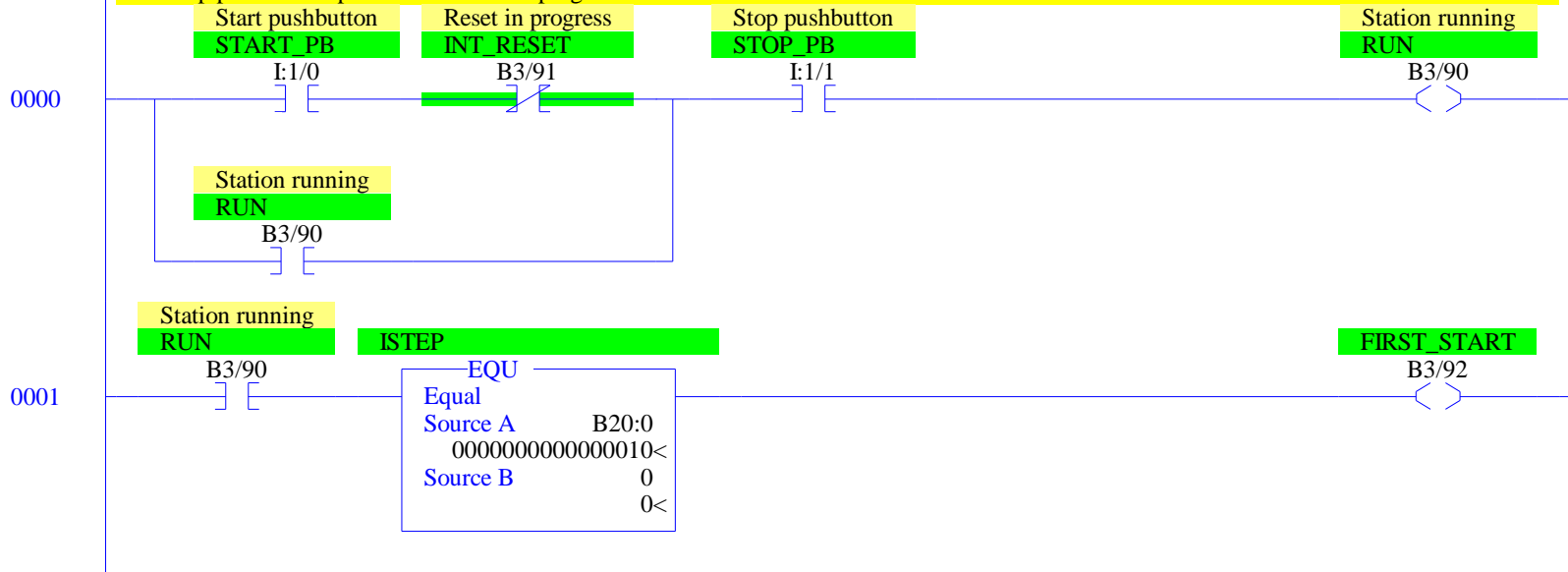


Example 9.3 - Engine Inverter Control with Shift Reg-based Sequence & Simulation

Copyright (c) 2023 Dogwood Valley Press, LLC

Start/stop/pause. Start prevented if reset in progress.



