



***Allen-Bradley***

**1336 PLUS II AC Drive**

**Load Sharing  
for the  
1336 PLUS II  
AC Drive**



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# Load Sharing for the 1336 PLUS II AC Drive

## Load Sharing Techniques

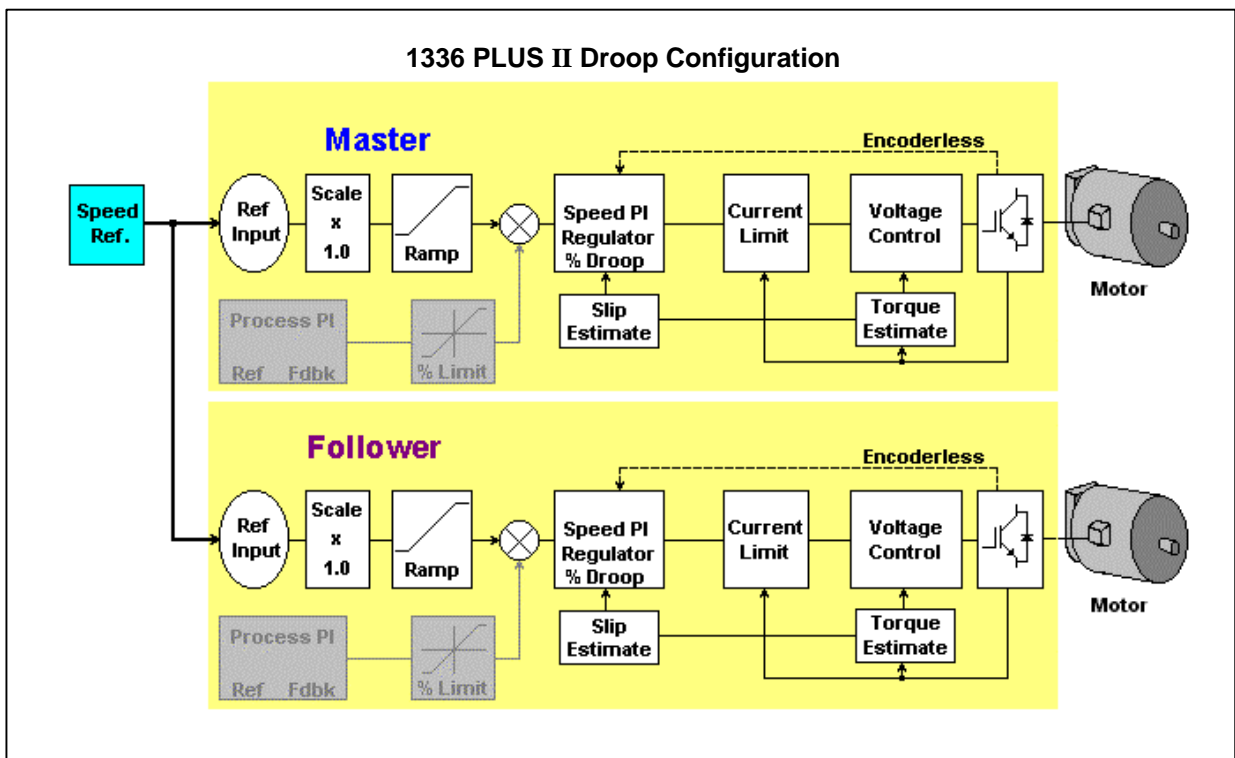
Three categories are Droop, Torque Follower, and Speed Trim Follower.

## Configurations

Three categories of load sharing techniques will be presented, each having unique characteristics. The subtle differences will be addressed to better identify how to implement each to ensure a successful application. The categories are Droop, Torque Follower, and Speed Trim Follower.

