IDEX CORPORATION

Class 1

ISO 9001 CERTIFIED

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SUITABLE FOR EXTERNAL DISTRIBUTION

TECHNICAL PRODUCT DATASHEET

Captain Pressure Governor with trim control

P/N 107396

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1. Revision Log

Rev	Date	Changes
1.00	2/2/2010	Initial revision

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2. System Overview

2.1. System part numbers

Captain Pressure Governor (Uni-Gov) system kit 105244

Kit includes

Captain Pressure Governor	QTY-1	107396
Main system harness	QTY-1	107642 (105247)
Transducer 0-300 PSI	QTY-1	100581
System Manual (this manual)	QTY-1	107490

Captain Pressure Governor system kit (P) 105246 (P)

Kit includes

Captain Pressure Governor	QTY-1	107269 (P)
Transducer 0-300 PSI	QTY-1	100581
System Manual (this manual)	QTY-1	107490

2.2. Harness detail

The main system harness (p/n 105247 long, 107642 short) is comprised of a pair of harnesses: the power harness (C1) and the signals harness (C2/C3).

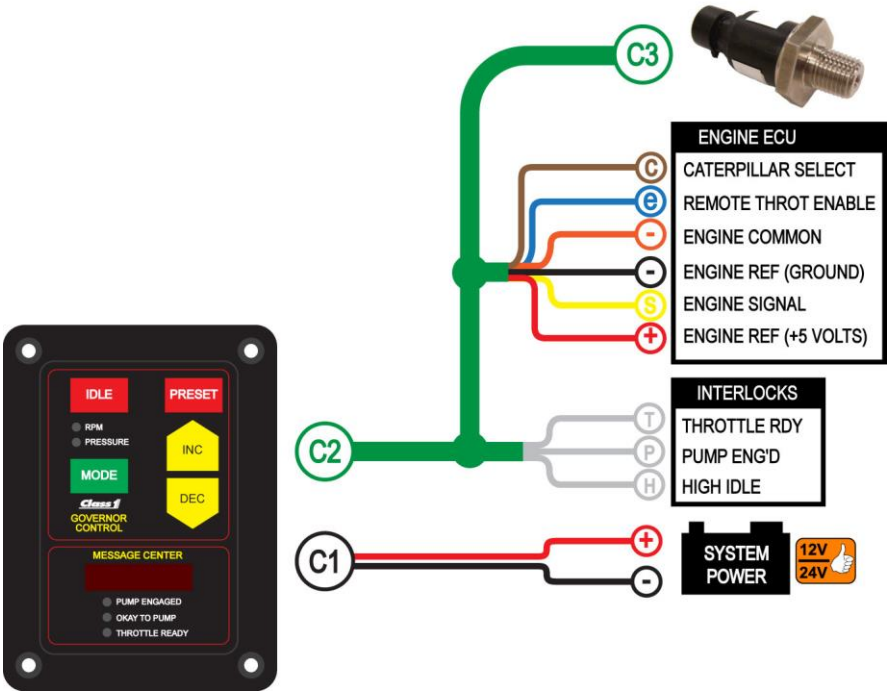

Figure 1. ***Harness nomenclature.***

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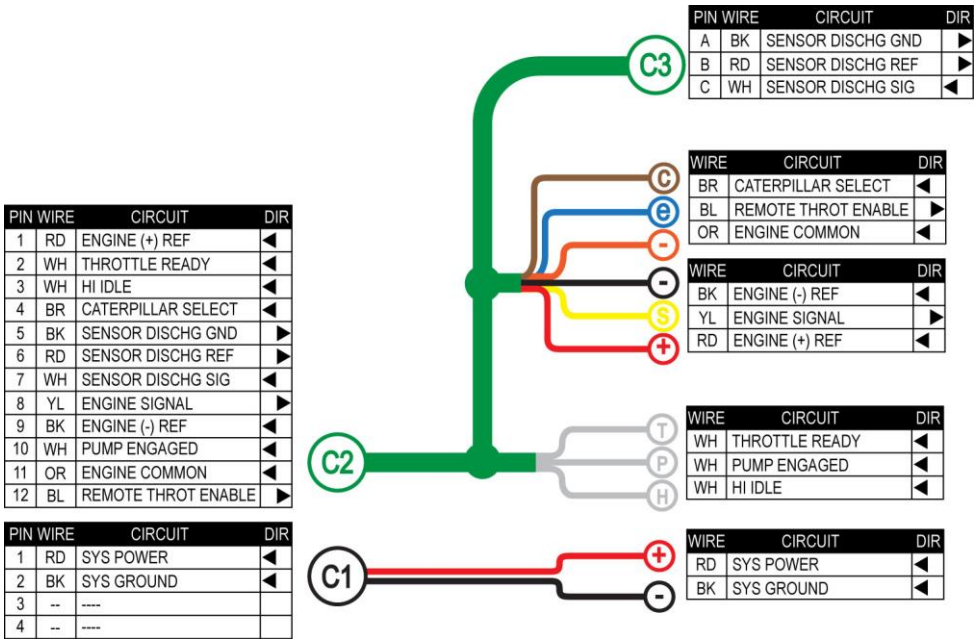
TECHNICAL DATA SHEET



PIN	WIRE	CIRCUIT	DIR
1	RD	ENGINE (+) REF	◀
2	WH	THROTTLE READY	◀
3	WH	HI IDLE	◀
4	BR	CATERPILLAR SELECT	◀
5	BK	SENSOR DISCHG GND	▶
6	RD	SENSOR DISCHG REF	▶
7	WH	SENSOR DISCHG SIG	◀
8	YL	ENGINE SIGNAL	▶
9	BK	ENGINE (-) REF	◀
10	WH	PUMP ENGAGED	◀
11	OR	ENGINE COMMON	◀
12	BL	REMOTE THROT ENABLE	▶

PIN	WIRE	CIRCUIT	DIR
1	RD	SYS POWER	◀
2	BK	SYS GROUND	◀
3	--	----	
4	--	----	

PIN	WIRE	CIRCUIT	DIR
A	BK	SENSOR DISCHG GND	▶
B	RD	SENSOR DISCHG REF	▶
C	WH	SENSOR DISCHG SIG	◀

WIRE	CIRCUIT	DIR
BR	CATERPILLAR SELECT	◀
BL	REMOTE THROT ENABLE	▶
OR	ENGINE COMMON	◀

WIRE	CIRCUIT	DIR
BK	ENGINE (-) REF	◀
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RD	ENGINE (+) REF	◀

WIRE	CIRCUIT	DIR
WH	THROTTLE READY	◀
WH	PUMP ENGAGED	◀
WH	HI IDLE	◀

WIRE	CIRCUIT	DIR
RD	SYS POWER	◀
BK	SYS GROUND	◀

Figure 2. ***Harness wiring detail - p/n 105247 long, 107642 short.***

3. Captain Pressure Governor Overview

The Captain Pressure Governor (Uni-Gov) p/n 107396 is designed to maintain pump pressure or engine speed setting. This unit will work with electronically controlled engines that accept a variable analog voltage signal (0 to 5 VDC) or a Pulse Width Modulated signal (PWM 12% to 87% at 400 Hz) as a remote throttle voltage (engine signal).

For Cummins, Caterpillar, and Navistar engines, once the Engine Control Unit (ECU) is programmed for remote throttle the ECU continuously looks for the remote throttle voltage. If the remote throttle voltage is not present the ECU will record a fault and illuminate the Check Engine Light (CEL) or Stop Engine Light (SEL) dependent on the ECU.

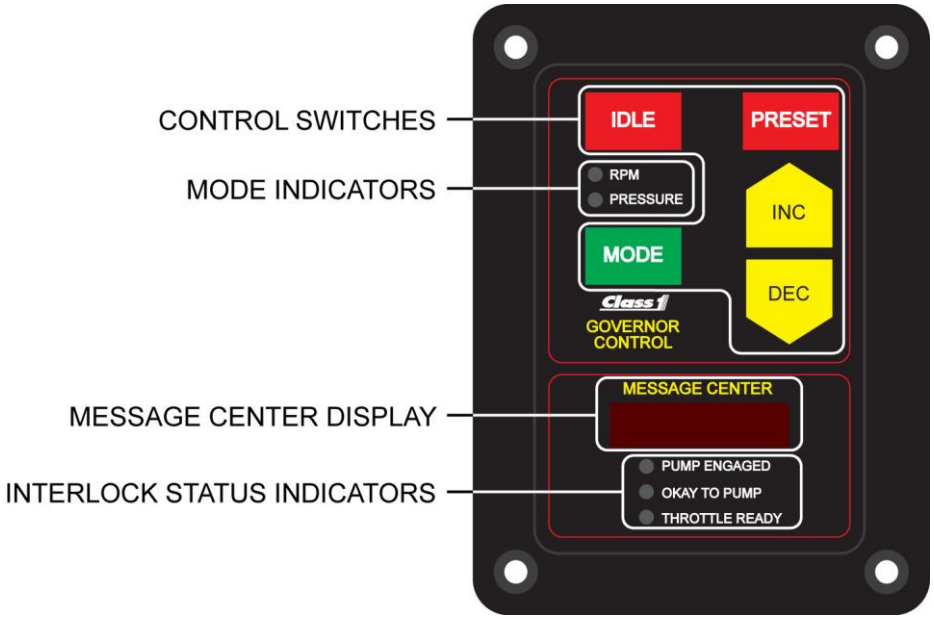

Figure 3. ***Governor controls and indicators.***

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3.1. Message Center Display

The display shows the status and warning messages. Refer to section 4.9 for a list of the status and warning messages with a description of their meanings.

