

**Fermilab  
FY2002 Self-assessment  
Process Assessment Report  
For**

**Division / Section:** Particle Physics Division

**Date:** September 19, 2002

Division/Section performing assessment

Particle Physics Division (PPD)

Name of organization that owns assessed process

PPD Mechanical Department, D-Zero Operations group

Organization Strategy

The organization's mission is to provide operational support for the D-Zero detector that is transparent to the users of the experiment.

The scope of the operational support covers the mechanical infrastructure of the detector and the D-Zero buildings. Multiple cryogenic, gas, water, HVAC and mechanical systems make up this infrastructure.

This support is to be done within the context of the secondary goals of improved reliability, increased automation and minimization of cost.

Names of Personnel on Assessment team

Russell A. Rucinski, Project engineer for the PPD/MD/D-Zero Operations group

Name of process assessed

The D-Zero operations log is the process to be assessed.

### Brief description of process to be assessed

The Mechanical Department, D-Zero Operations group log is a document used primarily for transferring operating system status information from the operators on duty to the rest of the group. For continuity of operations, it is essential that this information be transferred from the outgoing crew to the incoming crew as well as to the engineers of the group.

Information contained in the log helps identify systems that need operator attention or action and also identifies areas where mechanical repairs or improvements are need to be planned and made.

The log also provides the means for management to evaluate the necessity of shift and the manpower used to provide shift coverage.

### 1. Are metrics associated with this process? If so, what are they?

The metric used in assessing the quality of the operations log is the percentage of log entries which were completely acceptable for their intended use (Communication between operators and documentation of events). We used the following table to arrive at our rating.

Table 1. Quality rating for log entries

98% - 100%	Outstanding
95% - 98%	Excellent
90% - 95%	Good
75% - 90%	Marginal
0 % - 75%	Unsatisfactory

### 2. What are the names of the procedures associated with this process?

There is no procedure. We follow best management practices in logkeeping.

### 3. Are these procedures being followed?

N/A

### 4. Describe the methodology used to assess this process.

A. Log Quality assessment: The month of March 2002 was chosen at random. Log entries were studied to determine:

Are operators noting shift changes?

Is it clear who made the entry?

Is the information legible and coherent?

Entering and exiting values recorded for changes?

Is the log useful to management? (see B. below)

B. Shift Evaluation: The quality of the log is also reflected in the ability to glean organizational/managerial information from it. Management is interested in an evaluation of using extended shift coverage versus “downtime event driven call-in support” to cover operations.

Actions taken outside of normal hours were tallied for the period of December 2001 and May 2002. For each of the actionable events questions are asked in order to evaluate the result had there not been shift.

1. “Would the physicist probably call an expert? (Yes or No)”
2. “Would an ops tech or expert need to come in? (Yes or No)”
3. “How much lost experiment time would have resulted from this event?”

## 5. Results of the assessment:

A. Quality of operations log: Rating was Excellent.

The month of March 2002 was randomly chosen for a detailed assessment for quality. This time period is covered in pages 148 through 197 of D0 Cryogenic system log book number 5. There were a total of 402 separate entries during this time period.

Are the operators noting shift changes? 100 % of shift changes were documented by an entry by the operator coming on shift. In addition to the normal four operators, three additional operators were used to cover absences of the normal shifters.

Is it clear who made the entry? It is clear who the author and operator are in 100% of the entries.

Is the information legible and coherent? All entries are legible. The method of entry is block printing using a blue or black ink pen. All entries make sense and are coherent. There are some spelling mistakes that are of no consequence to the conveyance of the information. 100% is the rating.

Entering and exiting values recorded for changes? There were 63 entries that describe changes in valve position, set point or alarm points. In 87 % (55 entries out of 63) of the entries the value before the change was made is entered as well as the final change. There were about 10 entries where the starting value was obvious because it was adjusted within the previous few entries. Those were considered to be acceptable.

Is the log useful in evaluation of shift? The detailed shift evaluation is shown below. Enough detail was present about the events to categorize them and hypothesize the impact.

B. Shift Evaluation:

Actionable events were tabulated from logbook records (See Appendix A). Simple alarm acknowledgement or statement type entries were filtered out. Actionable events are those that required some action by the operator. Of those, many, typically 1/3 were simple magnet operations such as powering up or down the toroid and solenoid magnets. It is assumed that those actions could be delegated to physicists. Therefore, for those events no calls or call-ins would be made.

