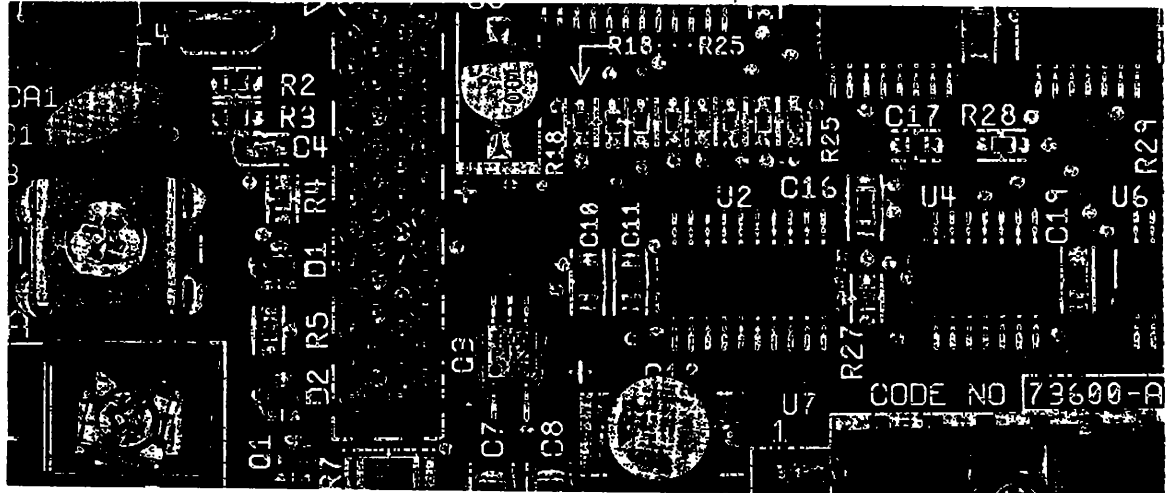


# PG Speed Controller PG-A

OPTIONAL CARD FOR Varispeed-616H3 SERIES



Before initial operation read these instructions thoroughly, and retain for future reference.

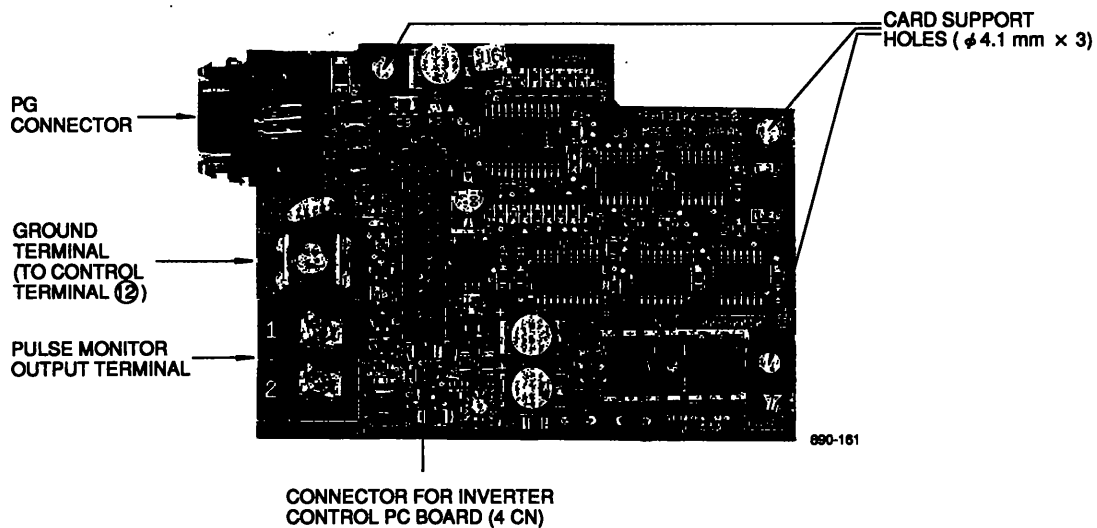


YASKAWA

PG speed control card PG-A is mounted on the control board of the inverter unit. It is used to compensate for speed fluctuations due to slip, utilizing a motor PG (pulse generator) which provides a means of speed feedback.

PG speed control card PG-A is available for the Varispeed-616H3 inverter series.

