USAXS Femto Amplifier Controller
controls I0 and I00 amplifiers
monitors output voltage from the amplifiers

How about averaging the signal over 10 readings and reporting that?

LBL
K10

check the gain, can't be less than 1e3 V/A

2 — V/A range V2000 < K3 — LD K3 — OUT V/A range V2000

check the gain, can't be more than 1e11 V/A

3 — V/A range V2000 ≥ K12 — LD K11 — OUT V/A range V2000

gains: 1e3 to 1e9 use low noise switch (x100 off)

4 — V/A range V2000 < K10 — LD K3 — OUT V2001 — LD K8 — OUT V2002

gains: 1e10 and 1e11 use high speed switch (x100 on)

5 — V/A range V2000 ≥ K10 — LD K5 — OUT V2001 — LD K0 — OUT V2002

VC200 is settings for output relays

6 _On SP1 → LD V/A range V2000; SUB V2001; OUT V2001; ADD V2002; BIN; OUT VC200

write the relays for Femto I0 control

7 C200 → I0 input 0 Y0 OUT

8 C201 → I0 input 1 Y1 OUT

9 C202 → I0 input 2 Y2 OUT

10 C203 → I0 input x100 Y3 OUT

ADC initialization

LBL K1

configure the ADC to read 4 channels fast
store the BCD values in v3000..v3003

12 _FirstScan SP0 → LD K400; OUT V7660; LDA O3000; OUT V7670

set up the DV1000 for display at V2200 & V2240

13 _FirstScan SP0

- LDA O2200
- OUT V7624
- LDA O2240
- OUT V7623

DV1000: text mask on row 1

14 _FirstScan SP0

- LD K8
- LD K0
- LDLBL K1
- MOVMC V2200

DV1000: numeric mask

15 _FirstScan SP0

- LD K202b
- OUTD V2202
- LDD K202e00
- OUTD V2204

DV1000: text mask, row 2

16 _FirstScan SP0

- LD K8
- LDA O2200
- MOV V2210

DV1000: text mask, row 3

17 _FirstScan SP0

- LD K8
- LDA O2200
- MOV V2220

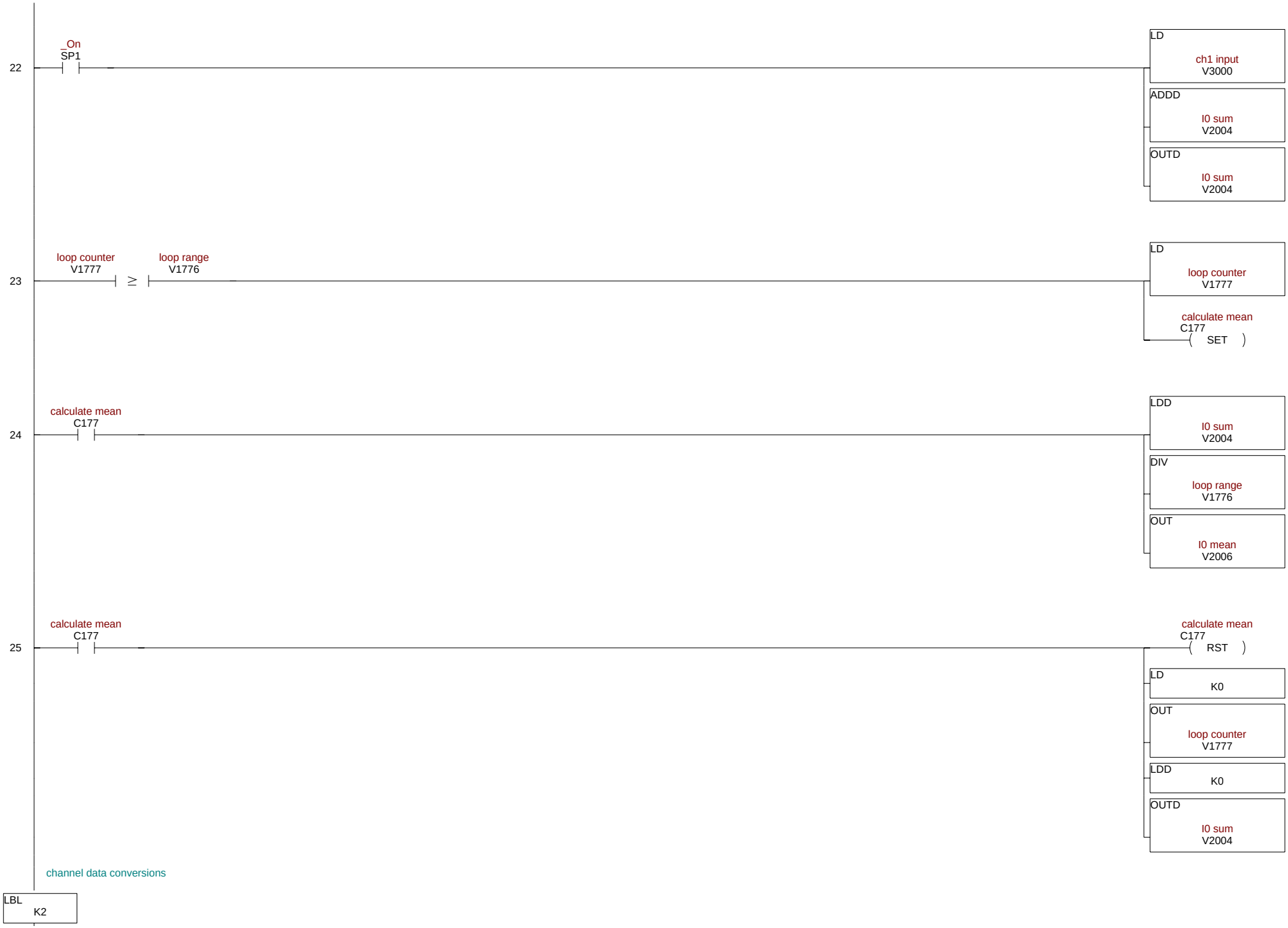
DV1000: text mask, row 4

18 _FirstScan SP0
- LD K8
- LDA O2200
- MOV V2230

19 _FirstScan SP0
- LD K5632
- OUT V2210
- ADDD K1
- OUT V2220
- ADDD K1
- OUT V2230

20 _FirstScan SP0
- LD K0
- OUT loop counter V1777
- LD K10
- OUT loop range V1776
- LDD K0
- OUTD I0 sum V2004

21 _On SP1
- INC loop counter V1777


22
_On
SP1
LD
ch1 input
V3000
ADDD
I0 sum
V2004
OUTD
I0 sum
V2004
23
loop counter
V1777
≥
loop range
V1776
LD
loop counter
V1777
calculate mean
C177
SET
24
calculate mean
C177
LDD
I0 sum
V2004
DIV
loop range
V1776
OUT
I0 mean
V2006
25
calculate mean
C177
calculate mean
C177
RST
LD
K0
OUT
loop counter
V1777
LDD
K0
OUTD
I0 sum
V2004
channel data conversions
LBL
K2

convert the channel 1 analog value to centiVolts, DC
Also keep track of the sign bit in a control relay

27 _On SP1

LD ch1 input V3000
ANDD K7fff
MUL K2000
DIV K8191
OUT | V1, DC | V3100

ch1 input V3000 ≥ K8001 — v1 negative C0 OUT

28 v1 negative C0 — | V1, DC | V3100 = K0 — v1 invalid C10 OUT