Table 3. Talled actionable events and impact

Month	Actionable Events	Calls to experts	"Call in" events	Lost data hours
December 2001	45	25	20	18
January 2002	28	14	11	10
February 2002	20	10	9	9
March 2002	26	8	3	5
April 2002	43	20	10	9
May 2002	47	12	6	10

Minimization of the column labeled "Lost data hours" is an ultimate goal for the Division.

Identified opportunities for improvement

A further examination of the possibility of reducing extended shift coverage can be made.

Schedule for implementation of improvements

The further examination of viable extended shift alternatives should be completed within six months.

Status of improvements from previous assessment

This was the first formal assessment performed on this process.

Attachments (supporting data, worksheets, reports, etc.

Actionable event data for December, 2001 through May, 2002.

## Appendix A.

### Actionable event data for December, 2001 – May, 2002.

DATE	EVENT description (brief)	Initiated by an alarm? (Y = 1, N = 0)	Initiated by Ops tech? (Y = 1 or N = 0)	Initiated by experiment physicist?	If not on shift, estimate resulting (extra) number of hours lost in D0 experiment data?
12/1/2001	Power magnets up	0	0	1	
12/5/2001	DCW conductivity low/ added H2O	0	1	0	0
12/5/2001	Power up solenoid	0	0	1	
12/6/2001	Power magnets down/ lock out	0	0	1	
12/6/2001	close/lockout valves and reconfig. From SEC Argon test	0	1	0	0
12/6/2001	Power magnets up	0	0	1	
12/9/2001	NEC liquid Argon purity testing, assist French team	0	1	0	
12/9/2001	Adjusted ODH monitors	0	1	0	
12/9/2001	Adjust MV783I on dryer tower	0	1	0	
12/9/2001	SEC not controlling well. PV302N cycled. Persistent flow detector alarm in MCH. Repair	1	0	0	
12/10/2001	(jumpers)	1	0	0	2
12/11/2001	SEC not controlling well. PV302N cycled.	1	0	0	
12/12/2001	Magnets powered up	0	0	1	
12/13/2001	Magnets powered down/ locked out	0	0	1	
12/13/2001	New WAMUS tube opened	0	1	0	
12/15/2001	Toroid tripped off/ autodialer. First indication of cathedral power failure. Elec. Called in.	1	0	0	2
12/15/2001	Toroid powered up, recover VLPC cryogenic system	0	1	0	2
12/15/2001	Changed out VLPC Deadspace he cylinders	0	1	0	
12/15/2001	2nd power loss to platform. Configure systems for no power	1	0	0	2
12/15/2001	Recover VLPC and other systems for power return	0	1	0	2
12/15/2001	Prepare systems for electrical breaker change out, then recover afterwards	0	1	0	3
12/15/2001	Power magnets up	0	0	1	
12/16/2002	Power down & lock out magnets for controlled access	0	0	1	

12/16/2001	Changed out N2H2 west bank cylinder	0	1	0	
12/16/2001	Reset 3 ODH crates	0	1	0	
12/16/2001	Dryer pres. Low. Open MV783I to increase pres.	0	1	0	
12/17/2001	Power magnets up	0	0	1	
	Pump #10 (rm.504) leaking. Switch to #9 and clean				
12/18/2001	up.	0	1	0	0
12/19/2001	LN2 storage alarm. Open MV515N.	1	0	0	0
12/19/2001	NEC not controlling well. Cycle PV110N.	1	0	0	0
12/19/2001	ODH alarm. Investigating.	1	0	0	0
12/19/2001	LN2 Dewar #42 emptied, for pipe repair	0	1	0	0
12/20/2001	Magnets powered up/ Solenoid trouble.	0	0	1	3
12/21/2001	Magnets powered down/ locked out for access.	0	0	1	
12/21/2001	Magnets powered up	0	0	1	
	SEC not controlling well. PV301N put in auto,				
12/22/2001	setpoint adjusted.	0	1	0	
12/23/2001	Cryo yard prepped for winter storm	0	1	0	
12/24/2001	Dewar #42 lo pres. Adjust MV550N.	1	0	0	0
12/24/2001	EMR Air Comp. Started up (EMR pre. @ 1366 psig)	0	1	0	
12/25/2001	Silicon Setpoint trouble. Reconfig. Setpoints	1	0	0	1
	Silicon Dewpoint Auto Dialer Alarm. Reconfig.				
12/25/2001	Setpoint	1	0	0	1
	Power down, switch polarity, & power up Solenoid				
12/25/2001	Magnet	0	0	1	
	Power down & lock out magnets for controlled				
12/27/2001	access	0	0	1	
	Silicon Dewpoint Alarm, evaluated to be within				
12/29/2001	acceptable limits.	1	0	0	
	Power down, switch polarity, & power up Toroid				
12/31/2001	Magnet	0	0	1	

