Controller PF525_Example
Motion Control Chap 8 VFD control AOI
Controller Fault Handler
Power-Up Handler

Tasks

MainTask
MainProgram
MainRoutine
PIC101_Control
Simple_Sequence
Unscheduled

Motion Groups

Ungrouped Axes

Add-On Instructions

Motor_VFD
PowerFlex 525 motor control
Logic

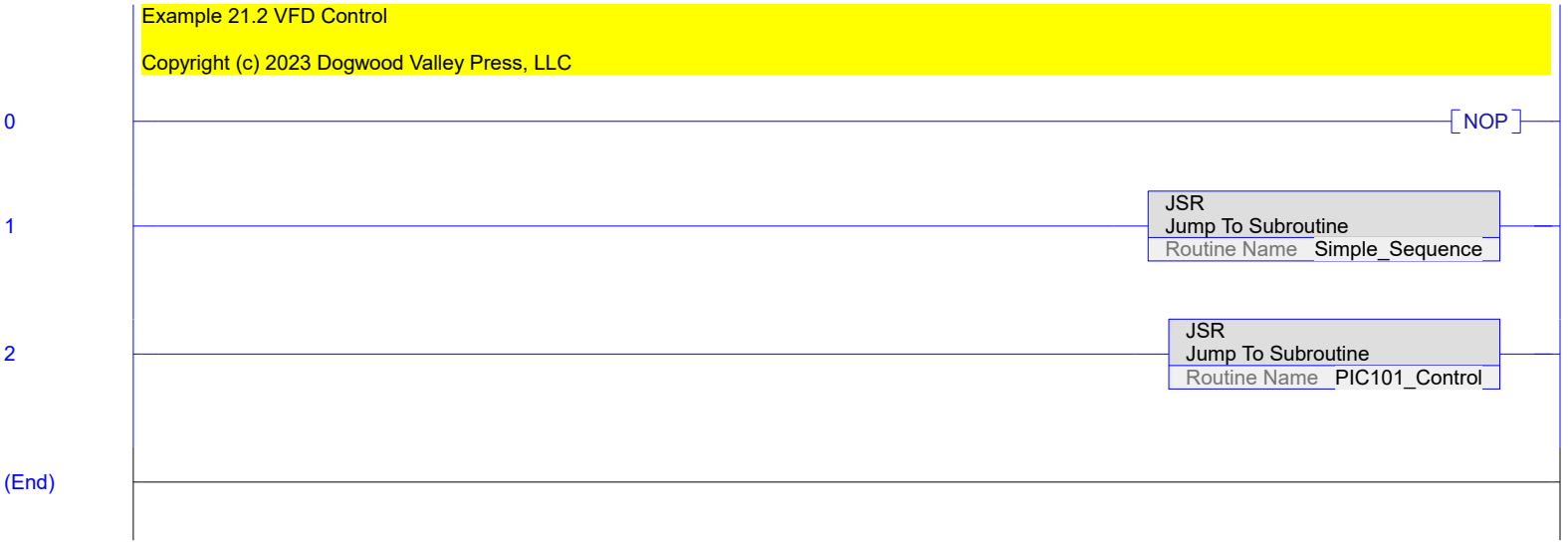
Data Types

User-Defined
Motor_Type
Motor data
Motor_VFD_Type
Motor data for variable speed drive
Strings
Add-On-Defined
Motor_VFD
PowerFlex 525 motor control
Module-Defined
AB:1734_4SLOT:I:0
AB:1734_4SLOT:O:0
AB:1734_8CFG:C:0
AB:1734_IE2:C:0
AB:1734_IE2:I:0
AB:1734_IT2I:C:0
AB:1734_IT2I:I:0
AB:PowerFlex40_Drive_4Bytes:O:0
AB:PowerFlex40_Drive_8Bytes:I:0
AB:PowerFlex525V_EENET_Drive:O:0
AB:PowerFlex525V_E_191810B5:I:0
AB:PowerFlex525V_E_2661FD24:I:0
AB:PowerFlex525V_E_3DC2426F:I:0
AB:PowerFlex525V_E_5352A421:I:0

Trends

I/O Configuration

1756 Backplane, 1756-A10
[5] 1756-L71 PF525_Example
[7] 1756-EN2TR EN2TR
Ethernet
PowerFlex 525-EENET SC101_Drv
1734-AENTR/B AENTR
PointIO 4 Slot Chassis
[0] 1734-AENTR/B AENTR
[1] 1734-8CFG/C Discrete_IO
[2] 1734-IE2C/C Analog_In
[3] 1734-IT2I/C TC_In
1756-EN2TR EN2TR



