Burr Puzzle Machine
Operation and Maintinance

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Engr 480
Manufacturing
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ENGR 480

Memo

To: Professor Ralph Stirling

From: Jeff Bahnmiller, David Helbley, and Andy Bryson.

Date: 6/10/2005

Re: Operation and Maintenance of the Burr Puzzle Machine

Introduction

This memo details the proper operation and maintenance of the burr puzzle machine. It will help the user to properly produce quality puzzles. This documentation also includes the wiring layout, ladder logic, state diagrams, and routine operating procedure. This should give the user ample qualifications to properly run the burr puzzle machine.

Burr Puzzle Criterion

1. Raw material: hardwood blocks (species including maple, walnut, and cherry, possibly others materials) of nominal dimension 0.75 x 0.75 x 2.25 inches, +/- 0.003 (95%).

2. Machine must cut one, two, three, or four notches 0.375 inches in width and depth on a single or double face. This will be accomplished with a computer controlled slide. The operation of the slide will be outlined in detail in the appendix of this memo.

3. The blocks are to be delivered to the cutting mechanism via a conveyor belt, and leave in the same manner it arrived. It will be able to cut any side of the block that is desired by the user.

4. The burr puzzle machine will be retrofitted with a dust collection device with a 4" inch port. This connection is fully adjustable.

5. An emergency shutoff switch is in plain view that will safely and quickly turns off power to all moving pieces of the machine.

General Startup Procedure

1. Make sure all components of the puzzle-manufacturing machine have power. This is very important because component of the machine will collide and cause damage.

2. Once the machine has power turn the conveyor belts on to full speed.

3. Open PLC-DL06 computer editor, write and save the ladder logic to the PLC

4. With the emergency shutoff still triggered, turn the PLC to run mode. This will allow the computer controlled slide to calibrate without the being pushed about. This is an extremely important step; it would also be advisable to disconnect the quick release air ram that controls the movement of the

router. If this action is taken make sure to leave the router bit just behind the main clamp (see appendix for diagram).

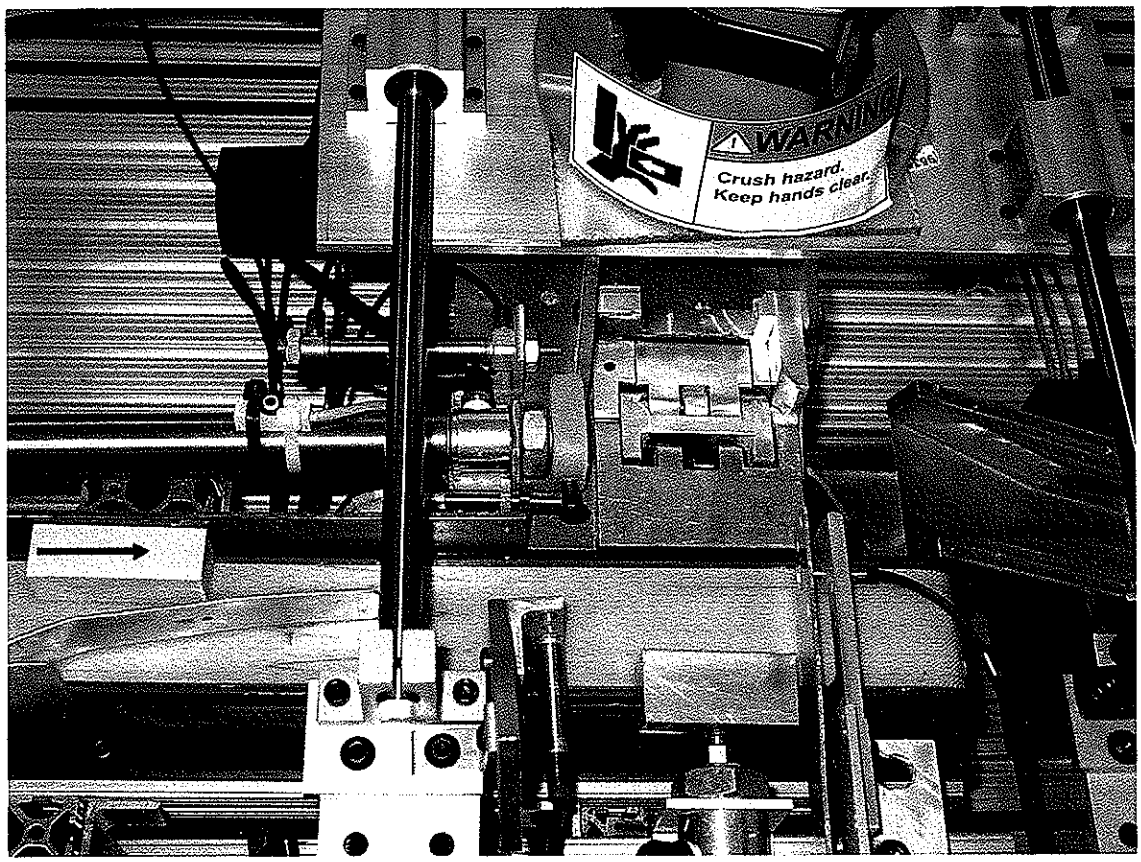
5. Once the slide has calibrated the emergency shutoff can be turned off. This will bring the puzzle-cutting machine to operational status. Make sure block flow path is clear of all debris.

6. The puzzle-cutting machine is ready to cut blocks, load the wood blanks on the conveyer as desired. Changing the cut path of the router is detailed in the appendix.

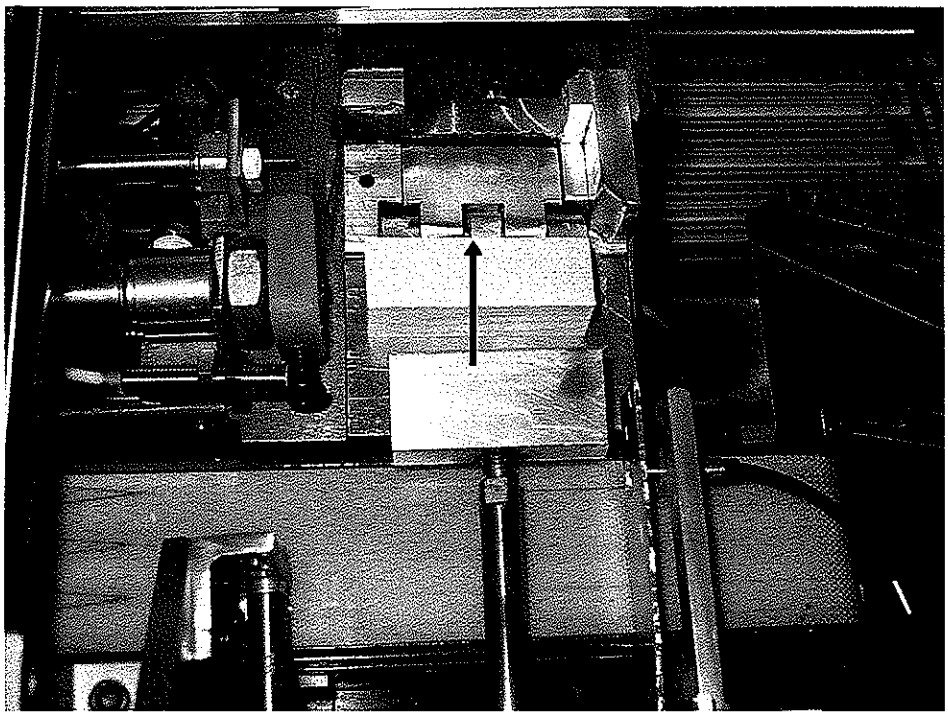
Block Flow

The following explanations and illustrations of the path the block takes through the puzzle cutting machine will help the user understand the functionality of the machine help in understanding the programming logic that this machine uses. This will also help in troubleshooting.

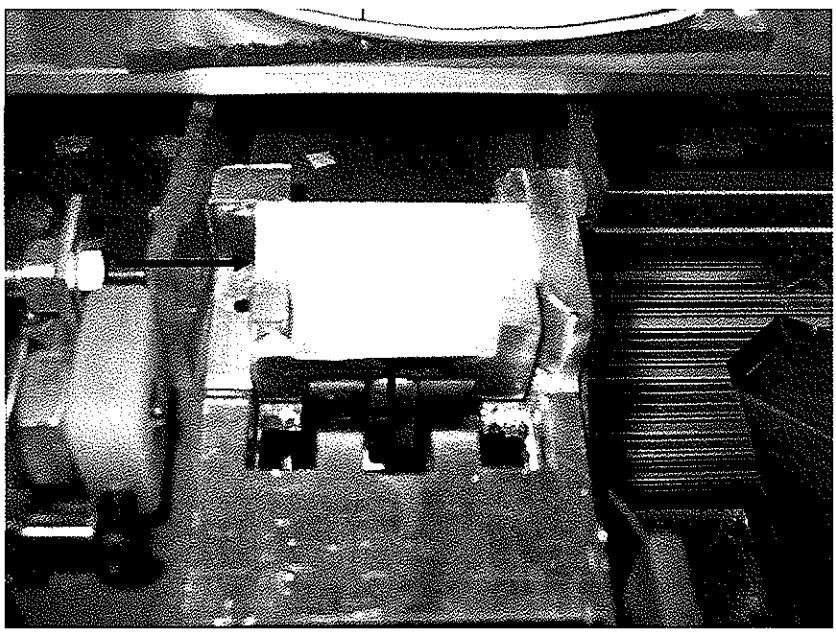
1. Loading the machine -- place the desired blocks on the conveyor to load the machine. The conveyor will handle multiple blocks simultaneously.



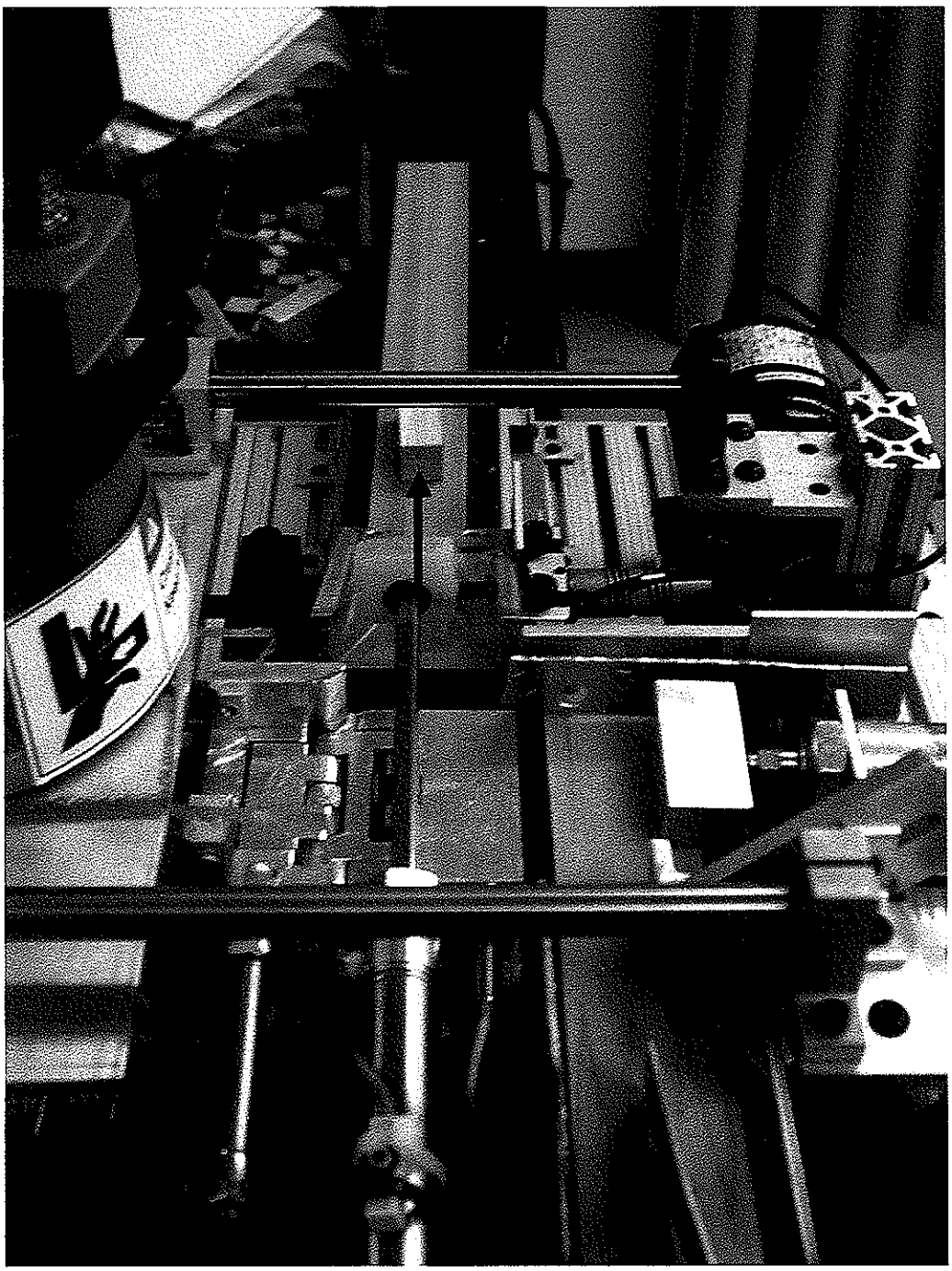
2. Loading the Main Clamp - Once the blanks are place on the conveyor the machine does the rest. The first block will pass through the gate and the sensor will trigger the plunger and the block will be pushed towards the main clamp.



