Contents

Engine Control

Overview
Many electronically controlled engines can be remotely operated by using an Analog throttle control signal. Some engine software must be configured for remote operation, check the engine application manuals for details. This programming should be accomplished whenever required for installing a remote throttle device.

Operation
Class1 offers Vernier throttle controls and interfaces for specific engine applications and pressure governor control systems that utilize the remote throttle input of the engine ECM.
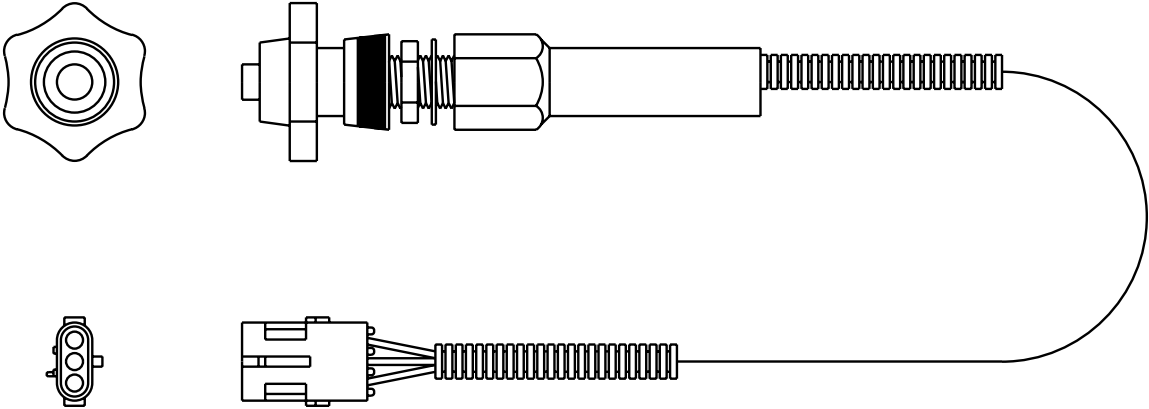
Variable Throttle Control   When the remote throttle is enabled, variable engine control is available to the operator using the remote throttle input. Some engines perform an idle validation, if the remote throttle is open when the throttle is enabled, the engine ECM will maintain the engine at idle RPM until the throttle is closed and then re-opened. This feature prevents sudden unexpected increases in engine speed when the unit is initially activated. See the appropriate engine manual for application specific information. Other engines do not validate idle. If the throttle is left open and the remote throttle is turned on, the engine will respond by increasing RPM to the remote throttle setting. Caution should be exercised whenever enabling this type of throttle.

High Idle Control   A High Idle signal can be used to bring the engine speed to a pre-determined engine RPM (High Idle) from a remotely mounted switch or load management device. This speed can be set by an external potentiometer, a resistor network or a switch input and is an integral function of the Class1 Pressure Governors.

Wiring   Interface wiring is straight forward and can consist of 2 to 5 wires dependent on the engine application. Refer to the diagrams in this manual for wiring examples.

Refer to the engine manufacturer's Electronic Application & Installation Guides for detailed information on engine electrical interfacing.

Part Number	Description	Weight
100076	ElectronicThrottle	1.00#

Class 1 provides a variety of engine controls that are used in a broad range of applications, therefore it is impossible for *Class 1* to determine the suitability of a particular control for any specific application. The flexibility of our products allows them to be used in a limitless number of custom applications. *Class 1* can advise you of the features that are available on a given product so that you can determine what product will meet your needs. We believe that the Original Equipment Manufacturer's (OEM) engineering departments are qualified experts in their product field and are the authorities on product application and safety. Since our products are typically used in safety critical applications, the OEM must undertake appropriate testing to prevent injury to the end user.

WARNING

⚠
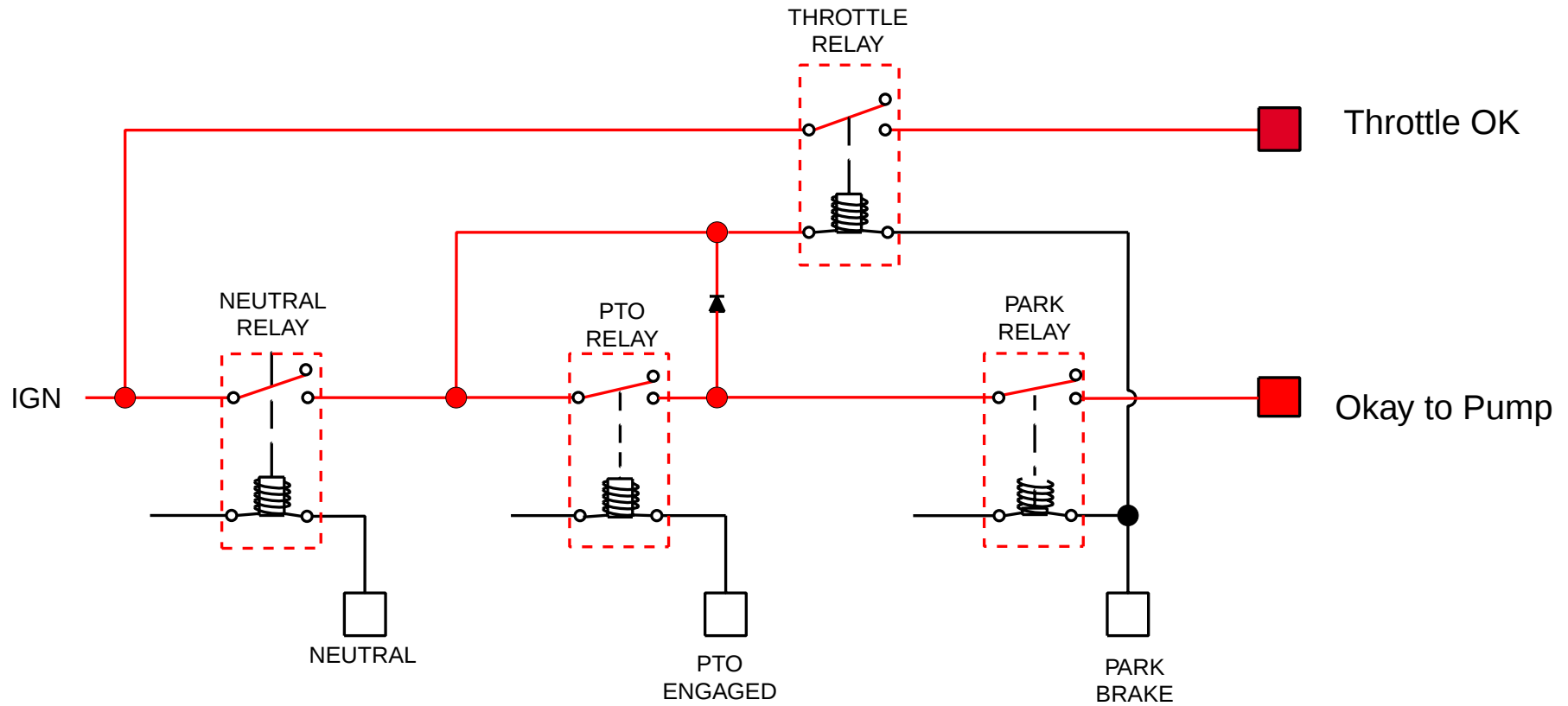
IT IS THE PURCHASER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF ANY PRODUCT FOR AN INTENDED APPLICATION, AND TO INSURE THAT IT IS INSTALLED AND GUARDED IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, LOCAL AND NFPA SAFETY AND HEALTH REGULATIONS, CODES AND STANDARDS.
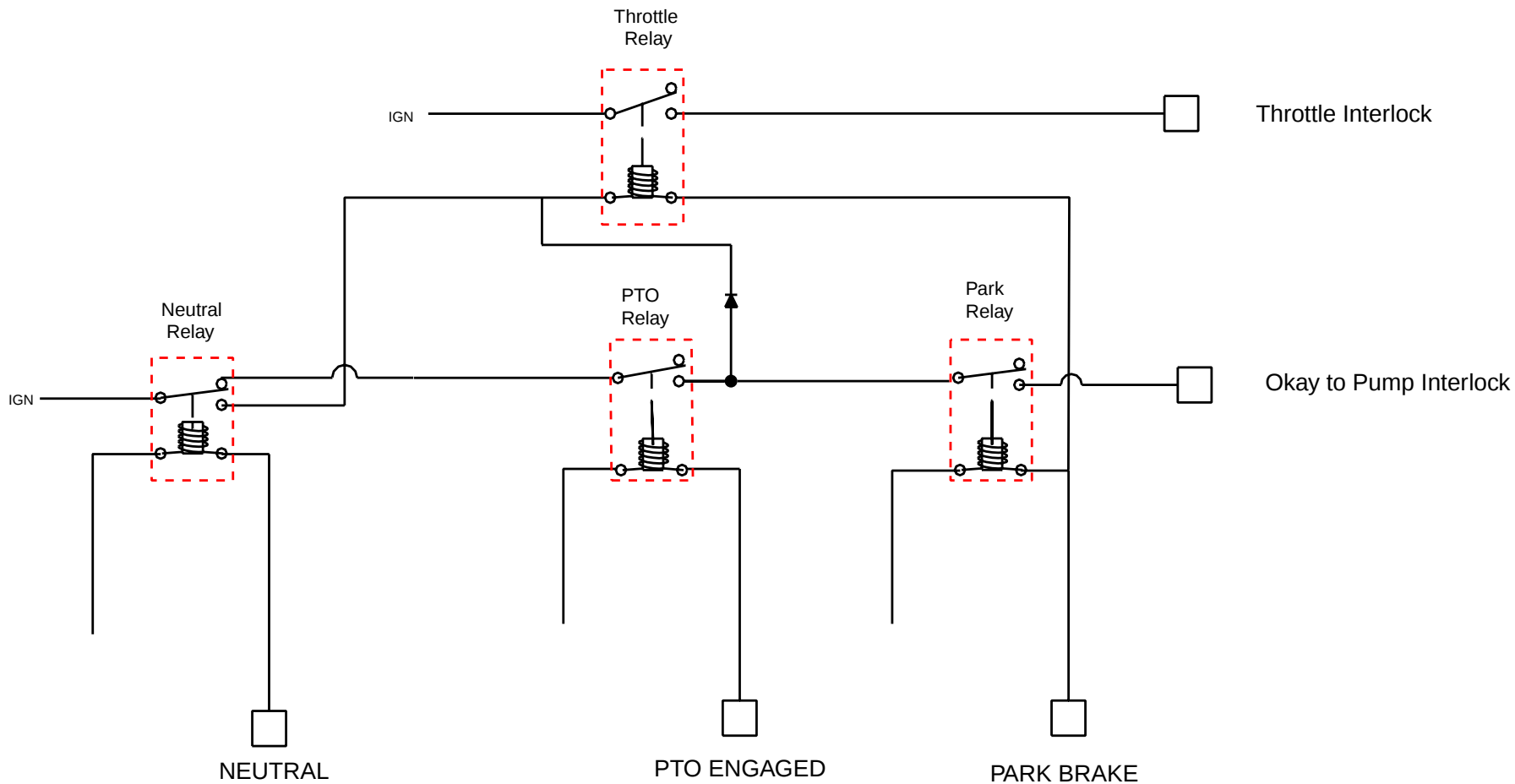
NOTE:
The interlock schemes shown in this manual are examples only and may not be suitable for specific applications.