**Totals 12 18 15 18**

**Total events for month = 45**

	WAMUS tube trailer empty/ open multiple tubes/				
1/1/2002	reset alarms	1	0	0	1
1/2/2002	Power magnets up	0	0	1	
1/5/2002	Secured EMR Air comp./ storage pres. Reached	0	1	0	
	East purge comp. Trouble/ switch to west comp/				
1/6/2002	maint. Performed	0	1	0	2
1/8/2002	Power magnets down/ lock out	0	0	1	
1/11/2002	DCW System Low Conductivity	0	1	0	0
1/11/2002	Power magnets up	0	0	1	
1/13/2002	Power magnets up	0	0	1	
1/13/2002	VLPC vac. Jacket trouble/ turbo pump on	1	0	0	0
1/13/2002	Power magnets down/ lock out	0	0	1	
1/16/2002	Power magnets up	0	0	1	
1/16/2002	Toroid will not power up. Fuse replaced.	0	1	0	2
1/17/2002	Power down & lock out magnets	0	0	1	
1/18/2002	Adjust ODH monitors out of red	0	1	0	0
	Notice LN2 #42 filter leaking. Isolate and begin				
1/19/2002	repairs.	0	1	0	2

1/19/2002	LN2 #42 filter put online.	0	1	0	0
	He. Compressor Tripped (hi oil temp.) - attempted				
1/20/2002	reset. Water prob. discovered.	0	1	0	3
1/20/2002	Mycom #2 started	0	1	0	0
1/20/2002	Begin HX cooldown	0	1	0	0
1/20/2002	Dry engine start up	0	1	0	0
1/20/2002	Wet engine start up	0	1	0	0
1/20/2002	Refrig. Recovery in progress	0	1	0	0
1/20/2002	Power magnets up	0	0	1	
	Lhe Dewar level adjustments - wet engine speed				
1/21/2002	raised.	0	1	0	0
	Lhe Dewar level adjustments - wet engine speed				
1/21/2002	lowered.	0	1	0	0
	Lhe Dewar level adjustments - wet engine speed				
1/24/2002	raised.	0	1	0	0
1/30/2002	Wamus sys. trip to one-pass mode. Reset to recirc.	1	0	0	0
1/31/2002	Power magnets down for access, then power up	0	0	1	0
	<b>Totals</b>	<b>3</b>	<b>16</b>	<b>9</b>	<b>10</b>

**Total events for month = 28**

	LN2 Dewar #42 trouble - high pressure, driver				
2/3/2002	closed wrong valve	0	1	0	
2/5/2002	AHU-1 trip off/reset - caused by ODH alarm	0	1	0	1
2/5/2002	ODH alarm - Collision hall, ECN	1	0	0	0
	Toroid trip - Glitch in interlock chassis, reset and				
2/6/2002	restarted	1	0	0	2
2/6/2002	Power magnets after trip off	0	0	1	
	Toroid trip - Glitch in interlock chassis, reset and				
2/8/2002	restarted	1	0	0	2
2/8/2002	Power magnets after trip off	0	0	1	
2/9/2002	LN2 Dewar #42 trouble	0	1	0	
2/10/2002	LN2 Dewar #39 trouble	0	1	0	
2/11/2002	Power magnets up after access	0	0	1	
2/11/2002	Power magnets down, beam didn't materialize	0	0	1	
2/13/2002	Power magnets up	0	0	1	
2/14/2002	Power magnets down for controlled access	0	0	1	
2/14/2002	Power magnets up after access	0	0	1	
2/16/2002	Power magnets	0	0	1	
2/16/2002	Power magnets	0	0	1	
2/18/2002	DCW System Low Conductivity	0	1	0	0
2/22/2002	Solenoid trouble	0	1	0	2
2/23/2002	Power magnets	0	0	1	
2/25/2002	Toroid trip	1	0	0	2
	<b>Totals</b>	<b>4</b>	<b>6</b>	<b>10</b>	<b>9</b>

**Total events for month = 20**

3/2/2002	Power magnets	0	0	1	
3/4/2002	Power Magnets From Forward to Reverse	0	0	1	
3/8/2002	LN2 Subcooler level adjustments	1	0	0	0