PLC Motion Control Chapter 8 Example VFD Control for duct pressure

0

NOP

Get communication health status for SC101 (SC101_Remote_Status). Limit check the returned value. if the value is between 16384 and 20479 (16#4000 - 16#4ffff) the module is up and running. Any other values indicate a faulted or non-communicating state

1

SC101 Reactor Material Pump Communication Status

GSV
Get System Value

Class Name	Module
Instance Name	SC101_Drv
Attribute Name	EntryStatus
Dest	SC101_Remote_Status
	16384

2

SC101 Reactor Material Pump Communication Status

LIMIT
Limit Test (CIRC)

Low Limit	16#4000
Test	SC101_Remote_Status
	16384
High Limit	16#4fff

SC101 Reactor Material Pump Communication Health
SC101_Comm_Health

Control for SC101 VFD

3

SC101 Reactor Material Pump AOI Control

Motor_VFD
PowerFlex 525 motor control

Motor_VFD	SC101_DB
Fault_Reset	HMI_Flt_Reset
	0
Man_Mode	R1_Man_Mode
	0
Man_Start	SC101_Man_Start
	0
Man_Stop	SC101_Man_Stop
	0
Comm_Health	SC101_Comm_Health
	1
Drive_Status	SC101_Status
	<SC101_Drv:I>
Drive_Cmds	SC101_Cmd
	<SC101_Drv:O>
Tag	SC101

PIC101 Pressure loop

4

PID_Timer.DN

TON
Timer On Delay

Timer	PID_Timer
Preset	100
Accum	7

EN
DN

Mode control of pressure loop

5

PIC101_Auto

PIC101.SWM

6

PID_Timer.DN

PID
Proportional Integral Derivative

PID	PIC101 ...
Process Variable	PT101
	<AENTR:2:I.Ch0Data>
Tieback	0
Control Variable	SC101.Cmd_Speed
PID Master Loop	0
Inhold Bit	0
Inhold Value	0
Setpoint	30.0
Process Variable	0.19838242
Output %	0.0

(End)

Simple sequence
Start in manual mode unlatch _Auto set .SO = 0
Start drive
Run_Loop sgnal on, set setpoint to desired value
Put in auto mode Latch _Auto
When Run_Loop off, unlatch _Auto

0

NOP

1

s:fs

MOVE
Move
Source 1
Dest Step_Num
7

Initialization step. Reset drive faults

2

EQ
Equal
Source A Step_Num
7
Source B 1

TON
Timer On Delay
Timer Initialization_Tmr
Preset 1000
Accum 0
EN
DN

HMI_Flt_Reset PIC101_Auto R1_Man_Mode
U U

MOVE
Move
Source 0
Dest PIC101.SO
0.0

Initialization_Tmr.DN

MOVE
Move
Source 2
Dest Step_Num
7

3

SC101
Reactor Material
Pump Motor start
initiated from
sequence
SC101.Seq_Start
L

