

Output Voltage PID

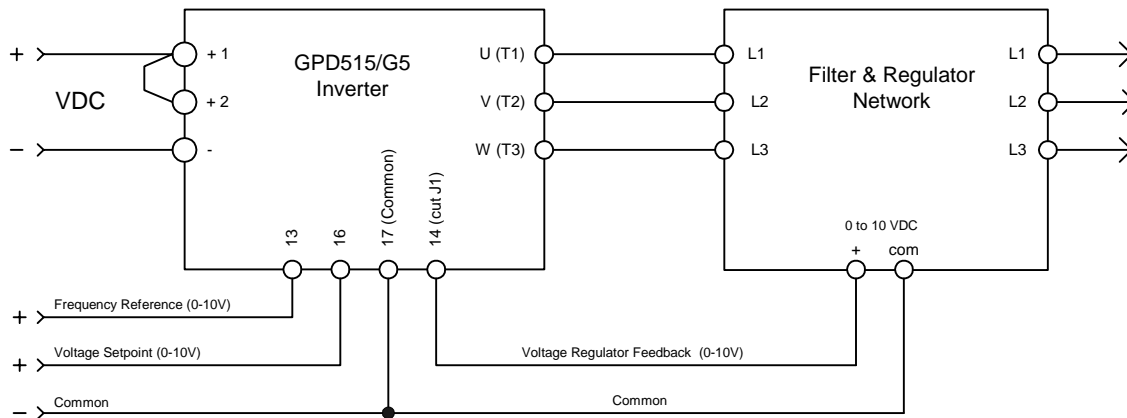
Document Name TM.G5SW.022
 Document Revised 07/01/04
 Software Number VSG114771
 Software Revised 07/10/2001

This software will convert a Yaskawa GPD515/G5 inverter into a VDC to VAC converter with the ability to control the frequency and the voltage of the VAC output. The frequency can be set via the normal frequency reference methods. The VAC output can be controlled by a voltage set point signal and regulated via a PID utilizing a voltage feedback signal. The E1-05 constant may be used to set the minimum voltage output. A filter network can be used to cleanup the pulse width modulated output.

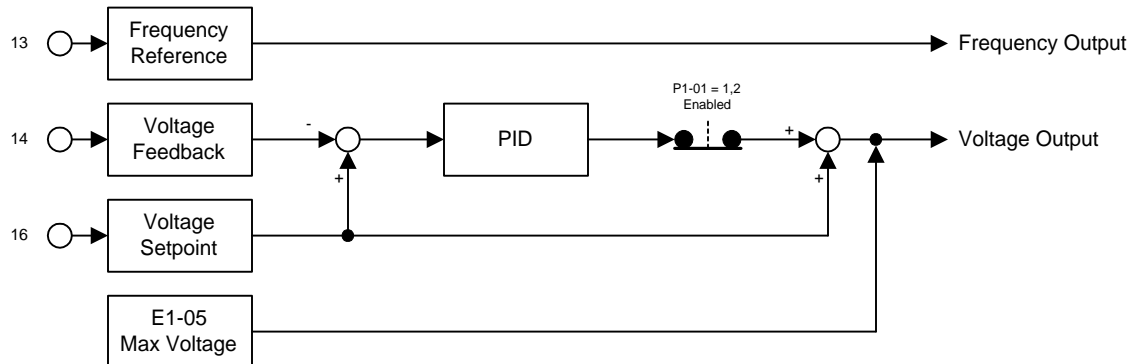
The PID algorithm is a duplicate of the one used in standard software with minor modifications. The Auxiliary PID constants function in the same manner as the B5 PID constants.

This document is an addendum to Technical Manual TM4515, listing the effect of this software on the parameters in the drive and function descriptions in the manual.

Application



Simplified Software Block Diagram



New Multi-Function Analog Input Setting

For Constants H3-05 or H3-09

Setting	Display	Description
20	Aux PID VRef	Analog voltage setpoint
21	Aux PID Vfb	Analog voltage feedback

New Multi-Function Analog output Setting

For Constants H4-01 or H4-04

Setting	Display	Description
35	Aux PID VRef	PID Voltage Setpoint
36	Aux PID Vfb	PID Voltage Feedback
37	Aux PID Output	PID Output

New Multi-Function Digital Input Setting

For Constants H1-01 through H1-06

Setting	Display	Description
80	Aux PID Off	When this input is closed, the voltage setpoint becomes the output voltage reference.

Default Parameters Differing from Standard Software

A1-01 = 4	Advanced Access Level	H4-05 = 1.00	Terminal 23 gain
A1-02 = 0	V/f Mode	H5-01 = 3	Serial Comm Station Address
B1-01 = 0	Operator	H5-03 = 2	Odd Parity
B1-02 = 2	Serial Communications	H5-05 = 0	Serial Comm fault det: Disabled
B1-04 = 1	Reverse Disable	L2-01 = 2	CPU Power Active
C1-01 = 0	Acceleration Time 1	L3-01 = 0	Accel Stall Prevention Disabled
C1-02 = 0	Deceleration Time 1	L3-04 = 0	Decel Stall Prevention Disabled
C2-01 = 0	S-Curve	L3-05 = 0	Running Stall Prevention Disabled
C2-02 = 0	S-Curve	L5-01 = 2	Number of auto restarts
C2-03 = 0	S-Curve	L8-07 = 0	Disable
C4-01 = 0	Torque Compensation Disabled	O1-02 = 2	Output frequency
C7-01 = 0	Hunting Prevention Disabled	O2-01 = 0	Disable
E1-04 = 65	Maximum Frequency	O2-02 = 0	Disable
E1-05 = 120.0	Maximum Voltage	O2-08 = 1	Running Time
E1-06 = 50.0	Base Frequency		
E1-08 = 0	Mid Voltage A		
E1-10 = 0	Minimum Voltage		
H1-06 = 80	Terminal 8, Aux PID off		
H3-03 = 0	Terminal 13 bias		
H3-05 = 20	Terminal 16, Aux PID VRef		
H3-08 = 0	Terminal 14, 0-10V		
H3-09 = 21	Terminal 14, Aux PID Vfb		
H4-04 = 06	Terminal 23, Output voltage		

