Controller Example_21_2
Text Example 21-2 VFD control AOI
Controller Fault Handler
Power-Up Handler

Tasks

MainTask
MainProgram
MainRoutine
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: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_3DC2426F:I:0

Trends

I/O Configuration

1756 Backplane, 1756-A10
[5] 1756-L71 Example_21_2
[7] 1756-EN2TR EN2TR
Ethernet
PowerFlex 525-EENET SC101_Drv
1756-EN2TR EN2TR

Copyright (c) 2023 Dogwood Valley Press, LLC.

Example 21.2 VFD Control

Copyright (c) 2023 Dogwood Valley Press, LLC

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

2

SC101
Reactor Material
Pump
Communication Status

LIM	
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	
Motor_VFD	SC101_DB ...
Alm_Rst	PC_Alm_Reset
	0
Man_Mode	R1_Man_Mode
	1
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

(End)

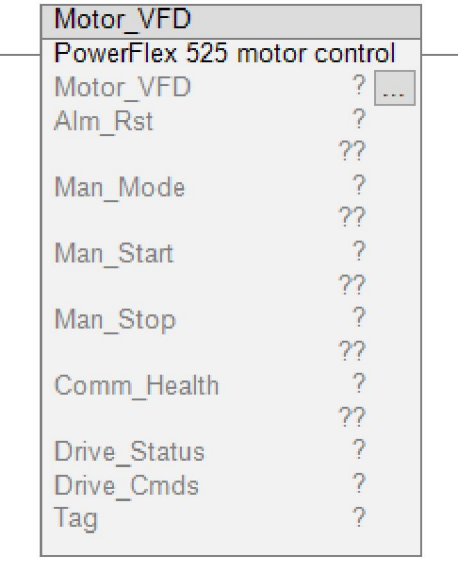
Signature Listing

Motor_VFD v1.1

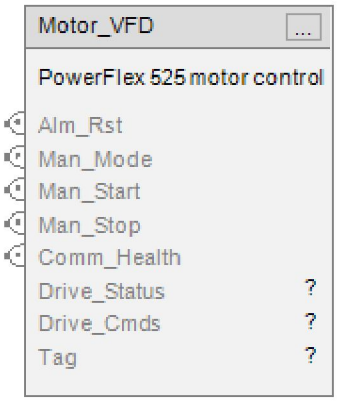
PowerFlex 525 motor control

Available Languages

Relay Ladder



Function Block



Structured Text

```
Motor_VFD(Alm_Rst, 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	Alm_Rst	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_191810B5: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

Copyright (c) 2023 Dogwood Valley Press, LLC.

Extended Description

Execution

Condition	Description
EnableIn is true	

Revision v1.1 Notes

Copyright (c) 2023 Dogwood Valley Press, LLC.

Name	Default	Data Type	Scope
Alm_Rst	0	BOOL	Motor_VFD
Resets alarms and clears faults			
Usage:	Input Parameter		
Required:	Yes		
Visible:	Yes		
External Access:	Read/Write		
Alm_Rst - Motor_VFD/Logic - 13(XIC)			
Comm_Health	0	BOOL	Motor_VFD
Health status of drive communications (1=okay)			
Usage:	Input Parameter		
Required:	Yes		
Visible:	Yes		
External Access:	Read/Write		
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		
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			

Copyright (c) 2023 Dogwood Valley Press, LLC.

Drive_Cmds (Continued)			
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.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_191810B5:I:0	Motor_VFD
Status from drive			
Usage:	InOut Parameter		
Required:	Yes		
Visible:	Yes		
Constant	No		
