



Tech Tips

Configuring the Point to Point Position Loop

Description

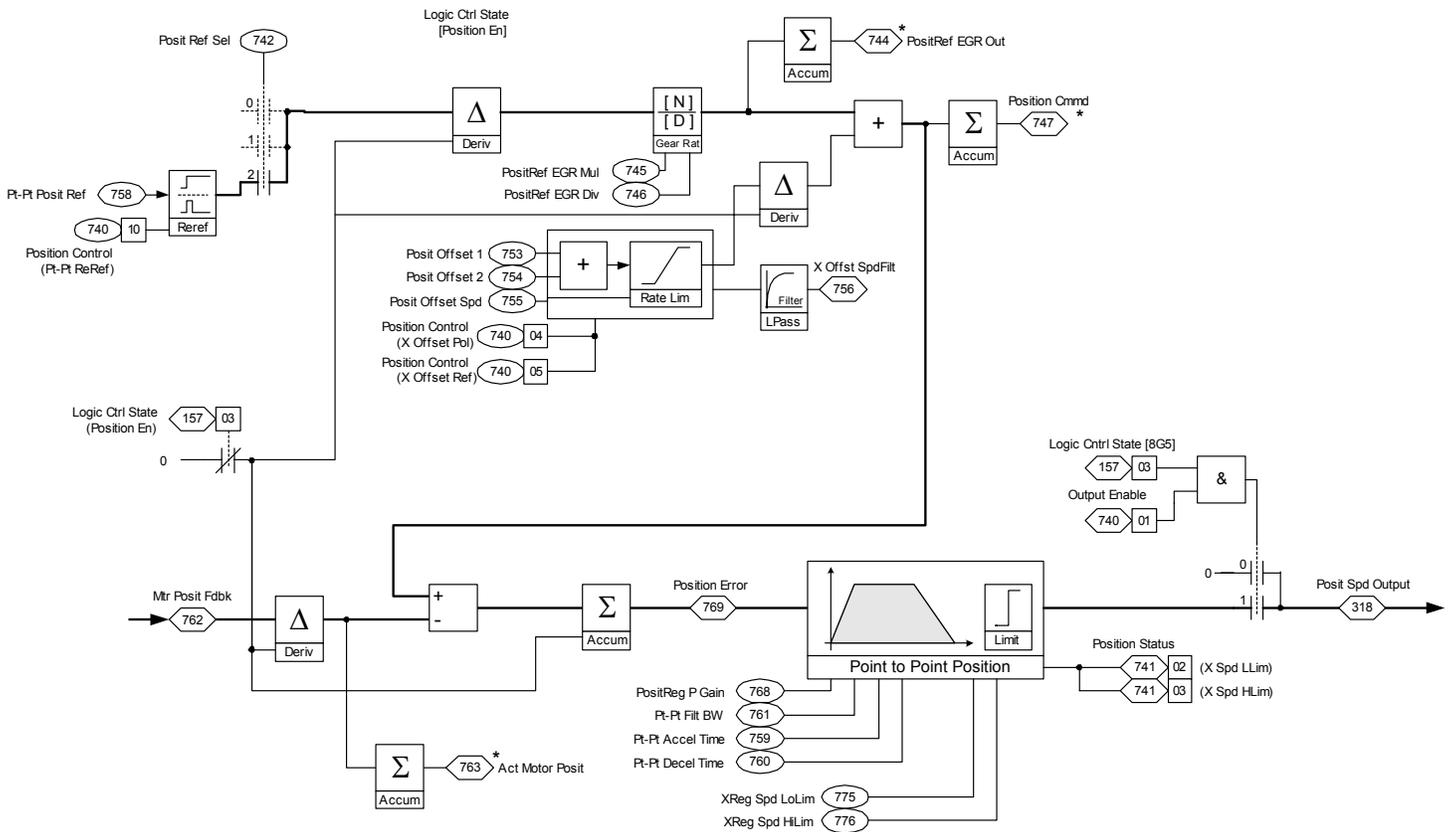
This document serves as a supplement to the PowerFlex Users Manual addressing items specific to the PowerFlex 700S. Please refer to the Users Manual for details on Position Loop configuration parameters. The position loop in the 700S drive can be used in place of an additional motion controller for simple positioning applications. The most common configuration will be in conjunction with PLC control. This example uses PLC control to send position references, position offsets, position redefines, starts, and stops to the 700S. This document does not reflect the position memory function added in firmware revision 1.14.

Technical Information

First a few general facts about the Point to Point Position Loop in the 700S:

1. Uses only P768 [PositReg P Gain] for tuning, no integral gain.
2. Uses quadrature encoder counts for positioning. I.E. 1024 encoder = 4096 counts per rev.
3. Position loop tuned independently of the speed loop.
4. Speed loop tuning directly affects the position loop tuning.
5. For best performance, should be used with Dynamic brake or regenerative system.

