

LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY  
-LIGO-  
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**ART OF REVIVING LLO CDS  
COMPUTERS/SYSTEMS  
FROM A POWER OUTAGE**

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## **1) ABSTRACT**

This document describes the best methods to undertake after a power outage to successfully revive the LIGO Livingston Observatory's (LLO) Control and Data Systems' (CDS) computers and systems to normal operation.

## **2) INTRODUCTION**

The LLO CDS sun workstations/processors are running at all times and a sudden power outage will not cleanly shutdown these sun workstations and processors. This creates problems when the sun workstations/processors come back up by themselves or are powered up by the user. The interdependencies of different sun workstations/processors also pose problems. Also some of the services/programs that are running on the processors start automatically while others have to be started manually. This is done on purpose to prevent programs dependent on other systems from crashing if the other systems are not yet running or due to the limitations that exist in them.

Also since the user home directories and the dtt/dataviewer directories are also mounted on all the sun workstations from central point servers, certain procedures have to be followed to get the systems up and running right.

All the interferometer related single board computers (SBC) such as Pentiums, bajas and mv162s load their boot/startup files from disks on LLO CDS server (LLO1). So these depend on the CDS Server for them to even boot.

The boot procedure may be different for different power outage scenarios. A power outage for short duration (say, less than 20 minutes) calls for a reboot procedure that does not involve any sun workstations in the mass storage room since the UPS in the mass storage room handles up to 20 minutes. A power outage of long duration calls for a different procedure. The restart procedure for most of the scenarios are looked at in this document and defined as clearly as possible.

Hence, the requirement for a procedure to revive the CDS computers/systems after a power outage.

### 3) LLO CDS SYSTEM

The LLO CDS System's broad block diagram in figure 1 clearly shows the layout of different CDS systems at LIGO Livingston.

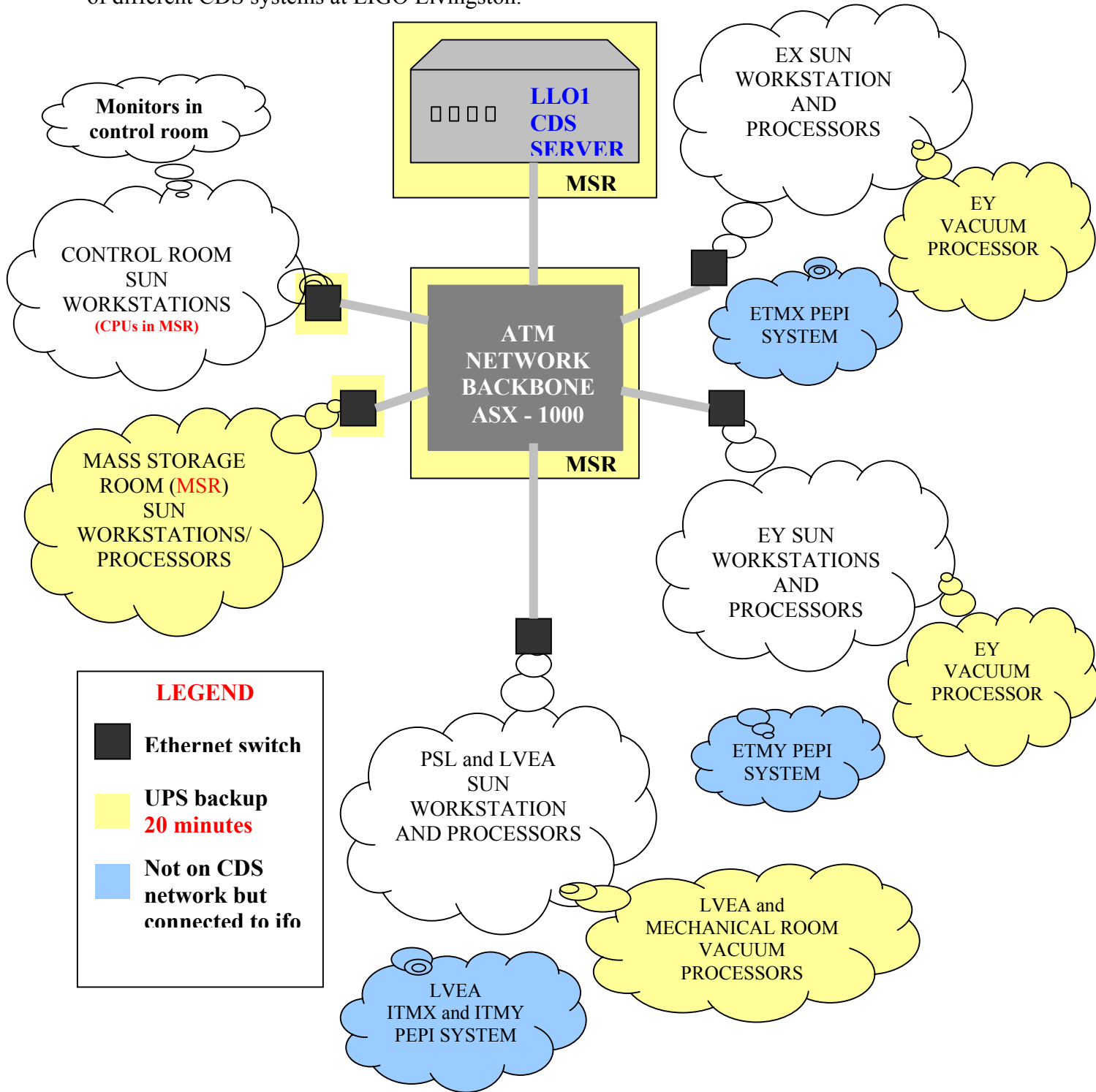


Figure 1: LLO CDS Layout.