3.2. Interlock status indicators

Green LEDs show the status of the three (3) interlocks: *pump engaged*, *okay to pump*, and *throttle ready*. *Throttle ready* and *pump engaged* are physical inputs into the Governor's 12 pin connector (pins 2 and 10 respectively). *Okay to pump* becomes active when both the *throttle ready* and *pump engaged* interlocks are present.

3.3. Control switches

The five (5) control switches are color coded and labeled for easy identification.

3.3.1. IDLE

The IDLE switch (red) forces the governor to **idle mode** (standby). Pressing and holding this button for one second while in rpm or pressure mode will cause the engine to ramp down to its idle position.

3.3.2. PRESET

The PRESET switch (red) sets the governor to the configured preset engine RPM while in **throttle mode**, or preset pressure while in **pressure mode**.

3.3.3. MODE

The MODE switch (green) sets the governor to either **throttle mode** (RPM) or **pressure mode** (PSI). The correct interlocks must be present for the system to begin governor operation: throttle ready for RPM mode, throttle ready, pump engaged, and okay to pump for PSI mode.

3.3.4. INC

The INC [increase] switch (yellow) is used to increase the engine RPM or pressure set point.

3.3.5. DEC

The DEC [decrease] switch (yellow) is used to decrease the engine RPM or pressure set point.

3.4. Mode indicator

The mode indicator consists of two (2) LEDs to show the governor's current operating mode. The PRESSURE LED (yellow) indicates the governor is operating in **pressure mode** and the RPM LED (green) indicates the governor is operating in **throttle mode**. When both LEDs are OFF the governor is in **idle mode** (standby).

4. Operation

4.1. Initialization

When the unit is first powered up, the message center display shows the software version for two (2) seconds and then shows [MODE]. The engine will remain at idle until the mode switch is pressed to select the desired operating mode.

The message center display shows the software version for 2 seconds.

The message center display shows **[MODE]** and is now ready for operation.

4.1.1. View software version and parameters

Press and hold the **idle** switch for 7 seconds while the Governor is at idle and the message center display is showing **[MODE]**. The message center display will scroll through the software version number and the operating parameters.

PARAMETER	EXAMPLE	DESCRIPTION
Software version	**--V7.1--**	Message center display shows the Governor's software version.
Ramp rate	**Ramp 05**	Message center display shows the Governor's ramp rate value (0 to 10). Ramp rate controls the how fast the Governor responds to **INC** and **DEC** switch requests.
PSI gain	**Gain 05**	Message center display shows the Governor's PSI gain value (0 to 10). PSI gain controls how quickly the Governor controls the engine speed when reacting to pressure changes.
PSI Sensitivity	**Sense 05**	Message center display shows the Governor's PSI sensitivity value (0 to 10). PSI sensitivity controls how much pressure is allowed to deviate from the set-point before the Governor will change the engine speed to restore the set pressure.
Trim percentage	**Trim 14%**	Message center display shows the Governor's trim percentage (5% to 20%). Trim percentage controls how much the Governor will increase engine speed in an attempt to correct a pressure drop.
RPM preset point	**Prpm 25%**	Message center display shows the Governor's current **throttle mode** preset point in percentage of throttle.
PSI preset point	**Ppsi 090**	Message center display shows the Governor's current **pressure mode** preset point in PSI.
Idle point	**IDLE 020**	Message center display shows the Governor's current **idle** point in internal potentiometer counts.
Output voltage range [(1)]	**0.7 to 4.3**	Message center display shows the Governor's current **configured** output voltage range (from idle to maximum)in volts.
Sensor voltage	**XDC= 0.6**	Message center display shows the Governor's current **pressure sensor** input voltage.
Output voltage [(1)]	**OUT= 0.4**	Message center display shows the Governor's current **output signal** voltage.
Output frequency [(2)]	**Freq 399**	Message center display shows the Governor's PWM output frequency in Hertz.

[(1)] ANALOG configured only, [(2)] PWM configured only

4.2. Operating mode selection

The Captain Pressure Governor has two operating modes: **throttle mode** (RPM) and **pressure mode** (PSI).

MODE

Press the **MODE** switch to select an operating mode. An operating mode will only be activated if the required interlock(s) are in place (see section 4.5). **Pressure mode** will be the first mode selected if the pump is engaged and the *okay to pump* LED is illuminated, otherwise **throttle mode** will be the first mode. If the proper interlocks are not set for the requested mode the message center display will show **NO-INTLK**.

There is no variation in engine RPM or pump pressure when changing between **throttle mode** and **pressure mode**.

If the proper interlocks are not present when changing from **throttle mode** to **pressure mode** the message center display will momentarily show **NO INTLK** and then continue showing **RPM MODE** and the operating mode will remain **throttle mode**.

Pressure mode is the desired operating mode because it offers protection from pressure changes that could injure personnel.

4.2.1. Internal relay (remote throttle enable)

The Governor has an internal relay which should be used to activate the remote throttle at the engine ECU (**Figure 4**). This relay will not energize until the **MODE** switch is pressed when a valid **throttle ready** interlock input is present at pin 2 of the 12-pin connector. Pins 11 and 12 of the 12-pin connector are tied when the internal relay energizes. A proper polarity signal required for the engine ECU's remote throttle enable should be attached to pin 11 and pin 12 should be attached to the engine ECU's remote throttle enable input. When the internal relay is energized the proper polarity signal will be applied to the engine ECU's remote throttle enable input.

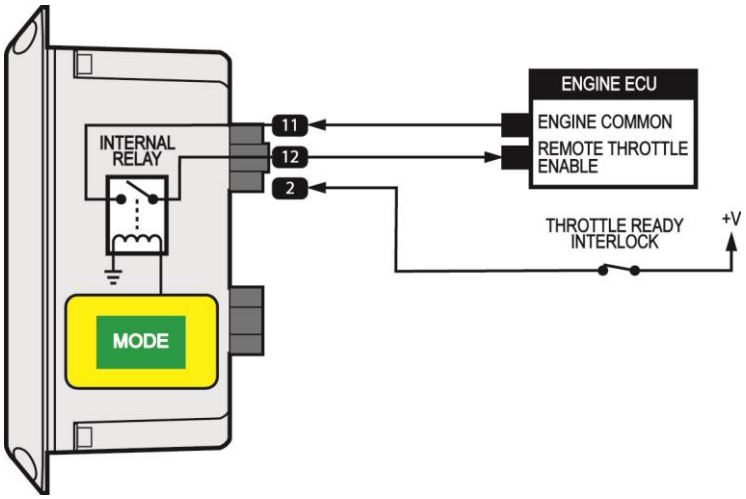


Figure 4. ***Governor internal relay operation.***

4.3. Throttle mode

Throttle mode (RPM) maintains a set engine RPM and will not deviate until the operator changes the RPM with the Governor's control switches. *(Proper interlocking is required for normal operation – refer to Required Interlocking section 4.5)*

Throttle mode is typically used when…

- *priming the pump*
- *connected to a stand pipe*
- *the water supply pressure stability is questionable*
- *acting as a relay pumper*

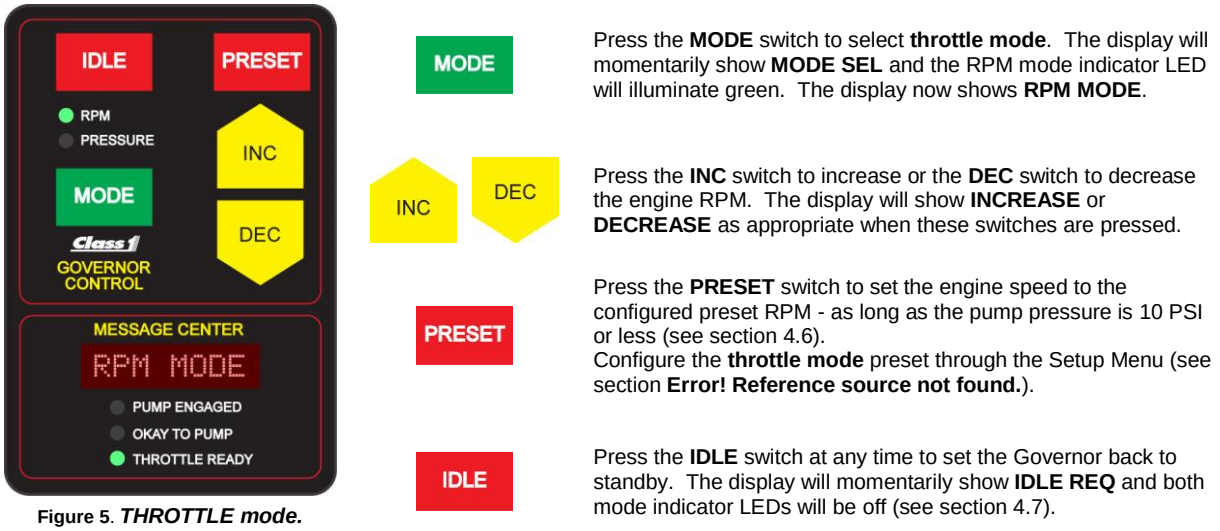


Figure 5. ***THROTTLE mode.***

4.3.1. Psi Limit warning message

If the Governor detects that the pressure has increased more than 50 PSI from the pressure logged at the last **INC/DEC** switch press it will attempt to limit the pressure increase to no more than a 50 PSI differential. The Governor may reduce engine RPM to achieve this and the message **Psi Limit** will be shown in the message center display.
NOTE: The Governor will NOT attempt to regulate pressure in **throttle mode**, but rather only limit the differential pressure to 50 PSI from the pressure present when the last **INC/DEC** switch was pressed.