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 (Continued)

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 - 17(CPT)			
Drive_Status.Fault1Code	??	INT	
Status from drive			
Drive_Status.Fault1Code - Motor_VFD/Logic - 10(MOV)			
Man_Mode	0	BOOL	Motor_VFD
Unit Man/Auto Mode			
Usage:	Input Parameter		
Required:	Yes		
Visible:	Yes		
External Access:	Read/Write		
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		
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		
Man_Stop - Motor_VFD/Logic - 8(XIC)			
Tag		Motor_VFD_Type	Motor_VFD
Motor Tag			
Usage:	InOut Parameter		
Required:	Yes		
Visible:	Yes		
Constant	No		
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_Fail	??	BOOL	
Motor Tag Overall Failure Alarm (1= alarm)			
*Tag.Any_Fail - Motor_VFD/Logic - *11(OTE), 1(XIO)*			
Tag.Run_Fail	??	BOOL	
Motor Tag Run failure alarm (1=failure)			
*Tag.Run_Fail - Motor_VFD/Logic - *10(OTL), *13(OTU), 11(XIC)*			
Tag.Drive_Fail	??	BOOL	
Motor Tag Drive Failure (1=failure)			
*Tag.Drive_Fail - 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)*			

Copyright (c) 2023 Dogwood Valley Press, LLC.

Tag (Continued)

Tag.Seq_Start	??	BOOL
Motor Tag Motor start initiated from sequence		
*Tag.Seq_Start - Motor_VFD/Logic - *18(OTU), 7(XIC)*		
Tag.Seq_Stop	??	BOOL
Motor Tag Motor stop initiated from sequence		
*Tag.Seq_Stop - Motor_VFD/Logic - *18(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(MOV), *12(CLR)*		
Tag.Cmd_Speed	??	REAL
Motor Tag Reference motor speed 0-100		
Tag.Cmd_Speed - Motor_VFD/Logic - 2(CPT), 2(LIM)		
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 - *17(CPT)*		

Copyright (c) 2023 Dogwood Valley Press, LLC.

Name	Default	Data Type	Scope
Motor_Start_Req	0	BOOL	Motor_VFD
Internal used for start logic			
Usage:	Local Tag		
External Access:	Read/Write		
*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		
*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		
*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		
*Run_Req - Motor_VFD/Logic - *1(OTE), 1(XIC), 5(XIC), 6(XIO), 9(XIC)*			

Copyright (c) 2023 Dogwood Valley Press, LLC.

Example 21.2 VFD Motor Control - Powerflex 525

Copyright (c) 2023 Dogwood Valley Press, LLC