Factory Level Access

C8-12 = 5 ms	
C8-13 = 1	2 Phase Modulate
C8-16 = 0.0 us	

ModBus RTU Modifications

The standard software address to initiate an enter command is 0xffff. This software extends that to include the use 0x4000 for this purpose. The Modbus RTU function 6 write command has also been implemented.

Startup Procedure

- 1) Cut J1 jumper located on the main control board converting terminal 14 analog input to a voltage input
- 2) Connect all supply power wiring
- 3) Verify VDC supply is within 10 % of the following values
 - a) 350 VDC – 250 VAC Maximum Output
 - b) 672 VDC – 480 VAC Maximum Output
- 4) Connect all output wiring
- 5) Connect all control wiring
- 6) Connect serial communications devices
- 7) Verify all connections
- 8) Energize the GPD515
- 9) 2 wire Initialize the inverter
- 10) Set parameter A2-02 = 0: V/f Control
- 11) If parameters A2-01 or A2-02 are set to anything but the default values the parameters and monitors associated with this software will not be accessible.
- 12) Test operation
- 13) Adjust necessary parameters

New Parameters

New Program Group

Group P
CASE Group

New Program Function

Function P1
Auxiliary PID

New Program Data

Mode	KEY			
	V/f	V/f (PG)	Open L V	Flux Vect.
Access Level	B	B	B	B

Q: Quick Start B: Basic A: Advanced -: Not Accessible

P1-01 PID Mode Selection

A	-	-	-
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PID Mode
P1-01= 1

Setting Range: 0 to 2
Factory Default: 1
Modbus Address: 0x580

Setting	Display	Description
0	PID Disabled	Auxiliary PID is not used
1	Enabled D=Fdbk	Auxiliary PID is enabled, standard mode
2	Enabled D=Fdfwd	Auxiliary PID is enabled, with a lead Derivative Block

P1-02 PID Proportional Gain

A	-	-	-
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PID Gain
P1-02= 1.00

Setting Range 0.00 to 25.00
Factory Default: 1.00
Modbus Address: 0x581

The voltage error determined by set point - feedback is multiplied by this value.

P1-03 PID Integral Time

A	-	-	-
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PID I Time
P1-03= 0.1 Sec

Setting Range 0.0 to 360.0 Seconds
Factory Default: 0.1 Sec
Modbus Address: 0x582

Sets the rate that the PID error accumulates providing control of the integral response time.

P1-04 PID Integral Limit

A	-	-	-
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PID I Limit P1-04= 100.0 %

Setting Range 0.0 to 100.0%
 Factory Default: 100.0%
 Modbus Address: 0x583

Sets the maximum limit of the accumulated integral error.

P1-05 PID Derivative Time

A	-	-	-
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PID D Time P1-05= 0.00 Sec

Setting Range 0.00 to 10.00 Seconds
 Factory Default: 0.00 Sec
 Modbus Address: 0x584

Sets the PID response based on how quickly the voltage feedback varies.

P1-06 PID Limit

PID Limit

A	-	-	-
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PID Limit P1-06= 100.0%
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Setting Range 0.0 to 100.0%
 Factory Default: 100.0%
 Modbus Address: 0x585

Sets the maximum output from the PID.

P1-07 PID Offset

A	-	-	-
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PID Offset P1-07= 0.0%

Setting Range 0.0 to 100.0%
 Factory Default: 0.0%
 Modbus Address: 0x586

This value is added to the PID output.

P1-08 PID Delay Time

A	-	-	-
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PID Delay Time P1-08= 0.00 Sec

Setting Range 0.00 to 10.00 Seconds
 Factory Default: 0.00 Sec
 Modbus Address: 0x587

Delays the PID output.

P1-09 Vref Accel Time

A	-	-	-
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Vref Rate Time P1-09= 0.20 Sec

Setting Range 0.00 to 2.00 Seconds
 Factory Default: 0.20 Sec
 Modbus Address: 0x588

Sets the rate that the PID will increase the output voltage.

New U1 Monitors

U1-50 *Aux PID Vref*

A	-	-	-
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Aux PID Vref U1-50= 0.00%
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Range: 0 to 100.00%
Modbus Address: 0x00d0

Displays the percentage of the PID voltage set point input on terminal 16.

U1-51 *Aux PID Vfb*

A	-	-	-
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Aux PID Vfb U1-51= 0.00%

Range: 0 to 100.00%
Modbus Address: 0x00d1

Displays the percentage of PID voltage feedback input on terminal 14.

U1-52 *Aux PID Output*

A	-	-	-
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Aux PID Output U1-52= 0.00%
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Range: 0 to 100.00 %
Modbus Address: 0x00d2

Displays the percentage of PID output that is summed with the voltage set point.