RSLogix Micro Project Report

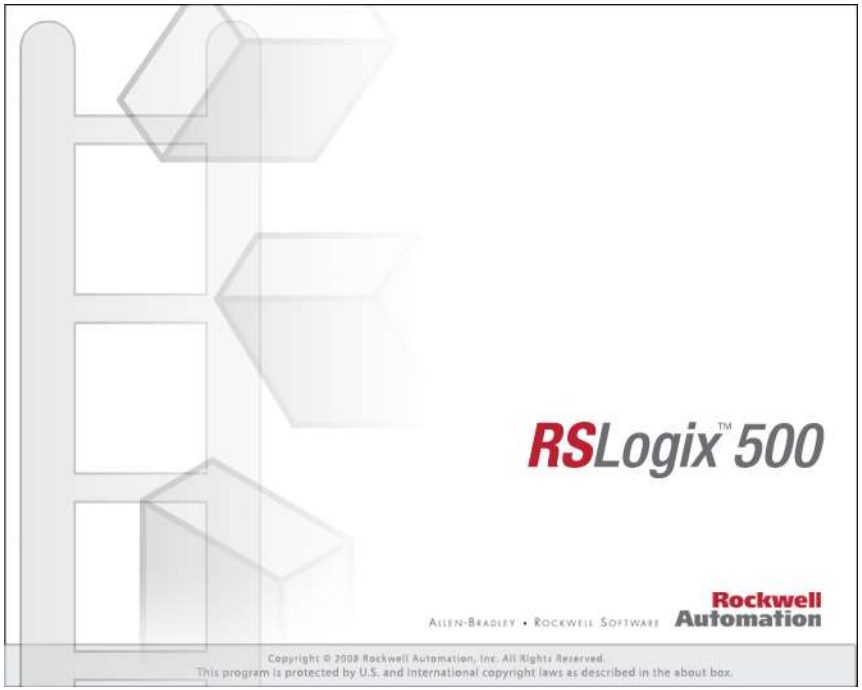


Table Of Contents

Processor Information

Processor Type: Bul.1763 MicroLogix 1100 Series B

Processor Name: UNTITLED

Total Memory Used: 266 Instruction Words Used - 117 Data Table Words Used

Total Memory Left: 6390 Instruction Words Left

Program Files: 6

Data Files: 11

Program ID: e6ed

I/O Configuration

0	Bul.1763	MicroLogix 1100 Series B
1		
2		
3		
4		

Revision History

Revision #	Revision Note

HSC

```
 Address (Symbol) = Value [Description]

 HSC:0 = {...} []
    PFN - Program File Number = 0 []
    ER - Error Code = 0 []
    UIX - User Interrupt Executing = 0 []
    UIE - User Interrupt Enable = 1 []
    UIL - User Interrupt Lost = 0 []
    UIP - User Interrupt Pending = 0 []
    FE - Function Enabled = 0 []
    AS - Auto Start = 0 []
    ED - Error Detected = 0 []
    CE - Counting Enabled = 0 []
    SP - Set Parameters = 0 []
    LPM - Low Preset Mask = 1 []
    HPM - High Preset Mask = 1 []
    UFM - Underflow Mask = 1 []
    OFM - Overflow Mask = 1 []
    LPI - Low Preset Interrupt = 0 []
    HPI - High Preset Interrupt = 0 []
    UFI - Underflow Interrupt = 0 []
    OFI - Overflow Interrupt = 0 []
    LPR - Low Preset Reached = 0 []
    HPR - High Preset Reached = 0 []
    DIR - Count Direction = 0 []
    UF - Underflow = 0 []
    OF - Overflow = 0 []
    MD - Mode Done = 0 []
    CD - Count Down = 0 []
    CU - Count Up = 0 []
    MOD - PLS file (bits 15-8)  HSC Mode (bits 7-0) = 0 (h) []
    ACC - Accumulator = 0 []
    HIP - High Preset = 2147483647 []
    LOP - Low Preset = -2147483648 []
    OVF - Overflow = 2147483647 []
    UNF - Underflow = -2147483648 []
    OMB - Output Mask Bits = 0 []
    HPO - High Preset Output = 0 []
    LPO - Low Preset Output = 0 []
```

PTO

```
 Address (Symbol) = Value [Description]

 PTO:0 = {...} []
    OUT - Output = -1 []
    DN - Done = 0 []
    DS - Decelerating Status = 0 []
    RS - Run Status = 0 []
    AS - Accelerating Status = 0 []
    RP - Ramp Profile = 0 []
    CS - Control Stop = 0 []
    IS - Idle Status = 0 []
    ED - Error Detected Status = 0 []
    NS - Normal Operation Status = 0 []
    JPS - Jog Pulse Status = 0 []
    JCS - Jog Continuous Status = 0 []
    ADI - Accel/Decel Pulses Independent = 0 []
    JP - Jog Pulse = 0 []
    JC - Jog Continuous = 0 []
    EH - Enable Hard Stop = 0 []
    EN - Enable Status (follows rung state) = 0 []
    ER - Error Code = 0 []
    OF - Output Frequency (Hz) = 0 []
    OFS - Operating Frequency Status (Hz) = 0 []
    JF - Jog Frequency (Hz) = 0 []
    TOP - Total Output Pulses To Be Generated = 0 []
    OPP - Output Pulses Produced = 0 []
    ADP - Accel/Decel Pulses or File:Elem, if ADI=1 = 0 []
 PTO:1 = {...} []
    OUT - Output = -1 []
    DN - Done = 0 []
    DS - Decelerating Status = 0 []
    RS - Run Status = 0 []
    AS - Accelerating Status = 0 []
    RP - Ramp Profile = 0 []
    CS - Control Stop = 0 []
    IS - Idle Status = 0 []
    ED - Error Detected Status = 0 []
    NS - Normal Operation Status = 0 []
    JPS - Jog Pulse Status = 0 []
    JCS - Jog Continuous Status = 0 []
    ADI - Accel/Decel Pulses Independent = 0 []
    JP - Jog Pulse = 0 []
    JC - Jog Continuous = 0 []
    EH - Enable Hard Stop = 0 []
    EN - Enable Status (follows rung state) = 0 []
    ER - Error Code = 0 []
    OF - Output Frequency (Hz) = 0 []
    OFS - Operating Frequency Status (Hz) = 0 []
    JF - Jog Frequency (Hz) = 0 []
    TOP - Total Output Pulses To Be Generated = 0 []
    OPP - Output Pulses Produced = 0 []
    ADP - Accel/Decel Pulses or File:Elem, if ADI=1 = 0 []
```

