

CDF Procedure for Power Outage Recovery

This procedure describes how to recover form a CDF Power Outage.

Approvals:

(CDF Department Head)

(Date)

1.0 Controlled Copies of this procedure.

1. CDF Department Office
2. CDF Control Room
3. CDF Operations Electrical Group Leaders Office

All other copies will be marked, "INFORMATIONAL USE ONLY"

2.0 The Procedure

Only trained people should execute this procedure. For the list of trained people (See Section 5.0). If you are not trained and not on the list and there is a power outage you should be calling an electrical expert (See Section 8.0).

If you are trained but still not sure about any of the following instructions call or get help from an expert (See Section 8.0).

Use the chart on the next page to determine which section of this procedure to follow.

Initial only those steps which you actually do.

2.1: If power to the whole building is lost.

Follow All Numbered Steps In Sequence

Here is a list of the items which will be shut off automatically, followed by the procedure to get them back up and running.

- A. The 1st, 2nd and 3rd floor air conditioners.
- B. The Chilled Water System for FastBus.
- C. The 1st, 2nd and 3rd floor Counting Room 60Hz power.
- D. All computers in the B0 cluster and the B0SGX processor farm.
- E. The 60Hz power to the Central Detector.
- F. 400Hz power (MG-1, MG-2, MG-3 and MG-4).
- I. 60Hz power to the high voltage racks in the 1st floor counting room.
- H. Toroid Power Supply.

___ 1. After power has been restored to the building proceed as follows.

___ 2. Turn the Liebert air conditioners on. To turn them on push the green start button. Wait a few minutes to see if cool air is coming out of the unit if not call a building manager. The 1st and 2nd floor Counting rooms have 2 air conditioners each, one at the east end of the room and one at the west end of the room. The 3rd floor Computer room has one air conditioner on the south side of the room in the middle of the room.

___ 3. Call CDF gas tech on duty to make sure the building and FastBus chilled water system starts up correctly. Warn the tech about monitoring the temperature because of the slowly increasing heat load.

_____ 4. Reset the FastBus Chilled Water Alarm Panel, located in the 1st and 2nd floor counting rooms on the Southwest side. Both panels are tied together, so you only have to reset one of them. **Instructions:** Depress the "**Alarm Reset**" button on the Chilled Water Alarm Panel only!

Do not touch any other buttons on the panel!!

If you do, call the on duty gas tech or building manager immediately you may have started a FastBus Chilled Water shutdown sequence.

_____ 5. Reset the Main Control Panel, located in the Southwest corner of the 2nd floor counting room. All the green lights on the panel should be green after you press the reset button. If there are any red lights lit **do not** proceed to the next step; instead call an electrical expert from the expert call list (section 8.0). You will have to wait until all the lights are green!!

_____ 6. Next turn off all High Voltage supplies individually. The supplies are located in the 1st floor counting room on the West end of the room in relay racks RR04-C thru F and RR06-C,D,F,G,H,I. They are C.A.E.N.S., Gammas, and Drogie's. **Note: You should refer to the list of HV crates and devices to be turned off.**

_____ 7. Reset the following breakers in power panel DHP-B0-2 (Experimental Power) located on the Southwest wall of the first floor Assembly Hall:

- _____ a) PHP-B0-15 Counting Room No. 1
- _____ b) PHP-B0-14 Counting Room No. 3
- _____ c) PHP-B0-3 Counting Room No. 1
- _____ d) PHP-B0-4 Counting Room No. 2
- _____ e) PHP-B0-7 Collision Hall

_____ 8. Call the computer on call expert to restart the computers, and all other necessary system experts on the early bird expert call list sec.(8.0). Have the computer expert talk to the ace or Scientific Coordinator before booting up the computers. The Host FastBus crate must be up and running before the computers are booted. See instructions below for starting FastBus racks.

_____ **9. Make sure all 60Hz power is restored to the Detector's Rabbit and ASD crates.**

Power panel (PHP-B0-2) located on the Northwest wall of the assembly hall pit will have breakers PP-B0-8 (circuit 39) and PP-B0-11 (circuit 40) tripped. Reset them.

_____ 10. Confirm that power is reaching the Detector and make sure the Rabbit crate fans are all on . This can be confirmed with the cameras in the Collision Hall by locating the indicator lights placed on the detector and seeing if they are on. If there are any problems, call an expert from the early bird expert call list sec.(8.0).