Special Programming
Some ECMs require programming for remote throttle operation and several considerations including vehicle speed and max RPM may need to be configured. The latest information should be available from the manufacturer's dealer network system.

Interlocks

THROTTLE
RELAY

Throttle OK

NEUTRAL
RELAY

PTO
RELAY

PARK
RELAY

IGN

Okay to Pump

NEUTRAL

PTO
ENGAGED

PARK
BRAKE

Class1

Throttle
Relay

IGN

Throttle Interlock

Neutral
Relay

PTO
Relay

Park
Relay

IGN

Okay to Pump Interlock

NEUTRAL

PTO ENGAGED

PARK BRAKE

Class1

The basic input for most engines is a variable 0-5 VDC signal at the remote throttle input of the ECM.

This input has various naming conventions and is manufacturer dependent.

DDC	Variable Speed Governor (VSG)
CAT	PTO Throttle Position (Multifunction Input #3)
CAT HEUI	Accelerator Input (Remote Accelerator Position Sensor)
Cummins	Remote Throttle Pedal Position Input
Navistar	Remote Sensor Output

All of these will be referred to as "Remote Throttle Inputs" except in the individual engine sections. With the exception of DDEC engines, all remote throttle applications must be programmed into the ECM. This can be performed using the appropriate engine software.

The remote throttle must be turned on in order to use it. This is a digital input for most engines and should the point at which safety interlocking is performed.

DDC	Switch from 525 to 510
CAT	K999GN PTO ON/OFF switch (MFI#1)
Cummins	Remote Accelerator Switch (Remote Throttle On/OFF switch)
Navistar	97CC Variable Enable

All engines except CAT provide a 5 VDC signal and a ground to be used with a remote throttle. Installation consists of connecting the 5 VDC supply to terminal C on the throttle (Red Wire), Signal Ground to terminal A (Black Wire) and the remote throttle input to terminal B (Green Wire).

+5VDC Output   Terminal C on the Vernier (RED)

DDC	916 circuit
CAT	NA
Cummins	Remote Throttle +5VDC (VSensor B)
Navistar	97DD Reference Voltage

Ground   Terminal A on the Vernier (BLACK)
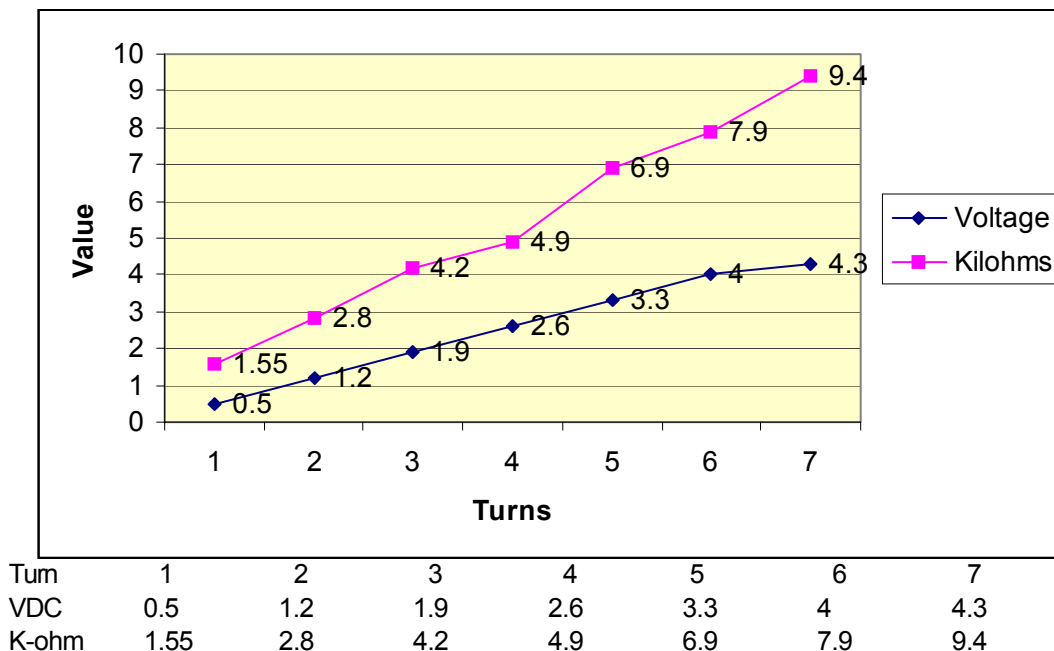
DDC	952 Sensor Return
CAT	NA (993-BR Input Sensor Common #2)
Cummins	Remote Throttle Return
Navistar	97WA Signal Return
	97DF Switch Voltage