Name	Code No.	Function
PG Speed Control Card PG-A	73600-A001X	<ul style="list-style-type: none"> <li>• Phase A pulse (single pulse) input</li> <li>• PG frequency range : 50 to 32767 Hz</li> <li>• Pulse monitor output : +12 V, 20 mA (Max)</li> </ul>



PG Speed Control Card PG-A

**IMPORTANT**

1. Read the manual for Varispeed-616H3 (VS-616H3) series thoroughly in conjunction with this manual,
2. Turn off VS-616H3 main circuit power and make sure that CHARGE lamp is off before connecting the PG speed control card PG-A or external terminals.
3. Specify the name and the code No. in ordering PG speed control card PG-A.

# INSTALLATION ON VS-616H3 CABINET (See Fig. 1)

- (1) Turn off the main circuit power supply and remove the inverter face plate. Then check that the CHARGE indicator lamp has been turned off.
- (2) Mount connector 4CN of the PG speed control card PG-A on the inverter control PC board connector 4CN (number of pins: 40 poles). At this time, insert PG speed control card PG-A supporting holes (3 places) into the optional card support on the control PC board evenly until it clicks, and fix the PG speed control card PG-A firmly.
- (3) After mounting PG speed control card PG-A, connect it with the peripheral devices. Then mount the inverter face plate.

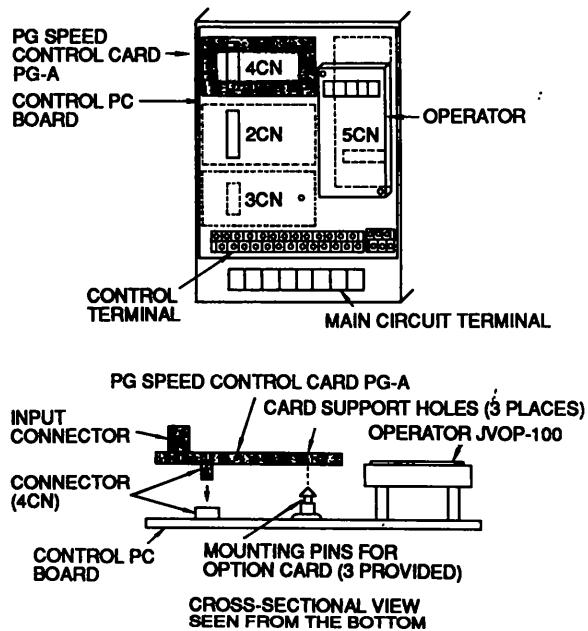


Fig. 1 Installation of PG Speed Control Card PG-A

# INTERCONNECTION

Fig. 2 shows the interconnection of VS-616H3, PG speed control card PG-A and peripheral units.

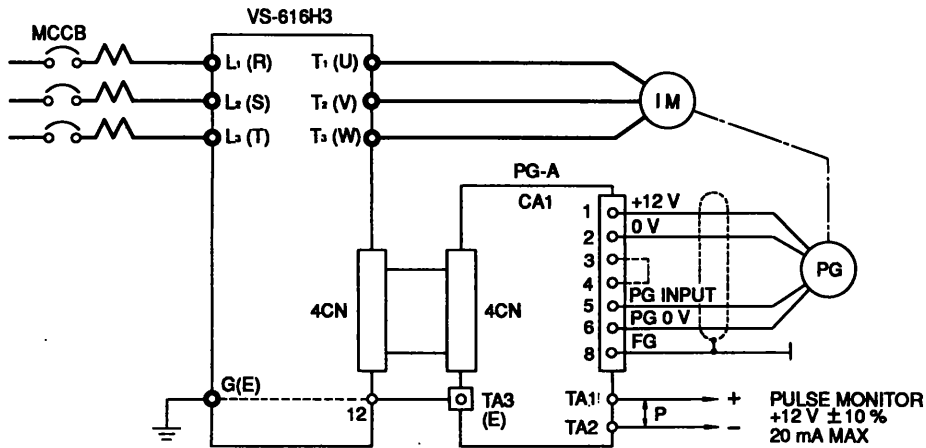


Fig. 2 Interconnection Diagram

## CAUTION

1. To prevent erroneous operation caused by noise interference:
  - Separate control circuit leads (connector CA1, terminals TA1 and TA2) from main circuit leads or large-current electrical equipment.
  - Use shielded leads for connection with PG and perform terminal processing as shown in Fig. 3. Wiring distance must be 50 m (164 feet).
2. If no control signal input terminals are used, connect it to 0 V.