_____ 11. Call the experts to turn on each individual system that uses high voltage supplies. **Note: You should refer to the early bird call list of experts of subsystems sec. (8.0) if you have not done this already.**

_____ 12. Reset 60Hz power to the High Voltage racks by resetting the main breakers in power panels PP-B0-3A and PP-B0-3B located on the South wall of the first floor counting room in the high voltage area.

_____ 13. Make sure the MX fans are on. The MX racks are located in room 106 at the East end. If fans are not on, check and reset (if needed) breaker panels PP-B0-15 D,E,F on the South wall of the 1st floor counting room just behind the row of MX racks.

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- ____ 14. Check main breakers in all four motor generator sets. Motor generators are located on the East side of the main floor, East of the pit. Breakers are located on the Northwest side of each motor generator, inside the door on the Northwest side of each motor generator. Reset them if they are tripped.
- ____ 15. Turn off the motor generator output breakers located on the upper right side, inside the door of motor generators 1 & 2. **Do not turn off the breakers of motor generators 3 & 4.**
- ____ 16. Push the start button on motor generator set 1 and wait for the internal relay to set (approximately 30 seconds) before pressing the start button on motor generator set 2. When the relay for motor generator 2 sets, push the start button for motor generator 3. When the relay for motor generator 3 sets, push the start button for motor generator 4. (Note if motor generators 3 & 4 do not start you probably had a gas alarm.)
- ____ 17. Wait 2 minutes and turn the output breakers back on. This should prevent the 15V Rabbit power supplies from crow barring. A hand lever for throwing the breakers is located inside the left door manual pocket.
- ____ 18. Check to make sure the output reaches 208V.
- ____ 19. Turn on the 400Hz MX breakers in the following panels located on the South wall of counting room 1 by the MX racks:
- a) PP-400-1A
 - b) PP-400-1B
 - c) PP-400-1C
- ____ 20. Pull out **all** FastBus SI's, SSP's, CSA's & SVX sequencers in counting room 1, the trigger room, and the three crates in the

computer room..

_____ 21. **WARNING**

In the event of a power outage the MX1T cards in relay rack 18H (addresses 7A and 7B) in the first floor counting room should be pulled out before the power is restored.

If you are careful you can use a card puller on the bottom screws of the MX1T cards and pull them **without** removing the extender cards on the TDC's.

After power-up, make sure that all power has been restored by checking the alarms and limits, and then push the MX1T cards back in . The +15 Volt LED's on the front panel of each card should then be checked to make sure that no fuses have blown. **Note:** If an LED looks dim, then it is probably off.

_____ 22. The Host FastBus rack (3RR23E) should be the first rack to be restarted. Go to the back of every single FastBus rack, push the unlabeled reset button at top of the breaker box in, and hold while resetting the main breaker. Do this to a row of racks at a time. Then go to the front of that same row of racks and push each system reset button on the Alarms & Limits chassis at the top of each rack. Wait 2 minutes at each row of racks after they are running to make sure there are no water leaks or other problems that would cause any rack to trip off.

The Trigger System relay racks on the 2nd floor have no individual reset buttons or main breakers on the backs of the racks; the reset button is on the Trigger System Fire Protection Panel and the main breaker is in breaker panel PP-B0-4E, both located in back of the

Trigger System relay racks, on the South wall. The Trigger System power supplies run on 400Hz power, which will have to be reset after the Trigger System relay racks are up and running.

Again wait 2 minutes to make sure there are no water leaks or other problems that would cause the racks to trip off. Reset

400Hz

breaker boxes PP-400-2A, PP-400-2B and PP-400-2C which are also located in back of the Trigger System relay racks, on the South wall. Reset all the breakers in these boxes that have a red flag indicating they are tripped.

_____ 23. Reinsert the FastBus cards, and put up the bus bars.

Do not reinsert the SVX Sequencers.

_____ 24. **WARNING**

Make sure that the MX1T cards in relay rack 18H (addresses 7A and 7B) in the first floor counting room have been pulled out before the power is restored.

If not you can carefully use a card puller on the bottom screws of the MX1T cards and pull them **without** removing the extender cards on the TDC's.

After power-up, make sure that all power has been restored by checking the alarms and limits, and then push the MX1T cards back in . The +15 Volt LED's on the front panel of each card should then be checked to make sure that no fuses have blown.

Note: If an LED looks dim, then it is probably off.