### **3.1) LLO1 – LLO CDS SERVER**

As seen in figure 1, LLO1 - LLO CDS Server running on Sun Enterprise 280 is the main and the most important system of the CDS network. This sun server located in the mass storage room (MSR) handles and servers the user accounts, the files required to boot single board computers (SBC) such as Pentiums, bajas and mv162s, and also holds the configuration files required by most of the systems. This sun server has a UPS backup from the MSR UPS which will keep it running for 20 minutes incase of a power outage.

### **3.2) CDS NETWORK**

The CDS Network is an ATM based network with a combination of multi-mode and single-mode fiber and, 10 Base T Ethernet and 100 Base T Fast Ethernet cat 5 cable. The backbone of the network is the ASX 1000 switch in the MSR. The ASX 1000 is also backed up the MSR UPS. Local Network switches – Fore systems 3810, are installed at all locations that provide Ethernet connections to the processors and sun workstations. These are indicated by the black squares in figure 1. There are three 3810 switches in the MSR with one each in the LVEA and the End Stations. Except for the MSR switches, the others do not have a UPS backup and will cut off network connections even for a shorter power glitch.

### **3.3) UPS BACKUP**

Currently the CDS Network has Uninterrupted Power Supply (UPS) installed in the MSR, the vacuum rack in the LVEA, vacuum rack in the mechanical room (MR), and in the vacuum racks in the End Stations. Each of these is good for about 20 minutes of backup power under fully charged conditions. All the systems that are UPS backed are indicated by the yellow background color in the figure.

### **3.4) PEIZOELECTRIC PRE-ISOLATOR (PEPI)**

The piezoelectric pre-isolator system is connected to the interferometer fine actuators at the Input Test Mass (ITM) and End Test Mass (ETM), and hence is a crucial part of the instrument. Currently, the DSpace computer, a PC which drives the PEPI

actuators is however not on the CDS network. The blue background in the figure represents the PEPI system, with the PEPI clouds separated by a gap from the rest of the CDS systems to show that the PEPI is not a part of the CDS Network. Since the PEPI system drives the ITM and ETM stacks, utmost care has to be taken to bring these up and running.

### **3.5) SUN SERVERS and WORKSTATIONS**

Sun servers and workstations are spread out through out the interferometer. Most of the critical sun machines are located in the MSR and are backed up by the MSR UPS. The control room sun workstations are also moved to the MSR and will also be on the UPS (except for the monitors). All other sun workstations in the control room, LVEA, end stations, EE lab and, Chethan and Ash's room are all clients that have similar setups and are considered to be way lower on the ladder for the case of reviving after a power outage. Recently these systems have been automated to boot and upgraded to self-correct disk errors without any human interference. After a power outage, these systems will restart themselves and display a login prompt. Do not login to these sun workstations till you are sure the MSR sun servers are running. Some of the MSR sun workstations will have to be shutdown and brought up in a proper order even if they have come up after a power outage as described in the following sections.

### **3.6) SINGLE BOARD COMPUTERS (SBC)**

The most critical part of the CDS Network is the SBC processors such as Pentiums, bajas and mv162s which interface directly with the components of the interferometer. Utmost care has to be taken before rebooting some of these processors after a power outage. It is important to make sure these processors are turned "ON" only after we are sure the LLO CDS Server (LLO1) is running. Also more important is to disable the drive outputs to the coils. The LVEA and End station vacuum processors control the liquid level in the cryopumps and are considered important to be brought up first and working properly after a power outage. After this the processors along the optical path starting from the PSL can be brought up one by one as described below.

## 4) POWER OUTAGE SCENARIOS

With the existing CDS setup, power outage can be divided into two scenarios – short power outage (SPO) of less than 20 minutes and long power outage (LPO) of greater than 20 minutes.

For the *SPO scenario*, the UPS backup if fully charged, kicks in for 20 minutes and hence, the main CDS Server, other sun workstations and the SBC processors in the MSR will stay on. Similarly, the vacuum processors in the LVEA, MR and the End Stations will also continue running even though they lose their network connection to the LLO1 CDS Server. The monitors in the control room will also shutdown but their sun CPUs (which have now been moved to MSR) will continue to work in the background. The network connection to the LVEA, MR and the End Stations will be disconnected. Figure 2 shows the state of the CDS network and systems for a SPO scenario.

For the *LPO scenario*, the whole of the CDS Network and systems will completely shutdown taking down the machines in the MSR and the vacuum systems along with it. In such a case, dial down the high voltage power supply. Also arrange for manual fill of the cryopumps (call Allen Sibley/Russ Wooley) if the power outage lasts more than six hours and close gate valves (Refer Vacuum document). Figure 3 shows the pictorial representation of the state of the CDS network for a LPO scenario.

Restarting computers/systems after the power outage is different for both the scenarios. For a SPO scenario, we have to deal with fewer machines in the LVEA and the End Stations, and is much easier than for a LPO scenario where all the systems have to be brought up.

The following sections of the document describe the procedure for reviving the CDS network and systems for each power outage scenario. The following assumptions are made:

- 1) vxWorks boot up files and processor startup.cmd files exist in the right directories and have not been changed. **A common problem is when the startup.cmd file is renamed with a different name or extension. For example, startup.cmd.good**
- 2) No changes are done to database and object files before the power outage.