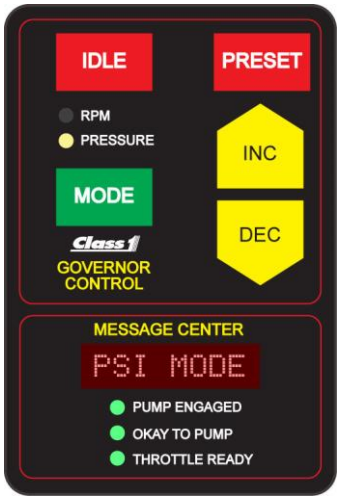
4.3.2. DISABLED warning message

The message center display will show **DISABLED** when the **PRESET** switch is pressed if there is more than 10 PSI of pressure on the pump or if the *pump engaged* interlock is ACTIVE.

4.4. Pressure mode

Pressure mode (PSI) maintains a set pump pressure by monitoring the pressure transducer and modifying the pump speed by adjusting the engine RPM. The operator can modify the set pump pressure with the Governor's control switches. *(Proper interlocking is required for normal operation – refer to Required Interlocking section 4.5)*

Pressure mode (PSI) affords the most safety to the operator by not allowing potentially hazardous pressure spikes. The Governor will maintain the set pump pressure even when discharge lines are actively opened and closed as long as the water supply is sufficient. The Governor will automatically increase engine speed when pump pressure has decreased due to discharge lines being opened. The increase in engine speed will return the pump pressure to the desired set pressure (and vice-versa when discharge lines are closed).



Press the **MODE** switch to select **pressure mode**. The display will momentarily show **MODE SEL** and the PSI mode indicator LED will illuminate yellow.

Press the **INC** switch to increase or the **DEC** switch to decrease the pump pressure set-point. The Governor will attempt to maintain the selected pressure.

Press the **PRESET** switch to set the pump pressure to the configured preset. The Governor will adjust the engine RPM to maintain the preset pressure value (see section 4.6). Configure the **pressure mode** preset through the Setup Menu (see section **Error! Reference source not found.**).

Press the **IDLE** switch at any time to set the Governor back to standby. The display will momentarily show **IDLE REQ** and both mode indicator LEDs will be off (see section 4.7).

Figure 6. ***PRESSURE mode.***

4.4.1. CTRL DEC and CTRL INC status messages

The Governor maintains pump pressure by controlling the engine RPM in response to the signal from the pressure sensor mounted on the pump. When the Governor is automatically controlling the engine RPM to maintain pump pressure the message center display will show **CTRL INC** (control increase) when increasing RPM or **CTRL DEC** (control decrease) when decreasing RPM.

4.4.2. Pressure / water loss

If the discharge pressure drops below 30 PSI (for any reason) the engine speed will NOT be increased. The Governor will reduce the engine RPM to the last known value where the pressure set-point was obtained. The message center display will flash **–INTAKE–** during this low pressure condition. If the pressure increases above 30 PSI the message center display will flash **OPERATOR** will flash and the Governor will not increase the output unless the operator presses the **INC** or **PRESET** switches. If pressure above 30 PSI is not regained within **5 seconds** the Governor will return the engine to idle and the message center display will show **LoSupply**. The operator must make certain that the water supply is adequate and then reinstate governing using **MODE**, **INC** and/or **PRESET** switches.

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4.4.3. Pressure recovery / Cavitation (trim)

The Governor has a trim adjustment which can be set between 5% and 20% of the maximum throttle. Trim limits the Governor's maximum increase in a pressure recovery attempt. The message center display flashes **OPERATOR** when the trim limit is reached and the engine RPM will not increase further. The operator must take positive action to restore discharge pressure. If the pressure is not restored within **4 seconds** the Governor will reduce output to the last known output where pressure was maintained. The operator must input a new set-point with the **INC**, **DEC** or **PRESET** switches. If the pressure rises above the original set-point and the Governor controls a decrease in engine speed the Governor will return to normal operation and the message center display shows **PSI MODE**.

While the Governor is determining cavitation, a drop in discharge pressure will be handled normally and the engine speed will be commanded to increase RPM to compensate for the pressure reduction within the trim limit.

This could result in an engine running at a speed that can cause a pressure "spike".

4.4.4. Switch session pressure increase

When the **INC** switch is pressed and held to increase discharge pressure the Governor will not allow a pressure change greater than **80 PSI** without releasing the **INC** switch and pressing it again. This is only applicable when the pressure is above **90 PSI**. This function prevents high pressures from being introduced by a distracted operator.

4.4.5. Minimum governing pressure (PSI enable)

The Governor will not control pressure until a discharge pressure of **70 PSI** is attained. The Governor will act as if it were in **throttle mode** until this pressure point is achieved.

4.4.6. Preset pressure verification

The Governor checks the pump pressure at intervals while it is attempting to reach the preset pressure. If the pressure is not increasing the Governor will maintain the engine speed at the point that the pressure stopped increasing and use that as the pressure set-point.

4.5. Required interlocking

The Governor requires interlocks before engine control operations are permitted. The Governor provides two interlock inputs that allow easy separation of pumping operations and throttle/high idle operations through two inputs dedicated as system interlocks: *THROTTLE READY* (pin 2 of the 12-pin Deutsch connector) and *PUMP ENGAGED* (pin 10 of the 12-pin Deutsch connector). These interlock inputs are activated when system power is applied (positive polarity).

The OEM is responsible for creating safe and effective interlocking routines.

The Governor utilizes three (3) green LEDs below the message center display to indicate interlock status.

THROTTLE READY interlock

Apply system power to pin 2 of the 12-pin Deutsch connector (through OEM interlocking).
THROTTLE READY LED illuminates green.

The Governor will operate in **throttle mode** (RPM) only.

PUMP ENGAGED interlock

Apply system power to pin 10 of the 12-pin Deutsch connector (through OEM interlocking).
PUMP ENGAGED LED illuminates green.

The Governor will **NOT** operate in any mode until the THROTTLE READY interlock is applied.

OKAY TO PUMP

When THROTTLE READY and PUMP ENGAGED interlocks are applied the OKAY TO PUMP LED illuminates green.

The Governor will operate in **throttle mode** (RPM) or **pressure mode** (PSI).

4.6. PRESET switch operation

PRESET

The **PRESET** switch brings the discharge pressure (in pressure mode) or engine RPM (in throttle mode) to the configured preset point (see section and).

Using the **PRESET** switch is a method of smoothly and expeditiously attaining water pressure and flow, but it is not intended to be the initial attack pressure. Attack pressures and flows should be determined by the actual fire status and manually achieved for best operation.

PRESET is an operational convenience and needs to be considered as a fixed point (higher or lower than the current point) that can be achieved with a single switch press.

Note: *Initiating pumping operations is simplified by bringing the pump to a preset pressure with a single switch press. Consequently, securing or regaining control operations can be aided by returning to this fixed pressure point with a single switch press.*

4.7. IDLE switch operation

IDLE

Press and hold the **IDLE** switch for one second to release engine RPM control back to the engine ECU. The engine's RPM will promptly go to its configured curb idle (see section).

Note: In view of the fact that driveline stress can be induced by quick changes in engine speed, depending on rpm and torque load, the engine speed is ramped to idle over a short duration to minimize the effect of driveline kick.

4.8. High idle operation

An input is available to bring the engine speed to a preset RPM (high idle) from a remotely mounted switch. Pin 3 of the 12-pin connector is the high idle input and requires system voltage to be ACTIVE. The message center display will show “HighIdle” while operating in this mode.

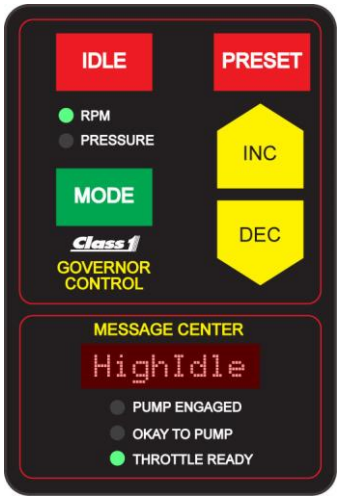

Figure 7. ***High Idle mode active.***

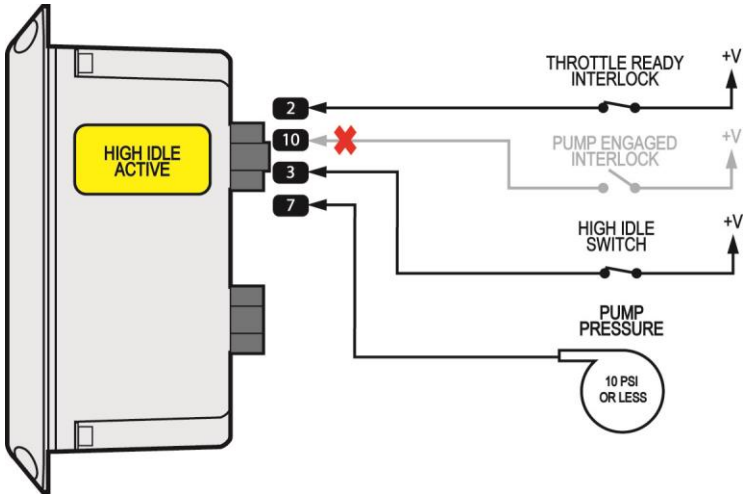

Figure 8. ***High idle requirements.***

The high idle function is only available when…

- No mode is currently selected - message center display shows **[MODE]** and engine RPM is at idle.
- The **throttle ready** interlock is active.
- The **pump engaged** interlock is NOT active.
- 10 PSI or less of pressure on the pump.