EQ
Equal
Source A Step_Num
7
Source B 2

SC101
Reactor Material
Pump Run Status
(1=running)
SC101.Run_Status

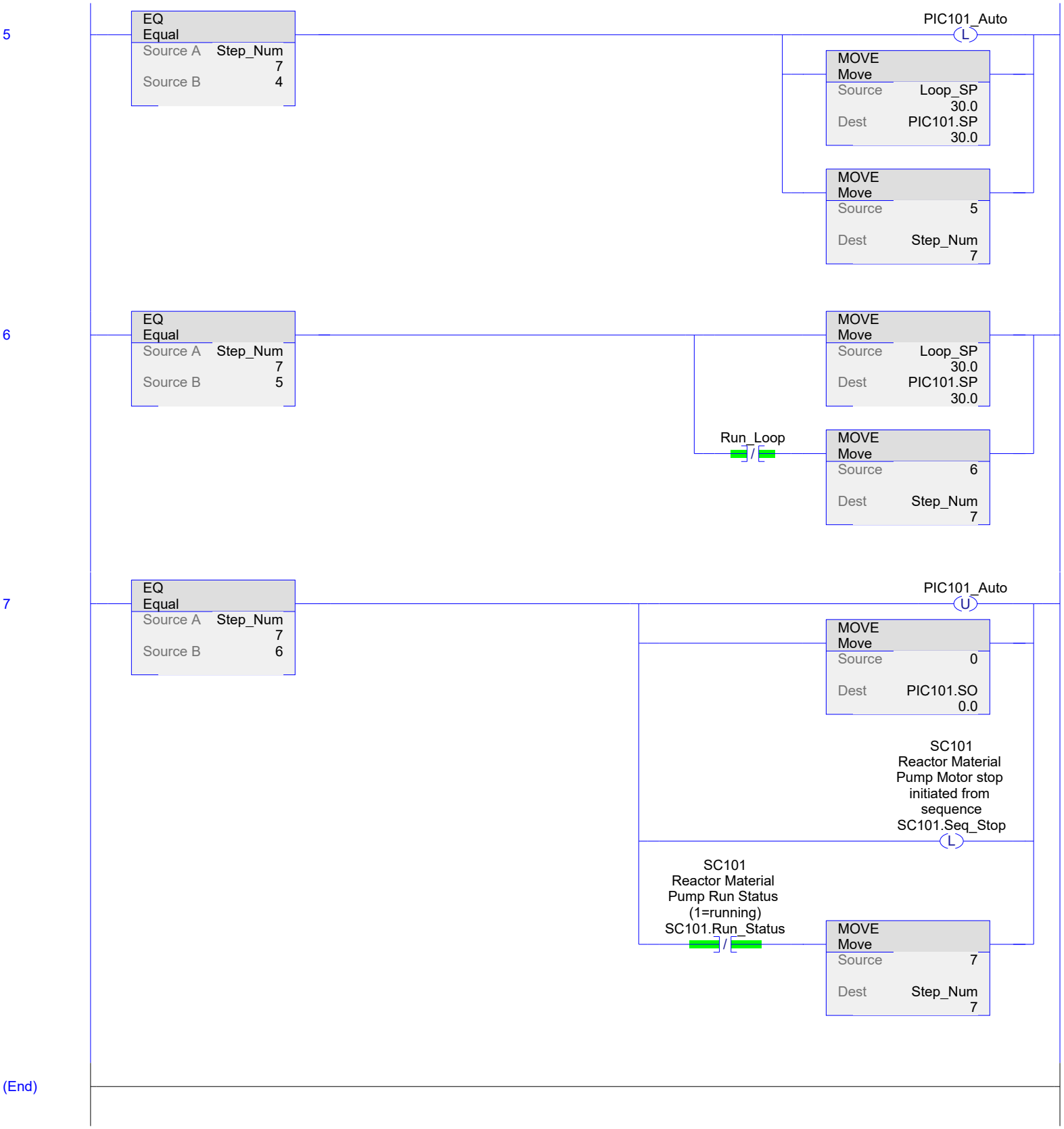
MOVE
Move
Source 3
Dest Step_Num
7

4

EQ
Equal
Source A Step_Num
7
Source B 3

Run_Loop

MOVE
Move
Source 4
Dest Step_Num
7



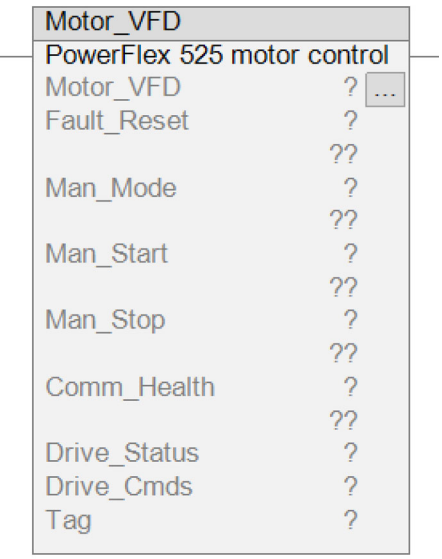
Signature Listing

Motor_VFD v1.1

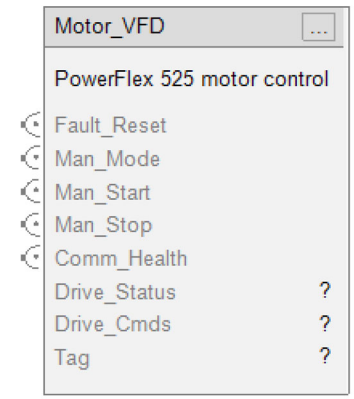
PowerFlex 525 motor control

Available Languages

Relay Ladder



Function Block



Structured Text

```
Motor_VFD(Fault_Reset, Man_Mode, Man_Start, Man_Stop, Comm_Health, Drive_Status, Drive_Cmds, Tag);
```

