

# 2301A Speed Control

4–20 mA / 1–5 Vdc Speed Set

## Applications

The 2301A Full Authority Speed Control sets the speed or load of a diesel engine, gas engine, steam turbine, or gas turbine according to the demand of a process or a computer control signal of 4–20 mA or 1–5 Vdc.

The unit provides isochronous operation, with droop control available through an externally-wired

potentiometer. The isochronous mode is used for constant speed of the controlled prime mover as long as it is able to provide power to satisfy the load. Droop control is provided when parallel-bus operation is required.

The Full Authority Speed Control is compatible with Woodward SPM-A synchronizers, load sensors, and other power generation controls. These auxiliary controls can be added to the system at any time, connecting the auxiliary or SPM inputs to the 2301A Speed Control.

The control is available for forward- or reverse-acting applications.

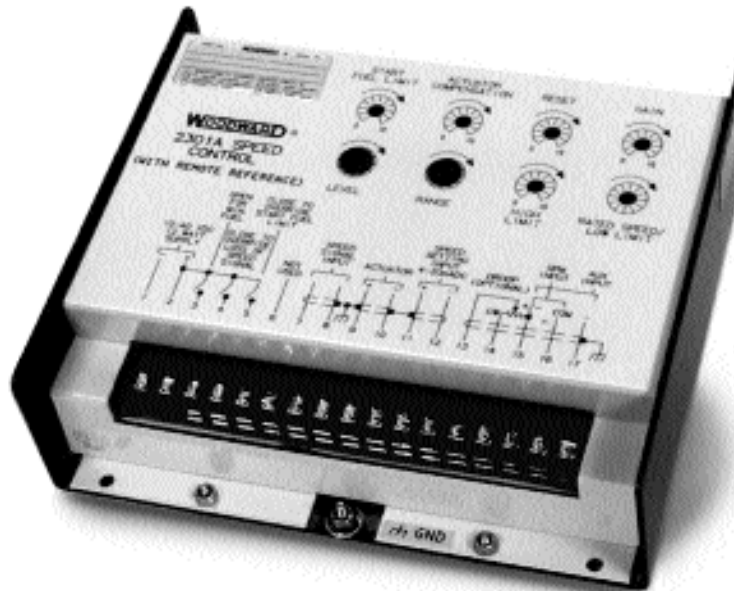
High-voltage models accept 88 to 132 Vac or 90 to 150 Vdc. Low-voltage models accept 10 to 40 Vdc supply.

Programmable Logic Control (PLC) is easily adapted to engine control with the use of the 4–20 mA speed setting input. The low-limit setting can prevent engine shutdown, even with loss of the PLC signal. Reverse-acting controls may be teamed with EGB or PG-EG governor/actuator for a mechanical ballhead backup.

## Description

The 2301A Full Authority Speed Control is housed in a sheet-metal chassis and consists of a single printed-circuit-board assembly. All adjustments are accessible through the front of the chassis.

Speed range is set by positioning an internal switch, accessible inside the cover of the control. Speeds are set according to the speed-sensor output frequency in hertz.



