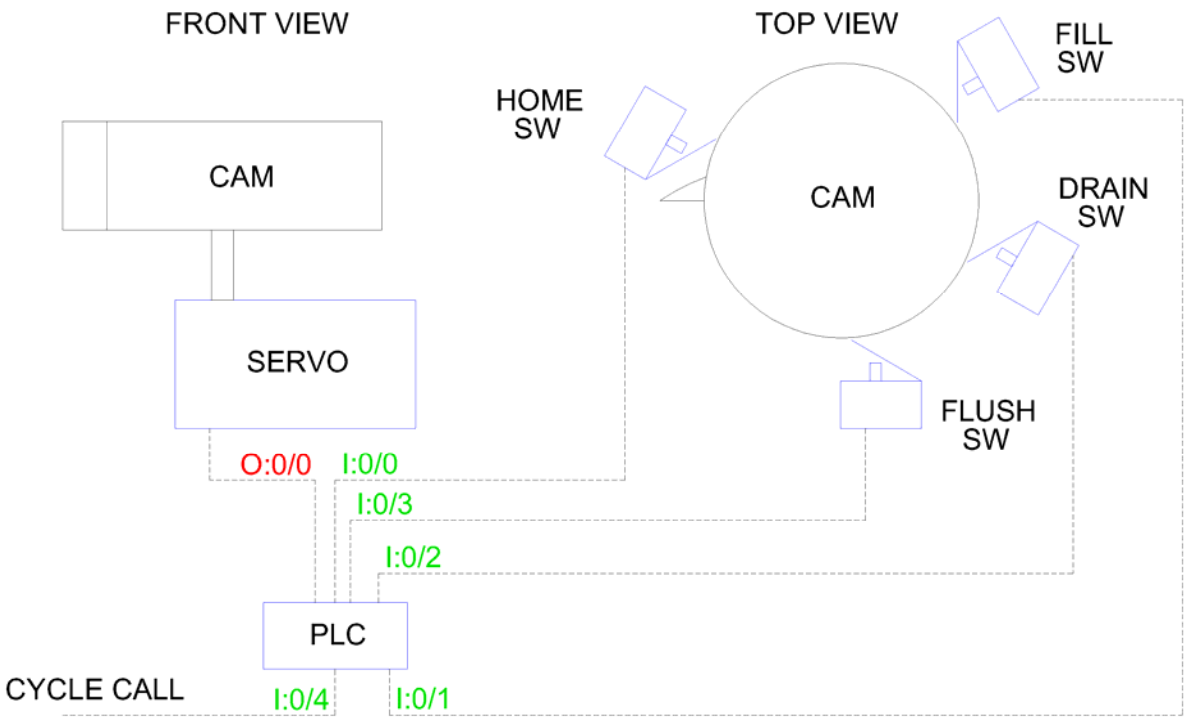
Project 4

PROCESS:



SUMMARY:

A modular water treatment system is being integrated into an existing system. When the host system calls for a cycle, our servo will cycle a control valve from the home position to fill for 10 seconds, then to drain for 20 seconds, then to flush for 10 seconds, and then back to home until the next call. The cam-operated microswitches tell us what position the valve is in.

BONUS TASK 1: If you really want to show off, create an integer N7:0 which reports the current position of the valve. The positions should be 0 = HOME, 1 = FILL, 2 = DRAIN, 3 = FLUSH and 4 = TRAVELLING (between positions).

BONUS TASK 2: Set up B3:0/0 as a reset / interrupt button which will abort the process and return the valve to the home position.

IO / ASSIGNED MEMORY:

I:0/0 - Home microswitch (closes when valve in home position)
I:0/1 - Fill microswitch (closes when valve in fill position)
I:0/2 - Drain microswitch (closes when valve in drain position)
I:0/3 - Flush microswitch (closes when valve in flush position)
I:0/4 - Cycle call (signal closes when host requires a cycle)
O:0/0 – Servo (energize to turn the cam thus changing valve position)

Bonus IO:
N7:0 – Valve position integer
B3:0/0 – Reset / cycle interrupt button

TEST CRITERIA:

To start, run your program on Emulate. The servo should energize immediately. If you did the bonus portion of this project, N7:0 should be equal to 4.

Next, force the fill microswitch on (closed). The servo should still remain energized looking for home, but N7:0 should now be 1.

Third, force the fill microswitch back off and the home microswitch on. Now the servo should deenergize and N7:0 should be set to 0.

Fourth, momentarily force I:0/4 on and then back off. The servo should energize once more, but N7:0 should still be 0.

Next step, force the home microswitch off. N7:0 should go to 4. Then force the fill microswitch on. N7:0 should be equal to 1 and the servo should deenergize FOR ONLY 10 SECONDS and then start back up automatically.

Now, force the fill microswitch off. N7:0 should go to 4. Then force the drain microswitch on. N7:0 should be equal to 2 and the servo should deenergize FOR ONLY 20 SECONDS and then start back up automatically.

Only one more mode to test. Force the drain microswitch off. N7:0 should go to 4. Then force the flush microswitch on. N7:0 should be equal to 3 and the servo should deenergize FOR ONLY 10 SECONDS and then start back up automatically.

Finally, force the flush microswitch off. N7:0 should go to 4. Then force the home microswitch on. N7:0 should be equal to 0 and the servo should deenergize and stay that way. SUCCESS!

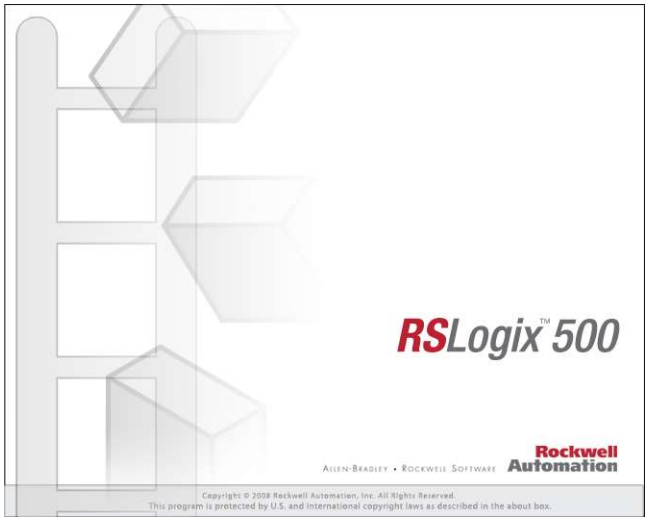
Bonus test: momentarily force I:0/4 on and then back off. The servo should energize, but N7:0 should still be 0. Then toggle B3:0/0 on and then back off. Next, force the home microswitch off and the fill microswitch on (closed). The servo should still remain energized looking for home, but N7:0 should now be 1. To wrap it up, force the fill microswitch off. N7:0 should go to 4. Then force the home microswitch on. N7:0 should be equal to 0 and the servo should deenergize and stay that way.