The Governor will cancel the high idle function in progress when…

- The **IDLE** switch is pressed.
- The **pump engaged** interlock is activated.
- The **throttle ready** interlock is de-activated.
- The **high idle** input is de-activated.

The **INC** and **DEC** switches are active during high idle operation and may be used to adjust the current engine speed. Using the **INC** and **DEC** switches will not change the preset RPM stored in memory. The preset RPM used for high idle operation is the same as the preset RPM configured for **throttle mode**.

4.9. Status messages

The table below details the status messages which are shown in the Governor's message center display.

STATUS	DESCRIPTION	GOVERNOR RESPONSE	OPERATOR ACTION
[MODE]	The Governor is in standby mode and the engine is at idle.	*The Governor maintains the throttle signal at idle.*	*The operator may select an operating mode by pressing the **MODE** switch (interlocks permitting).*
MODE SEL	The Governor is in the process of selecting a mode based on operator input or high idle request.	*The Governor begins operating in the newly selected mode or issues a warning message.*	
RPM MODE	The Governor is operating in **throttle mode**.	*The Governor maintains the engine speed selected by the operator.*	*The operator may change the engine speed by using the **INC**, **DEC**, and **PRESET** switches.*
PSI MODE	The Governor is operating in **pressure mode**.	*The Governor maintains the pump pressure selected by the operator.*	*The operator may change the pressure set-point by using the **INC**, **DEC**, and **PRESET** switches.*
HighIdle	The Governor is operating in **high idle**.	*The Governor increases engine speed to the preset RPM.*	*The operator may change the engine speed by using the **INC** and **DEC** switches.*
INCREASE	The operator has pressed the **INC** switch.	*The Governor increases engine speed while the **INC** switch is pressed.*	
DECREASE	The operator has pressed the **DEC** switch.	*The Governor decreases engine speed while the **DEC** switch is pressed.*	
CTRL INC	Control increase The Governor is increasing engine speed to maintain the pressure set-point.	*The Governor is operating normally in **pressure mode**.*	
CTRL DEC	Control decrease The Governor is decreasing engine speed to maintain the pressure set-point.	*The Governor is operating normally in **pressure mode**.*	
IDLE REQ	Idle request The operator has pressed the **IDLE** switch.	*The Governor reduces the engine speed to idle and changes to the mode to standby.*	

4.10. Warning messages

The table below details the warning messages which are shown in the Governor's message center display.

WARNING	DESCRIPTION	GOVERNOR RESPONSE	OPERATOR ACTION
SENSOR	Signal voltage from the discharge pressure sensor is: • less than +0.30 VDC OR • greater than +4.90 VDC.	*Governor flashes the PRESSURE LED and operates as if it were in **throttle mode** – no regulated control.*	*Operator may continue to use Governor in **throttle mode**. Operator should have the discharge pressure sensor and associated wiring verified.* *This warning will only clear when power to the governor is reset and the sensor voltage is within the valid range.*
-INTAKE-	Operating in **pressure mode** with a pump pressure greater than 70 PSI. The pump pressure has since dropped but the Governor was unable to regain the set pressure within 4 seconds.	*Governor reduces engine speed to last known point where pressure was last achieved Message center display now shows **OPERATOR** The Governor will not attempt to automatically regulate a decrease in pump pressure, but will respond to an increase in pump pressure.*	*Operator should verify water supply. The Governor will re-start pressure regulation after the operator has pressed the **DEC**, **INC** or **PRESET** switches.*
OPERATOR	The Governor can't achieve a desired pressure.	*The Governor maintains the last known good engine speed/pressure relationship.*	*Operator should verify water supply or change to **throttle mode**.*
LoSupply	Low supply pressure Pump discharge pressure has dropped below 30 PSI for more than 5 seconds.	*The Governor drops to idle (standby).*	*Operator must verify the water supply and re-select an operating mode.*
NO-INTLK	No interlock The operator has selected a mode without asserting the proper interlocks OR an interlock has been de-activated while operating in a mode.	*The Governor drops the engine RPM to idle (if the throttle ready interlock is removed).* *The Governor maintains current engine RPM (if the pump engaged interlock is removed).*	*Operator should visually verify the interlock status LEDs and check for proper interlock operation.*
PsiLimit	During **throttle mode** the Governor has detected that pump pressure has increased more than 50 PSI from the pressure logged when the operator last pressed an **INC** or **DEC** switch.	*The Governor may reduce engine speed to ensure that the pump pressure is no greater than 50 PSI above the logged pressure.*	*Operator should determine the reason for the increase in pump pressure.*
DISABLED	During **throttle mode** the Governor has detected more than 10 PSI of pump pressure when the operator pressed the **PRESET** switch.	*The Governor does not allow the preset function.*	*Operator should verify pump pressure before attempting to use preset in **throttle mode**.*

4.10.1. DISABLED warning message

The message center display will show **DISABLED** when the **PRESET** switch is pressed if there is more than 10 PSI of pressure on the pump or if the *pump engaged* interlock is ACTIVE.

5. Diagnostics

5.1. Entering passwords

There are several diagnostic modes available in the Governor. Access is provided by entering a password using the **INC** and **IDLE** switches in a specific sequence.

The Governor must be in standby (no mode selected) and the message center display must show **[MODE]** prior to entering any password.

PASSWORD	HEX	DESCRIPTION
IDLE-INC-IDLE-INC-IDLE-INC-IDLE-INC	**55**	Self test (section 5.2)
IDLE-INC-INC-IDLE-IDLE-INC-IDLE-INC	**65**	Set engine IDLE RPM level (section 6.1)
INC-IDLE-IDLE-INC-IDLE-INC-INC-INC	**97**	Set engine output range – IDLE and MAXIMUM RPM (section 6.2)
INC-IDLE-IDLE-INC-IDLE-INC-INC-IDLE	**96**	Set PRESETS: RPM and PRESSURE (section 6.3)
INC-IDLE-IDLE-IDLE-IDLE-INC-IDLE-IDLE	**84**	Toggle default mode: RPM or PRESSURE
IDLE-INC-INC-IDLE-IDLE-INC-INC-INC	**67**	Toggle RPM tollgate: ON or OFF
INC-IDLE-IDLE-INC-IDLE-INC-IDLE-INC	**95**	Show parameters (see section 4.1.1)
INC-IDLE-IDLE-IDLE-IDLE-IDLE-INC-INC	**83**	Load defaults Preset RPM = 5 Preset PSI = 10 Ramp = 5 Gain = 5 Sensitivity = 5 Default mode = PRESSURE Trim = 14% Idle voltage = 0.5 Maximum voltage = 4.2
INC-IDLE-IDLE-IDLE-IDLE-IDLE-IDLE-INC	**81**	Output voltage display (volts) **OUT= X.X**
INC-IDLE-IDLE-IDLE-IDLE-IDLE-INC-IDLE	**82**	Pressure sensor display (volts) **XDC= X.X**
INC-IDLE-IDLE-INC-IDLE-IDLE-IDLE-INC	**91**	PWM output display (duty cycle) **PWM= XX%**
INC-IDLE-IDLE-INC-IDLE-IDLE-INC-IDLE	**92**	Raw pressure sensor display (bits) **RAW: XXX**
INC-IDLE-IDLE-INC-IDLE-IDLE-INC-INC	**93**	Pressure sensor display (PSI) **PSI: XXX**
INC-IDLE-IDLE-INC-IDLE-INC-IDLE-IDLE	**94**	Engine control signal (bits) **CNTS: XXX**
INC-IDLE-IDLE-INC-INC-IDLE-IDLE-INC	**99**	Pressure set point versus actual (PSI) **SET -- ACT** **XXX – XXX** (left side is set PSI, right side is actual PSI)

5.2. Self test

The self test is capable of determining if there is a problem with the Governor that replacement will correct.

The apparatus should have the engine running at idle with the transmission in neutral, the parking brake applied and the pump should not be engaged.

Enter the password:

The Governor begins the self test. The OKAY TO PUMP LED flashes throughout the test. This table shows the first steps of the self test for ANALOG and PWM configured Governors.	**ANALOG configured**	**PWM configured**
The Governor checks the type of output signal present – ANA (analog) or PWM (pulse width modulated).		
The analog configured Governor tests the output voltage signal range. While testing the message center will show **OutpTest**.		
The analog configured Governor shows the result of the output voltage signal range. *Make note of this range*.		
The Governor shows the *results screen*.		

The *results screen* shows the status of the remaining self test items:

- Interlock inputs (THROTTLE READY and PUMP ENGAGED)
- Switches (IDLE, PRESET, MODE, INC, and DEC)
- Configured output (ANALOG or PWM)
- Pressure sensor voltage validation
- High Idle input
- Internal relay operation.

Any **X** in the *results screen* indicates that a particular item's function has not been tested.

This table shows the *results screen*'s test positions (0 through 7), their function, and the test result indications.

