Flare®

Personal Alarm Location System

Operator Manual

IP-based sensors

T1DA1702-001, Rev. A
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SENSTAR™

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1.0 INTRODUCTION

Flare is a Personal Alarm Locating System (PALS). Flare detects and locates the activation of small portable radio frequency transmitters carried by personnel. The system generates location information in near real-time and can process transmissions in rapid succession. The ID of the transmitter and its location on a site and floor plan are presented on a PC display.

Flare is designed to identify the location of personal portable transmitters to within one of a number of predefined Protection Zones into which the facility has been partitioned. The system is comprised of RF receivers strategically positioned within the facility to measure the signal strengths of RF transmissions. These measurements are correlated with previously recorded data using refined locating algorithms using radio frequency propagation modeling tools. The transmission is predicted to have originated from within the zone whose modeled values most closely match those of the transmission. A map of the facility is presented with the location of the alarm transmission highlighted.

1.1 Scope

The purpose of the Flare Operator manual is to provide an overview of Flare and its components, a description of the Flare system operations, and a guide to the Flare user interface and alarm processing. This manual is intended for individuals who will be acknowledging and processing alarms.

1.2 Applicability

This manual is specific to Flare software version 1.750 and later, which communicate through the Krypton Network Manager.

1.3 Related Documentation

The Flare System Administrator Manual (T1DA1602-001)
Describes Flare system management, configuration and database creation and calibration. Intended for the Flare system administrator.

The Flare Maintenance Manual (T1DA1502-001)
This describes the methods for maintaining the Flare system, including preventive and corrective maintenance procedures. Intended for technical personnel, responsible for the maintenance and repair of the Flare System.

The Flare PPD Manual (T1DA0502-001)
Provides configuration and setup details for the Flare Personal Protection Device (PPD).

2.0 SYSTEM OVERVIEW

The Flare Personal Protection Device (PPD) is a small, portable belt-worn UHF transmitter that is assigned to facility personnel such as correctional officers and health care professionals. Flare transmitters are also available as Fixed Point Alarms such as panic and duress buttons. In alarm situations the PPD is activated and transmits a signal, which is received, decoded, and processed by a distributed network of RF receivers (sensors). The data from the sensors is then forwarded to the Flare Central Monitoring Post Computer (CMPC) where the data is analyzed and the location of the transmitter is determined. The location of the alarm is displayed on a facility map presented on the Flare PC. The Flare alarm data can also be communicated to a third party security management system (SMS).

2.1 PPD Alarms

Push-Button

The PPD transmits an alarm message when the red push-button switch is pressed.

Low Battery

The PPD automatically transmits a low battery message when the battery drops below a certain voltage. Each subsequent activation of the PPD will retransmit the low battery message.

PPD Transmitters may be also equipped with one or more of the following optional methods of activation:

Man-Down (Tilt)

The PPD transmits an alarm message when the unit is tilted beyond a specified angle for a preset period of time. The tilt angle, and delay time are administrator programmable.

Tamper (Lanyard)

The PPD transmits an alarm message when a pull-pin is removed from the unit. The pull-pin lanyard is typically looped through the wearer's belt and the pin is pulled out if the PPD is forcibly removed from the wearer.

2.2 Flare System Components

The Flare system is typically comprised of the following components:

PPD Personal Protection Device: RF transmitter, aka. Personal Portable Alarm (PPA) also available as wireless fixed point alarms (panic or duress buttons)

SU Sensor Unit: an RF receiver, aka. Sensor

SaTU Sensor and Test Unit: a sensor that is also equipped with a PPD type transmitter to test nearby system receivers

CMPC Central Monitoring Post Computer: the Flare s/w application PC

PoE Power over Ethernet: network communication switch and power supply for SU's and SaTU's

Figure 2.2 is a block diagram of a Flare system covering four three level buildings and a large outdoor area.

