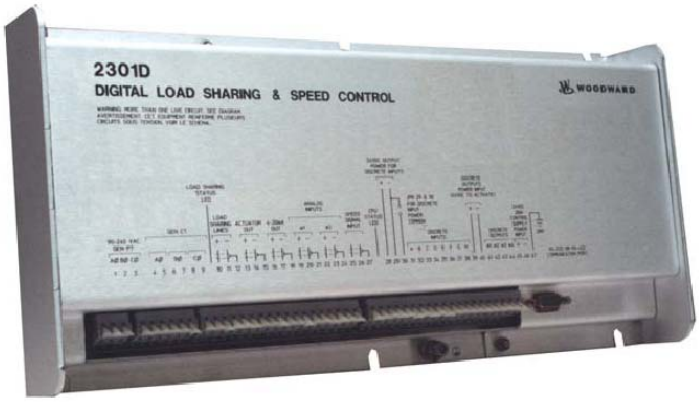
WOODWARD

Application Note 51263
(Revision NEW, 7/2005)
Original Instructions



2301D and 2301D-EC Load Sharing and Speed Controls Part Number Differences

Description	Old Part Number	New Part Number
2301D	8273-140	8273-501
2301D	8273-141	8273-503
2301D-EC	8273-138	8273-505
2301D-EC	8273-139	8273-507

2301D and 2301D-EC Load Sharing and Speed Controls Part Number Differences

Introduction

Woodward's 2301D Load Sharing and Speed Control has been improved with a new PID algorithm, an adaptive speed-sensing filter, a remote lock-in-last feature, actuator position droop, an idle speed proportional gain adjustment, and additions to the Modbus® * list. This application note explains the differences.

*—Modbus is a trademark of Schneider Automation Inc.

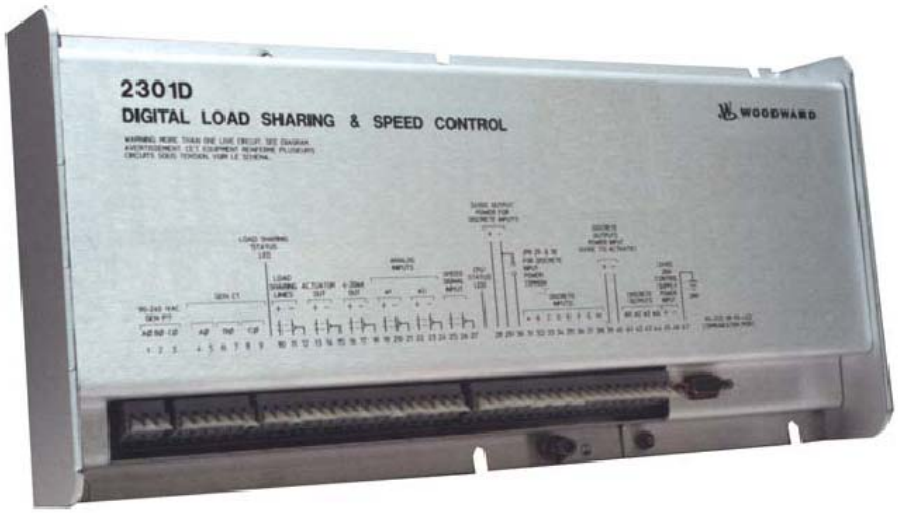
Description	Mounting Location	Old Part Number	Old Software Part Number	Replacement Part Number	Software Part Number
2301D	Ordinary Location	8273-140	5418-1989	8273-501	5418-159
2301D	Hazardous Location	8273-141	5418-1989	8273-503	5418-159
2301D-EC	Ordinary Location	8273-138	5418-1990	8273-505	5418-161
2301D-EC	Hazardous Location	8273-139	5418-1990	8273-507	5418-161

Compatibility with Existing Controls

The new 2301D and 2301D-EC software will operate with all existing 2301D / 2301D-EC controls, or any controls with analog load sharing. There will be some differences in the PID settings, particularly the GAIN, RESET, and ACTUATOR COMPENSATION. If replacing an old part number, leave the new part number's Gain, Reset, and Actuator compensation at default values to begin the tuning process. Do not copy the PID settings from and old unit to a new one. Manual 26288 lists some settings for various engines.