_____ 25. Next get the Level 3 relay racks up and running. Go to the East end of the 3rd floor computer room . The Level 3 relay racks are labeled RR27E thru H. To reset the power go to the power panels located on the South wall to the side of the row of racks. There is

a

box labeled Level 3 Protection System, and above that, a breaker box labeled PP-B0-14 C1. The power breakers for the Level 3 racks are breakers 4,5,9,17 in this box. First push and hold the reset button for relay rack RR27E on the front of the Level 3 Protection System. Next reset breaker 4 in the breaker box above. The red light next to the reset button will light and the relay rack power will come on. Next go to the relay rack and push the

System

Reset button on the Alarms & Limits box in the top of the rack. Next repeat the above procedure for relay racks RR27F thru H. (The breakers for the relay racks are RR27F=5, RR27G=9, RR27H=17.) Wait 2 minutes to make sure none of the 4 relay racks trip off. If there are any problems call the appropriate experts from the early bird expert call list sec.(8.0).

_____ 26. Turn on the two video recorders located in the bottom of relay rack 2RR02D.

_____ 27. When all is back up and running, have trained personnel turn the Toroid Power Supply on only if appropriate, following the procedures that are written.

_____ 28. If there are any problems you cannot solve call the appropriate expert from the early bird expert call list sec.(8.0).

2.2: If a high-level Flammable Gas alarm occurs.

Follow All Numbered Steps In Sequence

Here is a list of the items which will be shut off automatically, followed by the procedure to get them back up and running.

- A.** Main Argon-Ethane gas supply.
- B.** 60Hz power to the high voltage racks.
- C.** 400Hz power (MG-1 and MG-2).
- D.** Toroid Power Supply.
- E.** The 60Hz power to the Central Detector.

- ___ 1. Determine why a Flammable Gas alarm has occurred.
- ___ 2. Check that gas has been turned off automatically.
- ___ 3. Call the appropriate expert from the early bird call list sec.(8.0) to correct the problem.
- ___ 4. Confirm that CDF Procedure -3 "CDF Recovery Procedure" is complete and the incident has been terminated per the procedure. The procedure can be located at the SOD operators desk or in the CDF Department office.
- ___ 5. Reset the alarm by pushing the reset button on the Hazardous Atmosphere System panel located in Cryo rack RR-1.
- ___ 6. Next reset the Central Detector 60Hz power panels. Power panel (PHP-B0-2) located on the Northwest wall of the assembly hall pit will have breakers PP-B0-8 (circuit 39) and PP-B011 (circuit 40) tripped. Power panel (DHP-B0-2) located on the main floor level at the West end of the building near the rollup door will have breaker PHP-B0-7 (Collision Hall) tripped.

7. Make sure all 60Hz power is restored to the Detector's Rabbit and ASD crates.

Power panel (PHP-B0-2) located on the Northwest wall of the assembly hall pit will have breakers PP-B0-8 (circuit 39) and PP-B0-11 (circuit 40) tripped. Power panel (DHP-B0-2) located on the main floor level at the West end of the building near the rollup door will have breaker PHP-B0-7 (Collision Hall) tripped. Reset it.

8. Confirm that power is reaching the Detector and make sure the Rabbit crate fans are all on . This can be confirmed by locating indicator lights placed on the detector and see if they are on. If there are any problems call an expert from the early bird expert call list sec.(8.0).
9. Next turn off all High Voltage supplies individually. The supplies are located in the 1st floor counting room on the West end of the room in relay racks RR04-C thru F and RR06-C,D,F,G,H,I. They are C.A.E.N.S., Gammas, and Drogie's. **Note: You should refer to the list of HV crates and devices to be turned off.**
10. Call the experts to turn on each individual system that uses high voltage supplies. **Note: You should refer to the early bird call list of experts of subsystems sec.(8.0).**
11. Reset 60Hz power to the High Voltage racks by resetting the main breakers in power panels PP-B0-3A and PP-B0-3B located on the South wall of the first floor counting room in the high voltage area.
12. Reset the 400Hz power (MG-1 and MG-2) main breakers located on the Northwest side of each motor generator. To get to the breakers open the door on the Northwest side of each motor generator.