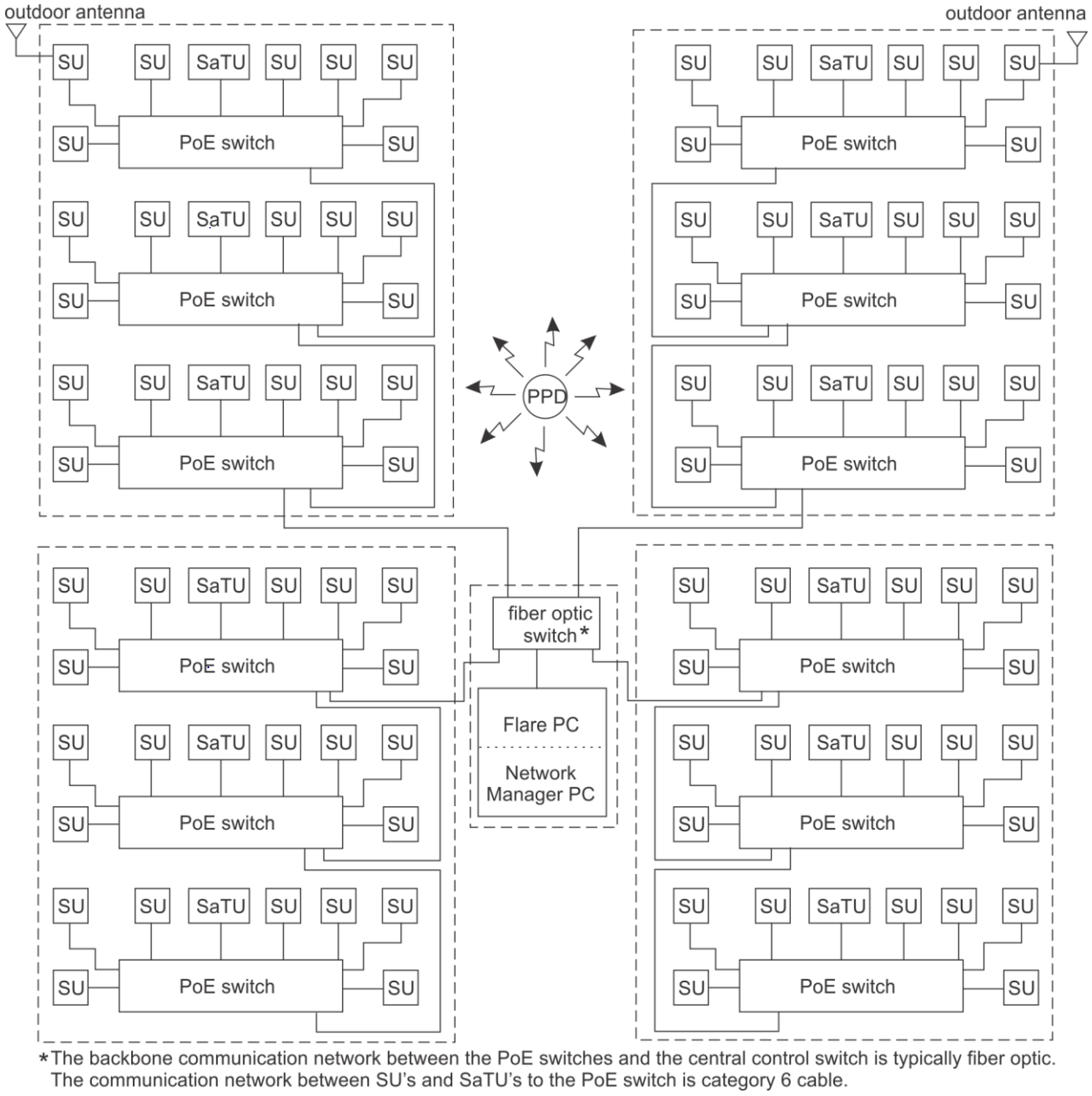

Figure 2.2 – Conceptual Flare System Block Diagram

2.2.1 Personal Protection Device (PPD)

The PPD is an RF transmitter that transmits an administrator programmable modulated code ID when activated. Optionally, the PPD can include man down and pull pin activation. It also transmits a low battery alarm when its battery voltage drops below a certain voltage. PPD IDs range from 0-4095.

2.2.2 Sensor Unit (SU)

The sensor unit consists of an RF receiver, microprocessor, and Ethernet communications interface. Flare installations typically include 100 to 300 sensors, which are strategically distributed throughout the

facility. When an SU detects a PPD alarm transmission, it measures the strength of the received signal and provides a normalized Received Signal Strength Indicator (RSSI). A single PPD transmission is received by many SUs, which, through the Network Manager, provide RSSI information to the Flare software for location analysis. Each sensor is connected to a class 3 PoE switch, and each sensor must be located within 100 m (328 ft.) of that switch. Typically, Flare systems include multiple PoE switches, which are in turn connected to a central switch located in the control room. The PoE switches are usually connected to the central switch via fiber optic cable.

2.2.3 Sensor and Test Units (SaTU)

The Sensor and Test Unit (SaTU) is a sensor unit that is equipped with a PPD based transmitter. The SaTU is used to verify the system's receivers are functioning properly. During system tests, the Flare software activates the SaTU PPD. The Flare software verifies that nearby sensors received the SaTU transmission and compares the results to previously recorded RSSI levels.

2.2.4 Central Monitoring Post Computer (CMPC)

The Flare software application runs on the CMPC, which is a PC running a Windows-based operating system. The Flare CMPC communicates with the distributed devices via the Krypton Network Manager. It controls the operations of the other system components and applies the locating algorithm on the signal strength measurements received from sensors during an alarm event. The Flare software determines the location of the PPD alarm transmissions and presents the alarm location to the user on graphics layouts of the facility. An audible alarm is also generated upon receipt of an alarm. If the facility is so equipped, the CMPC can also output alarm location messages to an external security management system over a Starcom or DWI protocol EIA-232C serial channel. The Flare software provides functions to configure the system, calibrate the system, set or modify various system parameters, and conduct various system diagnostic tests.

2.2.5 PoE switch

The Flare sensors are powered by, and communicate through a class 3 PoE switch. Each connected sensor must be located within 100 m of its PoE switch, and Category-6 wiring is required. When multiple PoE switches are used at a site, they are usually connected to a central switch located in the Control Room. The CMPC is also connected to the central switch as is the Network Manager PC and the UCM PC. Note that the Network Manager and UCM applications can reside on the CMPC (Flare computer).

2.3 Location Information

When an alarm occurs, Flare determines the location of the PPD transmission and highlights this location on a graphical representation of the facility floor plans. A text message at the bottom of the main operator screen indicates the PPD ID of the transmitter, the PPD alarm type and the description of the location.

The facility locations are defined within the Flare database by building, floor system, protection zone and calibration zone. The protection zones (PZones) are logical groupings of location points called calibration zones (CZones). When an alarm occurs, a building outline is presented on the site layout. When the building is selected the PZone outline is presented on the zoomed-in floor plan with the CZone highlighted.

2.3.1 Protection Zones (PZones)

Protection Zones typically represent logical and physical groupings of rooms and other areas within the facility. Examples include: Cell Block B, Administration First Floor, Food Service - Dining Room, Outdoor Zone 3, Building 1 - A Wing, etc. Flare database creation and PZone definition require knowledge of Flare function and must suit the facility's needs.

2.3.2 Calibration Zones (CZones)

A calibration zone (also referred to as a calibration point) identifies a specific location within the Protection Zone where the alarm was located. The placement and quantity of calibration zones play a major role in setting the accuracy and resolution of the system. Flare database creation and CZone definition require in-depth knowledge of Flare functionality, and ensure that the system meets the facility's defined specifications.