Signal   Terminal B on the Vernier (GREEN)
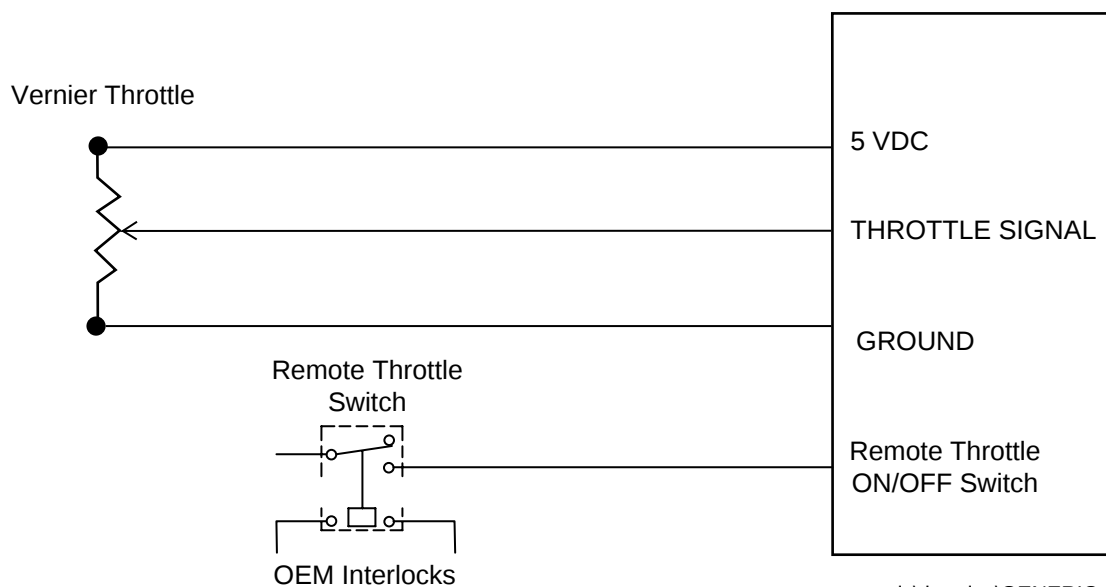
DDC	510 Variable Speed Governor	0-5 VDC
CAT	G845-PU Accelerator Input (Input #8)	10%-90% PWM
Cummins	Remote Throttle Pedal Position Input	0.25-4.2 VDC
Navistar	99F Remote Sensor Output	0.25-4.2 VDC

Vernier

Class 1

Vernier Throttle Voltage/Resistance relationship by full turns. Readings taken from the Black wire (ground) to the Green wire (signal). Regulated 5 VDC is applied to the Red Wire for Voltage readings. This chart can be used to troubleshoot throttles in the field using the ground and 5 VDC supply from the engine ECM or Class1 Interface Module. Voltage readings provide more reliable information than resistance checks. Field readings should be within 5 % of those shown.

Vernier 101558 readings will be slightly different since it uses a scaled voltage throttle.

Turn	1	2	3	4	5	6	7
VDC	0.5	1.2	1.9	2.6	3.3	4	4.3
K-ohm	1.55	2.8	4.2	4.9	6.9	7.9	9.4
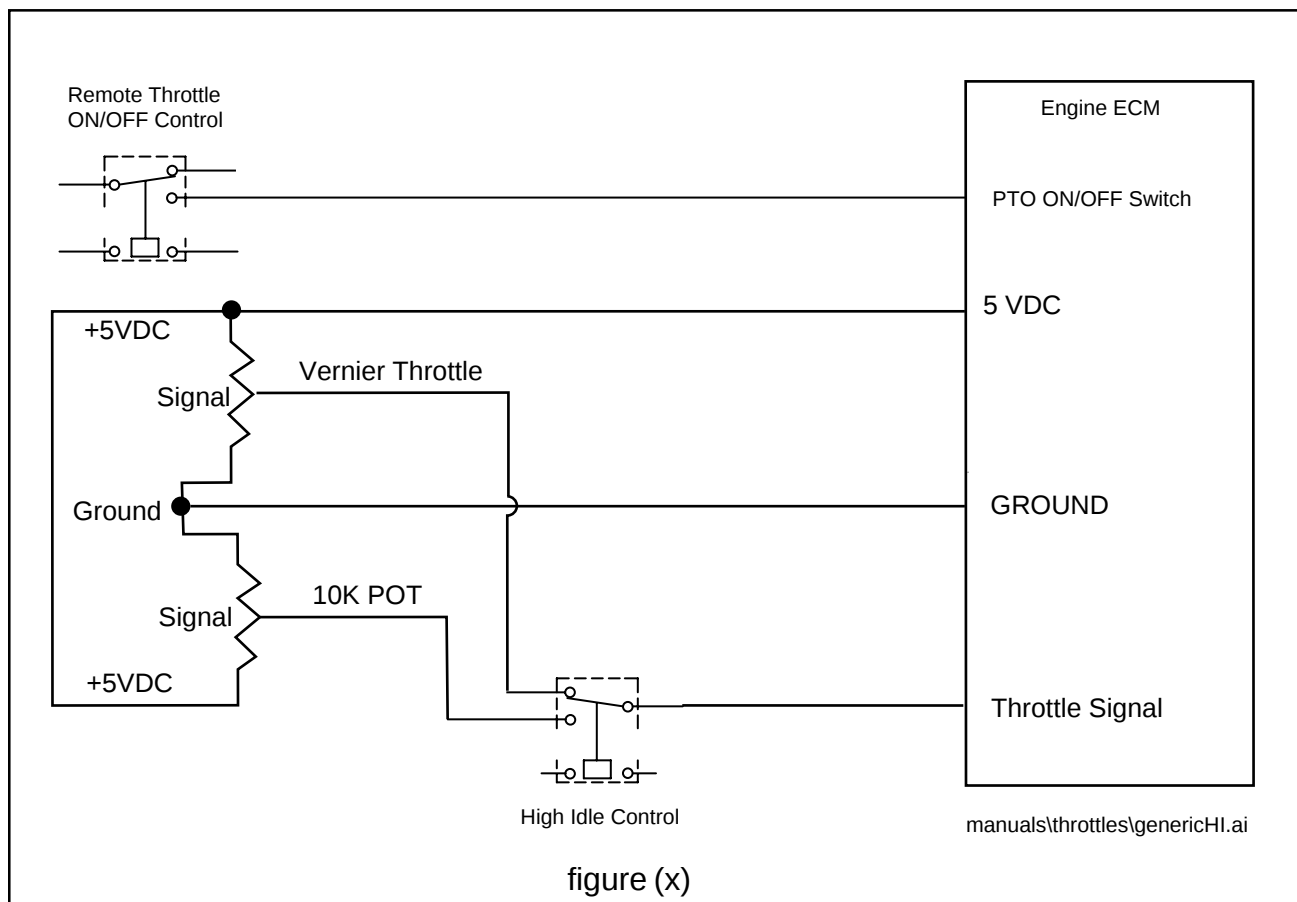
Generic Remote Throttle connections for analog voltage signal and remote turn on function.

manuals\throttles\GENERIC.ai

If the Remote Throttle input is used for a high idle function, a potentiometer or voltage divider must be used to set the engine RPM (ECM signal voltage input). Figure (x) shows a simple layout for using a vernier control and a potentiometer to accomplish both a variable throttle and a high idle function using the remote throttle functions on the ECM.

Remote Throttle Connections including High Idle for analog voltage signal and remote turn on function.

figure (x)

On some engines, the ECM performs an idle validation. In these cases a scheme must be devised to look at the closed throttle after the remote throttle has been turned on before changing over to the high idle potentiometer. A time delay relay or a signal from the engine ECM can be used. The delay only needs to be a few milliseconds.

Caterpillar has several engine models that are used in fire apparatus.