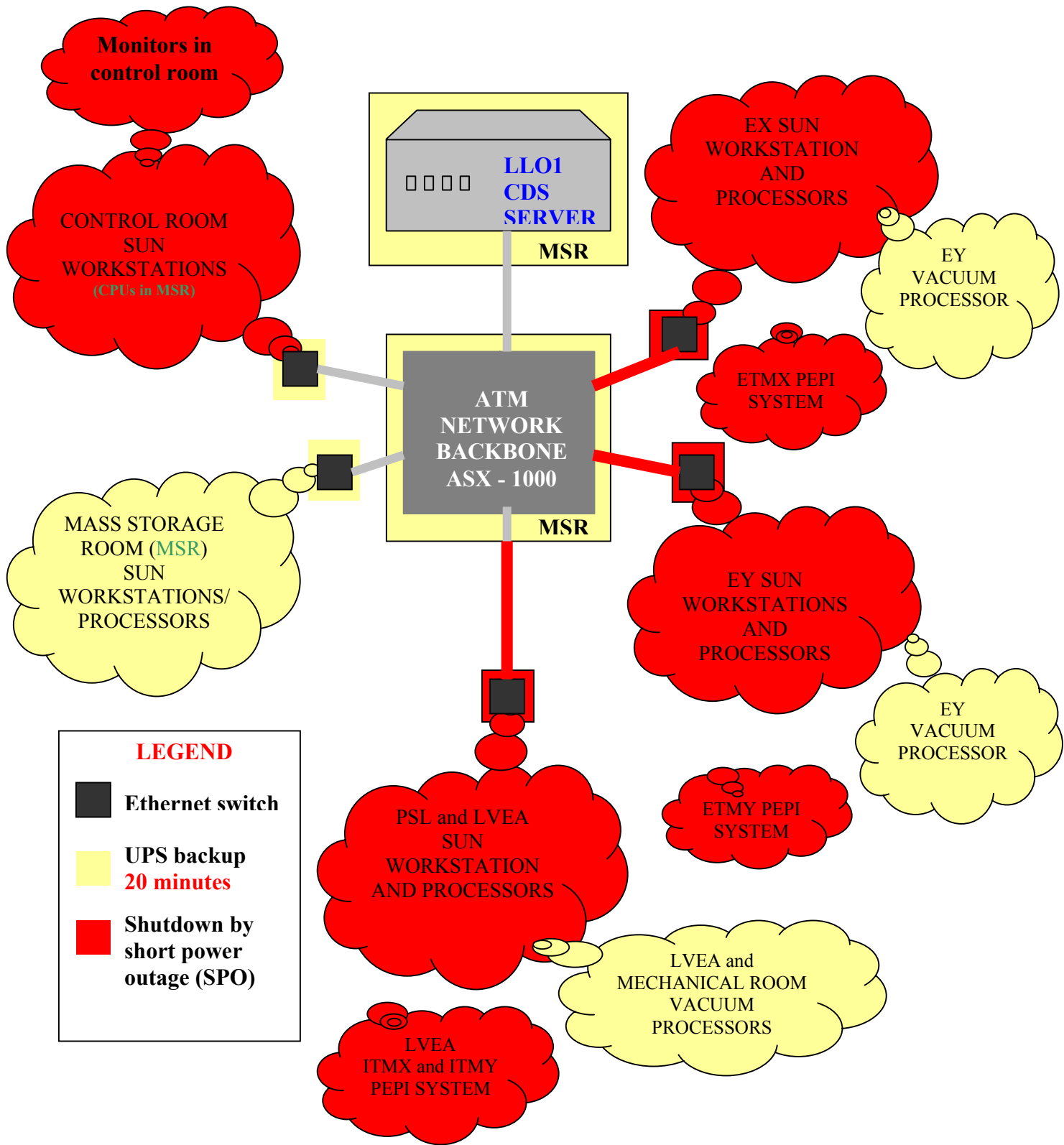


Figure 2: State of CDS Network/systems for Short Power Outage (SPO) Scenario

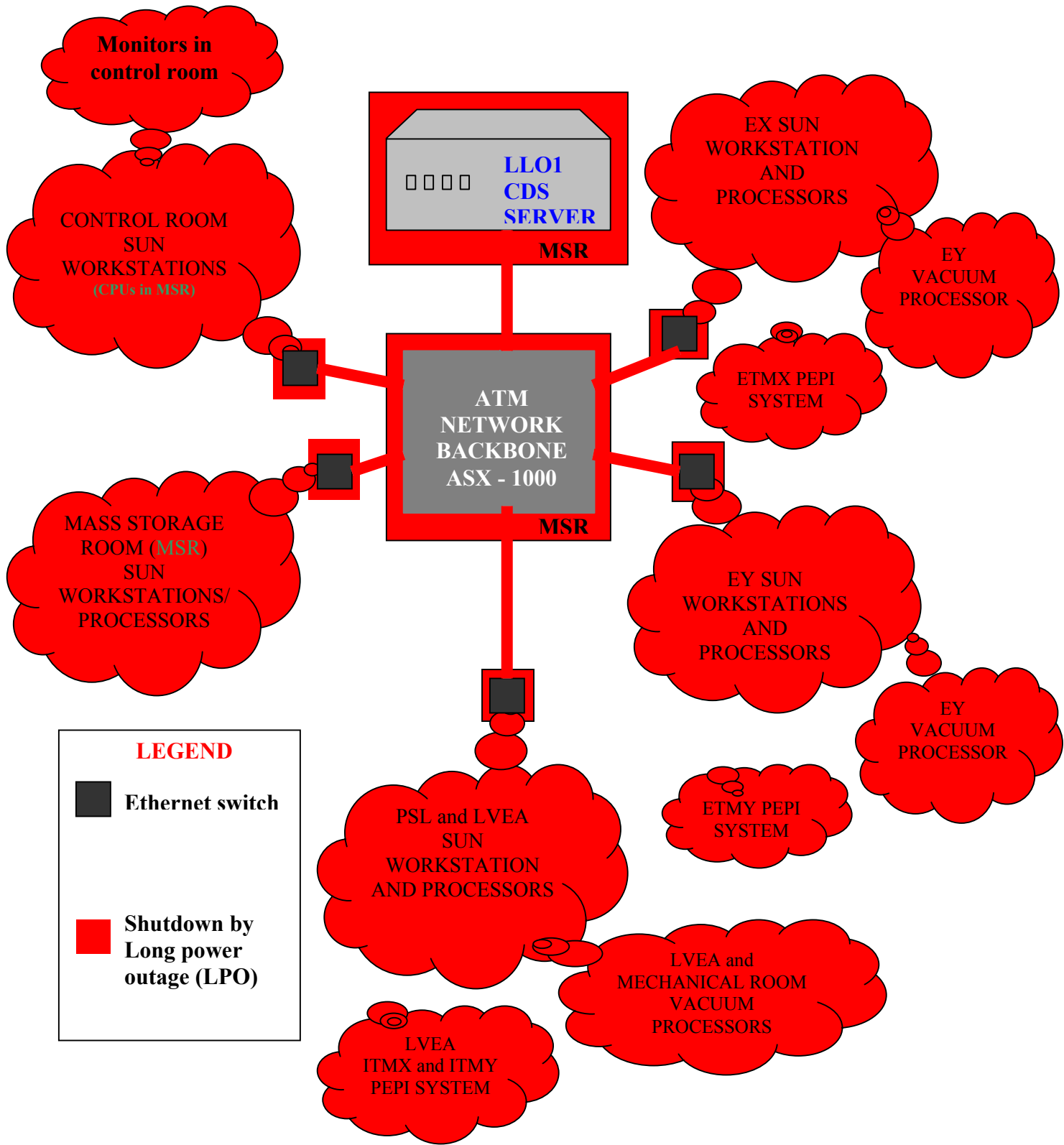


Figure 3: State of CDS Network/systems for Long Power Outage (LPO) Scenario



## 5) REVIVING

Reviving the CDS network for both the scenarios after the power to the site is back are described below.

### 5.1) SHORT POWER OUTAGE (SPO) SCENARIO

This is the slightly easier of the two since the MSR machines have not been shutdown. However care should be exercised to check the coil drive outputs and the fine actuator outputs when bring up the other processors.

Before you embark on the following procedures, please make sure that the MSR power didn't go down and the sun workstations (especially LLO1) are actually working.

If the sun workstations are working, you can login to one of the control room machines and bring up medm screen sitemap to monitor during boot up of the processors. If not, then the MSR also went through a power shutdown (faulty UPS maybe), then follow the instructions for the LPO scenario.

Note some of the processors have built in boot up scripts that would have already started them. However we still need to check the processors and burt restore them. The following order is recommended.

#### a) LVEA and End Station sun workstations

These should be up and running after the power returns. These can be used immediately since the MSR didn't go down.

#### b) Vacuum processors – 10velx, 10vely, 10vemr, 10veex, 10veey – mv162

Open up medm screens for the vacuum processors and make sure they are still running. For a short power outage, they should not have stopped running (unless a UPS failure).

If not, reboot the vacuum processors by pressing the 'RESET' button on the processor and burt restore the values to a time before the power

outage. Click on the ‘START’ Button to start the PID loop for the cryopumps level control.

**PEPI LVEA:**

Open the L1SEI\_PEPI\_LVEA screen and **disable the PEPI outputs** to the ITMs. (Since the switches are wired through the l0velx processor).

**c) l1susauxl0 – The suspension auxiliary processor – mv162**

This processor should already be up after the power returns. Open the L1SUS\_WATCHDOGS screen. Burt restore the l1susauxl0 processor to a time before the power outage. **SHUTDOWN/DISABLE ALL THE LVEA OPTICS.**

**d) l1iscauxex – The X End station suspension auxiliary processor – mv162**

This processor should already be up after the power returns. Open the L1SUS\_WATCHDOGS screen. Burt restore the l1iscauxex processor to a time before the power outage. **SHUTDOWN/DISABLE THE ETMX OPTIC.**

