



Application Guide

Topic: Analog Input Speed Reference Response Time

Drive Product: PowerFlex 700S

Introduction An Application Guide provides generic information on features and functions of drive products and their implementation. Application Guides are not specific to any one application, but generically discuss application techniques and/or functions as part of an application.

User Information Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://www.ab.com/documents/gj>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this document are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this document.

Reproduction of the contents of this document, in whole or in part, without written permission of Rockwell Automation, Inc. is prohibited.

Related Publications The following publications should be referenced and followed when operating, configuring, or commissioning this drive product. These publications may be found on the automation book store at www.theautomationbookstore.com ;

Publication Title	Pub Number
PowerFlex 700S User Manual	20D-UM001B-EN-P
PowerFlex 700S Reference Manual	PFlex-RM002A-EN-E
PowerFlex 700S Firmware Release Notes	20D-RN004A-EN-P
PowerFlex 700S Quick Start	20D-QS001A-EN-P

Application Guide

Precautions

Class 1 LED Product



ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber optic cable connectors.

General Precautions



ATTENTION: This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference Allen Bradley publication 8000-4.5.2, "Guarding Against Electrostatic Damage" or any other applicable ESD protection handbook.



ATTENTION: An incorrectly applied or installed drive can result in component damage or a reduction in product life. Wiring or application errors such as under sizing the motor, incorrect or inadequate AC supply, or excessive surrounding air temperatures may result in malfunction of the system.



ATTENTION: Only qualified personnel familiar with the PowerFlex 700S AC Drive and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.



ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC & -DC terminals of the Power Terminal Block (refer to Chapter 1 in the PowerFlex 700S User Manual for location). The voltage must be zero.



ATTENTION: Risk of injury or equipment damage exists. DPI or SCANport host products must not be directly connected together via 1202 cables. Unpredictable behavior can result if two or more devices are connected in this manner.



ATTENTION: Risk of injury or equipment damage exists. Parameters 365 [Encdr0 Loss Cnfg] - 394 [VoltFdbkLossCnfg] let you determine the action of the drive in response to operating anomalies. Precautions should be taken to ensure that the settings of these parameters do not create hazards of injury or equipment damage.



ATTENTION: Risk of injury or equipment damage exists. Parameters 383 [SL CommLoss Data] - 392 [NetLoss DPI Cnfg] let you determine the action of the drive if communications are disrupted. You can set these parameters so the drive continues to run. Precautions should be taken to ensure the settings of these parameters do not create hazards of injury or equipment damage.

Application Guide

Technical Information

The purpose of this test was to measure the response time between a change of an analog speed reference and when a fluxed up motor reacted to that change on a PowerFlex 700S. Before taking the measurements, motor data was entered and an autotune was performed on the connected motor. The motor was unloaded.

Additionally, the following parameters were set:

- P89 [Spd Err Filt BW] = 0 Rad/Sec
- P90 [Spd Reg BW] = 40 Rad/Sec
- P151 [Logic Cmd Word] = 0000 0000 0000 0001 (Bit 0 was set to 1 to disable the speed ramp)

To measure the response time, an analog input was configured as the speed reference. The drive was started with a 0 RPM speed reference. A 0 to 10V supply was wired through a switch into the analog input. Then the time between a 0 to 10V step change on the analog input and the motor current to reach 2/3 of its peak was measured with an oscilloscope.

20 trials were performed with the following results:

- Average time = 2.2 ms
- Worst case response time = 3.4 ms

The response times can be broken down as follows:

- Analog input delay time = 0.8 ms
- VPL (velocity processor loop) time = 0.5 ms
- Time to ramp Iq to 2/3 = remaining time

So the variable in the response time is the time to ramp Iq to 2/3. From our testing, we can see that P89 [Spd Err Filt BW] and P90 [Spd Reg BW] affect how fast the drive responds to a step change in the speed reference, and therefore how fast Iq is ramped up. Decreasing P354 [Iq Rate Limit] will tend to make the Iq ramp time longer. Setting P153 [Control Options] bit 11 will also make the Iq ramp time longer.