

Operation of the Diamond Phase Plate at Beamline 27-ID

Under construction, last updated 08/10/2016, tg

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0. Principle of Operation (Bragg Transmission Phase Plate)

By utilizing a diffraction plane rotated by 45° from the vertical around the incident synchrotron radiation beam, its natural horizontal polarization is divided into two equal in-plane (σ') and out-of-plane (π') components (see figure below). In a Bragg reflection these components are diffracted differently, generating a phase shift between them (Batterman, PRB **45**, 12677 (1992)). For a phase shift of π , a vertical, linear polarization results.

1. Hardware Setup (see Figure 1 and 2 below)

1.1 Attocube Rotation Stage

Back panel of ANC300 controller

- connect Attocube rotation stage to AXIS 2 output
- connect Ethernet cable on controller and on available network jack in 27-ID-B enclosure

Front panel of ANC300 controller

- connect DC-IN of ANM300 module to output of a beamline control DAC channel

Other

- connect PIN detector to input of an SR570 current amplifier > Nova1200 VFC > VME counter

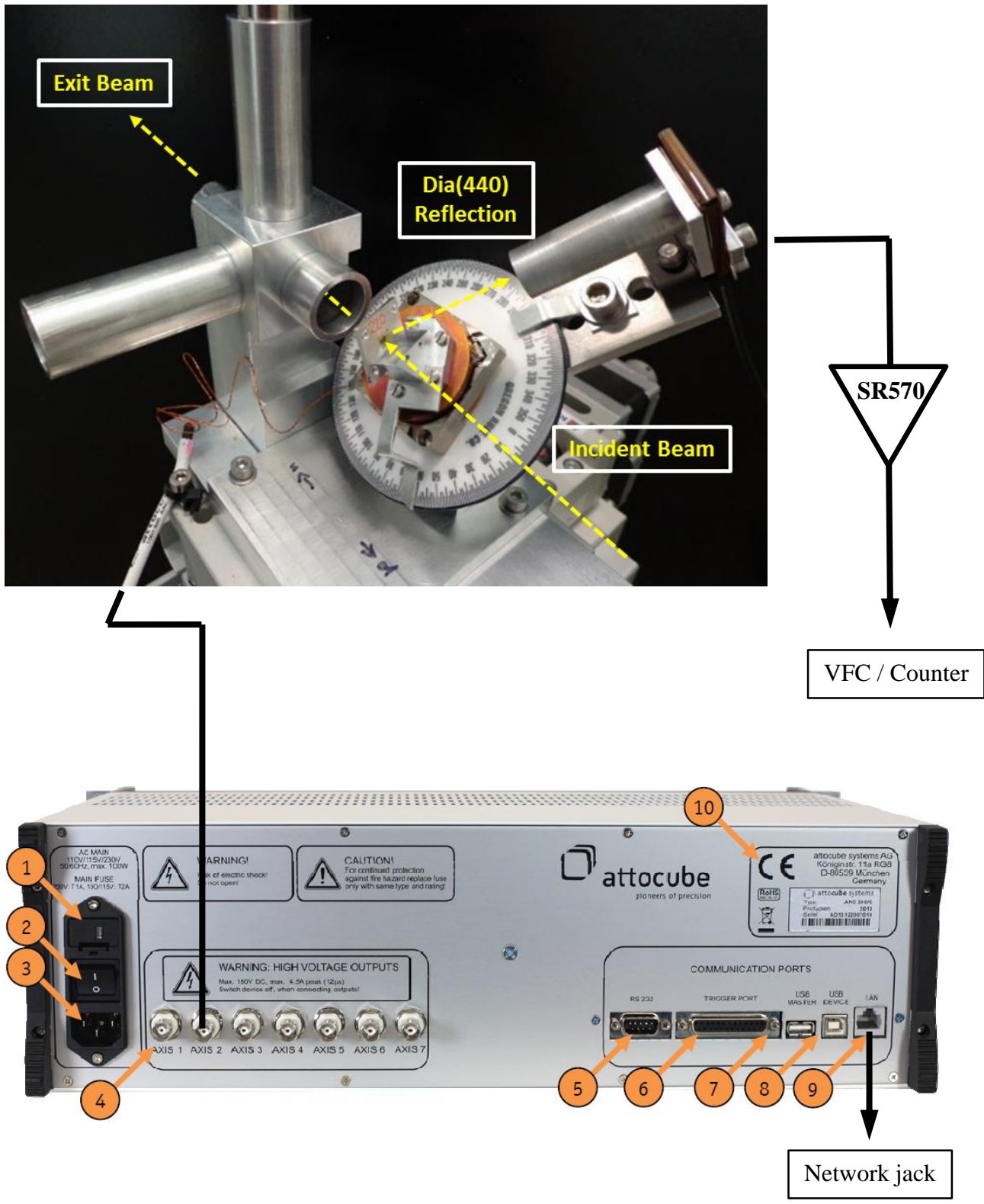


