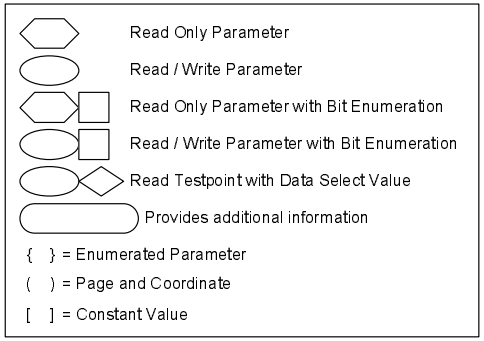
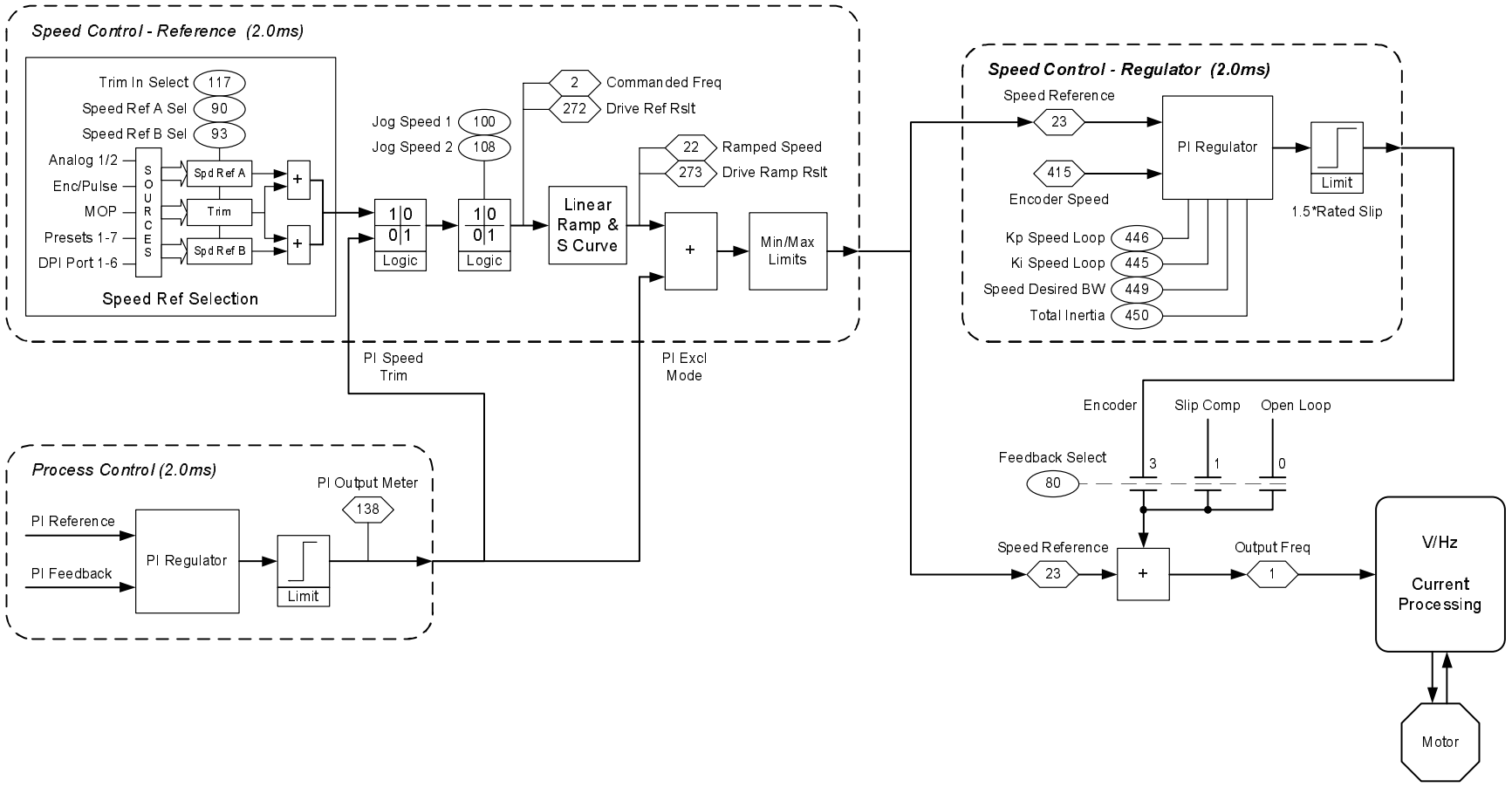
# PowerFlex 70EC