2.4 Flare Software Application Overview

This section provides an overview of the files that comprise the Flare software system. The Flare software system has two main elements:

Application Software	(FlareVxxxx.exe, xxxx = the version) and configuration settings file (Flare.ini)
System Database: type 1 = *.mdb	floor layout files (*.emf) calibration data files for dbas type 0 = *.arc, dbas or for

2.4.1 Flare Files Directory Structure

Flare system software and support files are contained in a local disk (C:) folder named Flare, or FlareVxxxx (with the version number appended, e.g., FlareV1734). The following example uses the name Flare, resulting in a folder C:\Flare.

C:\Flare\

- FlareVxxxx.exe
- Flare.ini
- prison1\
  - map files (prison1.emf and floor system emf files)
  - current\
    - type 0 database and calibration arc files (including prison1.arc)
    - type 1 database and calibration mdb file
  - logs\
    - OPS logs
    - DIAGS logs
    - ALRMS logs
    - SaTU_test_data\
      - Contains SaTU test data log files.

The ini setting MapPath determines the map folder and sitename, this sets the main map (site plan) emf filename and main database file. For the default site name, prison1, the map folder is

C:\Flare\prison1, the main map emf is C:\Flare\prison1\prison1.emf and the main database file is C:\Flare\prison1\current\prison1.emf.

However, with FlareV1710 and later the file structure can be customized using the new ini file settings for sitename, MapPath (e.g., C:\Flare\sitename\maps) and ArcPath (e.g., C:\Flare\sitename\arcs) for a more definitive structure:

C:\Flare\

- FlareVxxxx.exe
- Flare.ini
- sitename\
  - maps\
    - map files (sitename.emf and floor system emf files)
  - arcs\
    - type 0 database and calibration arc files (including sitename.arc)
    - type 1 database and calibration mdb file
- logs\
  - OPS logs
  - DIAGS logs
  - ALRMS logs
  - SaTU_test_data\
    - Contains SaTU test data log files
- Ophex\ (Device firmware files)
- SystemInfo\ (Device data files)

2.4.2 System Database

The database consists of two types of files: map files and data files.

Map Files

The map files are enhanced metafile format (.emf). There is one file for the main site map and as many other files as required for all floors of each building and the outdoor zones that make up the Flare locating coverage area. The sitename is user defined in the Flare.ini file and it determines the main map (site plan) emf filename. The indoor floor layout file names are in the format Buildingname_Floorlevel.emf. The outdoor protection zone map file names are in the format Zonename_.emf.

The building names, floor names, and zone names that the Flare application uses in database setup and definition will appear as in these user-defined file names. There must be a map file present in the map directory for each building floor level and each outdoor protection zone BEFORE the system setup can begin.

Data Files

A database uses either of two file types to store hardware configuration and calibration data.

Type 0 – arc file types:

The **arc** files are stored in a single folder. For the default site name, prison1, the main database arc file is prison1.arc. The arc files contain PZone information and PZone calibration data. There is one file per PZone.

Type 1 – mdb file:

The **mdb** file holds all PZone and calibration data. The default file naming convention is sitename_yymmdd.mdb.

2.4.3 Configuration Settings File

The file C:\Flare\Flare.ini contains various configuration parameters for the Flare system. System configuration issues are addressed in detail in the Flare Technical Manual. This file is read at Flare software startup and its parameters are typically presented in the System Configuration screen. This file format has changed occasionally with new Flare application software versions. Upon s/w upgrades the safe upgrade process is to edit the site specific configurations into the ini file supplied with the Flare application, which has the default values.

2.4.4 Log Files

During operation the Flare system automatically generates various log files including:

Operations Log: Alarm events, configuration changes.
Default name: PALS-OPS-YYMM.log

Diagnostic Log: Self Test results, system error/warning messages
Default name: PALS-DIAGS-YYMM.log

Alarm Log: All sensors RSSI data for alarms.
Default name: PALS-ALRMS-YYMM.log

SaTU Log: Contained in a log folder subdirectory called SaTU_test_data. SaTU_xxx_curr.log is the current SaTU test data log. SaTU_xxx_yyyymmdd_a.log is an SaTU test data log from calibration period starting on yyyymmdd.

3.0 SYSTEM OPERATIONS

The CMPC operator console is a PC with a Windows operating system running Flare application software. Flare software communicates with the distributed Flare hardware devices and provides a graphical user interface for the operator and maintenance technician to perform all necessary Flare operations. The application can be launched by clicking on a Flare shortcut on the system desktop, or on the Flare executable file in the current Flare folder. There should also be a Flare shortcut in the startup menu to automatically launch the Flare software at PC power-on and boot up. It can take several minutes for the system database to load and the system to initialize.

After initialization the system enters normal operating mode providing alarm monitoring and graphical display. This main operator screen typically shows a graphical overall site plan and an event message display. All alarm functions are presented in this mode, exit of operator mode into administrator functions is through password access. Entry of the user password allows access to selected maintenance functions.

The balance of this document will present the screen conditions that an operator will encounter during the operation and testing of Flare. Instructions regarding the appropriate responses to alarm and warning conditions will be provided as well.

3.1 Main Operator Screen

Figure 3.1 presents the operator screen in the normal mode. Here, no alarms or warnings have been received and the system is stable (required hardware is functional).

Refer to the message box, which contains the columns Date/Time, Type, and Message.

Date/Time: Presents the date and time when the system activity occurred.

Type: Three types of messages are presented on the operator screen:

1 Note: System status information which requires no action by the operator, e.g., the start and end notifications of automatic self-tests.

2 Warning: Warning messages reflect potential maintenance issues and may require the operator to alert facility maintenance staff, e.g., low battery or system unstable warnings.

3 Alarm: Alarms indicate that a PPD activation has been detected.

Message: Presents the pertinent details of the system activity. In the case of an alarm, the type of activation, ID of the transmitter, and its location is presented in this field.