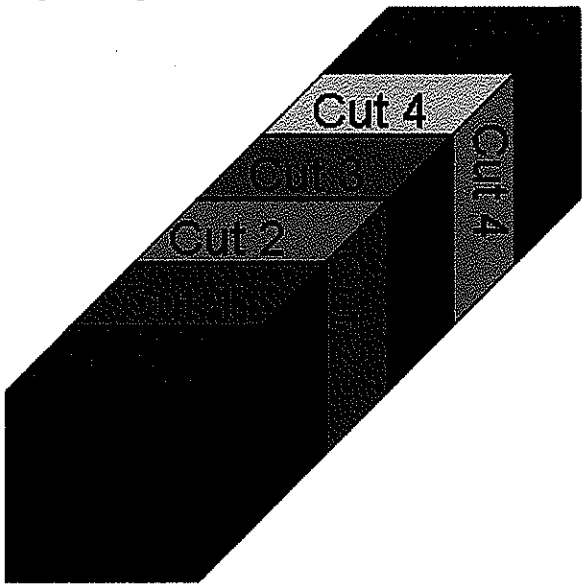
3. Cutting – Once in the main clamp the blank will be aligned by the small pneumatic cylinder and clamped. After it is clamped the router will make several passed before the block is flipped and cut on the other side.



4. Ejection – Once the puzzle piece has been cut the flipping mechanism will flip the block one more time and the last pneumatic cylinder will push the block down the slide to the exit conveyor.



Programming the Cut Paths



Figure

The puzzle piece cutter has the capability of cutting any combination of slots from either side 1 or side2. To ensure the machine is properly programmed for a particular burr puzzle it is essential to understand how to enter the cut paths into the DirectSOFT32 software.

1. Ensure the PLC is turned on, the programming cable is properly connected, and the PLC is in Terminal mode.

2. Open the DirectSOFT32 software application.

3. Open the memory editor by either accessing it from the menu or pressing CTRL+Y.

4. Find memory location v1200. This should be labeled B1S1 representing Block 1, Side 1. The memory locations for the second side start a v1210 but should be visible when v1200 is searched for.

5. The memory location is in 16 bit binary. A 1 represents a cut and a 0 represents no cut. Figure 1 shows the layout of the block. The last bit in the series of binary digits corresponds to CUT 1, the second to last CUT 2, and so on. If, for example, the machine should cut, CUT 1 and CUT 3, the binary patter would look like 0000000000000101.

6. Once all the side 1 and side2 memory locations are properly set exit the memory editor.

Two Burr Puzzle Programs

The burr-puzzle cutting machine comes with two distinct programs for the convenience of the customer. The first 1 side program is faster and cuts the blocks from a single side. However, if the customer is experiencing excessive blowout of the block resulting in mis-calibration of the cut, it is recommended to load the 2 side program. It will cut into the block from both sides at the most critical areas to minimize the effects of blowout.

Resetting The Machine

In the even the machine jams or has to be reset because of the emergency stop button was pressed it is vitally important to the machine that the following procedure be completed.

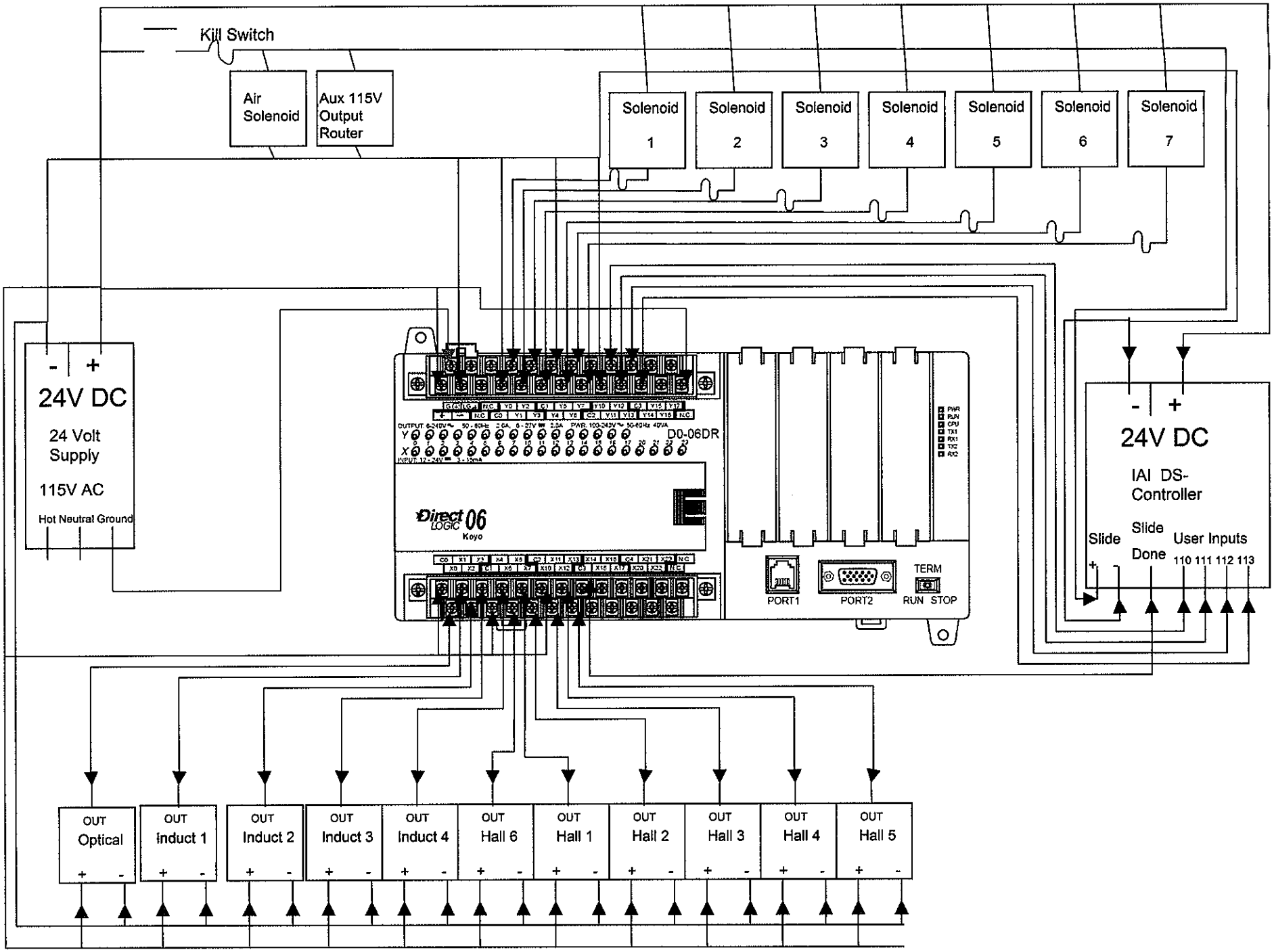
1. Switch the PLC from run mode to stop mode
2. Reset the emergency stop switch.
3. Wait for the IAI slide to recalibrate itself.
4. Only after the IAI slide has stopped moving switch the PLC into run mode.
5. Reset is completed.

System Highlights

1. Clearing the machine of block jams is easy with the quick release mechanism on the back of the router.
2. Compact system allows for fast and efficient cutting of the blocks.
3. Multiple programs for the users convenience.
4. Cutting bit is not exposed to fingers because it is well enclosed.
5. Block in held very well allowing for good cut to be made with the proper bit.
6. Block cut alignment adjustment is made simple with the slide program outlined above.
7. Optimum router path to prevent blowout.

Possible Improvements

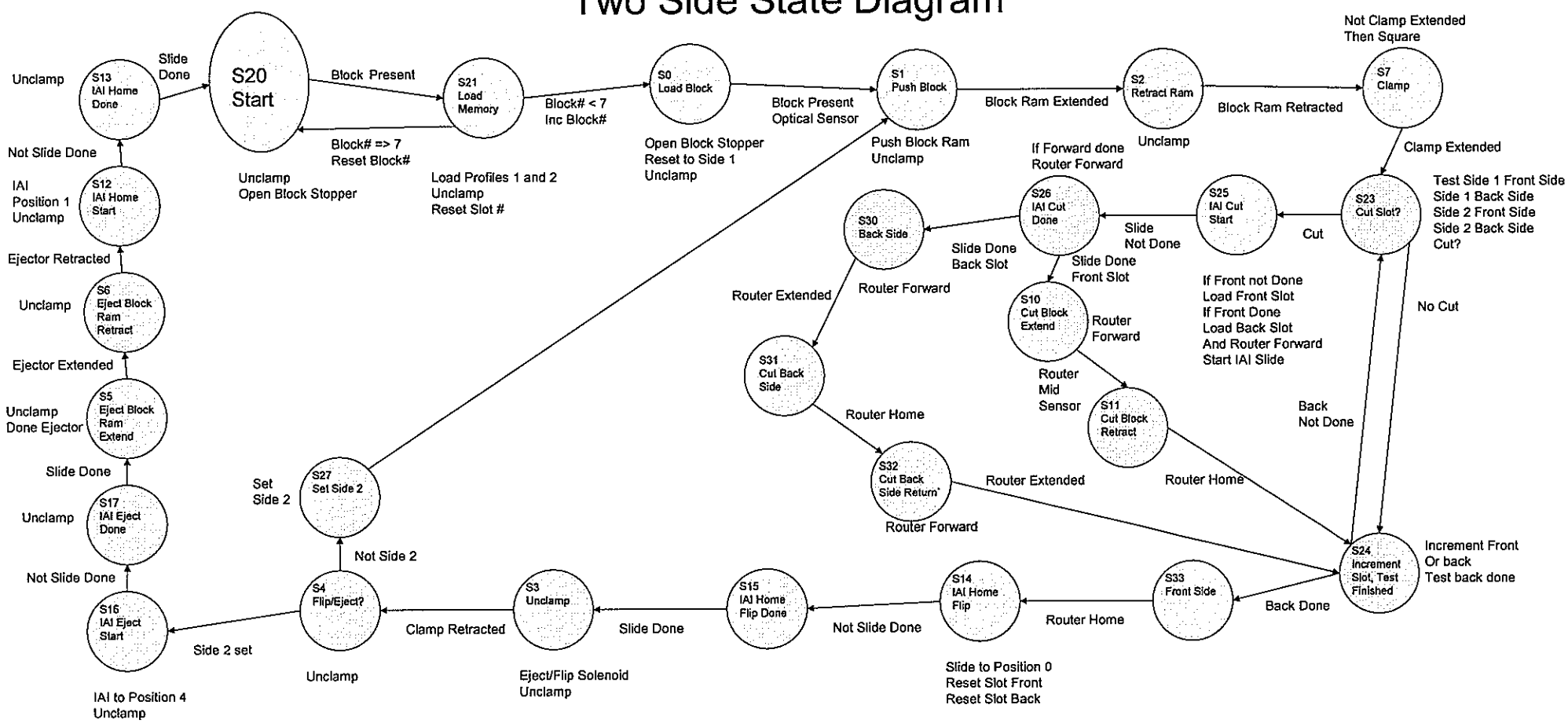
1. Modification to the dust collection device.
2. A Hopper would allow more efficient block flow through the system.

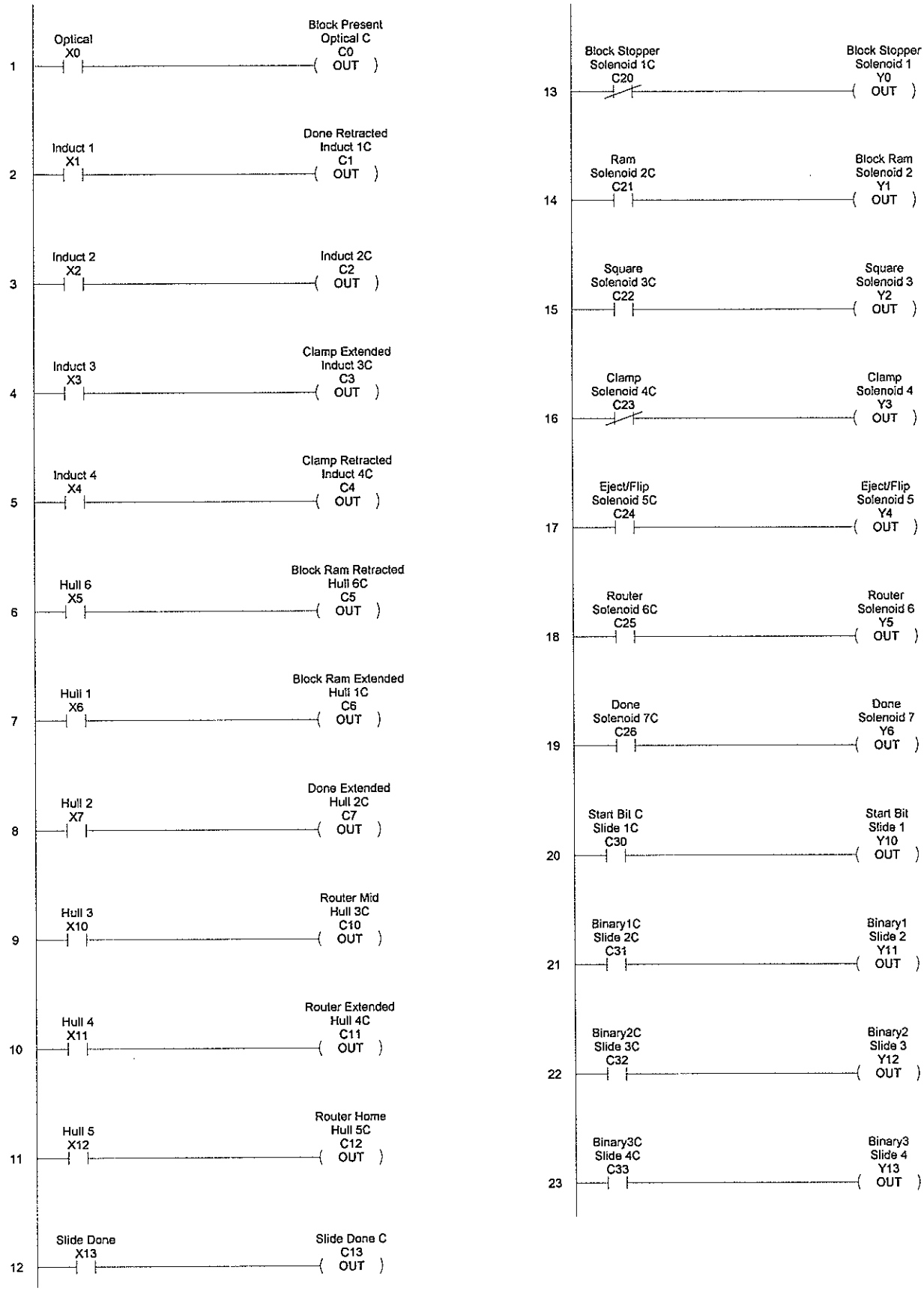

Kill Switch
Air Solenoid
Aux 115V Output Router
Solenoid 1
Solenoid 2
Solenoid 3
Solenoid 4
Solenoid 5
Solenoid 6
Solenoid 7
- +
24V DC
24 Volt Supply
115V AC
Hot Neutral Ground
D0-06DR
Direct LOGIC 06
Koyo
PORT1
PORT2
TERM
RUN STOP
- +
24V DC
IAI DS-Controller
Slide +
Slide Done
User Inputs
110 111 112 113
OUT Optical
OUT Induct 1
OUT Induct 2
OUT Induct 3
OUT Induct 4
OUT Hall 6
OUT Hall 1
OUT Hall 2
OUT Hall 3
OUT Hall 4
OUT Hall 5