Parameters

Required	Name	Data Type	Usage	Description
X	Motor_VFD	Motor_VFD	InOut	PowerFlex 525 motor control
	EnableIn	BOOL	Input	
	EnableOut	BOOL	Output	
X	Fault_Reset	BOOL	Input	Resets alarms and clears faults
X	Man_Mode	BOOL	Input	Unit Man/Auto Mode
X	Man_Start	BOOL	Input	Manual start for unit
X	Man_Stop	BOOL	Input	Manual stop for unit
X	Comm_Health	BOOL	Input	Health status of drive communications (1=okay)
X	Drive_Status	AB:PowerFlex525V_E_2661FD24:I:0	InOut	Status from drive
X	Drive_Cmds	AB:PowerFlex525V_EENET_Drive:O:0	InOut	Commands to drive
X	Tag	Motor_VFD_Type	InOut	Motor Tag

Extended Description

Execution

Condition	Description
EnableIn is true	

Revision v1.1 Notes

Name	Default	Data Type	Scope
Comm_Health	0	BOOL	Motor_VFD
Health status of drive communications (1=okay)			
Usage:	Input Parameter		
Required:	Yes		
Visible:	Yes		
External Access:	Read/Write		
OPC UA Access:	None		
Comm_Health - Motor_VFD/Logic - 10(XIO)			
Drive_Cmds		AB:PowerFlex525V_EENET_Drive:O:0	Motor_VFD
Commands to drive			
Usage:	InOut Parameter		
Required:	Yes		
Visible:	Yes		
Constant	No		
OPC UA Access:	None		
Drive_Cmds.LogicCommand	??	INT	
Commands to drive			
Drive_Cmds.LogicCommand.1	??	BOOL	
Commands to drive			
Drive_Cmds.LogicCommand.3	??	BOOL	
Commands to drive			
Drive_Cmds.LogicCommand.4	??	BOOL	
Commands to drive			
Drive_Cmds.LogicCommand.5	??	BOOL	
Commands to drive			
Drive_Cmds.Stop	??	BOOL	
Commands to drive			
*Drive_Cmds.Stop - Motor_VFD/Logic - *6(OTE)*			
Drive_Cmds.Start	??	BOOL	
Commands to drive			
*Drive_Cmds.Start - Motor_VFD/Logic - *5(OTE)*			
Drive_Cmds.Jog	??	BOOL	
Commands to drive			
Drive_Cmds.ClearFaults	??	BOOL	
Commands to drive			
*Drive_Cmds.ClearFaults - Motor_VFD/Logic - *13(OTE)*			
Drive_Cmds.Forward	??	BOOL	
Commands to drive			
*Drive_Cmds.Forward - Motor_VFD/Logic - *3(OTE)*			
Drive_Cmds.Reverse	??	BOOL	
Commands to drive			
*Drive_Cmds.Reverse - Motor_VFD/Logic - *4(OTE)*			
Drive_Cmds.ForceKeypadCtrl	??	BOOL	
Commands to drive			
Drive_Cmds.MOPIncrement	??	BOOL	
Commands to drive			
Drive_Cmds.AccelRate1	??	BOOL	
Commands to drive			
Drive_Cmds.AccelRate2	??	BOOL	
Commands to drive			
Drive_Cmds.DecelRate1	??	BOOL	
Commands to drive			
Drive_Cmds.DecelRate2	??	BOOL	
Commands to drive			
Drive_Cmds.FreqSel01	??	BOOL	
Commands to drive			
Drive_Cmds.FreqSel02	??	BOOL	
Commands to drive			
Drive_Cmds.FreqSel03	??	BOOL	
Commands to drive			