Upgrading Controls

Upgrading controls will only be done at the factory, for a minimal cost. Please talk to your account representative for details.



Description of Software Changes

1. New PID Algorithm and Adaptive Speed Sensing Filter

- The PID was changed to allow the 2301D to better control slow and medium speed engines.
- The speed sensor, as it measures speed, will only send an output to the PID with a new speed only if the engine speed has actually changed. This helps in control of slow speed engines.
- The adaptive speed sensor learns or adapts to any anomalies in the gear teeth, torsionals, and slow speed firing frequency.
- There are now three ways of selecting the method of speed sensing:
  - Speed Sensor Function 1 is used for medium and high-speed engines. Typically use this speed sensing type for MPU frequencies of 1000 Hz. and above. The MPU gear is divided into 16 pieces; therefore the speed is sensed and updated once every 1/16th of a full engine revolution.
  - Speed Sensor Function 4. The speed is sensed on every timing pulse. This function is specifically designed to give readings at low speeds. Speed is calculated by using only two inter-tooth time intervals. This function measures the time between each tooth and stores the two most recent measurements. This block samples and averages these two measurements each time the block executes and uses the average to calculate speed.
  - Speed Sensor Function 5 is specifically designed with an adaptive rotational speed-sensing filter. This filter will give stable speed sensor readings for:
    - Low and medium engine speeds.
    - Engine torsional frequencies caused by engine firing frequencies or various engine loads.
    - Noisy MPU signals caused by run out in the gear, irregular shaped gear teeth or irregular shaped holes in the flywheel.
- There is no correlation between the PID settings of the different software's.

2. Actuator Position Droop

- Actuator droop has been modified to work with the Droop / Isochronous discrete input.
- If Actuator Position Droop is enabled, and the Droop / Isochronous discrete input is open, as load is increased the actuator current increases, then the speed will droop off based on the droop percentage set in the control.
- Actuator Position Droop tracking was also added. This allows a unit transferring back to the utility grid to be bump less.

3. Remote Lock In Last

- When using the Remote Speed or the Remote Baseload analog input, a feature was added so that if the remote input was lost, the speed or load can be selected to lock in at the last level or to ramp down to the minimum value.

4. Idle Proportional Gain

- An Idle Proportional Gain feature was added.
- The value of Idle Prop Gain is determined by the ratio of Speed Reference divided by the Rated Speed value. Example: If the engine is idling at 1200 rpm, and the Rated Speed is 1800 rpm, the value of Idle Prop Gain will be 0.667 of the rated gain value. The Idle Proportional Gain adjustment can be used to increase or decrease this ratio value.

5. Modbus List Additions

- The following list contains the additional Modbus points that were added:

Boolean Writes

Addr	Description
0:0029	Enable Remote Speed Setting
0:0030	Disable Remote Speed Setting
0:0031	Enable Remote Baseload Setting
0:0032	Disable Remote Baseload Setting

Boolean Reads

Addr	Description
1:0034	CPU Failure
1:0035	Remote Speed Control State
1:0036	Remote Load Control State
1:0037	Load Share Relay State
1:0038	Run Engine State
1:0039	Stop Engine State
1:0040	Rated Speed State
1:0041	Idle Speed State
1:0042	Raise Speed State
1:0043	Lower Speed State
1:0044	Isoch Mode State
1:0045	Droop Mode State
1:0046	Load Generator State
1:0047	Unload Generator State
1:0048	Baseload Mode State
1:0049	Second Dynamics State
1:0050	Failed MPU Override State
1:0051	Reset Alarms - Shutdown State

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 51263.

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