PWM

```
 Address (Symbol) = Value [Description]

 PWM:0 = {...} []
    OUT - Output = 2 []
    DS - Decelerating Status = 0 []
    RS - Run Status = 0 []
    AS - Accelerating Status = 0 []
    PP - Profile Parameter Select = 0 []
    IS - Idle Status = 1 []
    ED - Error Detected Status = 0 []
    NS - Normal Operation Status = 0 []
    EH - Enable Hard Stop = 0 []
    ES - Enable Status (follows rung state) = 0 []
    ER - Error Code = 0 []
    OF - Output Frequency (Hz) (OUTPUT_FREQUENCY) = 100 []
    OFS - Operating Frequency Status (Hz) = 0 []
    DC - Duty Cycle (e.g., 456 = 45.6%) (DUTY_CYCLE_PER_1000) = 202 []
    DCS - Duty Cycle Status (e.g., 456 = 45.6%) = 0 []
    ADD - Accel Decel Delay (10ms) = 0 []
 PWM:1 = {...} []
    OUT - Output = -1 []
    DS - Decelerating Status = 0 []
    RS - Run Status = 0 []
    AS - Accelerating Status = 0 []
    PP - Profile Parameter Select = 0 []
    IS - Idle Status = 0 []
    ED - Error Detected Status = 0 []
    NS - Normal Operation Status = 0 []
    EH - Enable Hard Stop = 0 []
    ES - Enable Status (follows rung state) = 0 []
    ER - Error Code = 0 []
    OF - Output Frequency (Hz) = 0 []
    OFS - Operating Frequency Status (Hz) = 0 []
    DC - Duty Cycle (e.g., 456 = 45.6%) = 0 []
    DCS - Duty Cycle Status (e.g., 456 = 45.6%) = 0 []
    ADD - Accel Decel Delay (10ms) = 0 []
```

STI

```
 Address (Symbol) = Value [Description]

 STI:0 = {...} []
    PFN - Program File Number = 0 []
    ER - Error Code = 0 []
    UIX - User Interrupt Executing = 0 []
    UIE - User Interrupt Enable = 1 []
    UIL - User Interrupt Lost = 0 []
    UIP - User Interrupt Pending = 0 []
    TIE - Timed Interrupt Enabled = 0 []
    AS - Auto Start = 0 []
    ED - Error Detected = 0 []
    SPM - Set Point Msec (between interrupts) = 0 []
```

EII

```
 Address (Symbol) = Value [Description]

 EII:0 = {...} []
    PFN - Program File Number = 0 []
    ER - Error Code = 0 []
    UIX - User Interrupt Executing = 0 []
    UIE - User Interrupt Enable = 1 []
    UIL - User Interrupt Lost = 0 []
    UIP - User Interrupt Pending = 0 []
    EIE - Event Interrupt Enabled = 0 []
    AS - Auto Start = 0 []
    ED - Error Detected = 0 []
    ES - Edge Select = 1 []
    IS - Input Select = 0 []
 EII:1 = {...} []
    PFN - Program File Number = 0 []
    ER - Error Code = 0 []
    UIX - User Interrupt Executing = 0 []
    UIE - User Interrupt Enable = 1 []
    UIL - User Interrupt Lost = 0 []
    UIP - User Interrupt Pending = 0 []
    EIE - Event Interrupt Enabled = 0 []
    AS - Auto Start = 0 []
    ED - Error Detected = 0 []
    ES - Edge Select = 1 []
    IS - Input Select = 1 []
 EII:2 = {...} []
    PFN - Program File Number = 0 []
    ER - Error Code = 0 []
    UIX - User Interrupt Executing = 0 []
    UIE - User Interrupt Enable = 1 []
    UIL - User Interrupt Lost = 0 []
    UIP - User Interrupt Pending = 0 []
    EIE - Event Interrupt Enabled = 0 []
    AS - Auto Start = 0 []
    ED - Error Detected = 0 []
    ES - Edge Select = 1 []
    IS - Input Select = 2 []
 EII:3 = {...} []
    PFN - Program File Number = 0 []
    ER - Error Code = 0 []
    UIX - User Interrupt Executing = 0 []
    UIE - User Interrupt Enable = 1 []
    UIL - User Interrupt Lost = 0 []
    UIP - User Interrupt Pending = 0 []
    EIE - Event Interrupt Enabled = 0 []
    AS - Auto Start = 0 []
    ED - Error Detected = 0 []
    ES - Edge Select = 1 []
    IS - Input Select = 3 []
```

RTC

```
 Address (Symbol) = Value [Description]

 RTC:0 = {...} []
    YR - Year = 0 []
    MON - Month = 0 []
    DAY - Day = 0 []
    HR - Hour = 0 []
    MIN - Minute = 0 []
    SEC - Second = 0 []
    DOW - Day Of The Week = 0 []
    DS - Disabled = 0 []
    BL - RTC Battery is Low = 0 []
```

LCD

```
 Address (Symbol) = Value [Description]

 LCD:0 = {...} []
    CBS - Customized Boot Message String File Address Offset = 0 []
    SCD - Start with Customized Display = 0 []
    TO - Data Input Timeout of LCD Instruction(x Sec) = 0 []
    DN - LCD Instruction Job Done = 1 []
    ERR - LCD Display Operation Error Bit = 0 []
    ERN - LCD Module Operation Error Number = 0 []
    TBF - Target Bit File Number = 0 []
    TIF - Target Integer File Number = 0 []
    JOG - Jog data update Mode Set = 0 []
    TMIN - Trimpot Low Value = 0 []
    TMAX - Trimpot High Value = 250 []
    POT0 - Trimpot 0 Data (TMIN -TMAX) = 0 []
    POT1 - Trimpot 1 Data (TMIN - TMAX) = 0 []
    WND - Instruction Display Window = 0 []
    OK - OK key in Customized Display = 0 []
    ESC - ESC key in Customized Display = 0 []
```

MMI

```
 Address (Symbol) = Value [Description]

 NOTE: MMI Data values are a reflection of what is stored in
             the memory module, not your program.

 MMI:0 = {...} []
    CN - Catalog Number = {Integer} []
       [0] = 0 []
       [1] = 0 []
       [2] = 0 []
       [3] = 0 []
    SRS - Series = 0 []
    REV - Revision = 0 []
    FT - Functionality Type = 0 []
    MP - Module Present = 0 []
    WP - Write Protect Indicator = 0 []
    FO - Fault Override = 0 []
    LPC - Load Program Compare = 0 []
    LE - Load On Error = 0 []
    LA - Load Always = 0 []
    MB - Mode Behavior = 0 []
```

BHI

```
 Address (Symbol) = Value [Description]

 BHI:0 = {...} []
    CN - Catalog Number = {Integer} []
       [0] = 0 []
       [1] = 0 []
       [2] = 0 []
       [3] = 0 []
    SRS - Series = 0 []
    REV - Revision = 0 []
    FT - Functionality Type = 0 []
```

CSO

Address (Symbol) = Value [Description]