## Block Diagrams



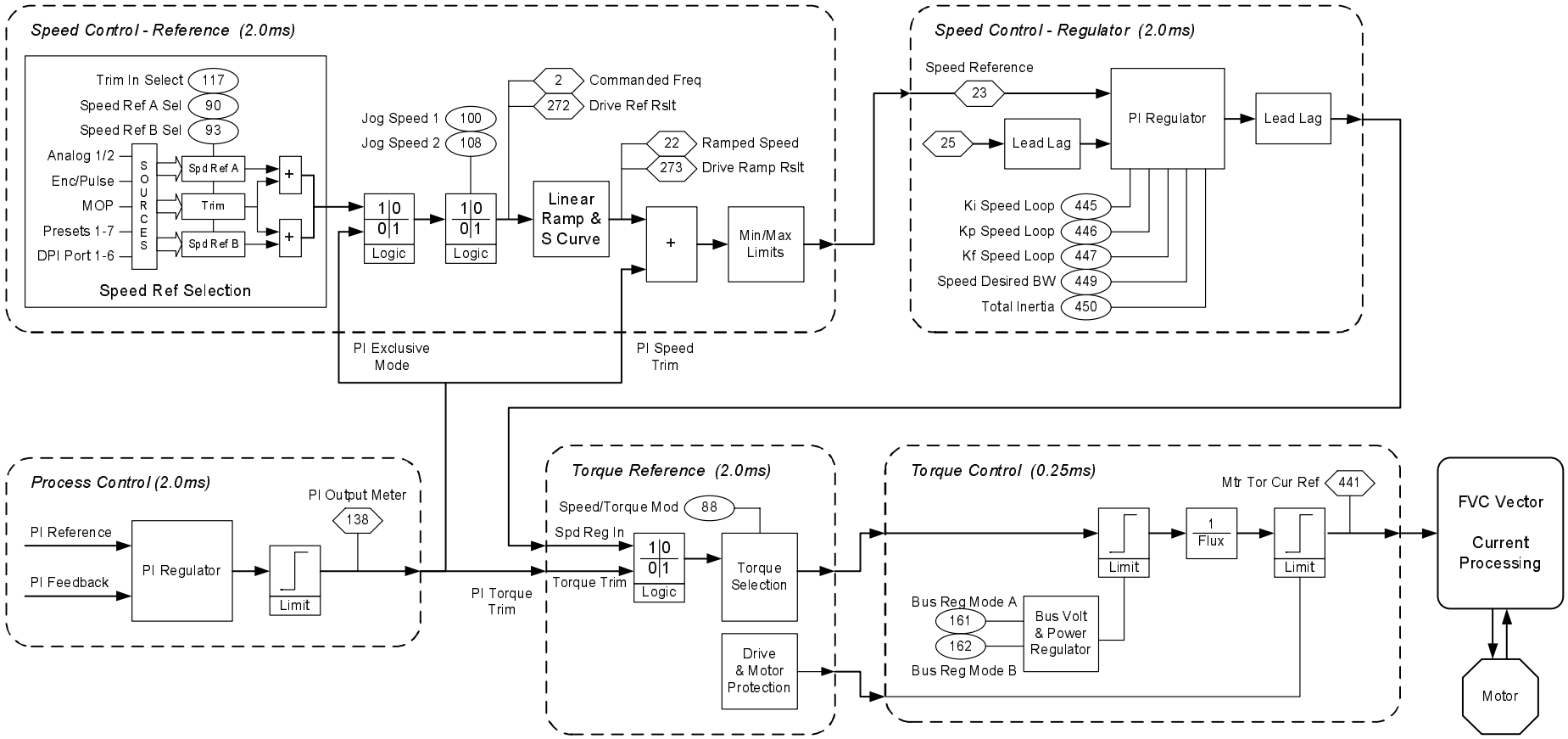
# V/Hz Mode with Speed Control



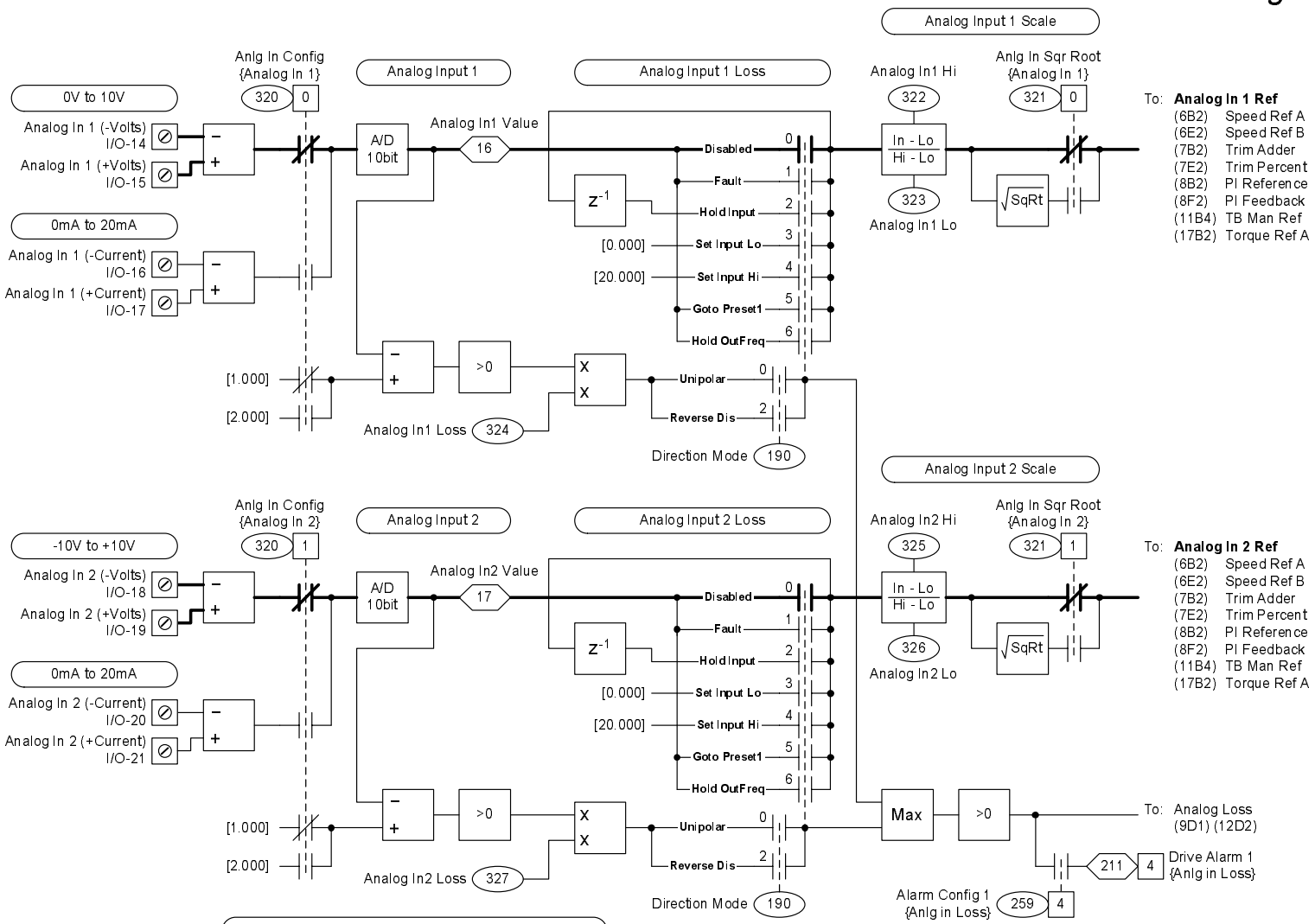


# FVC Vector Mode with Speed Control



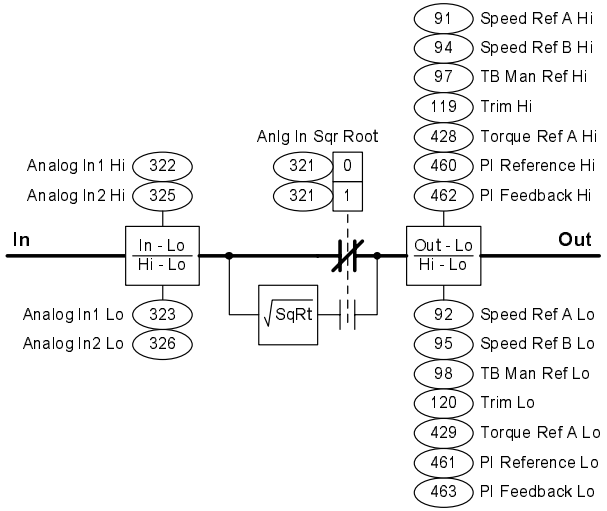


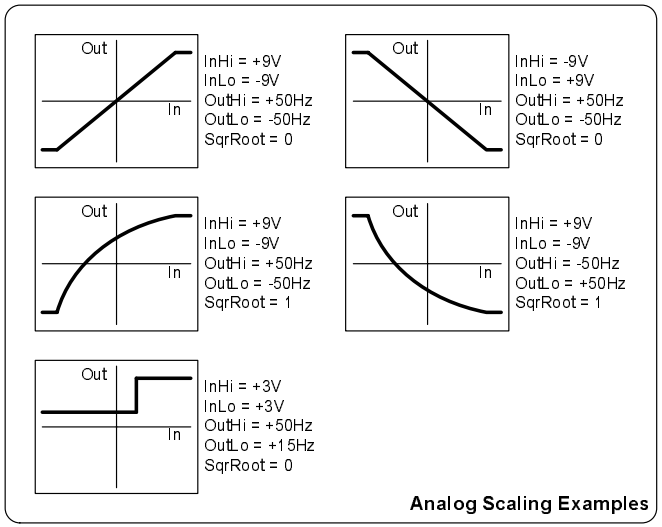
# Analog Inputs & Analog Loss (2.0ms)

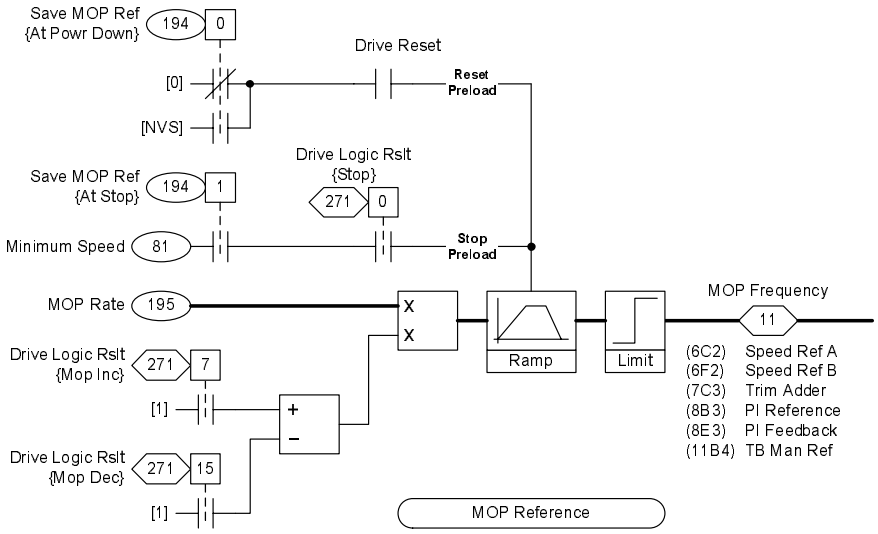



NOTE: Analog loss levels are; below 1.0 Volt or 2.0 mA to set and above 1.5 Volt or 3.0 mA to clear. Analog loss is disabled if Direction Mode = Bipolar.

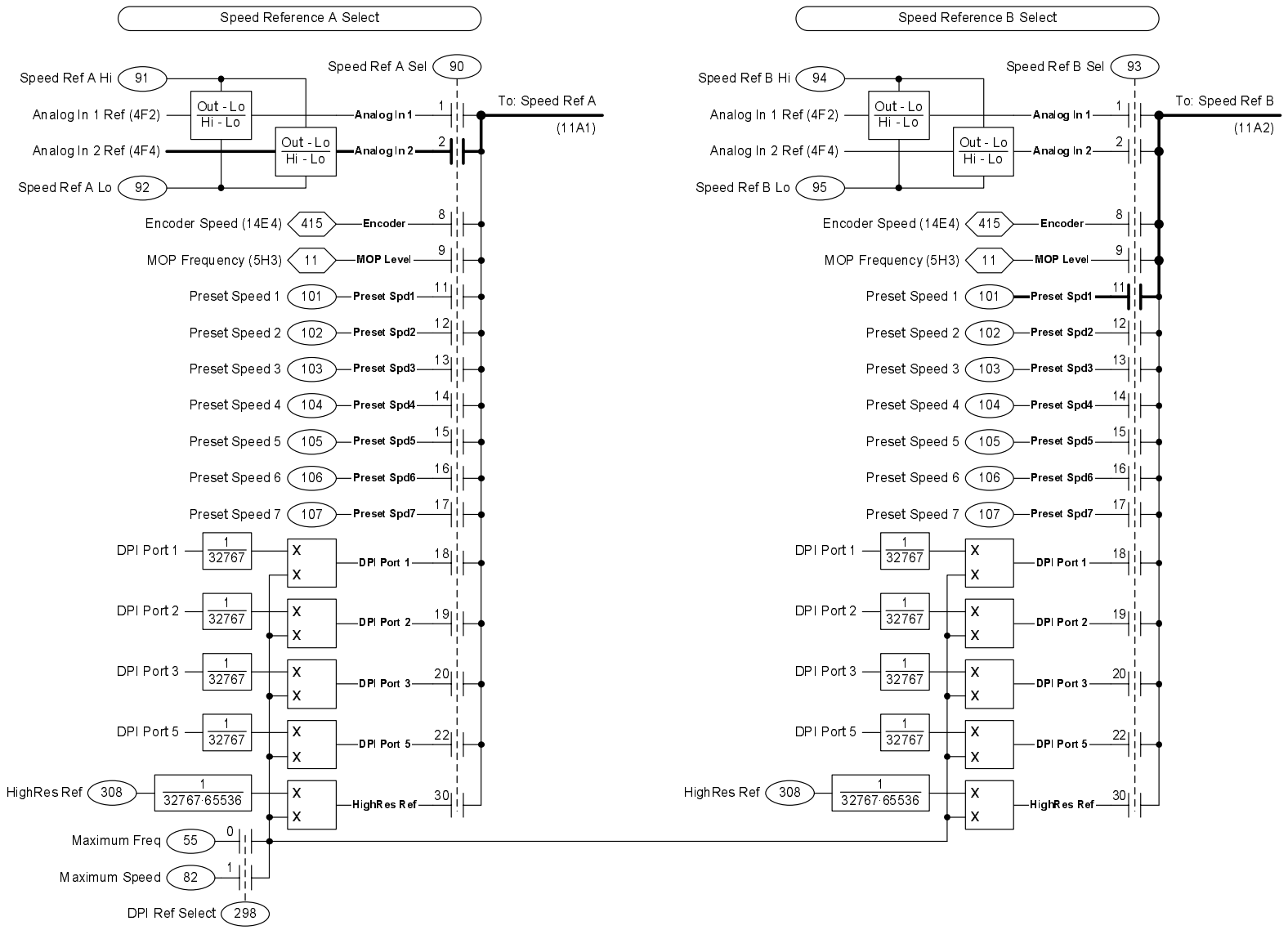
# Analog Scaling & MOP Control (2.0 ms)