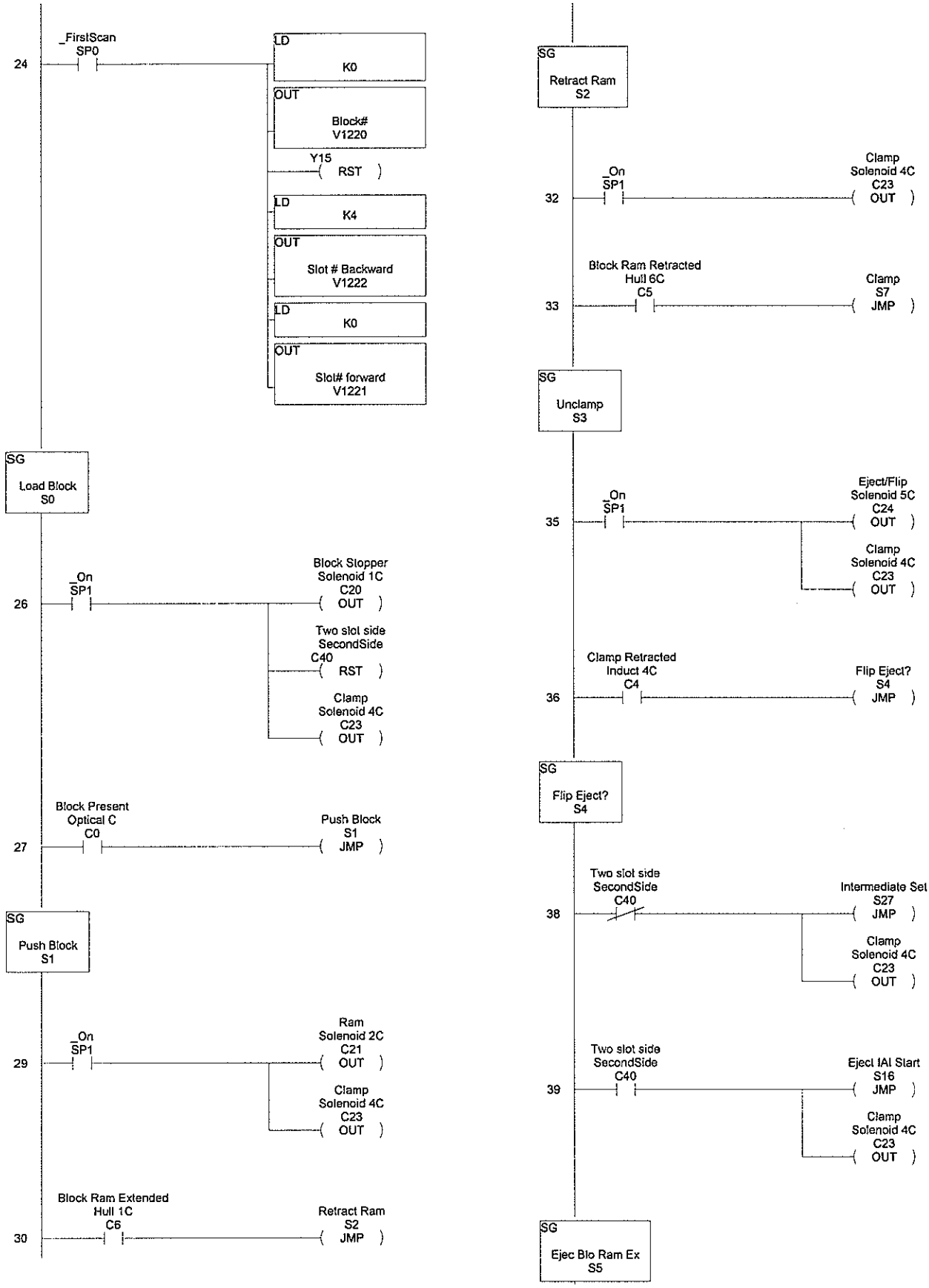
Ns	Step	A/O Cond	Cmnd	Operand 1	Operand 2	Pst	Comment
1	1		SVON	1			SERVOS ON
1	2		BTON	302			
1	3		HOME	1			HOME SERVO
1	4		ACC	0.3			SET ACCEL
1	5		VEL	1000			SET VELOCITY
1	6		MOVP	1			PICK UP POS.
1	7	--------	TAG	1			
1	8		WTON	011			Wait for START
1	9		BTOF	302			Reset Move Done
1	10		IN	012	014		Load pos to 99
1	11		ADD	99	1		Move to pos 0 + 1
1	12		PGET	1	5		
1	13		TRAN	200	199		
1	14		TRAN	201	99		
1	15		MOVP	*99			Move to pos #
1	16		BTON	302			Move Done
1	17		WTOF	011			Wait for /START
1	18		GOTO	1			

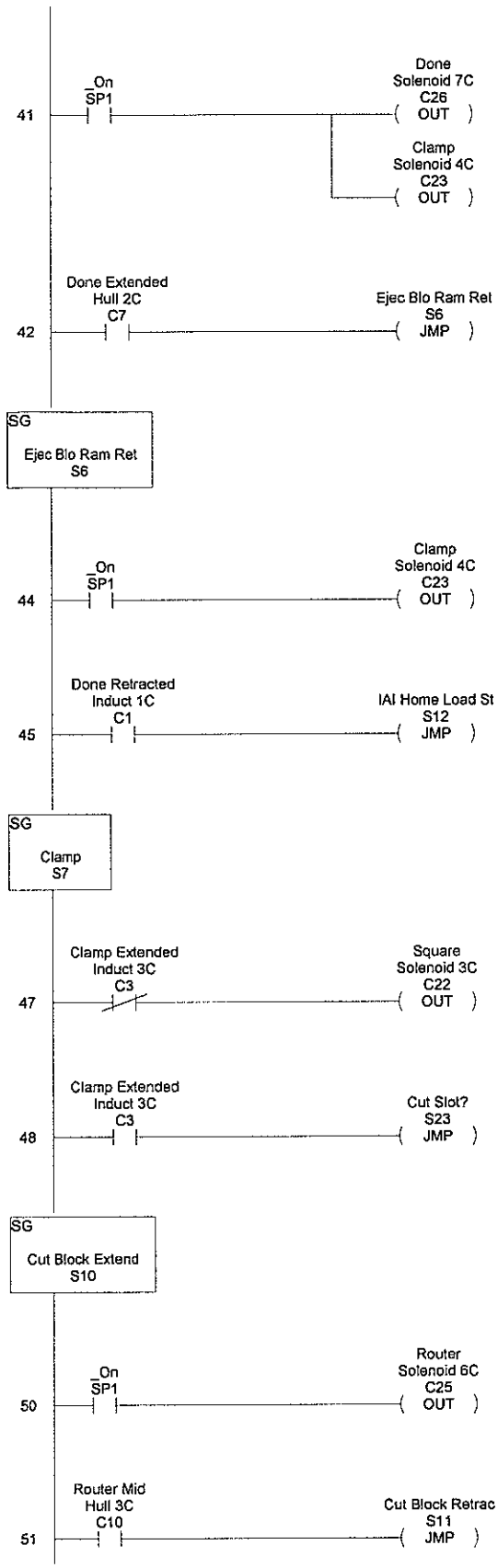
No.	Acc	Vel	Axis(1)
1	0.30	1000	4.570
2	0.30	1000	14.095
3	0.30	1000	23.620
4	0.30	1000	33.095
5	0.30	1000	0.000
6-	9		----------
10	x.xx	x	33.095
11	x.xx	x	23.620
12	x.xx	x	14.095
13	x.xx	x	4.570
14-	98		----------
99	x.xx	x	25.000
100	0.30	200	0.000
101	x.xx	x	0.000
102	0.30	200	1.000
103	0.30	200	2.000
104	0.30	200	26.000
105	0.30	200	13.000
106	x.xx	x	25.000
107	0.30	200	2.000
108-	109		----------
110	x.xx	x	0.000
111	x.xx	x	0.000
112	x.xx	x	0.000
113	x.xx	x	1.000
114	x.xx	x	1.000
115	x.xx	x	1.000