CS0:0 = 1 []
CS0:1 = 8 []
CS0:2 = 0 []
CS0:3 = 0 []
CS0:4 = 8 []
CS0:5 = 2560 []
CS0:6 = 2 []
CS0:7 = 30 []
CS0:8 = 9 []
CS0:9 = 0 []
CS0:10 = 0 []
CS0:11 = 0 []
CS0:12 = 0 []
CS0:13 = 0 []
CS0:14 = 0 []
CS0:15 = 0 []
CS0:16 = 0 []
CS0:17 = 0 []
CS0:18 = 0 []
CS0:19 = 0 []
CS0:20 = 0 []
CS0:21 = 0 []
CS0:22 = 0 []
CS0:23 = 3 []
CS0:24 = 18 []
CS0:25 = 0 []
CS0:26 = 255 []
CS0:27 = 0 []
CS0:28 = 0 []
CS0:29 = 0 []
CS0:30 = 0 []
CS0:31 = 0 []
CS0:32 = 0 []
CS0:33 = 0 []
CS0:34 = 0 []
CS0:35 = 0 []
CS0:36 = 0 []
CS0:37 = 0 []
CS0:38 = 0 []
CS0:39 = 0 []
CS0:40 = 0 []
CS0:41 = 0 []
CS0:42 = 0 []
CS0:43 = 0 []
CS0:44 = 0 []
CS0:45 = 0 []
CS0:46 = 0 []
CS0:47 = 0 []
CS0:48 = 0 []
CS0:49 = 0 []
CS0:50 = 0 []
CS0:51 = 0 []
CS0:52 = 0 []
CS0:53 = 0 []
CS0:54 = 0 []
CS0:55 = 0 []
CS0:56 = 0 []
CS0:57 = 0 []
CS0:58 = 0 []
CS0:59 = 0 []
CS0:60 = 0 []
CS0:61 = 0 []
CS0:62 = 0 []
CS0:63 = 0 []

ES
Address (Symbol) = Value [Description]

ES0:0 = 1 []
ES0:1 = 236 []
ES0:2 = 0 []
ES0:3 = 0 []
ES0:4 = 64 []
ES0:5 = -1509 []
ES0:6 = 15 []
ES0:7 = 29441 []
ES0:8 = 29188 []
ES0:9 = -16216 []
ES0:10 = 368 []
ES0:11 = -1 []
ES0:12 = -256 []
ES0:13 = -16216 []
ES0:14 = 257 []
ES0:15 = 0 []
ES0:16 = 0 []
ES0:17 = -16216 []
ES0:18 = 257 []
ES0:19 = -16216 []
ES0:20 = 257 []
ES0:21 = 0 []
ES0:22 = 0 []
ES0:23 = 0 []
ES0:24 = 0 []
ES0:25 = 0 []
ES0:26 = 0 []
ES0:27 = 0 []
ES0:28 = 0 []
ES0:29 = 0 []
ES0:30 = 0 []
ES0:31 = 0 []
ES0:32 = 0 []
ES0:33 = 0 []
ES0:34 = 0 []
ES0:35 = 0 []
ES0:36 = 0 []
ES0:37 = 0 []
ES0:38 = 0 []
ES0:39 = 0 []
ES0:40 = 0 []
ES0:41 = 0 []
ES0:42 = 0 []
ES0:43 = 0 []
ES0:44 = 0 []
ES0:45 = 0 []
ES0:46 = 0 []
ES0:47 = 0 []
ES0:48 = 0 []
ES0:49 = 0 []
ES0:50 = 0 []
ES0:51 = 0 []
ES0:52 = 0 []
ES0:53 = 0 []
ES0:54 = 0 []
ES0:55 = 0 []
ES0:56 = 0 []
ES0:57 = 0 []
ES0:58 = 0 []
ES0:59 = 0 []
ES0:60 = 0 []
ES0:61 = 0 []
ES0:62 = 0 []
ES0:63 = 0 []

ES
Address (Symbol) = Value [Description]

ES0:64 = 0 []
ES0:65 = 0 []
ES0:66 = 0 []
ES0:67 = 0 []
ES0:68 = 0 []
ES0:69 = 0 []
ES0:70 = 0 []
ES0:71 = 0 []
ES0:72 = 0 []
ES0:73 = 0 []
ES0:74 = 0 []
ES0:75 = 0 []
ES0:76 = 0 []
ES0:77 = 0 []
ES0:78 = 0 []
ES0:79 = 0 []
ES0:80 = 0 []
ES0:81 = 0 []
ES0:82 = 0 []
ES0:83 = 0 []
ES0:84 = 0 []
ES0:85 = 0 []
ES0:86 = 0 []
ES0:87 = 0 []
ES0:88 = 0 []
ES0:89 = 0 []
ES0:90 = 0 []
ES0:91 = 0 []
ES0:92 = 0 []
ES0:93 = 0 []
ES0:94 = 0 []
ES0:95 = 0 []
ES0:96 = 0 []
ES0:97 = 0 []
ES0:98 = 0 []
ES0:99 = 0 []
ES0:100 = 0 []
ES0:101 = 0 []
ES0:102 = 0 []
ES0:103 = 0 []
ES0:104 = 0 []
ES0:105 = 0 []
ES0:106 = 0 []
ES0:107 = 0 []
ES0:108 = 0 []
ES0:109 = 0 []
ES0:110 = 0 []
ES0:111 = 0 []
ES0:112 = 0 []
ES0:113 = 0 []
ES0:114 = 0 []
ES0:115 = 0 []
ES0:116 = 0 []
ES0:117 = 15000 []
ES0:118 = 3000 []
ES0:119 = 30 []
ES0:120 = 2 []
ES0:121 = 110 []
ES0:122 = 10 []
ES0:123 = -25765 []
ES0:124 = 0 []
ES0:125 = 15582 []
ES0:126 = 0 []
ES0:127 = 247 []

ES
Address (Symbol) = Value [Description]

ES0:128 = 0 []
ES0:129 = 92 []
ES0:130 = 0 []
ES0:131 = 0 []
ES0:132 = 0 []
ES0:133 = 0 []
ES0:134 = 0 []
ES0:135 = 0 []
ES0:136 = 0 []
ES0:137 = 0 []
ES0:138 = 0 []
ES0:139 = 0 []
ES0:140 = 0 []
ES0:141 = 0 []
ES0:142 = 0 []
ES0:143 = 0 []
ES0:144 = 0 []
ES0:145 = 0 []
ES0:146 = 0 []
ES0:147 = 0 []
ES0:148 = 0 []
ES0:149 = 0 []
ES0:150 = 0 []
ES0:151 = 0 []
ES0:152 = 0 []
ES0:153 = 0 []
ES0:154 = 0 []
ES0:155 = 0 []
ES0:156 = 0 []
ES0:157 = 84 []
ES0:158 = 0 []
ES0:159 = 83 []
ES0:160 = 0 []
ES0:161 = 0 []
ES0:162 = 0 []
ES0:163 = 0 []
ES0:164 = 0 []
ES0:165 = 0 []
ES0:166 = 0 []
ES0:167 = 0 []
ES0:168 = 0 []
ES0:169 = 1 []
ES0:170 = 0 []
ES0:171 = 1 []
ES0:172 = 0 []
ES0:173 = 0 []
ES0:174 = 0 []
ES0:175 = 32 []
ES0:176 = 0 []
ES0:177 = 0 []

