ISG
initialize
S0

This starts the thumb-twiddler
The thumb-twiddler counts the number of PLC DirectNET update cycles.
Can use this to figure out the update rate.
rate = (t2 - t1) / (16 * (count2 - count1))

t is the clock time in seconds, ms, or whatever
count is (for now) VY20, in decimal

2 _FirstScan SP0 — Y0 SET

Ignore PLC DirectNET errors for now.
Maybe use this later on to temporarily drop a PLC off the update list?

3 PLC netwrk error SP121 — C121 SET

Set the control bits to read each piece of data from the various PLCs
Use a different control relay for each type of data from each PLC
Each control bit will be reset when the READ is attempted
(A missing or off-net PLC will timeout in about a half second and
execution will continue to the next PLC)

Use memory location V2000 (retentive) to hold the mask that controls which
control bits are sent. E.g., V2000=00FF means set C100-C107

4 VC100 = K0 VC20 = K0
- LD updateMask V2000
- OUT VC100
- updateComplete C0 SET

relay	addr	description
C100	3	EPS X inputs
C101	3	EPS Y outputs
C102	3	EPS C relays
C103	12	F1 X inputs
C104	12	F1 Y outputs
C105	12	F1 C relays
C106	13	FOE Vacuum VDC
C107	14	SOE Vacuum VDC
C110	11	DCM Cryo VDC
C111	3	EPS Event Log
C112	17	DCM Vac VDC
C113	17	DCM Vac C Relays
C114	17	DCM Vac Y Outputs
C115	16	Pump Cabinets 1&2
C116	18	Pump Cabinets 3&Appendix
C117	15	DI Water Values

5 NOP

ISG
MPI setup
S10

ISG
EPS comm
S1000

read the EPS (Koyo #3, DL 440 CPU):
X0-X77 inputs, store locally in X400-X477

8 PLC network idle SP120 C100

LD K3
LD K8
LDA O40420
RX VX0
C100 RST

read the EPS (Koyo #3, DL 440 CPU):
Y0-Y77 outputs, store locally in Y400-Y477

9 PLC network idle SP120 C101

LD K3
LD K8
LDA O40520
RX VY0
C101 RST

read the EPS (Koyo #3, DL 440 CPU):
C0-C77 control relays, store locally in C400-C477

10 PLC network idle SP120 C102

LD K3
LD K8
LDA O40620
RX VC0
C102 RST

read the EPS (Koyo #3, DL 440 CPU):
log event index

11 PLC network idle SP120 C111
- LD K3
- LD K2
- LDA O3120
- RX EPS event index V3120
- C111 RST

12 PLC network idle SP120 PLC netwrk error SP121
- EPS com err C1000 OUT

13 PLC network idle SP120
- F1 Filter comm S1001 JMP

SG F1 Filter comm S1001

read the F1 Filter Switch Control (Koyo #12, DL 240 CPU):
X0-X17 inputs, store locally in X300-X317

15 PLC network idle SP120 C103
- LD K12
- LD K2
- LDA O40414
- RX VX0
- C103 RST

read the F1 Filter Switch Control (Koyo #12, DL 240 CPU):
Y0-X37 inputs, store locally in Y300-Y337

16 PLC network idle SP120 C104
- LD K12
- LD K4
- LDA O40514
- RX VY0
- C104 RST

read the F1 Filter Switch Control (Koyo #12, DL 240 CPU):
C0-C17 inputs, store locally in C300-C317

17 PLC network idle SP120 C105
- LD K12
- LD K2
- LDA O40614
- RX VC0
- C105 RST

18 PLC network idle SP120 PLC netwrk error SP121 — F1 com err C1001 OUT

19 PLC network idle SP120 — FOE vac comm S1002 JMP

SG FOE vac comm S1002

read the FOE Vacuum Monitor (Koyo #13, DL 240 CPU):
4 raw ADC values, store locally in V10000-V10003

21 PLC network idle SP120 C106
- LD K13
- LD K8
- LDA O10000
- RX V3000
- C106 RST

22 PLC network idle SP120 | PLC netwrk error SP121 → FOE vac com err C1002 OUT

23 PLC network idle SP120 → SOE vac comm S1003 JMP

SG SOE vac comm S1003

read the SOE Vacuum Monitor (Koyo #14, DL 240 CPU):
4 raw ADC values, store locally in V10004-V10007)

25 PLC network idle SP120 | C107 →
- LD K14
- LD K8
- LDA O10004
- RX V3000
- C107 RST

26 PLC network idle SP120 | PLC netwrk error SP121 → SOE vac com err C1003 OUT

27 PLC network idle SP120 → DCM cryo comm S1004 JMP

SG DCM cryo comm S1004

read the DCM Cryopump Monitor (Koyo #11, DL 240 CPU):
4 raw ADC values, store locally in V10010-V10017