3/9/2002	Power magnets	0	0	1	
3/11/2002	Power magnets	0	0	1	
3/15/2002	DCW System Low Conductivity	0	1	0	0
3/16/2002	Power magnets	0	0	1	
3/16/2002	Lhe Dewar level adjustments	0	1	0	0
3/17/2002	Power magnets	0	0	1	
3/17/2002	Power magnets	0	0	1	
3/17/2002	Power magnets	0	0	1	
3/19/2002	Power magnets	0	0	1	
3/20/2002	Power magnets	0	0	1	
3/20/2002	DCW System Low Conductivity	0	1	0	0
3/22/2002	Power magnets up	0	0	1	
3/22/2002	Power magnets down/ lock out	0	0	1	
3/23/2002	He. Compressor Tripped/Reset	1	0	0	5
3/24/2002	Power magnets/ polarity change	0	0	1	
3/24/2002	ODH Alarm. Tower bypassed.	1	0	0	0
3/28/2002	Power magnets down/ lock out	0	0	1	
3/28/2002	Power magnets: Sol=fwd@4750A; Tor=fwd@1500A	0	0	1	
3/29/2002	Power magnets	0	0	1	
3/30/2002	DCW System Low Conductivity: added 2.4 gallons to DCW	0	1	0	0
3/30/2002	Power down & lock out magnets	0	0	1	
3/31/2002	Power magnets: Sol=fwd@4750A; Tor=fwd@1500A	0	0	1	
3/31/2002	DCW System Low Conductivity: added 3.5 gallons to DCW	0	1	0	0

**Totals 3 5 18 5**

**Total events for month = 26**

4/2/2002	DCW System Low Conductivity: added 2.5 gallons to DCW	0	1	0	0
4/3/2002	Power down & lock out magnets	0	0	1	
4/3/2002	Power magnets: Sol=fwd@4750A; Tor=rev@1500A	0	0	1	
4/4/2002	Vesda Alarm Call to Fire Techs	1	0	0	0
4/4/2002	Power magnets: Sol=fwd@4750A; Tor=rev@1500A	0	0	1	
4/5/2002	ODH Head Died in lower Pipe Chase	1	0	0	0
4/6/2002	ODH Head Died in upper Pipe Chase	1	0	0	0
4/6/2002	Dewar 39 pressure regulator acting up, subcooler level problem	1	0	0	
4/7/2002	Vesda Alarm Call to Rick Hance Call to Fire Techs	1	0	0	0
4/12/2002	CV-3 actuator died on LCW system, loss of temperature control	1	0	0	2
4/12/2002	Power magnets	0	0	1	
4/15/2002	Water leak/condensation in MCH onto electrical panel	0	1	0	1
4/17/2002	AHU-1 adjustments to control Coll. Hall humidity	0	1	0	0
4/19/2002	Power magnets up	0	0	1	

4/20/2002	LN2 Subcooler level adjustments	1	0	0	0
4/21/2002	Reverse magnet polarity	0	0	1	
4/21/2002	LN2 Subcooler level adjustments	1	0	0	0
4/21/2002	LN2 Subcooler level adjustments	1	0	0	0
4/22/2002	LN2 Subcooler level adjustments	1	0	0	0
4/23/2002	LN2 Subcooler level adjustments.	1	0	0	0
4/24/2002	Arc Cell sampling	0	1	0	
4/24/2002	Enable Alarms.	0	1	0	0
4/25/2002	Dewar 39 pressure regulator acting up.	0	1	0	0
4/25/2002	Dewar 39 pressure regulator acting up.	0	1	0	0
4/26/2002	Dewar 39 pressure regulator acting up.	0	1	0	0
4/26/2002	Lower Setpoint, AHU-4	0	0	1	
	AHU-4 to previous setting. Lower Control Room				
4/26/2002	Temp.	0	0	1	
4/27/2002	LN2 Subcooler pressure	1	0	0	0
4/27/2002	LCW HI Alarm.	1	0	0	
4/27/2002	LCW HI Alarm. CV-3 will not cycle.	1	0	0	2
4/27/2002	Clean Wamus pump tripped off.	1	0	0	0
	CV-3 actuator died on LCW system, loss of				
4/27/2002	temperature control	1	0	0	2
4/28/2002	Lower Setpoint, CV-6.	0	1	0	0
4/28/2002	Lower Setpoint, CV-6.	0	1	0	0
4/28/2002	Clean Wamus pump tripped off.	1	0	0	0
4/28/2002	Lower Setpoint, CV-6.	0	1	0	0
4/28/2002	LN2 Subcooler level adjustments.	1	0	0	0
4/28/2002	LN2 Subcooler level adjustments.	0	1	0	0
4/28/2002	LN2 Subcooler level adjustments.	0	1	0	0
4/29/2002	LN2 #39 adjustments.	0	1	0	0
4/29/2002	MCH rack water flow alarm. Tripped off rack.	1	0	0	2
4/29/2002	CV-3 adjustment.	0	1	0	0
4/30/2002	CV-3 adjustment.	0	1	0	0

