



**PHENIX  
NTC  
PROTOTYPE INSTALLATION PROCEDURE**

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procedure name

**PHENIX Procedure No. 2.5.5.4-30**

**Revision: A**

**Date: 3/22/2007**

**Hand Processed Changes**

<b><u>HPC No.</u></b>	<b><u>Date</u></b>	<b><u>Page Nos.</u></b>	<b><u>Initials</u></b>
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**Approvals**

**Don Lynch**  
\_\_\_\_\_  
PHENIX S E & I      Date

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Cognizant Scientist/Engineer      Date  
/Activity Manager

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PHENIX QA/Safety      Date

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RHIC ES&H      Date

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue (Note: issued as procedure for control purposes. Originally prepared as attachments to work permit for Installation.	3/22/2007	D. Lynch	(See appropriate work permits)	D. Lynch
Deactivated	Original installation complete. Re-activate to re-issue or revise installation procedure when necessary	3/22/2007	D. Lynch	D. Lynch, R. Pisani, P. Giannotti	D. Lynch

**NTC installation procedure****Overall summary:**

We need to remove the MVD from its position around the beam pipe, attach the NTC to it, and reinstall the combined detectors. Due to space limitations, only two people can effectively work in the central region at one time. A third person is needed to wait at the bottom of the stairs to find tools, papers, etc. In general, the time to install the T0 counter would have to be added to the time to install this detector.

The time estimates below add up to 46.5 hours. This allows no contingency for problems (space, plumbing, electronics, etc). A sensible estimate is to approximately double this time -- 3 days plus one shift. We would like to start one morning, which should be a Monday, Tuesday, or Wednesday, and end at the end of the day shift 56 hours later.

**Most significant safety issue: Possible damage to Be beam pipe.**

Solution: As per the PHENIX MVD installation procedures documented in PHENIX Procedure Number PP-2.5.5.4-15, whenever possible, the beam pipe will be protected by several inches of foam padding. Beam pipe vacuum should be isolated during the installation. In addition, as much of the work as possible will take place out of reach of the beam pipe (on a platform approximately 2.4 meters below the beam line).

**1 - Retract East and West Arms, Install ladder on West Side of IR.**

Time estimate: 1 hour.

Items needed: a ladder

Required assistance from PHENIX: retract the East and West carriages.

Who: Carter, Sal, Jimmy, and Co.

Time into installation: 1 hour

**2 - Retract He bag, cut away strings.**

Time estimate: 1 hour

Items needed: not sure

Required assistance from PHENIX: retracting the He bag (Carter, Sal, Jimmy)

Who: Carter, Sal, Jimmy, and Co.

Time into installation: 2 hours

**3 - Install the MVD installation fixture on the lift table**

Time estimate: 1 hour.

Items needed: hex key (i.e. Allen wrench), medium sized flat head screwdriver, the parts of the installation fixture.

Required assistance from PHENIX: none

Who: Allan Hansen, Hubert van Hecke

Time into installation: 3 hours

**4 - Remove the air cooling "pipes" from the ends of the air cooling ducts on the MVD**

Time estimate: 15 minutes

Items needed: a knife, something to cut cable ties

Required assistance from PHENIX: none

Who: Allan Hansen, Hubert van Hecke

Time into installation: 3.25 hours

**5 - Lift table up and "capture" MVD**

Time estimate: 2 hours

Items needed: allen wrenches for horizontal adjustment of installation fixture and for the pieces which "capture" the MVD hinges, medium-sized flat screwdriver for pieces which hold the MVD in the "open" position, large flat-head screw driver to push in spring-loaded fixtures which capture the MVD on the nosecones, a long extension cord to plug in the lift table.  
Required assistance from PHENIX: none  
Who: Allan Hansen, Hubert van Hecke  
Time into installation: 5.25 hours