Figure 1

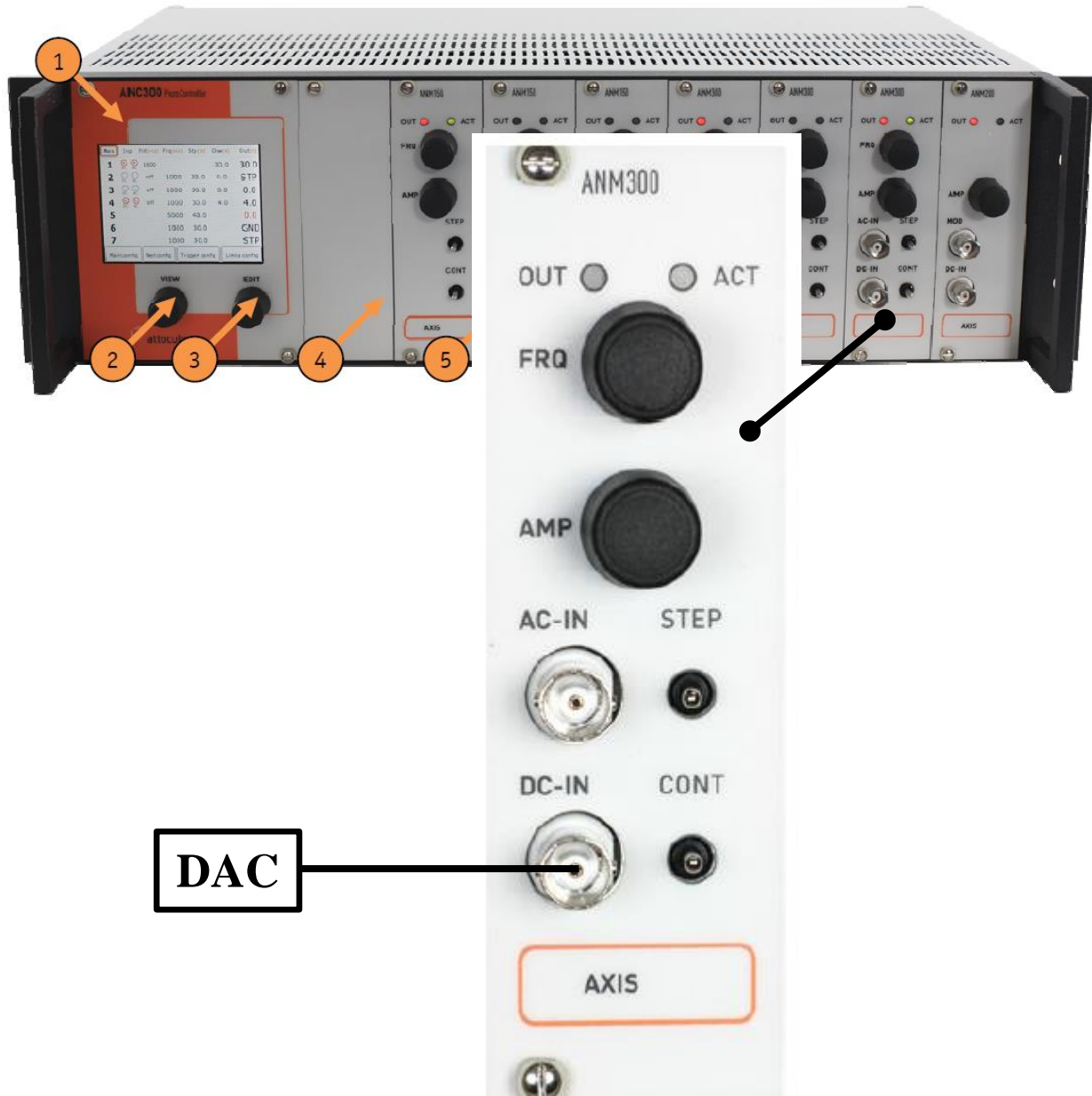


Figure 2

Network Connection for ANC300 Controller

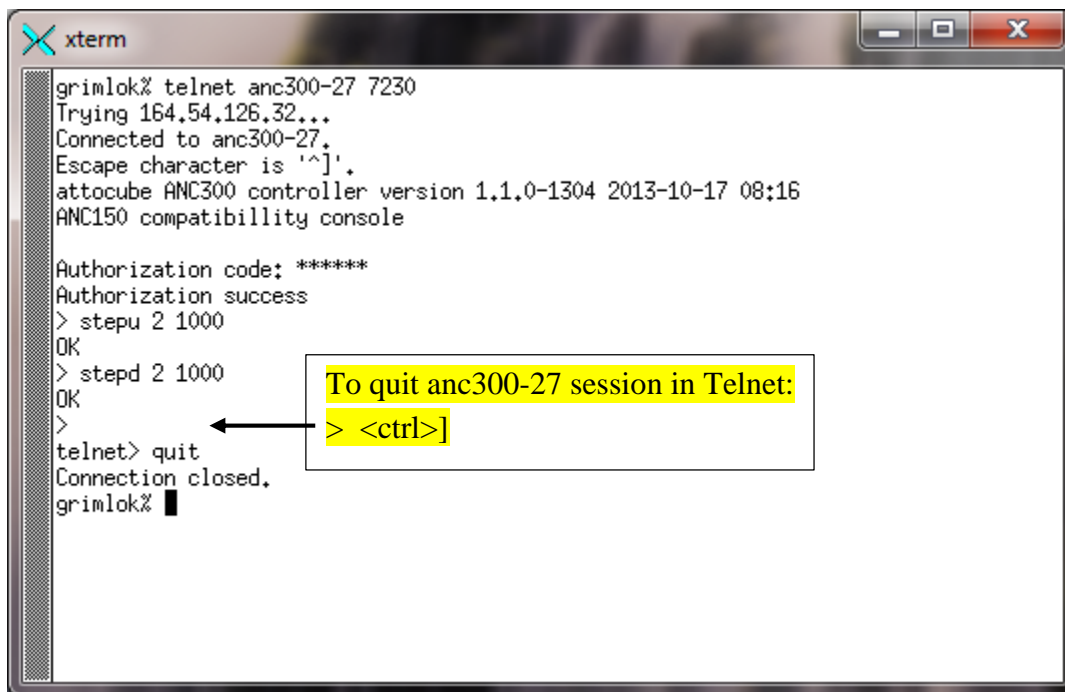
Network Name: anc300-27

IP #: 164.54.126.32

Mask: 255.255.255.0

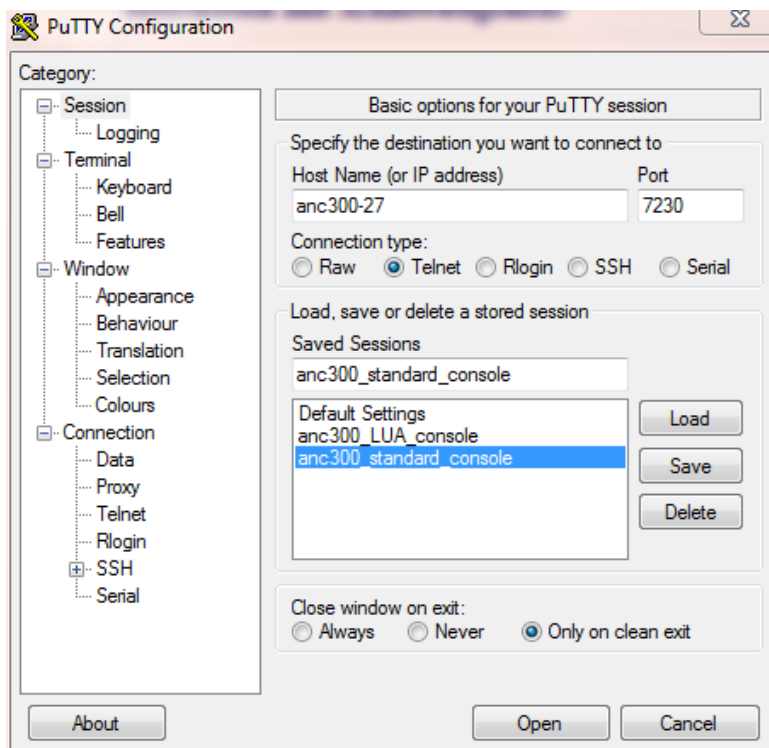
Gateway: 164.54.126.1

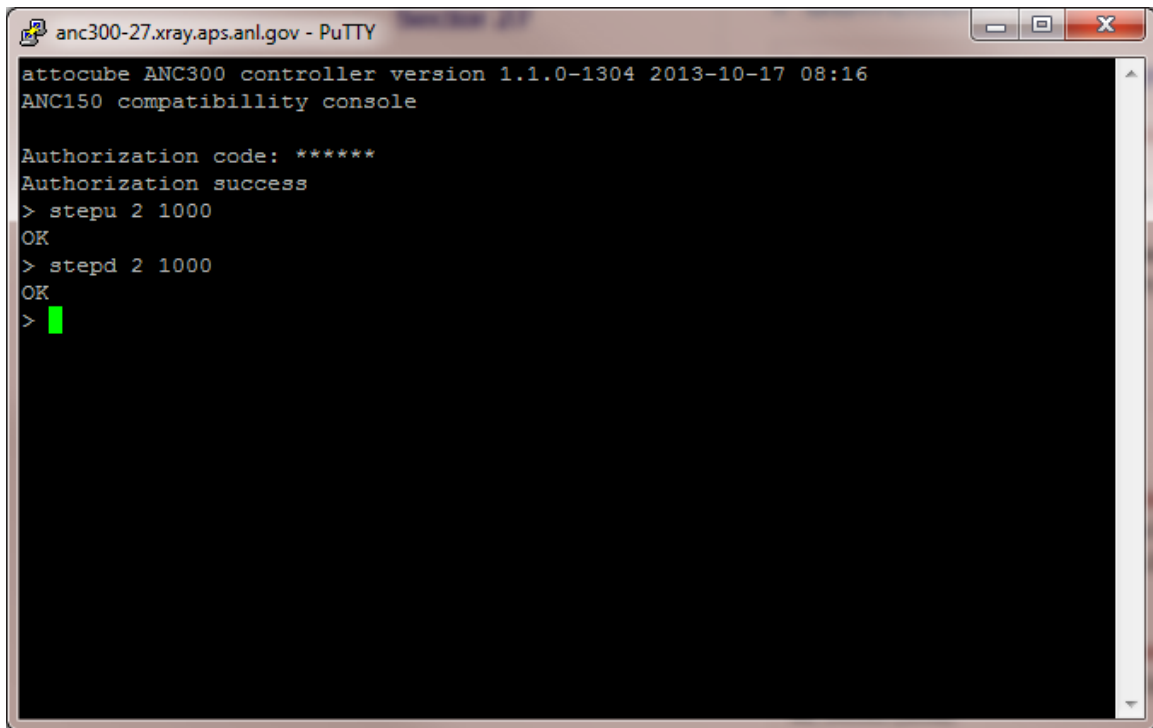
Connect to ANC300 Controller from LINUX, using Telnet