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 | Internal running status Run_Req | Motor Tag Overall Failure Alarm (1= alarm) Tag.Any_Fail / | S:FS / | 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
LIM
Low Limit 0.0
Test Tag.Cmd_Speed ??
High Limit 100.0

Commands to drive
CPT
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.

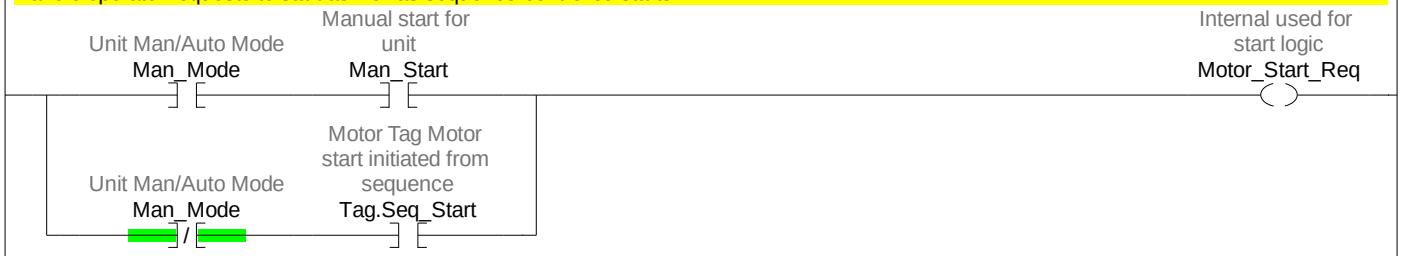
5 Internal running status Run_Req | Status from drive Drive_Status.Active / | Commands to drive Drive_Cmds.Start ( )

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 ( )

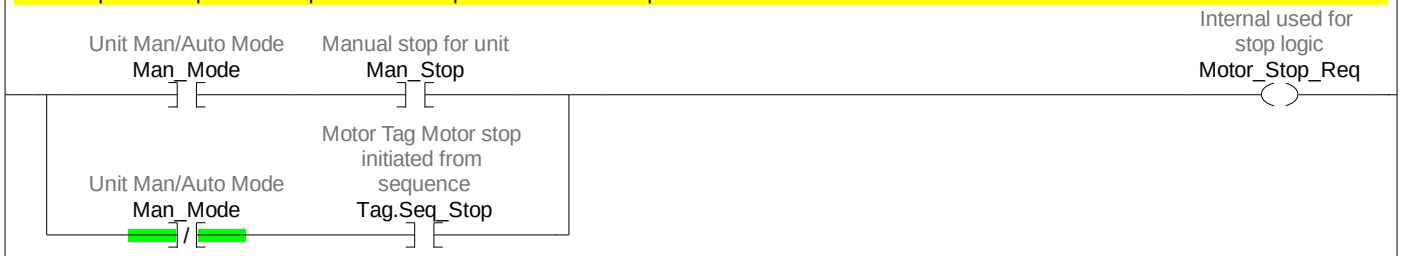
Handle operator requests to start as well as sequence-controlled starts

7



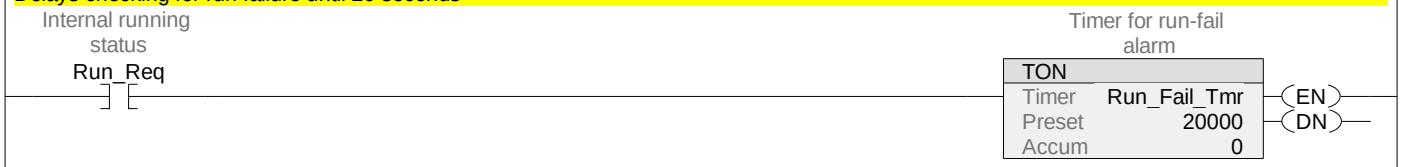
Handle operator requests to stop as well as sequence-controlled stops

8



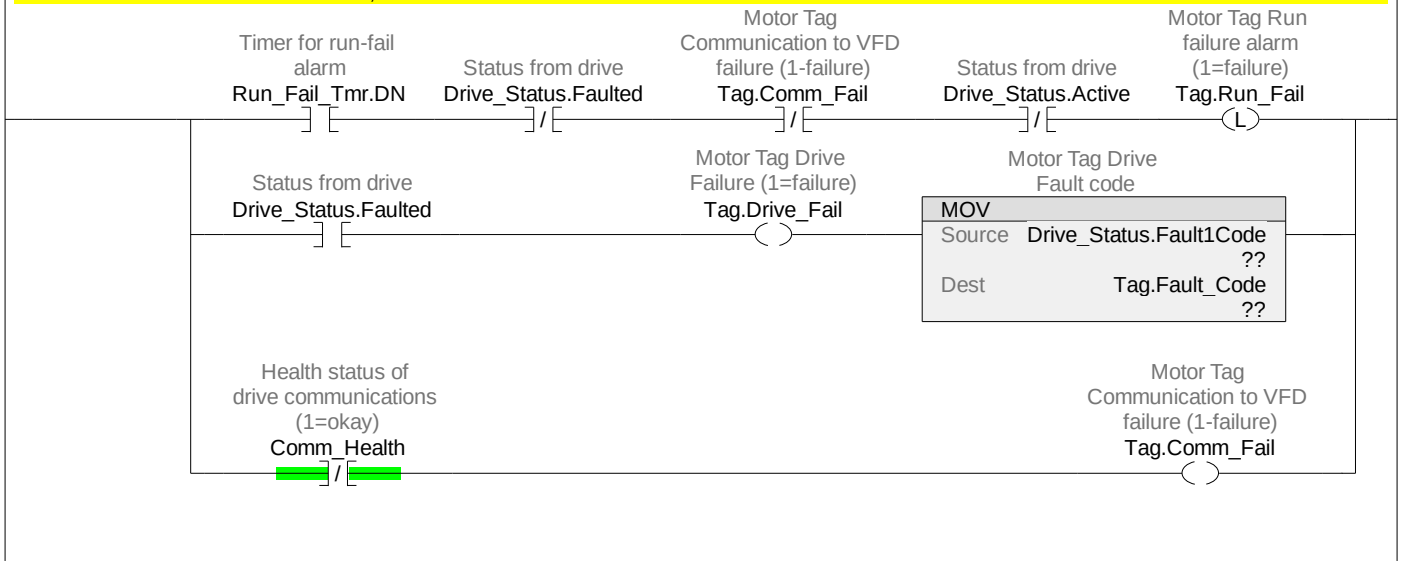
Delays checking for run failure until 20 seconds

9



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

10



Combined device failure bit

11

Motor Tag Run failure alarm (1=failure)
Tag.Run_Fail

Motor Tag Communication to VFD failure (1-failure)
Tag.Comm_Fail

Motor Tag Drive Failure (1=failure)
Tag.Drive_Fail

Motor Tag Overall Failure Alarm (1= alarm)
Tag.Any_Fail

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

12

Status from drive
Drive_Status.Faulted

Motor Tag Drive Fault code

```
CLR
Dest   Tag.Fault_Code
       ??
```

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

13

Resets alarms and clears faults
Alm_Rst

Commands to drive
Drive_Cmds.ClearFaults

Motor Tag Run failure alarm (1=failure)
Tag.Run_Fail

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 for OI

16

Motor Tag Actual motor speed 0-100

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

Calculate current from status INT

17

Motor Tag Actual motor current in amps

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

Copyright (c) 2023 Dogwood Valley Press, LLC.

Unlatch sequence start and stop command bits

18

Motor Tag Motor start initiated from sequence
Tag.Seq_Start
U

Motor Tag Motor stop initiated from sequence
Tag.Seq_Stop
U

(End)

Example_21_2
Label does not exist 1
MainTask
MainProgram
MainRoutine
Ladder Diagram 2
Add-On Instruction Signature Listing
Add-On Instructions
Instruction Definition 4
Motor_VFD
Parameter Listing 6
Local Tag Listing 10
Logic Routine 11