0002

FIRST_START

B3/92

DO_SHIFT

B3/93

Wait for pallet

STEP_1

B20/0

Proximity sensor

Pallet at engaging

hook 1

PROX1

Station running

RUN

B3/90

Move to hook 2

STEP_2

B20/1

Hook 1 engage timer

ENG1_TMR/DN

T4:1/DN

Raise pallet

STEP_3

B20/2

Limit switch

Indicates pallet off

conveyor

PALL_UPLS

Station running

RUN

B3/90

Lower rotator

STEP_4

B20/3

Rotator down limit

switch

ROTR_DNLS

Station running

RUN

B3/90

Clamp engine

STEP_5

B20/4

Clamp timer

CLMP_TMR/DN

T4:3/DN

Station running

RUN

B3/90

Raise rotator

STEP_6

B20/5

Rotator up limit

switch

ROTR_UPLS

Station running

RUN

B3/90

Rotate clockwise

STEP_7

B20/6

Rotator clockwise

limit switch

ROTR_CWLS

Station running

RUN

B3/90

Lower rotator

STEP_8

B20/7

Rotator down limit

switch

ROTR_DNLS

Station running

RUN

B3/90

Unclamp timer

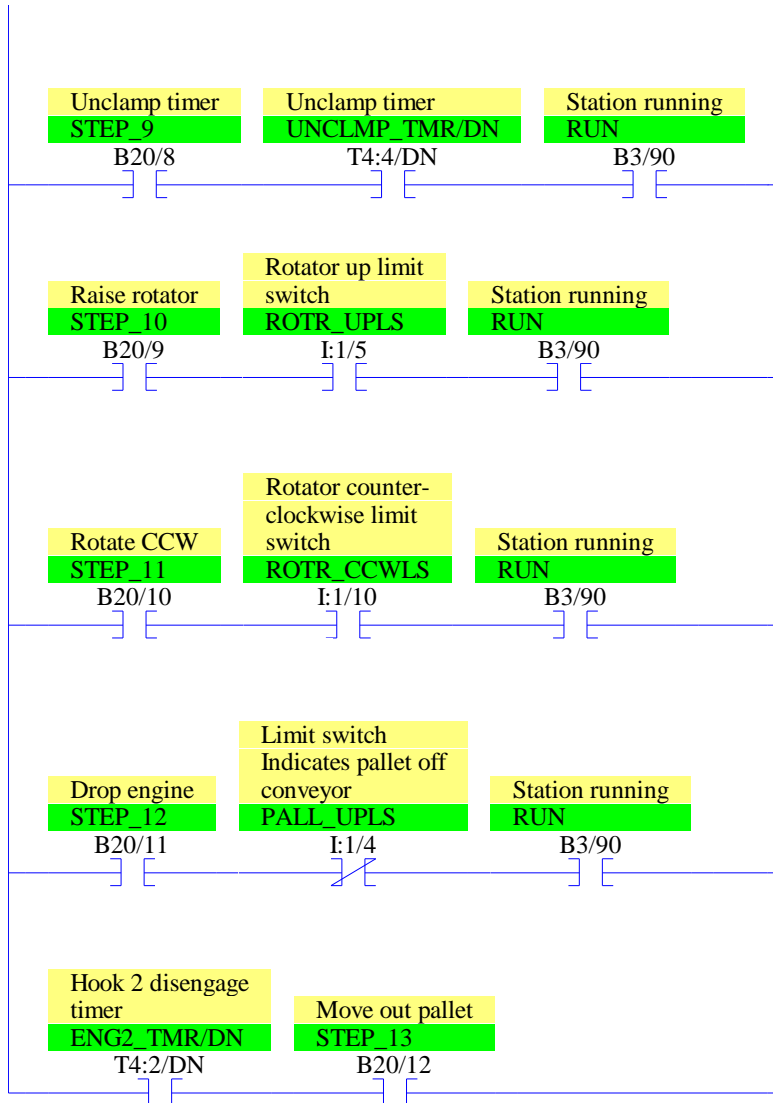
STEP_9

Unclamp timer

UNCLMP_TMR/DN

Station running

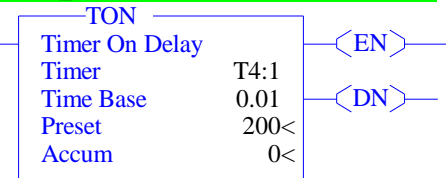
RUN



Step Timers

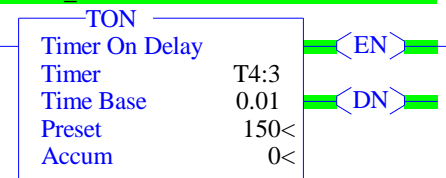
Move to hook 2
STEP_2
B20/1

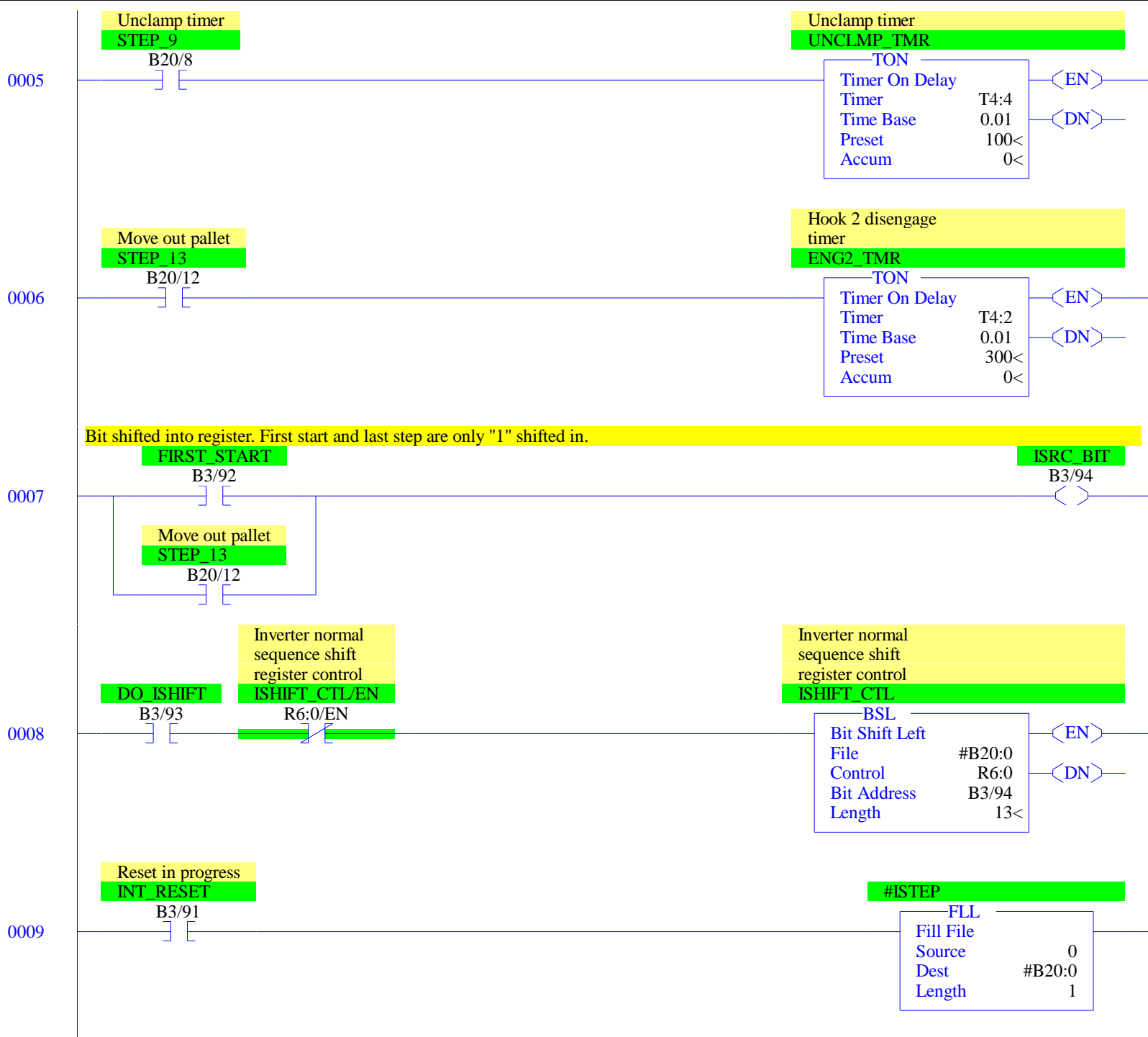
Hook 1 engage timer
ENG1_TMR

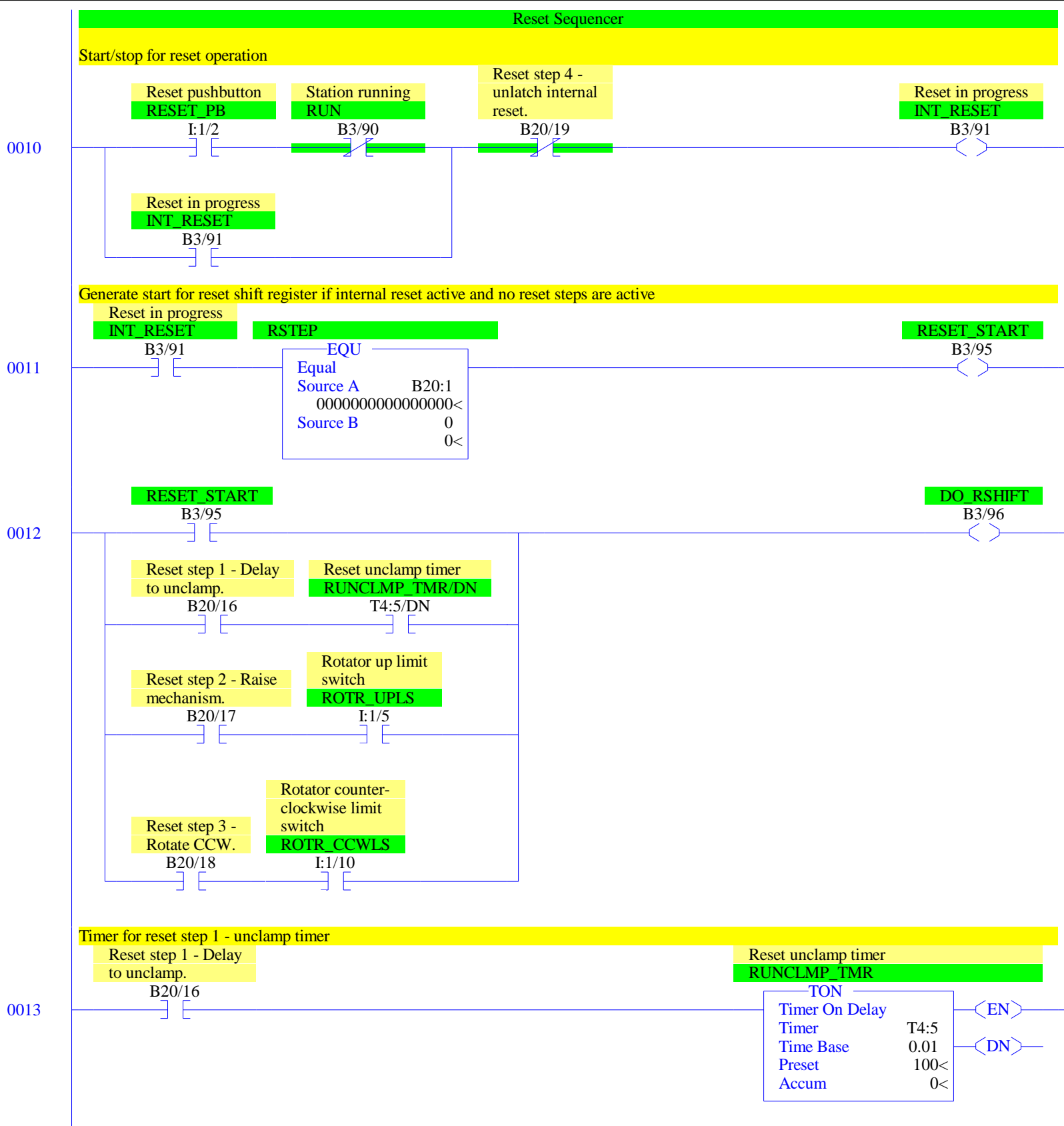


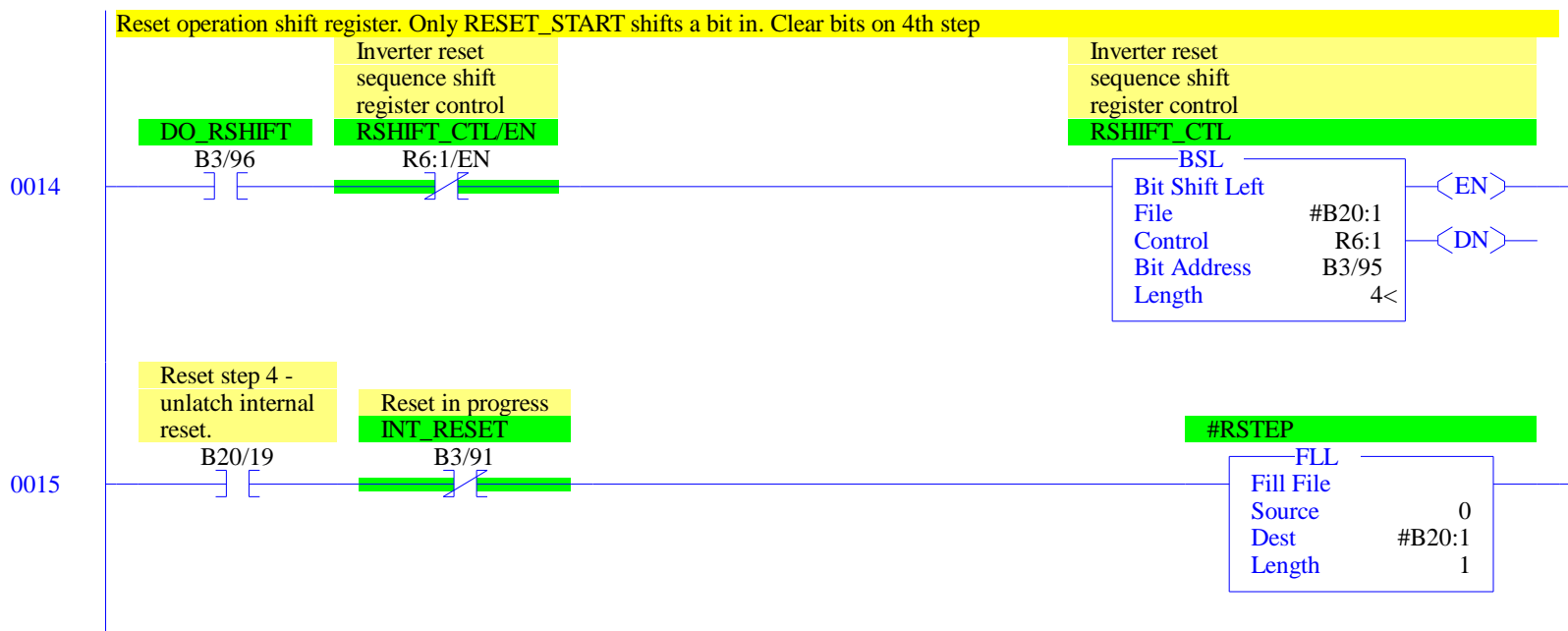
Clamp engine