**6 - Move MVD down by about 50 cm and uncable. Put foam protection around the beam pipe.**

Time estimate: 1 hour  
Items needed: something to cut cable ties  
Required assistance from PHENIX: none  
Who: Allan Hansen, Hubert van Hecke  
Time into installation: 6.25 hours

**7 - Remove outer shield from the low voltage cables**

Time estimate: 4 hour  
Items needed: razor?  
Required assistance from PHENIX: Phenix techs  
Who: Phenix techs  
Time into installation: 10.25 hours

**8 - Attach extension cables and arrange loose ends so that they do not dangle**

Time estimate: 2 hour  
Items needed: duct tape, cable ties  
Required assistance from PHENIX: Phenix tech+NTC or MVD person  
Who: Brendan Fox, Abhay Deshpande, maybe an MVD person, and maybe a Phenix Tech  
Time into installation: 12.25 hours

**9 - Replace copper water cooling lines w/flexible tubing**

Time estimate: 2 hour  
Items needed: tubing, wrench, RTV, vacuum grease, patience w/water leaks  
Required assistance from PHENIX: maybe need help from Phenix tech  
Who: Hubert van Hecke w/either Brendan Fox, Abhay Deshpande, Allan Hansen, or Phenix Tech  
Time into installation: 14.25 hours

**10 - Attach NTCs to MVD**

Time Estimate: 2 hours (see comment below)  
Items needed: allen wrench, screw driver, the NTCs w/labels, the NTC-MVD mounting C-clamps, tin snips, something to make a hole in thin brass  
Required assistance from PHENIX: Bill Lenz  
Who: Bill Lenz, Brendan Fox, Abhay Deshpande  
Time into Installation: 16.25 hours

Comment 1: due to the thickness of the NTCs, this step may take more time because we will want to judge whether or not the MVD+NTC will fit.

Comment 2: the northeast section of the MVD will not be cabled, so it gets the "fat" NTC.

Comment 3: steps 9 and 10 should be done together (but are not parallel) and are shown separate only for the sake of schedules.

Comment 4: if, as we attach the NTCs to the MVDs, we realize that the NTC+MVD does not fit, we will punt to the NTC w/o MVD installation plan.

**11 - Position Light Shield for NTC fiber bundles**

Time estimate: 0.5 hour  
Items needed: cable ties, light shielding material (felt/black paper), black tape  
Required assistance from PHENIX: Bill Lenz  
Who: Bill Lenz + Brendan Fox or Abhay Deshpande  
Time into installation: 16.75 hours

Comment: since we will have, at best, limited access to the NTC-end of the fiber bundles once the NTC+MVD is installed, we may want to position the light shield material at this time. The final positioning of this material, however, cannot be completed until the fiber bundles are in their final position.

**12 - Attach NTC fiber collectors to MVD lift fixture**

Time estimate: 1 hour  
Items needed: cable ties, some cardboard  
Required assistance from PHENIX: Bill Lenz  
Who: Bill Lenz + Brendan Fox or Abhay Deshpande  
Time into installation: 17.75 hours

**13 - Lift MVD+NTCs to installed position and attach to nosecones**

Time estimate: 6 hour  
Items needed: a flat-head screwdriver, allen wrenches, a piece of aluminium approximately 50x5x0.3cm to push springs, cable ties  
Required assistance from PHENIX: two people, possibly one of whom is a Phenix tech  
Who: Hubert van Hecke or Allan Hansen and one Phenix tech  
Time into installation: 23.75 hours

Comment: During this time, we will decide whether or not the MVD+NTC actually fits. If not, we punt to the NTC w/o MVD installation procedures.

