1 — NOP

ISG
Analog input handler
ADC stage
S10

F4-08AD 8-channel analog input module in slot 2
This module uses X00-X17 for data transfer

3 — Analog input handler ADC stage S10 — K8 FOR

4 — Analog input handler ADC stage S10

LDIF
F4-08AD analog input data address base
ADC input data
X0
K12

BCD

LDIF
F4-08AD analog input channel ID
ADC chanID
X14
K4

OUTX
DCM Perkin-Elmer ion pump vacuum, VDC analog chan 1
V3100

5 — NEXT

6 — NOP

F4-08AD 8-channel analog input module in slot 3
This module uses X20-X37 for data transfer

7 — Analog input handler ADC stage S10 — K8 FOR

8 — Analog input handler
ADC stage
S10

- LDIF X20 K12
- BCD
- LDIF X34 K4
- OUTX convectron gauge 2 vacuum, VDC analog chan 9 V3110

9 — NEXT

ISG
initialize the MPI
MPI init stage
S20

MPI: set the input data table to start at V3000
(default is V5100 when the MPI is in PLC base slot 1)
If setting this for the first time, then power-cycle the PLC
to set this in the MPI.

11 — initialize the MPI
MPI init stage
S20

- LD K3000
- OUT MPI table base address pointer MPI base ptr V7353

set the sample interval to 1 sec

12 — initialize the MPI
MPI init stage
S20

- LD K10
- OUT MPI sample rate V3000

roll over at 8 digits

13 initialize the MPI
MPI init stage
S20

LD K8
OUT MPI roll-over V3001

use an offset address from the MPI configuration data table at V3040

14 initialize the MPI
MPI init stage
S20

LD K0
OUT offset address V1400

set the configuration for all MPI channels

15 initialize the MPI
MPI init stage
S20

K32 FOR

K factor LSW is 0x0000

16 initialize the MPI
MPI init stage
S20

LD K0
LD offset address V1400
BIN
OUTX MPI ch1 K LSW V3040
INC offset address V1400

K factor MSW is 0x0001

initialize the MPI
MPI init stage
S20

17

LD
K1

LD
offset address
V1400

BIN

OUTX
MPI ch1 K LSW
V3040

INC
offset address
V1400

MSB = # digits to right of decimal point in K factor
LSB = # digits to right of decimal point in volume of flow
set to 0x0400

initialize the MPI
MPI init stage
S20

18

LD
K400

LD
offset address
V1400

BIN

OUTX
MPI ch1 K LSW
V3040

INC
offset address
V1400

MSB = # digits to right of decimal point in flow rate
LSB = flow rate units code, 01 = units/second
set to 0x0401

19 initialize the MPI
MPI init stage
S20

- LD K401
- LD offset address V1400
- BIN
- OUTX MPI ch1 K LSW V3040
- INC offset address V1400

20 NEXT

21 NOP

read the flow rate data for all channels

22 initialize the MPI
MPI init stage
S20

- LD Kff00
- OUT Read Data (bit mapped) MPI read data V3005

reset the flow rate data for all channels
do not bother to reset the total pulse count for each channel

23 initialize the MPI
MPI init stage
S20

- LD Kff00
- OUT Reset Data (bit mapped) MPI reset data V3006

read the MPI mode word

24 initialize the MPI
MPI init stage
S20

- LD MPI Mode Word (bit mapped) MPI mode word V3007
- OUT VC1700

set the bit to tell the MPI to read the new configuration

25 initialize the MPI
MPI init stage
S20 — C1700 SET

define flow sample rate in seconds

26 initialize the MPI
MPI init stage
S20 — C1701 RST

enable flow rate calculation

27 initialize the MPI
MPI init stage
S20 — C1702 SET

reset the bit that tells the MPI to write its clock to the PLC data area

28 initialize the MPI
MPI init stage
S20 — C1711 RST

reset the MPI fast update bit

29 initialize the MPI
MPI init stage
S20 — C1710 RST

set the SET MPI clock from PLC data bit

30 initialize the MPI
MPI init stage
S20 — C1717 SET

reload the MPI status word

31 initialize the MPI
MPI init stage
S20 — LD VC1700 / OUT MPI Mode Word (bit mapped) MPI mode word V3007