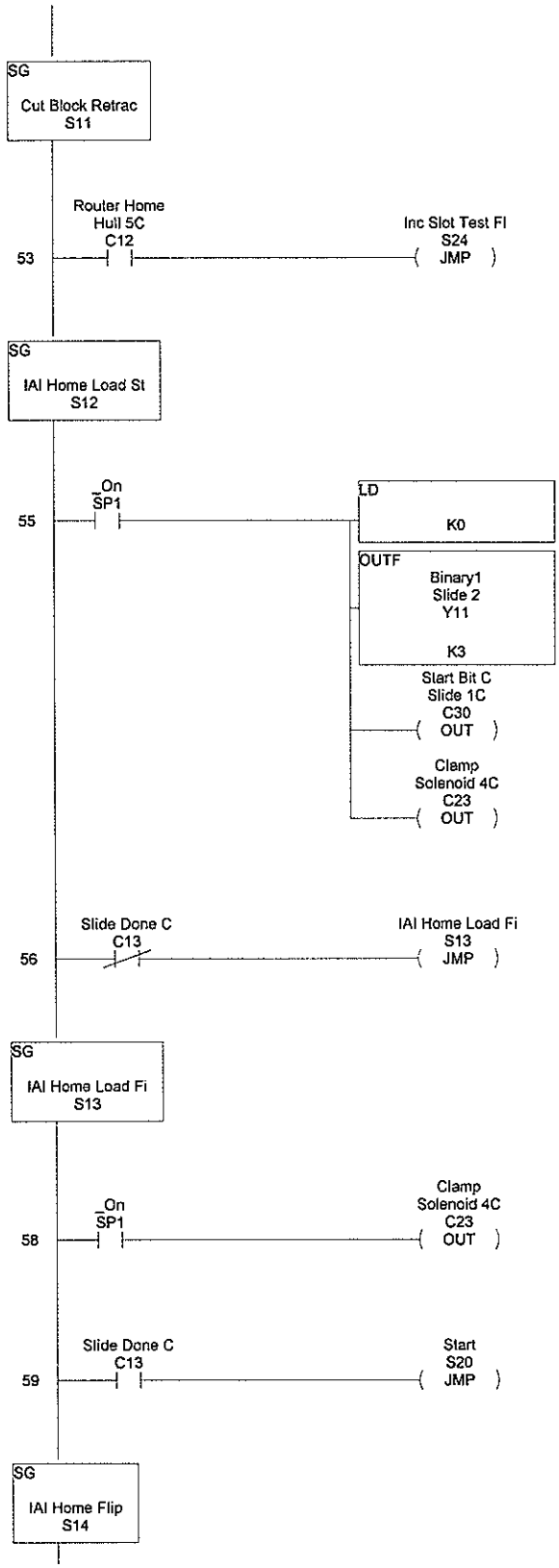
Two Side State Diagram

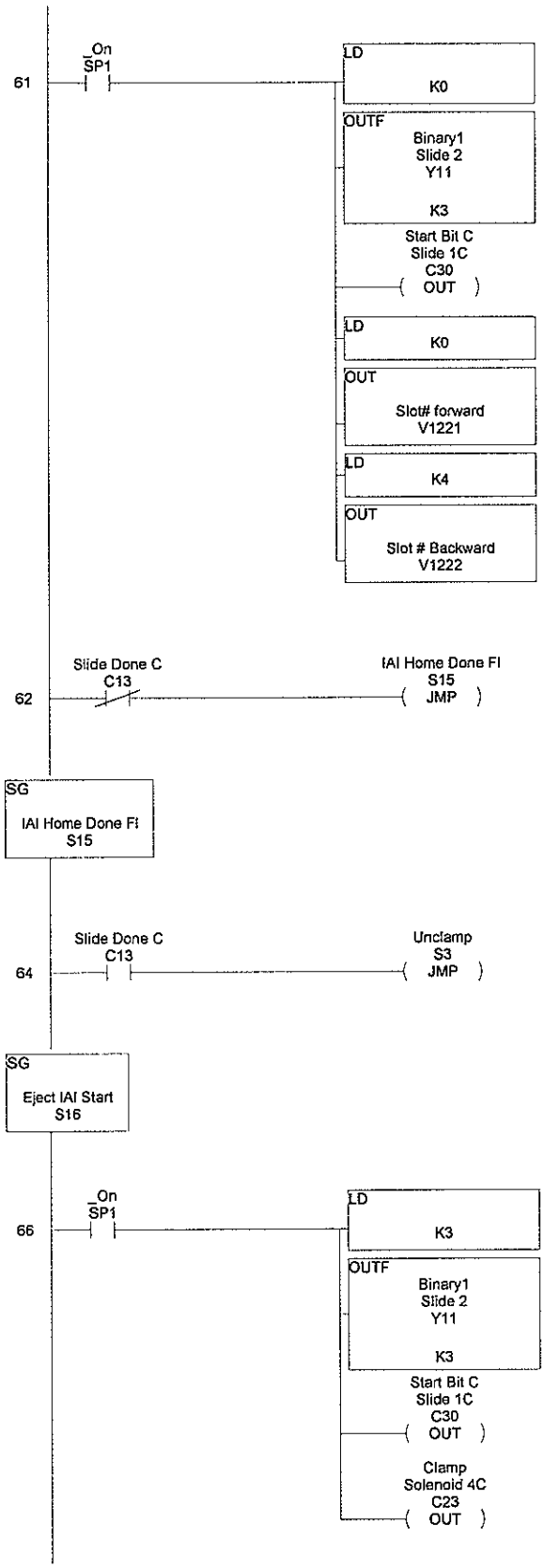


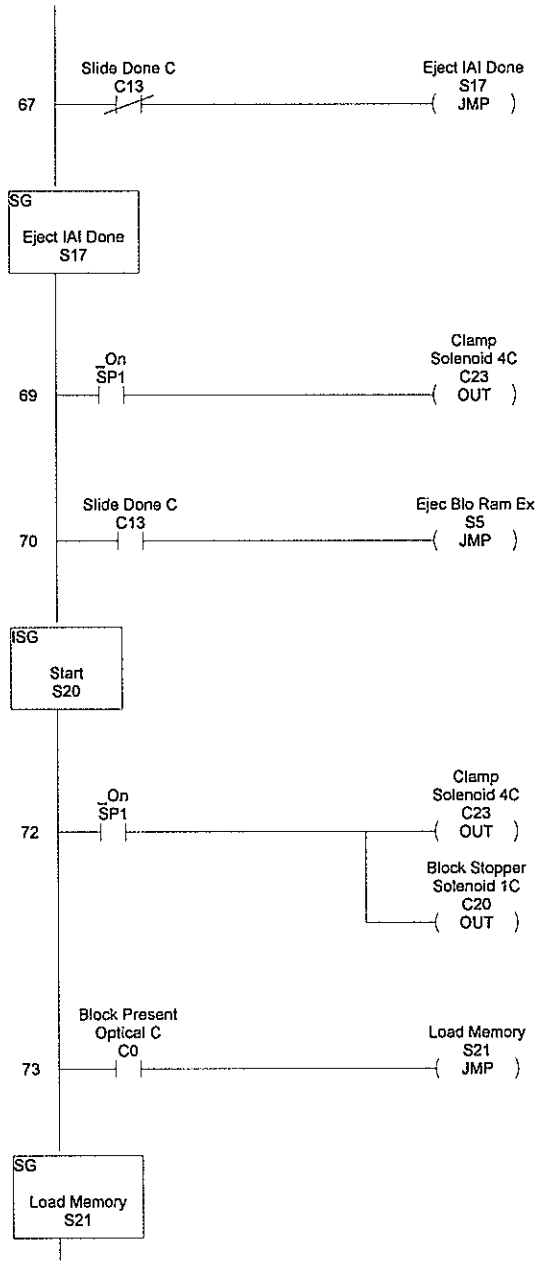

1
Optical
X0
Block Present
Optical C
C0
OUT
2
Induct 1
X1
Done Retracted
Induct 1C
C1
OUT
3
Induct 2
X2
Induct 2C
C2
OUT
4
Induct 3
X3
Clamp Extended
Induct 3C
C3
OUT
5
Induct 4
X4
Clamp Retracted
Induct 4C
C4
OUT
6
Hull 6
X5
Block Ram Retracted
Hull 6C
C5
OUT
7
Hull 1
X6
Block Ram Extended
Hull 1C
C6
OUT
8
Hull 2
X7
Done Extended
Hull 2C
C7
OUT
9
Hull 3
X10
Router Mid
Hull 3C
C10
OUT
10
Hull 4
X11
Router Extended
Hull 4C
C11
OUT
11
Hull 5
X12
Router Home
Hull 5C
C12
OUT
12
Slide Done
X13
Slide Done C
C13
OUT
13
Block Stopper
Solenoid 1C
C20
Block Stopper
Solenoid 1
Y0
OUT
14
Ram
Solenoid 2C
C21
Block Ram
Solenoid 2
Y1
OUT
15
Square
Solenoid 3C
C22
Square
Solenoid 3
Y2
OUT
16
Clamp
Solenoid 4C
C23
Clamp
Solenoid 4
Y3
OUT
17
Eject/Flip
Solenoid 5C
C24
Eject/Flip
Solenoid 5
Y4
OUT
18
Router
Solenoid 6C
C25
Router
Solenoid 6
Y5
OUT
19
Done
Solenoid 7C
C26
Done
Solenoid 7
Y6
OUT
20
Start Bit C
Slide 1C
C30
Start Bit
Slide 1
Y10
OUT
21
Binary1C
Slide 2C
C31
Binary1
Slide 2
Y11
OUT
22
Binary2C
Slide 3C
C32
Binary2
Slide 3
Y12
OUT
23
Binary3C
Slide 4C
C33
Binary3
Slide 4
Y13
OUT

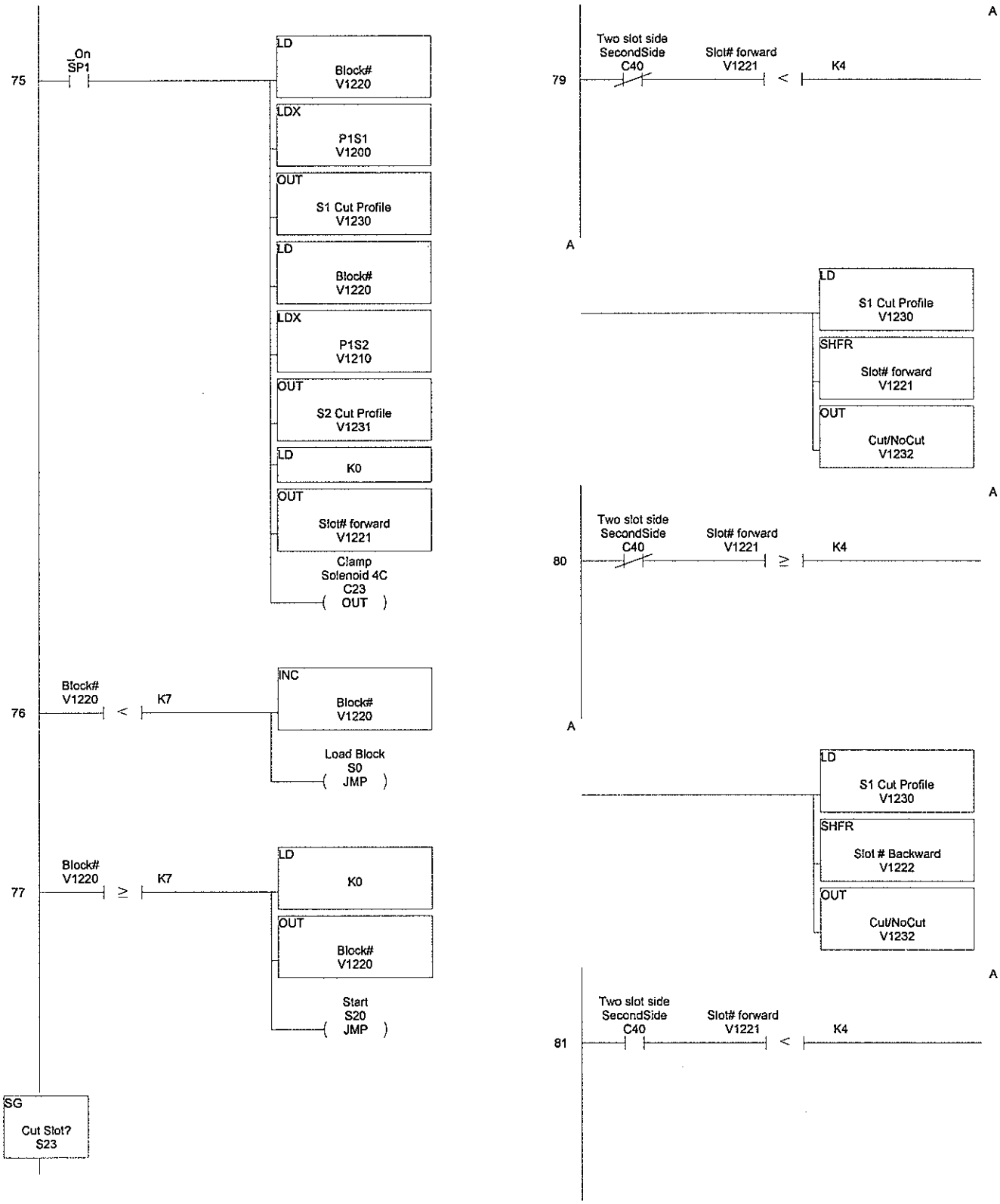

24
_FirstScan
SP0
LD
K0
OUT
Block#
V1220
Y15
RST
LD
K4
OUT
Slot # Backward
V1222
LD
K0
OUT
Slot# forward
V1221
SG
Load Block
S0
26
_On
SP1
Block Stopper
Solenoid 1C
C20
OUT
Two slot side
SecondSide
C40
RST
Clamp
Solenoid 4C
C23
OUT
27
Block Present
Optical C
C0
Push Block
S1
JMP
SG
Push Block
S1
29
_On
SP1
Ram
Solenoid 2C
C21
OUT
Clamp
Solenoid 4C
C23
OUT
30
Block Ram Extended
Hull 1C
C6
Retract Ram
S2
JMP
SG
Retract Ram
S2
32
_On
SP1
Clamp
Solenoid 4C
C23
OUT
33
Block Ram Retracted
Hull 6C
C5
Clamp
S7
JMP
SG
Unclamp
S3
35
_On
SP1
Eject/Flip
Solenoid 5C
C24
OUT
Clamp
Solenoid 4C
C23
OUT
36
Clamp Retracted
Induct 4C
C4
Flip Eject?
S4
JMP
SG
Flip Eject?
S4
38
Two slot side
SecondSide
C40
Intermediate Set
S27
JMP
Clamp
Solenoid 4C
C23
OUT
39
Two slot side
SecondSide
C40
Eject IAI Start
S16
JMP
Clamp
Solenoid 4C
C23
OUT
SG
Ejec Blo Ram Ex
S5

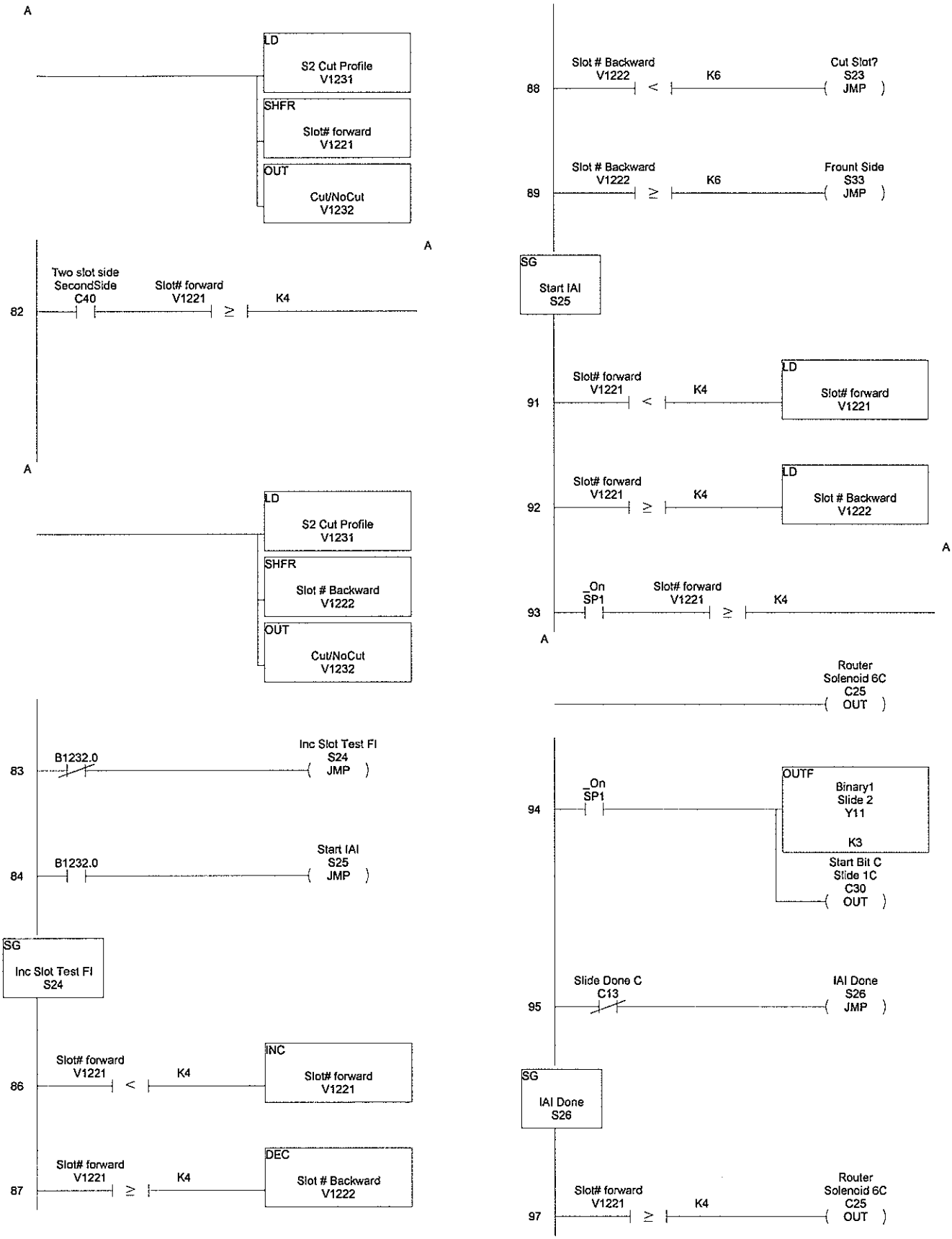

41
_On
SP1
Done
Solenoid 7C
C26
OUT
Clamp
Solenoid 4C
C23
OUT
42
Done Extended
Hull 2C
C7
Ejec Blo Ram Ret
S6
JMP
SG
Ejec Blo Ram Ret
S6
44
_On
SP1
Clamp
Solenoid 4C
C23
OUT
45
Done Retracted
Induct 1C
C1
IAI Home Load St
S12
JMP
SG
Clamp
S7
47
Clamp Extended
Induct 3C
C3
Square
Solenoid 3C
C22
OUT
48
Clamp Extended
Induct 3C
C3
Cut Slot?
S23
JMP
SG
Cut Block Extend
S10
50
_On
SP1
Router
Solenoid 6C
C25
OUT
51
Router Mid
Hull 3C
C10
Cut Block Retrac
S11
JMP