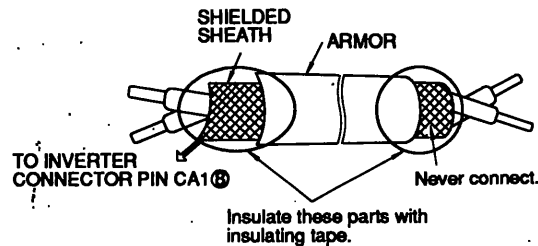
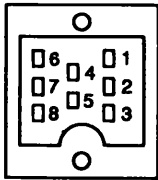


Fig. 3 Shielded Lead Termination

# WIRING

Connector consists of a receptacle Type MR-8F (G) and a casing Type MR-8L.

Table 1 PG Connector

Pin Location	Pin No.	Function		Remarks
 <p>MR-8RMA (G)</p>	1	+12 V	+12 V power	PG power
	2	0 V	+12 V $\pm$ 5% 200 mA Max *	
	3 4	For open-collector input, short-circuit ③ and ④.		
	5	+	PG input signal	Signal input level H : +4 to +12 V L : Less than + 1 V
	6	-		
	7	—		
	8	Shielded sheath connection terminal		

\* Up to +14 V,  $\pm$ 5% supply is possible by adjusting variable resistor RV1.

Table 2 External Terminal

Terminal No.	Function		Remarks
TA1	+	Pulse monitor output (Duty of pulse monitor output is determined by PG waveform.)	Output voltage : +12 V $\pm$ 10% Output current : 20 mA Max
TA2	-		

# CONSTANTS RELATED TO PG SPEED CONTROL

## SYSTEM CONSTANT LIST

Constant No.	Name	Function				Factory Setting	
		4-digit	3-digit	2-digit	1-digit		
Sn- [ ]	37 PG speed control card PG-A function selection 1	Speed control provided (closed-loop)				0	
		Speed control not provided (open-loop)				1	
		Integration during accel/decel provided				0	
		Integration during accel/decel not provided				1	
		Stopping method at PG disconnection detection	Decel to a stop (decel time : bn-02)				0
			Coasting to a stop				1
			Emergency stop (decel time : bn-12)				0
			Continuous operation				1
	38 PG speed control card PG-A function selection 2	Stopping method at excessive speed detection	Decel to a stop (decel time : bn-02)				0
			Coasting to a stop				1
			Emergency stop (decel time : bn-12)				1
			Continuous operation				0
		Stopping method at excessive speed deviation detection	Decel to a stop (decel time : bn-02)				0
			Coasting to a stop				1
Emergency stop (decel time : bn-12)				0			
Continuous operation				1			

## CONTROL CONSTANT LIST

Constant No.	Name	Unit	Setting Range	Factory Setting
49	PG constant	1p/rev	0.20 to 3000	0
50	Not used	—	—	—
51	Number of motor poles	2 pole	2 to 32	4
52	ASR proportional gain 1	0.01	0.00 to 2.55	0.00
53	ASR integral time 1	0.1 s	0.0 to 10.0	1.0
54	ASR proportional gain 2	0.01	0.00 to 2.55	0.20
55	ASR integral time 2	0.1 s	0.0 to 10.0	1.0
56	ASR limit	0.1%	0.0 to 10.0	5.0
Cn- [ ]	57 Excessive speed deviation detection level	0.1%	0.0 to 50.0	10.0
	58 Excessive speed deviation detection time	0.1 s	0.0 to 10.0	2.0
	59 Excessive speed detection level	1%	0 to 120	115
	60 Excessive speed detection time	0.1 s	0.0 to 10.0	2.0
	61 Not used	—	—	—
	62 Not used	—	—	—
	63 Not used	—	—	—
	64 Number of gear teeth 1	1	0 to 999	0
	65 Number of gear teeth 2	1	0 to 999	0

## DESCRIPTION OF CONSTANTS

### (1) PG Constant (Cn-49)

When the PG speed control card is connected, it determines the number of output pulses per revolution of the pulse generator (PG). Values are set in the units of 1 p/rev. When 0 is set, the V/f mode is entered and speed control is not performed.

Example: When the number of output pulses per PG revolution is 600: Cn-49 = 600

### (2) Number of Motor Poles (Cn-51)

The number of motor poles is set when the PG speed control card is connected. When the card is connected, values from 1 to 39 are disregarded even if any of them has been set to Cn-20.

If the set value of Cn-49 or Cn-51 does not satisfy the following condition, a setting error occurs and **PE04** is displayed. Set values are checked when the power supply is turned on or when the program mode is changed to the drive mode.

$$\frac{Cn-49 * Cn-02}{5 * Cn-51} > 32767$$

### (3) ASR Proportional Gain (Cn-52)

When the PG speed control card is connected, ASR proportional gain at 0% output frequency is set.