The C-10 and C-12 engines along with the 3406E are identical for remote throttle and engine ECM connections. They are in the process of changing over to the HEUI configuration and the ECM connections will change from the 40 pin connectors (over and under) to the 70 pin side by side connectors used on the newer ECMs. The 3116 and 3126 engines have two variations. The original 3116 and 3126 models are no longer being produced and will not be addressed here to avoid confusion. The 3126B HEUI and 3116 B HEUI engines are the current production models.

CAT remote throttle inputs require a pulse width modulated signal (PWM). The Class1 throttle interface module converts the 0-5 Volt signal from a vernier control to an appropriate PWM signal that is used to control engine RPM.
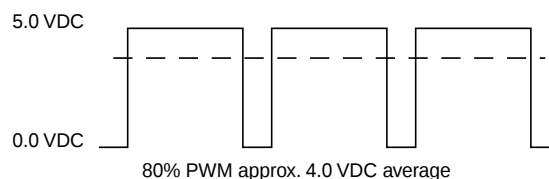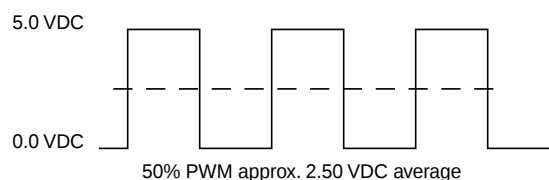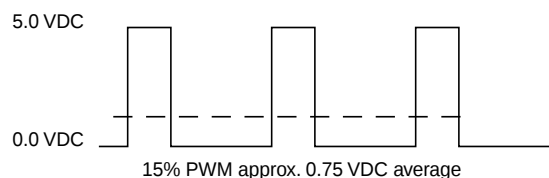
One note about the HEUI engines as currently delivered: They do not support oil pressure information on the J-1587 data bus unless that feature is specifically ordered with the engine. Class1 produces a module that delivers oil pressure to the information bus if an electronic information center is desired and the oil pressure feature was not ordered with the engine.

CAT currently performs idle validation on the remote throttle signal on HEUI engines. This means that there will be no throttle response if the control is left open or not closed properly when the remote throttle is turned on at the engine ECM. To use the throttle, it must be closed and then re-opened. The throttle interface module from Class1 also performs idle validation. If necessary for operation, the module's validation can be over-ridden by supplying 12 volts to connector C-4 (this is labeled high idle, but is actually the idle validation over-ride feature) at the same time that the module is turned on.
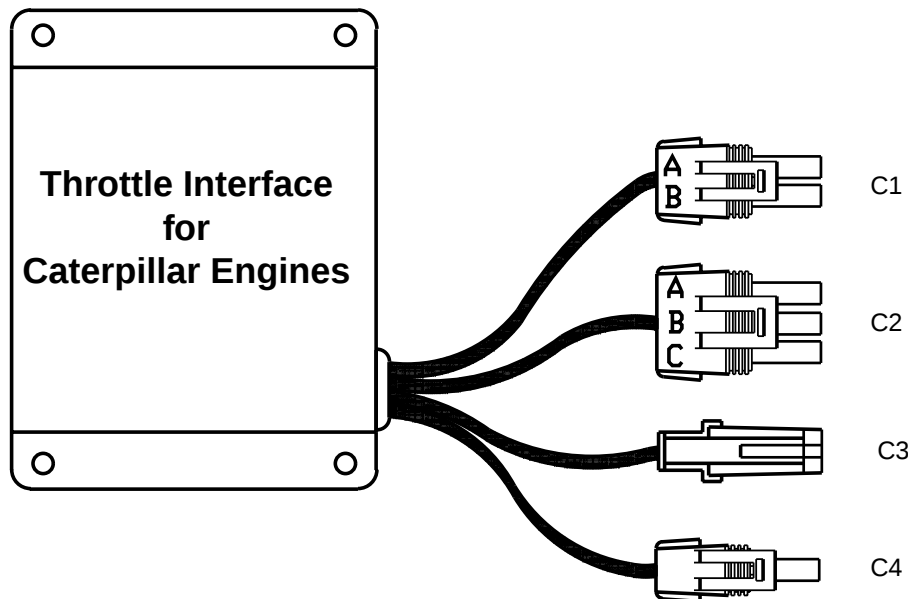
Best operation is attained if the interface module is turned on concurrently with the engine ECM. This method will work on all electronically controlled CAT engines. Safety Interlocking should be performed on the PTO On/Off switch (multi-function input #1).

Engine specific wiring information provided on the following pages is as accurate as possible at the time of publication. Bear in mind that engine control software is constantly changing and revisions may show up that may result in unexpected or unexplained operation.

As always, the engine manufacturer's dealers and publications are the best and most reliable source for application specific operational information.

5.0 VDC

0.0 VDC

15% PWM approx. 0.75 VDC average

5.0 VDC

0.0 VDC

50% PWM approx. 2.50 VDC average

5.0 VDC

0.0 VDC

80% PWM approx. 4.0 VDC average

Caterpillar Engines require a Pulse Width Modulated (PWM) throttle signal. Class1 provides an interface that performs a conversion from a 0-5 VDC analog signal to a 12%-85% PWM signal (PN 100924).

**Throttle Interface
for
Caterpillar Engines**

C1

C2

C3

C4

Connector Information

C1   Connector 12015792   Terminal 12089188   Seal 12015899

Position	Wire Color	Description
A	Red	Throttle Interlock
B	Black	Ground

C2   Connector 12015793   Terminal 12089188   Seal 12015899

Position	Wire Color	Description
A	White	Throttle ground
B	Blue	Throttle Signal
C	Orange	Throttle Source

C3   Connector 12010973   Terminal 12089040   Seal 12015899

Position	Wire Color	Description
A	Yellow	PWM Signal

C4   Connector 12015791   Terminal 12089188   Seal 12015899

Position	Wire Color	Description
A	Green	Fast Idle*

* This input bypasses idle validation and allows the interface to command engine speed as soon as power is applied. An external 10KΩ potentiometer can be used to set the High Idle RPM. This can be paralleled with the vernier and a relay used to segregate the signals.
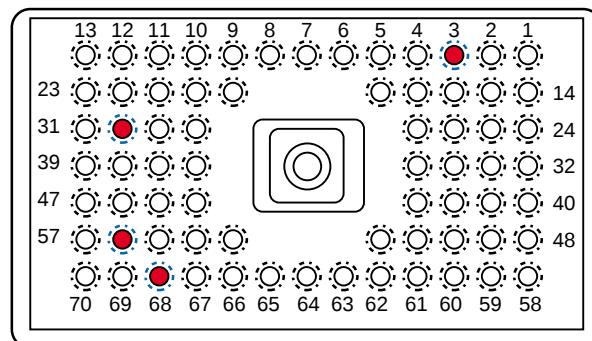
Connector C2 provides the 5 VDC source and ground to the Vernier Control.