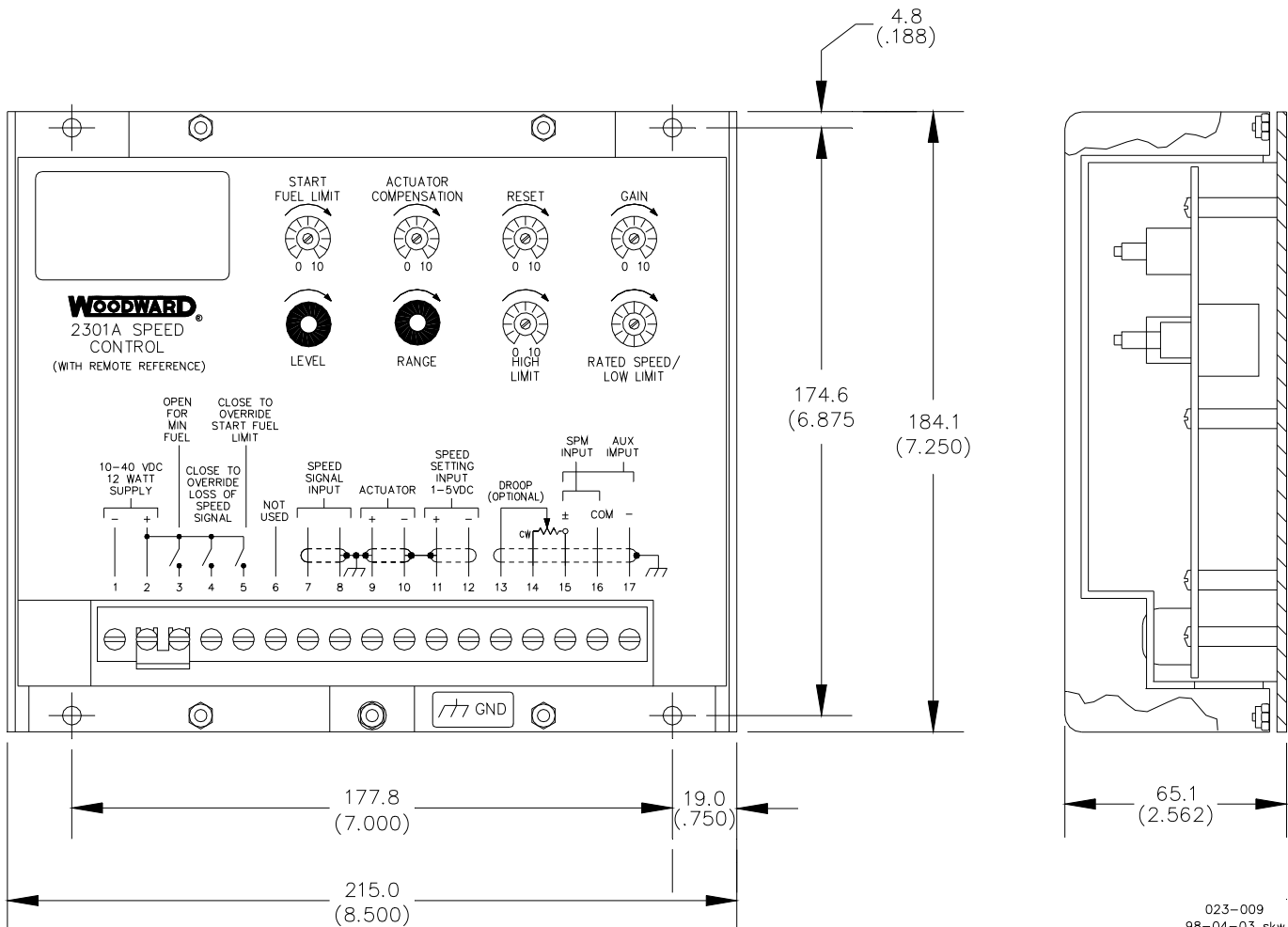
- 4–20 mA or 1–5 Vdc full authority speed setting
- Isochronous or droop speed control
- Low- and high-voltage models
- Signal converter included in same control package
- High and low speed adjustments
- Start fuel limit with override

Special circuits provide high- and low-limit adjustments. These limits set the maximum and minimum speed that can be set by varying the speed-setting milliamp or voltage reference. The low limit can be set as high as rated speed, if desired, limiting the ability of the process or computer speed setting to reduce speed. If needed, the low-limit setting can be used to control engine operation on loss of the speed-reference signal.

The start-fuel limit sets a maximum actuator position during the start sequence. It is biased out of the way when speed reaches the control set point. This feature

can be used to limit excessive startup smoke, reduce cylinder wear caused by the washing action of excessive fuel, and help reduce startup time. An external switch connection is provided to disable the start-fuel limit, if desired, to prevent reverse-acting systems from reverting to the start-fuel position on loss of magnetic pickup.

All 2301A controls feature an internal, isolated power supply for improved noise immunity and ground-loop protection. The control provides maximum protection from electromagnetic and radio-frequency interference.

