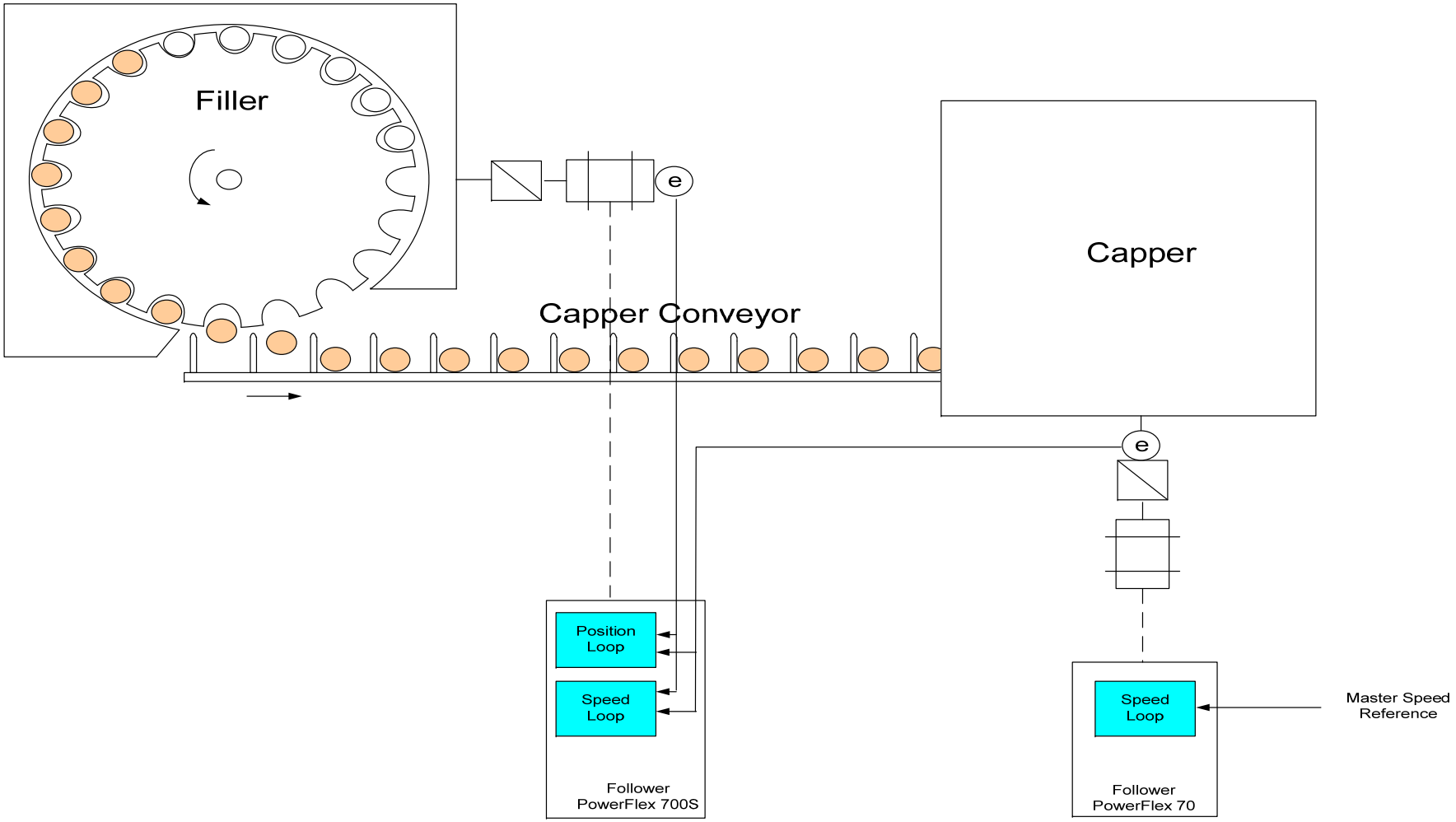
PF 750-Series Electronic Gearing

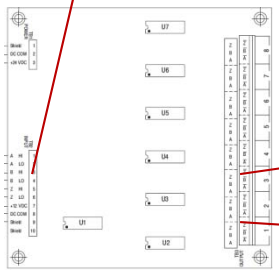
Electronic Gear Ratio

- Electronic Gear Ratio is used when two pieces of equipment need to be locked together.