**14 - Install top unistrut & fix NTC fiber collectors to it**

Time estimate: 0.5 hours  
Items needed: a flat-head screwdriver, hex wrenches  
Required assistance from PHENIX: Phenix tech  
Who: Phenix tech + Brendan Fox or Abhay Deshpande or Bill Lenz or Peter Kroon  
Time into installation: 24.25 hours

**15 - Remove MVD lift fixture from central region**

Time estimate: 0.5 hours  
Items needed: hex key (i.e. Allen wrench), medium-sized, flat-head screwdriver, string  
Required assistance from PHENIX: none  
Who: Anyone  
Time into installation: 25.75 hours

**16 - Install fiberglass unistruct spanning the interaction region below the MVD**

Time estimate: 0.5 hour  
Items needed: a flat-head screwdriver, hex wrenches  
Required assistance from PHENIX: Bill Lenz, Peter Kroon  
Who: Phenix tech + Brendan Fox or Abhay Deshpande or Bill Lenz or Peter Kroon  
Time into installation: 25.25 hours

**17 - Connect NTC fiber bundles to PMTs**

Time estimate: 1.5 hour (10 minutes per fiber collector)  
Items needed: flat-head screwdriver, cap screws  
Required assistance from PHENIX: none  
Who: Bill Lenz, Brendan Fox

Time into installation: 26.75 hours

**18 - Mount PMTs to the fiberglass unistruts**

Time estimate: 1.5 hour

Items needed: fiberglass unistrut, plexiglass PMT mounting pieces, allen wrenches

Required assistance from PHENIX: Bill Lenz, Peter Kroon

Who: Bill Lenz, Peter Kroon, Brendan Fox, Abhay Deshpande

Time into installation: 28.25 hours

**19 - Tap into BBC compressed air line for venting NTC PMTs**

Time estimate: 3 hours (0.5 hours)

Items needed: distribution manifold, plastic gas lines, brass gas hardware, wrenches

Required assistance from PHENIX: Carter Biggs

Who: Carter Biggs, Brendan Fox, maybe Bill Lenz

Time into installation: 28.75 hours

Comment: this task is mostly done in parallel ; that's why there is a second time quoted.

**20 - Connect HV and signal cables for NTC PMTs**

Time estimate: 0.75 hours

Items needed: the cables, cable ties, wire cutters

Required assistance from PHENIX: cables from BBC rack need to be laid

Who: Brendan Fox, Abhay Deshpande

Time into installation: 29.5 hours

**21 - Complete NTC light shield**

Time estimate: 1 hour

Items needed: black tape, cable ties

Required assistance from PHENIX: Bill Lenz

Who: Bill Lenz, Brendan Fox, Abhay Deshpande

Time into installation: 30.5 hours

**22 - Reattach MVD cables to extensions and reconnect air-cooling ducts**

Time estimate: 2 hours

Items needed: duct tape, tube of RTV, cable ties, paper towels

Required assistance from PHENIX: maybe Phenix tech

Who: Allan Hansen or Hubert van Hecke + Brendan Fox or Abhay Deshpande or Phenix tech

Time into installation: 32.5 hours

Comment 1: the MVD cables will need to be supported by fiberglass unistrut so that they do not collapse onto the NTC fiber bundles.

Comment 2: this task may take longer than the quoted time because the cables need to be threaded around the NTC fiber bundles.

**23 - Testing of electronics, readout, cabling, plumbing, air-cooling**

Time estimate: 2 hours

Items needed: paper towels

Required assistance from PHENIX: none

Who: Allan Hansen or Hubert van Hecke (MVD) and Brendan Fox and Abhay Deshpande (NTC) and maybe Chi, John Haggerty for FEEM/DAQ

Time into installation: 34.5 hours

**24 - Repair of problems noted in previous step**

Time estimate: 4 hours

Items needed: good luck

Required assistance from PHENIX: maybe Phenix techs  
Who: the sad person or people who find a problem, maybe need help from Phenix techs  
Time into installation: 38.5 hours

**25 - Cleanup, including removing installation fixture**

Time estimate: 1 hour  
Items needed: trash bag  
Required assistance from PHENIX: May need someone to survey the trash (cable ties, etc.) for radioactivity  
Who: Anyone  
Time into installation: 39.5 hours

**26 - Magnet Safety Review with CAD Engineer**

Time estimate: 1 hour (hopefully less)  
Items needed: none  
Required assistance from PHENIX: none  
Who: Charlie Pearson and Co.  
Time into installation: 40.5 hours

Comment: this step needs to be done during normal working hours.