**PEPI EX:**

Open the L1SEI-X\_End screen. **Disable the PEPI outputs, the MSFF outputs (microseism feed forward) and the SEI Master output (tidal servo) for the X End.**

**e) l1iscauxey – The Y End station suspension auxiliary processor – mv162**

This processor should already be up after the power returns. Open the L1SUS\_WATCHDOGS.adl screen. Burt restore the l1iscauxey processor to a time before the power outage. **SHUTDOWN/DISABLE THE ETMY OPTIC.**

**PEPI EY:**

Open the L1SEI-Y\_End.adl screen. **Disable the PEPI outputs, the MSFF outputs (microseism feed forward) and the SEI Master output (tidal servo) for the Y End.**

**f) 11psl – PSL processor – baja 4700**

This processor should already be up after the power returns. Open the L1PSL.adl screen. Burt restore the 11psl processor to a time before the power outage.

**g) 11lscepics – Length Sensing and Control (LSC) epics processor – mv162**

The LSC epics processor should already be up and running after the power returns. Open the L1LSC medm screen. Make sure it displays a text string “Coeff file load complete” at the bottom right hand corner. If not check the L1LSC.txt filter file in the /cvs/cds/llo/chans directory. Press the ‘Load Coefficients’ button and check again. If this does not solve the problem, reboot the 11lsc10 (described next) processor which is on the same crate. Disable all the LSC outputs to the optics on the L1LSC medm screen. Turn the LSC “OFF” using the button at the bottom right hand corner.

**h) 11lsc10 – LSC front end processor – Pentium**

This Pentium processor does all the LSC calculations and is an important processor in terms of timing of the CDS system. All other digital suspension control (dsc) processors are synced to the LSC processor such that they are exactly 1 cycle behind. This processor has to be manually started by telneting into the 11lsc10 processor.

At the prompt type:

➔ /cvs/cds/llo/target/11lsc10/startup.cmd

This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

Burt restore the 11lscepics to a time before the power outage. Make sure the burt restore did not turn on the outputs or the LSC. If they did, then turn them off.

**KNOWN BUG:**

Sometimes the Pentium processor waits for F1 key to be pressed. To do this, connect a keyboard and a monitor to the 11lsc10 processor and press the F1 key. The processor continues to load the operating system and

presents you with a prompt. Load the startup file as shown above. Remove the keyboard and monitor.

**i) 11ascepics – Angle Sensing and Control (ASC) epics processor – baja 4700**

The ASC epics processor should already be up and running after the power returns.