NOTES:

And there you have it – working with multi-position valves can be a real pain in the butt! So can managing cycles, and particularly when you write a robust program that takes into account all of the many things that can (and often do) go wrong. What if the system loses power in the middle of a cycle? What if I want to be able to manually send the valve to a particular position? What if we run multiple cycles that have different orders of positions or skip positions? What if our valve has a bi-directional servo that can turn either way?

Yes, PLC programmers really do have a sweet life. ☺

RSLogix Micro Project Report



Processor Information

Processor Type: Bul.1763 MicroLogix 1100 Series B

Processor Name: PROJ4

Total Memory Used: 210 Instruction Words Used - 51 Data Table Words Used

Total Memory Left: 6446 Instruction Words Left

Program Files: 6

Data Files: 9

Program ID: f92f

I/O Configuration

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

Channel Configuration

CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Edit Resource/Owner Timeout: 60
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Passthru Link ID: 1
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Write Protected: No
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Comms Servicing Selection: Yes
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Message Servicing Selection: Yes
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex 1st AWA Append Character: \d
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex 2nd AWA Append Character: \a

   Source ID: 1 (decimal)
   Baud: 19200
   Parity: NONE
   Control Line : No Handshaking
   Error Detection: CRC
   Embedded Responses: Auto Detect
   Duplicate Packet Detect: Yes
   ACK Timeout(x20 ms): 50
   NAK Retries: 3
   ENQ Retries: 3

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: 00:00:00:00:00:00
   IP Address: 0.0.0.0
   Subnet Mask: 0.0.0.0
   Gateway Address: 0.0.0.0
   Msg Connection Timeout (x 1mS): 15000
   Msg Reply Timeout (x mS): 3000
   Inactivity Timeout (x Min): 30
   Bootp Enable: Yes
   Dhcp Enable No
   SNMP Enable: No
   HTTP Enable: Yes
   Auto Negotiate Enable: Yes
   Port Speed Enable: 10/100 Mbps Full Duplex/Half Duplex
   Contact:
   Location:

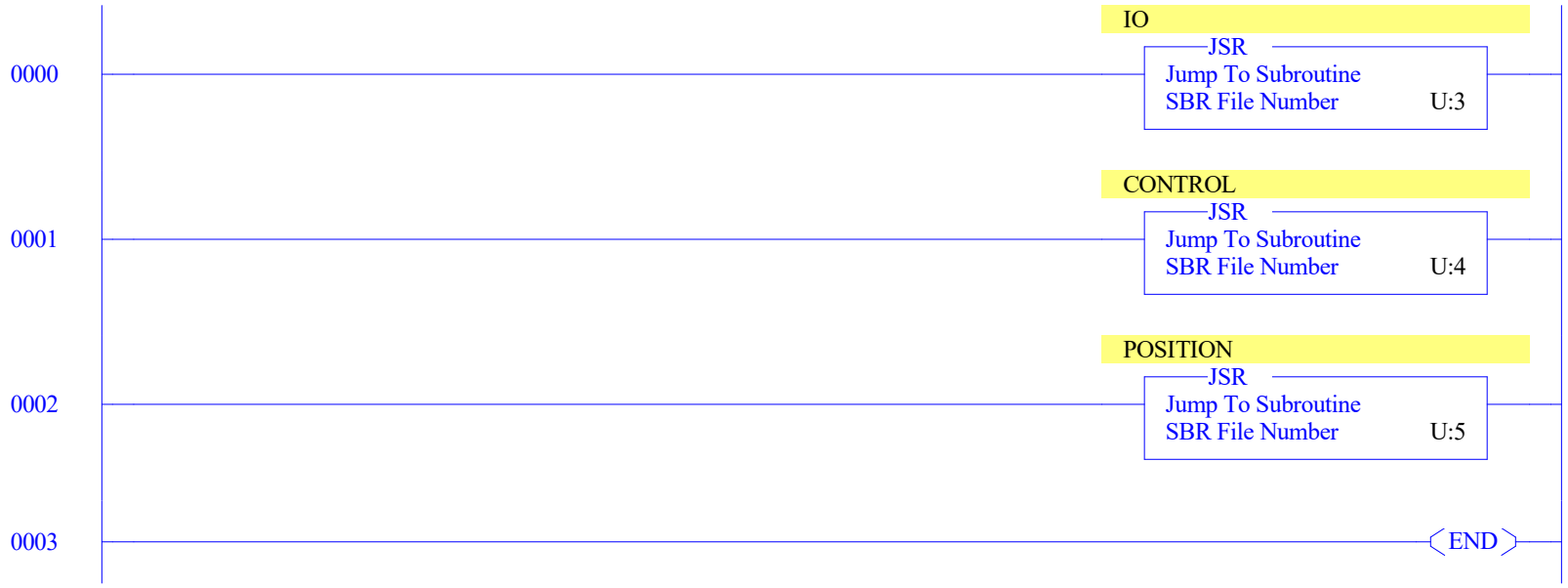
Program File List

Name	Number	Type	Rungs	Debug	Bytes
[SYSTEM]	0	SYS	0	No	0
	1	SYS	0	No	0
MAIN	2	LADDER	4	No	30
IO	3	LADDER	7	No	99
CONTROLS	4	LADDER	11	No	302
POSTION	5	LADDER	10	No	235