**27 - Reinstall Helium bag**

Time estimate: 3 hours  
Items needed: Helium bag, string, + ?  
Required assistance from PHENIX: Carter, Sal, Jimmy  
Who: Carter, Sal, Jimmy, and Co.  
Time into installation: 43.5 hours

**28 - Move East and West carriages back in**

Time estimate: 1 hour  
Items needed: not sure  
Required assistance from PHENIX: moving the carriages  
Who: Carter, Sal, Jimmy, and Co.  
Time into installation: 44.5 hours

**29 - Sweep area and close up**

Time estimate: 2 hours  
Items needed: not sure  
Required assistance from PHENIX: CA people for sweep and closeup  
Who: CA people  
Time into installation: 46.5 hours

Contact person for MVD Installation matters: John Sullivan (sullivan@lanl.gov)  
Contact people for NTC Installation matters: Brendan Fox (deni@bnl.gov), Abhay Deshpande (abhay@bnl.gov)

updated 16-November-2001

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**NTC w/o MVD installation procedure**

**Overall summary:**

If, during the installation, we realize that the MVD+NTC does not fit, we will need to install only the NTC. This work will require removing the MVD from the area, installing the mount hardware for the NTCs onto the nosecone, and then the NTCs. As in the NTC+MVD installation procedures, space limitations in the

central magnet region limit the manpower to two people at any one time. A third person is needed to wait at the bottom of the stairs to find tools, papers, etc. In general, the time to install the T0 counter would have to be added to the time to install this detector.

The time estimates below add up to 26.25 hours. The time should be added to the times spent with the MVD+NTC installation prior to realizing that the detectors do not fit (specifically, something around 23.75 hours). This plan allows little contingency for problems (space, plumbing, electronics, etc).

**Most significant safety issue: Possible damage to Be beam pipe.**

Solution: As per the PHENIX MVD installation procedures documented in PHENIX Procedure Number PP-2.5.5.4-15, whenever possible, the beam pipe will be protected by several inches of foam padding. Beam pipe vacuum should be isolated during the installation. In addition, as much of the work as possible will take place out of reach of the beam pipe (on a platform approximately 2.4 meters below the beam line).

**1 - Remove MVD from central region**

Time estimate: 4 hours (see comment below)

Items needed: unknown

Required assistance from PHENIX: retract the East and West carriages.

Who: MVD person(s) with a help from a Phenix tech

Time into installation: 27.75 hours (I am assuming that we realize our dilemma after trying to lift the MVD+NTC into place, i.e. 23.75 hours).

Comment: The time estimate for this task will depend a bit on when we realize our dilemma.

**2 - Attach protection pieces around beampipe**

Time estimate: 1 hour

Items needed: beam pipe protection pieces, duct tape

Required assistance from PHENIX: none

Who: Bill Lenz, Peter Kroon, Brendan Fox, Abhay Deshpande

Time into installation: 28.75 hours

**3 - Install fiberglass unistruts**

Time estimate: 1 hour

Items needed: unistrut, hex wrenches, bolts

Required assistance from PHENIX: Bill Lenz, Peter Kroon

Who: Bill Lenz, Peter Kroon, Brendan Fox, Abhay Deshpande

Time into installation: 29.75 hours

**4 - Attach NTCs to nosecones**

Time estimate: 2 hours

Items needed: NTCs, velcro, mounting pieces

Required assistance from PHENIX: Bill Lenz, Peter Kroon

Who: Bill Lenz, Peter Kroon, Brendan Fox, Abhay Deshpande

Time into installation: 31.75 hours

**5 - Mount PMTs onto fiberglass unistrut**

Time estimate: 1 hour

Items needed: PMT-nosecone brackets, fiberglass unistrut, plexiglass PMT mounting pieces, allen wrenches