### (4) ASR Integral Time 1 (Cn-53)

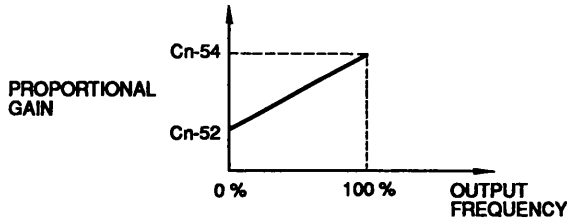
When the PG speed control card is connected, ASR integral time at 0% output frequency is set.

### (5) ASR Proportional Gain 2 (Cn-54)

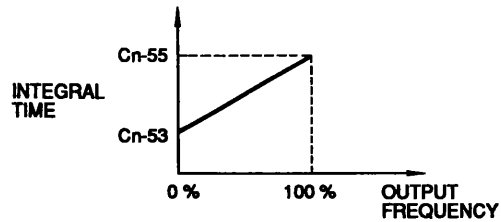
When the PG speed control card is connected, ASR proportional gain at 100% output frequency is set.

(6) ASR Integral Time 2 (Cn-55)

When the PG speed control card is connected, ASR integral time at 100% output frequency is set.



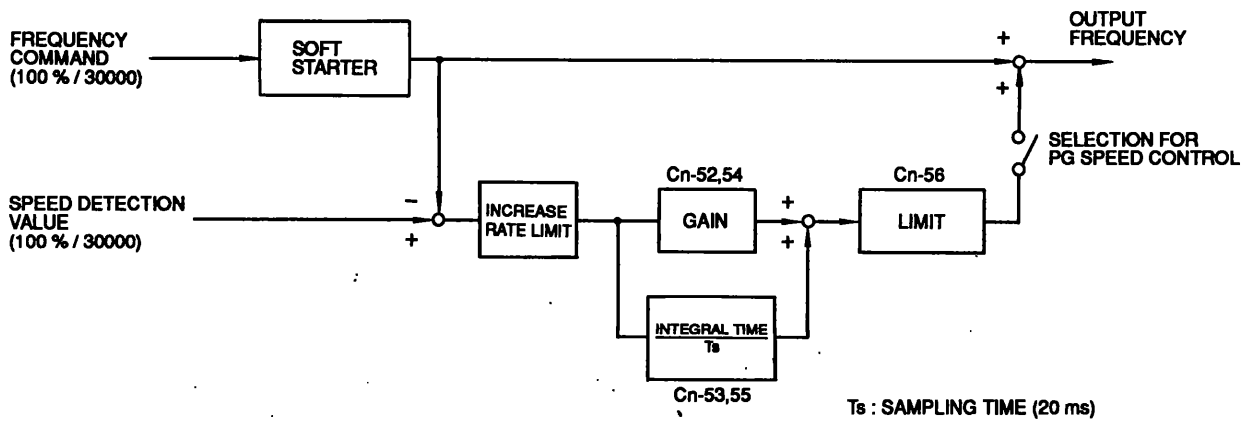
Relation between Output Frequency and Proportional Gain



Relation between Output Frequency and Integral Time

(7) ASR Limit (Cn-56)

When the PG speed control card is connected, ASR limit is set in units of 1% ratio for the maximum frequency.



ASR Block Diagram when PG Speed Control Card is Connected

(8) Excessive Speed Deviation Detection Level (Cn-57)

When the PG speed control card is connected, the level to detect excessive speed deviation is set in units of 0.1% ratio for the maximum frequency.

(9) Excessive Speed Deviation Detection Time (Cn-58)

When the PG speed control card is connected, the time to detect excessive speed deviation is set in units of 0.1 second.



(10) Excessive Speed Detection Level (Cn-59)

When the PG speed control card is connected, the level to detect excessive speed is set in units of 0.1% ratio for the maximum frequency.

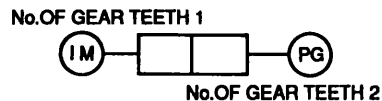
(11) Excessive Speed Detection Time (Cn-60)

When the PG speed control card is connected, the time to detect excessive speed is set in units of 0.1 second.