First check to make sure the Microseism Feed Forward is disabled as explained in the a, b and c sections above.

Open the L1ASC\_WFS\_MASTER medm screen. Make sure it displays a text string “Coeff file load complete” at the bottom right hand corner. If not check the L1ASC.txt filter file in the /cvs/cds/llo/chans directory. Press the ‘Load Coefficients’ button and check again. If this does not solve the problem, reboot the 11lsc10 (described next) processor which is on the same crate.

Check the filters for the microseism feed forward loop also on the L1ASC\_MSFF medm screen.

Turn off the ASC outputs to the optics on the L1ASC\_WFS\_MASTER, L1ASC\_MC\_MASTER, and the L1ASC\_QPD\_MASTER screens.

**j) 11ascl0 – ASC front end processor – Pentium**

This Pentium processor does all the ASC calculations. This processor has to be manually started by telneting into the 11lsc10 processor.

At the prompt type:

➔ /cvs/cds/llo/target/11ascl0/startup.cmd

This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

Burt restore the 11ascepics to a time before the power outage. Make sure the burt restore did not turn on the outputs of the ASC. If they did, then turn them off.

**k) 11sosepics – small optics suspension epics processor - Pentium**

This Pentium processor runs epics for small optics suspension systems in the LVEA and also the front 2048 Hz sampling rate section of the large

optics suspension systems in the LVEA. After power returns, this processor must be up and running.

On all suspension medm screens for the LVEA optics, it should display a text string “Coeff file load complete” at the bottom left hand corner. On all suspension medm screens for the LVEA small optics, it should display a text string “Coeff file load complete” at the bottom right hand corner.

If not the filter file “L1SUS\_(respective optic).txt” needs to be checked in the /cvs/cds/llo/chans directory.

**Wait to burt restore till the 11dscl0 (described next) processor is running.**

**1) 11dscl0 – small optics digital suspension controller – front end - Pentium**

This Pentium processor does the calculations for the small optics systems in the LVEA except MC2 which is done by 11dscl3. If the restart after the power returns was good, then the processor will already have been running.

To check this, open a small optic medm screen such as MC3 and see if the values in all the loops POS, PIT and YAW are changing and not frozen.

Burt restore the 11sosepics processor to a time before the power outage.

**KNOWN BUG:**

Due to known bug with two Pentium processors running on the same VME backplane, a race condition exists between the two and the front end Pentium processor keeps rebooting continuously. If you are caught in the above situation, follow these instructions to get out of this.

- 1) Connect a monitor and keyboard to the 11dscl0 processor.
- 2) Reboot the 11dscl0 processor by pressing the reset button, which will also reboot the 11sosepics processor. While the 11dscl0 processor reboots, stop it when it is counting down to zero to load the vxWorks operating system.
- 3) Wait for the 11sosepics processor to reboot completely, i.e., the lvea optics screen should display a text string “Coeff file load complete”.

- 4) On the connected keyboard, continue booting of the 11dsc10 processor by typing '@' without the quotes and the enter(return) key. This should get you to the prompt '->'.
  - 5) At the prompt type:
    - ➔ /cvs/cds/llo/target/11dsc10/startup.cmd
  - 6) This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

**m) 11losepics – LVEA large optics epics processor – Pentium**

This Pentium processor runs epics for large optics suspension systems in the LVEA. This processor is in the MSR and should not have shutdown for the short power outage (SPO) scenario. If the lvea large optics medm screen is white in the center of the screen, then the processor has to be rebooted by pressing the “RESET” button on the processor.

On all LVEA large optics suspension medm screens, it should display a text string “Coeff file load complete” at the bottom right hand corner.

If not the filter file “L1SUS\_(respective optic).txt” needs to be checked in the /cvs/cds/llo/chans directory.

**Wait to burt restore till all the 11dsc11 through 11dsc13 (described in next three sections) processors are running.**

**n) 11dsc11 – RM/BS digital suspension controller – front end – Pentium**

This Pentium processor does the calculations for the RM/BS optics suspensions in the LVEA. If the restart after the power returns was good, then the processor will already have been running.

To check this, open a RM/BS optic medm screen and see if the values in all the loops POS, PIT and YAW are changing and not frozen.

If not reboot this processor by pressing the “RESET” button on the processor.

At the prompt type:

➔ /cvs/cds/llo/target/11dsc11/startup.cmd

This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

**o) 11dscl2 – ITM digital suspension controller – front end – Pentium**

This Pentium processor does the calculations for the ITM optics suspensions in the LVEA. If the restart after the power returns was good, then the processor will already have been running.

To check this, open a ITM optic medm screen and see if the values in all the loops POS, PIT and YAW are changing and not frozen.

If not reboot this processor by pressing the “RESET” button on the processor.

At the prompt type:

➔ /cvs/cds/llo/target/11dscl2/startup.cmd

This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

**p) 11dscl3 – MC2 digital suspension controller – front end – Pentium**

This Pentium processor does the calculations for the MC2 optic suspensions in the LVEA. If the restart after the power returns was good, then the processor will already have been running.

To check this, open a MC2 optic medm screen and see if the values in all the loops POS, PIT and YAW are changing and not frozen.

If not reboot this processor by pressing the “RESET” button on the processor.

At the prompt type:

➔ /cvs/cds/llo/target/11dscl3/startup.cmd

This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

Burt restore the 11losepics processor to a time before the power outage.

Turn off all the LSC and ASC inputs to the suspension system if they were restored.

**q) l1dscepicscx – ETMX epics processor – mv162**

This Pentium processor runs epics for ETMX optic suspension system in the End X. After power returns, this processor must be up and running.

If the ETMX large optic medm screen L1SUS\_ETMX is white in the center of the screen, then the processor has to be rebooted by pressing the “RESET” button on the processor.

On the ETMX large optic suspension medm screen, it should display a text string “Coeff file load complete” at the bottom right hand corner.