29 PLC network idle SP120 / C110
- LD K11
- LD K8
- LDA O10010
- RX V3000
- C110 RST

30 PLC network SP120 / PLC netwrk error SP121
- DCM cryo com er C1004 OUT

31 PLC network idle SP120
- DCM vac comm S1005 JMP

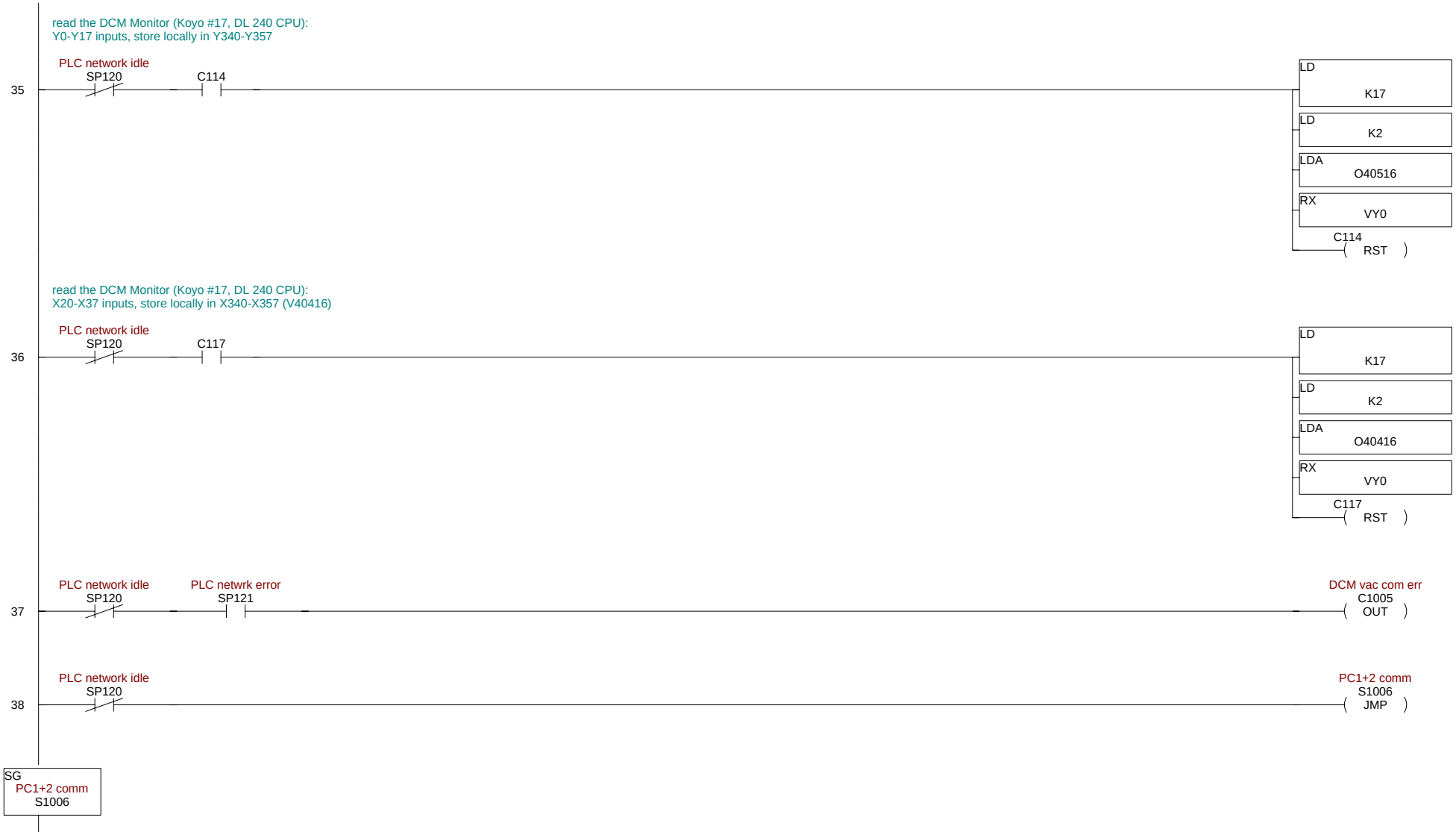
SG DCM vac comm S1005

read the DCM Vacuum Monitor (Koyo #17, DL 240 CPU):
4 raw ADC values, store locally in V10030-V10037

