APPLICATION

The Load Sharing and Speed Control is designed for use in electric generator systems. The controls are used in electric generator systems where load sharing is desired. They can be used with diesel engines and are compatible with all Woodward electronic controls.

The 2301A has a self-contained load sensor. Most 2301A controls provide zero to 200 mA output signals, designed to control Woodward EG, EGB, and 2301A actuators. The output signal is proportional to the needed fuel setting to attain the desired speed/load. Position feedback from the actuator is not required.

The 2310A is compatible with Woodward SPM-A synchronizers, Automatic Generator Loading Controls, Process Import/Export Controls, and Automatic Power Transfer and Load Controls.

DESCRIPTION

The 2301A Load Sharing and Speed Control is housed in a sheet-metal chassis and consists of a single printed circuit board. All potentiometers are accessible from the front of the chassis.

Speed range is set on an internal dip switch, available inside the cover of the control. Speeds are set according to the sensor output frequency in Hertz.

The start fuel limit feature can prevent start-up overspeed and excessive start-up smoke. The start fuel limit is automatically removed when the engine nears selected speed.

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

The 2301A allows isochronous load sharing between 2301A systems or other Woodward electronic load-sharing controls through load-sharing lines connected to the circuits.

Idle speed, rated speed, and acceleration ramp time are adjustable on the 2301A front panel. Isochronous or droop speed is selected through switch contacts in the plant wiring.
SPECIFICATIONS

Load Sensing
3-phase potentials:
  90 to 240 Vac, 45 to 66 Hz
  Maximum load 3 VA per phase
3-phase currents:
  3 to 7 A at full load
  Maximum load is 1 VA

Speed Range
A switch selects one of the following speed ranges:
500 to 1500 Hz
1000 to 3000 Hz
2000 to 6000 Hz
4000 to 12 000 Hz

Speed Sensing
1 to 30 Vac. Maximum load is 1 kΩ at 1 kHz.

SPM-A Synchronizer (optional)
-5 to +5 Vdc for -3.3% to +3.3% or -1.5 to +1.5 Vdc for -1% to +1% speed change.
Maximum load is 100 kΩ.

Speed Trim (optional)
0 to 10% speed decrease with 0 to 100 Ω pot (1 W)

Minimum Fuel (optional)
Opening an external contact in series with terminal 17 and the control’s dc switch power will send a minimum-fuel signal to the actuator. The minimum-fuel signal is an optional means for a normal shutdown.

Droop (optional)
The droop contact is wired in series with the auxiliary circuit breaker contact and terminal 14, and the control’s dc switch power. Isochronous operation is selected when both the droop contact and the auxiliary circuit breaker contact are closed.

Outputs
0 to 200 mA, 30 to 40 Ω
0 to 200 mA, 60 to 80 Ω for tandem actuators

ADJUSTMENTS

Rated Speed
Sets engine speed over specified range.

Idle Speed
Sets engine idle speed at 30 percent to 100 percent of rated speed.

Ramp Times
Zero to 10 second acceleration time from idle to rated speed. Rated to idle is instantaneous.

Start Fuel Limit
25 percent to 100 percent of specified maximum actuator current.

Gain, Reset, and Actuator Compensation
Sets dynamic response. Adjustable to accommodate diesel, gas, or turbine engines.

Load Gain
Provides calibration of the load on an individual generator when two or more generators are paralleled.

Droop
Provides a zero to 10 percent reduction in reference speed between no load and full load.

CONTROL CHARACTERISTICS

Steady State Speed Band
±1/4 of 1 percent of rated speed

Load Sharing
Within ±5 percent of rated load with speed settings matched

POWER SUPPLY
20 to 40 Vdc, 12 W
After power-up, a supply voltage as low as 9.6 Vdc or as high as 77 Vdc for up to five minutes

WEIGHT
About 1.9 kg (4.2 pounds). May vary slightly.
Shielded wires to be twisted pairs, with shield grounded at control end only.

Point of grounding if required by wiring code.

Internal current transformer burden must be connected across power source current transformers at all times, to prevent lethal high voltages.

Power source current transformers should be sized to produce 5A secondary current with maximum generator current. Current transformer burden is less than 0.1 VA per phase.

With a balanced three-phase load and unity power factor, the current transformers should be wired in the correct potential leg and must be phased at the control as follows:

- **PHASE A**: Potential terminal 1, with respect to neutral, in phase with CT terminals 4 ( ) to 5.
- **PHASE B**: Potential terminal 2, with respect to neutral, in phase with CT terminals 6 ( ) to 7.
- **PHASE C**: Potential terminal 3, with respect to neutral, in phase with CT terminals 8 ( ) to 9.

Remove jumper between terminals 23 & 24 if speed-trim potentiometer or digital reference unit is used. If speed-trim potentiometer is used, Caterpillar P/N 4W5971 or a similar high quality 100 ohm, 10-turn, 1 watt potentiometer is recommended.