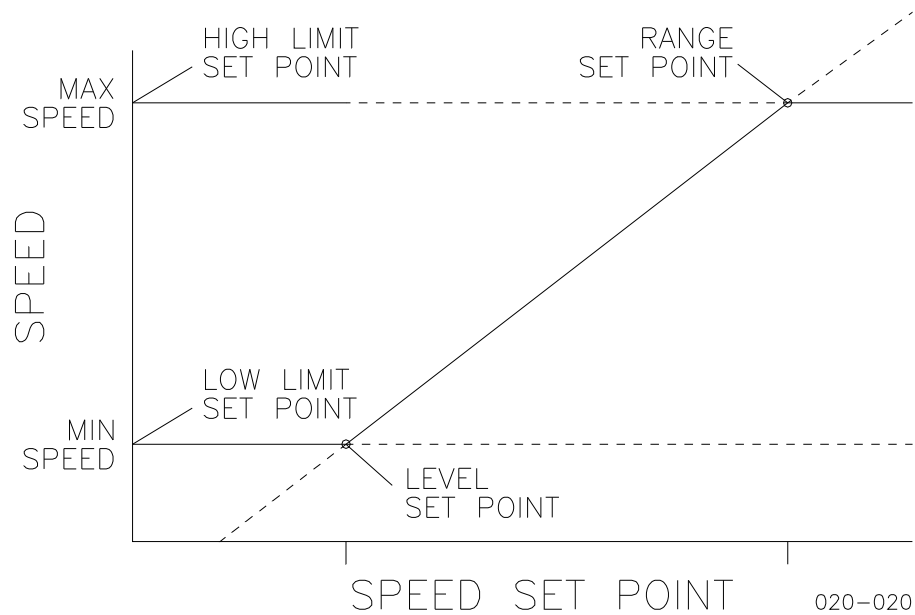


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**Outline Drawing of Remote Speed Reference 2301A**  
(Do not use for construction)

## Specifications

<b>Speed Range</b>	An internal switch selects one of the following speed ranges: 500 to 1500 Hz 1000 to 3000 Hz 2000 to 6000 Hz 4000 to 12000 Hz
<b>Speed Sensing</b>	1 to 30 Vac. Input Impedance is 1 k $\Omega$ at 1 kHz
<b>Externally Applied Speed Reference</b>	Proportional to 4–20 mA or 1–5 Vdc input. Speed reference is proportional to applicable input signal.
<b>SPM-A Synchronizer Input</b>	–5 to +5 Vdc for –3.3% to +3.3% or –1.5 to +1.5 Vdc for –1% to +1% speed change. Impedance is 100 k $\Omega$ .
<b>Minimum Fuel</b>	Opening the external minimum fuel switch will send a minimum-fuel signal to the actuator. The minimum-fuel switch is an optional means for a normal shutdown. Not to be used for emergency shutdown.
<b>Drop</b>	Where droop is required, an external potentiometer is used to set the desired percentage of droop. Use a 2 k $\Omega$ potentiometer for up to 7.5% droop when 2/3 actuator travel is used for 0–100% load. Leave droop potentiometer terminals open if only isochronous operation is desired.
<b>Failed Speed Signal Override</b>	Close the external contact to override the failed speed protective circuit when required for start-up.
<b>Weight</b>	About 1.1 kg (2.5 pounds). May vary slightly depending on model.
<b>POWER SUPPLY</b>	
<b>High Voltage Model</b>	90 to 150 Vdc or 88 to 132 Vac
<b>Low Voltage Model</b>	20 to 40 Vdc
<b>ADJUSTMENTS</b>	
<b>Start Fuel Limit</b>	Sets actuator current between 25% and 100% of specified maximum actuator current during start-up. Actuate the Start Fuel Limit Override when placing a reverse acting system on line.
<b>Level</b>	Sets speed set point demanded by minimum control signal input.
<b>Range</b>	Sets speed reference demanded by maximum control signal input.
<b>Low Limit</b>	Sets minimum speed reference that can be demanded by control signal. May be used to set rated speed in the absence of a control signal.
<b>High Limit</b>	Sets maximum speed reference that can be demanded by control signal. Prevents control signals in excess of normal from causing overspeed.
<b>Drop</b>	Provides 0 to 10% reduction in speed set point reference between no load and full load. External potentiometer required.
<b>Gain, Reset, and Actuator Compensation</b>	Sets dynamic response. Adjustable to accommodate diesel, gas, or turbine engines.
<b>CONTROL CHARACTERISTICS</b>	
<b>Steady State Speed Band</b>	$\pm 1/4$ of 1% of rated speed
<b>Load Sharing</b>	Within $\pm 5\%$ of rated load with speed settings matched and the addition of a Generator Load Sensor
<b>Operating Temperature</b>	–40 to +85 °C (–40 to +185 °F)
<b>Storage Temperature</b>	–55 to +105 °C (–67 to +221 °F)
<b>Maximum Ambient Humidity</b>	95% at 38 °C (100 °F)
<b>Vibration and Shock Tests</b>	Vibration tested at 4 Gs between 5 and 500 Hz. Shock tested at 60 Gs
<b>Technical Manual</b>	82020



### Speed Set Point



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