Caterpillar 3126B HEUI ECM
Throttle Interface Module

PTO ON/OFF
SWITCH

Caterpillar 3126B HEUI

.30   87a

87

85   86

Class 1

Caterpillar Interface

56   Input #1
PTO On/Off
Ground

Sensor Common
(Ground)

3   Input Sensor
Common #2
Ground

Throtle Position
C3

68   INPUT #8
RAPS
PWM

C1-A
12 VDC   C1-B

OEM
Interlocks

PTO ON Lamp

30   Output #1
PTO On Lamp
Ground

12 VDC

New Caterpillar 3126B

Vehaicle Harness Connector
ECM Side

Programming Considerations

Parameter	Available	Defaults
PTO	Remote Throttle	Off
PTO Top Engine Limit	600-2120	2120
PTO RPM set speed	Idle-PTO TEL	0 RPM
PTO Cab Throttle RPM	TEL, Idle,PTO TEL	TEL
PTO activates cooling fan	Normal, Continuous	Normal
Torque Limit	200 lb-ft to Rated	2000 lb-ft
Idle PTO vehicle speed limit	1 to 15 MPH	1 MPH

13 12 11 10 9 8 7 6 5 4 3 2 1
23   14
31   24
39   32
47   40
57   48
70 69 68 67 66 65 64 63 62 61 60 59 58

CAT J1/P1 Connector
ECM RIGHT SIDE

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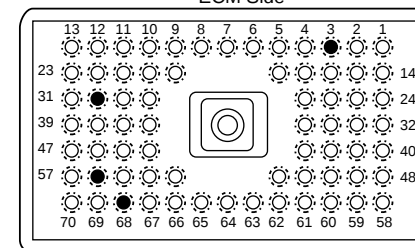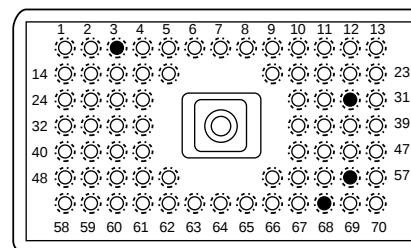
Terminal 68 is the Remote Throttle PWM input port.   (PWM)
Terminal 56 is the remote throttle ON/OFF switch input.   (ground IN)
Terminal 03 is the Sensor Ground output.   (ground OUT)
Terminal 30 is the PTO ON Lamp output.   (ground OUT)

Caterpillar 3126B ECM
Throttle Interface Module

HIGH IDLE POT (10K)

VERNIER CONTROL (10K)

Class 1
Caterpillar Interface

C2-A Ground

C2-C +5VDC

C2-B Throt Sig

Throtle Position
PWM Out   C3

C4
IdleValidation
Override

C1-B

C1-A 12 VDC

FAST IDLE
Interlocks

FAST IDLE
Request

**PTO
Interlocks**

PTO Engaged
Relay

30   87a

87

85   86

Sensor Common
(Ground)

56   PTO On/Off
     Ground

3   Input Sensor
    Common #2
    Ground

68   INPUT #8
     RAPS   PWM

30   Output #1
     PTO On Lamp
     Ground

12 VDC

PTO ON Lamp

ECM Power

Caterpillar 3126B

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Programming Considerations

Parameter	Available	CAT Default	Program
PTO	Remote Throttle	Off	ON
PTO Top Engine Limit	600-2120	2120	2120
PTO RPM set speed	Idle-PTO TEL	0 RPM	xx
PTO Cab Throttle RPM	TEL, Idle,PTO TEL	TEL	TEL
PTO activates cooling fan	Normal, Continuous	Normal	Continuous
Torque Limit	200 lb-ft to Rated	2000 lb-ft	Rated
Idle PTO vehicle speed limit	1 to 15 MPH	1 MPH	Max

CAT J1/P1 Connector
ECM RIGHT SIDE

Vehicle Harness Connector
Harness Side

Vehicle Harness Connector
ECM Side

1 2 3 4 5 6 7 8 9 10 11 12 13
14   23
24   31
32   39
40   47
48   57
58 59 60 61 62 63 64 65 66 67 68 69 70

13 12 11 10 9 8 7 6 5 4 3 2 1
23   14
31   24
39   32
47   40
57   48
70 69 68 67 66 65 64 63 62 61 60 59 58

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12

Caterpillar C10, C12, 3176 & 3406 ECM

Vehicle Harness Connector

CAT Lower Connector (J1/P1)

Class 1
Caterpillar Interface

C1-A
12 VDC

C1-B

Throttle Position
C3

PTO Engaged
Relay

30   87a
85   86   87

Caterpillar 3176/3406

8 PTO On/Off

29 Sensor Common
Ground

31 Multifunction Input #3
PWM

OEM
Interlocks

PTO

PTO Lamp

12 VDC

21 Output #1
PTO On Lamp

Caterpillar 3176/3406

Programming Considerations

| Parameter	Available	Default
PTO	Remote Throttle	Off
PTO Top Engine Limit	600-2120	2120
PTO RPM set speed	Idle-PTO TEL	0 RPM
PTO Cab Throttle RPM	TEL, Idle,PTO TEL	TEL
PTO activates cooling fan	Normal, Continuous	Normal
Torque Limit	200 lb-ft to Rated	2000 lb-ft
Max PTO vehicle speed limit	1 to 127 MPH	1 MPH

Class1
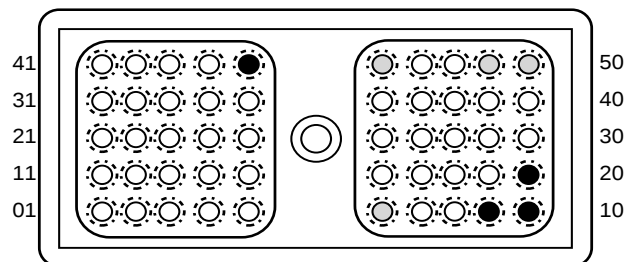
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Vernier Throttle for Cummins ISB/C
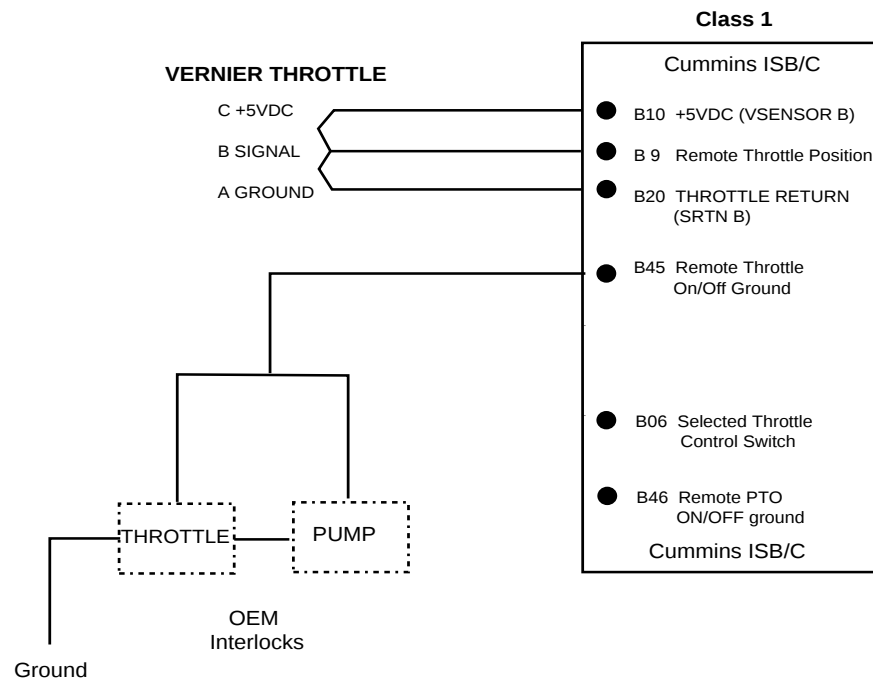
Class 1

NOTES:
The Cummins ECM must be programmed for Remote Throttle!
This document is meant only as an installation guide.

All information is correct as of the date drawn, but the customer
needs to be aware that any documentation is subject to change
without notice and that the best possible resource is from the
equipment manufacturer directly.

Interlocks should conform to any applicable safety considerations
for the vehicle's intended use, such as the latest edition of the
N.F.P.A. 1901 Standard for Automotive Fire Apparatus.

VERNIER THROTTLE

C +5VDC
B SIGNAL
A GROUND

Cummins ISB/C

- B10 +5VDC (VSENSOR B)
- B 9 Remote Throttle Position
- B20 THROTTLE RETURN (SRTN B)
- B45 Remote Throttle On/Off Ground
- B06 Selected Throttle Control Switch
- B46 Remote PTO ON/OFF ground

Cummins ISB/C

THROTTLE — PUMP

OEM Interlocks

Ground

41 | 50
31 | 40
21 | 30
11 | 20
01 | 10

Cummins "B" Connector
ECM SIDE

B06 changes between an automotive (min/max) governor and a variable speed governor.
B46 selects a preprogrammed remote PTO speed.
B49 J1587 data link pos.
B50 J1587 data link neg.

