Voltage Mode Note 400 Series

Introduction

In voltage mode, the voltage that is output to the motor is fed back to close a voltage loop. Since the voltage across the motor is proportional to the speed of the motor, this will allow coarse control of the motor speed, suitable for AGV's, conveyors, or a Mars Lander. Operation will be much like a tachometer. Hence the slang, poor mans tachometer.

Benefits

- Potentiometer Speed control.
- Improved PLC stability.
- Analog Position loop stability
- No need for tachometers

Procedure

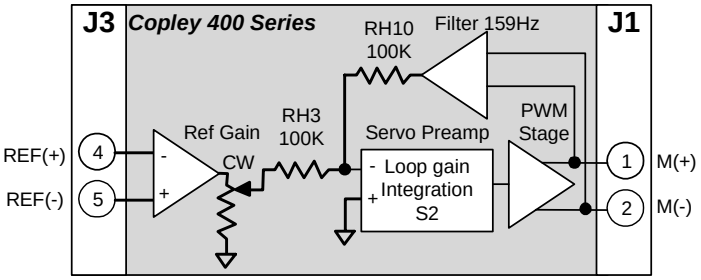
Determine the voltage gain required. Example: If 24V output is required with 10V input then,
Gain = Output Voltage / Input Voltage = 24V/10V = 2.4
Use the table for RH10 if the gain is common or use the formula to calculate uncommon gains. Install the resistor in the amplifier header Position RH10.

Gain	412, 413 RH10 Ω	421, 422, 423 RH10 Ω
1.2	12K Ohms	6K Ohms
2.4	24K Ohms	12k Ohms
7.5	75K Ohms	37.5k Ohms
15	150K Ohms	75K Ohms

Formula: RH10. For 41x amplifiers RH10 = HV (kΩ). For 42x, and 43x models, RH10 = HV/2 (kΩ). Use exact or next larger value. (RH3 must be factory default 100K Ohms) See functional diagram.

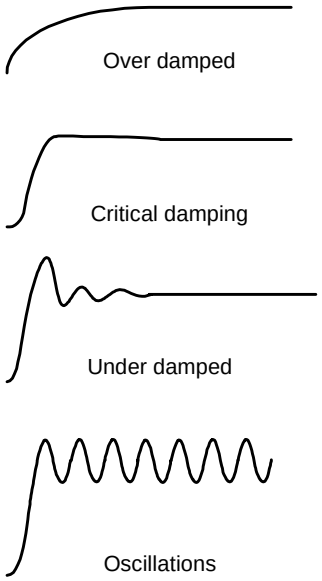
Set S2 OFF, Ref Gain, Integ Freq & Tach Gain pots fully CW, Loop Gain pot fully CCW.
Connect oscilloscope to J2-10, Output Voltage monitor.
Apply ±1V, 10Hz square wave to Ref inputs. Check for oscillation. If oscillation occurs, decrease RH12 to 10kΩ. Oscillation should now be gone.
The Loop Gain and Integration Gain can be adjusted to effect the step response. Critical damping is recommended. See the Step Response diagram.

Functional Diagram



Voltage mode functional diagram.
See the 400 series data sheet for more Servo Preamp details

Step Response



Note: If the motor has a large resistance, refer to the 400 Series data sheet for the IR compensation procedure. However, for most motors with low motor resistance and a normal back emf range, no IR compensation will be required.
Example: Motor resistance R = 0.5 Ohm, Back emf constant Ke = 10V/krpm
What is the speed lost at 3000rpm if 5Amps of current is continuously delivered?
Answer: 5Amps * 0.5ohms = 2.5V / 10V/krpm = 0.25krpm or 250rpm loss of speed, not bad regulation.