0	1	2	3	4	5	6	7		
								Internal relay	**7** = activated **F** = did not activate **x** = not activated
								HIGH IDLE input **(pin 3 of 12-pin connector)**	**6** = toggled **x** = not toggled
								Sensor voltage	**5** = between 0.3 and 0.9 VDC **H** = greater than 1.0 VDC **F** = less than 0.3 VDC
								PWM output	**4** = configured for PWM control **-** = not configured for PWM control
								Analog output	**3** = configured for analog control **-** = not configured for analog control
								Switch test	**2** = all switches have been pressed and recognized **i** = IDLE switch is pressed **p** = PRESET switch is pressed **m** = MODE switch is pressed **u** = INC switch is pressed **d** = DEC switch is pressed **x** = all switches have not been pressed and recognized
								PUMP ENGAGED interlock **(pin 10 of 12-pin connector)**	**1** = toggled (must be toggled from OFF to ON) **x** = not toggled
								THROTTLE READY interlock **(pin 2 of 12-pin connector)**	**0** = toggled (must be toggled from OFF to ON) **x** = not toggled

Note: *The self test's internal relay check does not verify the validity of the signal IN to the relay, the signal OUT of the relay, or if the signal is truly sent to the engine's ECU. This testing must be done manually if the remote throttle enable signal through the Governor's internal relay is suspected to be a problem.*

Note: *The self test's output signal check does not verify that the signal is correctly interfaced to the engine's ECU. This testing must be done manually.*

At this point all of the basic Governor functions have been tested. If all sections passed, then the problem is likely not in the Governor.

Press the **PRESET** and **IDLE** switches at the same time to exit the self test. The message center window will scroll through the software version and parameters (section 4.1.1).

6. Configuration

6.1. IDLE RPM level

Each engine manufacturer has different requirements for remote throttle signal voltage level. The Governor's idle output signal level is configurable to allow usage on many different engine makes and models.

The Governor's default idle output voltage is 0.3 to 0.4 VDC. Typical fire apparatus engines require a remote throttle signal voltage of 0.7 VDC or greater to increase the engine speed past idle. If the Governor's idle RPM level is left at its default voltage level it will cause the operator to have to hold the **INC** switch for 5 to 10 seconds before the engine's speed begins to ramp up. When using the PRESET switch in pressure mode the Governor may drop out of pressure mode and issue an OPERATOR warning because the Governor has been increasing output voltage but has not detected a rise in discharge pressure.

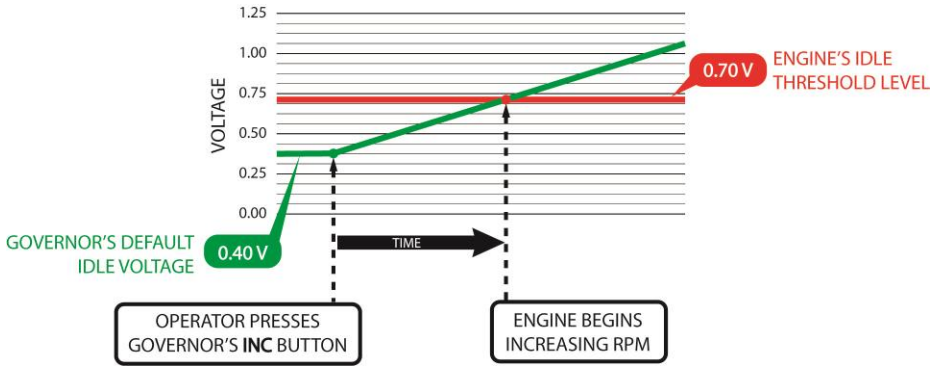

Figure 9. ***Improperly configured Governor idle RPM.***

A Governor with a properly configured idle RPM level will not have a noticeable lag between an operator pressing the INC button and the increase of engine speed. A good idle RPM configuration is required for the Governor to function properly.

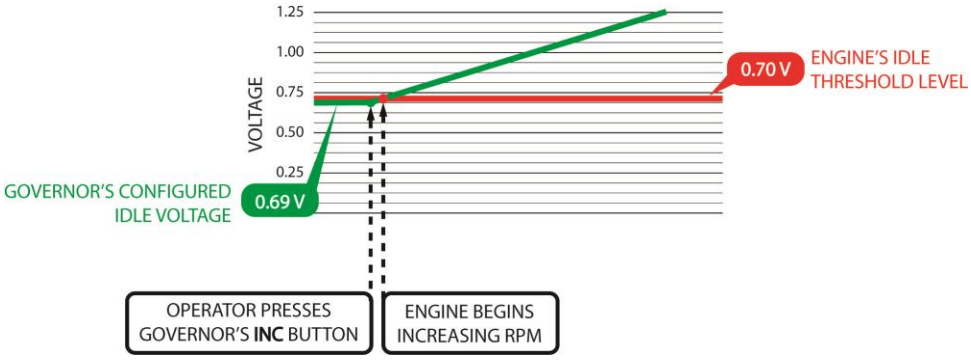

Figure 10. ***Properly configured Governor idle RPM.***

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Make certain the **THROTTLE READY** interlock is active and engine is running.

Enter the password:

The message center window shows **IDLE REQ** then **SET IDLE**. *If the message center window displays NO-INTLK then the **THROTTLE READY** interlock is not detected by the Governor.*

Press the **INC** switch until the engine speed increases slightly. This is the engine's idle threshold level voltage.

Press the **DEC** switch once or twice so that the engine speed is just back to curb idle.

Press the **PRESET** switch to save the idle voltage in the Governor's memory. The message center window shows **[MODE]**.

The idle voltage is saved in non-volatile memory and will not be lost when power is disconnected from the Governor.

6.2. Idle and Maximum RPM level (output range)

The Governor's default **idle** output voltage is 0.3 to 0.4 VDC and its default **maximum** output voltage is 4.2 VDC. The Governor allows the idle output voltage to be increased and the maximum remote throttle RPM to be reduced If the default maximum remote throttle RPM is not desired.

Make certain the **THROTTLE READY** interlock is active and engine is running.

Enter the password:

The message center window shows **IDLE REQ** then **–CUSTOM–**. *If the message center window displays NO-INTLK then the **THROTTLE READY** interlock is not detected by the Governor.*

Use the **INC** and **DEC** switches to set the desired idle engine speed (RPM).
The message center window shows **Vmin=X.X** (where X.X equals the current output voltage).
The message center window will show **NULL:X.X** when the maximum idle output voltage is 1.97 VDC or greater. The Governor will not save the idle level when NULL is displayed.

Press the **PRESET** switch to save the idle voltage in the Governor's memory. The message center window shows **SavingLo** and then **SET Vmax**.

Use the **INC** and **DEC** switches to set the desired maximum engine speed (RPM).
The message center window shows **NULL:X.X** (where X.X equals the current output voltage) until the maximum output voltage is greater than 3.15 VDC at which time the message center window will show **Vmax=X.X**. The Governor will not save the maximum level when NULL is displayed.

Press the **PRESET** switch to save the idle voltage in the Governor's memory. The message center window shows **SavingHi** and then **IDLE REQ** and then **[MODE]**.

The idle voltage and maximum voltage are saved in non-volatile memory and will not be lost when power is disconnected from the Governor.

6.3. Presets (RPM / PRESSURE)

The **RPM preset** is an engine speed that either enhances alternator output or provides good pump priming ability. Once set to department specifications it should not be changed.

The **PRESSURE preset** is normally one that is set by the department for initial attack operations or a safe pressure for pre-connects. If the PRESSURE preset is set too high it could present a hazard to operators. The design intent is to get the apparatus up and pumping in a minimal amount of time. Once the apparatus is operating, the pressure should be adjusted to the operation being performed.

For RPM preset configuration:
Make certain the **THROTTLE READY** interlock is active and engine is running.

For PRESSURE preset configuration:
Make certain the **THROTTLE READY** and **PUMP ENGAGED** interlocks are active, the engine is running, and the apparatus is ready for pumping operation.

Enter the password:

The message center window shows **–PRESET–** and the Governor selects an operating mode (**RPM** if only the THROTTLE READY interlock is active, **PRESSURE** if both the THROTTLE READY and PUMP ENGAGED interlocks are active). *If the message center window displays NO-INTLK then the **THROTTLE READY** interlock is not detected by the Governor.*

Operate the Governor using the **INC** and **DEC** switches until the desired engine speed (RPM mode) or pump pressure (PRESSURE mode) is attained.

Press the **PRESET** switch to save the preset in the Governor's memory. The message center window shows **–STORED–** for two seconds and then again shows **–PRESET–**.

*Press the **MODE** switch to select the alternate mode (RPM or PRESSURE) if its preset configuration is desired. Use the INC and DEC switches to adjust the engine speed (RPM mode) or pump pressure (PRESSURE mode) and save by pressing the **PRESET** switch.*

Press the **IDLE** switch to return to normal operation. The message center window shows **IDLE REQ**, then **UPDATING**, then **[MODE]**. The Governor is now ready to operate with the new preset configuration.

The presets are saved in non-volatile memory and will not be lost when power is disconnected from the Governor.

6.4. Parameters (ramp, gain, sensitivity, and trim)

The Governor uses four adjustable parameters to better match the engine/PTO/pump configuration of the apparatus.

Incorrectly configured parameters can cause erratic operation, serious injury or even death. Contact your OEM or Class 1 for guidance in their configuration.

RAMP (engine speed ramp rate):

This parameter controls how fast the Governor responds to **INC** and **DEC** switch requests. The configurable values are 0 to 10 (5 is the default). A lower value equals greater engine speed response with each switch **INC** or **DEC** switch press.

GAIN (pressure gain):

This parameter controls how quickly the Governor controls the engine speed when reacting to pressure changes. The configurable values are 0 to 10 (5 is the default). A lower value equals a slower engine speed response with pressure changes.

Note: *This parameter is critical to good operation. If the value is set too high the Governor can cause an oscillation or surging condition with high pressures resulting. If the value is set too low the Governor might not respond fast enough to pressure changes. This parameter should only be adjusted when flowing water in a normal configuration.*

SENS (pressure sensitivity):

This parameter controls how much the pressure is allowed to deviate from the pressure set point before the Governor will control the engine speed to restore the set point pressure. The configurable values are 0 to 10 (5 is the default). A lower the value equals a narrower pressure window that the Governor will maintain.