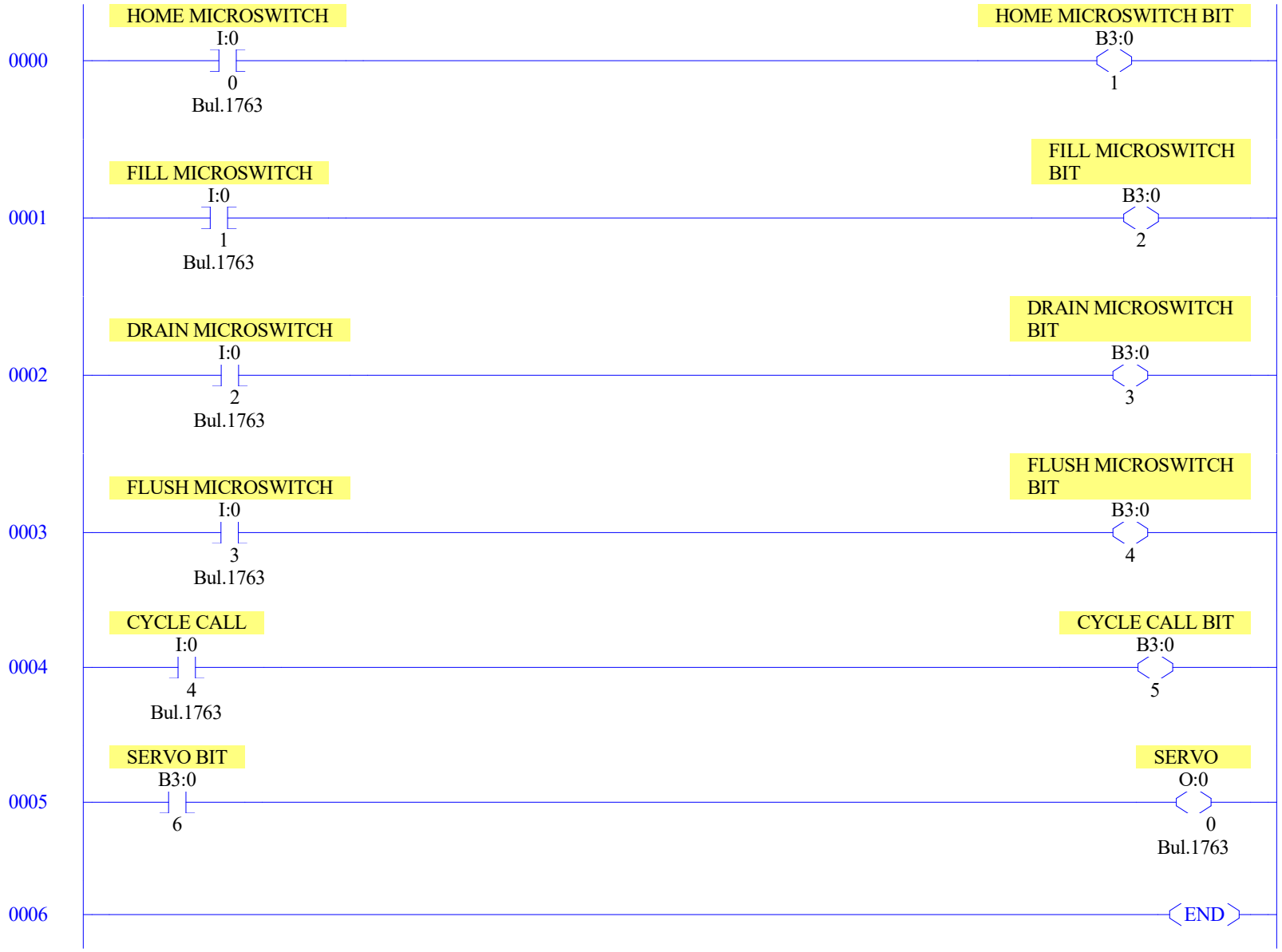
Data File List

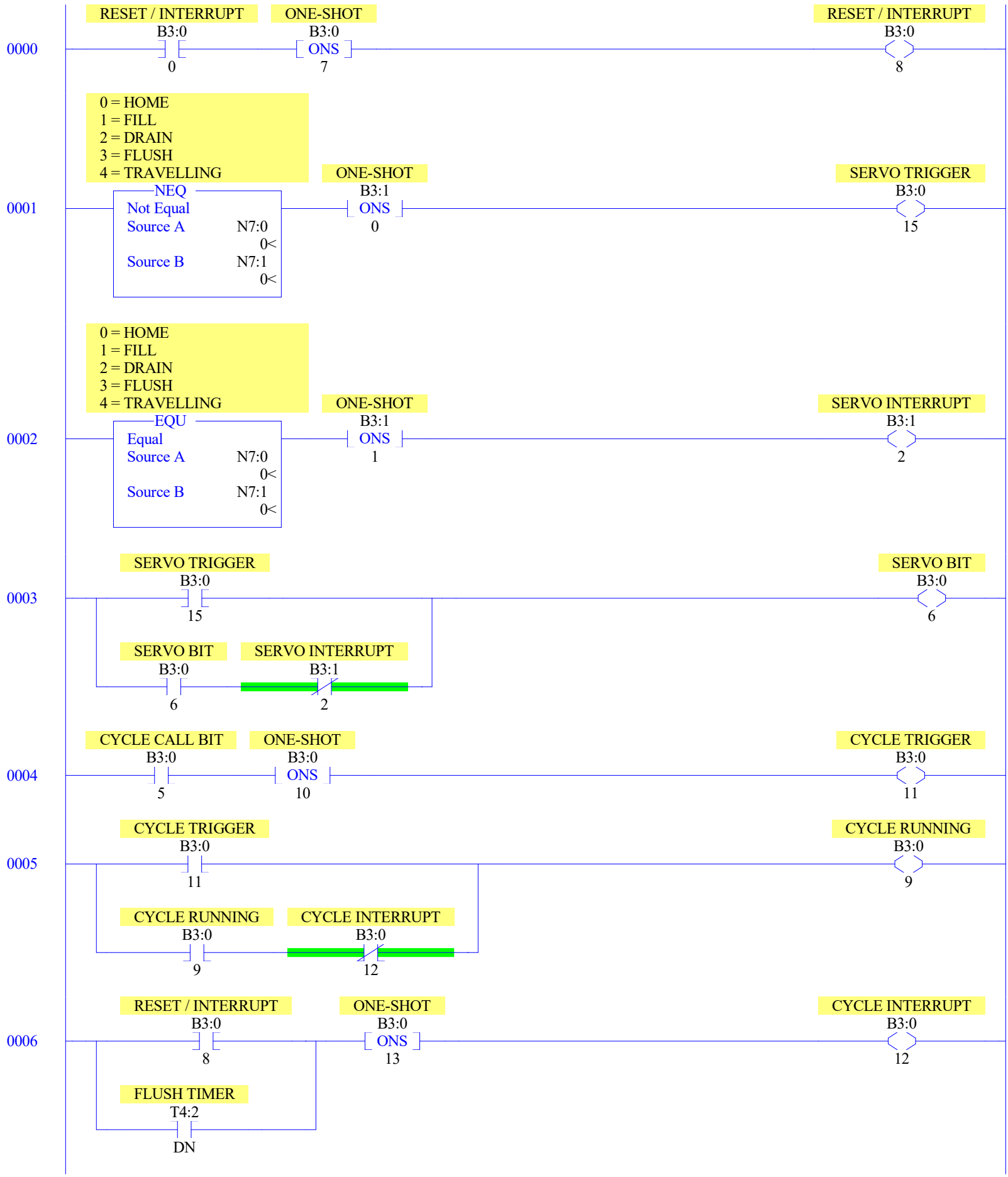
Name	Number	Type	Scope	Debug	Words	Elements	Last
OUTPUT	0	O	Global	No	12	4	O:3
INPUT	1	I	Global	No	18	6	I:5
STATUS	2	S	Global	No	0	66	S:65
BINARY	3	B	Global	No	2	2	B3:1
TIMER	4	T	Global	No	9	3	T4:2
COUNTER	5	C	Global	No	3	1	C5:0
CONTROL	6	R	Global	No	3	1	R6:0
INTEGER	7	N	Global	No	2	2	N7:1
FLOAT	8	F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