If not the filter file “L1SUS\_ETMX.txt” needs to be checked in the /cvs/cds/llo/chans directory.

**Wait to burt restore till all the l1iscex (described next) processor is running.**

**r) l1iscex – ETMX digital suspension processor – Pentium**

This Pentium processor does the calculations for the ETMX optic suspensions in the End X. If the restart after the power returns was good, then the processor will already have been running.

To check this, open the ETMX optic medm screen and see if the values in all the loops POS, PIT and YAW are changing and not frozen.

If not reboot this processor by pressing the “RESET” button on the processor or by pressing the “RESET” button for ETMX on the L1IFO\_RESET medm screen.

At the prompt type:

➔ /cvs/cds/llo/target/l1iscex/startup.cmd

This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

Burt restore the l1dscepicscx processor to a time before the power outage.



**s) l1dscepicey – ETMY epics processor – mv162**

This Pentium processor runs epics for ETMY optic suspension system in the End Y. After power returns, this processor must be up and running.

If the ETMY large optic medm screen L1SUS\_ETMY is white in the center of the screen, then the processor has to be rebooted by pressing the “RESET” button on the processor.

On the ETMY large optic suspension medm screen, it should display a text string “Coeff file load complete” at the bottom right hand corner.

If not the filter file “L1SUS\_ETMY.txt” needs to be checked in the /cvs/cds/llo/chans directory.

**Wait to burt restore till all the l1iscey (described next) processor is running.**

**t) l1iscey – ETMY digital suspension processor – Pentium**

This Pentium processor does the calculations for the ETMY optic suspensions in the End Y. If the restart after the power returns was good, then the processor will already have been running.

To check this, open the ETMY optic medm screen and see if the values in all the loops POS, PIT and YAW are changing and not frozen.

If not reboot this processor by pressing the “RESET” button on the processor or by pressing the “RESET” button for ETMY on the L1IFO\_RESET medm screen.

At the prompt type:

➔ /cvs/cds/llo/target/l1iscey/startup.cmd

This should start the front end successfully. To exit, simply close the terminal window or type ^] to get a telnet prompt and then type quit. DO NOT EXIT OR LOGOUT.

Burt restore the l1dscepicey processor to a time before the power outage.

**ON THE L1ISC\_NETWORK MEDM SCREEN CHECK IF ALL PROCESSOR’S CPU AND THE LSC SKEW IS WITHIN LIMITS. IF NOT REPEAT THE REBOOT PROCEDURE ACCORDINGLY.**

**u) 11i00l0 – IOO mode cleaner wfs/pico controls processor – mv162**

This processor will also be up and running after the power returns. Open the L1:IOO-MC\_LOCK medm screen. Burt restore the 11i00l0 processor to a time before the power outage.

**IMPORTANT NOTE: After a power outage, the input beam alignment to the mode cleaner may be disturbed even though the processor is burt restored. Use the PZT pitch and yaw alignment sliders on the L1:IOO-MC\_LOCK screen to adjust the input beam alignment.**

**v) 11i00l1 – IOO mode cleaner lock controls processor**

This processor will also be up and running after the power returns. Open the L1:IOO-MC\_LOCK medm screen. Burt restore the 11i00l1 processor to a time before the power outage. Disable the Mode Cleaner Auto locker till you are ready to lock the Mode Cleaner.

**w) 11adcuex – End X Analog Data collection unit – Pentium**

This processor handles the PEM and other analog data from the End X. After the power returns, this processor should be up and running. Open the L0DAQ\_Detail medm screen and check the indication for the 11adcuex. If green, this processor is running.

Check the channels on this processor using a dataviewer to see if they the processor resolved correctly after the power outage. If not, reboot it shutting down the crate and restarting it.

**KNOWN BUG:**

The ICS 110B A/D Converter loses its clock sync if the GPS receiver is not synced before the processor reboots. Rebooting the crate fixes this.

**x) 11adcuex – End Y Analog Data collection unit – Pentium**

This processor handles the PEM and other analog data from the End Y. After the power returns, this processor should be up and running. Open the L0DAQ\_Detail medm screen and check the indication for the 11adcuex. If green, this processor is running.

Check the channels on this processor using a dataviewer to see if they the processor resolved correctly after the power outage. If not, reboot it shutting down the crate and restarting it.

**KNOWN BUG:**

The ICS 110B A/D Converter loses its clock sync if the GPS receiver is not synced before the processor reboots. Rebooting the crate fixes this.

**y) lladcupem – LVEA PEM Analog Data collection unit – Pentium**

This processor handles the PEM analog data from the LVEA. After the power returns, this processor should be up and running. Open the L0DAQ\_Detail medm screen and check the indication for the lladcupem. If green, this processor is running.

Check the channels on this processor using a dataviewer to see if they the processor resolved correctly after the power outage. If not, reboot it shutting down the crate and restarting it.

**KNOWN BUG:**

The ICS 110B A/D Converter loses its clock sync if the GPS receiver is not synced before the processor reboots. Rebooting the crate fixes this.

**z) lladcusus – LVEA SUS Analog Data collection unit – Pentium**

This processor handles the SUS analog data from the LVEA. After the power returns, this processor should be up and running. Open the L0DAQ\_Detail medm screen and check the indication for the lladcusus. If green, this processor is running.

Check the channels on this processor using a dataviewer to see if they the processor resolved correctly after the power outage. If not, reboot it shutting down the crate and restarting it.

**KNOWN BUG:**

The ICS 110B A/D Converter loses its clock sync if the GPS receiver is not synced before the processor reboots. Rebooting the crate fixes this.

**aa) gdsivea1 – GDS Arbitrary waveform generator**

This processor handles the excitation of the channels. After the power returns, this processor should be up and running.

Check the excitation channels using DTT to see if they the processor resolved correctly after the power outage. If not, reboot it shutting down the crate and restarting it.