Drive_Cmds (Continued)		
Drive_Cmds.MOPDecrement	??	BOOL
Commands to drive		
Drive_Cmds.FreqCommand	??	INT
Commands to drive		
*Drive_Cmds.FreqCommand - Motor_VFD/Logic - *2(CPT)*		
Drive_Status		AB:PowerFlex525V_E_2661FD24:I:0 Motor_VFD
Status from drive		
Usage:	InOut Parameter	
Required:	Yes	
Visible:	Yes	
Constant	No	
OPC UA Access:	None	
Drive_Status.DriveStatus	??	INT
Status from drive		
Drive_Status.DriveStatus.1	??	BOOL
Status from drive		
Drive_Status.DriveStatus.7	??	BOOL
Status from drive		
Drive_Status.DriveStatus.8	??	BOOL
Status from drive		
Drive_Status.Ready	??	BOOL
Status from drive		
Drive_Status.Active	??	BOOL
Status from drive		
Drive_Status.Active - Motor_VFD/Logic - 10(XIO), 14(XIC), 5(XIO), 6(XIC)		
Drive_Status.CommandDir	??	BOOL
Status from drive		
Drive_Status.ActualDir	??	BOOL
Status from drive		
Drive_Status.Accelerating	??	BOOL
Status from drive		
Drive_Status.Decelerating	??	BOOL
Status from drive		
Drive_Status.Faulted	??	BOOL
Status from drive		
Drive_Status.Faulted - Motor_VFD/Logic - 10(XIC), 10(XIO), 12(XIO)		
Drive_Status.AtReference	??	BOOL
Status from drive		
Drive_Status.AtReference - Motor_VFD/Logic - 15(XIC)		
Drive_Status.CommFreqCnt	??	BOOL
Status from drive		
Drive_Status.CommLogicCnt	??	BOOL
Status from drive		
Drive_Status.ParmsLocked	??	BOOL
Status from drive		
Drive_Status.DigIn1Active	??	BOOL
Status from drive		
Drive_Status.DigIn2Active	??	BOOL
Status from drive		
Drive_Status.DigIn3Active	??	BOOL
Status from drive		
Drive_Status.DigIn4Active	??	BOOL
Status from drive		
Drive_Status.OutputFreq	??	INT
Status from drive		
Drive_Status.OutputFreq - Motor_VFD/Logic - 16(CPT)		
Drive_Status.OutputCurrent	??	INT
Status from drive		
Drive_Status.OutputCurrent - Motor_VFD/Logic - 16(CPT)		
Drive_Status.Fault1Code	??	INT

Drive_Status (Continued)
Status from drive
Drive_Status.Fault1Code - Motor_VFD/Logic - 10(MOVE)

Drive_Status.OutputPower	??	INT	

Status from drive
Drive_Status.OutputPower - Motor_VFD/Logic - 16(CPT)

Fault_Reset	0	BOOL	Motor_VFD

Resets alarms and clears faults
Usage: Input Parameter
Required: Yes
Visible: Yes
External Access: Read/Write
OPC UA Access: None
Fault_Reset - Motor_VFD/Logic - 13(XIC)

Man_Mode	0	BOOL	Motor_VFD

Unit Man/Auto Mode
Usage: Input Parameter
Required: Yes
Visible: Yes
External Access: Read/Write
OPC UA Access: None
Man_Mode - Motor_VFD/Logic - 7(XIC), 7(XIO), 8(XIC), 8(XIO)

Man_Start	0	BOOL	Motor_VFD

Manual start for unit
Usage: Input Parameter
Required: Yes
Visible: Yes
External Access: Read/Write
OPC UA Access: None
Man_Start - Motor_VFD/Logic - 7(XIC)

Man_Stop	0	BOOL	Motor_VFD

Manual stop for unit
Usage: Input Parameter
Required: Yes
Visible: Yes
External Access: Read/Write
OPC UA Access: None
Man_Stop - Motor_VFD/Logic - 8(XIC)

Tag		Motor_VFD_Type	Motor_VFD

Motor Tag
Usage: InOut Parameter
Required: Yes
Visible: Yes
Constant: No
OPC UA Access: None

Tag.Run_Status	??	BOOL

Motor Tag Run Status (1=running)
*Tag.Run_Status - Motor_VFD/Logic - *14(OTE)*

Tag.At_Speed	??	BOOL

Motor Tag Drive at speed
*Tag.At_Speed - Motor_VFD/Logic - *15(OTE)*

Tag.Any_Fault	??	BOOL

Motor Tag Overall Fault Indication (1= fault)
*Tag.Any_Fault - Motor_VFD/Logic - *11(OTE), 1(XIO)*

Tag.Not_Ready	??	BOOL

Motor Tag Drive not ready

Tag.Run_Fault	??	BOOL

Motor Tag Run fault (1=fault)

Tag (Continued)

*Tag.Run_Fault - Motor_VFD/Logic - *10(OTL), *13(OTU), 11(XIC)*

Tag.Drive_Faulted ?? BOOL
Motor Tag Drive Faulted (1=faulted)
*Tag.Drive_Faulted - Motor_VFD/Logic - *10(OTE), 11(XIC)*

Tag.Comm_Fail ?? BOOL
Motor Tag Communication to VFD failure (1-failure)
*Tag.Comm_Fail - Motor_VFD/Logic - *10(OTE), 10(XIO), 11(XIC)*

Tag.Seq_Start ?? BOOL
Motor Tag Motor start initiated from sequence
*Tag.Seq_Start - Motor_VFD/Logic - *17(OTU), 7(XIC)*

