VERNIER THROTTLE SYSTEM
for
Caterpillar Engines

Throttle Interface Control Module

System Overview
The *Class1* Vernier Throttle Interface is designed to allow industry standard vernier style controls (such as the Felsted Electronic Vernier II Control) and other potentiometer controls to be used with electronically controlled engines. This unit will work with electronically controlled Caterpillar Engines (C10, C12, 3116, 3126, 3176, 3406, 3116B and 3126B) using a Pulse Width Modulated (PWM) Signal.

The interface converts a linear voltage input (potentiometer) into a PWM signal to control the engine. True variable speed control is attained and the unit will maintain a selected engine RPM irrespective of the engine load within it's horsepower and torque capabilities. The interface can be used to govern engine speed for various applications including PTO driven generators and pumps and has an internal idle validation circuit that can be overriddenusing an input that allows for a fast idle activation.

Included in the package The throttle control is available alone or as a package shipped with the following components.

> interface module
> vernier control
> user manual

Operation

Variable Throttle Control   When the interface has power provided by the interlock circuit, variable engine control is available to the operator using the vernier control. If the vernier control is open more than 10% when power is applied to the interface, the interface 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.

High Idle Control   An input (C4) is available to bring the engine speed to a pre-determined engine RPM (High Idle) from a remotely mounted switch or load management device. When the interface is powered up with this input active, the idle validation routine is bypassed and the interface will increase the engine speed to the preset RPM. This speed can be set by an external potentiometer or resistor network.

Installation

Control Module   The interface module requires minimal space (3.63" x 4.75" x1.00"). The module is watertight and may be mounted in any location that is not subject to extreme temperature or vibration.

Wiring   The interface package comes with cables and leads to make the following connections:
> Power and Ground
> Engine Control Extension Cable
> High Idle connector with leads

Refer to the diagrams in the manual for specific wiring requirements.

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

Class1 provides a variety of engine controls that are used in a broad range of applications, therefore it is impossible for *Class1* 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. *Class1* 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 should be 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

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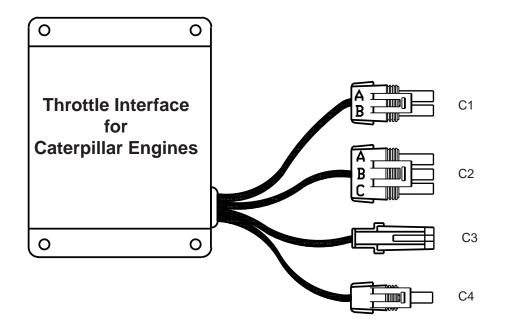
IT IS THE PURCHASER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF ANY PRODUCT FOR AN INTENDED APPLICATION, AND TO INSURE THAT IT IS INSTALLED AND GUARDED IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, LOCAL AND NFPA SAFETY AND HEALTH REGULATIONS, CODES AND STANDARDS.

NOTE: The interlock schemes shown in this manual are examples only and may not be suitable for specific applications. The throttle interface is active whenever power is applied.

Special Programming   The ECM must be programmed for remote throttle operation and there are several considerations including vehicle speed and max RPM that need to be configured.

Throttle Interface
for
Caterpillar Engines

C1

C2

C3

C4

Connector Information
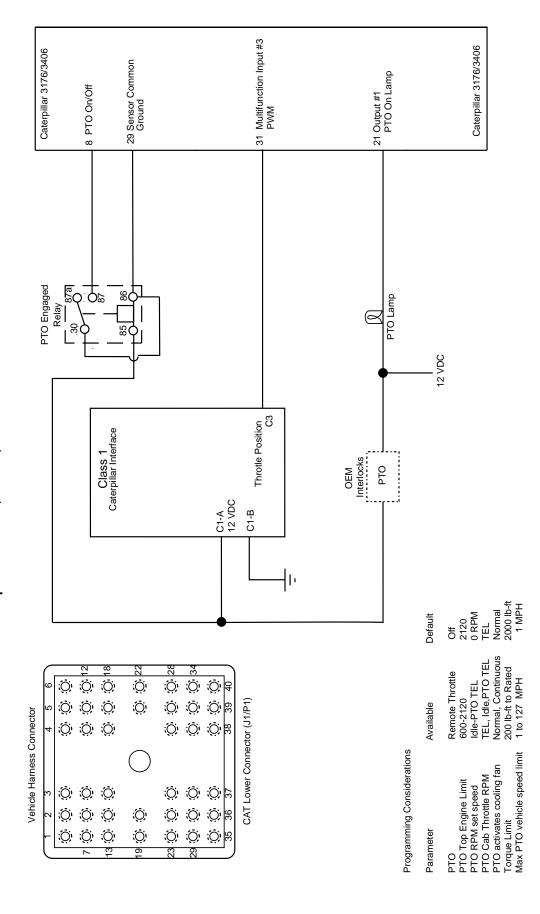
C1   Connector 12015792   Terminal 12089188   Seal 12015899

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.
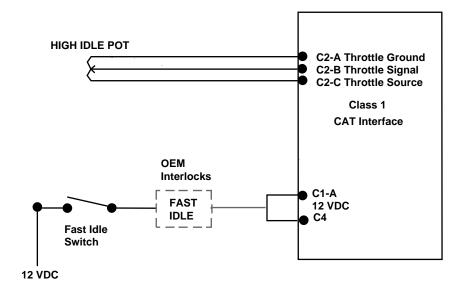
Caterpillar C10, C12, 3176 & 3406 ECM

