

## ALARM INTERLOCK SYSTEM FOR PHENIX GAS SYSTEMS

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The Alarm Interlock System provides reliable control of the gas systems for PHENIX DC/PC and TEC/TRD detectors (PHENIX Project, Brookhaven, USA) and prevents the detectors from operating under unsafe conditions.

The Alarm System (Fig.1) is based on Intel 8051 microcontroller running at a 11.0592 MHz clock frequency [1]. It has 8Kb non-volatile RAM to keep the alarms configuration and status information there. Analog signals from the sensors go through two 16-channel multiplexers and instrumentation amplifier to 12-bit ADC (Burr-Brown ADS7806 [2,3]), which can be replaced by 16-bit one. CPU takes care of handling these signals, comparing them to the alarm thresholds,

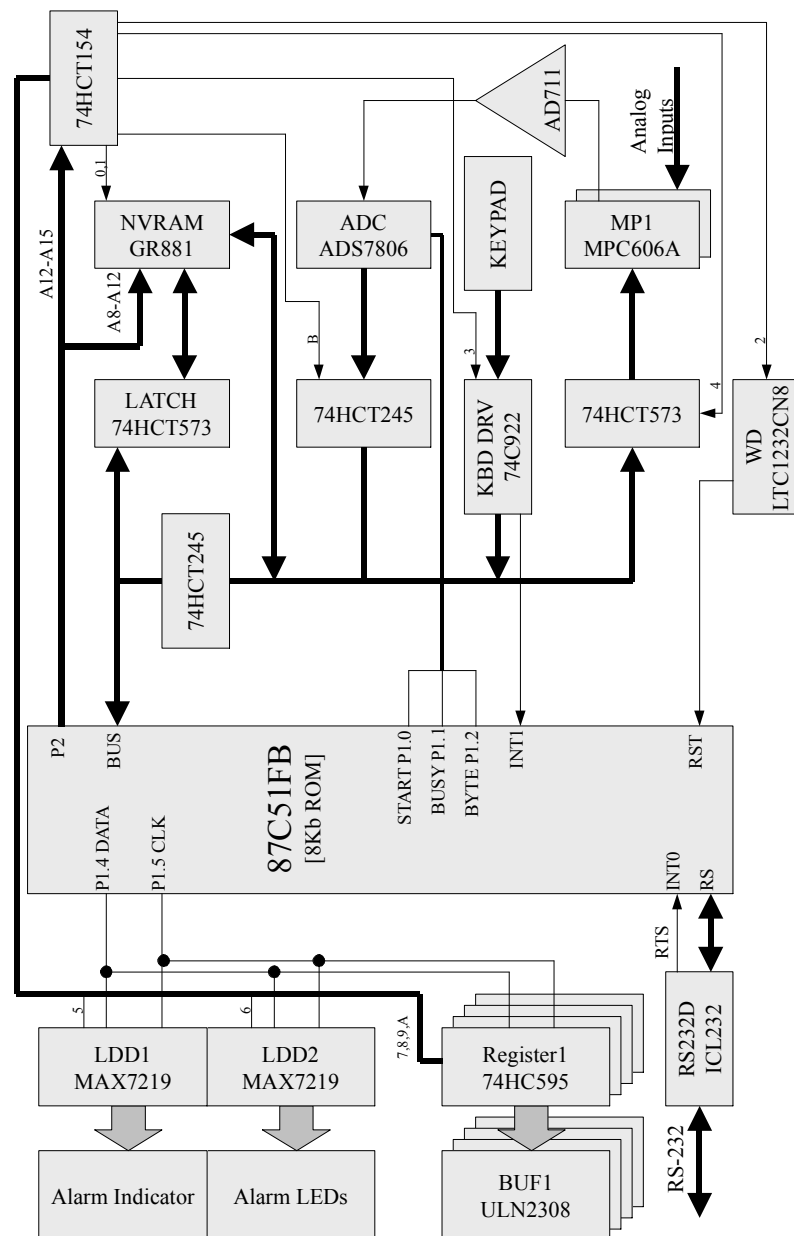


Fig. 1. Alarm System function diagram.

and sets corresponding digital output signals via four 3-wire registers. In order to block some alarms a keypad is used. All triggered and blocked alarms are indicated on two lines LED indicator. There is a supervisor watch-dog LTC1232 on this board, which attends to 8051 program faults and resets CPU as fast as in 0.8 s in this case. Alarm system can be connected to PC via standard RS-232 port.

During tests and measurements Alarm System appears to be very reliable and stable device. Flexible alarm action configuration gives one a possibility to use it not only for Gas System, but also in any project that requires simple and fast interlock system. The main features of the Alarm system are:

- 32 analog input channels with 16-bit resolution
- 32 digital output channels (transistor switches)
- RS-232 interface at 19200 baud
- Separate and total alarm blocking from keypad on front panel
- 22 ms minimal response time (without averaging)
- Flexible alarm actions configuration for each particular alarm
- System information available via RS-232, including watchdog resets counter, up time, analog values and digital output status
- Analog inputs test mode for choosing convenient averaging number
- Power consumption - 15 mA for  $\pm 12$  V and 250 mA for 5 V with all LEDs lighted

## **REFERENCES**

1. MCS-51 Intel Family of Single-Chip Microcomputers. Users manual. Intel Corp., 1981.
2. Tips for using the ads78xx family of a/d converters, Burr-Brown Application Note AB-95.
3. ADS7807 Low-Power 16-Bit Sampling CMOS analog-to-digital converter, Burr-Brown product information.
4. Avocet C51 Reference Manual.