33 PLC network idle SP120 / C112
- LD K17
- LD K8
- LDA O10030
- RX V3000
- C112 RST

read the DCM Monitor (Koyo #17, DL 240 CPU):
C0-C17 inputs, store locally in C340-C357

34 PLC network idle SP120 / C113
- LD K17
- LD K2
- LDA O40616
- RX VC0
- C113 RST


read the DCM Monitor (Koyo #17, DL 240 CPU):
Y0-Y17 inputs, store locally in Y340-Y357
35
PLC network idle
SP120
C114
LD
K17
LD
K2
LDA
O40516
RX
VY0
C114
RST
read the DCM Monitor (Koyo #17, DL 240 CPU):
X20-X37 inputs, store locally in X340-X357 (V40416)
36
PLC network idle
SP120
C117
LD
K17
LD
K2
LDA
O40416
RX
VY0
C117
RST
37
PLC network idle
SP120
PLC netwrk error
SP121
DCM vac com err
C1005
OUT
38
PLC network idle
SP120
PC1+2 comm
S1006
JMP
SG
PC1+2 comm
S1006

read the Pump Cabinet 1 & 2 Vacuum Monitor (Koyo #16, DL 240 CPU):
4 raw ADC values, store locally in V10020-V10023
40
PLC network idle
SP120
C115
LD
K16
LD
K8
LDA
O10020
RX
V3000
C115
RST
41
PLC network idle
SP120
PLC netwrk error
SP121
PC1+2 com err
C1006
OUT
42
PLC network idle
SP120
PC3 comm
S1007
JMP
SG
PC3 comm
S1007
read the Pump Cabinet 3 Vacuum Monitor (Koyo #18, DL 240 CPU):
4 raw ADC values, store locally in V10024-V10027
44
PLC network idle
SP120
C116
LD
K18
LD
K8
LDA
O10024
RX
V3000
C116
RST
45
PLC network idle
SP120
PLC netwrk error
SP121
PC3 com err
C1007
OUT
46
PLC network idle
SP120
DI water comm
S1010
JMP

SG
DI water comm
S1010

skip the DI water PLC for now, it does not exist

48 PLC network idle SP120 — EPS logs comm S1011 JMP

read the DI Water Plant Monitor (Koyo #15, DL 240 CPU):
8 raw ADC values, store locally in V10__0-V10__7

49 PLC network idle SP120, C117
- LD K15
- LD K16
- LDA O10030
- RX V3000
- C117 RST

50 PLC network idle SP120, PLC netwrk error SP121 — DI water com err C1010 OUT

SG
EPS logs comm
S1011

52 EPS event index V3120 ≠ EPSoldEventIndex V3121, EPSloadEventLog C10
- LD EPS event index V3120
- OUT EPSoldEventIndex V3121
- EPSloadEventLog C10 SET

A bit indirect but allows us to detect
multiple log events while in the midst of
transferring the logs.
In that case, just restart loading the logs.