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- ___ 13. Turn off the motor generator output breakers located on the upper right side, inside the door of motor generators 1 & 2.
Do not turn off the breakers of motor generators 3 & 4.
- ___ 14. Push the start button on motor generator set 1 and wait for the internal relay to trip before pressing the start button on motor generator set 2.
- ___ 15. Wait 2 minutes and turn the output breakers back on. This should prevent the 15V Rabbit power supplies from crow barring. A hand lever for throwing the breakers is located inside the left door manual pocket.
- ___ 16. Check to make sure the output reaches 208V.
- ___ 17. Allow the Argon-Ethane to flow for at least 1 hour, then check the oxygen content of each chamber. Call on duty CDF gas tech to do this. If the oxygen level is >500 ppm, individual systems must be checked to determine who's leaking. This takes many hours.
- ___ 18. When all is back up and running, the Toroid Power Supply can be turned on if it is appropriate following the procedures that are written.
- ___ 19. If there are any problems and you cannot solve them call the appropriate expert from the early bird expert call list sec.(8.0).

2.3: If any of the 3 counting rooms lose power.

Follow All Numbered Steps In Sequence

Here is a list of the items which will be shut off automatically followed by the procedure to get them back up and running.

- A.** The 1st, 2nd and 3rd floor Counting Room 60Hz power.
- B.** The 60Hz power to the Central Detector.
- C.** 400Hz power (MG-1 and MG-2).

___ 1. First determine what caused the power to go down. There are 3 possibilities;

- (a) FastBus water temperature, which will trip the 1st and 2nd floor counting rooms 60Hz and 400Hz (MG-3 & 4).
- (b) The Sprinkler System pressurized, which will trip one or all of the counting rooms 60Hz and 400Hz (MG-3 & 4).
- (c) Room over temperature, which will trip power to that room.

The above mentioned conditions can be checked by going to the Southwest corner of the 2nd floor counting room and looking at the Main Control Panel, a red led indicates a trip.

___ 2. If the trip was caused by a FastBus water temperature alarm, call the gas tech on duty and have him check the water temperature. Only after the gas tech says the FastBus chilled water system is OK should you go to step 5.

___ 3. If the sprinkler system is pressurized, follow CDF Procedure -1 "CDF Fire Alarm Procedure" which can be located at the SOD operators desk or in the CDF Department office. When it is complete and the incident is terminated then go to next step.

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- _____ 4. If the trip was caused by the Sprinkler System pressurizing, determine what caused it and what floor has tripped the power, the SOD operator should be able to find out where the reported problem occurred. You should also go through all the floors to make sure there are no water leaks from the ceiling. Then call Facility Operations to drain the system and reset it. Only after this is done should you go to step 5.
- _____ 5. If the trip was caused by Room over temperature, then determine why the room is hot. See if the air conditioners are running and cold air is coming out of them. There are two air conditioners in the 1st and 2nd floor counting rooms. They are located on the East and West side of those rooms. The 3rd floor computer room has one air conditioner which is located on the south wall in the middle of the room. If there is an air conditioner problem call the on duty gas tech. Also check the room temperature sensors. The 1st floor counting room has one sensor on the South wall in the middle of the room. The 2nd floor counting room has one sensor on the South wall in back of the Trigger System relay racks on the East end of the room. The 3rd floor computer room has one on the South wall in the middle of the room. Make sure no one has changed the setting on them. The correct trip setting is 85 degrees F. If no reason can be found, then call a building manager.
- _____ 6. Next turn off all High Voltage supplies individually. The supplies are located in the 1st floor counting room on the West end of the room in relay racks RR04-C thru F and RR06-C,D,F,G,H,I. They are C.A.E.N.S., Gammas, and Drogie's. **Note: You should refer to the list of HV crates and devices to be turned off.**

____ 7. In any case, one or more of the following 60Hz breakers in power panel DHP-B0-2 located in the Assembly Hall on the main floor by West bay door will have to be reset if tripped:

- a) PHP-B0-15 Counting room No. 1
- b) PHP-B0-14 Counting room No. 3
- c) PHP-B0-3 Counting room No. 1
- d) PHP-B0-4 Counting room No. 2
- e) PHP-B0-7 Collision Hall

Only reset the breakers that are apparently tripped. If you don't know which one's are tripped call an expert from the early bird expert call list sec.(8.0).

____ **8. Make sure all 60Hz power is restored to the Detectors Rabbit and ASD crates.**

Power panel (PHP-B0-2) located on the Northwest wall of the assembly hall pit will have breakers PP-B0-8 (circuit 39) and PP-B0-11 (circuit 40) tripped. Reset them.

____ 9 Confirm that power is reaching the Detector and make sure the Rabbit crate fans are all on . This can be confirmed with the cameras in the Collision Hall by locating the indicator lights placed on the detector and seeing if they are on. If there are any problems, call an expert from the early bird expert call list sec.(8.0).