(12) Number of Gear Teeth 1, 2 (Cn-64, Cn-65)

Used when there are gears between the PG and motor. When the PG speed control card is connected, the number of gear teeth is set. (When there are no gears, the set value is to be 0.) The number of motor revolutions from the PG output pulse is calculated as shown below:

$$\text{Motor r/min} = \frac{\text{PG output pulse} \times 60}{\text{PG constant (Cn-49)}} \times \frac{\text{No. of gear teeth 2 (Cn-65)}}{\text{No. of gear teeth 1 (Cn-64)}}$$

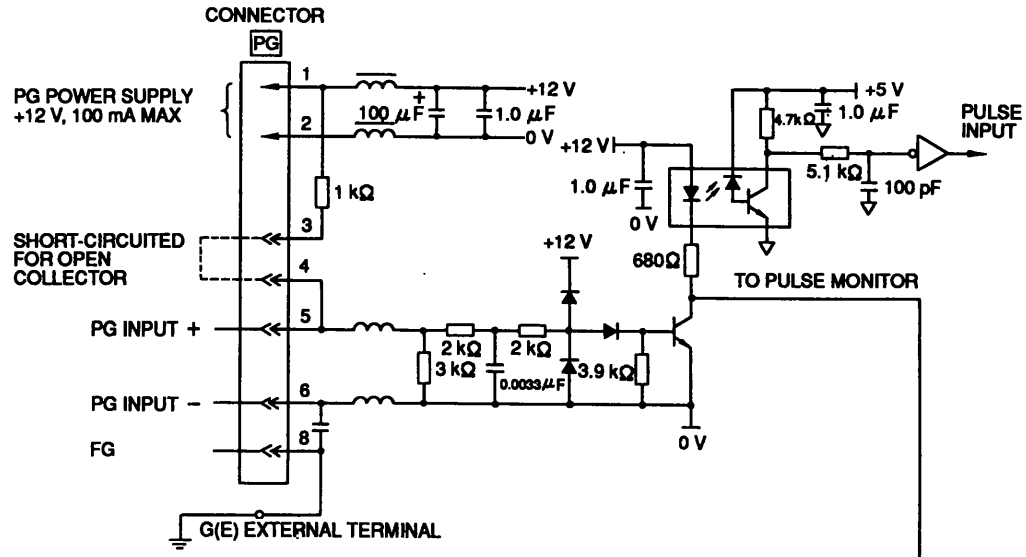


Note: When the number of either gear teeth 1 or 2 = 0, calculation of gear teeth is not performed.

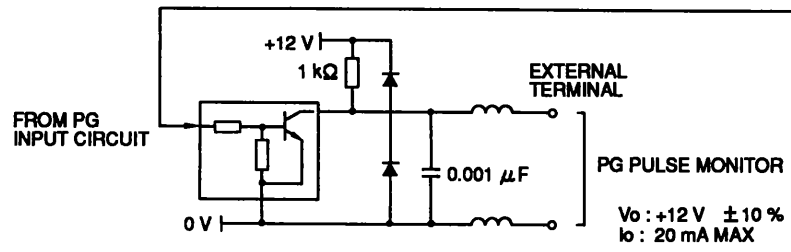
# APPENDIX

## INTERFACE CIRCUIT

### (1) PG Input Circuit



### (2) Pulse Monitor Output Circuit



# SELECTION OF PG

Maximum PG output pulse detection is 32767 Hz.

Select the PG which outputs approximately 20 kHz at the motor speed of maximum frequency output.

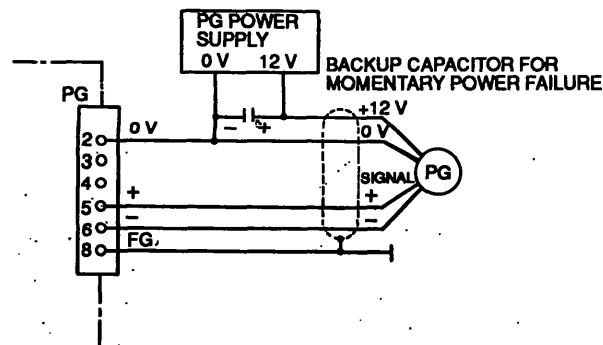
$$\frac{\text{Motor Speed at Max Frequency Output}}{60} \times \text{PG rating (p/rev)} = 20,000 \text{ Hz}$$

## PG Selection

Motor Speed at Max Frequency Output (r/min)	PG Rating (p/rev)	PG Output Frequency at Max Frequency Output (Hz)
1,800	600	18,000
1,500	800	20,000
1,200	1,000	20,000
900	1,200	18,000

### Notes :

1. Motor speed at max frequency output is indicated by synchronous speed.
2. PG power is +12 V.
3. When PG power capacity is 100 mA or more, separate power supply must be provided. (Backup capacitor is required to counteract momentary power failure.)



# PG Speed Controller PG-A

OPTIONAL CARD FOR Varispeed-616H3 SERIES

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