Electronic Gear Ratio Example



Example



PowerFlex™ Powerful Performance. Flexible Control.

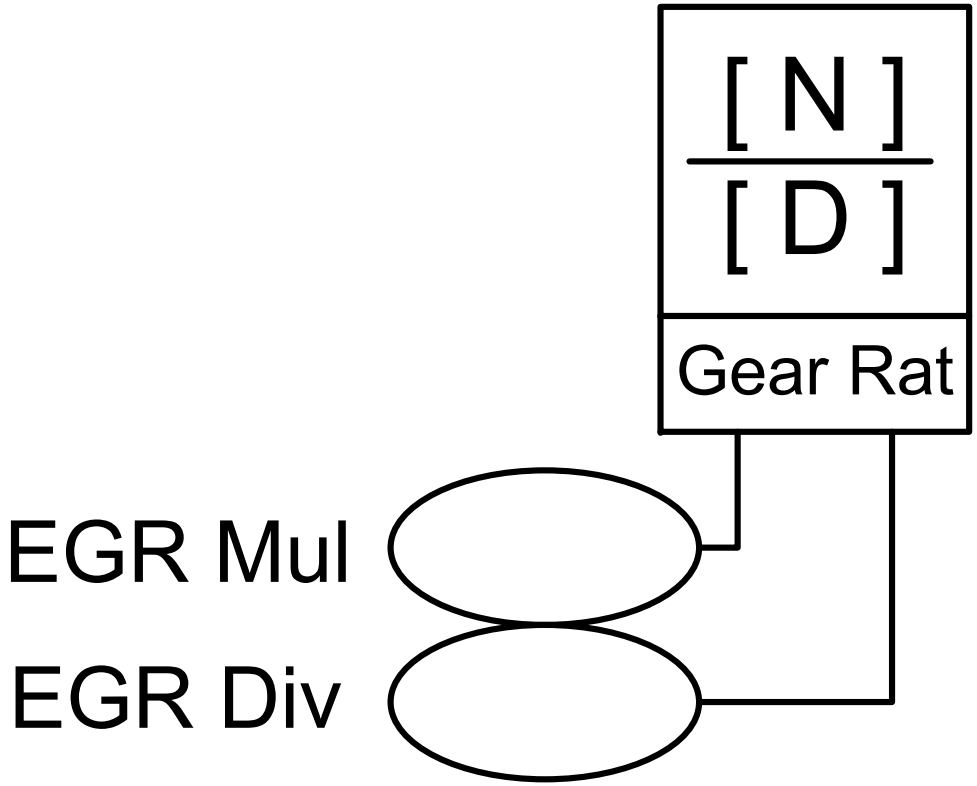
Speed Loop Parameter Setup

- Par 35 [Motor Ctrl Mode] = 3 or 6 “Flux Vector”
- Par 125 [Pri Vel FB Sel] = Follower Encoder (on motor shaft)
- Par 132 [Aux Vel Fdbk Sel] = Leader Encoder
- Par 545 [Speed Ref A Sel] = Port 0 Par 134 [Aux Vel FB]
- Par 549 [Speed Ref A Mult] = Gear Ratio
- Par 635 bit 1 [Ramp Disable] = 1
- Par 636 [Speed Bandwidth] = application dependent
- Par 721 bit 10 [Add Spd Ref] = 1 [Position Control word]