Tag.Seq_Stop ?? BOOL
Motor Tag Motor stop initiated from sequence
*Tag.Seq_Stop - Motor_VFD/Logic - *17(OTU), 8(XIC)*

Tag.Cmd_Direction ?? BOOL
Motor Tag Commanded direction 0 - forward, 1 - reverse
Tag.Cmd_Direction - Motor_VFD/Logic - 3(XIO), 4(XIC)

Tag.Fault_Code ?? INT
Motor Tag Drive Fault code
*Tag.Fault_Code - Motor_VFD/Logic - *10(MOVE), *12(CLR)*

Tag.Cmd_Speed ?? REAL
Motor Tag Reference motor speed 0-100
Tag.Cmd_Speed - Motor_VFD/Logic - 2(CPT), 2(LIMIT)

Tag.Act_Speed ?? REAL
Motor Tag Actual motor speed 0-100
*Tag.Act_Speed - Motor_VFD/Logic - *16(CPT)*

Tag.Act_Amps ?? REAL
Motor Tag Actual motor current in amps
*Tag.Act_Amps - Motor_VFD/Logic - *16(CPT)*

Tag.Act_kW ?? REAL
Motor Tag Actual motor power in kW
*Tag.Act_kW - Motor_VFD/Logic - *16(CPT)*

Name	Default	Data Type	Scope
Motor_Start_Req	0	BOOL	Motor_VFD
Internal used for start logic			
Usage:	Local Tag		
External Access:	Read/Write		
OPC UA Access:	None		
*Motor_Start_Req - Motor_VFD/Logic - *7(OTE), 1(XIC)*			
Motor_Stop_Req	0	BOOL	Motor_VFD
Internal used for stop logic			
Usage:	Local Tag		
External Access:	Read/Write		
OPC UA Access:	None		
*Motor_Stop_Req - Motor_VFD/Logic - *8(OTE), 1(XIO)*			
Run_Fail_Tmr		TIMER	Motor_VFD
Timer for run-fail alarm			
Usage:	Local Tag		
External Access:	Read/Write		
OPC UA Access:	None		
*Run_Fail_Tmr - Motor_VFD/Logic - *9(TON)*			
Run_Fail_Tmr.PRE	20000	DINT	
Timer for run-fail alarm			
Run_Fail_Tmr.ACC	0	DINT	
Timer for run-fail alarm			
Run_Fail_Tmr.EN	0	BOOL	
Timer for run-fail alarm			
Run_Fail_Tmr.TT	0	BOOL	
Timer for run-fail alarm			
Run_Fail_Tmr.DN	0	BOOL	
Timer for run-fail alarm			
Run_Fail_Tmr.DN - Motor_VFD/Logic - 10(XIC)			
Run_Req	0	BOOL	Motor_VFD
Internal running status			
Usage:	Local Tag		
External Access:	Read/Write		
OPC UA Access:	None		
*Run_Req - Motor_VFD/Logic - *1(OTE), 1(XIC), 5(XIC), 6(XIO), 9(XIC)*			

Example Chap 8 VFD Motor Control - Powerflex 525

0

NOP

Main control that drives the motor start/stop requests

1

Internal used for stop logic Motor_Stop_Req

Internal used for start logic Motor_Start_Req

Motor Tag Overall Fault Indication (1= fault) Tag.Any_Fault

S:FS

Internal running status Run_Req

Internal running status Run_Req

Change commanded speed from 0-100 to an integer in range of 0 to 600, which represents 0 to 60.0 Hz.
Make sure commanded speed in limits before converting.

2

Motor Tag Reference motor speed 0-100

LIMIT
Limit Test (CIRC)
Low Limit 0.0
Test Tag.Cmd_Speed
??
High Limit 100.0

Commands to drive

CPT
Compute
Dest Drive_Cmds.FreqCommand
??
Expression (Tag.Cmd_Speed/100)*6000

Handle direction - drive can handle direction changes while running.

3

Motor Tag Commanded direction 0 - forward, 1 - reverse Tag.Cmd_Direction

Commands to drive Drive_Cmds.Forward

4

Motor Tag Commanded direction 0 - forward, 1 - reverse Tag.Cmd_Direction

Commands to drive Drive_Cmds.Reverse

Set motor start bit when requested to run and not running already.

5

Internal running status Run_Req

Status from drive Drive_Status.Active

Commands to drive Drive_Cmds.Start

Set motor stop bit when requested to stop and running already.