TRIM (engine trim percentage):

This parameter controls how much the Governor will increase engine speed in an attempt to correct a pressure drop. The configurable values are 5% to 20% of maximum governor output (14% is the default). This parameter will limit an engine speed increase to between 200 and 400 RPM above the RPM used to achieve the pressure set point.
For example, if the engine speed is running at 1500 RPM and the trim is set to 5% then the Governor will only allow the engine speed to increase to around 1700 RPM. If the trim was set to 20% the Governor would allow the engine speed to increase to around 1900 RPM. The actual increases are engine dependent and the figures stated here are only approximations.

Press and hold: PRESET and IDLE

Then also press: MODE (all 3 switches are now pressed simultaneously).

The message center window shows **–MENU–** and then **SET RAMP**.

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MODE — Press the **MODE** switch to select the desired parameter (RAMP, GAIN, SENS, and TRIM).

INC / DEC — Use the **INC** and **DEC** switches to change the parameter's value.

PRESET — Press the **PRESET** switch to save the parameter's value. The message center window shows **–STORED–** for one second and then **– MENU –**.
Make certain to save the parameter's value before using the **[MODE]** switch to cycle to the next parameter (or changes will NOT be saved).

IDLE — Press the **IDLE** switch twice to return to normal operation. The message center window shows **– DONE –** and then **[MODE]**. The Governor is now ready to operate with the new parameters.

The parameters are saved in non-volatile memory and will not be lost when power is disconnected from the Governor. The parameters may be viewed by following the steps in section 4.1.1.

7. Mounting & Installation

7.1. Governor mounting dimensions

The Governor requires the cutout shown below (not to scale). The Governor is watertight and may be mounted in any location on the operator's panel.

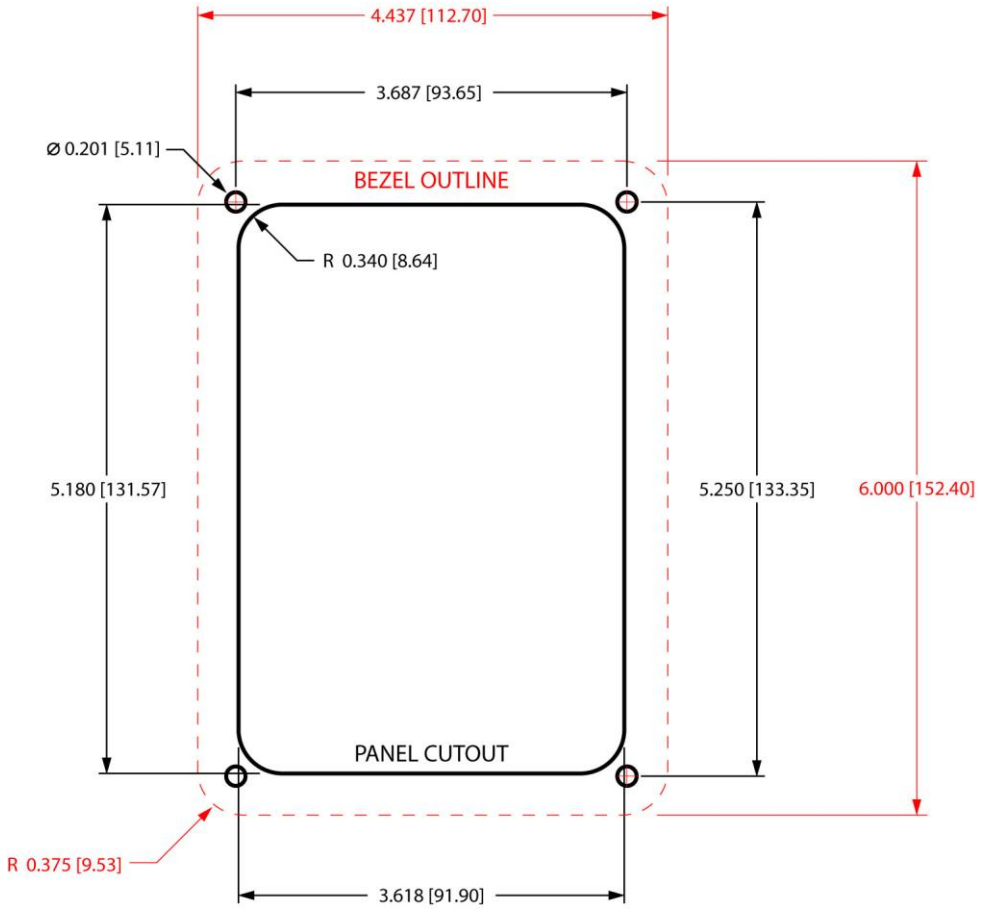

Figure 11. ***Installation dimensions in inches [millimeters].***

7.2. Pressure sensor installation

Mount the pressure sensor where it can read pump discharge pressure without turbulence. A 'tee' at the master discharge gauge is a good location which would also reduce vibration to the sensor.

The pressure sensor's threads are ¼ NPT and a sealant should be applied prior to installation.

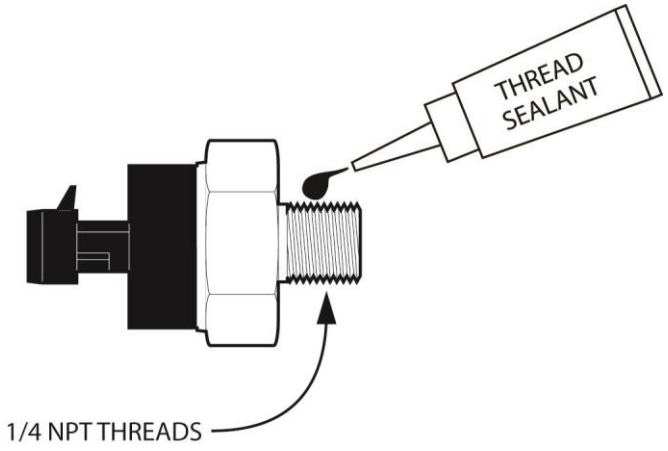

Figure 12. ***Thread sealant applied to pressure sensor's threads.***

Apply torque only to the 1-1/4" hex flange of the pressure sensor when tightening. Do not apply torque to the pressure sensor's body.

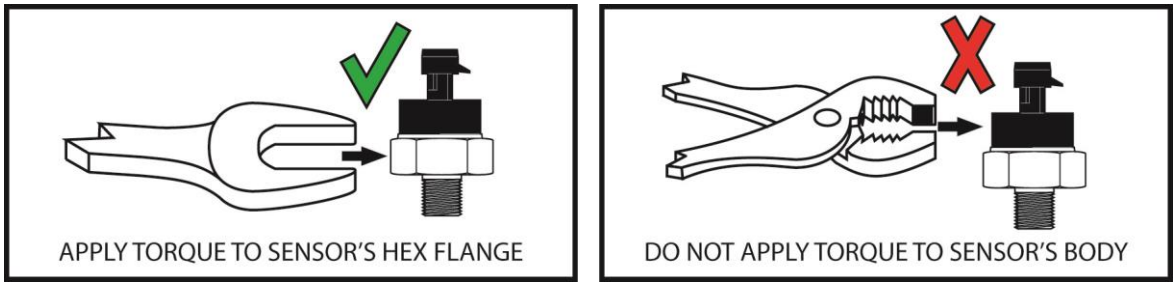

Figure 13. ***Tightening the pressure sensor.***

Every effort should be made to eliminate the chance for moisture entering the pressure sensor's connector including immediate connection of the sensor harness connector after installation. Make certain that the weather seal is in place before inserting into the pressure sensor.

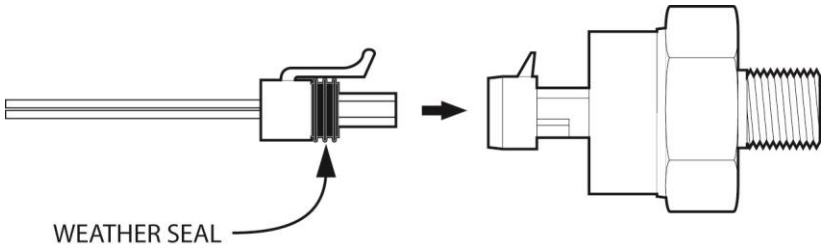

Figure 14. ***Pressure sensor's connector weather seal.***

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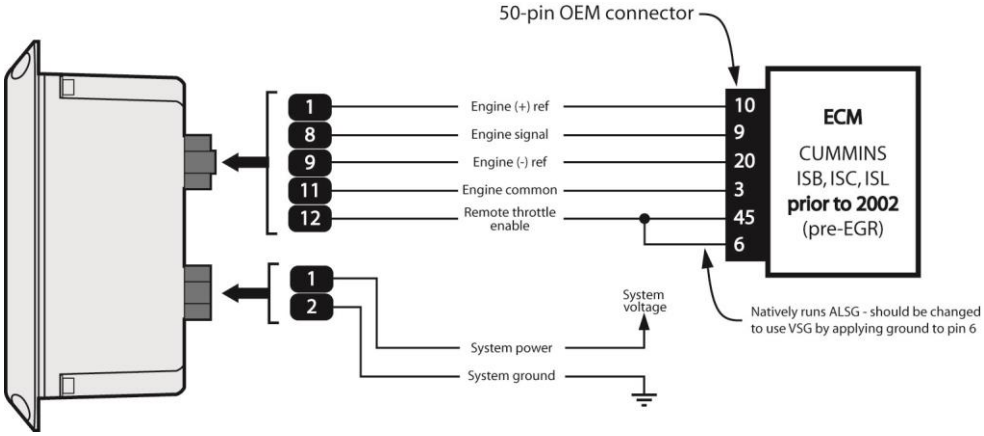
8. Governor to ECU interface