When the list of text messages exceeds the space available, a scroll bar appears on the right side of the message box and the earlier received messages scroll off the screen. These messages can be reviewed by clicking the mouse on the up and down arrows or by dragging the scroll bar. The operator cannot delete or alter any messages from the message box – these are permanently stored in system memory and on hard disk.

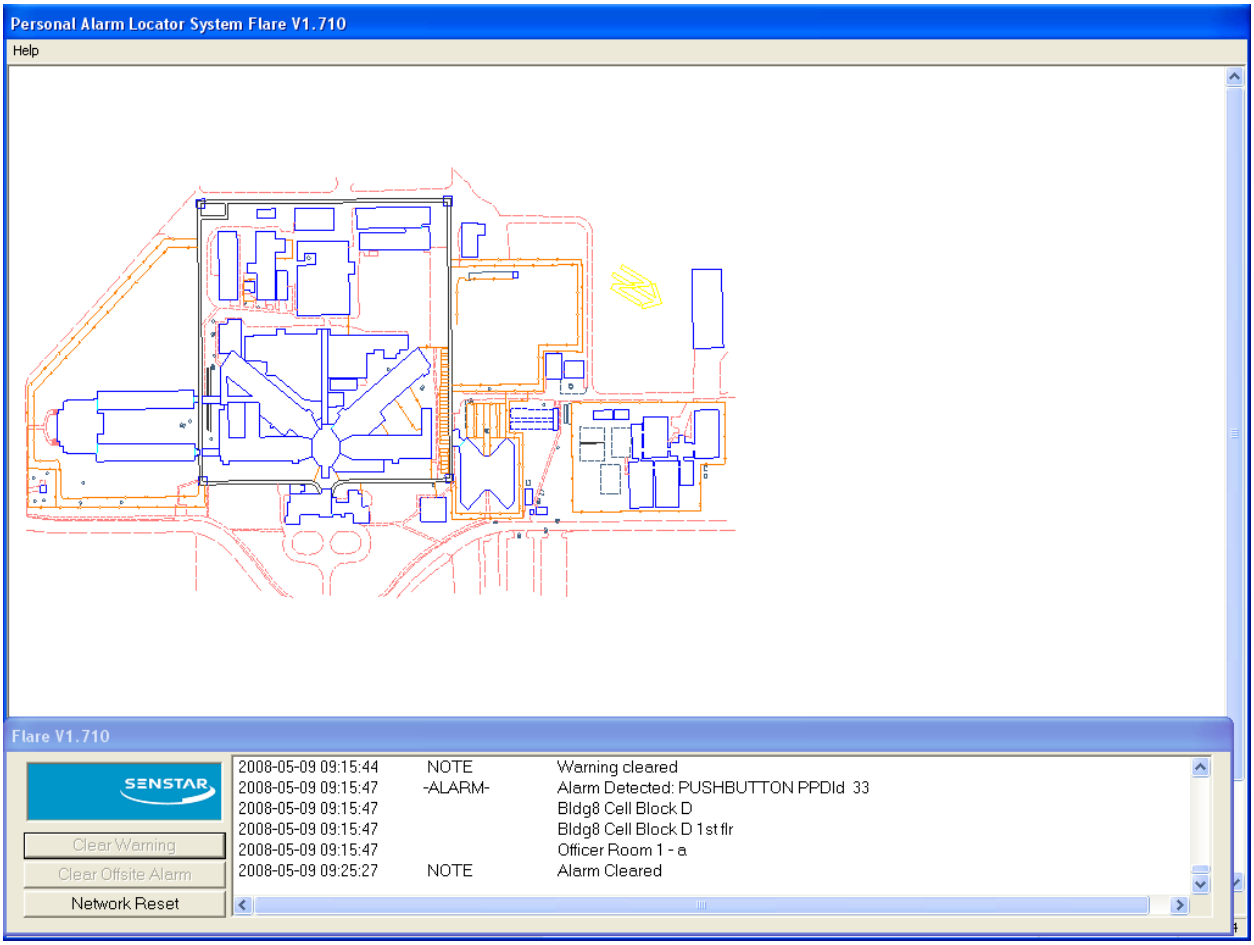

Figure 3.1 - Operators Screen Normal Operations

3.2 Alarm Received and Located

When an alarm is received an audible alert will sound and the alarm type and PPD ID and descriptions (if defined and enabled) will be listed in the message box. Next the alarm location is resolved and is presented as a red outline around the building or out door zone on the site plan. Figure 3.2 presents the operator screen when an alarm has been received and located. The resolved alarm location information will be listed as well as a building name, Protection Zone and Calibration Zone.