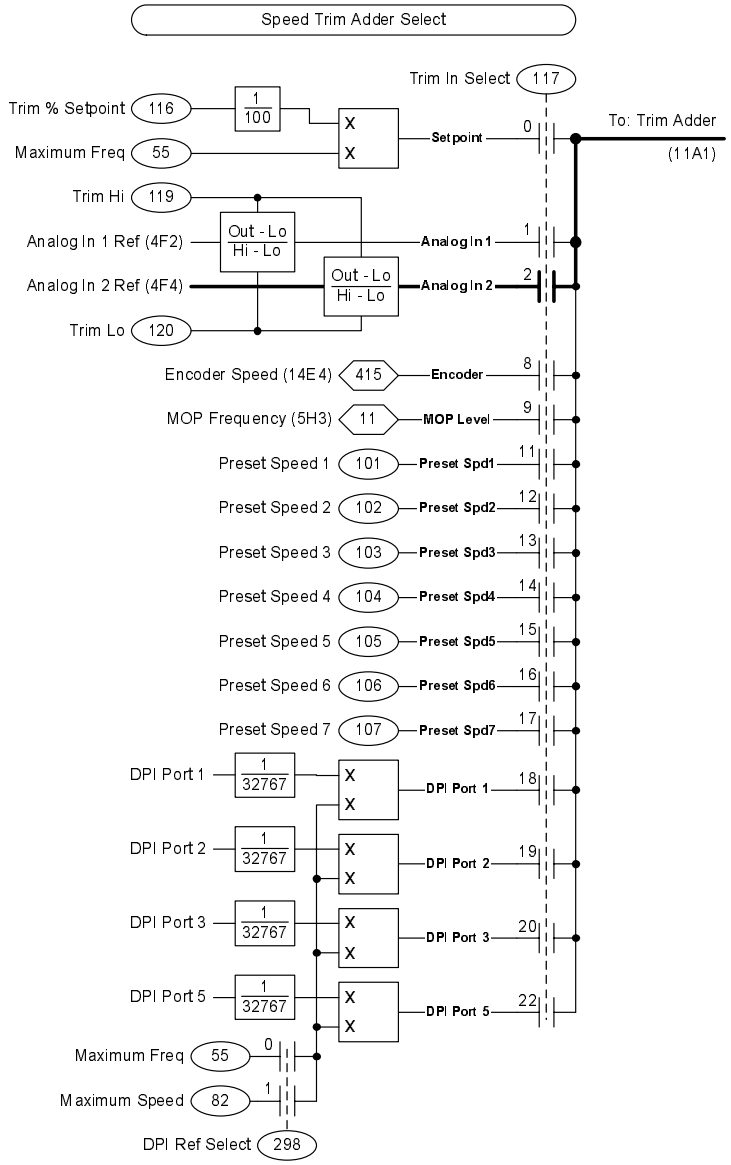



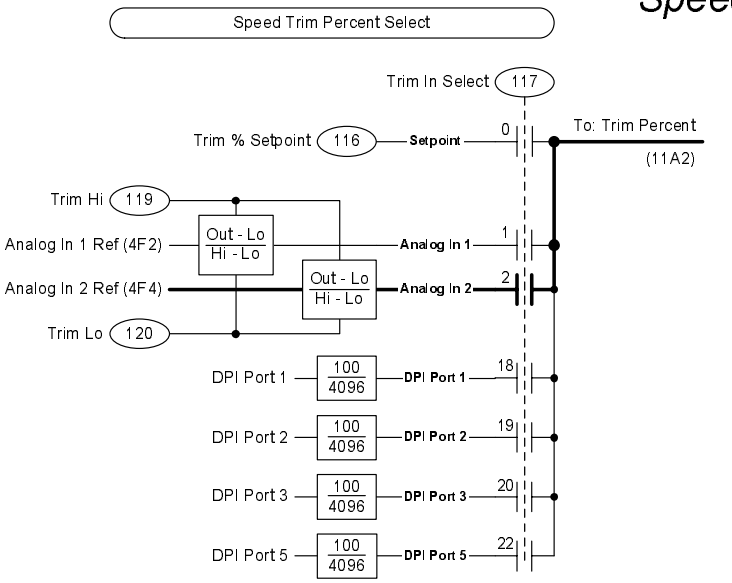



# *Speed Reference Select (2.0 ms)*



# Speed Trim Select (2.0 ms)

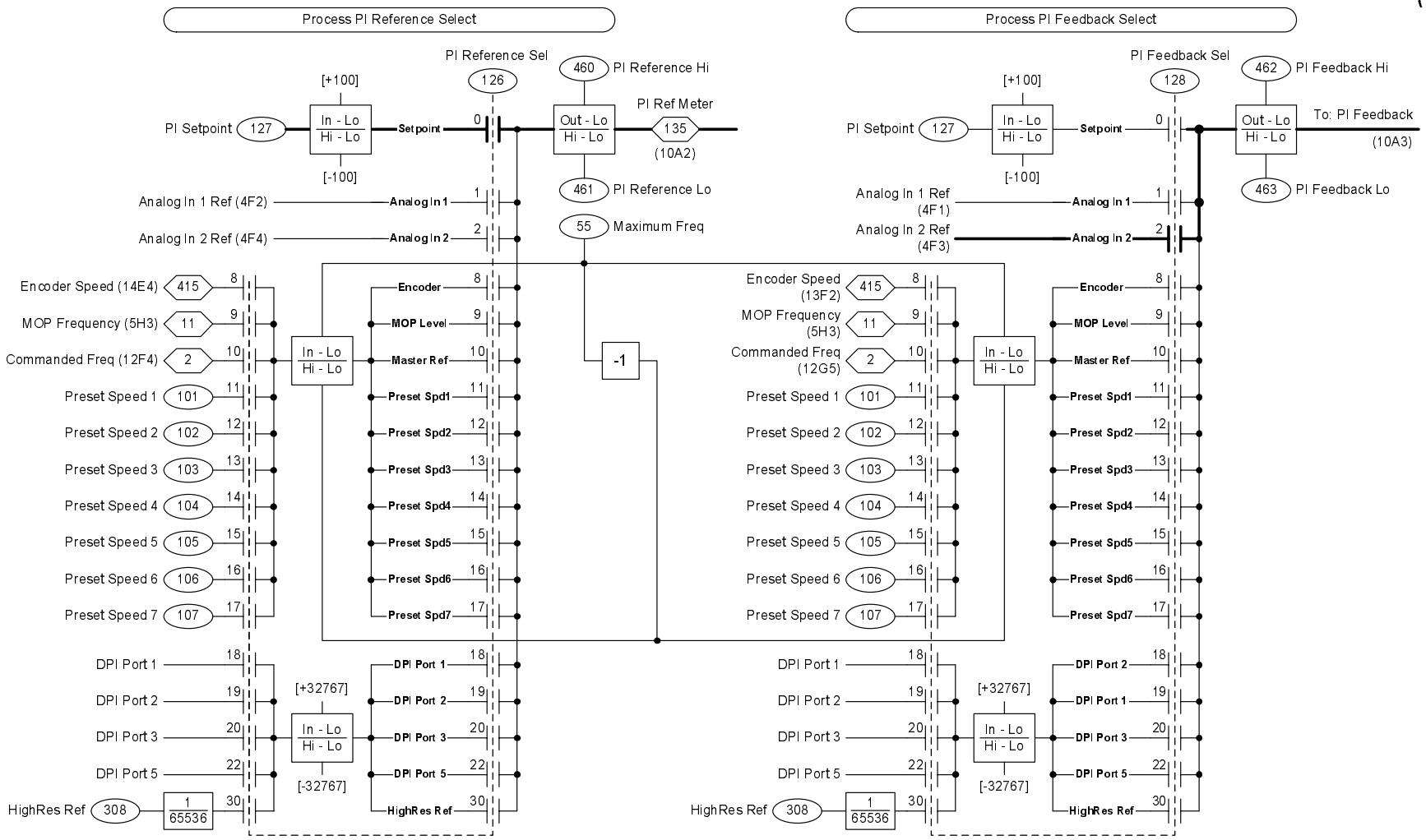


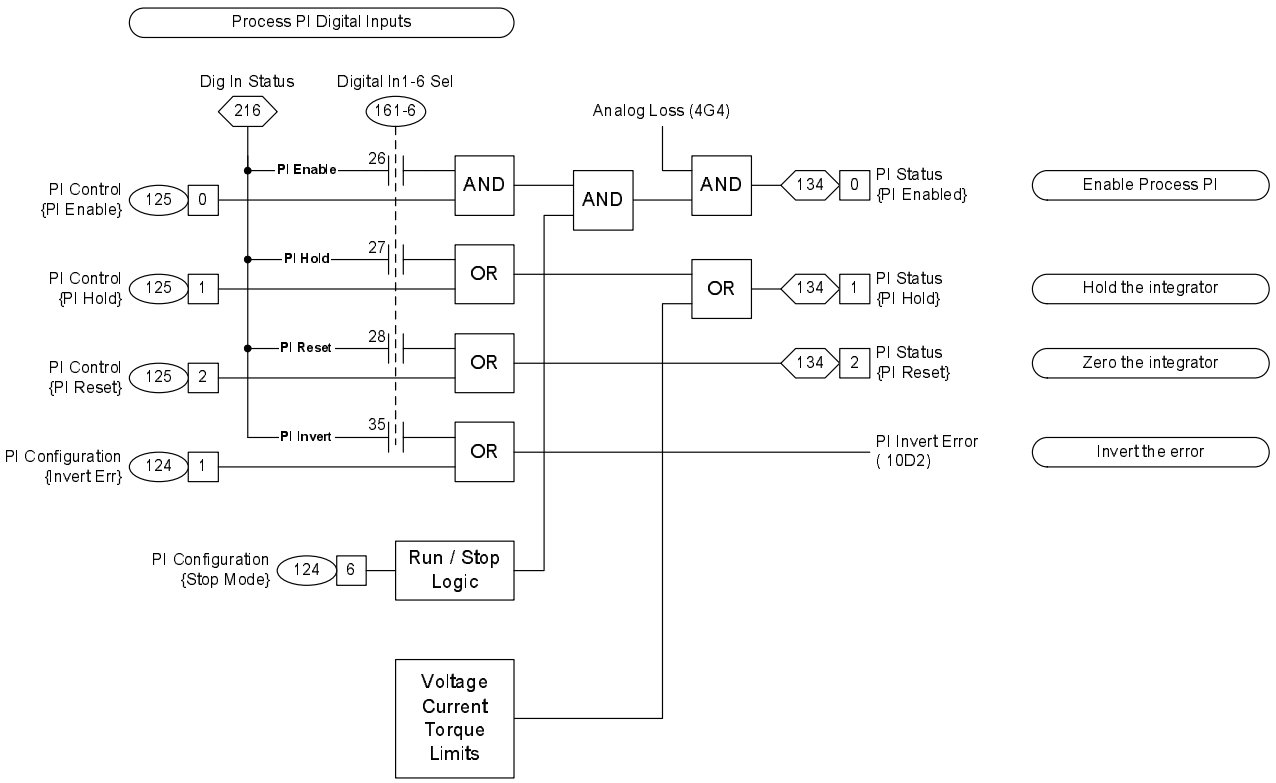

NOTE: If Trim Out Select {Add or %} = 0, trim is in Hz and is added to the speed reference. Ex: If the reference is Preset Speed 1 = 40 Hz and the trim is Preset Speed 2 = 10 Hz, the result is 50 Hz.

If Trim Out Select {Add or %} = 1, trim is in % and that % of the reference is added to the reference. Ex: If the reference is Preset Speed 1 = 40 Hz and the trim is Trim % Setpoint = 10 %, the result is (40 + 40 · 10 ÷ 100) = 44 Hz.