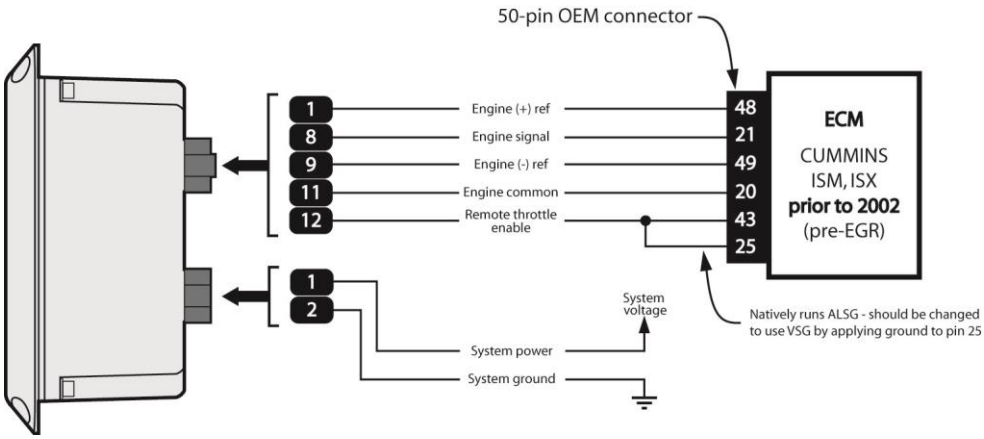
8.1. Special programming considerations for the engine

Some engine manufacturer's engine Electronic Control Unit (ECU) must be programmed for remote PTO or remote THROTTLE operation. Refer to the appropriate engine manual for details. If available, the engine should operate in Variable Speed Governing (VSG) mode when pumping.

8.2. Cummins ISB, ISC, ISL prior to 2002 (pre-EGR)



8.3. Cummins ISM, ISX prior to 2002 (pre-EGR)



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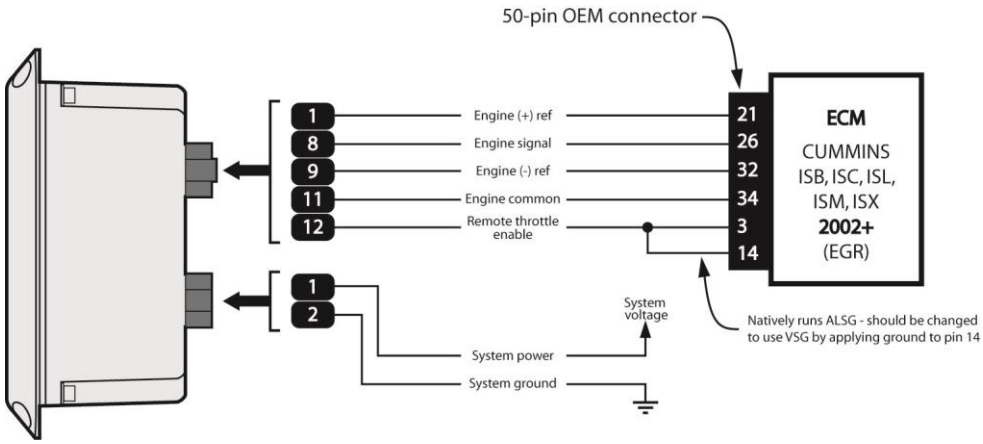
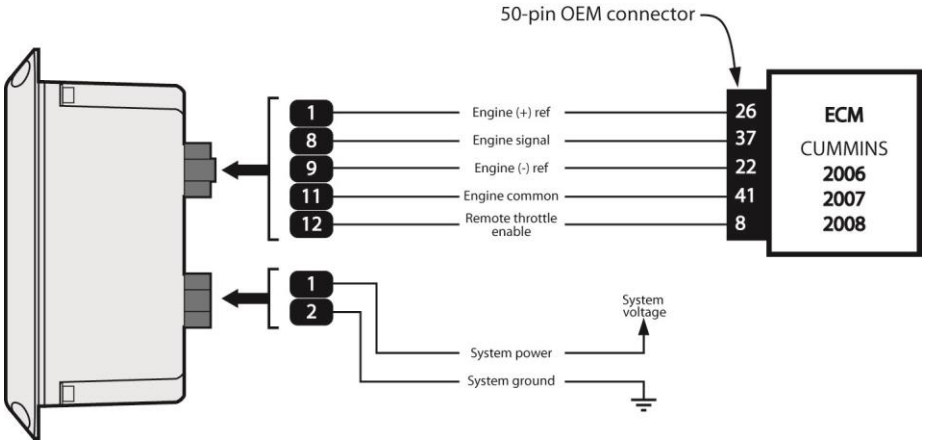
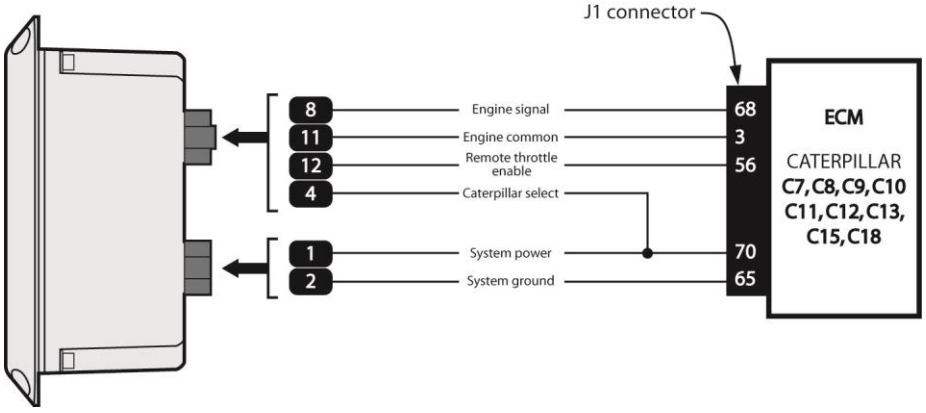
8.4. Cummins ISB, ISC, ISL, ISM, ISX 2002+ (EGR)



8.5. Cummins 2006, 2007, 2008



8.6. Caterpillar C7 – C13, C15, C18



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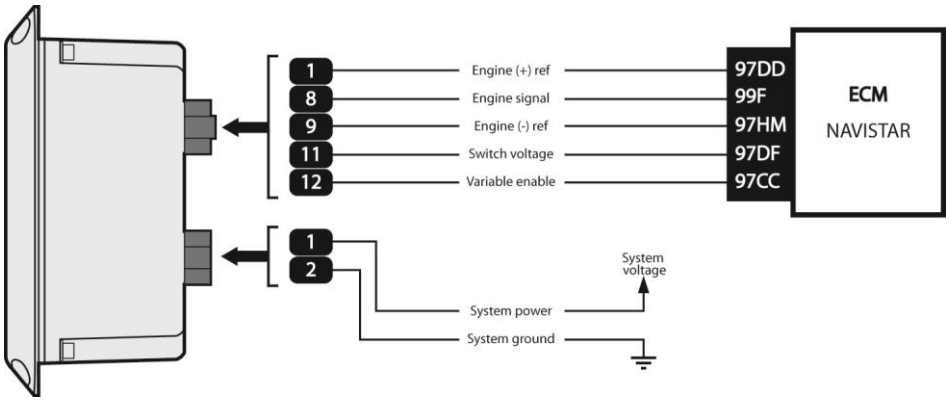
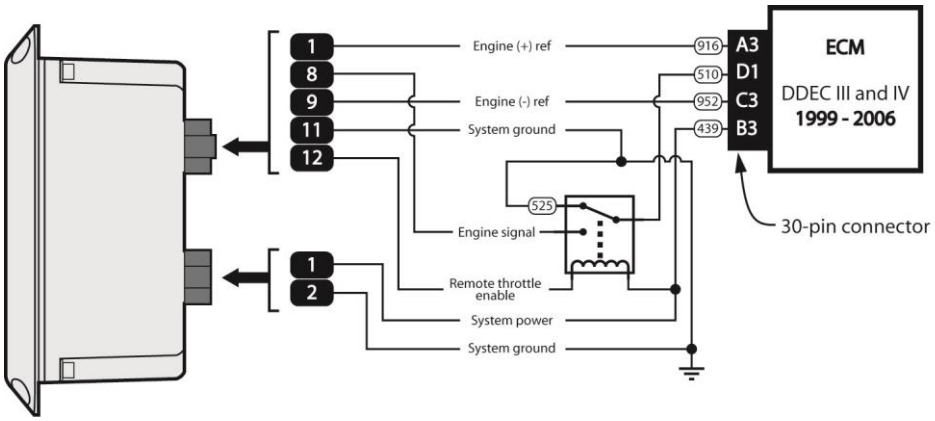
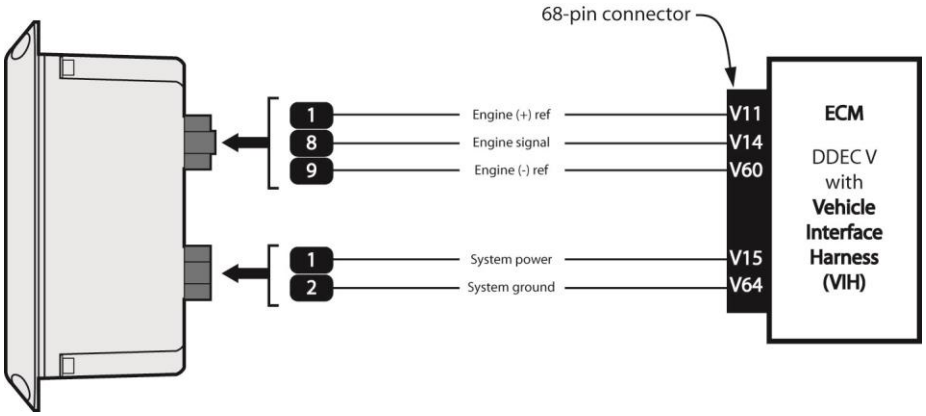
8.7. Navistar