6

Internal running status Run_Req

Status from drive Drive_Status.Active

Commands to drive Drive_Cmds.Stop

Handle operator requests to start as well as sequence-controlled starts

7

Unit Man/Auto Mode Man_Mode

Manual start for unit Man_Start

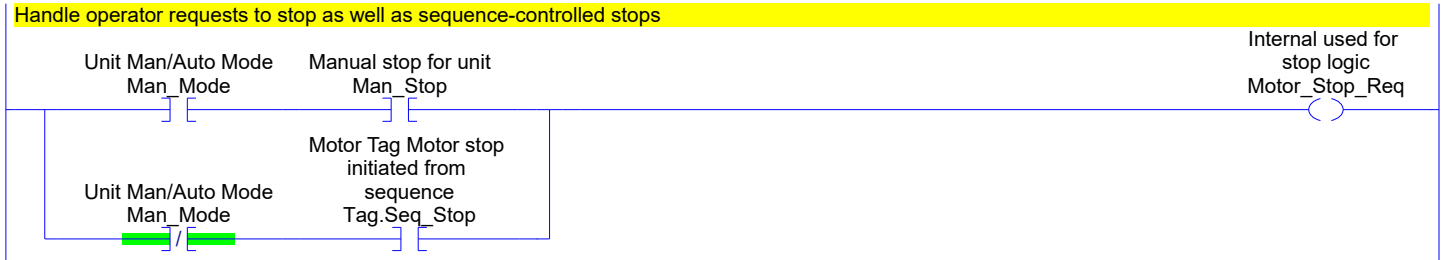
Internal used for start logic Motor_Start_Req

Unit Man/Auto Mode Man_Mode

Motor Tag Motor start initiated from sequence Tag.Seq_Start

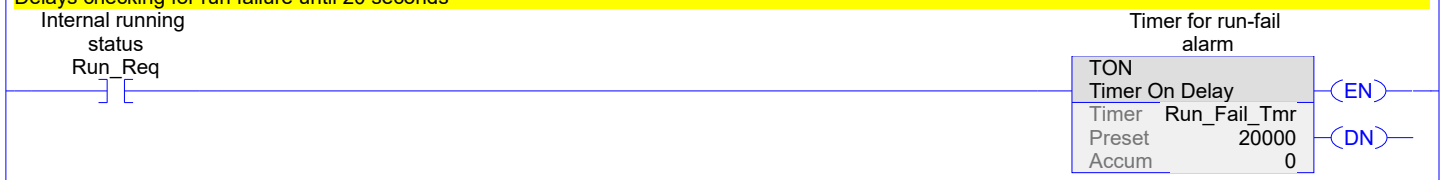
Handle operator requests to stop as well as sequence-controlled stops

8



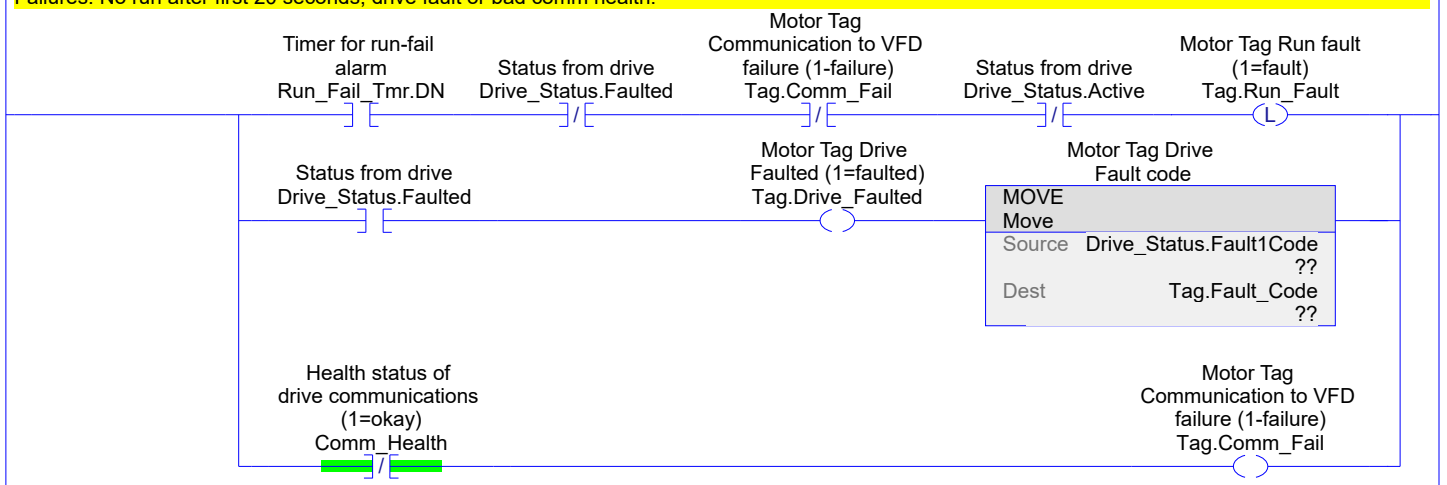
Delays checking for run failure until 20 seconds