IOS

```
 Address (Symbol) = Value [Description]

 IOS:0 = 0 (h) []
 IOS:1 = 0 (h) []
 IOS:2 = 0 (h) []
 IOS:3 = 0 (h) []
 IOS:4 = 0 (h) []
```

PID - Rung #4:5 - PD10:0

Controller Gain, Kc: 10.0	Setpoint: 8191
Reset Term, Ti: 0.00	Setpoint MAX(Smax): 16383
Rate Term, Td: 0.00	Setpoint MIN(Smin): 0
Loop Update Time: 0.02	Process Variable PV: 16356
Control Mode: E = PV - SP	Control Output CV (%): 100
PID Control: Auto	Output Max CV(%): 100
Time Mode: STI	Output Min CV(%): 0
Limit Output CV: No	Scaled Error: 8165
Deadband: 0	Feed Forward Bias: 8191

Channel Configuration

CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master
   CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master Edit Resource/Owner Timeout: 60
   CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master Passthru Link ID: 1
   CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master Write Protected: No
   CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master Comms Servicing Selection: Yes
   CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master Message Servicing Selection: Yes
   CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master 1st AWA Append Character: \d
   CHANNEL 0 (SYSTEM) - Driver: Modbus RTU Master 2nd AWA Append Character: \a

   Baud: 38.4K
   Parity: NONE
   Control Line : No Handshaking
   InterCharacter Timeout(x1 ms): 0
   Pre Transmit Delay(x1 ms): 0

CHANNEL 1 (SYSTEM) - Driver: Ethernet
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Edit Resource/Owner Timeout: 60
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Passthru Link ID: 1
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Write Protected: No
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Comms Servicing Selection: Yes
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Message Servicing Selection: Yes

   Hardware Address: 00:0F:73:01:72:04
   IP Address: 192.168.1.112
   Subnet Mask: 255.255.255.0
   Gateway Address: 192.168.1.1
   Msg Connection Timeout (x 1mS): 15000
   Msg Reply Timeout (x mS): 3000
   Inactivity Timeout (x Min): 30
   Bootp Enable: No
   Dhcp Enable Yes
   SNMP Enable: No
   HTTP Enable: Yes
   Auto Negotiate Enable: Yes
   Port Speed Enable: 10/100 Mbps Full Duplex/Half Duplex
   Contact:
   Location:

Program File List

Name	Number	Type	Rungs	Debug	Bytes
[SYSTEM]	0	SYS	0	No	0
	1	SYS	0	No	0
CONTINUOUS	2	LADDER	7	No	131
DRIVESERVO	3	LADDER	3	No	204
PID_SCHED	4	LADDER	7	No	153
SINE_SIMUL	5	LADDER	7	No	469

Data File List

Name	Number	Type	Scope	Debug	Words	Elements	Last
OUTPUT	0	O	Global	No	12	4	O:3
INPUT	1	I	Global	No	18	6	I:5
STATUS	2	S	Global	No	0	66	S:65
BINARY	3	B	Global	No	1	1	B3:0
TIMER	4	T	Global	No	3	1	T4:0
COUNTER	5	C	Global	No	3	1	C5:0
CONTROL	6	R	Global	No	3	1	R6:0
INTEGER	7	N	Global	No	30	30	N7:29
FLOAT	8	F	Global	No	8	4	F8:3
LONGS	9	L	Global	No	16	8	L9:7
	10	PD	Global	No	23	1	PD10:0

Ladder Table of Contents

Use simulated sine wave to drive measured value (N7:0), or not

ENABLE_SINE_WAVE

B3:0

0000 1

SIMULATE_SINE_WAVE

JSR

Jump To Subroutine

SBR File Number U:5

Scale mesaured process value to PID PV input

PID_PV

0001

SCP

Scale w/Parameters

Input N7:0 0<

Input Min. 0 0<

Input Max. 16383 16383<

Scaled Min. 0 0<

Scaled Max. 16383 16383<

Output N7:20 0<

Evaluate PID at loop update times

PID_SCHEDULING

0002

JSR

Jump To Subroutine

SBR File Number U:4

Scale PID CV output to pulse width (0-16383)

PWM_CV_0_TO_16K

0003

SCP
Scale w/Parameters
Input N7:21 0<
Input Min. 0 0<
Input Max. 16383 16383<
Scaled Min. 0 0<
Scaled Max. 16383 16383<
Output N7:1 0<

Scale pulse width (0-16383), using PWM output frequency and servo range, to duty cycle per thousand to set pulse width