8.8. Detroit Diesel DDEC III and IV 1999-2006



8.9. Detroit Diesel DDEC V with Vehicle Interface Harness (VIH)



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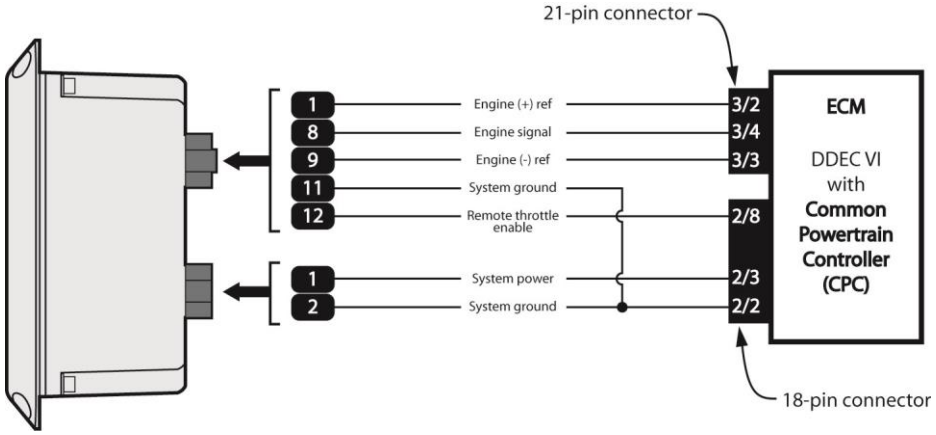
8.10. Detroit Diesel DDEC VI with Common Powertrain Controller (CPC)



8.11. Mack

Some

8.12. Mercedes MBE 900

Some

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9. Troubleshooting

9.1. Does not power up

Some

9.2. No throttle response

Some

9.3. Shows SENSOR in message center window

Some

9.4. Engine speed oscillates while in RPM mode

Some

9.5. Engine speed oscillates while in PRESSURE mode

Some

9.6. Overshoots preset pressure and then oscillates with increasingly wider swings

Some

9.7. Does not respond fast enough

Some

9.8. Presets (RPM and PRESSURE) not working

Some

9.9. One or more switches are inoperative

Some

9.10. Fast idle does not work

Some

9.11. Pressure spikes

Some

9.12. Control does not return to cab throttle when finished pumping

Some

9.13. Message center display is garbled or dim

Some

9.14. CAVITATE is shown in the message center window

Some

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9.15. PUMP ENGAGED or THROTTLE READY LEDs are inoperative

Some

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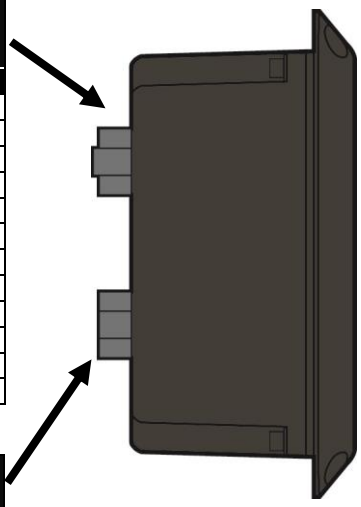
10. Connector Description

10.1. Governor connectors

The module has two connectors and the following definitions apply:

Mating connector: Deutsch DT06-12SA GRAY
Mating sockets: Deutsch 0462-201-16141
Wedge lock: W12S
Recommended wire gage: 16-18 AWG

PIN	CIRCUIT	DESCRIPTION
1	ENG REF (+)	(INPUT) – analog signal reference (+5VDC)
2	THROT INTLK	(INPUT) – throttle ready interlock (positive polarity)
3	HI IDLE	(INPUT) – high idle enable (positive polarity)
4	CAT SELECT	(INPUT) – Caterpillar control select (positive polarity)
5	Sensor GND	(OUTPUT) – pressure sensor ground
6	Sensor REF	(OUTPUT) – pressure sensor supply (+5VDC)
7	Sensor SIGNAL	(INPUT) – pressure sensor signal (+0.5VDC to +4.5VDC)
8	ENG SIGNAL	(OUTPUT) – analog signal control (+0.5VDC to +4.5VDC)
9	ENG REF (-)	(INPUT) – analog signal reference (ground)
10	PUMP INTLK	(INPUT) – pump engaged interlock (positive polarity)
11	RELAY COM	(INPUT) – remote throttle (ground polarity)
12	RELAY N.O.	(OUTPUT) – remote throttle activate (ground polarity)



Mating connector: Deutsch DT06-4SA GRAY
Mating sockets: Deutsch 0462-201-16141
Wedge lock: W4S
Recommended wire gage: 16-18 AWG

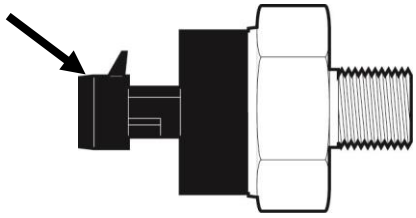
PIN	CIRCUIT	DESCRIPTION
1	SUPPLY (+)	(INPUT) – battery voltage (+9VDC…+32VDC)
2	SUPPLY (-)	(INPUT) – battery ground
3	----	----
4	----	----

10.2. Pressure sensor connector

The pressure sensor has one connector and the following definitions apply:

Mating connector: Packard 12078090
Mating sockets: Packard 12089290
Recommended wire gage: 16-18 AWG

PIN	CIRCUIT	DESCRIPTION
A	SUPPLY (-)	(INPUT) – pressure sensor ground
B	SUPPLY (+)	(INPUT) – pressure sensor supply (+5VDC)
C	Signal	(OUTPUT) – pressure sensor signal (+0.5VDC to +4.5VDC)



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11. Module Operating Parameters

Product category	Throttle Control
Voltage range	+9VDC…+32VDC
Power consumption	Logic supply+ input (pin 1 of the 6-pin Deutsch connector)
@13.8VDC	350mA
@27.6VDC	195mA
Output power	
Alarm	250mA (ground polarity)
Operational temperature range	-40ºC…+85ºC
Environmental range	IP 67
Protection	Internal thermal fuse (1850mA on pin 1 of the 6-pin Deutsch connector) Reverse voltage protection (pins 1 and 2 of the 6-pin Deutsch connector) CAN buses protected to 24V ESD voltage protected to SAE J1113 specification for heavy duty trucks (24V) Transient voltage protected to SAE J1113 specification for heavy duty trucks (24V) Load dump voltage protected to SAE J1113 specification for heavy duty trucks (24V) Outputs protected for short circuit and thermal overload
Dimensions (W x H x D) in inches [mm]	4.437 [112.70] x 6.000 [152.39] x 2.250 [57.15]

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Fax : 352-629-2902 or 1-800-520-3473

12. 产品中有毒和有害的物质或成份的名称和含量 – (NAMES AND CONTENTS OF THE TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS IN THE PRODUCTS)

Class1 is committed to comply with the Management Methods on Control of Pollution from Electronic Information Products of China (China RoHS). The RoHS Directive restricts substances including lead (Pb), mercury (Hg), Cadmium (Cd), hexavalent chromium (CrVI) and certain halogenated flame retardants such as polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment.

零件名称 Parts	有毒和有害的物质或成份 TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS					
	铅 (Pb)	汞 (Hg)	六价铬 (CrVI)	多溴联苯 (PBBs)	多溴二苯醚 (PBDEs)	镉 (Cd)
面板 Faceplate	O	O	O	O	O	O
基准 Base	O	O	O	O	O	O
盒子 Box	O	O	O	O	O	O
油脂 Grease	O	O	O	O	O	O
标签 Label	O	O	X	O	O	O
O形圈 O-ring	O	O	O	O	O	O
印制电路汇编 1 PCB assembly 1	X	O	O	O	O	O
印制电路汇编 2 PCB assembly 2	X	O	O	O	O	O
螺钉 Screw	O	O	O	O	O	O
垫片 Washer	O	O	O	O	O	O
连接器 Connector	X	O	O	O	O	O

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下。
○：Indicates that this hazardous substance contained in all homogeneous materials of this part is below the limit requirement in SJ/T 11363-2006.

×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求。
×：Indicates that this hazardous substance contained in at least one of the homogeneous materials of this part is above the limit requirement in SJ/T 11363-2006.

除非另外特别的标注,此标志为针对所涉及产品的环保使用期限标志.此环保使用期限只适用于产品在产品手册中所规定的条件下工作.

The Environment-Friendly Use Period (EFUP) for all enclosed products and their parts are per the symbol shown here, unless otherwise marked. The Environment-Friendly Use Period is valid only when the product is operated under the conditions defined in the product manual.