9



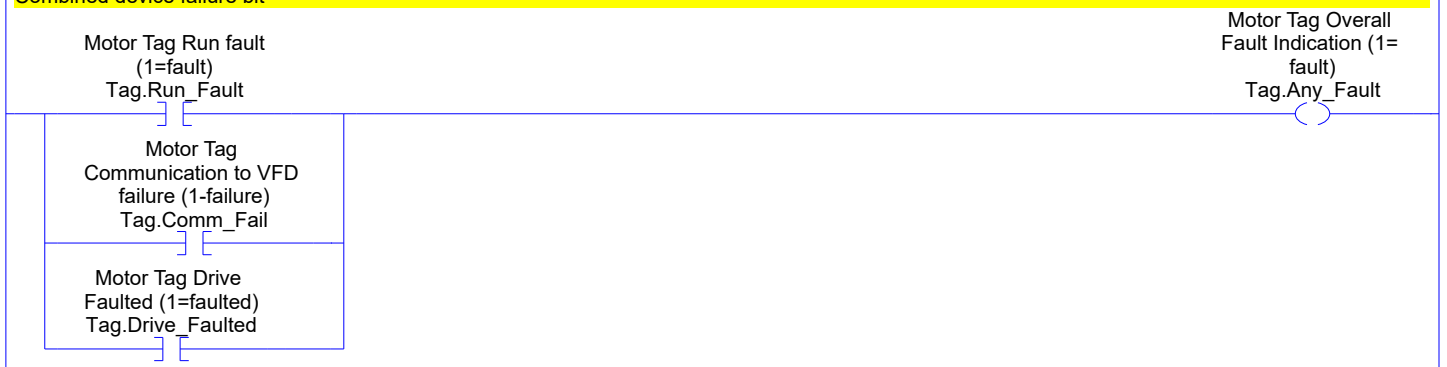
Failures: No run after first 20 seconds, drive fault or bad comm health.

10



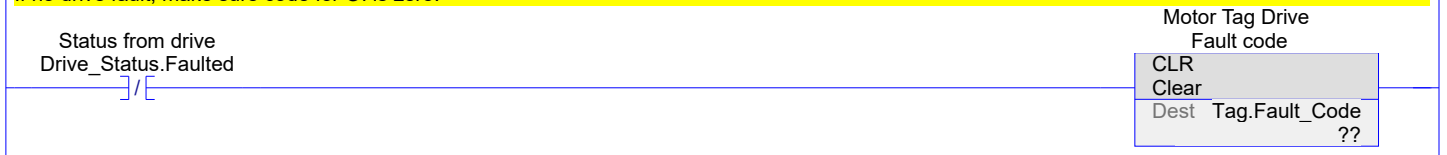
Combined device failure bit

11



If no drive fault, make sure code for OI is zero.

12



Unlatch fail bits when alarm reset. Also command drive to clear its faults.

13

Resets alarms and clears faults
Fault_Reset

Commands to drive
Drive_Cmds.ClearFaults

Motor Tag Run fault (1=fault)
Tag.Run_Fault
U

Pass drive run and at-speed status to OI

14

Status from drive
Drive_Status.Active

Motor Tag Run Status (1=running)
Tag.Run_Status

15

Status from drive
Drive_Status.AtReference

Motor Tag Drive at speed
Tag.At_Speed

Compute drive speed, current and power for OI

16

Motor Tag Actual motor speed 0-100

CPT Compute
Dest Tag.Act_Speed ??
Expression (Drive_Status.OutputFreq/6000)*100

Motor Tag Actual motor current in amps

CPT Compute
Dest Tag.Act_Amps ??
Expression Drive_Status.OutputCurrent*0.01

Motor Tag Actual motor power in kW

CPT Compute
Dest Tag.Act_kW ??
Expression Drive_Status.OutputPower*0.01

Unlatch sequence start and stop command bits

17

Motor Tag Motor start initiated from sequence
Tag.Seq_Start
U

Motor Tag Motor stop initiated from sequence
Tag.Seq_Stop
U

(End)