STEP_5
B20/4

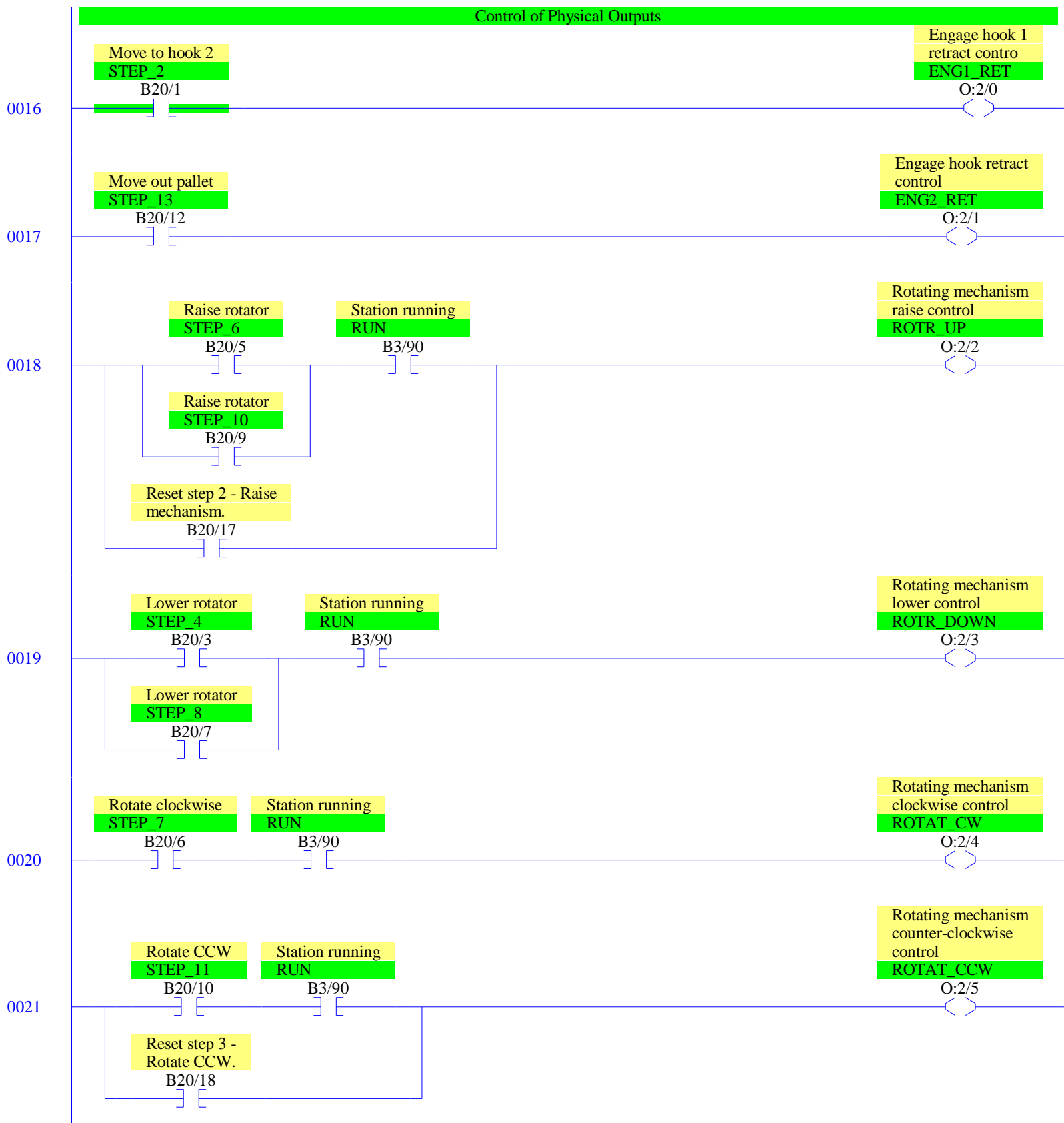
Clamp timer
CLMP_TMR



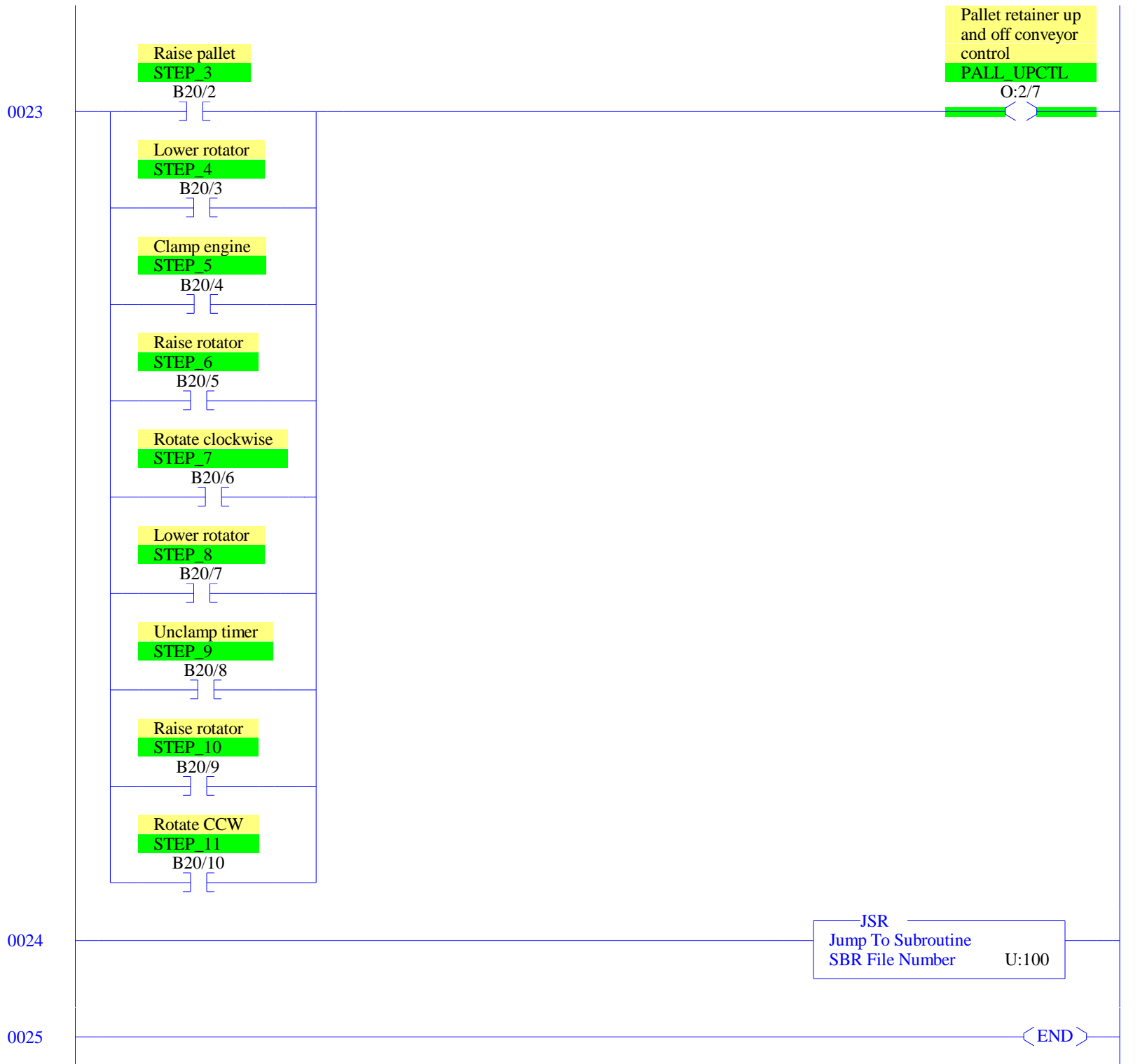








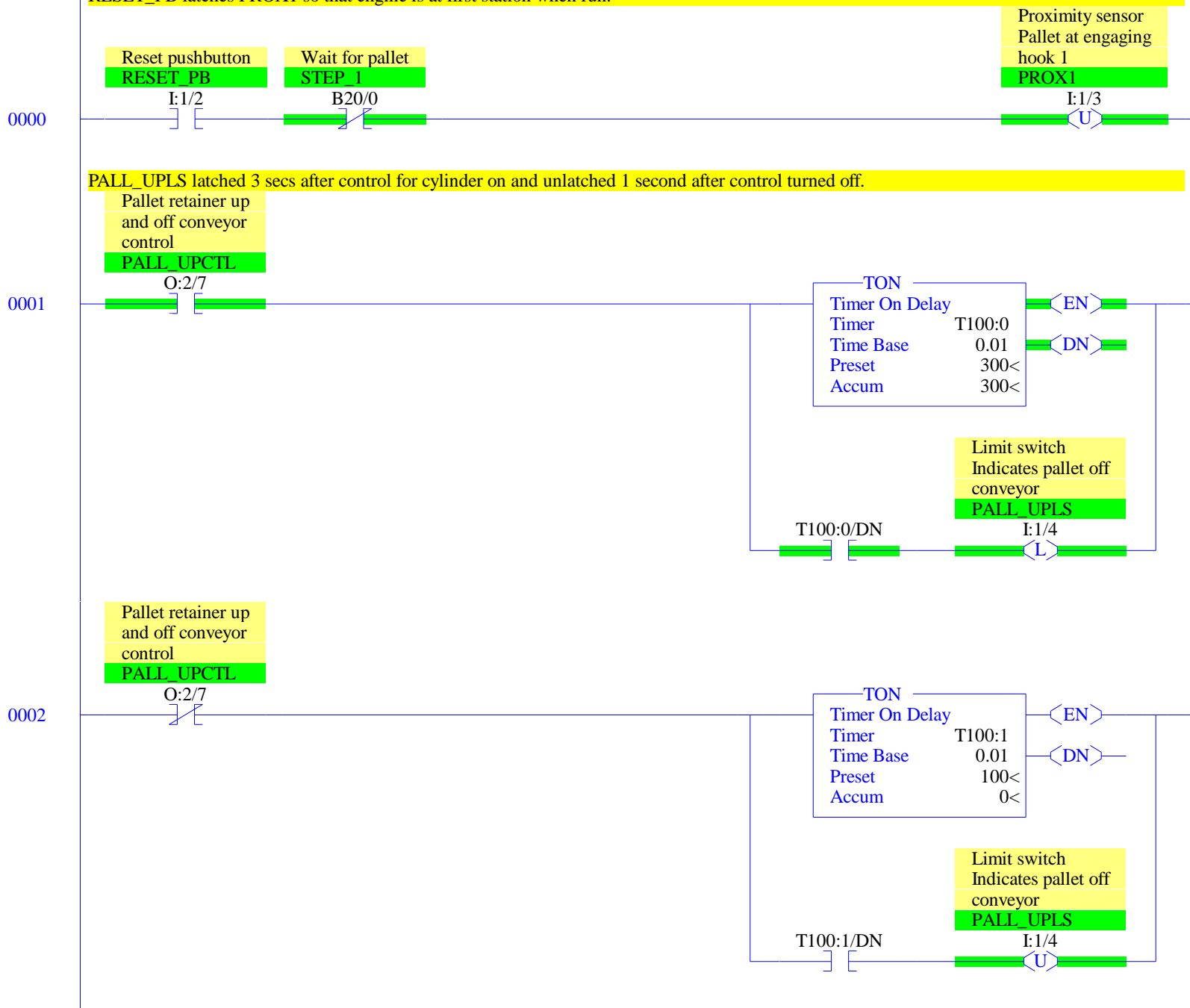




Simulation Logic

This version uses RESET_PB to generate first engine. Each subsequent engine appears 5 seconds after second engage hook goes back up.

RESET_PB latches PROX1 so that engine is at first station when run.



Up/Down limit switches.

Down LS latched 3 secs after down control active and unlatched immediately when up control active.

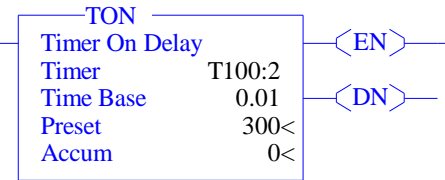
Up LS latched 3 secs after up control active and unlatched immediately when down control active.

