

Responding to Alarms and Warnings

Jonathan Warren

jwarren@slac.stanford.edu

SLAC National Accelerator Laboratory
Menlo Park, CA, USA



Introduction

Effectively responding to alarms and warnings is paramount for ensuring safety and mitigating potential risks at our laboratories. The control room operators at the SLAC National Accelerator Laboratory are expected to promptly and cohesively respond to critical alerts.

Are the severities of the alerts in the control room immediately obvious? Are the control room operators prepared to handle various emergency scenarios?

The audible alerts in the Accelerator Control Room (ACR) are classified as either an alarm or a warning. The Engineering Operator In Charge (EOIC) is required to follow a step-by-step procedure in response to an alarm or warning.

To help the EOICs and Operators prepare for incidents such as fire or earthquake, tabletop training exercises are performed periodically.

Identify the Source

Quickly identify the source of the alarm or warning. Determine whether it is a false alarm or an actual threat. It is good practice to **limit the number of audible alerts** in the control room. It should be obvious to the Operator when a fault requires immediate action.



Follow Established Procedures

Each alarm or warning channel has an associate response procedure. Operators are expected to follow the step-by-step procedure when a channel is faulted.

The Accelerator Operations and Safety Division (AOSD) alarms indicate an immediate threat to personnel safety or a possibility of environmental damage. Alarms must be provided to the ACR as hard-wired signals, or “hard wire equivalent” signals.

AOSD warnings require response but do not indicate an immediate safety-related problem. Warnings may indicate conditions that could cause a significant interruption to the accelerator operations program, or conditions that could develop into a threat to safety or the environment if not addressed.

Prioritize Safety and Communicate Effectively

In all circumstances, safety must be the top priority. It is essential that Operators use clear and concise communication.

Keeping call-in lists up-to-date can be a challenge. Ideally, each support group has a Point of Contact (PoC) who regularly updates their contact lists.

Channel 07: 21-29 Secure

Reviewer: AD Safety Office *Zoe Van Hoover* P. Miller or Z. Van Hoover
Approver: Accelerator Operations and Safety Division *Peter Schulk* P. Schulk

Channel Name 21-29 Secure

Annunciator Location The Master Alarms and Warnings Panel is located on the west wall of the ACR, just to the right of the door to the ANR. Alarm and warning displays and reset functions are also provided on all CyBoxes.

Equipment Location Equipment located at CCR, the LCLS Injector Vault, and throughout the Klystron Gallery.

Meaning The Alarm indicates that the 21-29 PPS Secure loop has been interrupted.
Inputs to this secure loop are listed in Table 2 below.
PPS security may be lost if a person opens an interlocked door or gate or presses an Emergency-off (EO) button, although there may be other reasons why this alarm might sound that do not involve a person in a PPS area.

Alarm Response Procedure Objectives

- Ensure immediate safety of personnel and environment.
 - Confirm correct PPS interlock action.
 - Determine the cause of the alarm.
- Determine whether a reportable safety incident occurred.
- Report problems and restore beam operations.

Response Procedure

Ensure Immediate Safety

If at any point during Steps 1-5 of this procedure the control system is not functioning take the following actions:

- Use a CyBox to stop the LCLS-I NC, LCLS-II SC, and FACET-II electron beams by inhibiting the beam permissive for each accelerator.
- If the CyBox is not functioning, turn off all Linear Accelerator Facility electron beams by pressing the LAF Emergency Beam Stop button in the ACR.
- Contact the EED Controls Deputy and request assistance in recovering the control system.
- After the control system is functioning, resume this procedure.

June 23, 2023 SLAC-I-040-307-002-04-R006 Page 1 of 7

Record and Report

Record the details of the incident and escalate as needed. Operators typically use the electronic logbook to document events and follow the escalation policy as needed.

Flags	Time	Title	Name	Areas
+	21:01	tripping frequently on BLM26 in undulator	K_Lubana	LCLS_SC
+	20:23	lost 6x6 feedback LTUH energy BPM IOC out REbooting	M_DeMario	LCLS_NC
+	20:19	currently stable at 10Hz ~30uJ	K_Lubana	LCLS_SC
+	20:18	This was troubleshooted by the photon side * Re: PMPS SXR Motion fast fault 1 due to putting a photon imager in the beam, wont clear, working on a fix	K_Lubana	LCLS_SC
+	19:52	PMPS SXR Motion fast fault 1 due to putting a photon imager in the beam, wont clear, working on a fix	K_Lubana	LCLS_SC
+	19:45	using PV 'EM2K0.XGMD:HPS:KeithleySum' for SXR FEL tuning	K_Lubana	LCLS_SC
+	19:38	10Hz through UNDS - currently nothing on GMD	K_Lubana	LCLS_SC
+	19:27	1Hz steering through UNDS. C Zimmer attempting SVD steering GUI	K_Lubana	LCLS_SC
+	19:13	1.65mJ e-loss scan	M_DeMario	LCLS_NC

Tabletop Training Exercises

In addition to alarms and warnings, Operators are often involved during incident response.

An incident is defined as an event causing injury to one or a small number of personnel or creating an immediate danger of such injury, causing substantial property damage or program delay, or involving a release of hazardous materials, but which does not seem likely to exceed the capabilities of the normal technical or public safety crews available to the site.

Incidents can be stressful. **To prepare the control room for incidents, simulated tabletop exercises are performed periodically.**

Safety Officers, Specialists, or Management present a scenario to an EOIC. The EOIC describes how they would react and respond based on the information that is being presented to them. The dialogue continues, often getting more complex, as the presenter describes the situation and the team listens. At the conclusion of each scenario, there is an opportunity for the group to discuss and ask questions. These simulations are a great learning opportunity for the whole group and help prepare the control room for actual incidents.