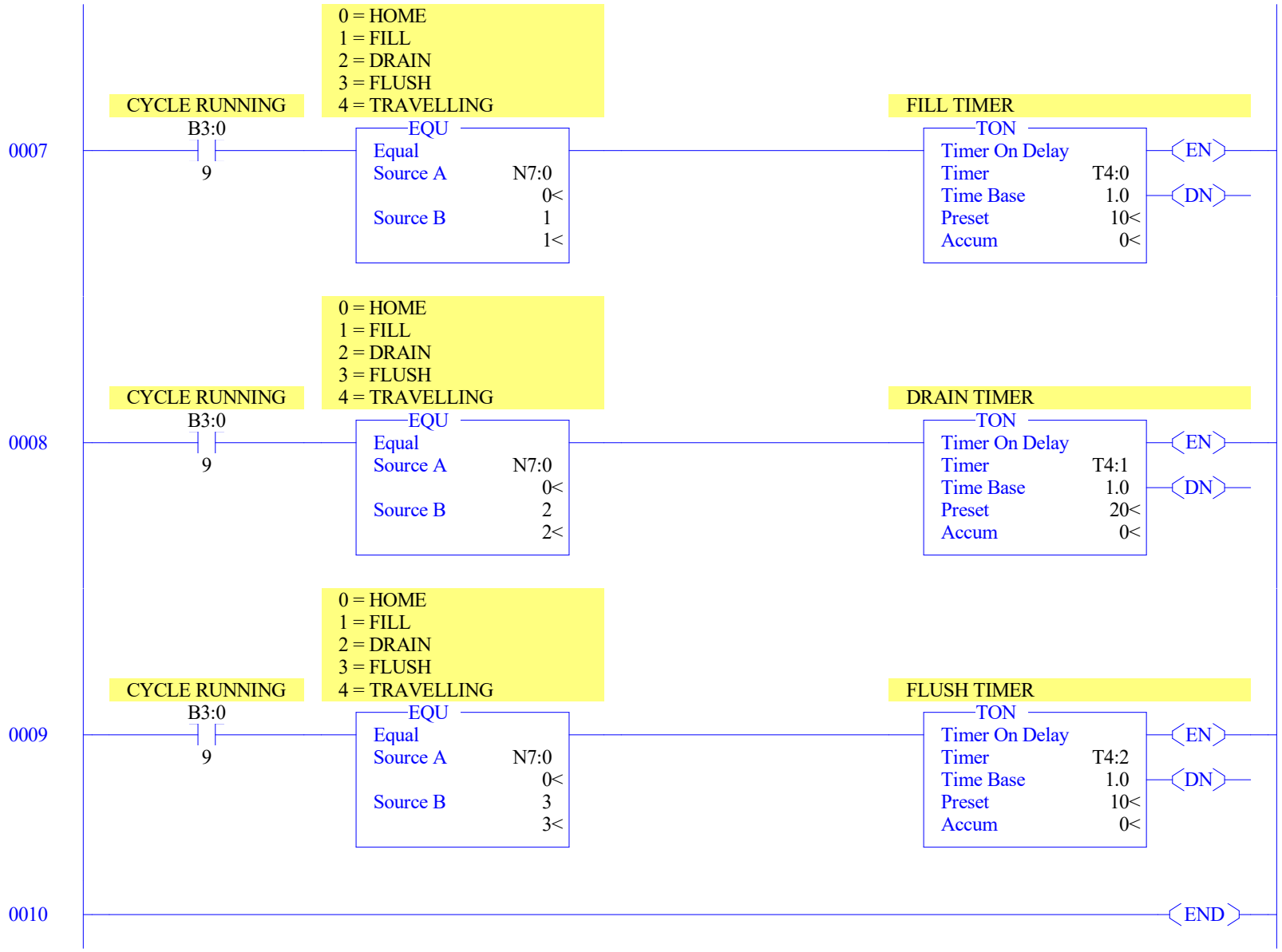
LAD 2 - MAIN --- Total Rungs in File = 4