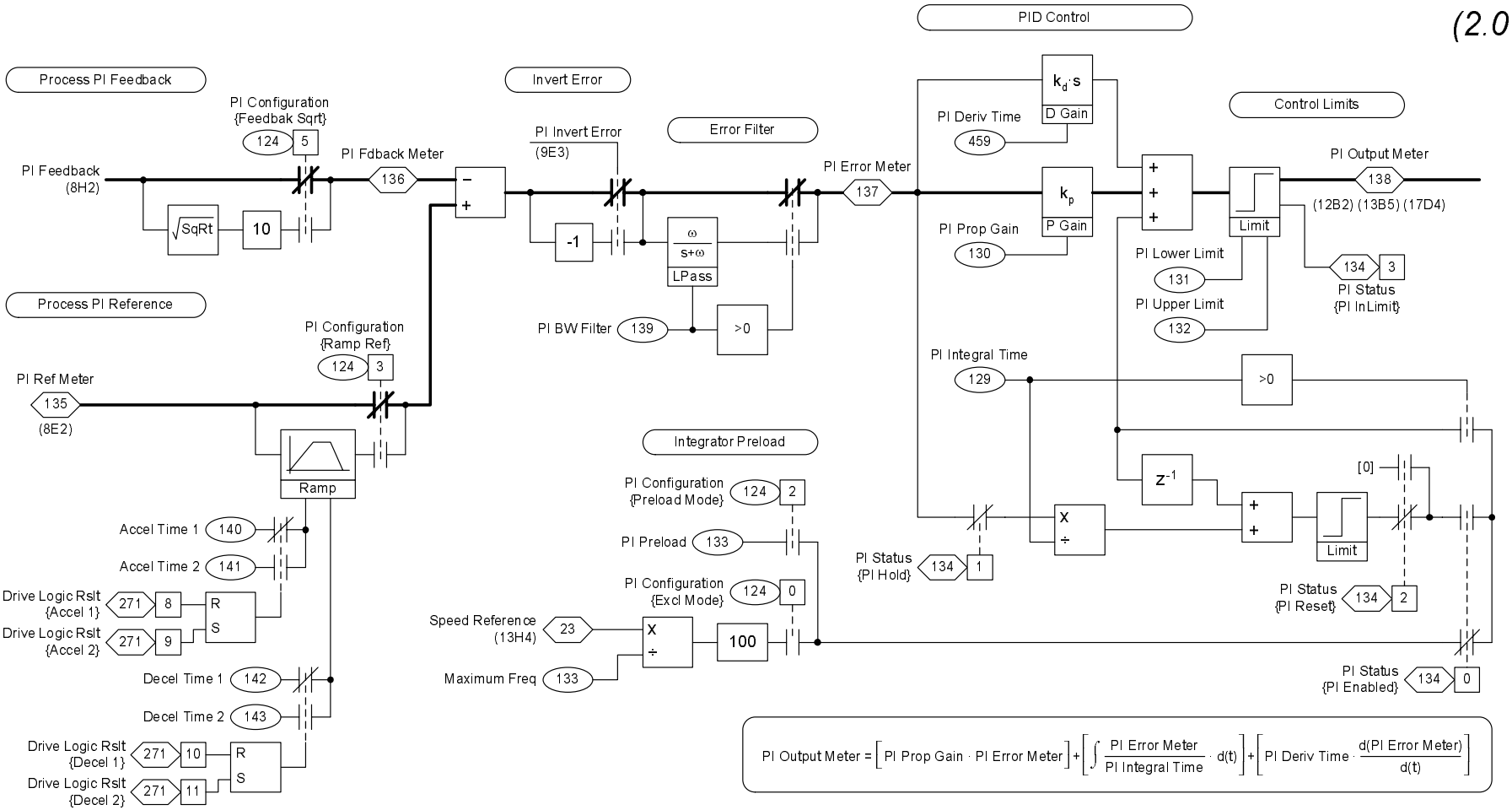
# Process PI Reference Select (2.0 ms)



# *Process PI Digital Inputs (2.0 ms)*

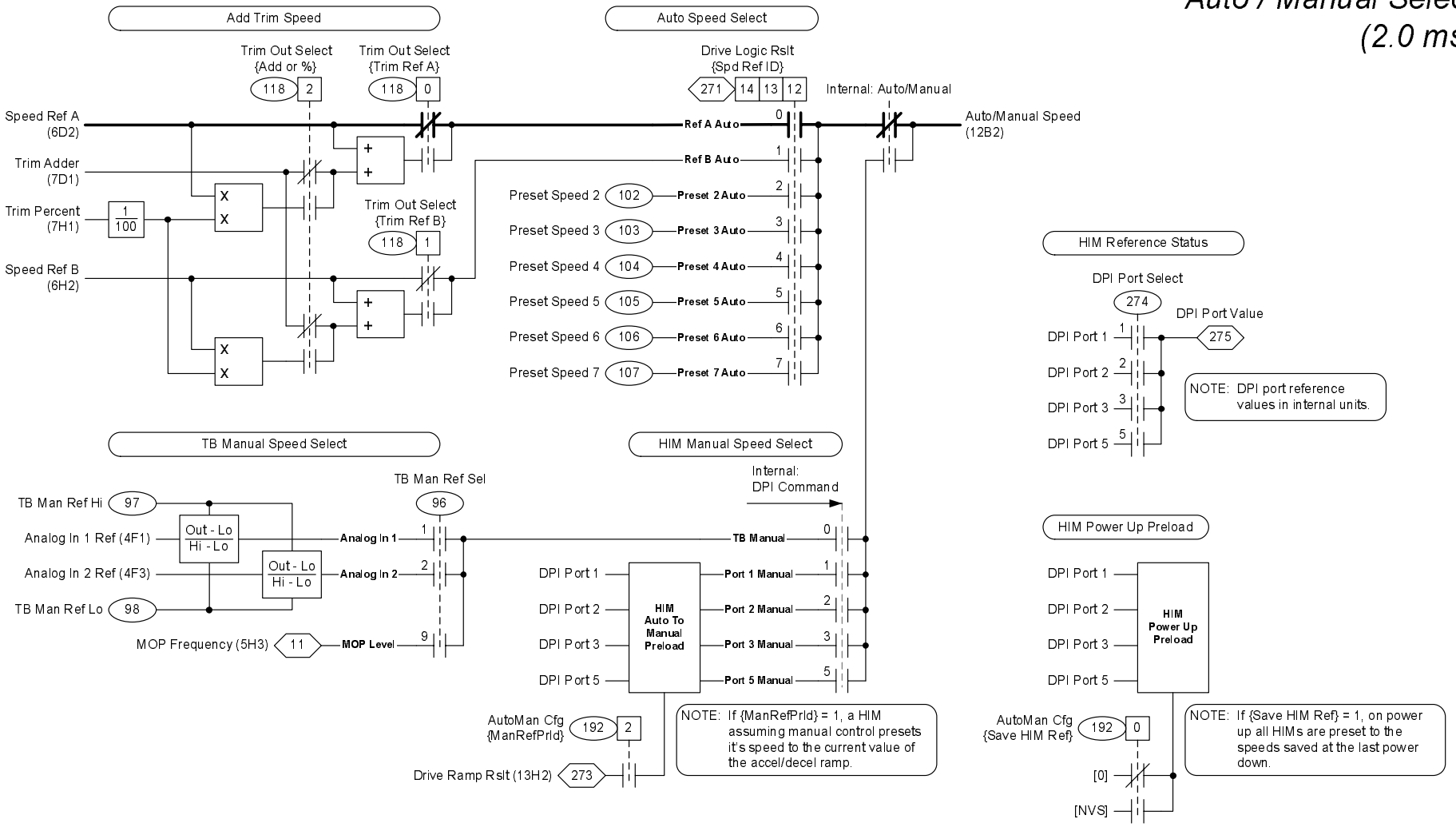


# Process PI Control (2.0 ms)

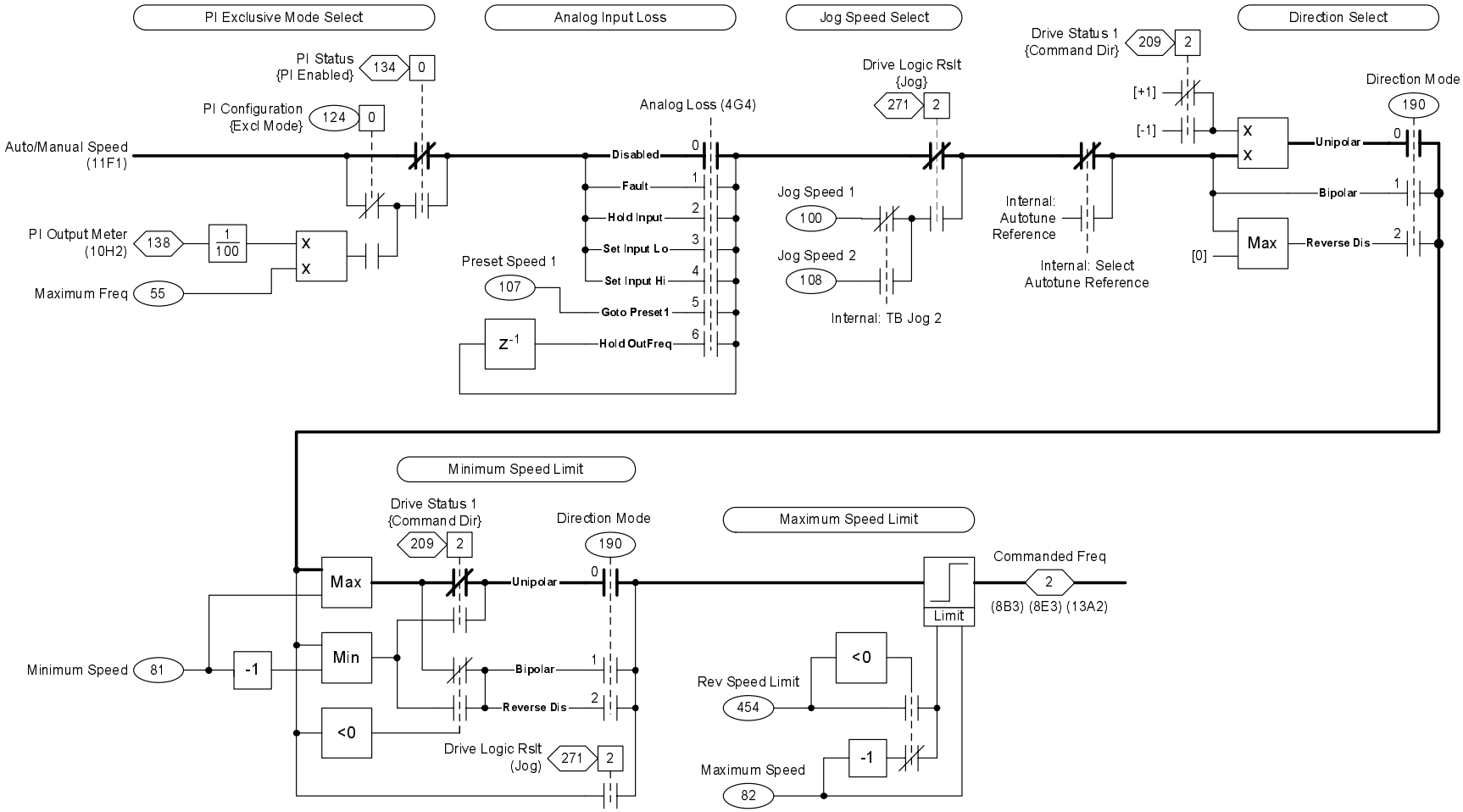



$$\text{PI Output Meter} = \left[\text{PI Prop Gain} \cdot \text{PI Error Meter}\right] + \left[\int \frac{\text{PI Error Meter}}{\text{PI Integral Time}} \cdot d(t)\right] + \left[\text{PI Deriv Time} \cdot \frac{d(\text{PI Error Meter})}{d(t)}\right]$$