Below is a block diagram of the Point to Point Position Loop.





Tech Tips

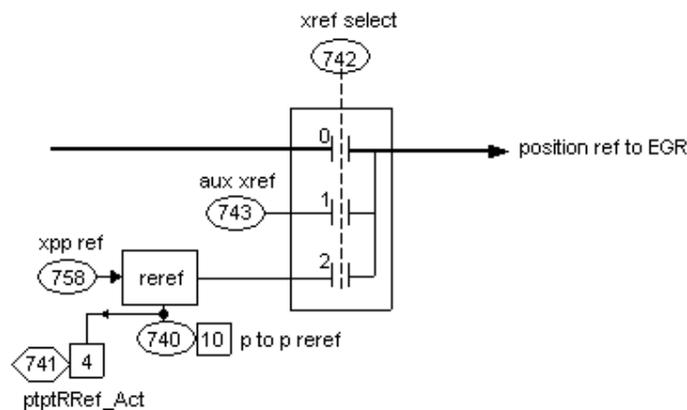
Overview

The Point to Point positioning feature in the PowerFlex 700S gives the user the ability to position the load without an external position controller. The Point to Point function of the position loop moves from current location to commanded location then holds that position until given a new reference or a stop command. The position is not maintained when the drive is stopped or the position loop is not enabled. When the position loop is enabled, the value at P758 [Pt-Pt Posit Ref] is the current position. A position ReRef needs to be used to establish the correct position for meaningful operation. The position loop can be scaled to different units other than feedback counts, I.E. Degrees or Inches.

Required Links

1. P740 [Position Control] ← P707 [Data In A1 Int]
2. P22 [Speed Trim 2] ← P318 [Posit Spd Output] Position Regulator Speed Command Output for use by the Speed Loop.
3. P151 [Logic Command] ← P709 [Data In A2 Int]
4. P758 [Pt-Pt Posit Ref] ← P711 [Data In B1 Int]

Mode Select & Referencing



P742 [Posit Ref Sel] = 2, Select Point to Point operation.

P758 [Pt-Pt Posit Ref] Point to Point Position Reference. This value comes to the drive via a PLC.

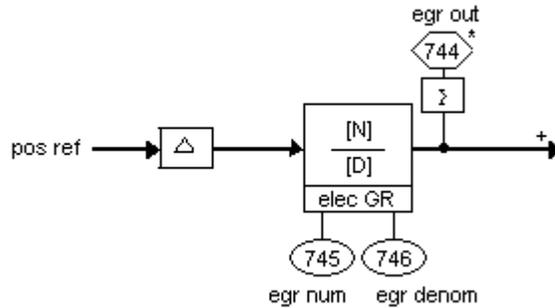
P740 bit 10 [Pt-Pt ReRef] This does a position redefine when active. When this bit is set, the position reference in P758 [Pt-Pt Posit Ref] can be changed to the position value desired for the current location. This can be used as a home zero setup by moving the load to the home position. Example: setting P740 bit 10 = 1 and then setting P758 = 0, this will set P747 [Position Command] value to be the position command for zero. Also if P758 is set to a different number, that will become the new position value. After setting P758 to the desired value P740 bit 10 can be set = 0.

P16 [Speed Ref Sel] = 0 (Zero Speed)



Tech Tips

Position Reference Scaling



Position reference can be entered in user units by using the EGR scaling . P745 [PositRef EGR Mul] and P746 [PositRef EGR Div] are used to scale the position reference. If you would like to use degrees of motor revolution for the positioning units, scale as follows:

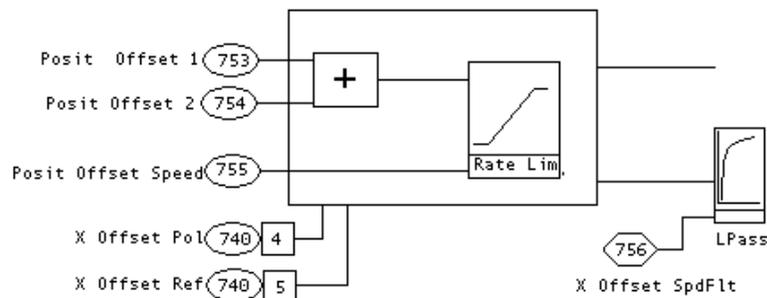
With a 1024 encoder on the motor, this translates to 4096 counts per rev quadrature position counts.

P745 [PositRef EGR Mul] = 4096

P746 [PositRef EGR Div] = 360

Translates the position command of 0-360 degrees to 0-4096 position counts. This will allow you to enter degrees of motor rotation for the position command.