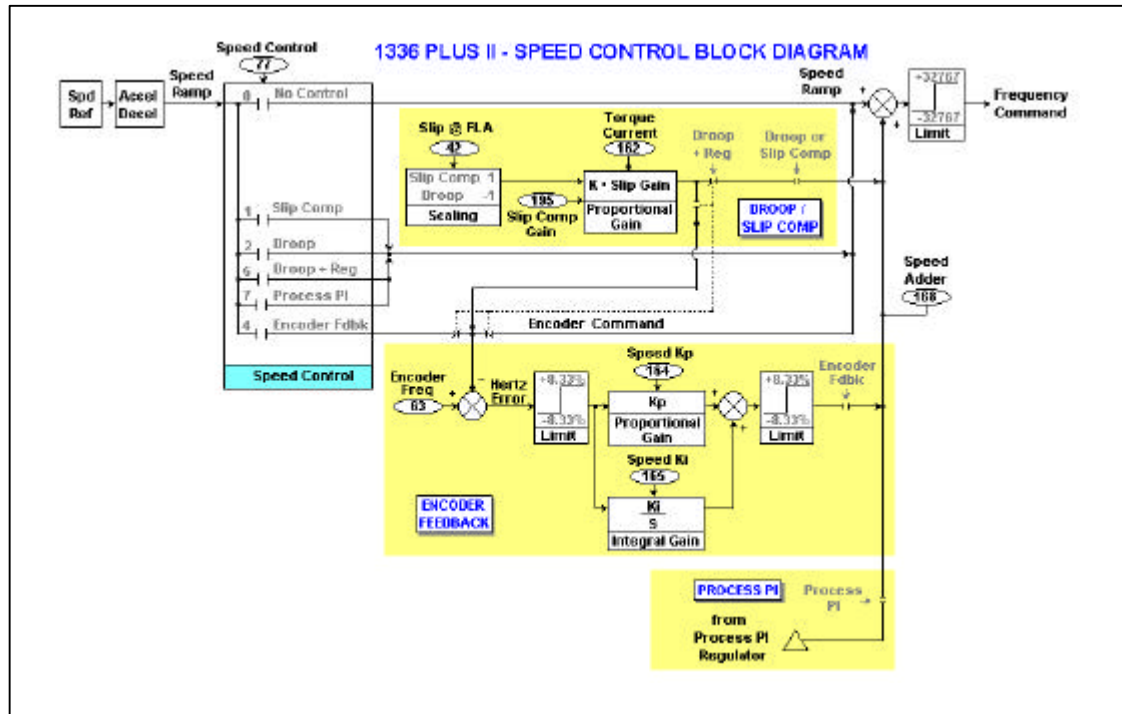
## Droop

The master and follower drive(s) receive the same speed reference and no interconnection of the drives is required. The speed of the motors will be dependent on the load and amount of droop that is programmed at full load current. The process regulator is disabled during droop mode.



The drives will operate independent of each other so setup parameters are critical to the load sharing performance. Tuning of the drives to the motor will ensure a more accurate torque current measurement. The torque current is used to determine the load and therefore the droop of the motor.

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To configure the drives, set (P77) [Speed Control] to “Droop” (2). The amount of frequency that is subtracted from the speed reference at full load current is set by (P42) [Slip @ FLA]. The gain for droop is set by (P195) [Slip Comp Gain], which adjusts the recovery rate for load changes.

Systems using droop typically have the (P195) [Slip Comp Gain] set to a low level to soften load transitions.

### Load Types

Droop should be used when the load coupling is non-rigid. Examples of applications that can benefit from droop are air handling units with a common discharge, or conveyors with small load changes and limited speed range.

### Advantages

- Simple
- No extra wiring for interconnection
- High performance drive not required
- No runaway condition with load loss

### Disadvantages

- Poor speed regulation
- Limited speed range
- Sharing of load not precise
- Less speed regulation as more drives are added