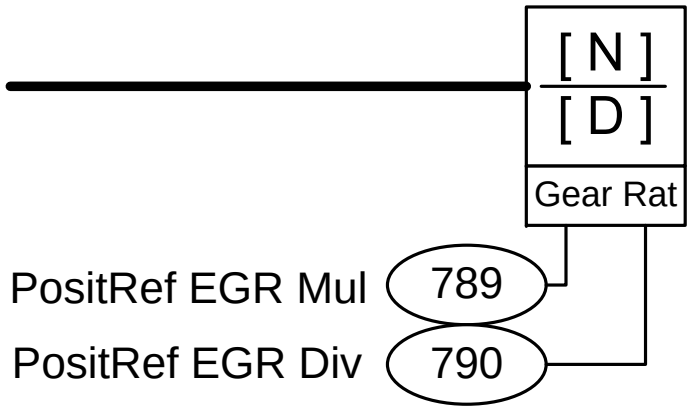
Position Loop Parameter Setup

- Par 309 [SpdTrqPsn Mode A] = 10 (Position Direct)
- Par 308 [Direction Mode] = 2 (Rev Disable)
- Par 135 [Pos FB Sel] = Follower Encoder (on Motor or Load)
- Par 765 [Psn Ref Sel] = Leader Encoder
- Par 816 [Psn EGR Mult] = Application Dependent
- Par 817 [Psn EGR Div] = Application Dependent
- Par 848 [Psn Gear Ratio] = Application Dependent
- Par 839 [Psn Reg Kp] = 1/3 to 1/5 of par 636
- Par 844 [Preg Pos Spd Lmt] = +10%
- Par 845 [Preg Neg Spd Lmt] = -10%

Electronic Gear Ratio



Why don’t we lose counts if irrational number ratio?

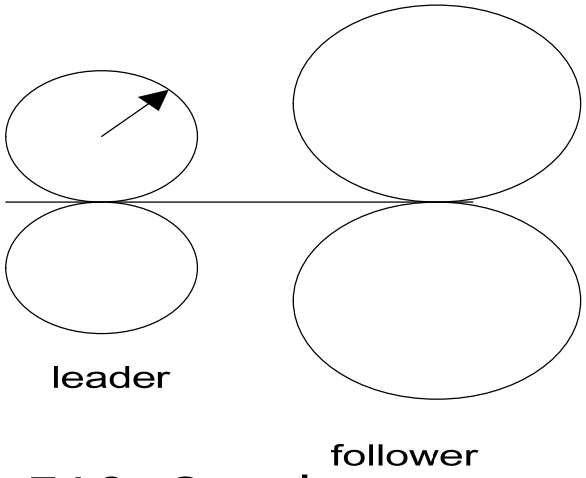


- Double Integer Math Resultant
  - Result
  - Remainder
- The drive keep track of the remainder.
- Example 1/3

Input	Result	Remainder
1	0	1
1	0	2
1	1	0

Example: Getting the scaling correct

Leader



Follower

PPR:	512 Quad		1024 Quad
Roll Diameter	4in		8in
Motor Gear Ratio	2:1		10:1
Gear Ratio Difference		3:1	

Calculating speed scaling par 549

- Leader Diameter = 4in x PI = 12.566 in
- Follower Diameter = 8in x PI = 25.1327 in
- Leader Gear Ratio is 2:1
- Leader motor rotates once = 12.566 in x 2 = 25.1327 in
- Follower to maintain 1:1 ratio would move

  25.1327 x 1 = 25.1327 in
- This represents 25.137 / leader roll diameter = 1 turns of the follower roll.
- To get 1 turn of the follower roll you would have to turn the motor shaft 1/10 (because of a 10:1 GR)
- Therefor par 549 = 0.1

Calculating Position scaling par 816 and 817

- Leader motor turns one rev = 512 pulses x 4 = 2048 pulses
- Need to convert this pulse count into Follower Pulses
- When there are 2048 pulses on the master there is

  12.566 in x 1/2 = 6.283 in linear motion on master
- This represents 6.283/ leader roll diameter = 0.25 turns of the follower roll.
- To get 0.25 turns of the follower roll you would have to turn the motor shaft 2.5 turns (because of a 10:1 GR)

Calculating Position scaling par 816 and 817

- The position Reference to Command a 2.5 rotation on Follower is 2.5 (1024 x 4) = 10240 counts
- 2048 counts on Leader = 10240 counts on Follower
- Par 816 = 5
- Par 817 = 1

Tuning

- Tuning for the drive is based on the bandwidth for the speed loop and the position loop. Typically the position loop bandwidth is ¼ of the speed loop.
- Parameter 636 = application dependent
- Parameter 839 = ¼ of parameter 636
- For fine tuning turn on the integral gain in the position loop. Set
- Parameter 721 bit 1 to 1
- Raise parameter 838 as needed.
- Parameter 372 = 0 (disabled) or 2 (dynamic brake if available)