PID_DRIVE_PWM_SERVO

0004

JSR
Jump To Subroutine
SBR File Number U:3

Run PWM, or not

ENABLE_SERVO
B3:0
0

0005

PWM
Pulse Width Modulation
PWM Number 0

0006

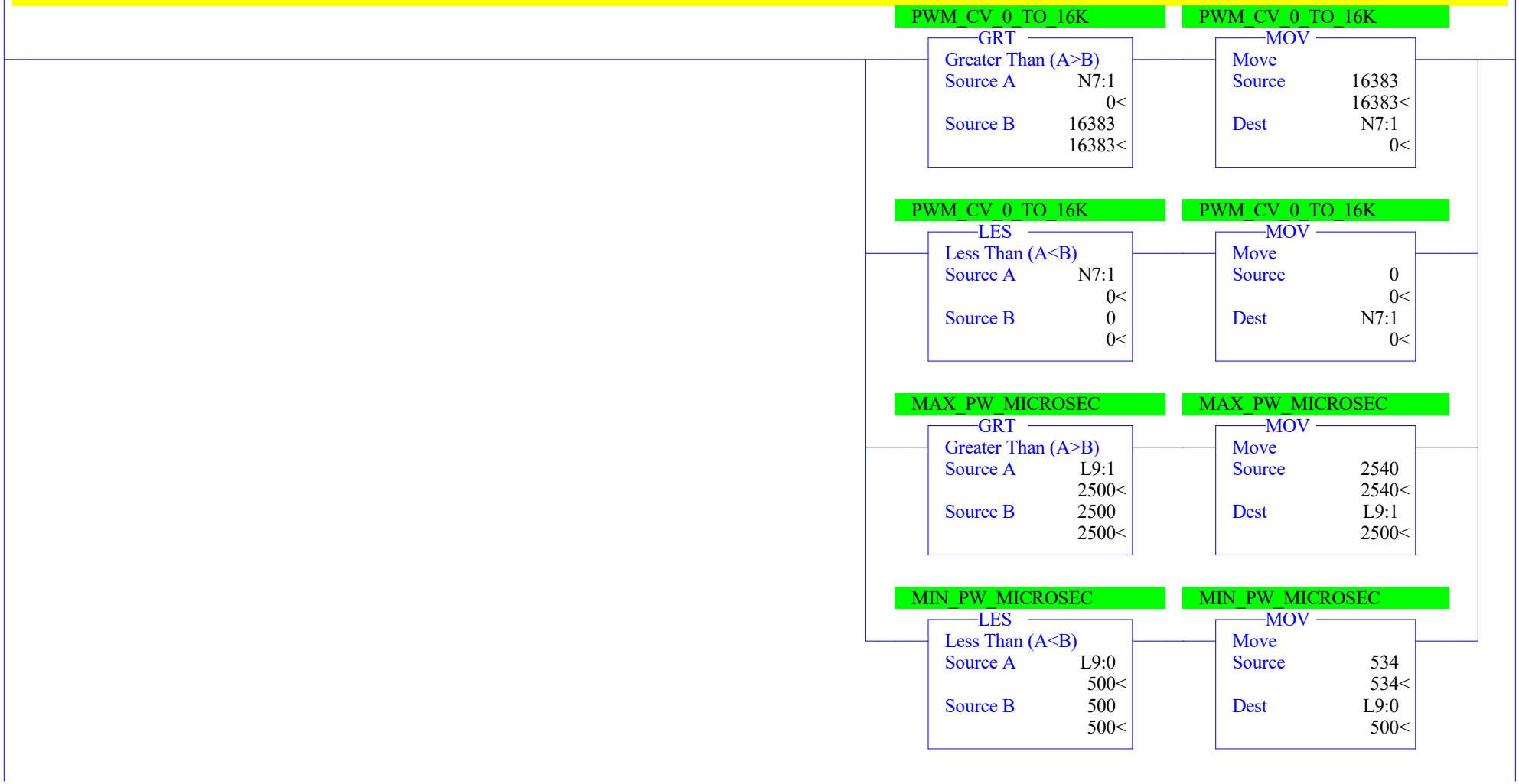
END

Scale 0-16k PID CV output to drive an "EMAX ES08 II Analog Servo" via PWM output

Details: see (END) rung below

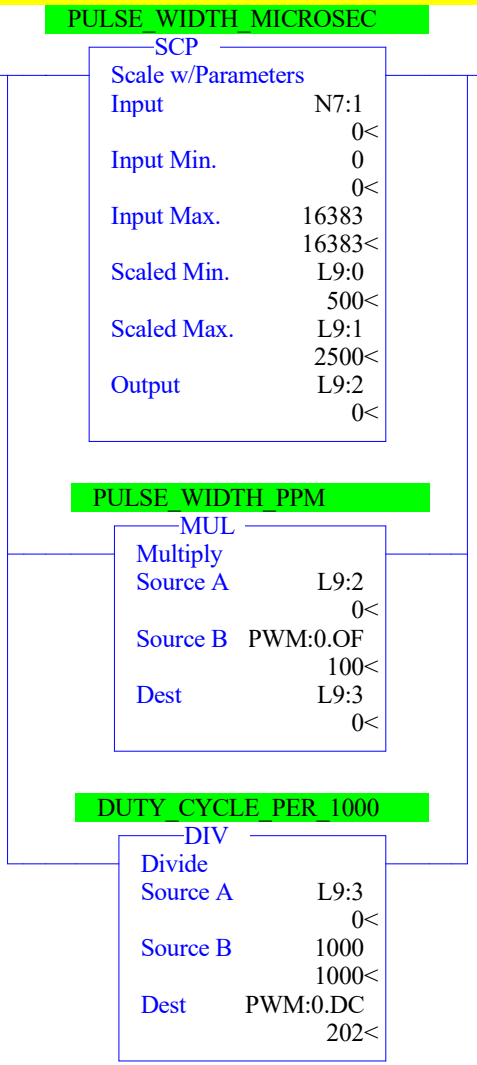
This first rung limits CV to 0-16383 range, and limits min and max pulse width to protect servo

0000



Scale CV to PWM per-thousand Duty Cycle (PWM:0.DC) value suitable for the current PWM output frequency (PWM:0.OF)

0001



0002

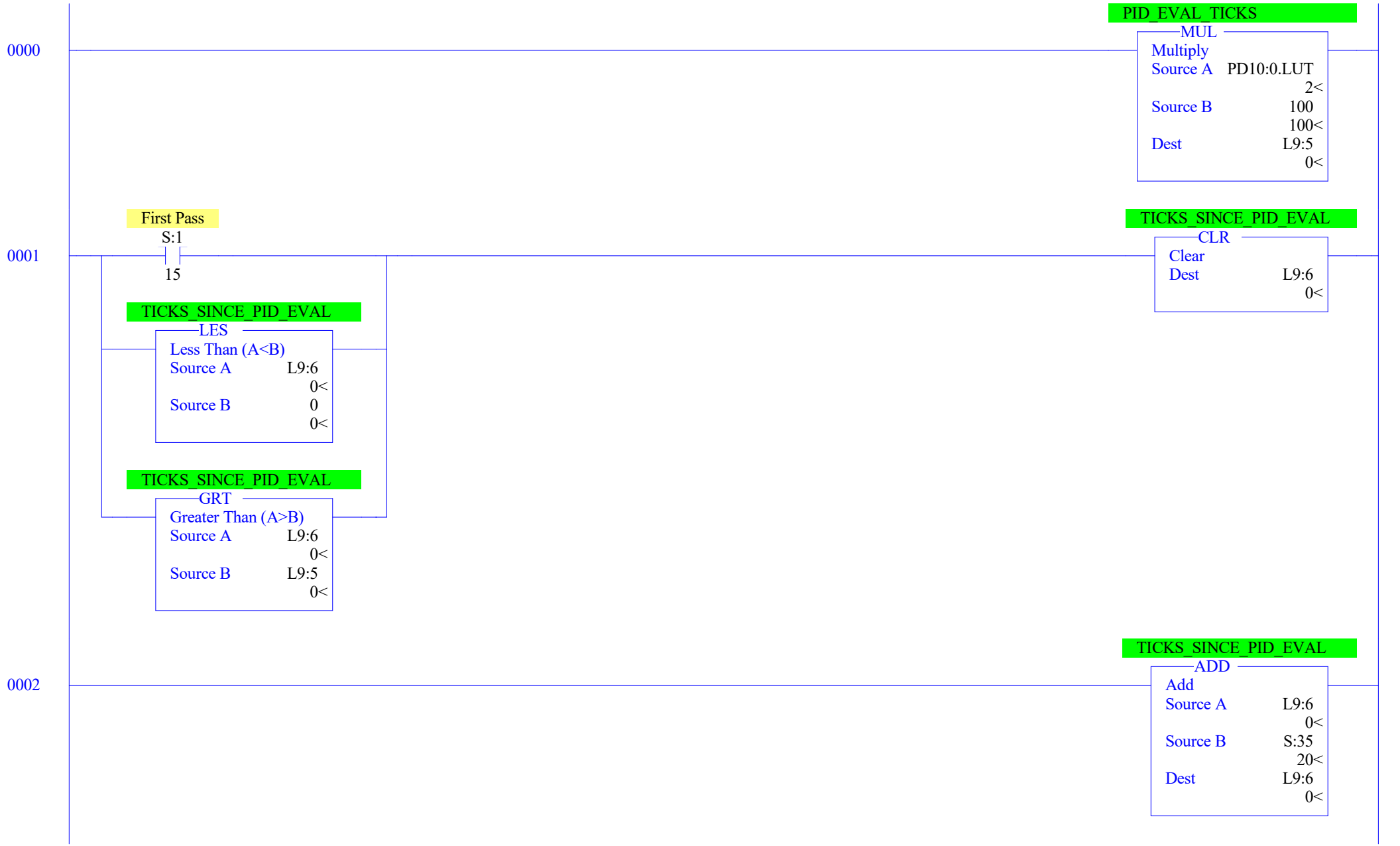
Takes 5V PWM signal at a frequency of 20-50Hz
- Pulse width determines servo position
  - 1ms pulse drives servo to nominal minimum i.e. counter-clockwise position (~0.5m is actual minimum)
  - 2ms pulse drives servo to nominal maximum i.e. clockwise positin (~2.5ms is actual maximum)