32 initialize the MPI
MPI init stage
S20 — set MPI clock S22 JMP

SG
MPI update stage
S21

reset the MPI reset data bit

34 MPI update stage S21 — LD K0 — OUT Reset Data (bit mapped) MPI reset data V3006

read the MPI status word

35 MPI update stage S21 — LD MPI Mode Word (bit mapped) MPI mode word V3007 — OUT VC1700

reset the bit that sets the MPI RTC

36 MPI update stage S21 — C1717 RST

enable flow rate calculation and read the MPI RTC (clock)

37 MPI update stage S21 — C1702 SET — C1711 SET

if there is fresh data, reset the fresh data bit

38 C1704 — C1704 RST

reload the MPI status word

39 MPI update stage S21 — LD VC1700 — OUT MPI Mode Word (bit mapped) MPI mode word V3007

adjust the MPI clock every hour

40 PLC hour V7770 ≠ last hour value V1401 — LD PLC hour V7770 — OUT last hour value V1401 — set MPI clock S22 JMP

SG
set MPI clock
S22

prepare to set the MPI clock chip: year YY

42 set MPI clock S22 — LD V7774 — OUT YY MPI year V3033

prepare to set the MPI clock chip: Month and Date MMDD

43 set MPI clock S22 — LD V7773 — SHFL K8 — ADD V7772 — OUT MMDD MPI MonthDate V3034

prepare to set the MPI clock chip: hour and minute hhmm

44 set MPI clock S22 — LD PLC hour V7770 — SHFL K8 — ADD V7767 — OUT hhmm MPI HrMin V3031

prepare to set the MPI clock chip: second.milliseconds ss.mm

45 set MPI clock S22 — LD V7766 — SHFL K8 — ADD V7747 — OUT ss.nn MPI seconds V3030

prepare to set the MPI clock chip: day of the week

46 set MPI clock S22 → LD V7771; OUT 01-07 MPI dayOfWeek V3032

47 set MPI clock S22 → LD K8000; OUT MPI Mode Word (bit mapped) MPI mode word V3007

48 set MPI clock S22 → MPI update stage S21 JMP

ISG initialize DCM piezo controller protection code PZT switch init S30

limits for the DCM ion gauge:
K2072 = 0.12 VDC = 1.3e-11 Torr (on 1.0 range)
K3481 = 7.00 VDC = 1.0e-4 Torr (on 1.0 range)

50 initialize DCM piezo controller protection code PZT switch init S30 → LD K2072; OUT DCM ion gauge low limit (ADC units) DCM IG lo lim V4000; LD K3481; OUT DCM ion gauge high limit (ADC units) DCM IG hi lim V4001

limits for the DCM convectron gauge:
K2072 = 0.12 VDC = 1.3e-4 Torr
K2441 = 1.92 VDC = 8.3e-3 Torr
K3481 = 7.00 VDC = 1.0e3 Torr (under vacuum, CG reads ~2.3e-3 Torr)

51 — initialize DCM piezo controller protection code PZT switch init S30

- LD K2072
- OUT DCM convectron gauge low limit (ADC units) DCM CG lo lim V4002
- LD K3481
- OUT DCM convectron gauge high limit (ADC units) DCM CG hi lim V4003
- LD K2441
- OUT DCM convectron gauge atmospheric pressure lo limit (ADC units) DCM atm lo lim V4004

limits for the DCM ion pump current:
K2049 = 0.01 VDC = 4.0e-11 Torr
K4093 = 9.99 VDC = 4.1e-8 Torr

52 — initialize DCM piezo controller protection code PZT switch init S30

- LD K2049
- OUT DCM ion pump low limit (ADC units) DCM IP lo lim V4005
- LD K4093
- OUT DCM ion pump high limit (ADC units) DCM IP hi lim V4006

53 — initialize DCM piezo controller protection code PZT switch init S30 — (JMP) DCM piezo controller protection against bad vacuum PZT switch S31

SG
DCM piezo controller protection against bad vacuum
PZT switch
S31

is the ion pump vacuum in range?

