16 Loop PID CoProcessor

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F4-16PID <--->

Overview

The F4-16PID is a Proportional Integral Derivative (PID) CoProcessor designed to execute up to 16 PID loops independent of the DL405 CPU. Using the high-speed Intelligent Bus Interface, the F4-16PID reads the process variable and writes the PID output directly into V-memory of the DL405 CPU. Configure the module PID loop using *Direct*SOFT Data View or ladder logic.

Minimal ladder logic is required in the CPU, therefore, the floating point math-intensive PID calculations in the CoProcessor have little effect on the CPU scan time. As a result, the CPU can perform high-speed discrete control while the CoProcessor performs high-speed PID.

Operation

The process variable (PV) comes from an input module, usually an analog input or thermocouple. The user ladder logic copies the input value to the Process Variable location.

The PID module calculates the loop output value and places it at the Output location. The user can write this value to an analog output channel, use it as a time proportion for a discrete output, or send it to the setpoint or another loop for cascading loops.

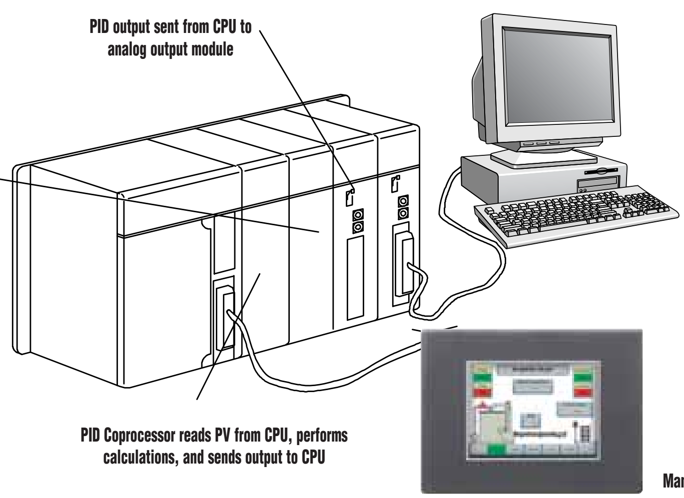
All loop information is read from and written to a user specified block of V-memory. Each loop that is enabled requires 32 V-memory locations. Since all loop parameters are stored in V-memory, any device capable of reading and writing DL405 V-memory can be used to configure, tune, and monitor loops.

The information included in each loop's block of V-memory includes:

- Bit Mapped Mode Word
- Process Variable (PV)
- Setpoint (SP)
- Bias
- Output
- Bit Mapped Alarm word
- Sample Rate (.1 to 999.9 sec. or min.)
- Gain
- Reset
- Rate
- PV Low Low Alarm
- PV Low Alarm
- PV High Alarm
- PV High High Alarm
- PV Yellow Deviation Limit
- PV Orange Deviation Limit
- Alarm Deadband
- Error Deadband Below SP
- Error Deadband Above SP
- Derivative Gain Limiting Coefficient
- Setpoint Low Limit
- Setpoint High Limit
- Maximum Output Clamp
- Minimum Output Clamp

Some variations of PID control are done with supporting ladder logic. Examples that are included in the PID manual are:

- Auto/Manual Mode Control
- Setpoint Ramp and Soak
- Alarm Word Decoding
- Time Proportioning Control Loops
- Cascading Loops
- Positioning Actuator Control Loops



16 Loop PID CoProcessor

Specifications and Key Features	
Module Type	CoProcessor, Intelligent
Number of Loops	16 maximum
Modules per CPU	Six maximum, any slot in CPU base
PID Algorithm	Position or Velocity form of the PID equation. Optionally specify direct or reverse acting, square root of the error and error squared control.
Sample Rate	Specify the time interval between PV samples, 0.1 to 999.9 in units of seconds or minutes
Auto/Manual	A control relay, CR, which when energized places the corresponding loop into automatic mode. PV alarm monitoring continues when loops are in manual mode.
Square Root PV	Specify a square root of the PV for a flow control application.
Limit SP	Specify a high and low limit for allowable setpoint changes.
Gain	Specify proportional gain of 0.00 to 99.99.
Reset	Specify reset time of 0.1 to 999.9 minutes, seconds, milliseconds, or microseconds
Bumpless Transfer I	Bias and setpoint are initialized automatically when the module is switched from manual to automatic. This provides for a bumpless transfer.
Bumpless Transfer II	Bias is set equal to the Output when the module is switched from manual to automatic. This allows switching in and out of automatic mode without having to re-enter the setpoint.
Limit Output	Optionally specify maximum and minimum output values
Step Bias	Provides proportional bias adjustment for large setpoint changes. This may stabilize the loop faster and reduce the chance of the output going out of range. Step bias should be used in conjunction with the normal adjusted bias operation.
Anti-windup	If the position form of the PID equation is specified, the reset action is stopped when the PID output reaches 0 or 100%. Select adjusted bias or freeze bias operation.
Rate	Specify the derivative time, 0 to 999.9 in units of minutes or seconds.
Rate Limiting	Specify a derivative gain limiting coefficient to filter the PV used in calculating the derivative term (99.99 to 00.01).
Error Deadband	Specify an incremental value above and below the setpoint in which no change in output is made.
Error Squared	Squaring the error minimizes the effect a small error has on the Loop output, however; both Error Squared and Error Deadband control may be enabled
20% offset of PV	Specify a 20% offset of the PV to input a 4-20mA transmitter using a 0-20mA analog input module range.
Internal Power Consumption	160mA at +5VDC, (supplied by base power supply)
Operating Environment	0°C to 60°C (32°F to 140°F) 5% to 95% humidity (non-condensing)
Manufacturer	FACTS Engineering
Alarm Specifications	
Deadband	Specify 0.1% to 5% alarm deadband on all alarms except Rate of Change.
PV Alarm Points	A Y output or CR may be activated based on four PV alarm points.
PV Deviation	A Y output or CR may be activated based on four PV alarm points. Specify an alarm for PV deviation above or below the setpoint (Yellow Deviation) and an alarm for greater PV deviation from the setpoint (Orange Deviation).
Rate of Change	A Y output or CR may be activated when the PV changes faster than a specified rate of change limit.
Broken Transmitter	Monitor the PV for a broken transmitter.