____ 10. Call the experts to turn on each individual system that uses high voltage supplies. **Note: You should refer to the early bird call list of experts of subsystems sec.(8.0).**

____ 11. Reset the 400Hz power (MG-3 and MG-4) main breakers located on the Northwest side of each motor generator. To get to the breakers, open the door on the Northwest side of each motor generator.

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- _____ 12. Push the start button on motor generator set 3 and wait for the internal relay to trip before pressing the start button on motor generator set 4.

 - _____ 13. Check to make sure the output reaches 208V.

 - _____ 14. If all else fails and you have any problems, call the appropriate expert from the early bird expert call list sec.(8.0).

2.4: If room 112,113,114 lose power.

Follow All Numbered Steps In Sequence

Here is a list of the items which will be shut off automatically followed by the procedure to get them back up and running.

- A. The 60Hz power to the clean rooms.
- B. 400Hz power to the clean room.
- C. The clean room ventilation system fans..

- ___ 1. Determine what caused the problem and how to fix it.
(Temperature or Flammable Gas leak)

- ___ 2. First reset the main 60Hz breaker in power panel PHP-B0-5 located on the North wall at the entrance of the mezzanine area.

- ___ 3. Next reset the main 400Hz breaker in power panel PP-400-3B located on the North wall at the entrance of the mezzanine area.

- ___ 4. Next reset the clean room fans by shutting off fan disconnects and turning them back on. Then push the start buttons on variable speed controllers for the clean room fans. The disconnects are located through the outside door on the clean room's North outside wall. Right next to them are the variable speed fan controllers.

- ___ 5. If there are any problems call the appropriate experts from the early bird expert call list sec.(8.0).

2.5: For any other power outage at CDF.

Follow All Numbered Steps In Sequence

- ___ 1. Determine what caused the problem.

- ___ 2. Call the appropriate experts if you are unsure how to correct the problem or what may have caused it from the early bird expert call list sec.(8.0).

3.0 Checklist

The checklist is incorporated into the body of the procedure.

Everytime a power recovery procedure occurs, a current informational copy of this procedure should be initialed for each step which is used for later review.

Put a signed off copy in the back of the Procedure Manual in the 3rd floor CDF Department office.

4.0 Deviations from the Procedure

Any deviation from this procedure requires authorization from the following:

A. CDF department head or designee.

or

B. CDF operations manager.

5.0 Required Training and Authorized Training Personnel

You must go through this procedure with an instructor and demonstrate that you have a good working knowledge of it.

The training must be documented on a standard Fermilab Training Form and the completed form must be inserted in the CDF Department Office copy of this procedure.

LIST OF AUTHORIZED INSTRUCTORS FOR THIS PROCEDURE:

<u>Name</u>	<u>I.D.#</u>
Keith Schuh	2282
Mark A. Knapp	5384
Steve Hahn	8372
Jim Hylan	9463

All are qualified because of their working knowledge of CDF.

6.0 Training Materials

Section 2.0 of this procedure, a Fermilab training sheet and a walk thru of this procedure.

7.0 Trained People for this procedure

Eventually the list may reside in a lab-wide database.

Until that time, a list of trained personnel for this CDF Power Outage Recovery Procedure should be maintained in the CDF Department Office copy of the procedure in a separate section at the end of this procedure.

The CDF Department is responsible for the list and for updating all the copies.

8.0 References and Supporting Documentation

Maps of CDF areas on following pages.

Early Bird Call List

Computer Experts

<u>Name</u> <u>Pager</u>	<u>Home Phone</u>	<u>Work Phone</u>	<u>Long Range</u>
Jim Pangburn	665 - 4024	2207	(708) 314 - 7721
Mark Schmitz	513 - 5449	2253	(708) 314 - 7721
Brian Troemel	741 - 3165	4196	(708) 341 - 7721

Electrical Experts

<u>Name</u> <u>Pager</u>	<u>Home Phone</u>	<u>Work Phone</u>	<u>Long Range</u>
Keith Schuh	985 - 0406	4575	(708) 314 - 2346
Mark A. Knapp	416 - 3864	4382	
Bob Gatze	896 - 3719	4659	

All Others

<u>Name</u>	<u>Home Phone</u>	<u>Work Phone</u>	<u>Long Range</u>
Steve Hahn	851 - 1268	2123	(708) 314 - 4862
Jim Hylan	369 - 2614	2147	(708) 314 - 2147