**KNOWN BUG:**

The ICS 115B D/A Converter loses its clock sync if the GPS receiver is not synced before the processor reboots. Rebooting the crate fixes this.

**DAMPING:**

**TURN THE OPTICAL LEVER DAMPING OFF ON ALL LARGE OPTICS AND DAMP ALL THE OPTICS, BOTH LARGE AND SMALL ON OSEM DAMPING. THEN TURN ON THE OPTICAL LEVER DAMPING AND MAKE SURE THE OPTICS IS STILL DAMPED. CHECK TO SEE IF THE PITCH AND YAW ANGLE OFFSETS ARE SET RIGHT ON THE L1IFO\_ALIGN MEDM SCREEN. ENABLE THE LSC AND ASC OUTPUTS AS NEEDED.**

**bb)PEPI LVEA – DSpace Control Desk program running on a PC**

Make sure the PEPI is disabled as described in section ‘a’ above.

Start the DSpace PC in the LVEA. Login using the Administrator account with the password in the envelope in the control room.

Double click on the “Control Desk” icon on the desktop to start the DSpace program.

Refresh the connection to the RT chip.

Load the experiment from the working directory.

Start the animation and set the gains for the knobs to 0.20 or to the values mentioned on the screen, whichever is the latest.

**cc) PEPI EX – DSpace Control Desk program running on a PC**

Make sure the PEPI is disabled as described in section ‘b’ above.

Start the DSpace PC in the LVEA. Login using the Administrator account with the password in the envelope in the control room.

Double click on the “Control Desk” icon on the desktop to start the DSpace program.

Refresh the connection to the RT chip.

Load the experiment from the working directory.

Start the animation and set the gains for the knobs to 0.15 20 or to the values mentioned on the screen, whichever is the latest.

**dd)PEPI EY – DSpace Control Desk program running on a PC**

Make sure the PEPI is disabled as described in section ‘c’ above.

Start the DSpace PC in the LVEA. Login using the Administrator account with the password in the envelope in the control room.

Double click on the “Control Desk” icon on the desktop to start the DSpace program.

Refresh the connection to the RT chip.

Load the experiment from the working directory.

Start the animation and set the gains for the knobs to 0.15 20 or to the values mentioned on the screen, whichever is the latest.

**ENABLE THE MASTER SEI OUTPUTS, MSFF SWITCHES AND THE PEPI SWITCHES WHEN NEEDED.**

This completes the steps required to bring back the CDS network and systems after a short power outage (SPO).

## 5.2) LONG POWER OUTAGE (LPO) SCENARIO

The first place to start for this scenario is the MSR. Even though other sun workstations and processors might be up, it does not good till LLO1, the ATM backbone and other machines are up.

**DO NOT LOGIN TO ANY CONTROL ROOM, LVEA, AND END STATION SUN WORKSTATIONS TILL THE MSR MACHINES ARE UP.**

### a) LLO1 – LLO CDS Server – Sun Enterprise 280

This sun server is the main important machine of the CDS network. It handles all the user accounts, the main /cvs/cds directory required by all other suns and processors. After the power returns, this sun server should restart without any intervention. On the monitors in the MSR, select LLO1 and check to see if it is displaying the login screen.

This sun server has been configured to self-correct for disk errors and also not depend on any other machine to be up and running.

Make sure the A1000 disk array below the sun server is also on.

Check if conlog is running:

Login as ops. Password in the control room and make sure the conlog process is running. This should have started when rebooted.

If not, the location of the files is at:

/cvs/cds/llo/web/conlog

Check if the nameserver is running:

Check if the nameserver process is running. It should have started when rebooted.

If not, the location of the nameserver file is at:

/cvs/cds/scripts/

**b) LLOCDSSw0 – ATM switch – ASX1000**

The ASX 1000 is the network backbone for the CDS Network. It loads its configuration file /tftpboot/lecs.cfg from LLO1.

The ATM might restart faster than LLO1. Hence, even though this switch is running after the power returns, please reboot it to make sure it loads the configuration file.

**c) LLOMSR, LLOMSR1 and LLOMSR2 – 3810 Network switches in the MSR**

The next ones in line are the 3810 network switches in the MSR. These switches have to be on for machines to communicate. Even though the 3810 network switches are already running please reboot it to configure the switch.

**d) control3 – Application server – Ultra 60**

This ultra 60 sun server holds the /opt/apps application directory, the /data directory and the /users directory without which all the other suns will freeze when logged in.

Reboot this sun server to refresh its network connection. Make sure the A1000 disk array below the sun server is also on.

**AFTER THIS YOU SHOULD BE ABLE TO LOGIN TO ANY CONTROL ROOM SUN AND BRING UP MEDM SCREENS.**

**e) LLOLVEA, LLORightEnd and LLOLeftEnd – 3810 Network switches in the MSR**

The next ones in line are the 3810 network switches in the LVEA and END Stations. These switches have to be on for machines to communicate. Even though the 3810 network switches are already running please reboot it to configure the switch.

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**AT THIS POINT FOLLOW THE INSTRUCTIONS OF THE SHORT POWER OUTAGE SCENARIO TO BRING UP ALL THE LVEA, MECHANICAL ROOM AND END STATION PROCESSORS.**

**NOTE: ALL PROCESSORS HAVE TO BE REBOOTED IF THEY ARE ALREADY UP TO REFRESH THEIR CONNECTION TO LLO1**

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**f) l0daqctrl – DAQ Controller – Pentium**

This processor is the heart of the DAQ system. This processor should be rebooted by keying the crate off. This processor may sometimes take more than a few minutes if the GPS is not synced. Rebooting will load the correct master.config file and also reset the Test Point manager.

**g) l1iocstat – DAQ epics and EDCU / iocstat processor – Sun Blade 100**

Reboot this machine by pressing the ON/OFF switch in front of the sun workstation.