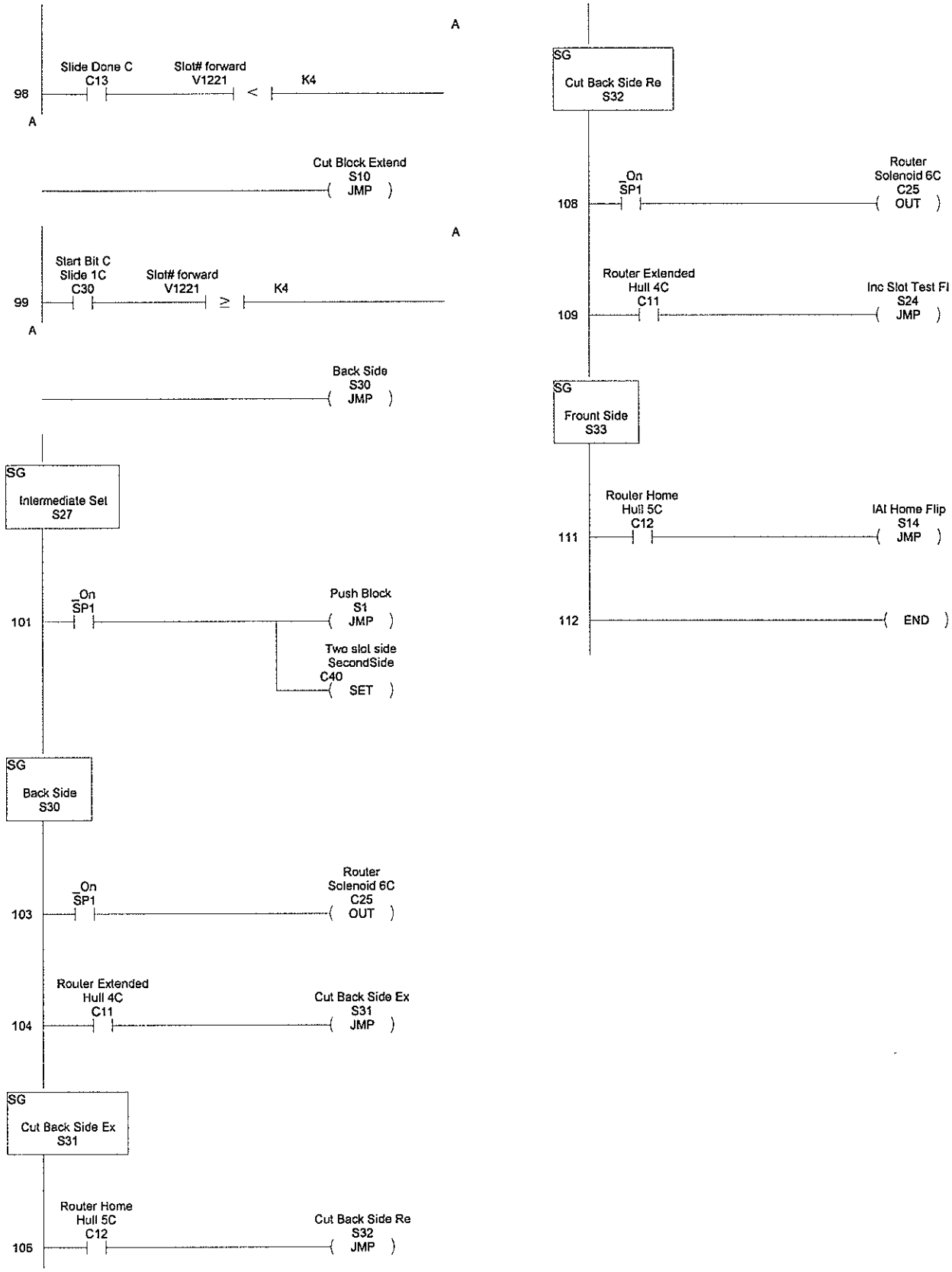

SG
Cut Block Retrac
S11
53
Router Home
Hull 5C
C12
Inc Slot Test Fl
S24
JMP
SG
IAI Home Load St
S12
55
_On
SP1
LD
K0
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
Clamp
Solenoid 4C
C23
OUT
56
Slide Done C
C13
IAI Home Load Fi
S13
JMP
SG
IAI Home Load Fi
S13
58
_On
SP1
Clamp
Solenoid 4C
C23
OUT
59
Slide Done C
C13
Start
S20
JMP
SG
IAI Home Flip
S14


61
_On
SP1
LD
K0
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
LD
K0
OUT
Slot# forward
V1221
LD
K4
OUT
Slot # Backward
V1222
62
Slide Done C
C13
IAI Home Done FI
S15
JMP
SG
IAI Home Done FI
S15
64
Slide Done C
C13
Unclamp
S3
JMP
SG
Eject IAI Start
S16
66
_On
SP1
LD
K3
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
Clamp
Solenoid 4C
C23
OUT


67
Slide Done C
C13
Eject IAI Done
S17
JMP
SG
Eject IAI Done
S17
69
_On
SP1
Clamp
Solenoid 4C
C23
OUT
70
Slide Done C
C13
Ejec Blo Ram Ex
S5
JMP
ISG
Start
S20
72
_On
SP1
Clamp
Solenoid 4C
C23
OUT
Block Stopper
Solenoid 1C
C20
OUT
73
Block Present
Optical C
C0
Load Memory
S21
JMP
SG
Load Memory
S21


75
On
SP1
LD
Block#
V1220
LDX
P1S1
V1200
OUT
S1 Cut Profile
V1230
LD
Block#
V1220
LDX
P1S2
V1210
OUT
S2 Cut Profile
V1231
LD
K0
OUT
Slot# forward
V1221
Clamp
Solenoid 4C
C23
OUT
76
Block#
V1220
<
K7
INC
Block#
V1220
Load Block
S0
JMP
77
Block#
V1220
≥
K7
LD
K0
OUT
Block#
V1220
Start
S20
JMP
SG
Cut Slot?
S23
79
Two slot side
SecondSide
C40
Slot# forward
V1221
<
K4
A
LD
S1 Cut Profile
V1230
SHFR
Slot# forward
V1221
OUT
Cut/NoCut
V1232
80
Two slot side
SecondSide
C40
Slot# forward
V1221
≥
K4
A
LD
S1 Cut Profile
V1230
SHFR
Slot # Backward
V1222
OUT
Cut/NoCut
V1232
81
Two slot side
SecondSide
C40
Slot# forward
V1221
<
K4
A


A
LD
S2 Cut Profile
V1231
SHFR
Slot# forward
V1221
OUT
Cut/NoCut
V1232
A
Two slot side
SecondSide
C40
Slot# forward
V1221
82
K4
A
LD
S2 Cut Profile
V1231
SHFR
Slot # Backward
V1222
OUT
Cut/NoCut
V1232
B1232.0
Inc Slot Test FI
S24
JMP
83
B1232.0
Start IAI
S25
JMP
84
SG
Inc Slot Test FI
S24
Slot# forward
V1221
86
K4
INC
Slot# forward
V1221
Slot# forward
V1221
87
K4
DEC
Slot # Backward
V1222
Slot # Backward
V1222
88
K6
Cut Slot?
S23
JMP
Slot # Backward
V1222
89
K6
Frount Side
S33
JMP
SG
Start IAI
S25
Slot# forward
V1221
91
K4
LD
Slot# forward
V1221
Slot# forward
V1221
92
K4
LD
Slot # Backward
V1222
A
_On
SP1
Slot# forward
V1221
93
K4
A
Router
Solenoid 6C
C25
OUT
_On
SP1
94
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
Slide Done C
C13
IAI Done
S26
95
JMP
SG
IAI Done
S26
Slot# forward
V1221
97
K4
Router
Solenoid 6C
C25
OUT


A
Slide Done C
C13
Slot# forward
V1221
<
K4
98
A
Cut Block Extend
S10
JMP
A
Start Bit C
Slide 1C
C30
Slot# forward
V1221
≥
K4
99
A
Back Side
S30
JMP
SG
Intermediate Set
S27
On
SP1
101
Push Block
S1
JMP
Two slot side
SecondSide
C40
SET
SG
Back Side
S30
On
SP1
103
Router
Solenoid 6C
C25
OUT
Router Extended
Hull 4C
C11
104
Cut Back Side Ex
S31
JMP
SG
Cut Back Side Ex
S31
Router Home
Hull 5C
C12
105
Cut Back Side Re
S32
JMP
SG
Cut Back Side Re
S32
On
SP1
108
Router
Solenoid 6C
C25
OUT
Router Extended
Hull 4C
C11
109
Inc Slot Test Fl
S24
JMP
SG
Frount Side
S33
Router Home
Hull 5C
C12
111
IAI Home Flip
S14
JMP
112
END

X0
Optical

X1
Induct 1

X2
Induct 2

X3
Induct 3

X4
Induct 4

X5
Hull 6

X6
Hull 1

X7
Hull 2

X10
Hull 3

X11
Hull 4

X12
Hull 5

X13
Slide Done

Y0
Solenoid 1
Block Stopper

Y1
Solenoid 2
Block Ram

Y2
Solenoid 3
Square

Y3
Solenoid 4
Clamp

Y4
Solenoid 5
Eject/Flip

Y5
Solenoid 6
Router

Y6
Solenoid 7
Done

Y10
Slide 1
Start Bit

Y11
Slide 2
Binary1

Y12
Slide 3
Binary2

Y13
Slide 4
Binary3

C0
Optical C
Block Present

C1
Induct 1C
Done Retracted

C2
Induct 2C

C3
Induct 3C
Clamp Extended

C4
Induct 4C
Clamp Retracted

C5
Hull 6C
Block Ram Retracted

C6
Hull 1C
Block Ram Extended

C7
Hull 2C
Done Extended

C10
Hull 3C
Router Mid

C11
Hull 4C
Router Extended

C12
Hull 5C
Router Home

C13
Slide Done C

C20
Solenoid 1C
Block Stopper

C21
Solenoid 2C
Ram

C22
Solenoid 3C
Square

C23
Solenoid 4C
Clamp

C24
Solenoid 5C
Eject/Flip

C25
Solenoid 6C
Router

C26
Solenoid 7C
Done

C30
Slide 1C
Start Bit C

C31
Slide 2C
Binary1C

C32
Slide 3C
Binary2C

C33
Slide 4C
Binary3C

C40
SecondSide
Two slot side

S0
Load Block

S1
Push Block

S2
Retract Ram

S3
Unclamp

S4
Flip Eject?

S5
Ejec Blo Ram Ex

S6
Ejec Blo Ram Ret

S7
Clamp

S10
Cut Block Extend

S11
Cut Block Retrac

S12
IAI Home Load St

S13
IAI Home Load Fi

S14
IAI Home Flip

S15
IAI Home Done FI

S16
Eject IAI Start

S17
Eject IAI Done

S20
Start

S21
Load Memory

S22
Not Used

S23
Cut Slot?