For isoch control without isoch/droop switch, set droop potentiometer maximum CCW and replace droop switch with jumper. If droop potentiometer is not maximum CCW control is in droop when isoch/droop switch or circuit breaker auxiliary contact is open.

For series or tandem operation, see detail B.

For optional current transformer connection, see detail A.

WARNING: Do not use for emergency shutdown. The engine should be equipped with a separate overspeed, overtemperature, or overpressure shutdown device(s) to protect against runaway or damage to the engine with possible personal injury or loss of life.

Jumper if switch is not used.

Install jumpers if meters are not used.

On low voltage units, connect to terminal 16 for switch power.

On low voltage units, jumper terminals 16 to 17 if minimum fuel switch is not used.

On low voltage units, jumper terminals 16 to 17 if minimum fuel switch is not used.

**NOTES:**

1. Shielded wires to be twisted pairs, with shield grounded at control end only.
2. Point of grounding if required by wiring code.
3. Internal current transformer burden must be connected across power source current transformers at all times, to prevent lethal high voltages.
4. Power source current transformers should be sized to produce 5A secondary current with maximum generator current. Current transformer burden is less than 0.1 VA per phase.
5. With a balanced three-phase load and unity power factor, the current transformers should be wired in the correct potential leg and must be phased at the control as follows:
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6. Remove jumper between terminals 23 & 24 if speed-trim potentiometer or digital reference unit is used. If speed-trim potentiometer is used, Caterpillar P/N 4W5971 or a similar high quality 100 ohm, 10-turn, 1 watt potentiometer is recommended.
7. For isoch control without isoch/droop switch, set droop potentiometer maximum CCW and replace droop switch with jumper. If droop potentiometer is not maximum CCW control is in droop when isoch/droop switch or circuit breaker auxiliary contact is open.
8. For series or tandem operation, see detail B.
9. For optional current transformer connection, see detail A.
10. WARNING: Do not use for emergency shutdown. The engine should be equipped with a separate overspeed, overtemperature, or overpressure shutdown device(s) to protect against runaway or damage to the engine with possible personal injury or loss of life.
11. Jumper if switch is not used.
12. Install jumpers if meters are not used.
13. On low voltage units, connect to terminal 16 for switch power.
14. On low voltage units, jumper terminals 16 to 17 if minimum fuel switch is not used.

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Operating Temperature

-40 to +85° C (-40 to +185° F)

Storage Temperature

-55 to +105° C (-67 to +221° F)

Maximum Ambient Humidity

95 percent at 38° C (100° F)

Vibration and Shock Tests

Vibration tested at 4 Gs between 5 and 500 Hz. Shock tested at 60 Gs.

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2301A WOODWARD LOAD SHARING/SPEED CONTROL

**WARNING**

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- Power source current transformers should be sized to produce 5A secondary current with maximum generator current. Current transformer burden is less than 0.1 VA per phase.
- With a balanced three-phase load and unity power factor, the current transformers should be wired in the correct potential leg and must be phased at the control as follows:
  - **PHASE A**: Potential terminal 1, with respect to neutral, in phase with CT terminals 4 ( ) to 5.
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- Remove jumper between terminals 23 & 24 if speed-trim potentiometer or digital reference unit is used. If speed-trim potentiometer is used, Caterpillar P/N 4W5971 or a similar high quality 100 ohm, 10-turn, 1 watt potentiometer is recommended.
- For isoch control without isoch/droop switch, set droop potentiometer maximum CCW and replace droop switch with jumper. If droop potentiometer is not maximum CCW control is in droop when isoch/droop switch or circuit breaker auxiliary contact is open.
- For series or tandem operation, see detail B.
- For optional current transformer connection, see detail A.
- WARNING: Do not use for emergency shutdown. The engine should be equipped with a separate overspeed, overtemperature, or overpressure shutdown device(s) to protect against runaway or damage to the engine with possible personal injury or loss of life.
- Jumper if switch is not used.
- Install jumpers if meters are not used.
- On low voltage units, connect to terminal 16 for switch power.
- On low voltage units, jumper terminals 16 to 17 if minimum fuel switch is not used.

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**DIMENSIONAL DRAWINGS**

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DECLARATION OF INCORPORATION

In accordance with the EMC Directive 89/336/EEC and its amendments, this controlling device, manufactured by the Woodward Governor Company, is applied solely as a component to be incorporated into an engine prime mover system. Woodward Governor declares that this controlling device complies with the requirements of EN50081-2 and EN50082-2 when put into service per the installation and operating instructions outlined in the product manual.

NOTICE: This controlling device is intended to be put into service only upon incorporation into an engine prime mover system that itself has met the requirements of the above Directive and bears the CE mark.