Required assistance from PHENIX: Bill Lenz, Peter Kroon

Who: Bill Lenz, Peter Kroon, Brendan Fox, Abhay Deshpande

Time into installation: 32.75 hours

**6 - Connect NTC fiber bundles to PMTs**

Time estimate: 1 hour  
Items needed: flat-head screwdriver  
Required assistance from PHENIX: Bill Lenz  
Who: Bill Lenz, Brendan Fox, Abhay Deshpande  
Time into installation: 33.75 hours

**7 - Install light shield for NTC fiber bundles**

Time estimate: 1.5 hour (~10 minutes/fiber bundle)  
Items needed: cable ties, light shielding material (felt/black paper), black tape  
Required assistance from PHENIX: Bill Lenz  
Who: Bill Lenz, Brendan Fox, Abhay Deshpande  
Time into installation: 35.25 hours

**8 - Tap into BBC compressed air line for venting NTC PMTs**

Time estimate: 3 hours (0.5 hours)  
Items needed: distribution manifold, plastic gas lines, brass gas hardware, wrenches  
Required assistance from PHENIX: Carter Biggs  
Who: Carter Biggs  
Time into installation: 35.75 hours

Comment: this task is mostly done in parallel; that's why there is a second time quoted.

**9 - Connect HV and signal cables for NTC PMTs**

Time estimate: 0.75 hour  
Items needed: the cables, cable ties, wire cutters  
Required assistance from PHENIX: cables from BBC rack need to be laid  
Who: Brendan Fox, Abhay Deshpande  
Time into installation: 36.5 hours

**10 - Testing of electronics, readout, cabling, plumbing, air-cooling**

Time estimate: 2 hours  
Items needed: paper towels  
Required assistance from PHENIX: none  
Who: Brendan Fox, Abhay Deshpande, Chi  
Time into installation: 38.5 hours

**11 - Repair of problems noted in previous step**

Time estimate: 4 hours  
Items needed: good luck  
Required assistance from PHENIX: none  
Who: Bill Lenz, Brendan Fox, Abhay Deshpande, Chi  
Time into installation: 42.5 hours

**12 - Cleanup, including removing installation fixture**

Time estimate: 1 hour  
Items needed: trash bag  
Required assistance from PHENIX: May need someone to survey the trash (cable ties, etc.) for radioactivity  
Who: Anyone  
Time into installation: 43.5 hours

**13 - Magnet Safety Review with CAD Engineer**

Time estimate: 1 hour (hopefully less)  
Items needed: none

Required assistance from PHENIX: none  
Who: Charlie Pearson and Co.  
Time into installation: 44.5 hours

Comment: this step needs to be done during normal working hours.

**14 - Reinstall Helium bag**

Time estimate: 3 hours  
Items needed: Helium bag, string, + ?  
Required assistance from PHENIX: Carter, Sal, Jimmy  
Who: Carter, Sal, Jimmy and Co.  
Time into installation: 47.5 hours

**15 - Move East and West carriages back in**

Time estimate: 1 hour  
Items needed: not sure  
Required assistance from PHENIX: moving the carriages  
Who: Carter, Sal, Jimmy and Co.  
Time into installation: 48.5 hours

**16 - Sweep area and close up**

Time estimate: 2 hours  
Items needed: not sure  
Required assistance from PHENIX: CA people for sweep and closeup  
Who: CA people  
Time into installation: 50.5 hours

Contact person for MVD Installation matters: John Sullivan (sullivan@lanl.gov)  
Contact people for NTC Installation matters: Brendan Fox (deni@bnl.gov), Abhay Deshpande (abhay@bnl.gov)

updated 16-November-2001