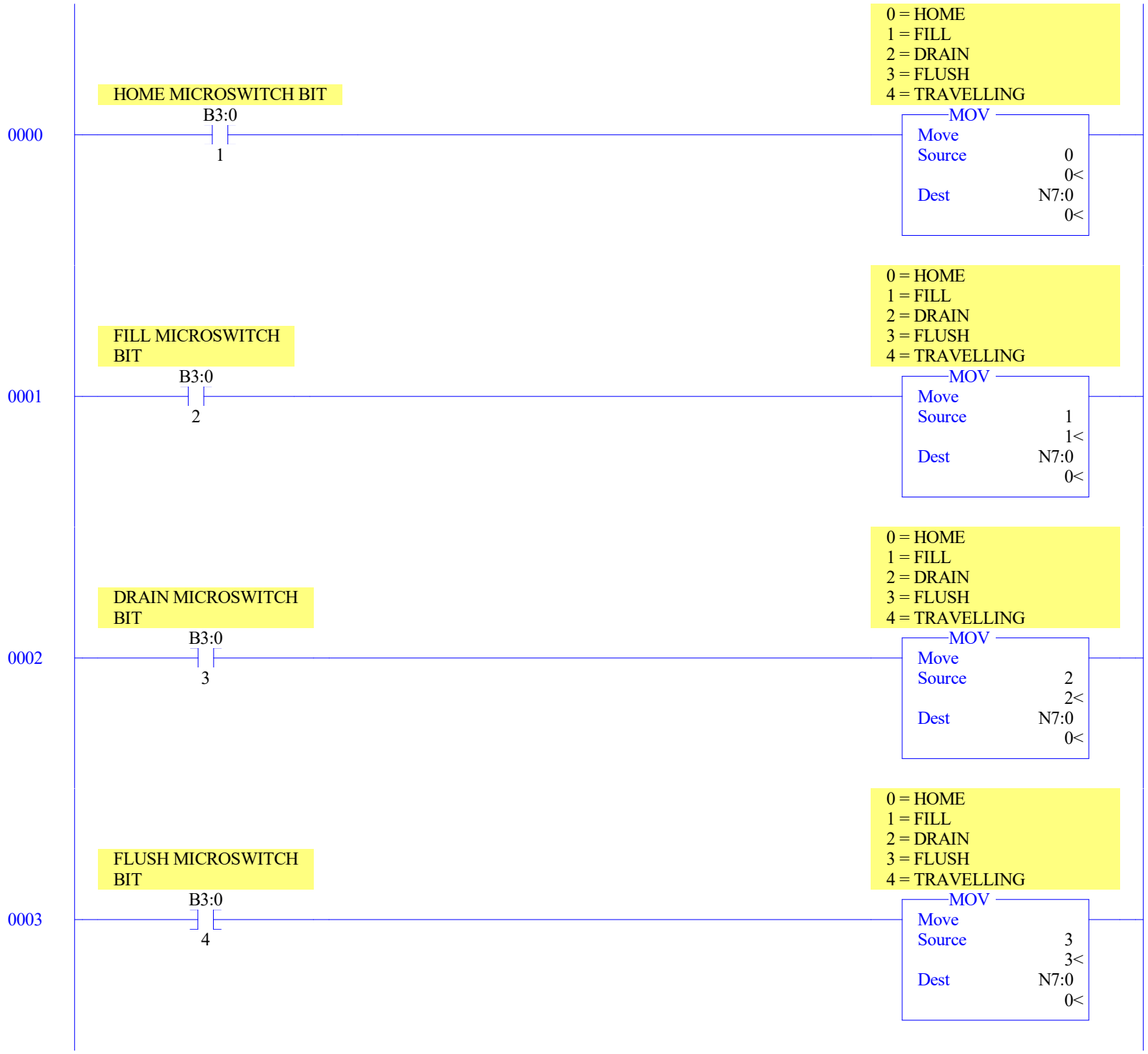


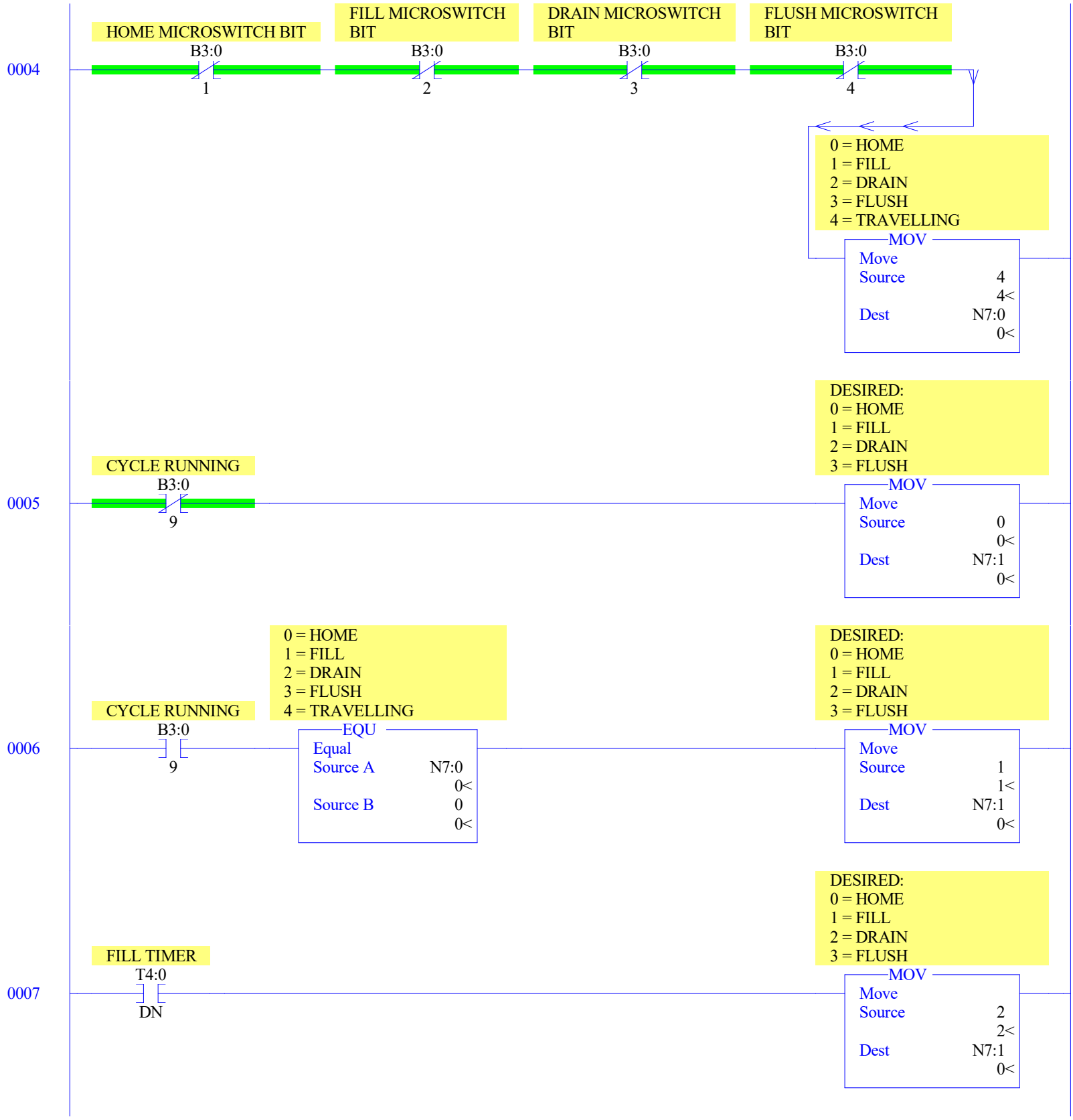
LAD 3 - IO --- Total Rungs in File = 7

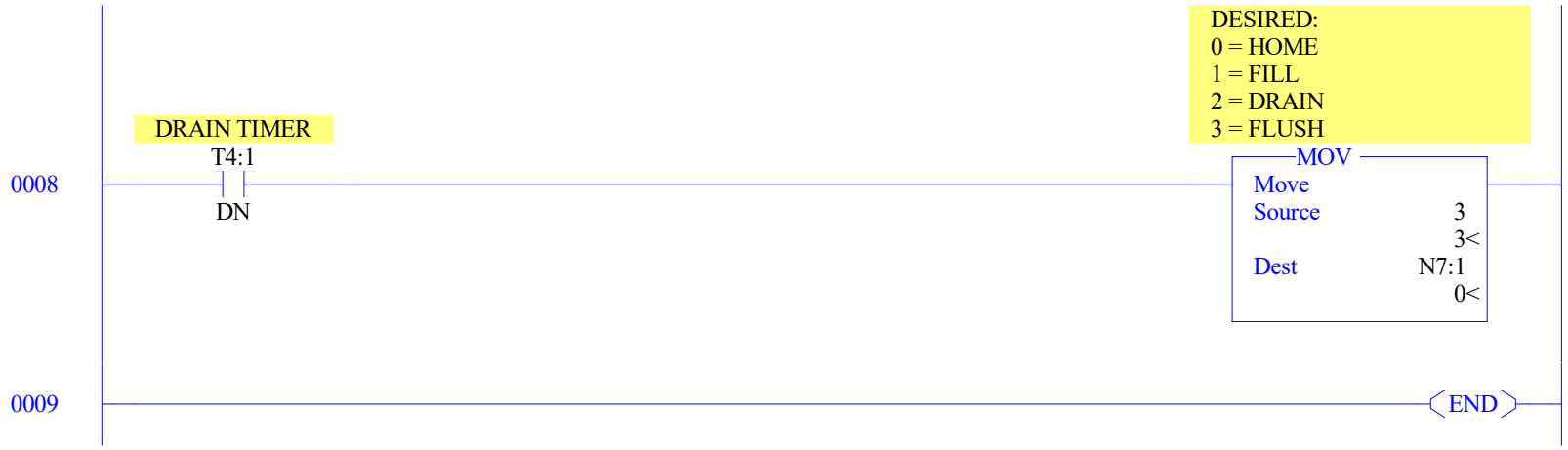



RESET / INTERRUPT
B3:0
0
ONE-SHOT
B3:0
ONS
7
RESET / INTERRUPT
B3:0
8
0000
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
NEQ
Not Equal
Source A N7:0
0<
Source B N7:1
0<
ONE-SHOT
B3:1
ONS
0
SERVO TRIGGER
B3:0
15
0001
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
EQU
Equal
Source A N7:0
0<
Source B N7:1
0<
ONE-SHOT
B3:1
ONS
1
SERVO INTERRUPT
B3:1
2
0002
SERVO TRIGGER
B3:0
15
SERVO BIT
B3:0
6
0003
SERVO BIT
B3:0
6
SERVO INTERRUPT
B3:1
2
CYCLE CALL BIT
B3:0
5
ONE-SHOT
B3:0
ONS
10
CYCLE TRIGGER
B3:0
11
0004
CYCLE TRIGGER
B3:0
11
CYCLE RUNNING
B3:0
9
0005
CYCLE RUNNING
B3:0
9
CYCLE INTERRUPT
B3:0
12
RESET / INTERRUPT
B3:0
8
ONE-SHOT
B3:0
ONS
13
CYCLE INTERRUPT
B3:0
12
0006
FLUSH TIMER
T4:2
DN


0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
CYCLE RUNNING
B3:0
9
0007
EQU
Equal
Source A N7:0
0<
Source B 1
1<
FILL TIMER
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 10<
Accum 0<
EN
DN
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
CYCLE RUNNING
B3:0
9
0008
EQU
Equal
Source A N7:0
0<
Source B 2
2<
DRAIN TIMER
TON
Timer On Delay
Timer T4:1
Time Base 1.0
Preset 20<
Accum 0<
EN
DN
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
CYCLE RUNNING
B3:0
9
0009
EQU
Equal
Source A N7:0
0<
Source B 3
3<
FLUSH TIMER
TON
Timer On Delay
Timer T4:2
Time Base 1.0
Preset 10<
Accum 0<
EN
DN
0010
END


