

E.8: Panic button alarm system for Indus-2 beamlines personnel safety

In a significant step toward augmenting the safety infrastructure of the Indus-2 Synchrotron Radiation Source, an indigenously developed Panic Button Alarm System has been successfully commissioned across 24 beamlines. Designed as a fail-safe rapid-response mechanism for medical, fire, or radiation emergencies, the system ensures that critical assistance is only a button-press away for beam line scientists, researchers and other staff. By providing immediate audio-visual alerts to the Indus control room, security posts and first aid centre, the system facilitates rapid activation of the response in case of any emergency at the beamlines, significantly enhancing the safety and security architecture of the Indus-2 facility.

System Overview

Developed as per recommendations of the Safety Review Sub-Committee' for Indus and EAG activities, the system features 24 strategically placed panic boxes (Fig. E.8.1) at the beamline hutch entries. The architecture as shown in Fig. E.8.2 is built on "Fail-Safe" principles, utilizing three parallel redundant cables to ensure that the system remains functional even in the event of physical cable damage. Furthermore, the entire network is supported by an Uninterrupted Power Supply (UPS), guaranteeing performance during power fluctuations or outages.



Fig. E.8.1: Panic Button Boxes (BL-1 to 24)

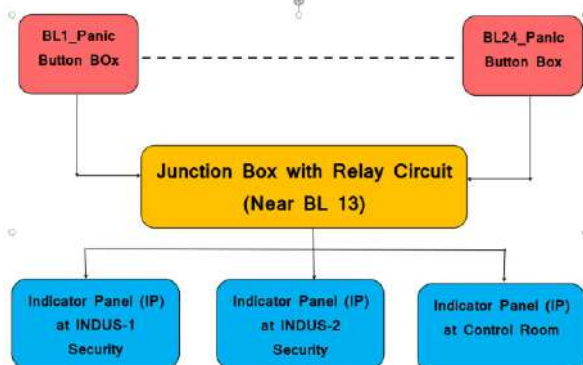


Fig. E.8.2: Block diagram of Panic Button Alarming system

Strategically Located Indicator Panels (IP): To ensure zero-latency response, high-visibility Indicator Panels equipped with synchronized flashing lights and high-decibel audible alarms have been installed at three primary security and monitoring hubs:

- **Indus Control Room:** Mounted at the main entrance for immediate operator awareness.
- **Indus-2 Security Post:** Positioned on the left sidewall to alert security personnel.
- **Indus First-aid Centre:** Installed on the primary front wall to ensure immediate medical assistance



Fig. E.8.3: Indicator panel with audio/visual alarming

The IP is having 22mm dia EM lamps in a matrix form (Fig. E.8.3) with marking of Beam Line locations.

Each panel features a localized matrix of LED indicators, allowing responders to identify the specific beamline in distress at a glance. The internal wiring of junction box (Fig. E.8.4), which contains the relay logic, is located near BL13.



Fig. E.8.4: Internal wiring of junction box

Operational Workflow: From Trigger to Resolution

The system follows a synchronized four-stage protocol. An emergency is triggered by pressing a local mushroom top latch-type button located outside experimental hutch of each beamline of Indus-2, which immediately alerts the control room, security posts and first aid centre simultaneously with precise location mapping. An intuitive indicator panel allows to pinpoint the exact location of the emergency instantly, facilitating a rapid response to the emergency.

The commissioning of this system reinforces the commitment to a robust safety culture at the facility. By utilizing high-reliability components and a redundant signal architecture, the system provides a dependable safety net for the diverse operations conducted at the Indus-2 beamlines.

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