55 — DCM Perkin-Elmer ion pump vacuum, VDC analog chan 1 V3100 ≥ DCM ion pump low limit (ADC units) DCM IP lo lim V4005 — DCM Perkin-Elmer ion pump vacuum, VDC analog chan 1 V3100 < DCM ion pump high limit (ADC units) DCM IP hi lim V4006 — (OUT) DCM ion pump vacuum in range DCM IP Vac OK C10

is the ion gauge vacuum in range?

56 — DCM ion gauge vacuum, VDC analog chan 7 V3106 ≥ DCM ion gauge low limit (ADC units) DCM IG lo lim V4000 — DCM ion gauge vacuum, VDC analog chan 7 V3106 < DCM ion gauge high limit (ADC units) DCM IG hi lim V4001 — (OUT) DCM ion gauge vacuum in range DCM IG Vac OK C11

is the convectron gauge vacuum in range?

57 — convectron gauge 1 vacuum, VDC analog chan 8 V3107 ≥ DCM convectron gauge low limit (ADC units) DCM CG lo lim V4002 — convectron gauge 1 vacuum, VDC analog chan 8 V3107 < DCM convectron gauge high limit (ADC units) DCM CG hi lim V4003 — (OUT) DCM convectron gauge vacuum in range DCM CG Vac OK C12

is the ion gauge vacuum on?
(vac must be in range AND CG must be low)

58 — DCM ion gauge vacuum in range DCM IG Vac OK C11 — convectron gauge 1 vacuum, VDC analog chan 8 V3107 < DCM convectron gauge low limit (ADC units) DCM CG lo lim V4002 — (OUT) DCM ion gauge is ON DCM IG ON C13

GP307 controller is ON if either gauge is ON

59 — DCM ion gauge vacuum in range DCM IG Vac OK C11 — DCM convectron gauge vacuum in range DCM CG Vac OK C12 — (OUT) DCM ion gauge controller is ON DCM GP307 ON C14

60 — DCM ion gauge controller is ON DCM GP307 ON C14 — DCM ion gauge is ON DCM IG ON C13 — DCM ion pump vacuum in range DCM IP Vac OK C10 — (OUT) DCM vac < 0.1 mTorr DCM at high vac C15

61
DCM ion gauge controller is ON DCM GP307 ON C14
DCM ion gauge is ON DCM IG ON C13
DCM ion pump vacuum in range DCM IP Vac OK C10
DCM ion gauge vacuum, VDC analog chan 7 V3106 ≥ DCM convectron gauge atmospheric pressure lo limit (ADC units) DCM atm lo lim V4004
DCM vac > 10 Torr DCM at atmos C16 OUT

PZT can be powered ON when pressure is in either range

62
DCM vac < 0.1 mTorr DCM at high vac C15
DCM vac > 10 Torr DCM at atmos C16
DCM pressure OK to permit PZT ON DCM Pressure OK C0 OUT

wait for 1 minute (600 intervals of 0.1 sec) before allowing PZT to be powered ON
this avoids rapid cycling as pressure transits invalid range

63
DCM pressure OK to permit PZT ON DCM Pressure OK C0
TMR DCM pressure OK timer DCM PZT timer T10 K600

Switch the 120 VAC hot lead on the DCM PZT controller.
Use a 2A, slo-blo fuse.

64
DCM pressure OK timer DCM PZT timer T10
DCM piezo controller permitted to be ON DCM PZT ON Y0 OUT

65
END

66
NOP