Rotating mechanism

lower control

ROTR_DOWN

O:2/3

Rotator down limit
switch

ROTR_DNLS

T100:2/DN

I:1/6

<L>

Rotator up limit
switch

ROTR_UPLS

I:1/5

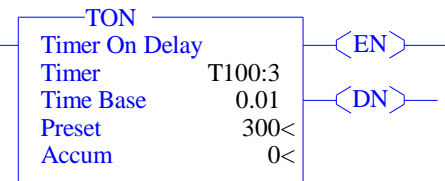
<U>

Rotating mechanism

raise control

ROTR_UP

O:2/2

Rotator up limit
switch

ROTR_UPLS

T100:3/DN

I:1/5

<L>

Rotator down limit
switch

ROTR_DNLS

I:1/6

<U>

Clockwise/Counterclockwise limit switches.

CW LS latched 3 secs after CW control active and unlatched immediately when CCW control active.

CCW LS latched 3 secs after CCW control active and unlatched immediately when CW control active.

Rotating mechanism
clockwise control

ROTAT_CW

O:2/4

TON
Timer On Delay
Timer T100:4
Time Base 0.01
Preset 300<
Accum 0<

Rotator clockwise
limit switch

ROTR_CWLS

I:1/7

Rotator counter-
clockwise limit
switch

ROTR_CCWLS

I:1/10

Rotating mechanism
counter-clockwise
control

ROTAT_CCW

O:2/5

TON
Timer On Delay
Timer T100:5
Time Base 0.01
Preset 300<
Accum 0<

Rotator counter-
clockwise limit
switch

ROTR_CCWLS

I:1/10

Rotator clockwise
limit switch

ROTR_CWLS

I:1/7

Generate next engine present by latching PROX1. Each subsequent engine appears 5 seconds after second engage hook goes back up.