Authorization Code: 123456

Connect to ANC300 Controller from Windows, using Putty





```
anc300-27.xray.aps.anl.gov - PuTTY
attocube ANC300 controller version 1.1.0-1304 2013-10-17 08:16
ANC150 compatibility console

Authorization code: *****
Authorization success
> stepu 2 1000
OK
> stepd 2 1000
OK
> █
```

Authorization Code: 123456

1.2 Kohzu Vertical Stage

Type: ZA10A-W2C
 Motion Range: ± 2.5 mm
 Lead Screw Pitch: 1 mm / rev
 Motor Full Step: 0.36° /step, 1000 steps/rev (DATA1/DATA2 switch on driver: 0)
 Motor Half Step: 0.18° /step, 2000 steps/rev (DATA1/DATA2 switch on driver: 1)
 Vertical Travel: 0.25 mm / rev (1:4 wedge)

Sample EPICS Motor Setup

Half Step (Driver: 1)

motorx_setup.adl (27idmot2:)

phplv

| | | USER | DIAL |
|--------|------|----------|----------|
| Limits | High | 2.50000 | 2.50000 |
| | Low | -2.50000 | -2.50000 |

| Dynamics | Normal Backlash | Calibration |
|-----------------------|-----------------|-------------|
| Max. Speed (Rev/s) | 0.00000 | |
| Speed (Rev/s) | 0.50000 0.50000 | Cal Use Set |
| Base speed (Rev/s) | 0.00000 | Off 0.00000 |
| Accel time (s) | 0.20000 0.20000 | Frozen |
| Backlash dist. (mm) | 0.04992 | Dir Pos Neg |
| Move fraction | 1.00000 | |
| Home Speed (mm /s) | 0.10000 | |

| Resolution, Readback | | | |
|----------------------|---------|------------|--------------------|
| Units: | mm | | |
| Motor: | 2000 | Steps/Rev. | Readback delay (s) |
| | 0.25000 | mm/Rev. | 0.00000 |
| Encoder: | 0.00000 | mm/Step | Use: No Yes |
| Readback: | 0.00000 | mm/Unit | Use: No Yes |
| RBV inLink: | | | |

| Retry | Misc. |
|--------------|-------------------|
| Deadband | Code version 6.90 |
| Max. retries | VME card# 5 |
| | Precision 5 |
| | NIM NO YES |
| | NIM Factor 2 |

More V1.9

Full Step (Driver: 0)

motorx_setup.adl (27idmot2:)

phplv

| | | USER | DIAL |
|--------|------|----------|----------|
| Limits | High | 2.50000 | 2.50000 |
| | Low | -2.50000 | -2.50000 |

| Dynamics | Normal Backlash | Calibration |
|-----------------------|-----------------|-------------|
| Max. Speed (Rev/s) | 0.00000 | |
| Speed (Rev/s) | 0.50000 0.50000 | Cal Use Set |
| Base speed (Rev/s) | 0.00000 | Off 0.00000 |
| Accel time (s) | 0.20000 0.20000 | Frozen |
| Backlash dist. (mm) | 0.04992 | Dir Pos Neg |
| Move fraction | 1.00000 | |
| Home Speed (mm /s) | 0.10000 | |

| Resolution, Readback | | | |
|----------------------|---------|------------|--------------------|
| Units: | mm | | |
| Motor: | 1000 | Steps/Rev. | Readback delay (s) |
| | 0.25000 | mm/Rev. | 0.00000 |
| Encoder: | 0.00000 | mm/Step | Use: No Yes |
| Readback: | 0.00000 | mm/Unit | Use: No Yes |
| RBV inLink: | | | |

| Retry | Misc. |
|--------------|-------------------|
| Deadband | Code version 6.90 |
| Max. retries | VME card# 5 |
| | Precision 5 |
| | NIM NO YES |
| | NIM Factor 2 |