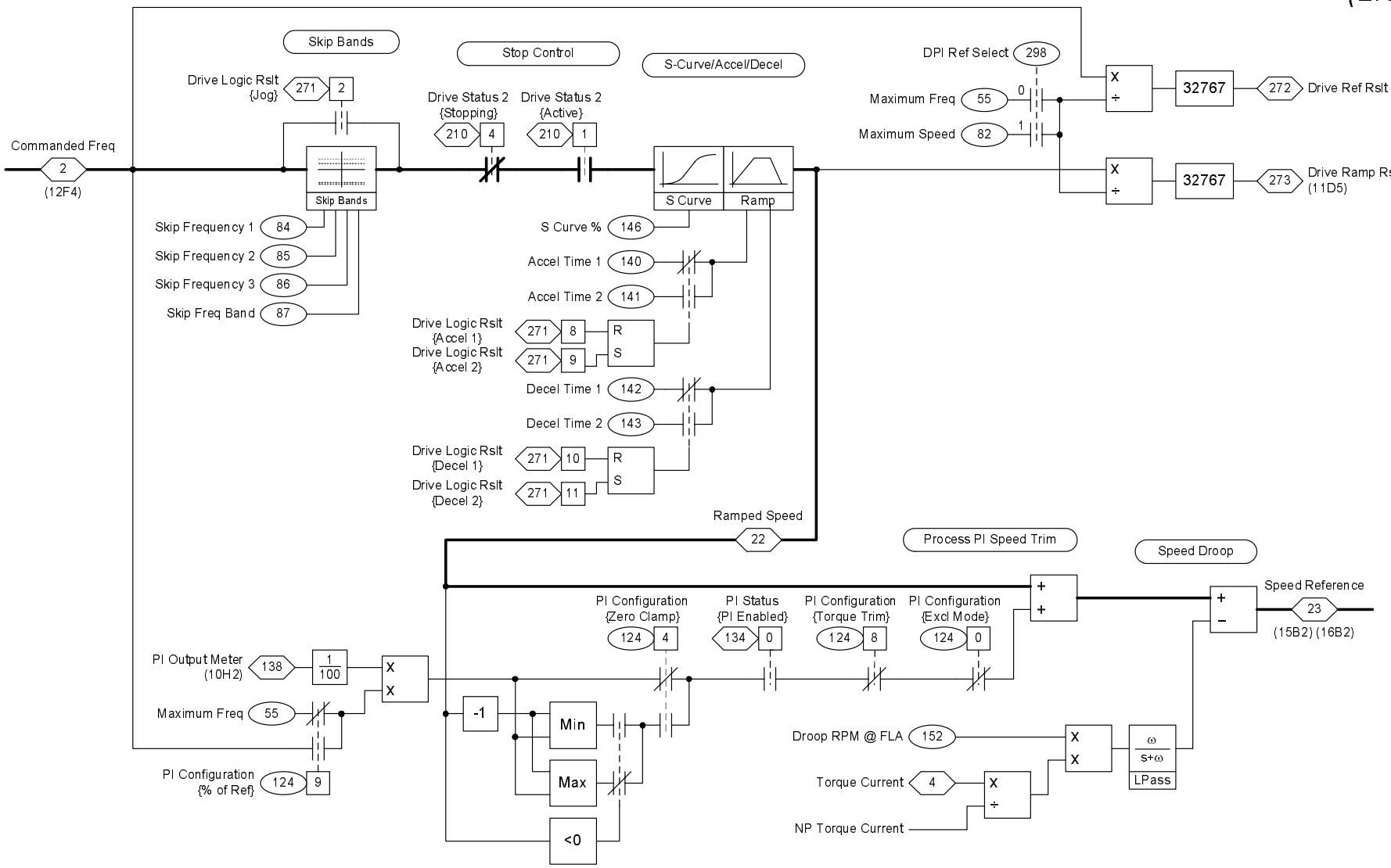
# Auto / Manual Select (2.0 ms)



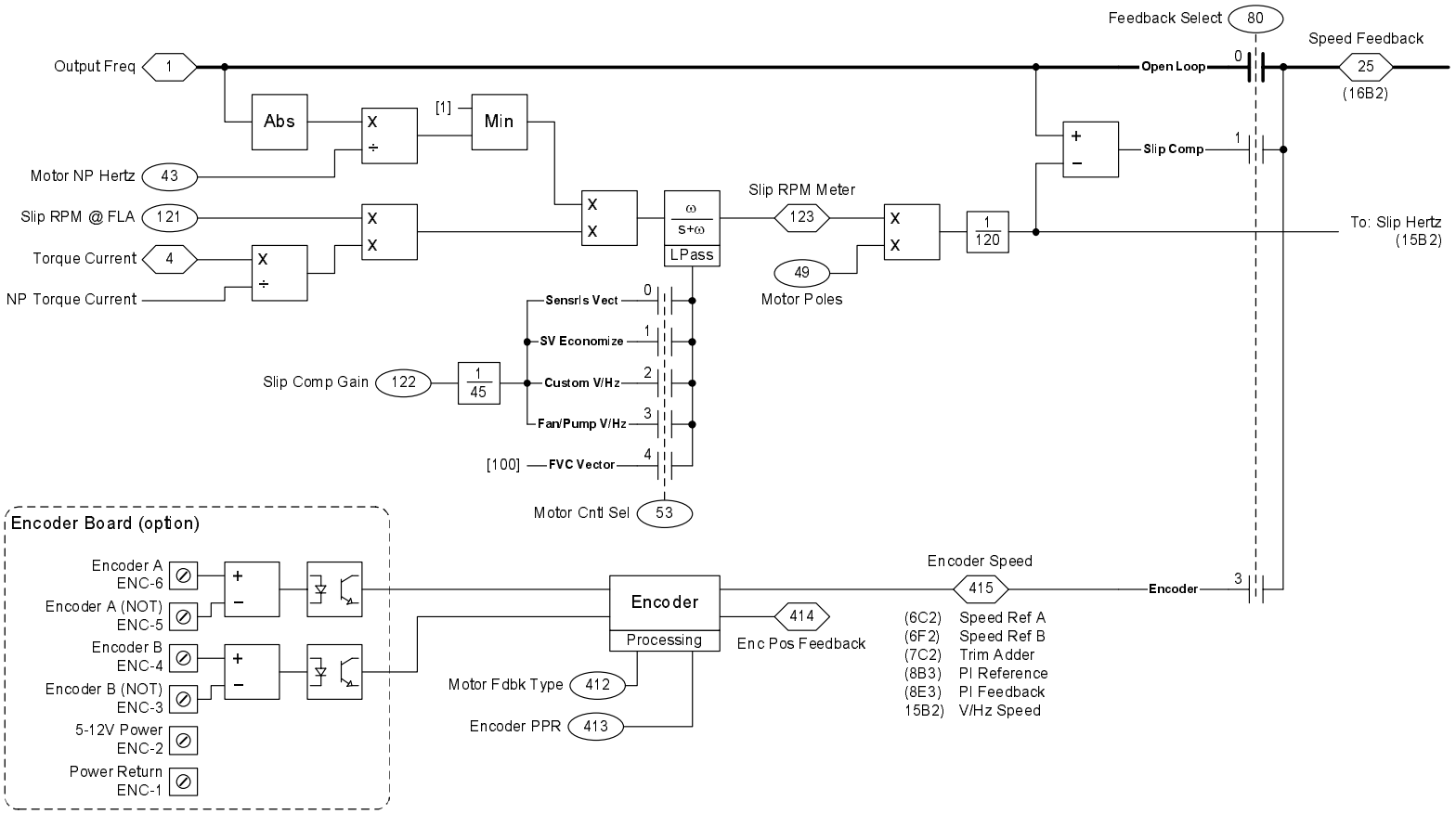
# *Jog & Direction & Speed Limit (2.0 ms)*