Wait for pallet

STEP_1

B20/0

Engage hook retract
control

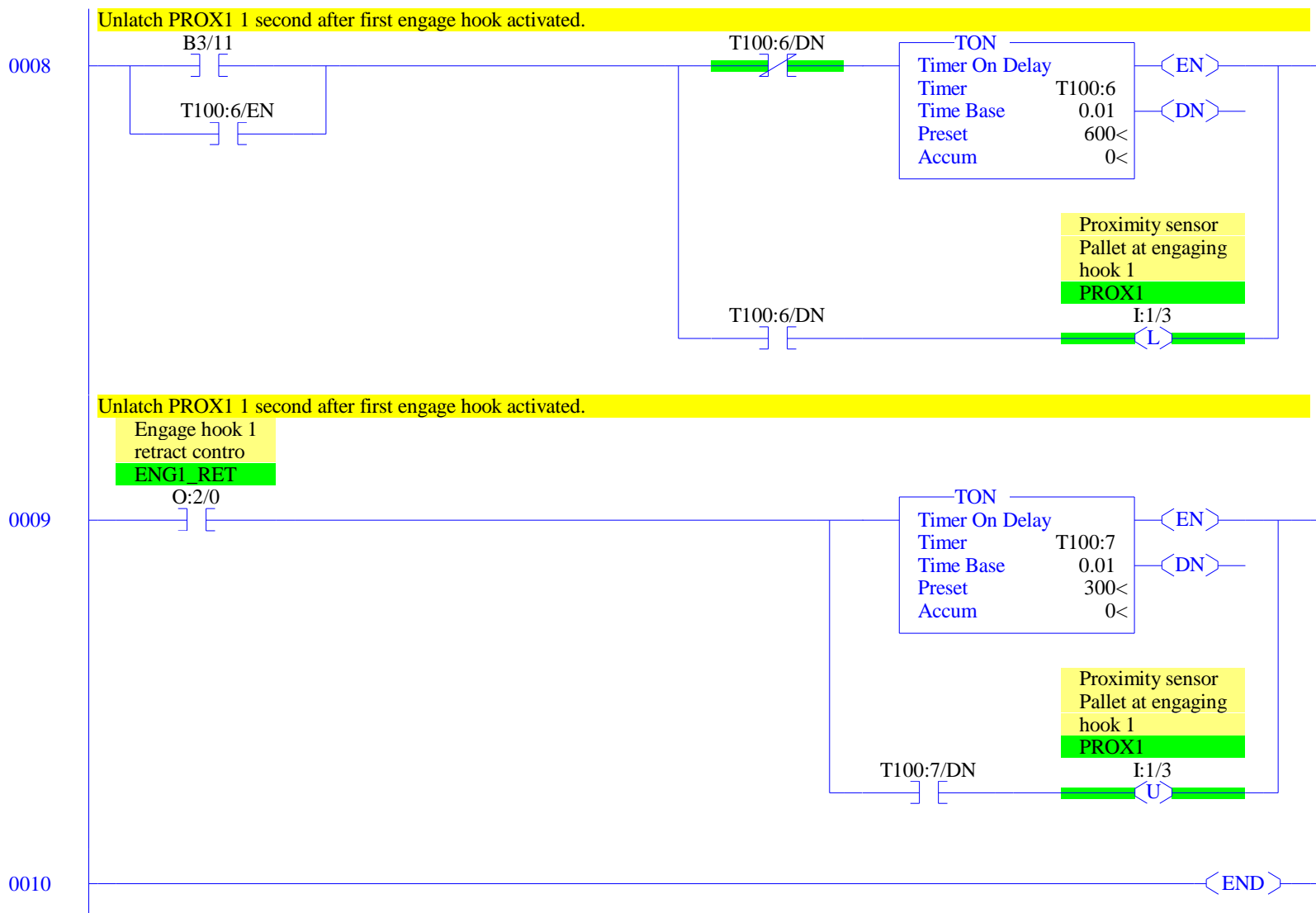
ENG2_RET

O:2/1

B3/10

OSR

B3/11



RSLogix 500 Cross Reference Report - Sorted by Address

O:2/0	- {ENG1_RET} Engage hook 1 retract contro
	OTE - File #2 - 16
	XIC - File #100 SIMULATION - 9
O:2/1	- {ENG2_RET} Engage hook retract control
	OTE - File #2 - 17
	XIO - File #100 SIMULATION - 7
O:2/2	- {ROTR_UP} Rotating mechanism raise control
	OTE - File #2 - 18
	XIC - File #100 SIMULATION - 4
O:2/3	- {ROTR_DOWN} Rotating mechanism lower control
	OTE - File #2 - 19
	XIC - File #100 SIMULATION - 3
O:2/4	- {ROTAT_CW} Rotating mechanism clockwise control
	OTE - File #2 - 20
	XIC - File #100 SIMULATION - 5
O:2/5	- {ROTAT_CCW} Rotating mechanism counter-clockwise control
	OTE - File #2 - 21
	XIC - File #100 SIMULATION - 6
O:2/6	- {GRIP_CLOS} Gripper close control
	OTE - File #2 - 22
O:2/7	- {PALL_UPCTL} Pallet retainer up and off conveyor control
	OTE - File #2 - 23
	XIC - File #100 SIMULATION - 1
	XIO - File #100 SIMULATION - 2
I:1/0	- {START_PB} Start pushbutton
	XIC - File #2 - 0
I:1/1	- {STOP_PB} Stop pushbutton
	XIC - File #2 - 0
I:1/2	- {RESET_PB} Reset pushbutton
	XIC - File #2 - 10
	File #100 SIMULATION - 0
I:1/3	- {PROX1} Proximity sensor Pallet at engaging hook 1
	OTL - File #100 SIMULATION - 8
	OTU - File #100 SIMULATION - 0, 9
	XIC - File #2 - 2
I:1/4	- {PALL_UPLS} Limit switch Indicates pallet off conveyor
	OTL - File #100 SIMULATION - 1
	OTU - File #100 SIMULATION - 2
	XIC - File #2 - 2
	XIO - File #2 - 2
I:1/5	- {ROTR_UPLS} Rotator up limit switch
	OTL - File #100 SIMULATION - 4
	OTU - File #100 SIMULATION - 3
	XIC - File #2 - 2, 12
I:1/6	- {ROTR_DNLS} Rotator down limit switch
	OTL - File #100 SIMULATION - 3
	OTU - File #100 SIMULATION - 4
	XIC - File #2 - 2
I:1/7	- {ROTR_CWLS} Rotator clockwise limit switch
	OTL - File #100 SIMULATION - 5
	OTU - File #100 SIMULATION - 6
	XIC - File #2 - 2
I:1/10	- {ROTR_CCWLS} Rotator counter- clockwise limit switch
	OTL - File #100 SIMULATION - 6
	OTU - File #100 SIMULATION - 5
	XIC - File #2 - 2, 12
B3:0/10	- OSR - File #100 SIMULATION - 7
B3:0/11	- OTE - File #100 SIMULATION - 7
	XIC - File #100 SIMULATION - 8
B3:5/10	- {RUN} Station running
	OTE - File #2 - 0
	XIC - File #2 - 0, 1, 2, 18, 19, 20, 21
	XIO - File #2 - 10
B3:5/11	- {INT_RESET} Reset in progress
	OTE - File #2 - 10
	XIC - File #2 - 9, 10, 11