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14
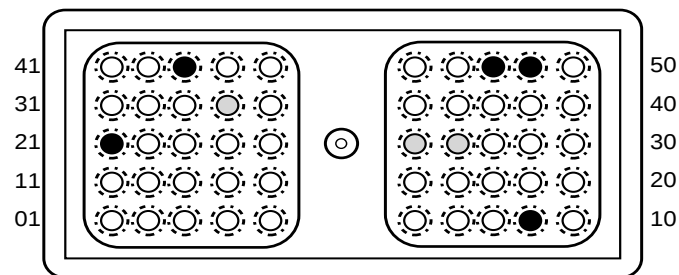
Vernier Throttle for Cummins ISM

NOTES:

The Cummins ECM must be programmed for Remote Throttle!
This document is meant only as an installation guide.

All information is correct as of the date drawn, but the customer
needs to be aware that any documentation is subject to change
without notice and that the best possible resource is from the
equipment manufacturer directly.

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for the vehicle's intended use, such as the latest edition of the
N.F.P.A. 1901 Standard for Automotive Fire Apparatus.

VERNIER THROTTLE

Cummins ISM

C +5VDC — 48 +5VDC (VSENSOR B)

B SIGNAL — 21 Remote Throttle Position

A GROUND — 49 THROTTLE RETURN
(SRTN B)

43 Remote Throttle
On/Off
Ground

THROTTLE — PUMP — 09 Switch Common

OEM
Interlocks

Cummins ISM

Term 48 and 49 shared with cab throttle
Term 34 selects a preprogrammed remote PTO speed.
Term 26 J1708 data link pos.
Term 27 J1708 data link neg.

41
31
21
11
01

50
40
30
20
10

Cummins "OEM" Connector
ECM SIDE

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Class1

Detroit Diesel DDEC III engine ECMs are ready to connect and operate without any extra programming. The remote throttle is called the Variable Speed Governor and the signal input is to ECM terminal D-1.

Interlocking should be accomplished so that the circuit is grounded whenever the remote throttle should **NOT** be used. When the circuit is grounded, it is called 525 and when it is operational, it is called 510.

DDEC ECM

VIH Connector
A-3   D-1   C-3

BLACK
GREEN
A
B
C
RED

OEM
Interlocks

+12 VDC

DDECIII ECM

916 5 VDC

916

Vernier Throttle

510

952

952 GROUND

952

10K POT

510

525

916

510 Throttle Signal

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ECM Information

Vehicle Interface Harness Connector

Wire	Cavity	Polarity	Function
417	D-2	0-5 VDC	LSG Cab Throttle
419	B-1	GND	Check Engine Light
439	B-3	12 VDC	Switched Ignition
451	E-1	GND	Fan Override
509	B-2	GND	Stop Engine Light
510	D-1	0-5 VDC	VSG remote throttle
555	A-2	GND	(Fan Control #1
749	D-3	0-5 VDC	H2O PSI
900	C-2	digital	J-1587 +
901	C-1	digital	J-1587 -
916	A-3	5 VDC	Sensor Supply
952	C-3	GND	Sensor Ground

Ignition Connector

440	A	12 VDC	BATT +
953	B	GND	BATT -
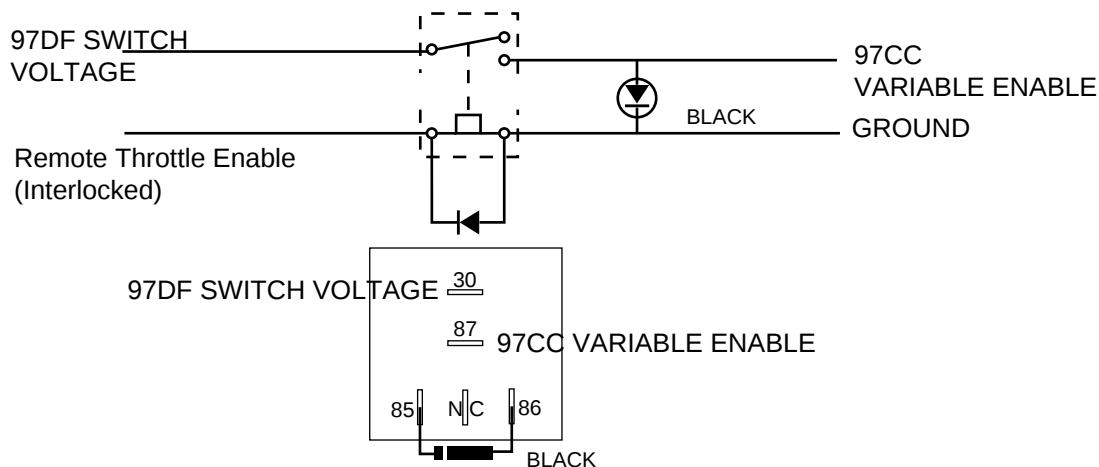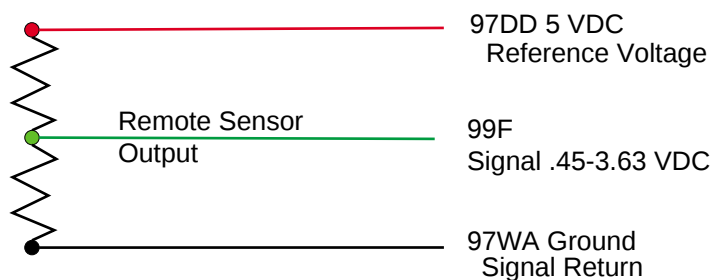
There are several digital inputs and outputs on the VIH connector that are programming specific

Their usage includes fan override, cruise control, pressure sensor governor, throttle inhibit, etc.

The VIH connector is a metri-Pack

International Remote Variable Throttle Inputs

Vernier

97DD 5 VDC
Reference Voltage

Remote Sensor
Output

99F
Signal .45-3.63 VDC

97WA Ground
Signal Return

97DF SWITCH
VOLTAGE

97CC
VARIABLE ENABLE

BLACK

GROUND

Remote Throttle Enable
(Interlocked)

97DF SWITCH VOLTAGE 30

87 97CC VARIABLE ENABLE

85 N C 86

BLACK

Accelerator Pedal Sensor Limits

LOW IDLE   0.25 V to 0.5 V

HIGH IDLE   3.5 V to 4.0 V

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Programming Considerations:
PTO Enable   Remote, In-Cab, In-Cab + Remote
Disable In-Cab Controls   Yes/No
Remote Thorttle for Engine Control   Yes/No

1	J1922 Data Link		36	Speedometer +
2	+ 5 VDC Supply		37	Speedometer -
3	Input Sensor Common #2		38	Tachometer +
4	+ 8 VDC Supply		39	Tachometer -
5	AP Sensor/Switch Sensor Common		40	Retarder/Sol. Med/Hi Switch (ground)
6	Input #6 (Switch to Gnd)		41	Input #11 (ground)
7	Input #4 (Switch to Gnd)		42	J 1939 Data Link Shield
8	J 1587 Data Link Positive		43	Not Used
9	J 1587 Data Link Negative		44	Resume (switch to ground)
10	Output #2 (High Side)		45	Service Brake Pedal Position (ground)
11	Output # 5 (High Side PWM)		46	Input #7 (ground)
12	Output #3 (High Side)		47	Input #5 (ground)
13	Output #4 (High Side)		48	Not Used
14	J 1922 Data Link		49	Coolant Level Normal Input
15	Not Used		50	J 1939 Data Link positive
16	Not Used		51	Not Used
17	Not Used		52	Unswitched Battery
18	Input Sensor Common #1		53	Unswitched Battery
19	Output #6		54	Coolant Level Low Input
20	Output #7 (High Side)		55	Not Used
21	Output #8		56	Input #1 (ground)
22	Clutch Pedal Position Switch (ground)		57	Not Used
23	Retarder Sol. Low/Hi Switch		58	Input #2 (ground0
24	Not Used		59	Cruise Control ON/OFF (ground)
25	Not Used		60	Input #3 (ground)
26	Input #10		61	Not Used
27	Input #10		62	Input #12 (battery)
28	Check Engine LAmp (Low Side)		63	Not Used
29	Warning Lamp (Low Side)		64	Input #13 (battery)
30	Output #1 (Low Side)		65	- Battery Supply
31	Output #9 (Low Side)		66	Accelerator Pedal Position (PWM)
32	Vehicle Speed IN +		67	- Battery Supply
33	Vehicle Speed IN -		68	Input #8 (Remote Accelerator PWM)
34	J 1939 Data Link Negative		69	Not Used
35	SET (Switch to Ground)		70	Switched Battery