53 EPSloadEventLog C10
- EPSloadEventLog C10 RST
- C20 SET C27

read the EPS (Koyo #3, DL 440 CPU):
event log, part 1 of 8

54 PLC network idle SP120 C20

LD K3
LD K128
LDA O4000
RX EPS event log V4000
C20 RST

read the EPS (Koyo #3, DL 440 CPU):
event log, part 2 of 8

55 PLC network idle SP120 C21

LD K3
LD K128
LDA O4100
RX V4100
C21 RST

read the EPS (Koyo #3, DL 440 CPU):
event log, part 3 of 8

56 PLC network idle SP120 C22

LD K3
LD K128
LDA O4200
RX V4200
C22 RST

read the EPS (Koyo #3, DL 440 CPU):
event log, part 4 of 8

57 PLC network idle SP120 C23

LD K3
LD K128
LDA O4300
RX V4300
C23 RST

read the EPS (Koyo #3, DL 440 CPU):
event log, part 5 of 8

PLC network idle

58 SP120 C24

LD K3
LD K128
LDA O4400
RX V4400
C24 RST

read the EPS (Koyo #3, DL 440 CPU):
event log, part 6 of 8

PLC network idle

59 SP120 C25

LD K3
LD K128
LDA O4500
RX V4500
C25 RST

read the EPS (Koyo #3, DL 440 CPU):
event log, part 7 of 8

PLC network idle

60 SP120 C26

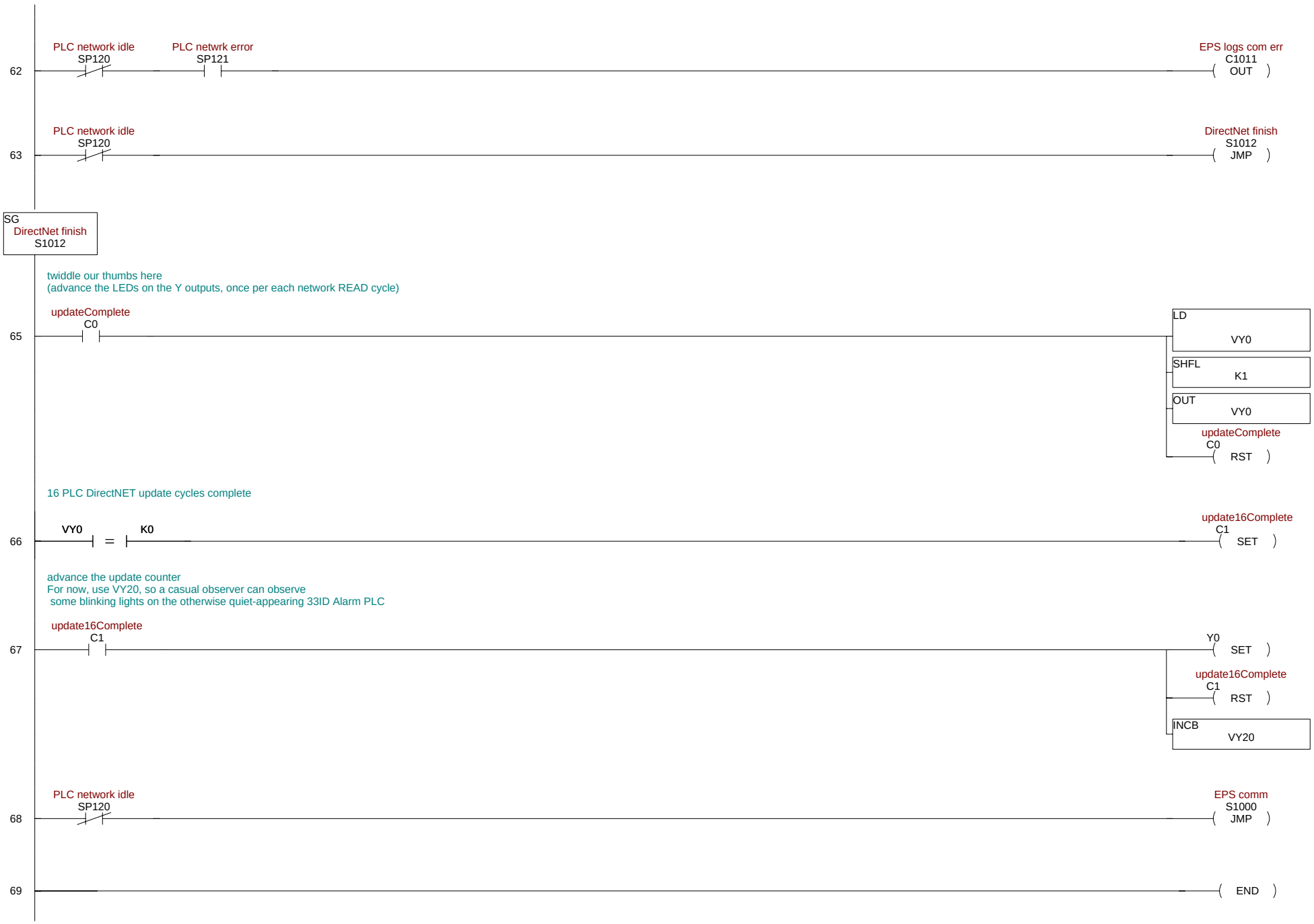
LD K3
LD K128
LDA O4600
RX V4600
C26 RST

read the EPS (Koyo #3, DL 440 CPU):
event log, part 8 of 8

PLC network idle

61 SP120 C27

LD K3
LD K128
LDA O4700
RX V4700
C27 RST


62
PLC network idle
SP120
PLC netwrk error
SP121
EPS logs com err
C1011
OUT
63
PLC network idle
SP120
DirectNet finish
S1012
JMP
SG
DirectNet finish
S1012
twiddle our thumbs here
(advance the LEDs on the Y outputs, once per each network READ cycle)
65
updateComplete
C0
LD
VY0
SHFL
K1
OUT
VY0
updateComplete
C0
RST
16 PLC DirectNET update cycles complete
66
VY0
=
K0
update16Complete
C1
SET
advance the update counter
For now, use VY20, so a casual observer can observe
some blinking lights on the otherwise quiet-appearing 33ID Alarm PLC
67
update16Complete
C1
Y0
SET
update16Complete
C1
RST
INCB
VY20
68
PLC network idle
SP120
EPS comm
S1000
JMP
69
END

70 (NOP)