Open the L0DAQ\_Detail screen. First make sure the screen is not white. If it is, then the daqepics process is not running.

If the screen is up, check to see if the epics data collection unit (EDCU) processor is up and running. It may take a few minutes for the EDCU to collect all the channels and start running.

To check iocstat process is running, open the L1IFO\_Status medm screen or its sub screens and make sure it is not white. Burt restore l1iocstat to a time before the power outage.

To restart any of these three processes - daqepics, edcu or iocstat, the best option is to reboot the machine.

If you still have problems,

check if the daqepics, edcu, iocstat processes are running on this sun machine. Login as controls. Password in the control room envelope.

Files located in the target directory:

/cvs/cds/llo/target/l0edcus0 and /cvs/cds/llo/target/l1iocstat.



**h) LLOFb0 – Frame Builder 0 – Enterprise 450**

This frame builder is our backup frame builder and also has its disks in the MSR. First make sure the disk arrays A1000 and the D1000 are both ON, Reboot the Frame Builder to load the master.config file from LLO1.

If you still have problems,

check if the daqd daemon and the nds daemon are running on the framebuilder. Login as controls. Password in the control room envelope.

Files located in the directory:

`/usr/controls/core3.d`

**i) LLOFb1 – Frame Builder 1 – Ultra 60**

This frame builder is the gds frame builder used to serve data to the DMT monitors. Reboot the Frame Builder to load the master.config file from LLO1.

If you still have problems,

check if the daqd daemon and the nds daemon are running on the framebuilder. Login as controls. Password in the control room envelope.

Files located in the directory:

`/usr/controls/core3.d`

**j) LLOFb2 – Frame Builder 2 – Sun Blade 2000**

This frame builder is main frame builder whose disks are in the LDAS room in the new building across the street. First make sure the disk array from LDAS is up and running. Reboot the Frame Builder to load the master.config file from LLO1.

If you still have problems,

check if the daqd daemon and the nds daemon are running on the framebuilder. Login as controls. Password in the control room envelope.

Files located in the directory:

`/space/controls/core3.d`

**k) london (gateway) – CDS web gateway - Ultra 10**

This sun server is the CDS web gateway to the world. It runs the apache server and also the ndsproxy required to run the dataviewer and DTT

outside CDS network. Reboot the sun workstation to get the apache daemon and the ndsproxy to run. Note: The ndsproxy requires the frame builders to be running to configure itself.

On any control room sun, check if you can see the CDS web page. To check the ndsproxy, use dataviewer on GC to connect to london.ligo-la.caltech.edu with port 8088 or 8089.

If you still have problems,

check if the apache httpd daemon and the ndsproxy is running. Login as ops. Password in the control room envelope.

Apache files located at:

`/usr/apache/bin , /var/apache/ , /etc/apache`

ndsproxy files located at:

`/cvs/cds/llo/web/ndsproxy`

**l) river (river) – CDS user gateway – Ultra 60**

This sun server is the CDS user gateway to and from the CDS network. Reboot this sun workstation. Check by logging into this machine using ssh with your assigned username and password

**m) LLO2 – web-epics interface – Ultra 2**

This sun workstation is used to display the real time medm snapshots on the web page.

Reboot this machine. Login as ops. Password in the control room envelope

Open medm screens that you wish to display on all the six workspaces.

Minimize all windows except the screens that need to be snapshot. Open a terminal and run the command

`/cvs/cds/scripts/wrkspcerotate.dtksh`

Minimize the terminal window.

**n) delaronde (E 450), pickerel and nesslin (Sun Blade 1000) – GDS DMT suns**

Reboot all the three sun machines. Check the GDS web page

[http://london.ligo-la.caltech.edu/gds/dmt/Monitors/spiM\\_LLO.html](http://london.ligo-la.caltech.edu/gds/dmt/Monitors/spiM_LLO.html)

to see if the monitors are running on the three machines.

If you still have problems, call John Zweizig or Szabi Marka.

**o) alvar – GDS gateway**

This is a 3u size computer running linux and is mounted above the delaronde. Reboot his processor and turn it on.

**p) l0llosuper – CDS epics security processor**

Reboot this processor (Note: This will also reboot the l0tidal processor) to load the security database and configuration file.

Burt restore this processor to a time before the power outage.

**q) l0tidal – Tidal servo and tidal prediction processor**

This processor is used for the tidal servo calculations and tidal prediction. Reboot this epics processor by pressing the reset button on the processor (Note: This will also reboot the l0llosuper processor) and burt restore it to a time before the power outage.

For the tidal prediction, a data file loaded by the processor sitetide\_current.dat file must exist in the directory:

`/cvs/cds/llo/tidal/`

The tidal.pl paladin program to generate the tide prediction information must run every two weeks to update this sitetide\_current.dat file as cronjob on the sun machine control3.

**r) control4 – disk backup sun workstation**

Reboot this sun workstation and turn it on.

**s) control21, control22 – figure of merit display – sun blade 150**

Reboot this processor. Setup the DMT viewer and the figure of merit screens on the display. Control21 has figure of merit 1 and 2 on each display and control22 has figure of merit 3 on display 1. Note: These are also snapshot and elogged on the ilog and displayed on the CDS web page. Hence the location of these figure of merit displays have to be in their proper location. A cronjob running a perl program to snapshot, elog and display is on the LLO2 processor.

**t) control31 – epics display sun – Ultra 10**

This sun workstation is used to display a medm screen that represents the whole interferometer. This medm screen will be a guide to indicate any problems in the system.

This completes the steps required to bring back the CDS network and systems after a Long power outage (LPO).

**PROBLEMS KNOWN:**

- 1) Sometimes the ports on the 3810 do not work. Hence processors do not boot up but complain about network problem. Solution: Move the Ethernet cable to the next port on the 3810 switch and reboot.
- 2) Changed database and object files that were put in the target area but was not loaded before the power outage. Since these new files are loaded during power outage, we may run into problems during boot up.