1	Stop Lamp		26	On Idle Switch
2	Water in Fuel Lamp		27	Clutch Switch Input
3	Diagnostic Lamp		28	Gear Ratio Switch
4	Engine Protection Lamp		29	V Throttle +5 VDC
5	Auxiliary Output		30	Throttle Position Input Signal
6	Selected Throttle Control Switch		31	Cold Starting Aid Relay 2
7	Cruise Control/PTO Resume Switch		32	
8	VSS +		33	Srvice Brake Switch Input
9	Remote Throttle Position Input		34	Engine Brake ON/OFF Input
10	Remote Throttle +5VDC (V sensor B)		35	Idle and Diagnostic Increment Input
11	Wait to Start Lamp		36	Idle and Diagnosticc Decrement Input
12	Tachometer Out (logic level)		37	Diagnostic ON/OFF Input
13	Cruise and PTO SET and Coast Input		38	A/C ON/OFF Switch
14	Cruise and PTO ON/OFF		39	
15			40	Water In Fuel
16	Fan Clutch Switch Inputs		41	Cold Starting Aid Relay 1
17	Switched Torque Limit		42	
18	VSS -		43	A/C Pressure Switch
19	Throttle Return		44	
20	Remote Throttle Return (SRTN B)		45	Remote Throttle ON/OFF Input
21	Analog Torque		46	Remote PTO ON/OFF Input
22			47	A/C Cycle Switch
23	Switched Max Operating Speed		48	
24	Throttle Interlock Input		49	J-1587 +
25	OFF Idle Switch		50	J-1587 -
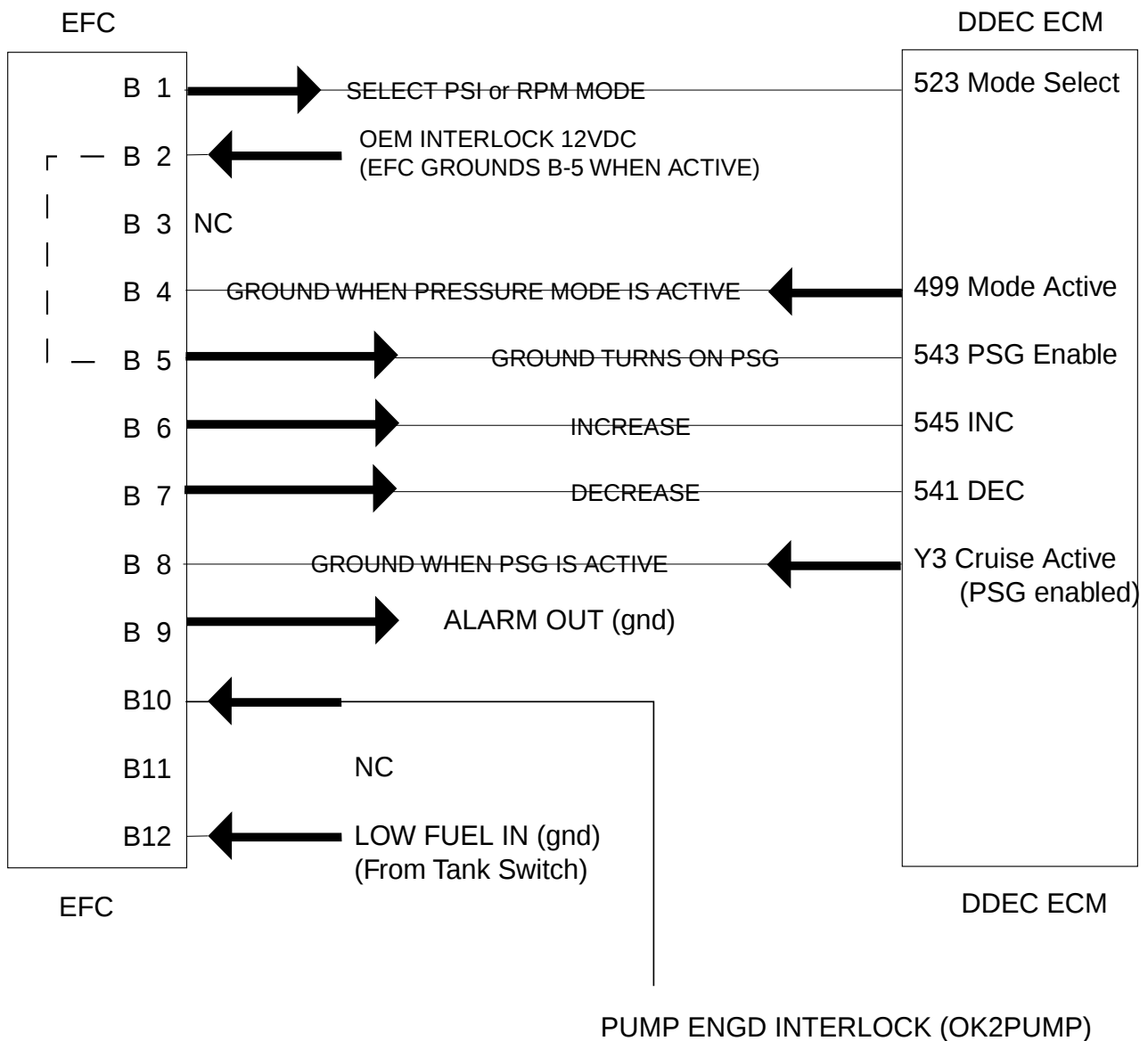
1	Service Brake Switch
2	Clutch Switch
3	OFF Idle Switch
4	
5	Maintenance Lamp
6	Engine Stop Lamp
7	Unswitched Power +
8	Unswitched Power +
9	Switch Common #1
10	Switch Common #2
11	Tachometer
12	Engine Protection Shutdown Override
13	ON Idle Switch
14	Cruise and PTO Set/Coast Res+/INC
15	Manual Fan Switch Signal
16	Engine Warning lamp
17	Unswitched Power +
18	Unswitched Power +
19	Switch Common #3
20	Switch Common #4
21	Remote Throttle Position Signal
22	Engine Brake Selector #1 Signal
23	Cruise Control/PTO ON/OFF
24	Cruise/PTO Resume/Accel/RSC-/DEC
25	Cab Governor Switch
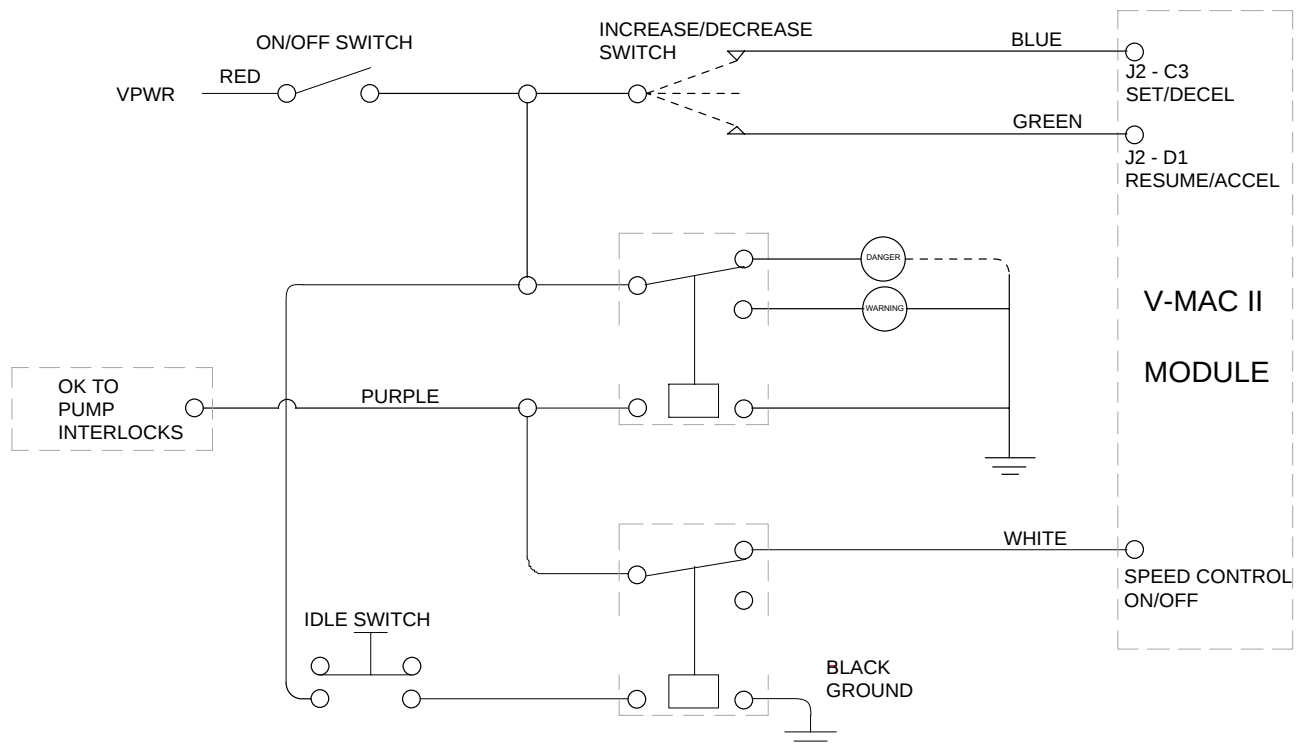
26	J-1708 Data Link +
27	J-1708 Data Link -
28	Unswitched Power +
29	Unswitched Power Return -
30	Unswitched Power Return -
31	Engine Brake Selector #2 Signal
32	
33	
34	Remote PTO Enable Signal
35	Idle Shutdown
36	J1939 Datalink Shield
37	J1939 Datalink -
38	Key Switch
39	Unswitched Power Return -
40	Unswitched Power Return -
41	Max Operating Speed
42	Accelerator Interlock
43	Remote Throttle Enable Signal
44	Diagnostic/Snapshot
45	Starter Switch
46	J1939 Datalink +
47	Accelerator Position
48	Accelerator Postion +5 VDC Supply
49	Accelerator postiion return
50	Unswitched Power Return -