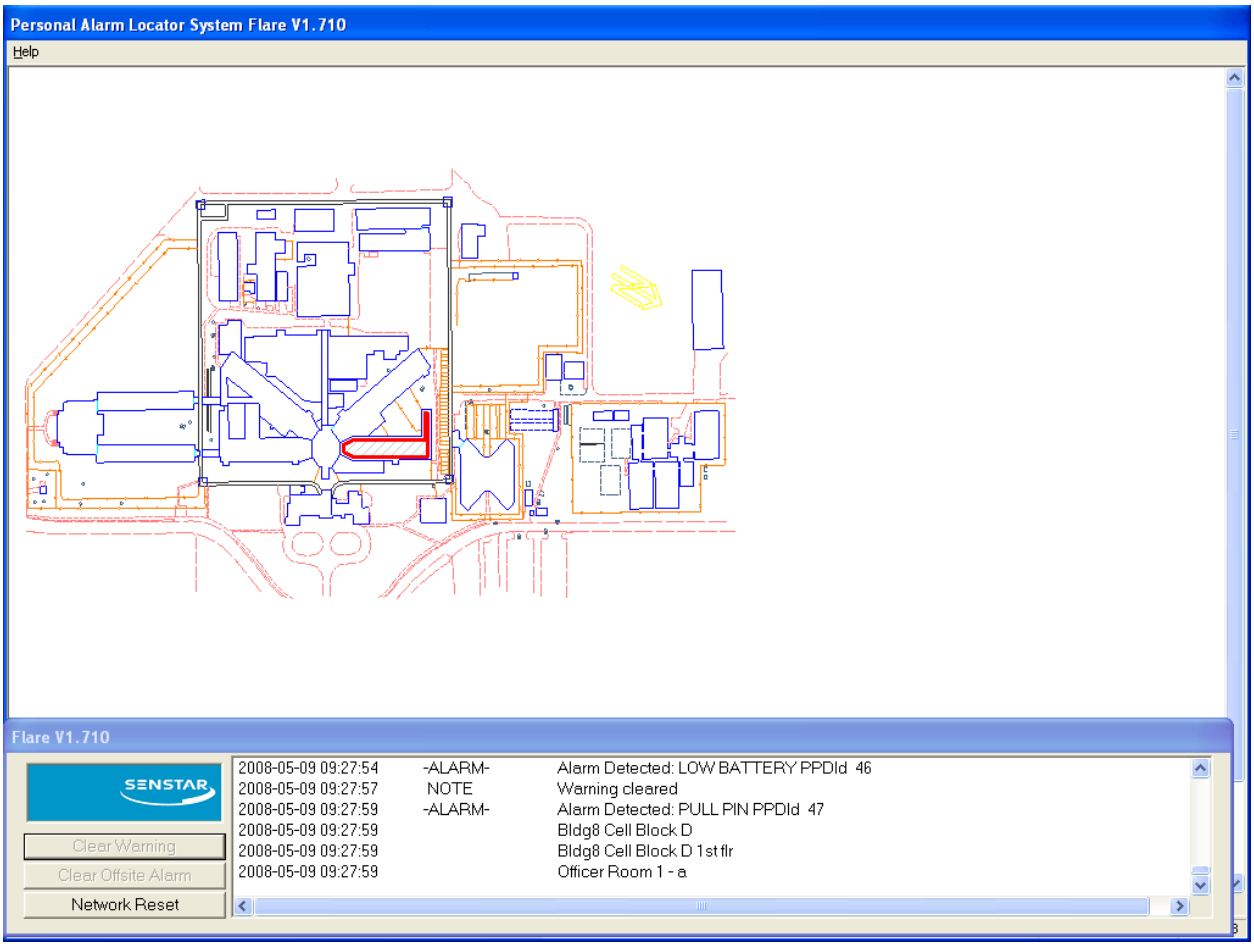

Figure 3.2 - Operators Screen Alarm Received

3.3 Zoom to Alarm Display Screen

The display zoom in is activated by clicking the left mouse button inside the highlighted outline of the building or out door zone in alarm. This zoom in alarm display screen presents the Protection Zone and Calibration Zone of the resolved alarm location.

Protection Zones are typically defined by personnel access and response team path. For the example shown below, the cell block floors of each building are defined as separate zones since moving from one to another requires returning to a common stairwell. Protection Zones can be either indoors or outdoors. Calibration Zones or points, are located in specific rooms in the case of indoor Protection Zones and are usually grid-based positions in the case of outdoor Protection Zones. The location of these Calibration points are presented graphically when the operator requests the system to zoom in to the location of the alarm.

Calibration Zone points can be identified by a room number or name, stairwell, corridor or area name, typically followed by a letter to denote multiple points within that area name. The operator should omit the letter information when alerting response teams. In the case of outdoor Protection Zones, the calibration point name can be a unique alphanumeric sequence, which does not provide more specific location information. In this case the sub-zone specific information can be derived only from the location depicted on the graphical display. Typically outdoor resolution is less than indoor resolution but the increased line of sight helps with alarm response evaluation.

Figure 3.3 shows the zoomed in alarm display. The system zooms in to present the Protection Zone under alarm and indicates the Calibration Zone point (red dot) resolved closest to the origin of the alarm transmission. The alarm audible alert sound is still active – the alarm has not yet been acknowledged as indicated by the fact that the Protection Zone is still outlined in red.