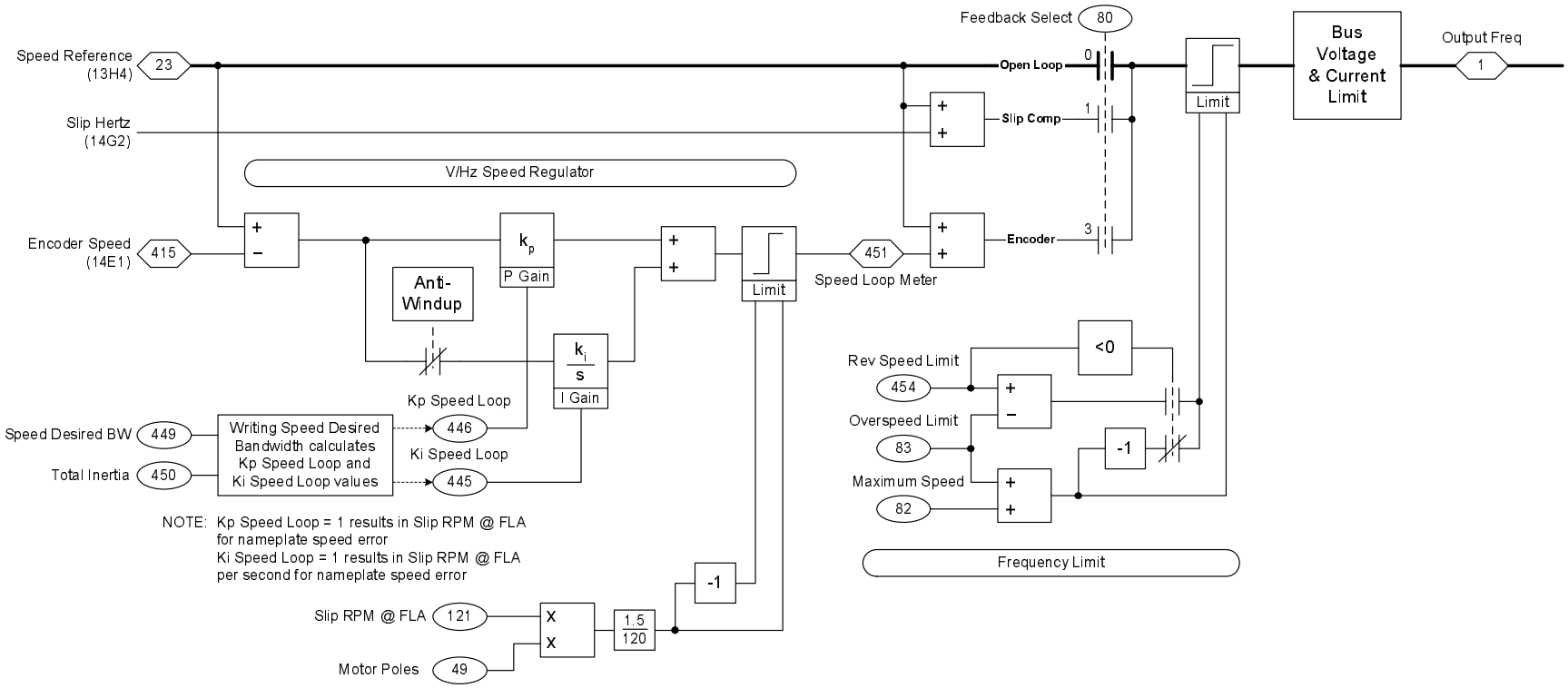
# *Speed Ramp & Process Trim (2.0 ms)*



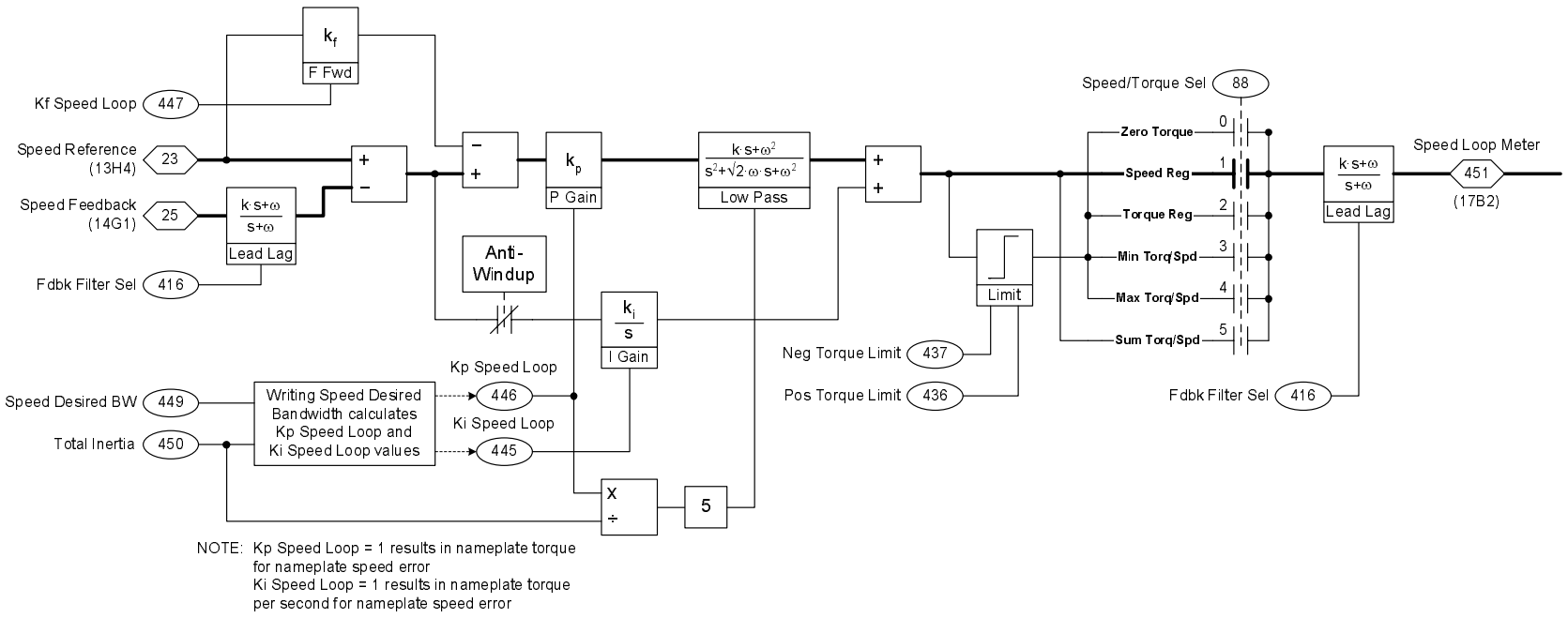
# *Speed Feedback Select (2.0 ms)*



# *Speed Control - V/Hz (2.0 ms)*

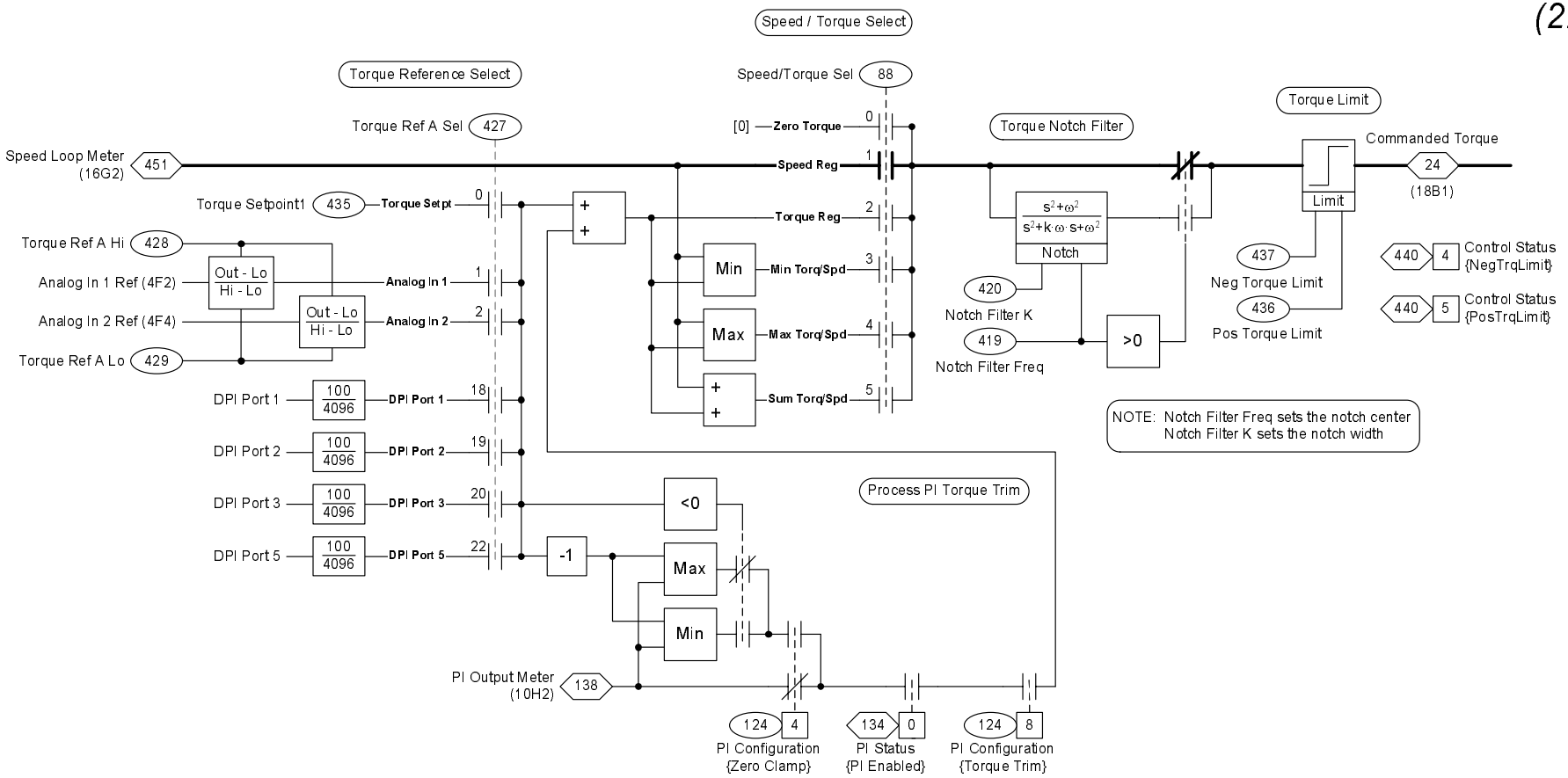


# *Speed Control - FVC Vector (2.0 ms)*

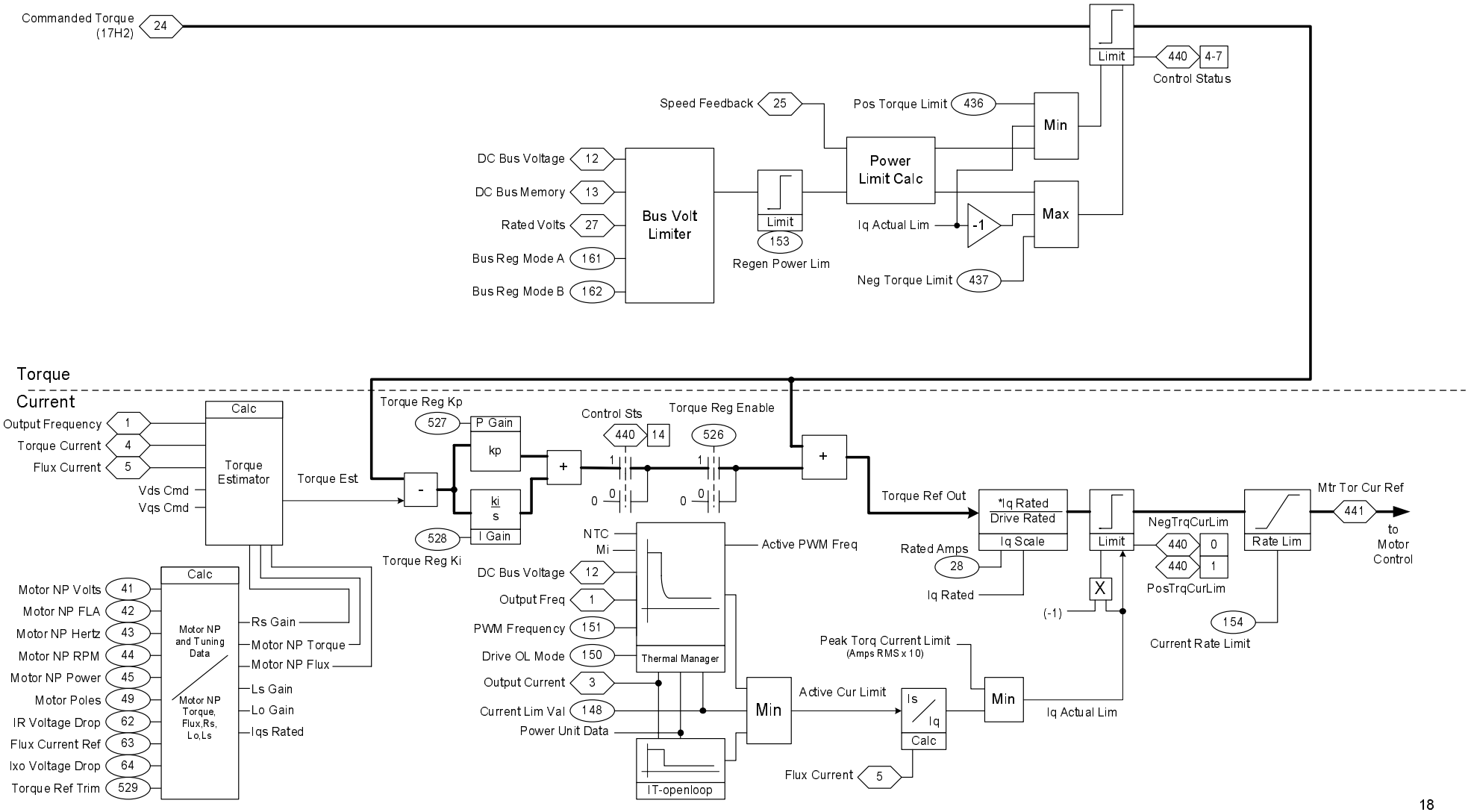



NOTE: Kp Speed Loop = 1 results in nameplate torque for nameplate speed error
Ki Speed Loop = 1 results in nameplate torque per second for nameplate speed error