0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
HOME MICROSWITCH BIT
B3:0
1
0000
MOV
Move
Source 0
0<
Dest N7:0
0<
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
FILL MICROSWITCH BIT
B3:0
2
0001
MOV
Move
Source 1
1<
Dest N7:0
0<
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
DRAIN MICROSWITCH BIT
B3:0
3
0002
MOV
Move
Source 2
2<
Dest N7:0
0<
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
FLUSH MICROSWITCH BIT
B3:0
4
0003
MOV
Move
Source 3
3<
Dest N7:0
0<


HOME MICROSWITCH BIT
B3:0
1
FILL MICROSWITCH BIT
B3:0
2
DRAIN MICROSWITCH BIT
B3:0
3
FLUSH MICROSWITCH BIT
B3:0
4
0004
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
MOV
Move
Source 4
4<
Dest N7:0
0<
DESIRED:
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
CYCLE RUNNING
B3:0
9
0005
MOV
Move
Source 0
0<
Dest N7:1
0<
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
4 = TRAVELLING
DESIRED:
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
CYCLE RUNNING
B3:0
9
0006
EQU
Equal
Source A N7:0
0<
Source B 0
0<
MOV
Move
Source 1
1<
Dest N7:1
0<
DESIRED:
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
FILL TIMER
T4:0
DN
0007
MOV
Move
Source 2
2<
Dest N7:1
0<


DESIRED:
0 = HOME
1 = FILL
2 = DRAIN
3 = FLUSH
DRAIN TIMER
T4:1
DN
0008
MOV
Move
Source
3
3<
Dest
N7:1
0<
0009
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	0	0	0	Bul.1763	MicroLogix 1100 Series B-Analog
I:0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Series B-Analog

Data File S2 (hex) -- STATUS

Main

Processor Mode S:1/0 - S:1/4 = Remote Program Mode
On Power up Go To Run (Mode Behavior) S:1/12 = 0
First Pass S:1/15 = No
Free Running Clock S:4 = 0000-0000-0000-0000

Proc

OS Catalog Number S:57 = 1100
OS Series S:58 = A
OS FRS S:59 =
Processor Catalog Number S:60 =
Processor Series S:61 = A
Processor FRN S:62 =
User Program Type S:63 = 8001h
Compiler Revision Number S:64 =

Scan Times

Maximum (x10 ms) S:22 = 0
Watchdog (x10 ms) S:3 (high byte) = 10
Last 100 uSec Scan Time S:35 = 0
Scan Toggle Bit S:33/9 = 0

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 Program Mode
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

Errors

Fault Override At Power Up S:1/8 = 0
Startup Protection Fault S:1/9 = 0
Major Error Halt S:1/13 = 0
Overflow Trap S:5/0 = 0
Control Register Error S:5/2 = 0
Major Error Executing User Fault Rtn. S:5/3 = 0
Battery Low S:5/11 = 0
Input Filter Selection Modified S:5/13 = 0
ASCII String Manipulation error S:5/15 = 0
Fault Routine S:29 = 0
Major Error S:6 = 0h
Error Description:

Protection

Deny Future Access S:1/14 = No
Data File Overwrite Protection Lost S:36/10 = False

Mem Module

Memory Module Loaded On Boot S:5/8 = 0
Password Mismatch S:5/9 = 0
Load Memory Module On Memory Error S:1/10 = 0
Load Memory Module Always S:1/11 = 0
On Power up Go To Run (Mode Behavior) S:1/12 = 0
Program Compare S:2/9 = 0
Data File Overwrite Protection Lost S:36/10 = 0

Forces

Forces Enabled S:1/5 = Yes
Forces Installed S:1/6 = No

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	
B3:1	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	1.0 sec	10	0	FILL TIMER
T4:1	0	0	0	1.0 sec	20	0	DRAIN TIMER
T4:2	0	0	0	1.0 sec	10	0	FLUSH TIMER

Data File C5 -- COUNTER

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

Data File F8 -- FLOAT

Offset	0	1	2	3	4
F8:0	0				

Address/Symbol Database

Address	Symbol	Scope	Description	Sym Group	Dev. Code	ABV
B3:0/0			RESET / INTERRUPT			
B3:0/1			HOME MICROSWITCH BIT			
B3:0/2			FILL MICROSWITCH BIT			
B3:0/3			DRAIN MICROSWITCH BIT			
B3:0/4			FLUSH MICROSWITCH BIT			
B3:0/5			CYCLE CALL BIT			
B3:0/6			SERVO BIT			
B3:0/7			ONE-SHOT			
B3:0/8			RESET / INTERRUPT			
B3:0/9			CYCLE RUNNING			
B3:0/10			ONE-SHOT			
B3:0/11			CYCLE TRIGGER			
B3:0/12			CYCLE INTERRUPT			
B3:0/13			ONE-SHOT			
B3:0/14			CYCLE COMPLETE			
B3:0/15			SERVO TRIGGER			
B3:1/0			ONE-SHOT			
B3:1/1			ONE-SHOT			
B3:1/2			SERVO INTERRUPT			
I:0/0			HOME MICROSWITCH			
I:0/1			FILL MICROSWITCH			
I:0/2			DRAIN MICROSWITCH			
I:0/3			FLUSH MICROSWITCH			
I:0/4			CYCLE CALL			
N7:0			0 = HOME 1 = FILL 2 = DRAIN 3 = FLUSH 4 = TRAVELLING			
N7:1			DESIRED: 0 = HOME 1 = FILL 2 = DRAIN 3 = FLUSH			
O:0/0			SERVO			
S:0			Arithmetic Flags			
S:0/0			Processor Arithmetic Carry Flag			
S:0/1			Processor Arithmetic Underflow/ Overflow Flag			
S:0/2			Processor Arithmetic Zero Flag			
S:0/3			Processor Arithmetic Sign Flag			
S:1			Processor Mode Status/ Control			
S:1/0			Processor Mode Bit 0			
S:1/1			Processor Mode Bit 1			
S:1/2			Processor Mode Bit 2			
S:1/3			Processor Mode Bit 3			
S:1/4			Processor Mode Bit 4			
S:1/5			Forces Enabled			
S:1/6			Forces Present			
S:1/7			Comms Active			
S:1/8			Fault Override at Powerup			
S:1/9			Startup Protection Fault			
S:1/10			Load Memory Module on Memory Error			
S:1/11			Load Memory Module Always			
S:1/12			Load Memory Module and RUN			
S:1/13			Major Error Halted			
S:1/14			Access Denied			
S:1/15			First Pass			
S:2/0			STI Pending			
S:2/1			STI Enabled			
S:2/2			STI Executing			
S:2/3			Index Addressing File Range			
S:2/4			Saved with Debug Single Step			
S:2/5			DH-485 Incoming Command Pending			
S:2/6			DH-485 Message Reply Pending			
S:2/7			DH-485 Outgoing Message Command Pending			
S:2/15			Comms Servicing Selection			
S:3			Current Scan Time/ Watchdog Scan Time			
S:4			Time Base			
S:5/0			Overflow Trap			
S:5/2			Control Register Error			
S:5/3			Major Err Detected Executing UserFault Routine			
S:5/4			M0-M1 Referenced on Disabled Slot			
S:5/8			Memory Module Boot			
S:5/9			Memory Module Password Mismatch			
S:5/10			STI Overflow			
S:5/11			Battery Low			
S:6			Major Error Fault Code			
S:7			Suspend Code			
S:8			Suspend File			
S:9			Active Nodes			
S:10			Active Nodes			
S:11			I/O Slot Enables			
S:12			I/O Slot Enables			
S:13			Math Register			
S:14			Math Register			
S:15			Node Address/ Baud Rate			
S:16			Debug Single Step Rung			
S:17			Debug Single Step File			
S:18			Debug Single Step Breakpoint Rung			
S:19			Debug Single Step Breakpoint File			
S:20			Debug Fault/ Powerdown Rung			
S:21			Debug Fault/ Powerdown File			