repeat for channel 2

29 _On SP1

LD V3001
ANDD K7fff
MUL K2000
DIV K8191
OUT | V2, DC | V3102

V3001 ≥ K8001 — v2 negative C1 OUT

30 v2 negative C1 — | V2, DC | V3102 = K0 — v2 invalid C11 OUT

repeat for channel 3

31 _On SP1 → LD V3002; ANDD K7fff; MUL K2000; DIV K8191; OUT | V3, DC | V3104

V3002 ≥ K8001 → v3 negative C2 OUT

32 v3 negative C2 ; | V3, DC | V3104 = K0 → v3 invalid C12 OUT

repeat for channel 4

33 _On SP1 → LD V3003; ANDD K7fff; MUL K2000; DIV K8191; OUT | V4, DC | V3106

V3003 ≥ K8001 → v4 negative C3 OUT

34 v4 negative C3 ; | V4, DC | V3106 = K0 → v4 invalid C13 OUT

write the output numbers as BCD at V3110-3113
OR the sign bit to the MSB

LBL K3

channel 1

36 v1 invalid C10 — LD | V1, DC | V3100

V1 < 0 so set the sign bit

37 v1 invalid C10, v1 negative C0 — ORD K8000

save the result

38 v1 invalid C10 — OUT V1, V DC V3110

channel 2

39 v2 invalid C11 — LD | V2, DC | V3102

40 v2 invalid C11, v2 negative C1 — ORD K8000

41 v2 invalid C11 — OUT V2, V DC V3111

channel 3

42 v3 invalid C12 — LD | V3, DC | V3104

43 v3 invalid C12, v3 negative C2 — ORD K8000

44 v3 invalid C12 — OUT V3, V DC V3112

channel 4

45 v4 invalid C13 — LD | V4, DC | V3106

46 v4 invalid C13 / v4 negative C3 → ORD K8000

47 v4 invalid C13 → OUT V4, V DC V3113

update the DV1000 display area

LBL K4

49 _100MilliSeconds SP5 → DV1000 update C100 PD

DV1000: value of channel 1

50 DV1000 update C100 → LD | V1, DC | V3100; LD K6532; SFLDGT; OUTD V2241

positive value

51 DV1000 update C100 / v1 negative C0 → LD K2020

negative value, write the "-" sign

52 DV1000 update C100 / v1 negative C0 → LD K202d

write the sign text

53 DV1000 update C100 / v1 invalid C10 → OUT V2202

DV1000: value of channel 2

54 DV1000 update C100 → LD | V2, DC | V3102; LD K6532; SFLDGT; OUTD V2245

55 DV1000 update C100, v2 negative C1 → LD K2020

56 DV1000 update C100, v2 negative C1 → LD K202d

57 DV1000 update C100, v2 invalid C11 → OUT V2212

DV1000: value of channel 3

58 DV1000 update C100 → LD | V3, DC | V3104; LD K6532; SFLDGT; OUTD V2251

59 DV1000 update C100, v3 negative C2 → LD K2020

60 DV1000 update C100, v3 negative C2 → LD K202d

61
DV1000 update
C100
v3 invalid
C12
OUT
V2222
DV1000: value of channel 4
62
DV1000 update
C100
LD
| V4, DC |
V3106
LD
K6532
SFLDGT
OUTD
V2255
63
DV1000 update
C100
v4 negative
C3
LD
K2020
64
DV1000 upda
C100
v4 negative
C3
LD
K202d
65
DV1000 update
C100
v4 invalid
C13
OUT
V2232
66
END
DLBL
K1
68
ACON
V1: +00.00 V DC
69
NOP