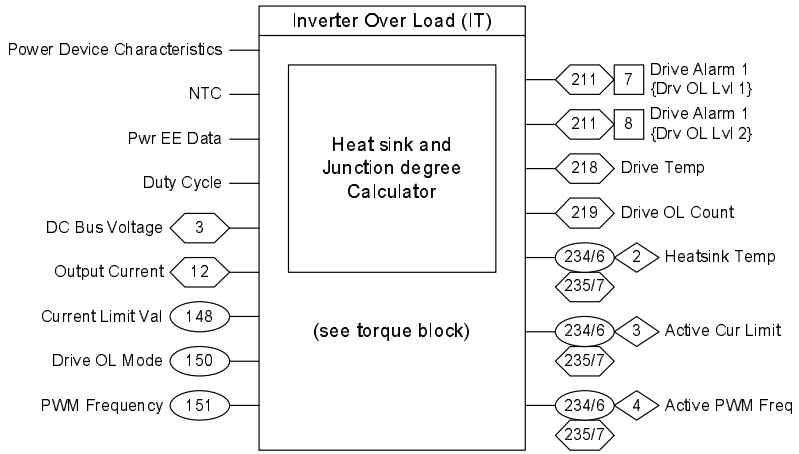
# *Torque Reference Select (2.0 ms)*

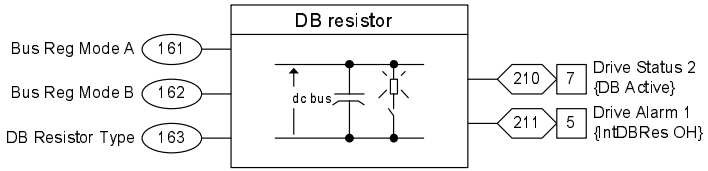


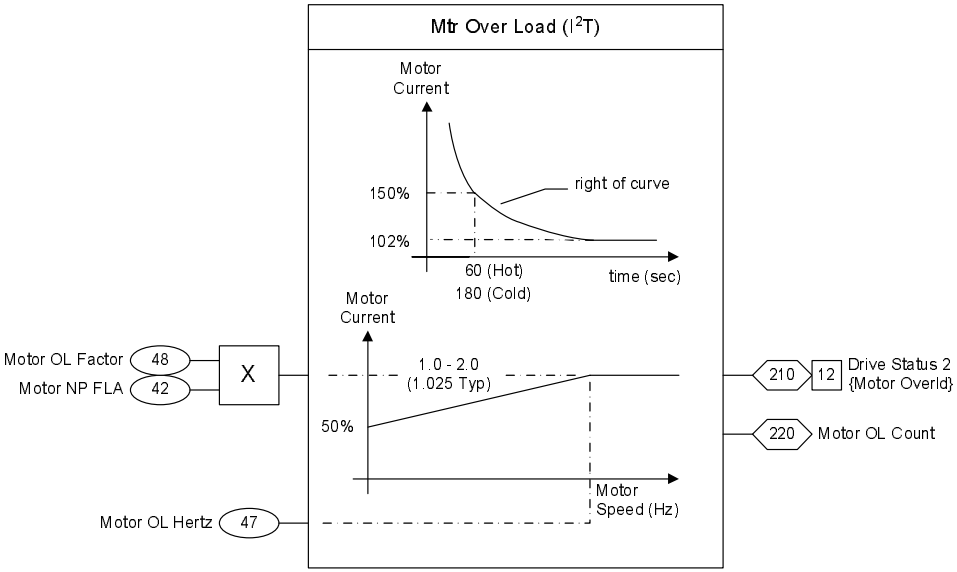
# *Torque Control (0.25ms)*



# *Motor & Inverter Overload (2.0ms)*

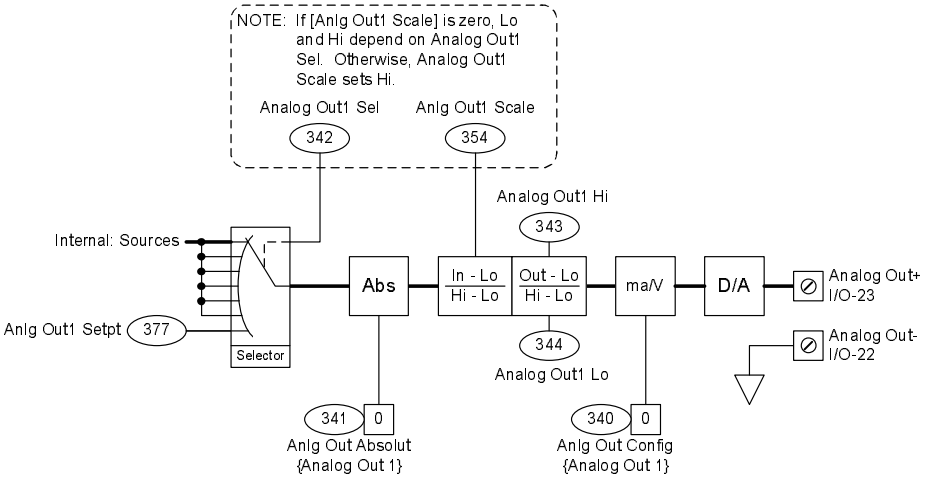


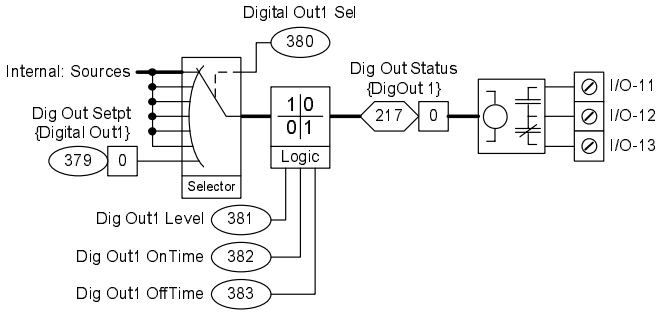



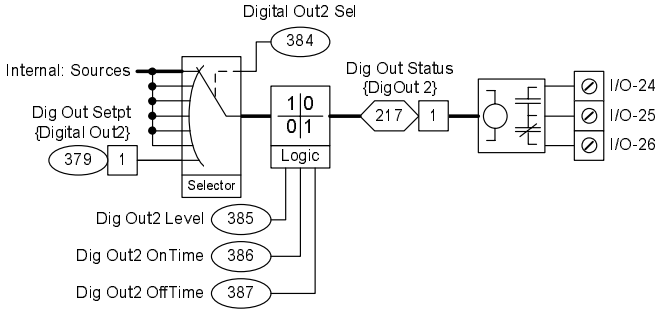
# Analog & Digital Outputs (2.0ms)

| Analog Out Sel | | Analog Out Lo | | Analog Out Hi |
|---|---|---|---|---|
| | | Signed | Absolute | |
| 0 | "Output Freq" | –[Maximum Speed] | 0 Hz | [Maximum Speed] |
| 1 | "Command Freq" | –[Maximum Speed] | 0 Hz | [Maximum Speed] |
| 2 | "Output Amps" | 0 Amps | 0 Amps | 200% Drive Rated |
| 3 | "Torque Amps" | –200% | 0 Amps | 200% Drive Rated |
| 4 | "Flux Amps" | 0 Amps | 0 Amps | 200% Drive Rated |
| 5 | "Output Power" | 0 kW | 0 kW | 200% Drive Rated |
| 6 | "Output Volts" | 0 Volts | 0 Volts | 120% Drive Rated |
| 7 | "DC Bus Volts" | 0 Volts | 0 Volts | 200% Drive Rated |
| 8 | "PI Reference" | –100% | 0% | 100% |
| 9 | "PI Feedback" | –100% | 0% | 100% |
| 10 | "PI Error" | –100% | 0% | 100% |
| 11 | "PI Output" | –800% | 0% | 800% |
| 12 | "%Motor OL" | 0% | 0% | 100% |
| 13 | "%Drive OL" | 0% | 0% | 100% |
| 14 | "CommandedTrq" | –800% | 0% | 800% Motor Rated |
| 15 | "MtrTrqCurRef" | –200% | 0% | 200% Motor Rated |
| 16 | "Speed Ref" | –[Maximum Speed] | 0 Hz | [Maximum Speed] |
| 17 | "Speed Fdbk" | –[Maximum Speed] | 0 Hz | [Maximum Speed] |
| 19 | "Torque Est" | –800% | 0% | 800% Motor Rated |
| 24 | "Param Cntl" | | | |