1	Keep Alive Memory Power	97 J		31	Resume PTO Speed	48 A
2				32	Set PTO Speed	48 B
3				33	IDM Enable Relay	97 AH
4	HPG Enable	97HE		34	Cylinder Identification	97 BA
5	Voltage Ref +5 VDC	97 DD		35	Engine Crank Inhibit	97 H
6	Remote Accelerator Return	97 HM		36	Variable PTO Enable	97 CC
7	Signal Return	97 WA		37	Preset PTO Enable	97 CB
8	Idle Validation Switch	97 D		38		
9	Data Communication Link -	97 AT		39		
10	Driveline Disengagement Switch	97 A		40		
11				41		
12				42		
13	Hydraulic Pressure Sensor	97 EA		43		
14	Engine Oil Temperature	97 CE		44		
15				45		
16				46		
17	Self Test Output/Warn LAmp	97 T		47		
18	Coolant Level Switch	34 B		48		
19				49	HPG Mode Indicator	97 HG
20	Case Ground	97 GB		50		
21	Injection Pressure Regulator	97 BH		51		
22	Fuel Delivery Command Signal	97 BB		52		
23	Brake Normally Open Switch	97 N		53		
24	IDM Feedback	97 AZ		54	Oil/Water Light	97 WL
25	Intake Air Temperature Sensor	97 AX		55	Engine Warning	97 EW
26	Voltage Reference	97 AA		56		
27	Injection Control Pressure Sensor	97 BG		57		
28	Data Communication Link +	97 AS		58	Speedometer	47 B
29				59	Tachometer	97 AR
30	Remote Accelerator Pedal Sensor	99 F		60		

PIN	WIRE	ROW 1	WIRE	ROW 2	WIRE	ROW 3
A	988	Coolant Level Low Light	555	Fan Control #1	916	Sensor Supply
B	419	CEL	509	SEL	439	Ignition
C	901	J1587 Datalink -	900	J1587 Datalink +	952	Sensor Return
D	510	Variable Speed Governor	417	Limiting Speed Governor	749	Firetruck Water Pressure
E	451	Fan Control Override	556	Vehicle Speed Sensor +	557	Vehicle Speed Sensor -
F	542	AC Status	544	Cruise Enable	499	Vehicle Power Shutdown
G	528	SEO/Diag. Request	543	Service Brake Released	545	Resume/Accel ON
H	523	Aux Shutdown #1	524	Park Brake Interlock	115	Coolant Level
J	541	Set/Coast ON	531	Clutch Released	908	PWM #1 Transmission
K	505	Tach Drive	583	Engine Brake Med.	979	Engine Brake Low

EFC   **DDEC ECM**

B 1 → SELECT PSI or RPM MODE — 523 Mode Select

B 2 ← OEM INTERLOCK 12VDC
        (EFC GROUNDS B-5 WHEN ACTIVE)

B 3 NC

B 4 GROUND WHEN PRESSURE MODE IS ACTIVE ← 499 Mode Active

B 5 → GROUND TURNS ON PSG — 543 PSG Enable

B 6 → INCREASE — 545 INC

B 7 → DECREASE — 541 DEC

B 8 GROUND WHEN PSG IS ACTIVE ← Y3 Cruise Active
                                    (PSG enabled)

B 9 → ALARM OUT (gnd)

B10 ←

B11 NC

B12 ← LOW FUEL IN (gnd)
        (From Tank Switch)

EFC   **DDEC ECM**

PUMP ENGD INTERLOCK (OK2PUMP)

ON/OFF SWITCH

INCREASE/DECREASE
SWITCH

VPWR RED

BLUE J2 - C3
SET/DECEL

GREEN J2 - D1
RESUME/ACCEL

DANGER

WARNING

V-MAC II

MODULE

OK TO
PUMP
INTERLOCKS

PURPLE

WHITE SPEED CONTROL
ON/OFF

IDLE SWITCH

BLACK
GROUND

REMOTE THROTTLE FOR THE V-MAC II ELECTRONIC ENGINE

VPWR...........VEHICLE POWER
J2 - C2..........SPEED CONTROL ON/OFF
J2 - C3..........SET/DECEL
J2 - D1..........RESUME/ACCEL

CUSTOMER PROGRAMMING

Preset SSC.......................................NO
Lower Gear Road Speed Limit..........NO
Delay Engine Brake in Cruise...........YES
Low Idle Speed Adjust w/Switches...YES/NO
Hand Throttle MAX Road Speed.......0-20 MPH
Hand Throttle MIN Set Speed...........0-2150 RPM
Hand Throttle MAX Set Speed..........750-2150 RPM
PTO-1 Engine Speed Limit...............MAX Attainable
PTO-2 Engine Speed Limit...............MAX Attainable
SHUT DOWN Features.....................Customer Selectable

VMAC III
  VJ3-4 5 VDC Supply
  VJ3-5 Pedal Signal
  VJ3-6 Ground

Pedal Spec:
  3 wire ratiometric control
  Idle   .5 - 1.0 VDC
  Span 3.0 - 3.75 VDC
  Max   3.5 - 4.25 VDC

Fault Detection;
  Open Circuit below 0.4 VDC
  Short circuit above 4.9 VDC