More V1.9

1.3 Kohzu Horizontal Stage

Type: XA10A-R1
 Motion Range: ± 12.5 mm
 Lead Screw Pitch: 0.5 mm / rev
 Motor Full Step: 0.36° /step, 1000 steps/rev (DATA1/DATA2 switch on driver: 0)
 Motor Half Step: 0.18° /step, 2000 steps/rev (DATA1/DATA2 switch on driver: 1)
 Horizontal Travel: 0.5 mm / rev

Sample EPICS Motor Setup

Half Step (Driver: 1)

motorx_setup.adl (27idmot2:)

php1h

| | | USER | DIAL |
|--------|------|-----------|-----------|
| Limits | High | 12.50000 | 12.50000 |
| | Low | -12.50000 | -12.50000 |

| Dynamics | Normal Backlash | Calibration |
|-----------------------|-----------------|-------------|
| Max. Speed (Rev/s) | 0.00000 | |
| Speed (Rev/s) | 0.50000 0.50000 | Cal Use Set |
| Base speed (Rev/s) | 0.00000 | Off 0.00000 |
| Accel time (s) | 0.20000 0.20000 | Frozen |
| Backlash dist. (mm) | 0.04992 | Dir Pos Neg |
| Move fraction | 1.00000 | |
| Home Speed (mm /s) | 0.10000 | |

| Resolution, Readback | | | |
|----------------------|---------|------------|--------------------|
| Units: | mm | | |
| Motor: | 2000 | Steps/Rev. | Readback delay (s) |
| | 0.50000 | mm/Rev. | 0.00000 |
| Encoder: | 0.00000 | mm/Step | Use: No Yes |
| Readback: | 0.00000 | mm/Unit | Use: No Yes |
| RBV inLink: | | | |

| Retry | Misc. |
|--------------|-------------------|
| Deadband | Code version 6.90 |
| Max. retries | VME card# 5 |
| | Precision 5 |
| | NIM NO YES |
| | NIM Factor 2 |

More V1.9

Full Step (Driver: 0)

motorx_setup.adl (27idmot2:)

php1h

| | | USER | DIAL |
|--------|------|-----------|-----------|
| Limits | High | 12.50000 | 12.50000 |
| | Low | -12.50000 | -12.50000 |

| Dynamics | Normal Backlash | Calibration |
|-----------------------|-----------------|-------------|
| Max. Speed (Rev/s) | 0.00000 | |
| Speed (Rev/s) | 0.50000 0.50000 | Cal Use Set |
| Base speed (Rev/s) | 0.00000 | Off 0.00000 |
| Accel time (s) | 0.20000 0.20000 | Frozen |
| Backlash dist. (mm) | 0.04992 | Dir Pos Neg |
| Move fraction | 1.00000 | |
| Home Speed (mm /s) | 0.10000 | |

| Resolution, Readback | | | |
|----------------------|---------|------------|--------------------|
| Units: | mm | | |
| Motor: | 1000 | Steps/Rev. | Readback delay (s) |
| | 0.50000 | mm/Rev. | 0.00000 |
| Encoder: | 0.00000 | mm/Step | Use: No Yes |
| Readback: | 0.00000 | mm/Unit | Use: No Yes |
| RBV inLink: | | | |

| Retry | Misc. |
|--------------|-------------------|
| Deadband | Code version 6.90 |
| Max. retries | VME card# 5 |
| | Precision 5 |
| | NIM NO YES |
| | NIM Factor 2 |

More V1.9