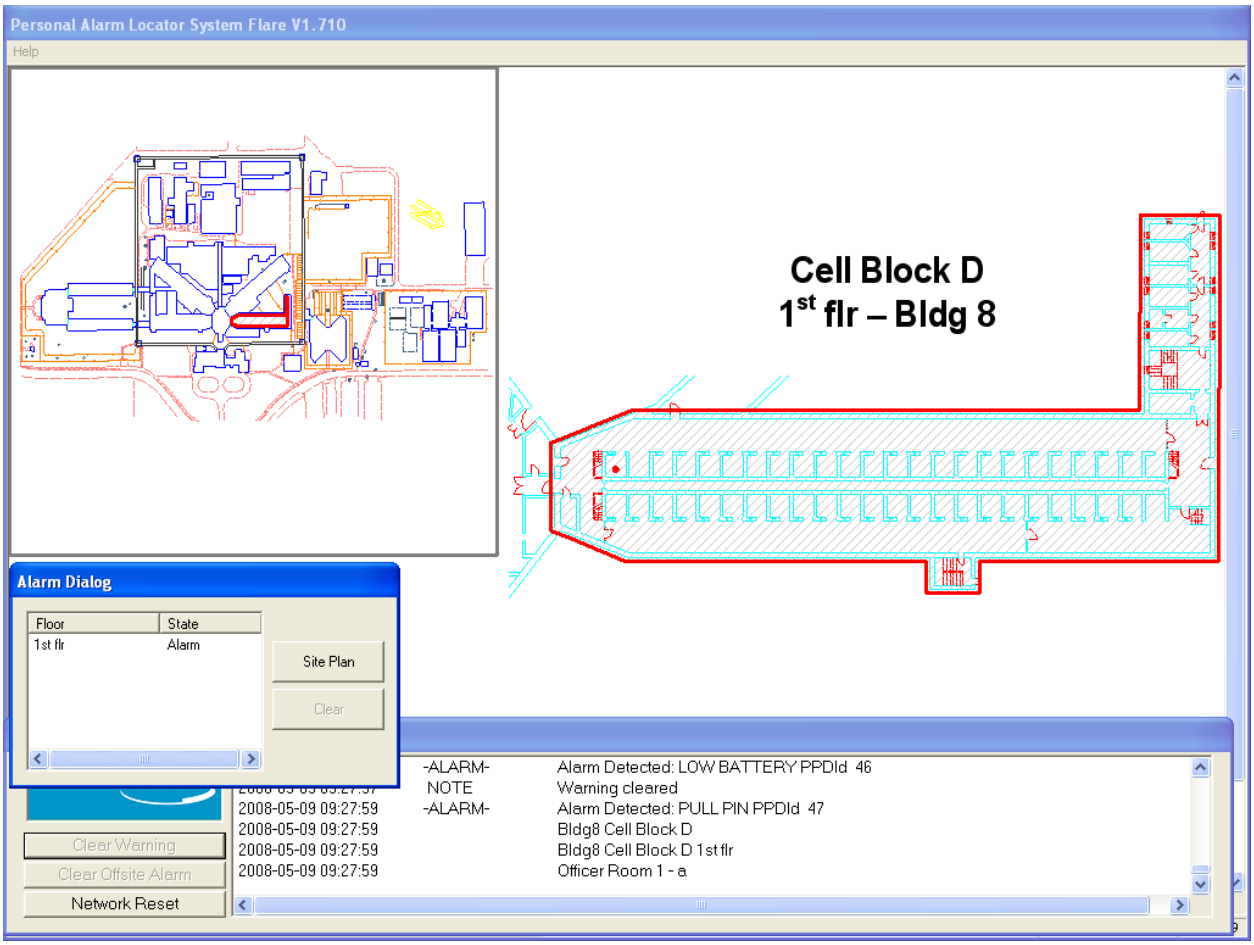

Figure 3.3 - Alarm Display Screen - Alarm Active

A smaller view of the site plan is still shown on the left side of the screen. This minimized site plan provides the operator with a reference view of the whole facility and also indicates to the operator of other area alarms and their statuses by building outline colour.

The Alarm Dialog box has also appeared. This box tells the operator the floor system and status of the current system alarms and allows the operator to return to the full screen site plan. At any time, the operator may return to the full screen site plan by clicking on the Site Plan button in the Alarm Dialog box – even if current alarms have not yet been acknowledged or cleared. Alarm processing colour scheme is as follows:

Building and Protection Zone Outline Status Colors:

Red	Alarm is active. Alarm sound is active.
Yellow	Alarm is acknowledged. Alarm sound is silenced.
Green	Alarm is clearable.
None	Alarm has been cleared.

3.4 Acknowledge Alarm

The active alarm is acknowledged when the operator clicks the left mouse button within the red highlighted Protection Zone. The audible alert alarm sound will cease. The highlight has changed from red to yellow on both the zoomed in PZone view and on the minimized site plan building outline (Figure 3.4).

At this time, the operator should dispatch the response team to the location shown on the screen. The calibration point shown is the closest match to the actual alarm recorded in the Flare database and should be inspected first. However, the actual alarm location could be different from this point shown so the response team should inspect in all directions from this point and continue moving outwards until the source of the PPD alarm transmission is located.