S24
Inc Slot Test FI

S25
Start IAI

S26
IAI Done

S27
Intermediate Set

S30
Back Side

S31
Cut Back Side Ex

S32
Cut Back Side Re

S33
Frount Side

V0
Sylinoid C1

V1200
P1S1

V1201
P2S1

V1202
P3S1

V1203
P4S1

V1204
P5S1

V1205
P6S1

V1210
P1S2

V1211
P2S2

V1212
P3S2

V1213
P4S2

V1214
P5S2

V1215
P6S2

V1220
Block#

V1221
Slot# forward

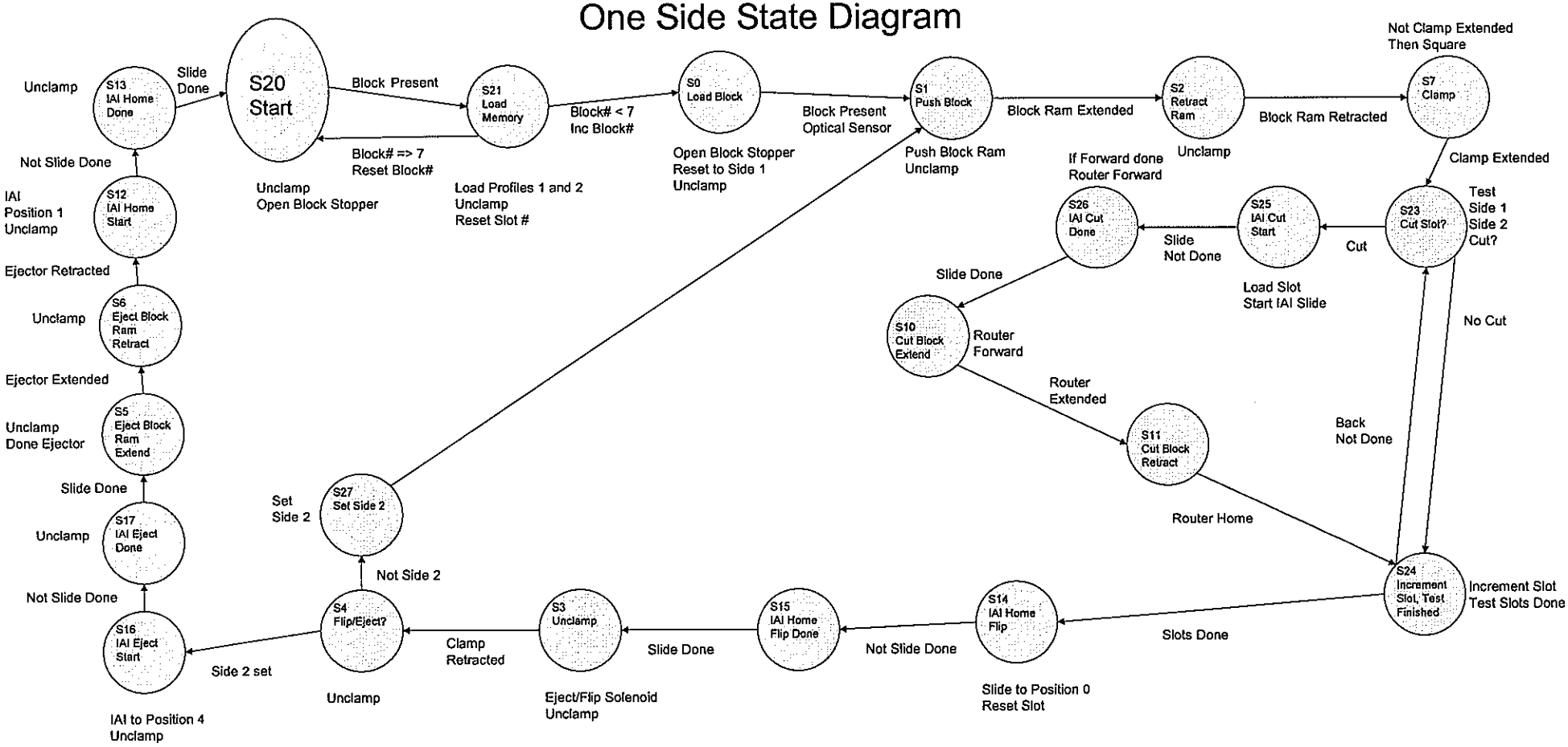
V1222
Slot # Backward

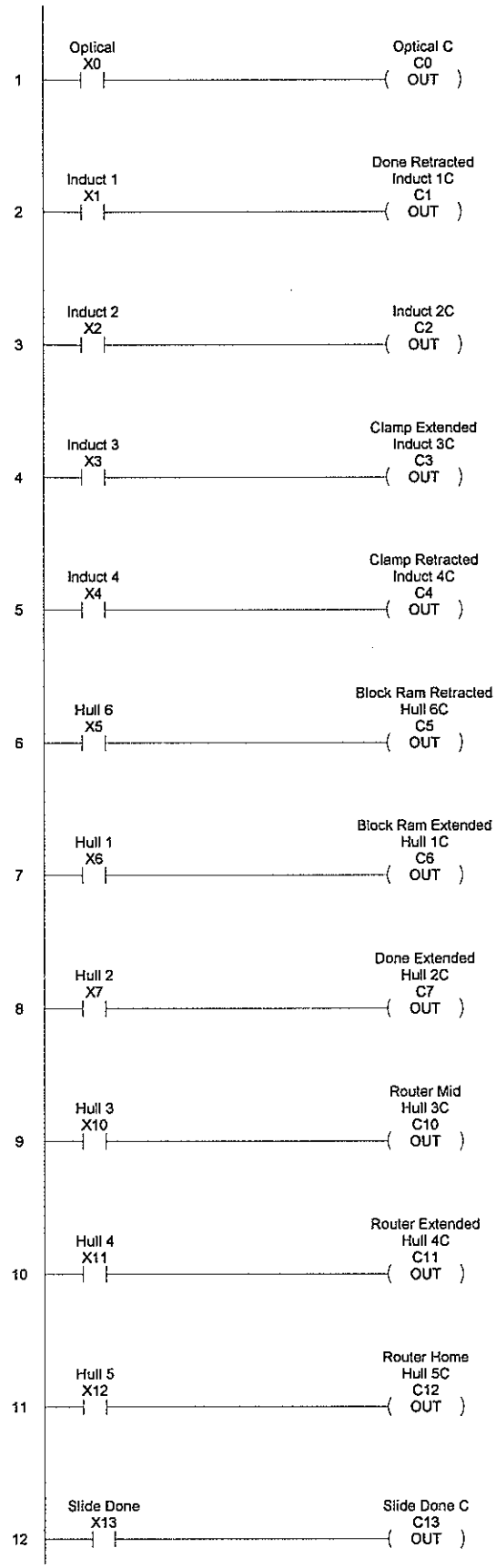
V1230
S1 Cut Profile

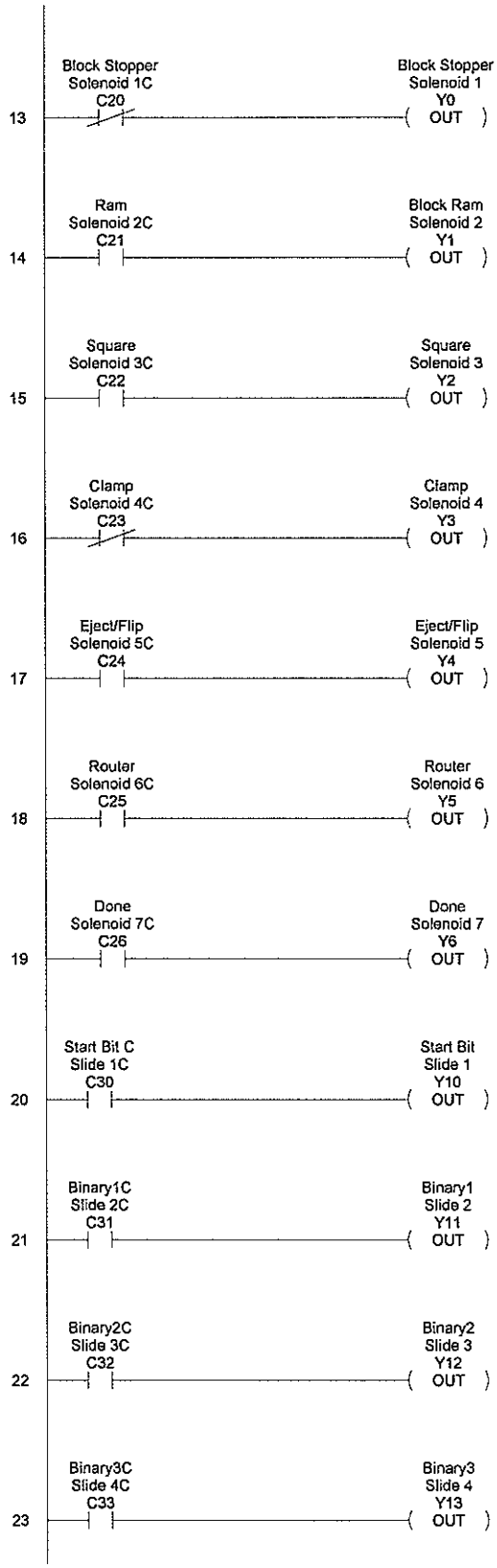
V1231
S2 Cut Profile

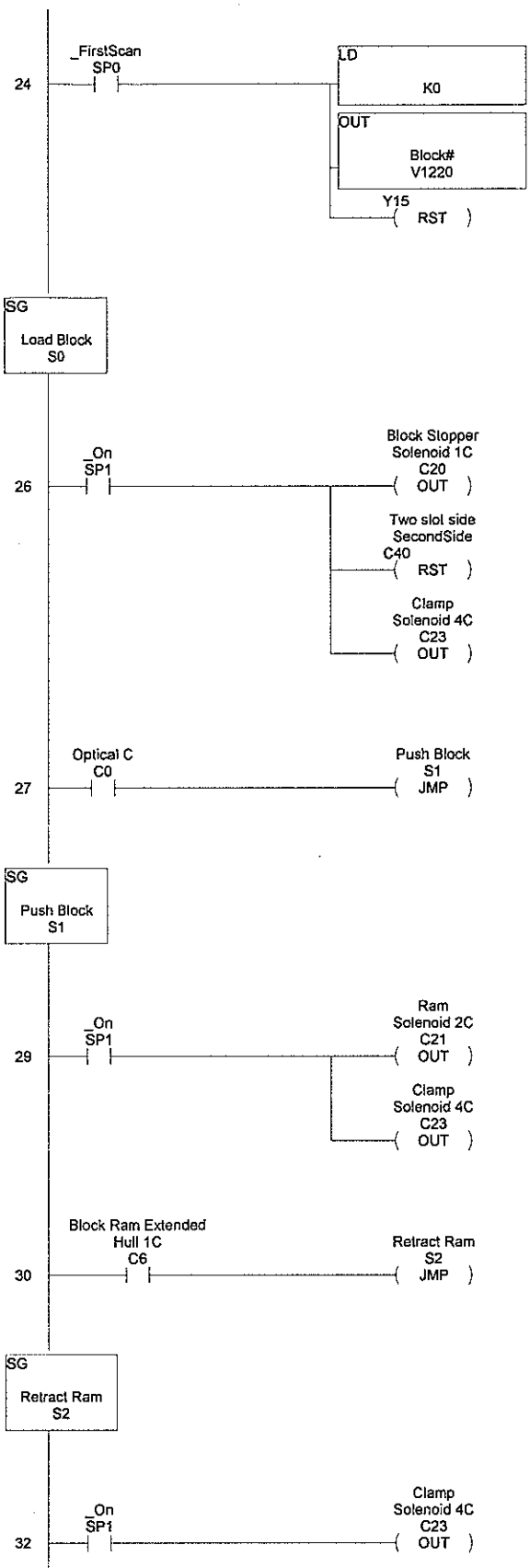
V1232
Cut/NoCut

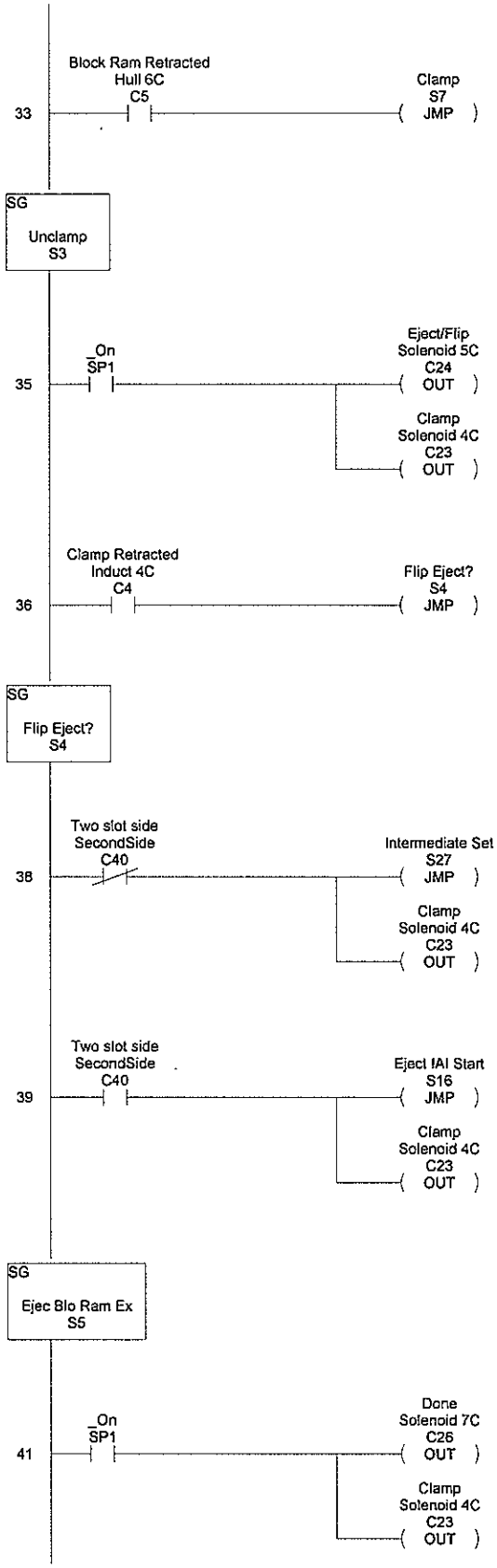
One Side State Diagram

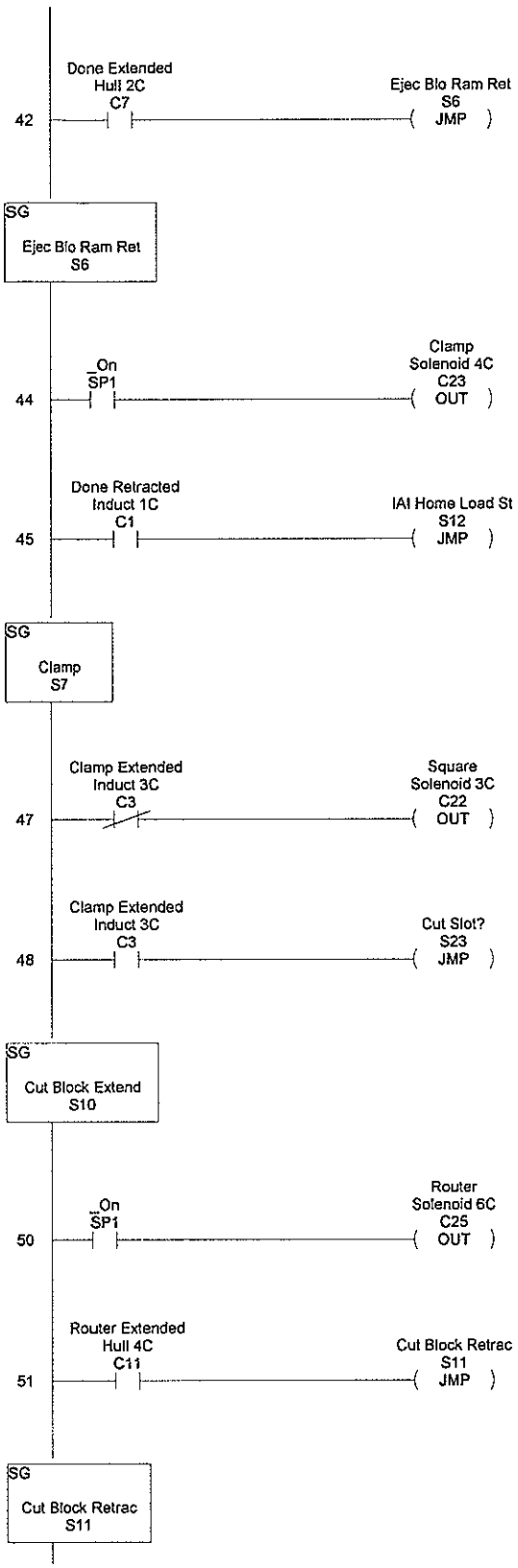


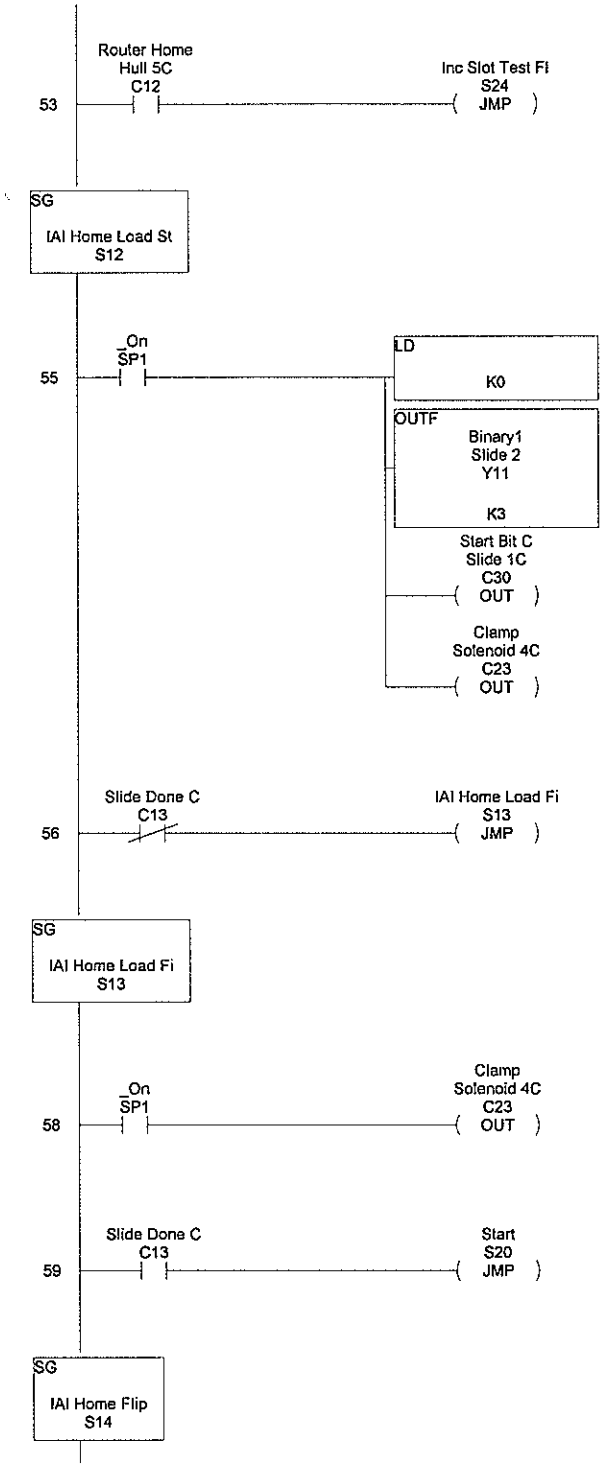

1
Optical
X0
Optical C
C0
OUT
2
Induct 1
X1
Done Retracted
Induct 1C
C1
OUT
3
Induct 2
X2
Induct 2C
C2
OUT
4
Induct 3
X3
Clamp Extended
Induct 3C
C3
OUT
5
Induct 4
X4
Clamp Retracted
Induct 4C
C4
OUT
6
Hull 6
X5
Block Ram Retracted
Hull 6C
C5
OUT
7
Hull 1
X6
Block Ram Extended
Hull 1C
C6
OUT
8
Hull 2
X7
Done Extended
Hull 2C
C7
OUT
9
Hull 3
X10
Router Mid
Hull 3C
C10
OUT
10
Hull 4
X11
Router Extended