Caterpillar 3176/3406

8 PTO On/Off

29 Sensor Common Ground

31 Multifunction Input #3 PWM

21 Output #1 PTO On Lamp

Caterpillar 3176/3406

PTO Engaged Relay

87a 87 86 30 85

Class 1
Caterpillar Interface

Throttle Position C3

C1-A 12 VDC
C1-B

PTO Lamp

12 VDC

OEM Interlocks
PTO

Vehicle Harness Connector

CAT Lower Connector (J1/P1)

1 2 3 4 5 6
7
12 18
13
19 22
23 28
29 34
35 36 37 38 39 40

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

Wiring the Class1 Vernier Throttle with high idle option only

HIGH IDLE POT

C2-A Throttle Ground
C2-B Throttle Signal
C2-C Throttle Source

Class 1
CAT Interface

OEM Interlocks

FAST IDLE

C1-A
12 VDC
C4

Fast Idle Switch

12 VDC

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Wiring the Class1 Vernier Throttle with a remote high idle option

HIGH IDLE POT

VERNIER THROTTLE

Relay 1

87a 30

87

85 86

C2-B
Throttle Signal

Class 1
CAT Interface

PTO

OEM Interlocks

FAST IDLE

Fast Idle Switch

12 VDC

Relay 3

30 87a

87

85 86

Relay 2

87a 30

87

85 86

C1-A
12 VDC

C4

VERNIER THROTTLE

5 VDC	C2-C	HOOKED IN PARALLEL TO HIGH IDLE POT.
SIGNAL	C2-B	CONNECT TO VERNIER THROTTLE INPUT AT RELAY 1
GROUND	C2-A	HOOKED IN PARALLEL TO HIGH IDLE POT.

HIGH IDLE POT.

FROM C2-C

CONNECT TO HIGH IDLE POT INPUT AT RELAY 1

FROM C2-A

RELAY 3 DISABLES HIGH IDLE WHEN OK TO PUMP/PTO ENGAGED SIGNAL IS PRESENT

RELAY 2 SELECTS THE SOURCE OF THE INTERLOCK (HIGH IDLE OR PTO)

RELAY ONE SELECTS WHICH THROTTLE SIGNAL (HIGH IDLE OR VERNIER) IS DELIVERED TO THE INTERFACE MODULE

3176/3406

Class1

Caterpillar 3126 ECM

VERNIER CONTROL (10K)

HIGH IDLE POT (10K)

C2-A

Sensor Common
(Ground)   C1-B

C2-C

C4

Caterpillar Interface

C2-B
Throttle Signal

C1-A
12 VDC

Throtle Position
C3

**Remote Throttle
Switch
(PTO Engaged)**

K999 Green   8   PTO On/Off

C993 Brown   29 Sensor Common
Ground

CAB Throttle

Sensor Common

+8 VDC   C985 Blue   35 8 VDC

Throttle Position

Relay

87a   30   C986 Brown   37 TPS Input
87

85   86

**OEM
Interlocks**

PTO

**FAST
IDLE**

Fast Idle
Switch

K998 Blue   21 Output #1
PTO On Lamp

PTO Lamp

12 VDC

Caterpillar ECM 3126

Caterpillar ECM 3126

Wiring the Class1 Vernier Throttle Interface with a fast idle option

Class1

3126

Caterpillar 3126B HEUI ECM
Throttle Interface Module

Caterpillar 3126B HEUI

56	PTO On/Off Ground
3	Input Sensor Common #2 Ground
68	INPUT #8 RAPS PWM
30	Output #1 PTO On Lamp Ground

New Caterpillar 3126B

PTO Engaged Relay
87a 87 86
30 85

PTO Lamp
12 VDC

Class 1
Caterpillar Interface
Sensor Common (Ground)
Throttle Position C3
C1-A C1-B
12 VDC

OEM Interlocks
PTO

Vehaicle Harness Connector
ECM Side

CAT J1/P1 Connector
ECM RIGHT 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

Caterpillar 3126B ECM
Throttle Interface Module

New Caterpillar 3126B

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56 PTO On/Off Ground

3 Input Sensor Common #2 Ground

68 INPUT #8 RAPS PWM

30 Output #1 PTO On Lamp Ground

PTO Engaged Relay
87a 87
30
85 86

Sensor Common (Ground)

PTO Lamp

12 VDC

Vehaicle Harness Connector ECM Side

CAT J1/P1 Connector ECM RIGHT SIDE

Class 1
Caterpillar Interface

C1-B

Throttle Position PWM Out   C3

C2-A Ground

C2-C +5VDC

C2-B Throt Sig

C4 IdleValidation Override

C1-A 12 VDC

HIGH IDLE POT (10K)

VERNIER CONTROL (10K)

FAST IDLE

Fast Idle Switch

OEM Interlocks

PTO

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

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Throttle Interface Module

4.75"

4.25"

3.625"

3.000"

Ø 0.201" (4) HOLES

1.0"

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When the throttle interface module is powered up by the safety (interlock) system the throttle module will perform a self check and the module will then output a PWM signal of 12 %.

The interface will verify that the throttle is fully closed. If the throttle is not fully closed, the interface module will not increase the PWM until the zero position is detected.

IMPORTANT   The throttle interface module will not command increased speed from the engine until the zero position is detected. This feature is present to avoid unintentional increases in engine speed should the throttle be left in the open position.
The fast idle input overrides this feature and should be used with caution.

When finished operating the remote throttle, the operator should return the throttle to idle and turn the control to it's full clockwise position. This will insure a zero throttle position.

NOTE: The new 3126B and 3116B HEUI engines perform their own idle validation for remote throttle operations. This presents a timing and signal problem that must be overcome to use the interface module for Fast Idle.

For questions or concerns regarding the interface module, call *Class1* at 352-629-5020
FAX 352-629-2902

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