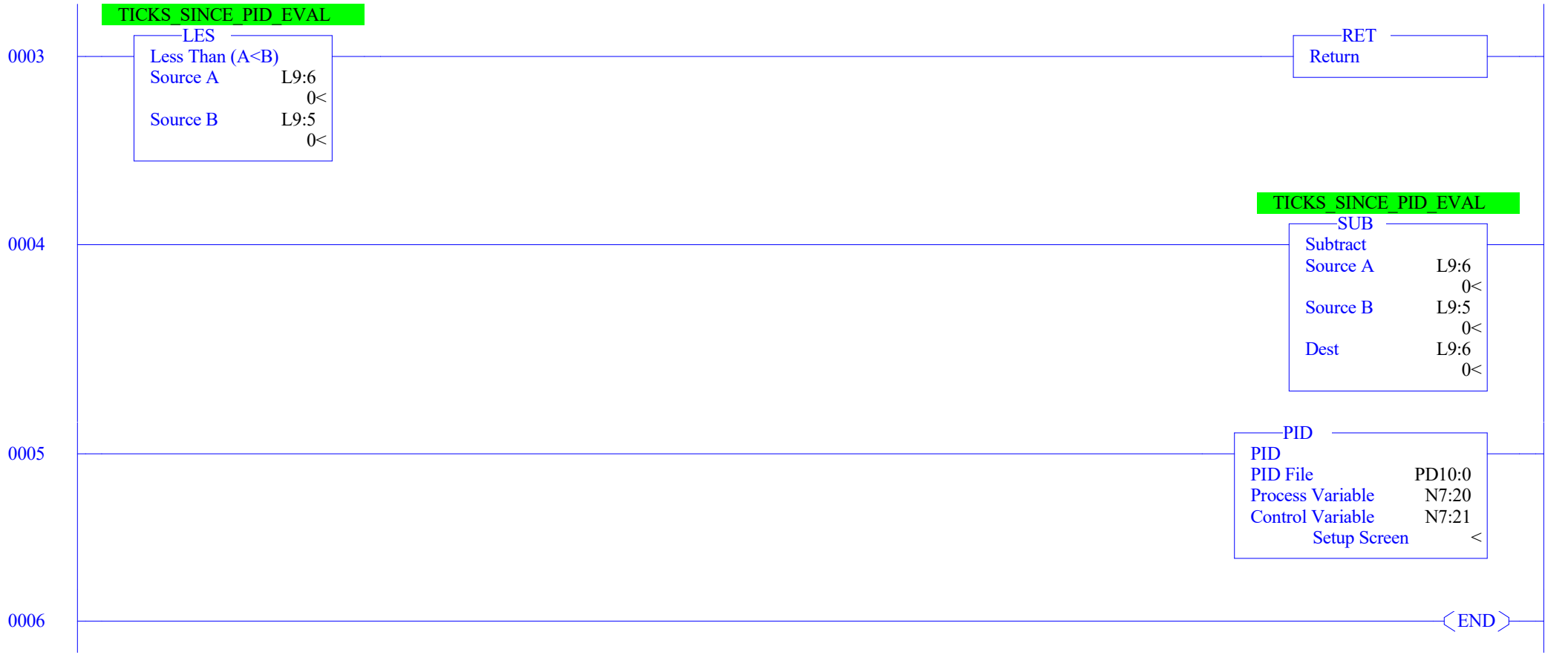
PWM:0 is configured for
- PWM:0.OUT = 2 - OUTput 2 (O:0.0/2)
- PWM:0.OF = 100 - pulses will be generated at Output Frequency of 100Hz

PWM:0.DC (Duty Cycle) will be controlled by the program
- .DC = 0/1000 => 0% duty cycle (always off)
- .DC = 1000/1000 => 100% duty cycle (always on)
- At PWM:0.OF Hz, one cycle is 1000/PWM:0.OF ms, so
  - .DC = PWM:0.OF would generate 1ms pulses (nominal minimum postion)
  - .DC = 2*PWM:0.OF would generate 2ms pulses (nominal maximum position)
  - .DC = k*PWM:0.OF would generate [k]ms pulses
  - .DC = u*PWM:0.OF/1000 would generate [u]microsecond pulses

Empirical range of Servo, PWM:0.OUT = 100Hz, 2023-04-25
- Low: servo is quiet at 535us pulse width (PWM0:DC=54/1000 @ 100Hz); servo hums at 534us pulse width (PWM0:DC=53/1000 @ 100Hz)
-High: servo is quiet at 2534us pulse width (PWM0:DC=253/1000 @ 100Hz); servo hums at 2535us pulse width (PWM0:DC=254/1000 @ 100Hz)

END


0000
PID_EVAL_TICKS
MUL
Multiply
Source A PD10:0.LUT
2<
Source B 100
100<
Dest L9:5
0<
0001
First Pass
S:1
15
TICKS_SINCE_PID_EVAL
LES
Less Than (A<B)
Source A L9:6
0<
Source B 0
0<
TICKS_SINCE_PID_EVAL
GRT
Greater Than (A>B)
Source A L9:6
0<
Source B L9:5
0<
TICKS_SINCE_PID_EVAL
CLR
Clear
Dest L9:6
0<
0002
TICKS_SINCE_PID_EVAL
ADD
Add
Source A L9:6
0<
Source B S:35
20<
Dest L9:6
0<


TICKS_SINCE_PID_EVAL
LES
Less Than (A<B)
Source A L9:6
0<
Source B L9:5
0<
0003
RET
Return
TICKS_SINCE_PID_EVAL
0004
SUB
Subtract
Source A L9:6
0<
Source B L9:5
0<
Dest L9:6
0<
0005
PID
PID
PID File PD10:0
Process Variable N7:20
Control Variable N7:21
Setup Screen <
0006
END