Hull 4C
C11
OUT
11
Hull 5
X12
Router Home
Hull 5C
C12
OUT
12
Slide Done
X13
Slide Done C
C13
OUT

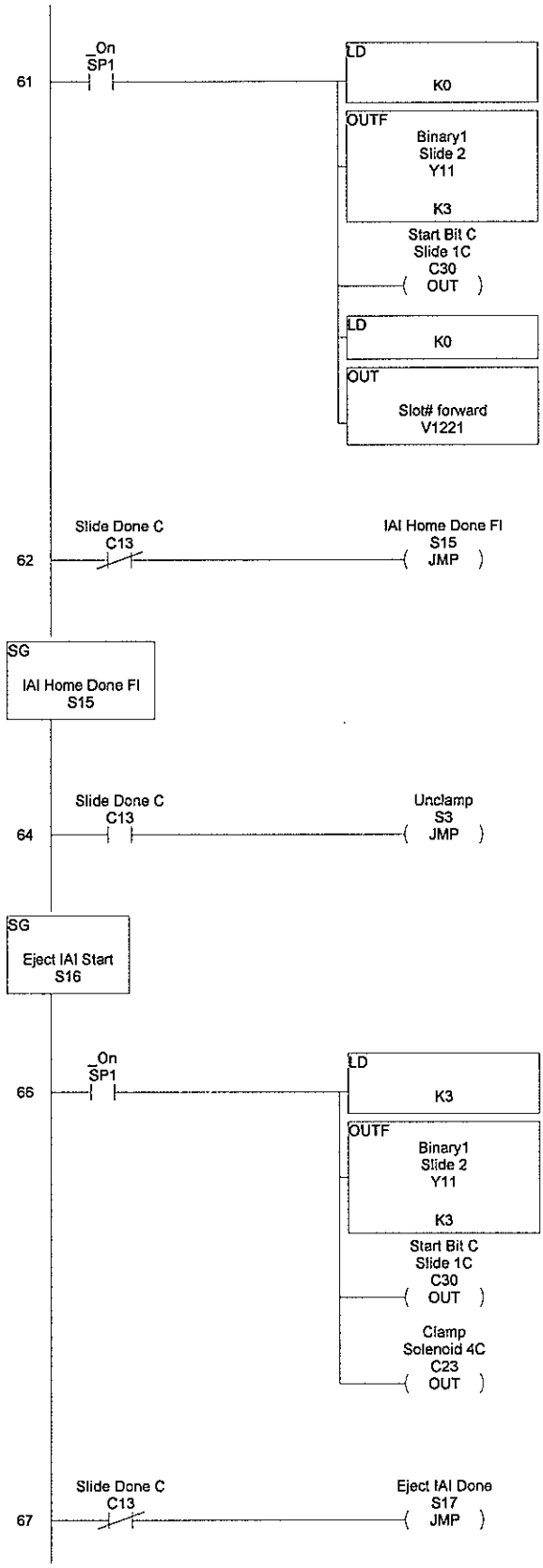

13
Block Stopper
Solenoid 1C
C20
Block Stopper
Solenoid 1
Y0
OUT
14
Ram
Solenoid 2C
C21
Block Ram
Solenoid 2
Y1
OUT
15
Square
Solenoid 3C
C22
Square
Solenoid 3
Y2
OUT
16
Clamp
Solenoid 4C
C23
Clamp
Solenoid 4
Y3
OUT
17
Eject/Flip
Solenoid 5C
C24
Eject/Flip
Solenoid 5
Y4
OUT
18
Router
Solenoid 6C
C25
Router
Solenoid 6
Y5
OUT
19
Done
Solenoid 7C
C26
Done
Solenoid 7
Y6
OUT
20
Start Bit C
Slide 1C
C30
Start Bit
Slide 1
Y10
OUT
21
Binary1C
Slide 2C
C31
Binary1
Slide 2
Y11
OUT
22
Binary2C
Slide 3C
C32
Binary2
Slide 3
Y12
OUT
23
Binary3C
Slide 4C
C33
Binary3
Slide 4
Y13
OUT

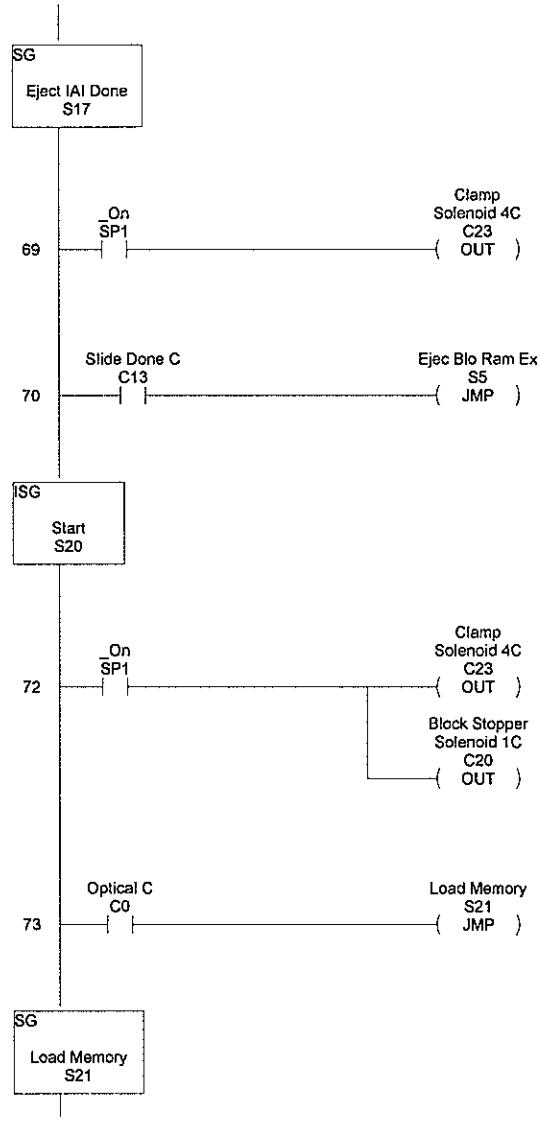

24
_FirstScan
SP0
LD
K0
OUT
Block#
V1220
Y15
RST
SG
Load Block
S0
26
_On
SP1
Block Stopper
Solenoid 1C
C20
OUT
Two slot side
SecondSide
C40
RST
Clamp
Solenoid 4C
C23
OUT
27
Optical C
C0
Push Block
S1
JMP
SG
Push Block
S1
29
_On
SP1
Ram
Solenoid 2C
C21
OUT
Clamp
Solenoid 4C
C23
OUT
30
Block Ram Extended
Hull 1C
C6
Retract Ram
S2
JMP
SG
Retract Ram
S2
32
_On
SP1
Clamp
Solenoid 4C
C23
OUT