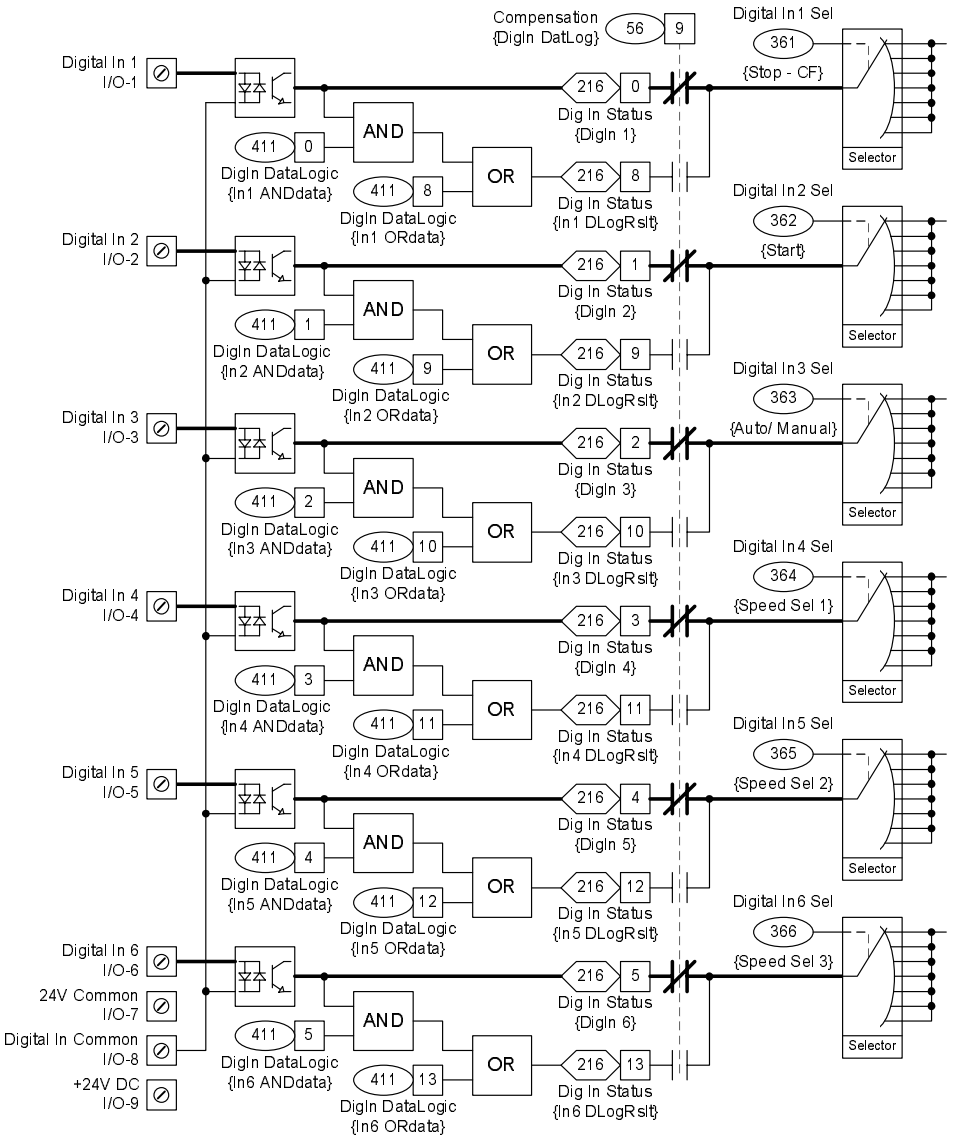



| Digital Out Sel | |
|---|---|
| 1 | Fault |
| 2 | Alarm |
| 3 | Ready |
| 4 | Run |
| 5 | Forward Run |
| 6 | Reverse Run |
| 7 | Auto Restart |
| 8 | Powerup Run |
| 9 | At Speed |
| 10 | At Freq |
| 11 | At Current |
| 12 | At Torque |
| 13 | At Temp |
| 14 | At Bus Volts |
| 15 | At PI Error |
| 16 | DC Braking |
| 17 | Curr Limit |
| 18 | Economize |
| 19 | Motor Overld |
| 20 | Power Loss |
| 21 | Input 1 Link |
| 22 | Input 2 Link |
| 23 | Input 3 Link |
| 24 | Input 4 Link |
| 25 | Input 5 Link |
| 26 | Input 6 Link |
| 27 | PI Enabled |
| 28 | PI Hold |
| 29 | Drive Overld |
| 30 | Param Cntl |

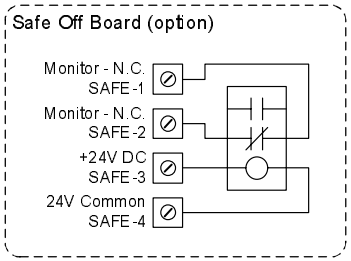


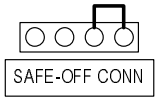



# Digital Inputs (2.0ms)

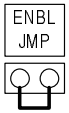



| Digital In Sel | |
|---|---|
| 0 | Not Used |
| 1 | Enable |
| 2 | Clear Faults |
| 3 | Aux Fault |
| 4 | Stop - CF |
| 5 | Start |
| 6 | Fwd/ Reverse |
| 7 | Run |
| 8 | Run Forward |
| 9 | Run Reverse |
| 10 | Jog 1 |
| 11 | Jog Forward |
| 12 | Jog Reverse |
| 13 | Stop Mode B |
| 14 | Bus Reg Md B |
| 15 | Speed Sel 1 |
| 16 | Speed Sel 2 |
| 17 | Speed Sel 3 |
| 18 | Auto/ Manual |
| 19 | Local |
| 20 | Acc2 & Dec2 |
| 21 | Accel 2 |
| 22 | Decel 2 |
| 23 | MOP Inc |
| 24 | MOP Dec |
| 25 | Excl Link |
| 26 | PI Enable |
| 27 | PI Hold |
| 28 | PI Reset |
| 30 | Precharge En |
| 34 | Jog 2 |
| 35 | PI Invert |
| 41 | UserSet Sel1 |
| 42 | UserSet Sel2 |
| 43 | Run Level |
| 44 | RunFwd Level |
| 45 | RunRev Level |
| 46 | Run w/Comm |



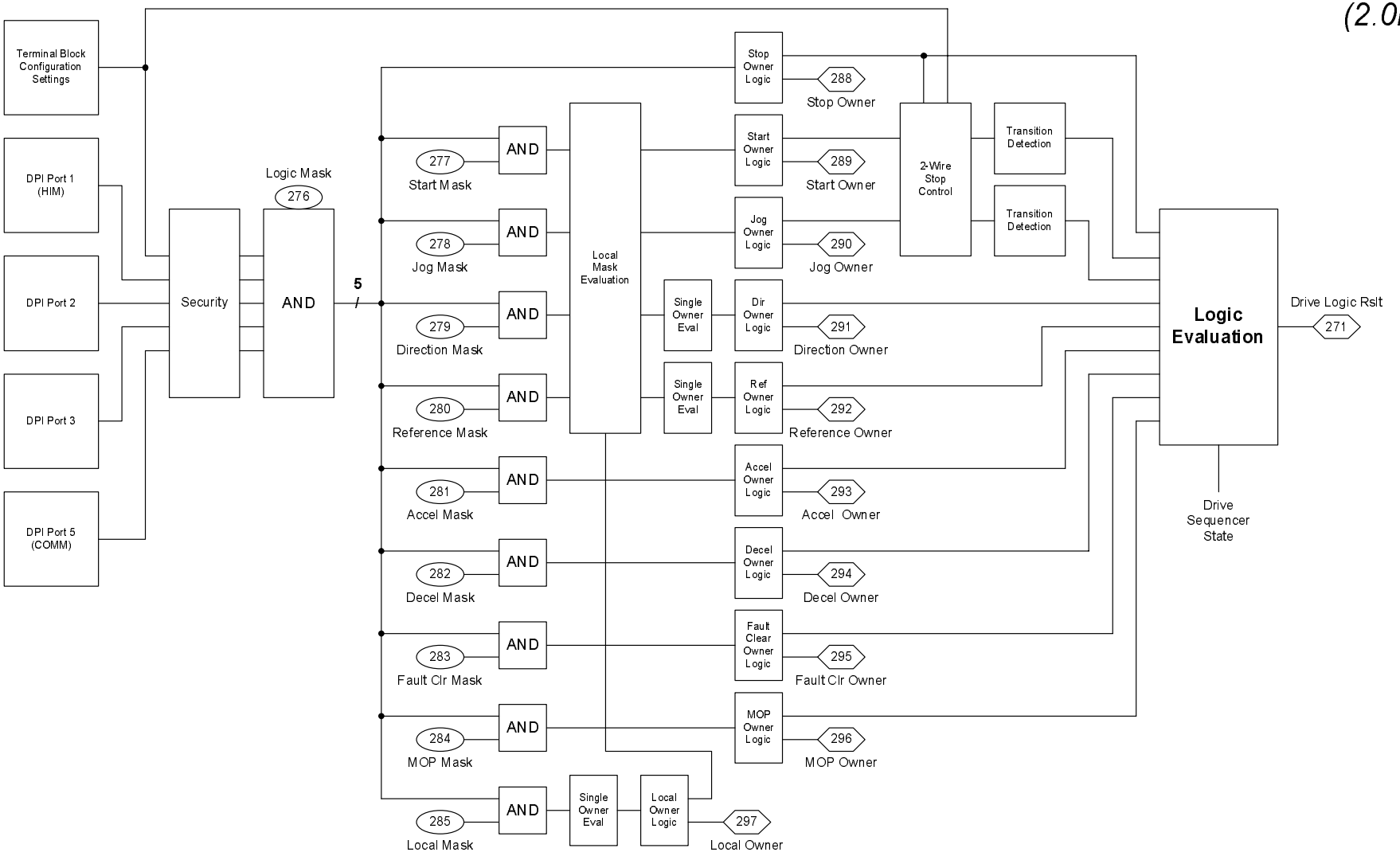



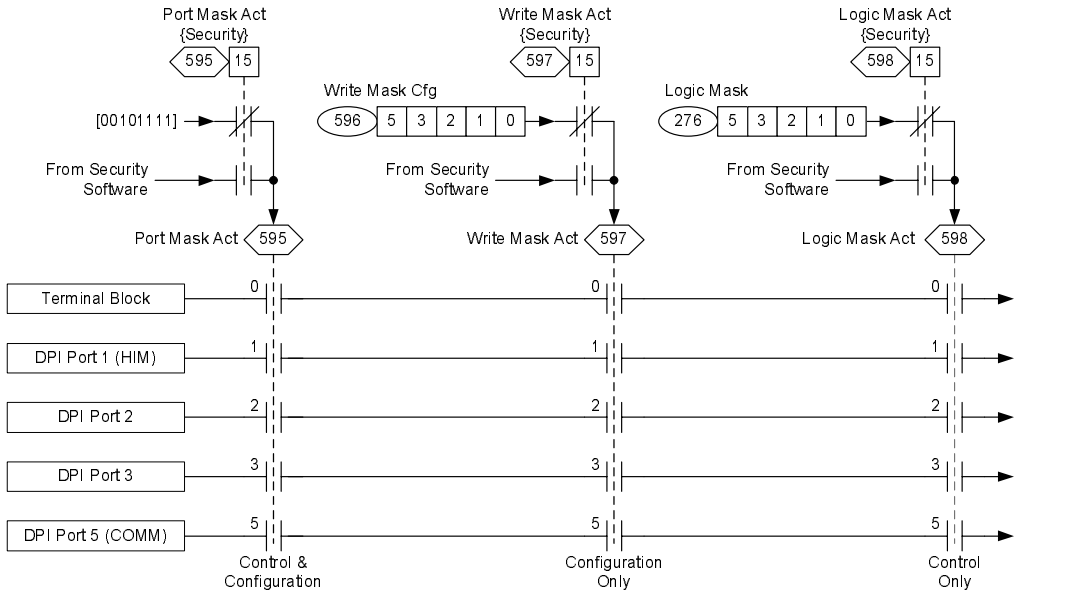

NOTE: If the Safe Off Board is not installed, the 2 right pins must be jumpered.




NOTE: If the ENBL JMP jumper is removed, Digital In6 Sel is forced to Enable and de-energizing Digital In 6 disables the inverter transistors.

# Control Logic (2.0ms)






NOTE: A "0" bit in [Port Mask Act] completely DISABLES that port.

NOTE: A "0" bit in [Write Mask Act] prohibits that port from writing to the drive.

NOTE: A "0" bit in [Logic Mask Act] prohibits that port from controlling the drive (except for STOP and CLEAR FAULTS).

## *Revision History*

| Date | Rev | Description |
|---|---|---|
| 03/14/05 | 1.0 | Original Release |
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