Generate a sine wave over time

Amplitude scaling: 0 when sine = -1.0; 8191.5 when sine = 0.0; 16383 when sine = +1.0
Time scaling: F8:3 = 10kHz Free-Running Clock ticks per Radian

==========

Scale the current value of the sine wave output N7:0 from 0-16383 to -1.0 to +1.0

0000

SINE_THETA
SUB
Subtract
Source A N7:0 0<
Source B 8191.5 8191.5<
Dest F8:0 0.0<

SINE_THETA
DIV
Divide
Source A F8:0 0.0<
Source B 8195.5 8195.5<
Dest F8:0 0.0<

If sine value is 1.0 or greater, then set cosine (=SQRT(1-sine*sine)) to 0.0 and invert the sine slope direction to negative

0001

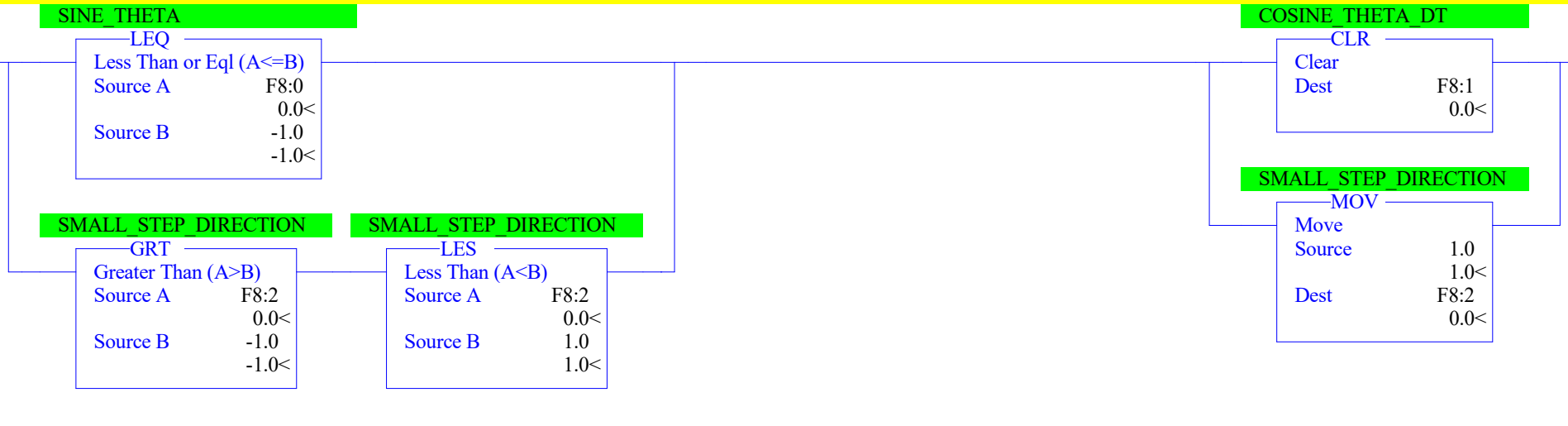
SINE_THETA
GEQ
Grtr Than or Eql (A>=B)
Source A F8:0 0.0<
Source B 1.0 1.0<

COSINE_THETA_DT
CLR
Clear
Dest F8:1 0.0<

SMALL_STEP_DIRECTION
MOV
Move
Source -1.0 -1.0<
Dest F8:2 0.0<

If sine value is -1.0 or less, or sine slope value is neither -1.0 nor +1.0, then set cosine to 0.0 and make (or invert) the sine slope direction to positive

0002



If sine is between -1.0 and +1.0 exclusive, then
1) Calculate cosine (=SQRT(1-sine*sine)) as sine slope (dSine/dt) magnitude.
2) Scale that magnitude by
2.1) BOTH time since last calculation,
2.2) AND for output range 0-16383
3) Correct that scaled magnitude for the current sine slope direction

0003

SINE_THETA

LES
Less Than (A<B)
Source A F8:0 0.0<
Source B 1.0 1.0<

SINE_THETA

GRT
Greater Than (A>B)
Source A F8:0 0.0<
Source B -1.0 -1.0<

COSINE_THETA_DT

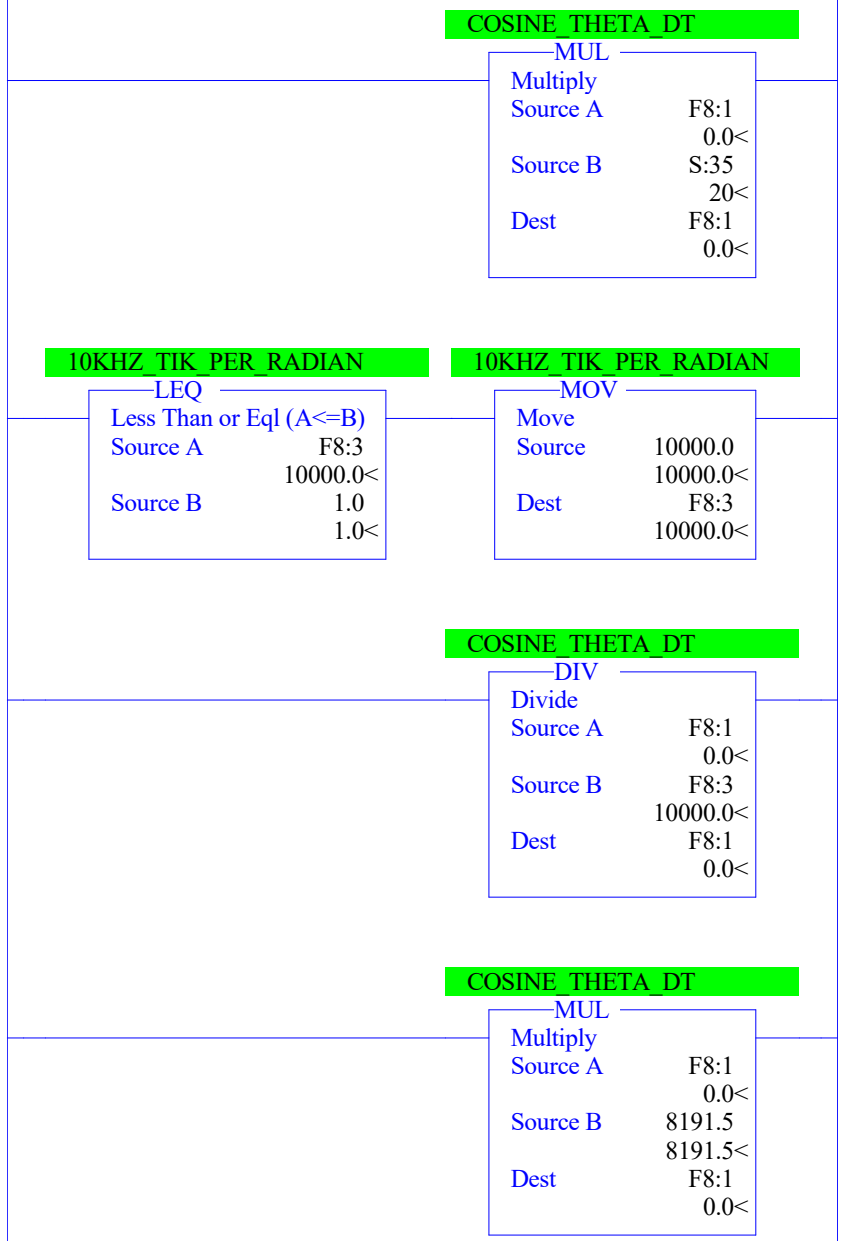
MUL
Multiply
Source A F8:0 0.0<
Source B F8:0 0.0<
Dest F8:1 0.0<