**Totals 19 16 8 9**

**Total events for month = 43**

5/3/2002	LN2 Subcooler level adjustments	0	1	0	0
5/4/2002	LN2 Subcooler level adjustments.	1	0	0	0
5/4/2002	Added oil to MDT purifier.	0	1	0	
5/4/2002	Added H2O to AfterCooler.	0	1	0	0
5/4/2002	Opened new WAMUS Gas Tube.	1	0	0	0
5/4/2002	Adjusted ODH Monitor.	0	1	0	0
5/5/2002	LN2 #39 adjustments.	0	1	0	0
5/5/2002	Power down & lock out magnets	0	0	1	
5/5/2002	Power up magnets.	0	0	1	
5/5/2002	Adjusted ODH Monitor.	0	1	0	0
5/7/2002	Silicon Comp. Air Valve Interlock Trip (Auto Dialer)	1	0	0	2
5/7/2002	Silicon Chiller Cooling Interlock Trip (Auto Dialer)	1	0	0	0
5/7/2002	Silicon System Trips All Interlocks	1	0	0	3
5/7/2002	Added 3ft .250in Tubing To Dewpoint Sensor Rm	0	1	0	0

	215				
5/7/2002	Blew out Backup air line/Changed Rm 510 Hygrometer for Sampling	0	1	0	0
5/7/2002	Watch Rm 215 Dryer Switchovers Times 21:18,22:41,1:21,5:18	0	1	0	0
5/8/2002	Magnets Engagement Toroid and Solenoid	0	0	1	
5/8/2002	Watch Rm 215 Dryer Switchovers Times 21:18,22:41,1:21,5:18	0	1	0	0
5/9/2002	Watch Rm 215 Rm 604 Dryer Switchovers Times Total of 6 Times	0	1	0	0
5/11/2002	Opened new MDT Tube (Trailer)	1	0	0	0
5/11/2002	Watch Rm 215 Dryer Switchovers Times 21:18,22:41,1:21,5:18	0	1	0	0
5/12/2002	Watch Rm 215 Dryer Switchovers Times 21:18,22:41,1:21,5:18	0	1	0	0
5/13/2002	Power down & lock out magnets	0	0	1	
5/14/2002	Turn off Hi Press. Compressor.	0	1	0	
5/15/2002	Adjusted regulator on East Comp. Autodialer 'I/A Dryer Switch Failure'. Physical Insp.	0	1	0	0
5/15/2002	Disable alarm.	1	0	0	0
5/15/2002	Reverse magnet polarity and power up.	0	0	1	
5/17/2002	Power up magnets.	0	0	1	
5/18/2002	Started Hi Press. Comp.	0	1	0	0
5/18/2002	Turn off Hi Press. Compressor.	0	1	0	
5/20/2002	Reverse magnet polarity and power up.	0	0	1	
5/21/2002	Vesda Alarm Call to Duty Elec.	1	0	0	0
5/21/2002	Added H2O to DCW.	0	1	0	0
5/24/2002	Power down & lock out magnets	0	0	1	
5/25/2002	Power up magnets.	0	0	1	
5/25/2002	Power down & lock out magnets	0	0	1	
5/26/2002	Power up magnets.	0	0	1	
5/26/2002	Loss of comercial power	1	0	0	3
5/26/2002	Test magnets - ramp up then down	0	0	1	
5/27/2002	Power up magnets.	0	0	1	
5/27/2002	Power down & lock out magnets	0	0	1	
5/27/2002	Power up magnets.	0	0	1	
5/27/2002	Trouble with toroid interlock chassis	0	1	0	2
5/28/2002	Power down & lock out magnets	0	0	1	
5/28/2002	Power up magnets.	0	0	1	
5/29/2002	Power down & lock out magnets	0	0	1	
5/30/2002	Opened new WAMUS Tube (Trailer)	1	0	0	0
	<b>Totals</b>	<b>10</b>	<b>19</b>	<b>18</b>	<b>10</b>
	<b>Total events for month = 47</b>				