RSLogix 500 Cross Reference Report - Sorted by Address

```

B3:5/12      - XIO - File #2 - 0, 15
              - {FIRST_START}
              OTE - File #2 - 1
              XIC - File #2 - 2, 7
B3:5/13      - {DO_ISHIFT}
              OTE - File #2 - 2
              XIC - File #2 - 8
B3:5/14      - {ISRC_BIT}
              BSL - File #2 - 8
              OTE - File #2 - 7
B3:5/15      - {RESET_START}
              BSL - File #2 - 14
              OTE - File #2 - 11
              XIC - File #2 - 12
B3:6/0       - {DO_RSHIFT}
              OTE - File #2 - 12
              XIC - File #2 - 14
T4:1         - {ENG1_TMR} Hook 1 engage timer
              TON - File #2 - 3
T4:1/DN      - XIC - File #2 - 2
T4:2         - {ENG2_TMR} Hook 2 disengage timer
              TON - File #2 - 6
T4:2/DN      - XIC - File #2 - 2
T4:3         - {CLMP_TMR} Clamp timer
              TON - File #2 - 4
T4:3/DN      - XIC - File #2 - 2
T4:4         - {UNCLMP_TMR} Unclamp timer
              TON - File #2 - 5
T4:4/DN      - XIC - File #2 - 2
T4:5         - {RUNCLMP_TMR} Reset unclamp timer
              TON - File #2 - 13
T4:5/DN      - XIC - File #2 - 12
R6:0         - {ISHIFT_CTL} Inverter normal sequence shift register control
              BSL - File #2 - 8
R6:0/EN      - XIO - File #2 - 8
R6:1         - {RSHIFT_CTL} Inverter reset sequence shift register control
              BSL - File #2 - 14
R6:1/EN      - XIO - File #2 - 14
B20:0        - {ISTEP}
              FLL - File #2 - 9
              BSL - File #2 - 8
              EQU - File #2 - 1
FILE B20:0 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/0      - {STEP_1} Wait for pallet
              XIC - File #2 - 2
                  File #100 SIMULATION - 7
              XIO - File #100 SIMULATION - 0
FILE B20:0/0 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/1      - {STEP_2} Move to hook 2
              XIC - File #2 - 2, 3, 16
FILE B20:0/1 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/2      - {STEP_3} Raise pallet
              XIC - File #2 - 2, 23
FILE B20:0/2 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/3      - {STEP_4} Lower rotator
              XIC - File #2 - 2, 19, 23
FILE B20:0/3 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/4      - {STEP_5} Clamp engine
              XIC - File #2 - 2, 4, 22, 23
FILE B20:0/4 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8

```

RSLogix 500 Cross Reference Report - Sorted by Address

```

B20:0/5      - {STEP_6} Raise rotator
              XIC - File #2 - 2, 18, 22, 23
FILE B20:0/5 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/6      - {STEP_7} Rotate clockwise
              XIC - File #2 - 2, 20, 22, 23
FILE B20:0/6 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/7      - {STEP_8} Lower rotator
              XIC - File #2 - 2, 19, 22, 23
FILE B20:0/7 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/8      - {STEP_9} Unclamp timer
              XIC - File #2 - 2, 5, 23
FILE B20:0/8 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/9      - {STEP_10} Raise rotator
              XIC - File #2 - 2, 18, 23
FILE B20:0/9 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/10     - {STEP_11} Rotate CCW
              XIC - File #2 - 2, 21, 23
FILE B20:0/10 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/11     - {STEP_12} Drop engine
              XIC - File #2 - 2
FILE B20:0/11 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:0/12     - {STEP_13} Move out pallet
              XIC - File #2 - 2, 6, 7, 17
FILE B20:0/12 LEN:1 - FLL - File #2 - 9
              BSL - File #2 - 8
B20:1        - {RSTEP}
              FLL - File #2 - 15
              BSL - File #2 - 14
              EQU - File #2 - 11
FILE B20:1 LEN:1 - FLL - File #2 - 15
              BSL - File #2 - 14
B20:1/0      - Reset step 1 - Delay to unclamp.
              XIC - File #2 - 12, 13
FILE B20:1/0 LEN:1 - FLL - File #2 - 15
              BSL - File #2 - 14
B20:1/1      - Reset step 2 - Raise mechanism.
              XIC - File #2 - 12, 18
FILE B20:1/1 LEN:1 - FLL - File #2 - 15
              BSL - File #2 - 14
B20:1/2      - Reset step 3 - Rotate CCW.
              XIC - File #2 - 12, 21
FILE B20:1/2 LEN:1 - FLL - File #2 - 15
              BSL - File #2 - 14
B20:1/3      - Reset step 4 - unlatch internal reset.
              XIC - File #2 - 15
              XIO - File #2 - 10
FILE B20:1/3 LEN:1 - FLL - File #2 - 15
              BSL - File #2 - 14
T100:0       - TON - File #100 SIMULATION - 1
T100:0/DN    - XIC - File #100 SIMULATION - 1
T100:1       - TON - File #100 SIMULATION - 2
T100:1/DN    - XIC - File #100 SIMULATION - 2
T100:2       - TON - File #100 SIMULATION - 3
T100:2/DN    - XIC - File #100 SIMULATION - 3
T100:3       - TON - File #100 SIMULATION - 4
T100:3/DN    - XIC - File #100 SIMULATION - 4
T100:4       - TON - File #100 SIMULATION - 5
T100:4/DN    - XIC - File #100 SIMULATION - 5
T100:5       - TON - File #100 SIMULATION - 6

```


RSLogix 500 Cross Reference Report - Sorted by Address

T100:5/DN	-	XIC	-	File #100	SIMULATION	-	6
T100:6	-	TON	-	File #100	SIMULATION	-	8
T100:6/DN	-	XIC	-	File #100	SIMULATION	-	8
		XIO	-	File #100	SIMULATION	-	8
T100:6/EN	-	XIC	-	File #100	SIMULATION	-	8
T100:7	-	TON	-	File #100	SIMULATION	-	9
T100:7/DN	-	XIC	-	File #100	SIMULATION	-	9
U:100	-	JSR	-	File #2	-	24	