COSINE_THETA_DT

SUB
Subtract
Source A 1.0 1.0<
Source B F8:1 0.0<
Dest F8:1 0.0<

COSINE_THETA_DT

SQR
Square Root
Source F8:1 0.0<
Dest F8:1 0.0<


COSINE_THETA_DT
MUL
Multiply
Source A F8:1 0.0<
Source B S:35 20<
Dest F8:1 0.0<
10KHZ_TIK_PER_RADIAN
LEQ
Less Than or Eql (A<=B)
Source A F8:3 10000.0<
Source B 1.0 1.0<
10KHZ_TIK_PER_RADIAN
MOV
Move
Source 10000.0 10000.0<
Dest F8:3 10000.0<
COSINE_THETA_DT
DIV
Divide
Source A F8:1 0.0<
Source B F8:3 10000.0<
Dest F8:1 0.0<
COSINE_THETA_DT
MUL
Multiply
Source A F8:1 0.0<
Source B 8191.5 8191.5<
Dest F8:1 0.0<

SMALL_STEP_DIRECTION

LES
Less Than (A<B)
Source A F8:2 0.0<
Source B 0.0 0.0<

COSINE_THETA_DT

MUL
Multiply
Source A -1.0 -1.0<
Source B F8:1 0.0<
Dest F8:1 0.0<

Ensure the magnitude of the scaled cosine (change in sine) is not less than 1,
so the sine will move toward 0.0 (8191.5 scaled) from either -1.0 or +1.0 (0 or 16383 scaled)

0004

COSINE_THETA_DT

GRT
Greater Than (A>B)
Source A F8:1 0.0<
Source B F8:2 0.0<

SMALL_STEP_DIRECTION

LES
Less Than (A<B)
Source A F8:2 0.0<
Source B 0.0 0.0<

COSINE_THETA_DT

MOV
Move
Source F8:2 0.0<
Dest F8:1 0.0<

COSINE_THETA_DT

LES
Less Than (A<B)
Source A F8:1 0.0<
Source B F8:2 0.0<

SMALL_STEP_DIRECTION

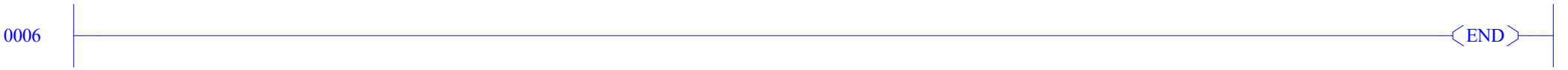
GRT
Greater Than (A>B)
Source A F8:2 0.0<
Source B 0.0 0.0<

Add the scaled change in sine to the output value N7:0

0005

MEASURED_VALUE

ADD
Add
Source A N7:0 0<
Source B F8:1 0.0<
Dest N7:0 0<


0006
END

Data File O0 (bin) -- OUTPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
O:0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
O:0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
O:0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
O:0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B

Data File I1 (bin) -- INPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
I:0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B
I:0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Bul.1763	MicroLogix 1100 Series B-Analog Inp 0
I:0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Bul.1763	MicroLogix 1100 Series B-Analog Inp 1

Data File S2 (hex) -- STATUS

Main

Processor Mode S:1/0 - S:1/4 = Remote Run
On Power up Go To Run (Mode Behavior) S:1/12 = 0
First Pass S:1/15 = No
Free Running Clock S:4 = 0011-1011-1110-0100

Proc

OS Catalog Number S:57 = 1100
OS Series S:58 = B
OS FRS S:59 =
Processor Catalog Number S:60 =
Processor Series S:61 = A
Processor FRN S:62 =
User Program Type S:63 = 8108h
Compiler Revision Number S:64 =

Scan Times

Maximum (x10 ms) S:22 = 52
Watchdog (x10 ms) S:3 (high byte) = 10
Last 100 uSec Scan Time S:35 = 20
Scan Toggle Bit S:33/9 = 1

Math

Math Overflow Selected S:2/14 = 0
Overflow Trap S:5/0 = 0
Carry S:0/0 = 0
Overflow S:0/1 = 0
Zero Bit S:0/2 = 0
Sign Bit S:0/3 = 0
Math Register (lo word) S:13 = 0
Math Register (high word) S:14-S:13 = 0
Math Register (32 Bit) S:14-S:13 = 0

Chan 0

Processor Mode S:1/0- S:1/4 = Remote Run
Node Address S:15 (low byte) = 0
Baud Rate S:15 (high byte) = ?
Channel Mode S:33/3 = 0
Comms Active S:33/4 = 0
Incoming Cmd Pending S:33/0 = 0
Msg Reply Pending S:33/1 = 0
Outgoing Msg Cmd Pending S:33/2 = 0

Debug

Suspend Code S:7 = 0
Suspend File S:8 = 0

Data File B3 (bin) -- BINARY

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Symbol) Description
B3:0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Data File T4 -- TIMER

Offset	EN	TT	DN	BASE	PRE	ACC	(Symbol)	Description
T4:0	0	0	0	.01 sec	0	0		

Data File C5 -- COUNTER

Offset	CU	CD	DN	OV	UN	UA	PRE	ACC	(Symbol)	Description
C5:0	0	0	0	0	0	0	50	0		

Data File R6 -- CONTROL

Offset	EN	EU	DN	EM	ER	UL	IN	FD	LEN	POS	(Symbol)	Description
R6:0	0	0	0	0	0	0	0	0	0	0		

Data File N7 (dec) -- INTEGER

Offset	0	1	2	3	4	5	6	7	8	9
N7:0	0	0	0	0	0	0	0	0	0	0
N7:10	0	0	0	0	0	0	0	0	0	0
N7:20	0	0	0	0	0	0	0	0	0	0

Data File F8 -- FLOAT

Offset	0	1	2	3	4
F8:0	0	0	0	10000	

Data File L9 (dec) -- LONGS

Offset	0	1	2	3	4
L9:0	500	2500	0	0	0
L9:5	0	0	0		

Data File PD10

Offset	TM	AM	CM	OL	RG	SC	TF	DA	DB	UL	LL	SP	PV	DN	EN	SPS	KC	Ti	TD	MAXS	MINS	ZCD	CVH	CVL	LUT	SPV	C
PD10:0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	8191	100	0	0	16383	0	0	100	0	2	16356	1