Hall C User Howto
Drift Chamber Flammable Gas Leak Detectors

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Abstract
A gas mixture containing ethane (a flammable gas) is produced in the Hall-C Gas Shed for use in drift chambers in the HMS, SOS, and occasionally other user-supplied detectors. Unusually large leaks from the mixer or the detectors will be detected by the Flammable Gas Sensor System, and the counting-house operations crew will be alerted by an alarm. This document provides an overview of the sensor system and what users should do in the event that it triggers an alarm.

1 Flammable Gas Sensor System Overview

The system consists of a control unit (in the counting room: the upper white GasMaster box) and three sensor heads (one each in the Gas Shed, the HMS shield house, and the SOS shield house). The sensor heads look like orange electrical junction boxes on the end of a flexible armored cable. They usually sit on the floor underneath potential leaks.

The control unit powers the sensor heads and displays (red LED numerals) the measured flammable gas concentrations seen by each one. The units of the display are percent of lower-explosive-limit (LEL). For example, if the reading is 10 it means that the flammable gas concentration is 10% of that necessary to burn. Only one of the sensor readings is displayed at any given time. The controller cycles through the sensors automatically (unless you press the HOLD button). The CHANNEL display indicates which sensor reading is currently being displayed.

The fourth channel (rightmost module) is currently unused, always indicates a fault, and reads a large negative number. This is normal.
2 Controller Operation

2.1 Indicators

GAS CONCENTRATION DISPLAY 3-digit numeric display (with sign) indicating %LEL for the channel currently being read.

CHANNEL DISPLAY Shows Cn, where n is the channel number whose reading is currently displayed.

FAULT light (each channel) Yellow LED illuminated when a system fault is detected on that channel.

LOW ALARM light (each channel) Red LED illuminated when the channel reading has exceeded 10% LEL since the last RESET/ACCEPT.

HIGH ALARM light (each channel) Red LED illuminated when the channel reading has exceeded 20% LEL since the last RESET/ACCEPT. (When any HIGH ALARM LED is lit the gas interlock system is tripped, shutting off the ethane supply to the gas shed.)

2.1.1 Controls

ACCEPT/RESET Pushbutton that silences the audible alarm. If the condition causing the alarm has been cleared, the indicator LED will be extinguished and the ethane flow, if interrupted, will be re-enabled.

HOLD Causes the controller to stop cycling through the different sensor channels and continuously read/display the currently indicated one.

RUN Restores cycling of the readout through the different channels.

3 Alarms and Actions

If all of the sensors read 10% LEL or lower, nothing happens. This is the normal state of the system.

1 Note: if the ethane supply has been off for more than a few seconds, the gas interlock panel will indicate “Low Pressure”, and the “Override” button on that panel will need to be pressed for a minute or so until ethane pressure is restored upstream of the gas mixer.
When a flammable gas concentration between 10% and 20% LEL is measured, the controller registers a **LOW** alarm by sounding an alert beep and illuminating the **LOW ALARM** red light on the corresponding module (visible through the window on the front of the control box). This is not a dangerous situation. The gas is not shut off. Shift crews should silence the alarm, observe the reading for the channel indicating an alarm, and record it in the electronic logbook, along with notes about any work in the relevant area that may have caused an elevated sensor reading. They should also monitor the reading to see if it continues to rise (or fall). If it is seen to be rising, contact a system expert as discussed below.

Usually a **LOW ALARM** indicates that the sensor system needs recalibration. (The system is calibrated annually when flammable gas is in use in the detectors, and, historically, this has been sufficient to keep the background readings below 5%). In this case, no action beyond silencing the alarm and putting a note in the logbook is required. At present, Howard Fenker maintains the calibration records.

If the flammable gas concentration exceeds 20% on a channel, it triggers a **HIGH** alarm. This illuminates the **HIGH ALARM** red light, sounds the beeper, and automatically shuts off the supply of ethane before it reaches the gas shed. This is still not a dangerous situation, but it indicates that something is wrong and must be fixed. In this event the shift crew should immediately contact (phone or page) the system experts listed at [http://hallcweb.jlab.org/document/personnel](http://hallcweb.jlab.org/document/personnel). Since the gas supply will be interrupted, it would be wise to interrupt data-taking and contact the person(s) responsible for the affected detectors, as well.

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2Note that the gas already mixed and stored within the plumbing at a few psig will continue to flow to the detectors until it is consumed. This volume is less than about one cubic foot.