# Load Sharing for the 1336 PLUS II AC Drive

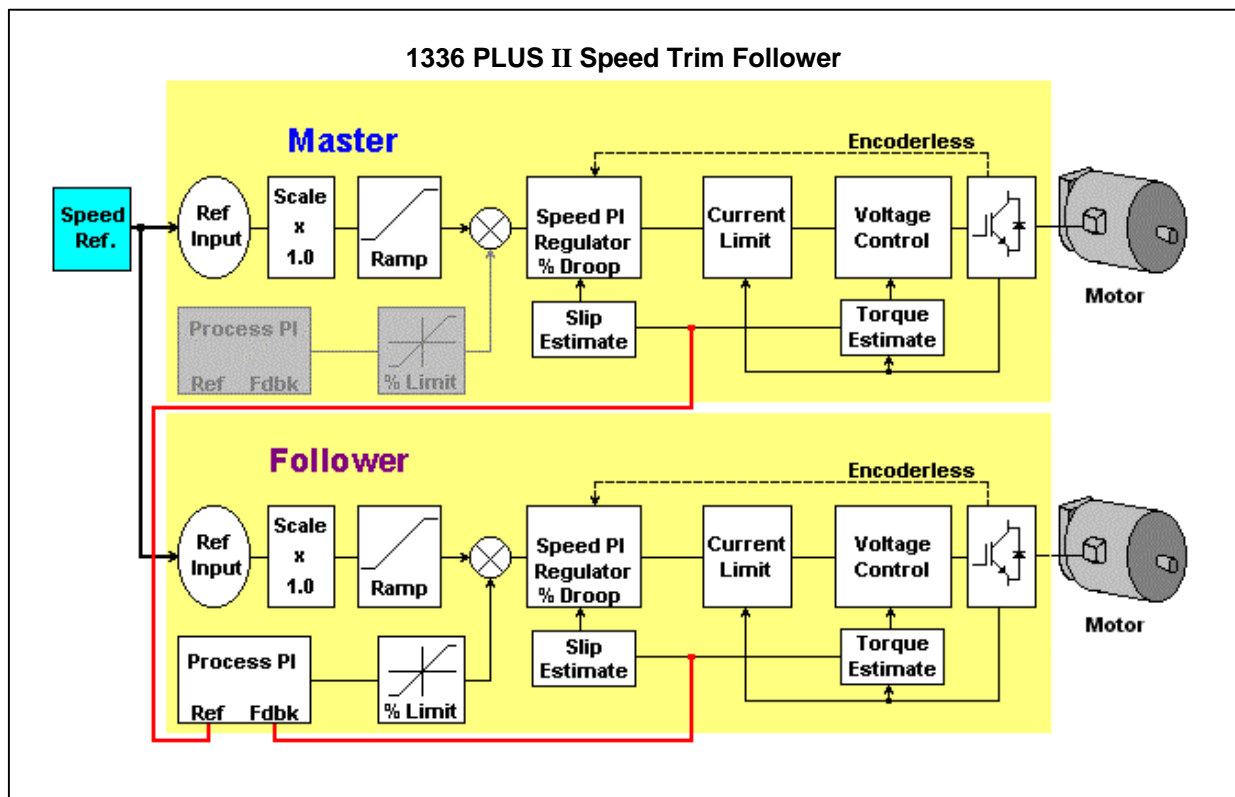
## Torque Follower

The 1336 PLUS II cannot operate as a torque regulator, therefore, a pure torque follower configuration is not applicable.

## Torque Trim Follower

The master drive is operated in speed regulation. The follower drive(s) are operated in speed regulation mode with a speed trim. The comparison of the torque currents of the master and follower drives creates an error signal that is used to trim the speed of the follower.

The Process PI loop of the follower drives is used to compare the torque current signals of the drives and create an error signal used for speed trim.



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The [Torque Current] (P162) of the master drive must be sent to the follower drive. If this is done with analog I/O, the master drive must have [Anlg Out 0 Sel] (P25) set to "Torque" (digital value of 2). (Assumes analog output zero for example purposes.)

The follower drive must take this analog input and direct it to the reference input of the process regulator. In the follower set [PI Ref Select] (P215) to "Analog In 0" (digital value of 1). (Assumes analog input zero for example purposes.)

The torque signal of the follower drive must be used for the feedback input to the process regulator. To accomplish this, the torque signal must be sent to an analog output and then sent back into an analog input. Set [Anlg Out 0 Sel] (P25) set to "Torque" (digital value of 2). Then set [PI Fdbk Select] (P216) to "Analog In 1" (digital value of 2).