Position Offset

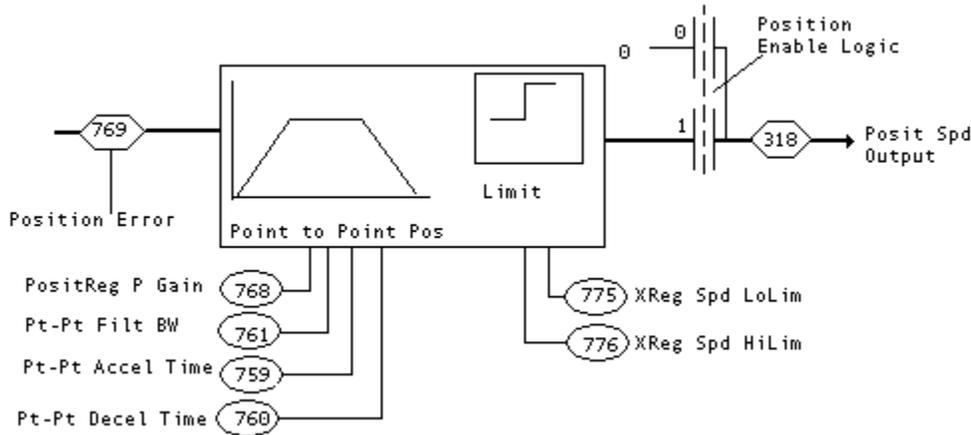


Offsets can be added to the position reference. Offset can be used to offset the commanded position or to make a correction move. There are two offset, P753[Posit Offset 1] and P754 [Posit Offset 2]. Offset speed must be entered in P755, if this is left at zero the move will not occur. Offsets to position must be entered in counts of feedback. Offsets must be maintained to keep the position, I.E. if you enter a 300 in the offset the position loop will move 300 counts extra. If you zero the offset command the motor will return to the previous position. Offsets can be added to or zeroed. To zero the offset after a move, set P740 bit 5 =1 then set offset value = 0 then set P740 bit 5 = 0. The system will not make an offset move when P740 bit 5 is set.



Tech Tips

Point to Point Control Tuning



Note: The speed loop of the drive must be tuned prior to tuning the Position Loop.

P768 [PositReg P Gain] = 4 (Default)

P761 [Pt-Pt Filt BW] Sets the bandwidth of a low pass filter which affects smoothness at the start of deceleration in the point to point mode. A high filter bandwidth will produce a more square Deceleration torque, one with a higher level of jerk. Typical values are 5 to 100 (rad/sec). A Zero value will bypass the filter. Tail-out is influenced mainly by P768. Too high of a value in this parameter will cause unstable operation at the end of the move. Default = 25

P759 [Pt-Pt Accel Time] Acceleration time from zero to Base Speed of the motor. This is only active in Point to Point mode. Default = 10

P760 [Pt-Pt Decel Time] Deceleration time from Base Speed of the motor to zero. This is only active in Point to Point mode. Default = 10

P775 [Xreg Spd LoLim] Negative speed limit at which the position regulator will output. Default = -1750

P776 [Xreg Spd HiLim] Positive speed limit at which the position regulator will output. Default = 175

Tuning Tips

Do not attempt to set the accel/decel rates of the point to point position loop faster than can be accomplished by the speed loop bandwidth. Attempting to set the accel/decel rates faster than the speed loop can handle will cause instability in the position loop. Do not attempt to operate at the torque limits of the drive motor combination.

Typical P768[PositReg P Gain] is set betwing 1/5 to 1/3 of the velocity BW, but may be set higher using lead compensation on the Position Regulator Output. Lead/Lag filtering of the position regulator output is accomplished via the speed trim 2 filter. P25 [Strim2 Filt Gain] and P26 [Strim2 Filt BW]. Making the Lead filter = 1/BW. Example: BW = 40 r/s Setting P25 [Strim2 Filt Gain] = 5 and P26 [Strim2 Filt BW] = 200 will effectively cancel the 1/40 sec lag. This will allow a higher position gain for increased stability.



Tech Tips

Additional Information

On the rising edge (activation) of P741 bit 7 the following bit assignments occur:

- If P740 bit 8 is set, then P763, P765, P744, and P747 get loaded with:
 {[Mtr Posit Fdbk] (P762) – [Abs Posit Offset] (P757)}.
- If P740 bit 8 is reset and P740 bit 6 is set, then P763, P765, P744, and P747 get loaded with:
 [Mtr Posit Fdbk] (P762).
- If P740 bit 8 is reset and P740 bit 6 is reset, then P763, P765, P744, and P747 get loaded with the reference value.