostics Operation

There are 4 "pages" of diagnostic displays that can be selected. Each page uses the SBF401 on module LEDs to display status and allow for setting changes. Each status page is described below.

Selecting the Page:

Diagnostic mode is selected by pressing and releasing the TEST button. After the first press of the button the firmware version is displayed by blinking 3 "digits' to LED 1. The version will be shown in number of blinks in 3 stages to illustrate X.X.X version. For example version 4.17 would blink 4times, then once, then 7 times.

PAGE 1: Version Display

After version has been displayed the status ('ST') LED will blink '1' repeatedly indicating page 1. Another press of the TEST button at this point will move to page 2.

PAGE 2: Flash Rate Setting

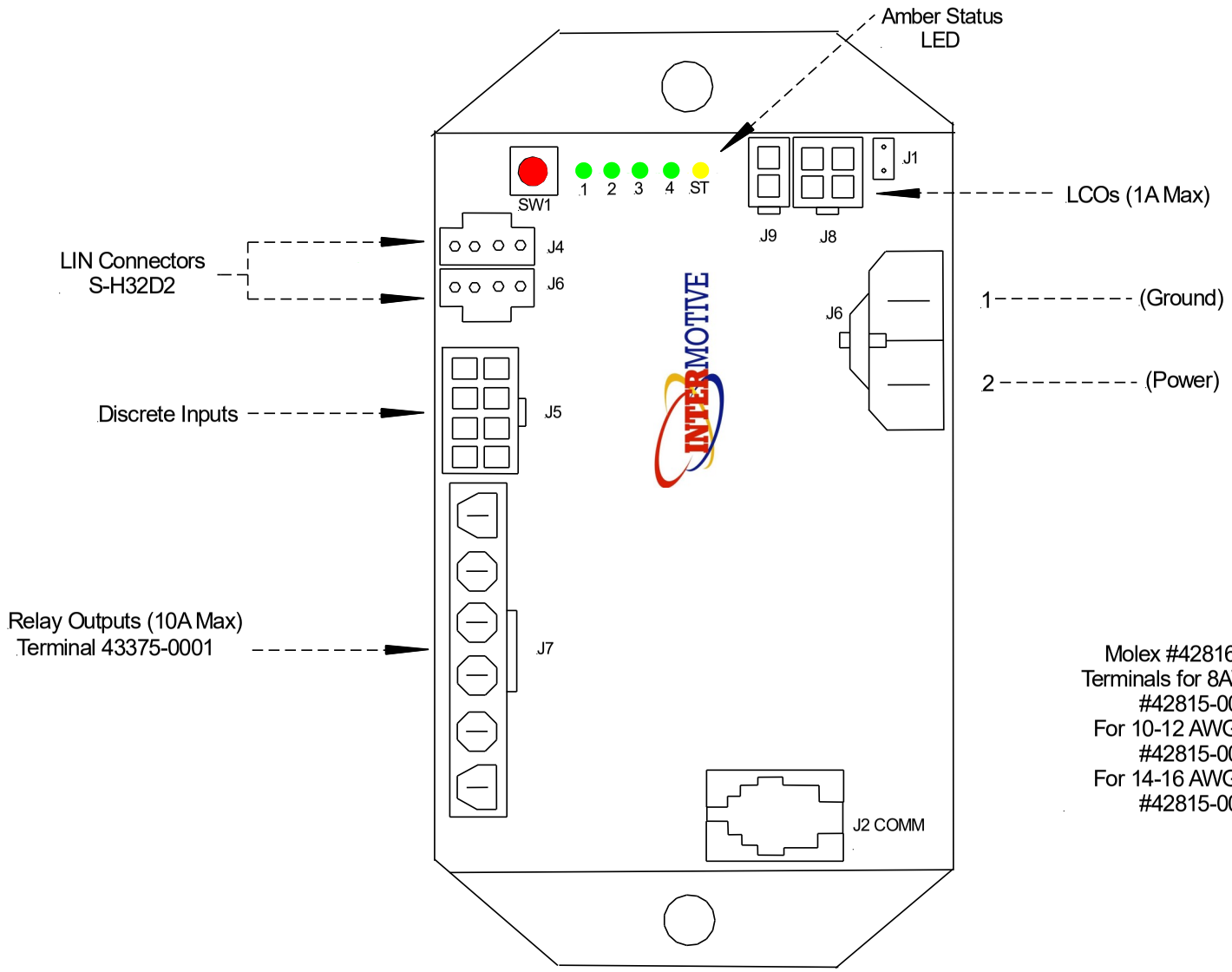
The status ('ST') LED will blink '2' repeatedly indicating page 2. In this page the flash rate can be set using the blunt cut wire at Input 3 (PnR Input). Each active high detected by the module will cycle through the rate settings. The flash rate is shown using module LEDs, LED3,LED2,LED1. With 001= 250mS, 010= 500mS, 011 = 1S, 100=1.5S, 101=2S, 110 =2.5S. Another press of the TEST button will move to page 3.

PAGE 3: Flash Mode Setting

The status ('ST') LED will blink '3' repeatedly indicating page 3. In this page the flash mode can be set using the blunt cut wire at Input 3 (PnR Input). Each active high detected by the module will cycle through the mode settings. The flash rate is shown using module LEDs,LED2,LED1. LED1 lit = Standard Mode LED2 lit = Alternate Mode (WIG/WAG). Another press of the TEST button will move to page 4.

PAGE 4: Indicator Display Setting

The status ('ST') LED will blink '4' repeatedly indicating page 4. In this page the user indication output mode can be set using the blunt cut wire at Input 3 (PnR Input). Each active high detected by the module will cycle through the mode settings. The indicator mode is shown using module LEDs,LED2,LED1. LED1 lit = Solid Indication LED2 lit = Flashing Indication (note with this setting the indicators will flash at the above set flash rate along with the outputs). Another press of the TEST button will exit test mode and restart the module. Settings will be incrementally saved so that none of the settings are lost in the event that the diagnostic mode is interrupted.



Submit product registration at www.intermotive.net

If the SBF401 fails any step in the Post Installation Test, review the installation instructions and the loaded PRPC configuration by running the FlexTech Programming Utility application. If necessary, call **InterMotive technical support @ (530) 823-1048.**