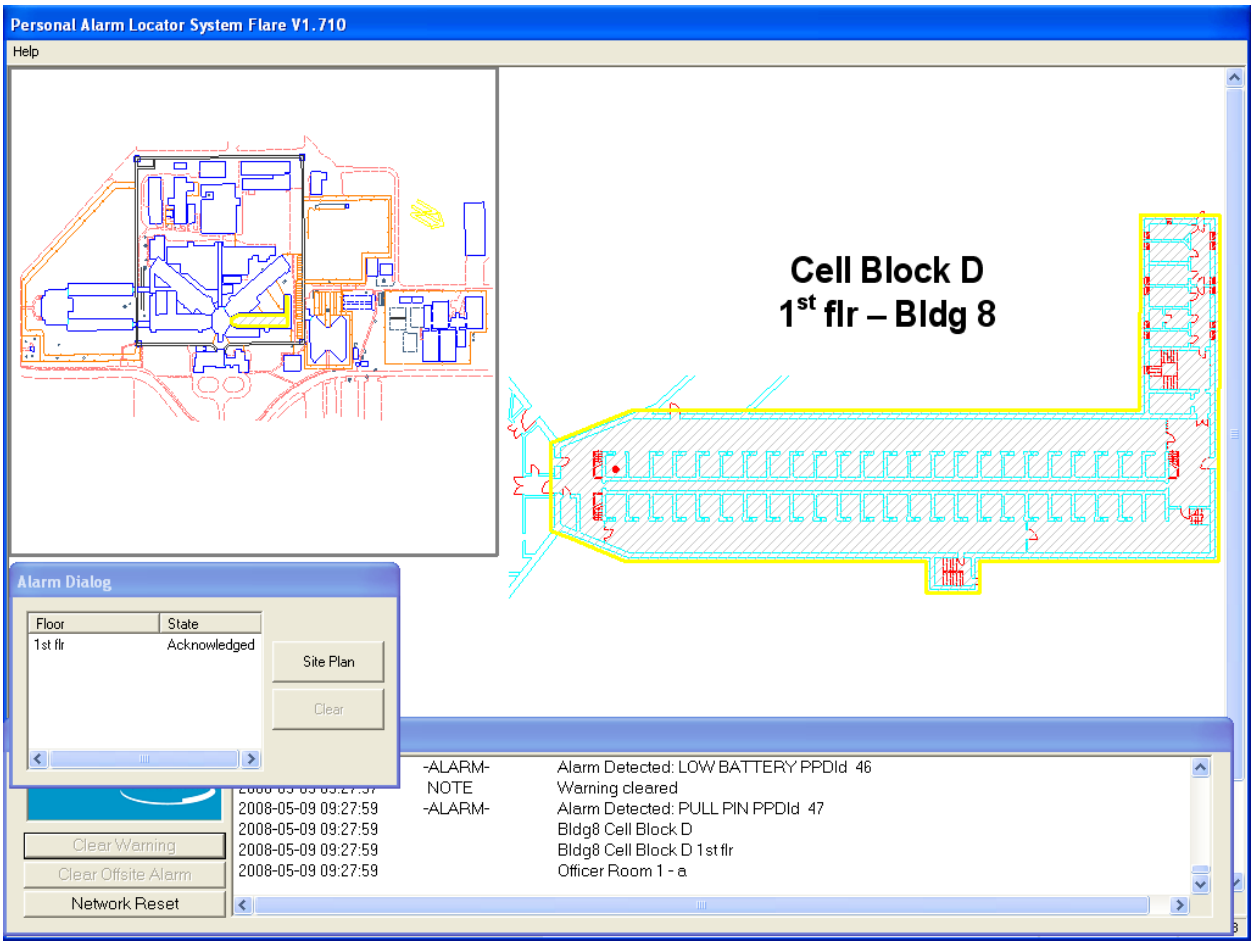

Figure 3.4 - Alarm Display Screen - Alarm Acknowledged

3.5 Clearing Alarms

When the response action is complete, the alarm is made clearable by the operator clicking the left mouse button within the yellow highlighted Protection Zone. The highlight has changed from yellow to green on both the zoomed in PZone view and on the minimized site plan building outline (Figure 3.5).

A Clear button is now available in the Alarm Dialog Box and the alarm state is shown as clearable. Selecting this button completes the alarm processing, and the green outlines are cleared.

The operator may return to the full screen site plan by clicking the left mouse on the Site Plan button in the Alarm Dialog box. The message box will contain the chronological log of all alarms, active and cleared.

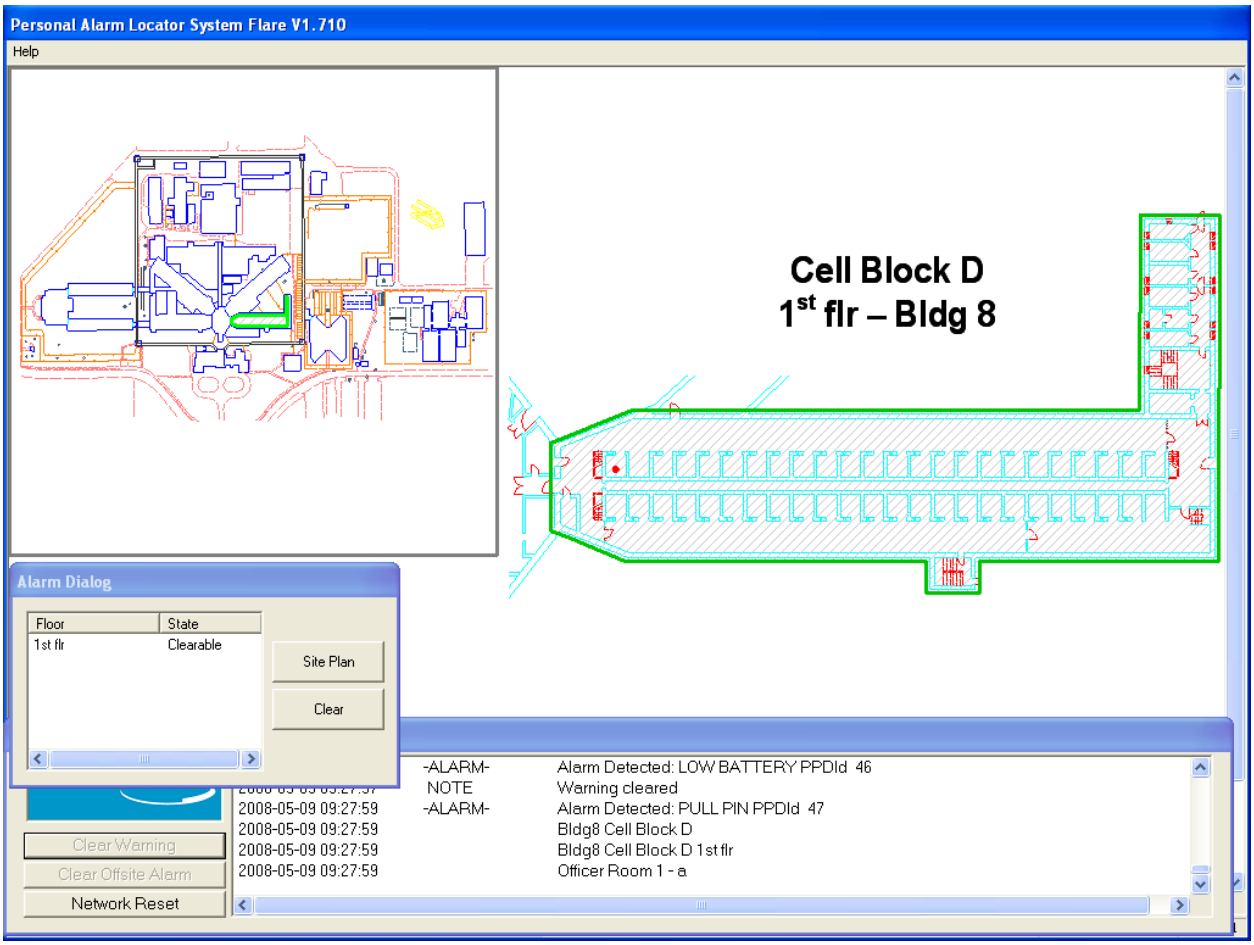

Figure 3.5 - Alarm Display Screen - Alarm Clearable

3.6 Multiple Alarms

Multiple alarms can occur, originating from the same or a different Protection Zone. In the case of the same PZone another Calibration Zone point is displayed on the zoomed-in alarm display screen and the Protection Zone alarm state returns to active. Figure 3.6 shows the screen that is displayed when a second alarm is received from a different PZone while the operator is zoomed in to process a current alarm. Notice that a second building is now highlighted in the minimized site plan. The alarm sound will begin again to indicate that a new alarm has been received. The message box lists the new alarm information for the operator to view. In the example there is a different alarm type – MAN DOWN, a tilt detection.