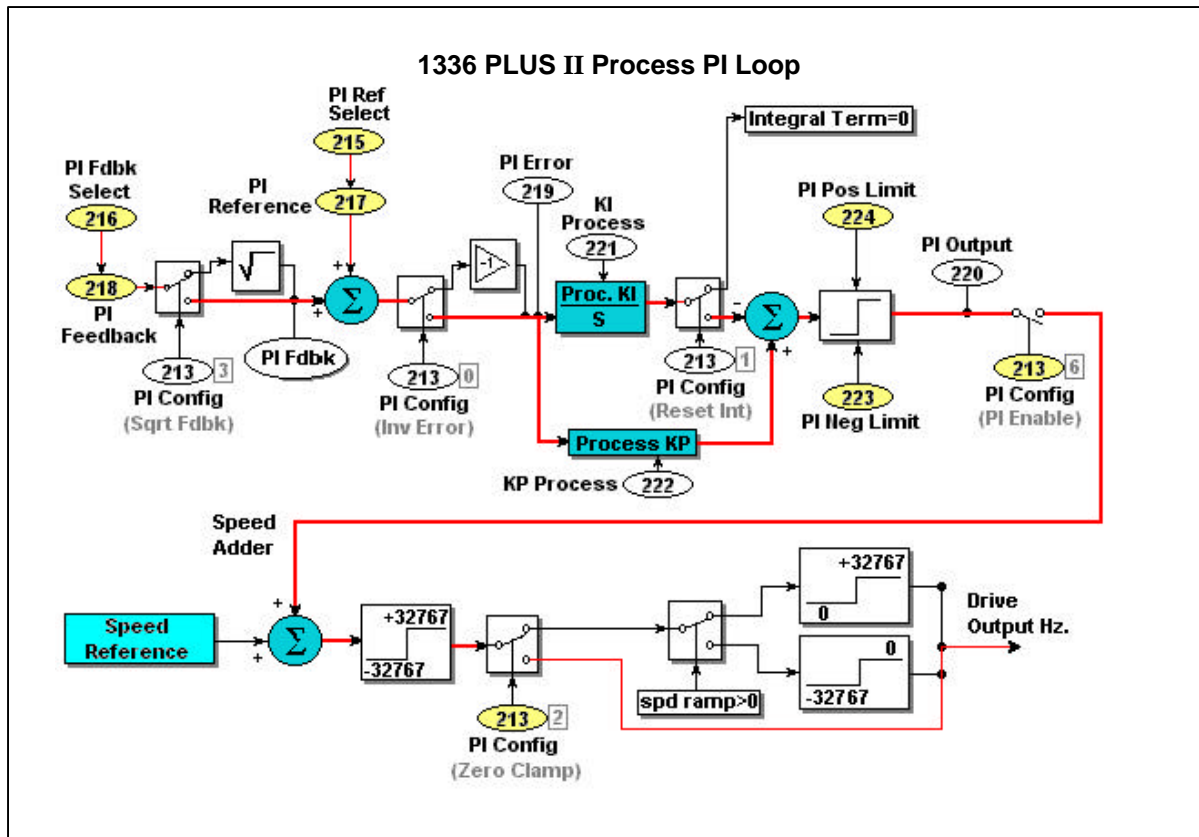
To operate in process control, set [Speed Control] (P77) to "Process PI" (digital value of 7). Enable the process regulator by setting bit 6 of [PI Config] (P213).

Set the limits [PI Neg Limit] (P223) and [PI Pos Limit] (P224) to small values (-2.5 Hz. And +2.5 Hz. respectively). This will create a tight band that can be added to or subtracted from the speed reference.

Tuning of the trim regulator is accomplished with [KI Process] (P221) and [KP Process] (P222). The correct setting can be determined by monitoring [PI Output] (P220) while adjusting the integral and proportional settings.

If the regulator is not properly tuned, the output signal will rapidly and continuously move between the plus and minus limits causing instability.

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## Advantages

- Continuous automatic compensation
- Operation over the entire speed range
- Process PI feature built into drive
- Speed regulation

## Disadvantages

- Requires programming and tuning to implement
- Requires interconnection wiring

A valid speed reference must be used so that the process regulator operates as a trim. This is programmed with [Freq Select 1] (P5) or [Freq Select 2] (P6). The master and follower drive must operate from the same speed reference.

The zero clamp function bit 2 of [PI Config] (P213) is set to prevent bi-directional operation. This is specific to each application. The diagram highlights the clamp in the “off” position.

NOTES

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