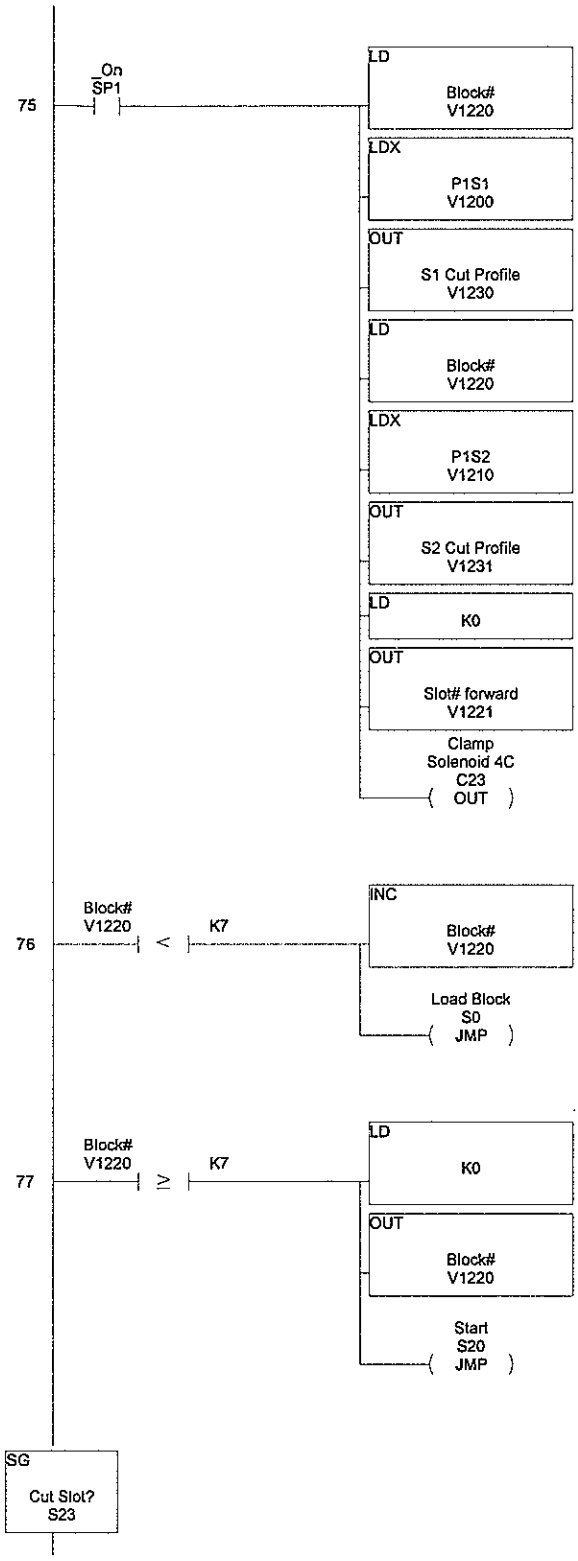

33
Block Ram Retracted
Hull 6C
C5
Clamp
S7
JMP
SG
Unclamp
S3
35
_On
SP1
Eject/Flip
Solenoid 5C
C24
OUT
Clamp
Solenoid 4C
C23
OUT
36
Clamp Retracted
Induct 4C
C4
Flip Eject?
S4
JMP
SG
Flip Eject?
S4
38
Two slot side
SecondSide
C40
Intermediate Set
S27
JMP
Clamp
Solenoid 4C
C23
OUT
39
Two slot side
SecondSide
C40
Eject IAI Start
S16
JMP
Clamp
Solenoid 4C
C23
OUT
SG
Ejec Blo Ram Ex
S5
41
_On
SP1
Done
Solenoid 7C
C26
OUT
Clamp
Solenoid 4C
C23
OUT

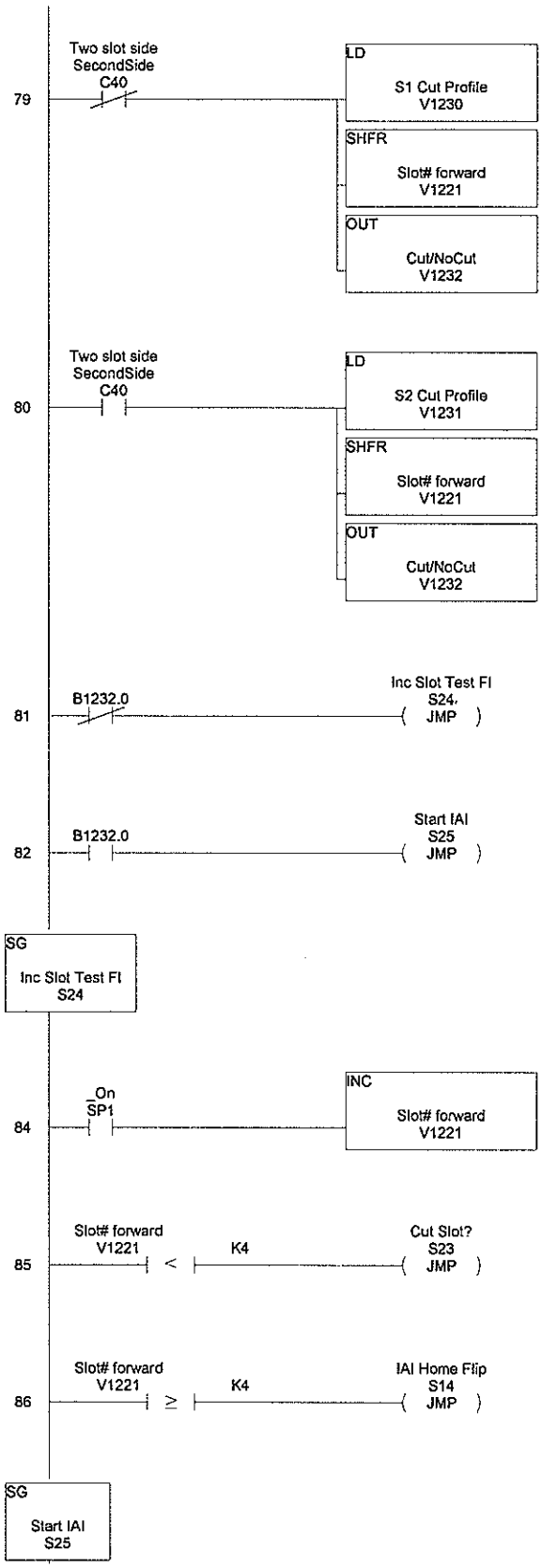

Done Extended
Hull 2C
C7
42
Ejec Blo Ram Ret
S6
JMP
SG
Ejec Blo Ram Ret
S6
On
SP1
44
Clamp
Solenoid 4C
C23
OUT
Done Retracted
Induct 1C
C1
45
IAI Home Load St
S12
JMP
SG
Clamp
S7
Clamp Extended
Induct 3C
C3
47
Square
Solenoid 3C
C22
OUT
Clamp Extended
Induct 3C
C3
48
Cut Slot?
S23
JMP
SG
Cut Block Extend
S10
On
SP1
50
Router
Solenoid 6C
C25
OUT
Router Extended
Hull 4C
C11
51
Cut Block Retrac
S11
JMP
SG
Cut Block Retrac
S11

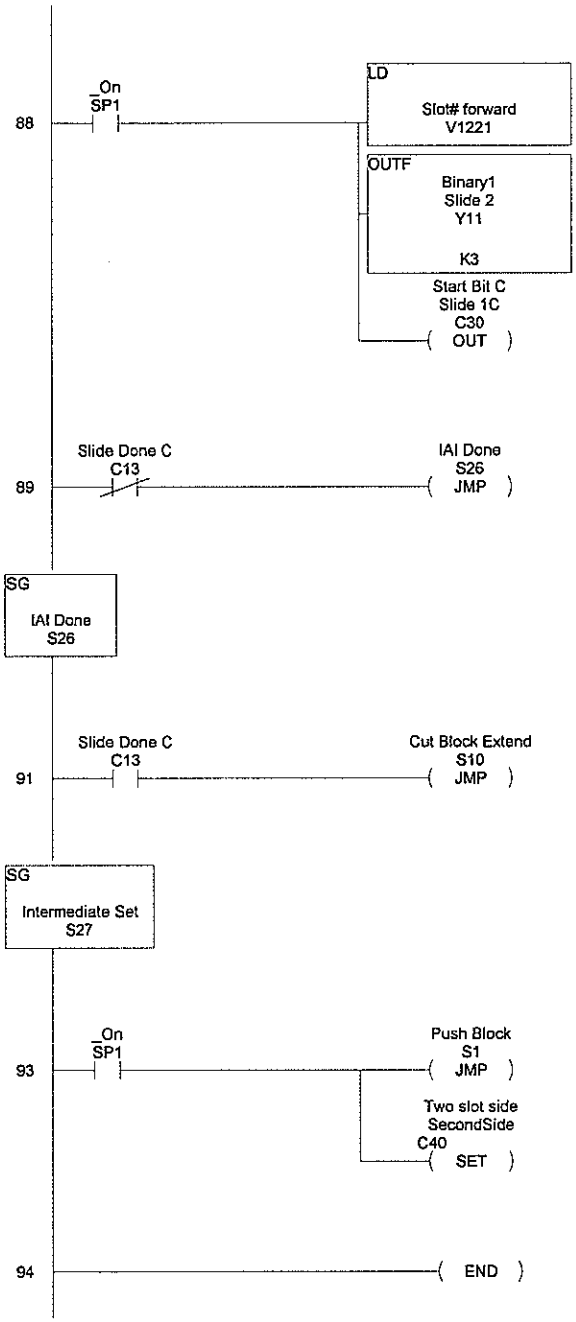

Router Home
Hull 5C
C12
53
Inc Slot Test Fl
S24
JMP
SG
IAI Home Load St
S12
On
SP1
55
LD
K0
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
Clamp
Solenoid 4C
C23
OUT
Slide Done C
C13
56
IAI Home Load Fi
S13
JMP
SG
IAI Home Load Fi
S13
On
SP1
58
Clamp
Solenoid 4C
C23
OUT
Slide Done C
C13
59
Start
S20
JMP
SG
IAI Home Flip
S14


61
_On
SP1
LD
K0
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
LD
K0
OUT
Slot# forward
V1221
62
Slide Done C
C13
IAI Home Done FI
S15
JMP
SG
IAI Home Done FI
S15
64
Slide Done C
C13
Unclamp
S3
JMP
SG
Eject IAI Start
S16
66
_On
SP1
LD
K3
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
Clamp
Solenoid 4C
C23
OUT
67
Slide Done C
C13
Eject IAI Done
S17
JMP


SG
Eject IAI Done
S17
69
_On
SP1
Clamp
Solenoid 4C
C23
OUT
70
Slide Done C
C13
Ejec Blo Ram Ex
S5
JMP
ISG
Start
S20
72
_On
SP1
Clamp
Solenoid 4C
C23
OUT
Block Stopper
Solenoid 1C
C20
OUT
73
Optical C
C0
Load Memory
S21
JMP
SG
Load Memory
S21


75
On
SP1
LD
Block#
V1220
LDX
P1S1
V1200
OUT
S1 Cut Profile
V1230
LD
Block#
V1220
LDX
P1S2
V1210
OUT
S2 Cut Profile
V1231
LD
K0
OUT
Slot# forward
V1221
Clamp
Solenoid 4C
C23
OUT
76
Block#
V1220
<
K7
INC
Block#
V1220
Load Block
S0
JMP
77
Block#
V1220
≥
K7
LD
K0
OUT
Block#
V1220
Start
S20
JMP
SG
Cut Slot?
S23


79
Two slot side
SecondSide
C40
LD
S1 Cut Profile
V1230
SHFR
Slot# forward
V1221
OUT
Cut/NoCut
V1232
80
Two slot side
SecondSide
C40
LD
S2 Cut Profile
V1231
SHFR
Slot# forward
V1221
OUT
Cut/NoCut
V1232
81
B1232.0
Inc Slot Test Fl
S24
JMP
82
B1232.0
Start IAI
S25
JMP
SG
Inc Slot Test Fl
S24
84
On
SP1
INC
Slot# forward
V1221
85
Slot# forward
V1221
<
K4
Cut Slot?
S23
JMP
86
Slot# forward
V1221
≥
K4
IAI Home Flip
S14
JMP
SG
Start IAI
S25


88
_On
SP1
LD
Slot# forward
V1221
OUTF
Binary1
Slide 2
Y11
K3
Start Bit C
Slide 1C
C30
OUT
89
Slide Done C
C13
IAI Done
S26
JMP
SG
IAI Done
S26
91
Slide Done C
C13
Cut Block Extend
S10
JMP
SG
Intermediate Set
S27
93
_On
SP1
Push Block
S1
JMP
Two slot side
SecondSide
C40
SET
94
END

X0
Optical

X1
Induct 1

X2
Induct 2

X3
Induct 3

X4
Induct 4

X5
Hull 6

X6
Hull 1

X7
Hull 2

X10
Hull 3

X11
Hull 4

X12
Hull 5

X13
Slide Done

Y0
Solenoid 1
Block Stopper

Y1
Solenoid 2
Block Ram

Y2
Solenoid 3
Square

Y3
Solenoid 4
Clamp

Y4
Solenoid 5
Eject/Flip

Y5
Solenoid 6
Router

Y6
Solenoid 7
Done

Y10
Slide 1
Start Bit

Y11
Slide 2
Binary1

Y12
Slide 3
Binary2

Y13
Slide 4
Binary3

C0
Optical C

C1
Induct 1C
Done Retracted

C2
Induct 2C

C3
Induct 3C
Clamp Extended

C4
Induct 4C
Clamp Retracted

C5
Hull 6C
Block Ram Retracted

C6
Hull 1C
Block Ram Extended

C7
Hull 2C
Done Extended

C10
Hull 3C
Router Mid

C11
Hull 4C
Router Extended

C12
Hull 5C
Router Home

C13
Slide Done C

C20
Solenoid 1C
Block Stopper

C21
Solenoid 2C
Ram

C22
Solenoid 3C
Square

C23
Solenoid 4C
Clamp

C24
Solenoid 5C
Eject/Flip

C25
Solenoid 6C
Router

C26
Solenoid 7C
Done

C30
Slide 1C
Start Bit C

C31
Slide 2C
Binary1C

C32
Slide 3C
Binary2C

C33
Slide 4C
Binary3C

C40
SecondSide
Two slot side

S0
Load Block

S1
Push Block

S2
Retract Ram

S3
Unclamp

S4
Flip Eject?

S5
Ejec Blo Ram Ex

S6
Ejec Blo Ram Ret

S7
Clamp

S10
Cut Block Extend

S11
Cut Block Retrac

S12
IAI Home Load St

S13
IAI Home Load Fi

S14
IAI Home Flip

S15
IAI Home Done FI

S16
Eject IAI Start

S17
Eject IAI Done

S20
Start

S21
Load Memory

S22
Not Used

S23
Cut Slot?

S24
Inc Slot Test FI

S25
Start IAI

S26
IAI Done

S27
Intermediate Set

S30
Cut Block Back E

S31
Cut Blk Back Ret

V0
Sylinoid C1

V1200
P1S1

V1201
P2S1

V1202
P3S1

V1203
P4S1

V1204
P5S1

V1205
P6S1

V1210
P1S2

V1211
P2S2

V1212
P3S2

V1213
P4S2

V1214
P5S2

V1215
P6S2

V1220
Block#

V1221
Slot# forward

V1222
Slot # Backward

V1230
S1 Cut Profile

V1231
S2 Cut Profile

V1232
Cut/NoCut