Address/Symbol Database

Address	Symbol	Scope	Description	Sym Group	Dev. Code	ABV
S:22			Maximum Observed Scan Time			
S:23			Average Scan Time			
S:24			Index Register			
S:25			I/O Interrupt Pending			
S:26			I/O Interrupt Pending			
S:27			I/O Interrupt Enabled			
S:28			I/O Interrupt Enabled			
S:29			User Fault Routine File Number			
S:30			STI Setpoint			
S:31			STI File Number			
S:32			I/O Interrupt Executing			
S:33			Extended Proc Status Control Word			
S:33/0			Incoming Command Pending			
S:33/1			Message Reply Pending			
S:33/2			Outgoing Message Command Pending			
S:33/3			Selection Status User/DF1			
S:33/4			Communicat Active			
S:33/5			Communicat Servicing Selection			
S:33/6			Message Servicing Selection Channel 0			
S:33/7			Message Servicing Selection Channel 1			
S:33/8			Interrupt Latency Control Flag			
S:33/9			Scan Toggle Flag			
S:33/10			Discrete Input Interrupt Reconfigur Flag			
S:33/11			Online Edit Status			
S:33/12			Online Edit Status			
S:33/13			Scan Time Timebase Selection			
S:33/14			DTR Control Bit			
S:33/15			DTR Force Bit			
S:34			Pass-thru Disabled			
S:34/0			Pass-Thru Disabled Flag			
S:34/1			DH+ Active Node Table Enable Flag			
S:34/2			Floating Point Math Flag Disable,Fl			
S:35			Last 1 ms Scan Time			
S:36			Extended Minor Error Bits			
S:36/8			DII Lost			
S:36/9			STI Lost			
S:36/10			Memory Module Data File Overwrite Protection			
S:37			Clock Calendar Year			
S:38			Clock Calendar Month			
S:39			Clock Calendar Day			
S:40			Clock Calendar Hours			
S:41			Clock Calendar Minutes			
S:42			Clock Calendar Seconds			
S:43			STI Interrupt Time			
S:44			I/O Event Interrupt Time			
S:45			DII Interrupt Time			
S:46			Discrete Input Interrupt- File Number			
S:47			Discrete Input Interrupt- Slot Number			
S:48			Discrete Input Interrupt- Bit Mask			
S:49			Discrete Input Interrupt- Compare Value			
S:50			Processor Catalog Number			
S:51			Discrete Input Interrupt- Return Number			
S:52			Discrete Input Interrupt- Accumulat			
S:53			Reserved/ Clock Calendar Day of the Week			
S:55			Last DII Scan Time			
S:56			Maximum Observed DII Scan Time			
S:57			Operating System Catalog Number			
S:58			Operating System Series			
S:59			Operating System FRN			
S:61			Processor Series			
S:62			Processor Revision			
S:63			User Program Type			
S:64			User Program Functional Index			
S:65			User RAM Size			
S:66			Flash EEPROM Size			
S:67			Channel 0 Active Nodes			
S:68			Channel 0 Active Nodes			
S:69			Channel 0 Active Nodes			
S:70			Channel 0 Active Nodes			
S:71			Channel 0 Active Nodes			
S:72			Channel 0 Active Nodes			
S:73			Channel 0 Active Nodes			
S:74			Channel 0 Active Nodes			
S:75			Channel 0 Active Nodes			
S:76			Channel 0 Active Nodes			
S:77			Channel 0 Active Nodes			
S:78			Channel 0 Active Nodes			
S:79			Channel 0 Active Nodes			
S:80			Channel 0 Active Nodes			
S:81			Channel 0 Active Nodes			
S:82			Channel 0 Active Nodes			
S:83			DH+ Active Nodes			
S:84			DH+ Active Nodes			
S:85			DH+ Active Nodes			

Address/Symbol Database

Address	Symbol	Scope	Description	Sym Group	Dev. Code	ABV
S:86			DH+ Active Nodes			
T4:0			FILL TIMER			
T4:0/DN						
T4:1			DRAIN TIMER			
T4:1/DN						
T4:2			FLUSH TIMER			
U:3			IO			
U:4			CONTROL			
U:5			POSITION			

Instruction Comment Database

Address	Instruction	Description

Symbol Group Database

Group_Name	Description