The operator can choose to continue to process the current alarm or to immediately zoom-in to respond to the new alarm by clicking on the new alarm building outline in the minimized site plan or in the full size site plan by first selecting the Site Plan button. The operator can switch between zoomed-in Protection Zone alarm screens and process each independently. As with single alarms, the outlines for each alarm state are maintained in both the PZone and building outline in the minimized site plan.

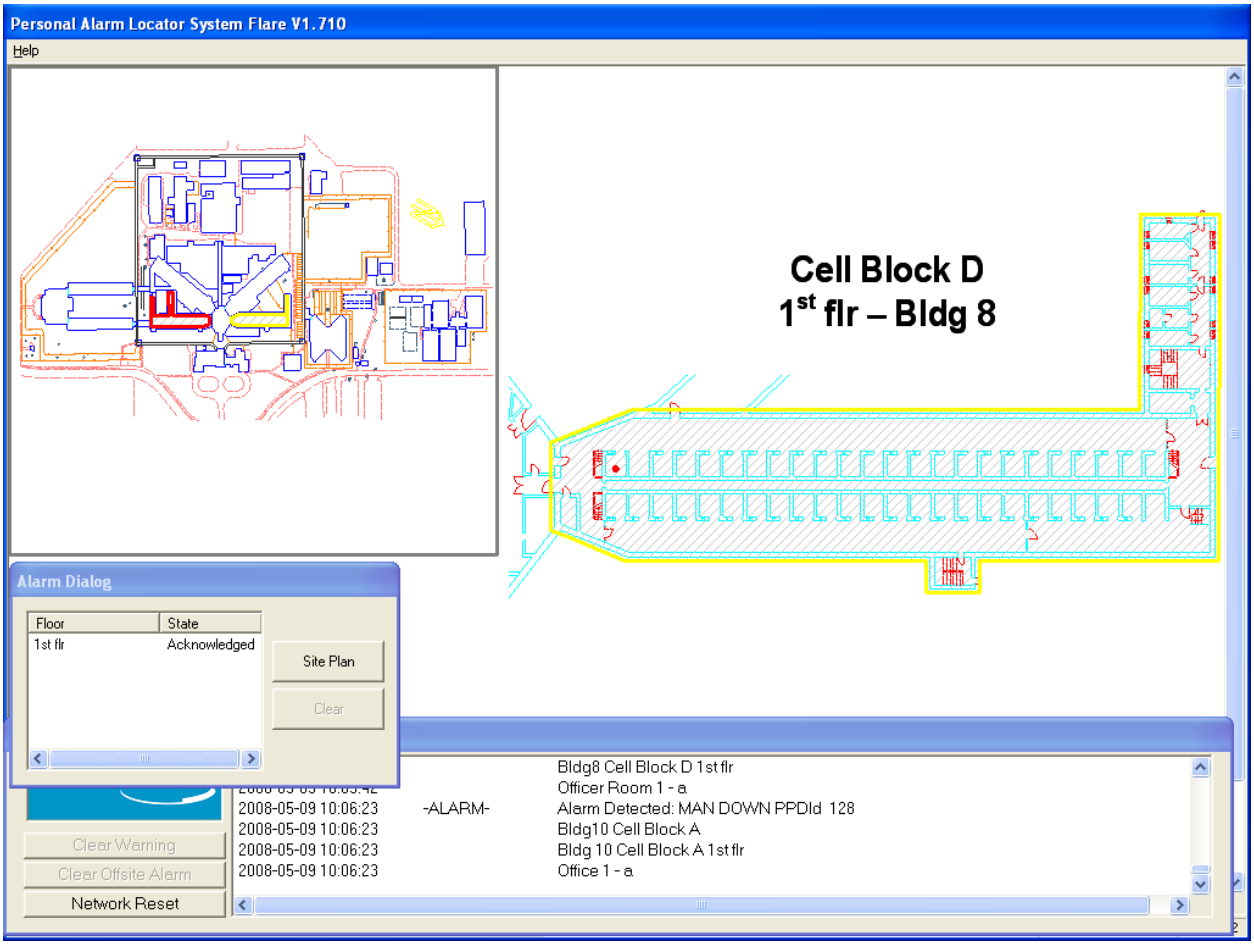

Figure 3.6 - Multiple Alarms in Different PZones

3.7 Other Operator Functions

There are three buttons on the lower left of the operator screen (Figure 3.2). These provide processing of other system events.

3.7.1 Clear Warning

Low Battery Warning

When a PPD detects its battery condition is low, it automatically activates a low battery warning transmission. This condition is listed in the message box showing the alarm type as low battery and the PPD ID of the unit (Figure 3.7.1) and an audible alarm will be annunciated. To clear the alarm, click on the Clear Warning button on the bottom left corner of the screen.

When a low battery warning message is received, the wearer of that PPD should be notified and the PPD taken out of service until its battery can be replaced by maintenance.

During the battery low condition, each time this transmitter is activated it will send two alarm messages. The first will be for the alarm event (push button, pull-pin, or man-down) and the second will be a reminder that the unit has a low battery condition.

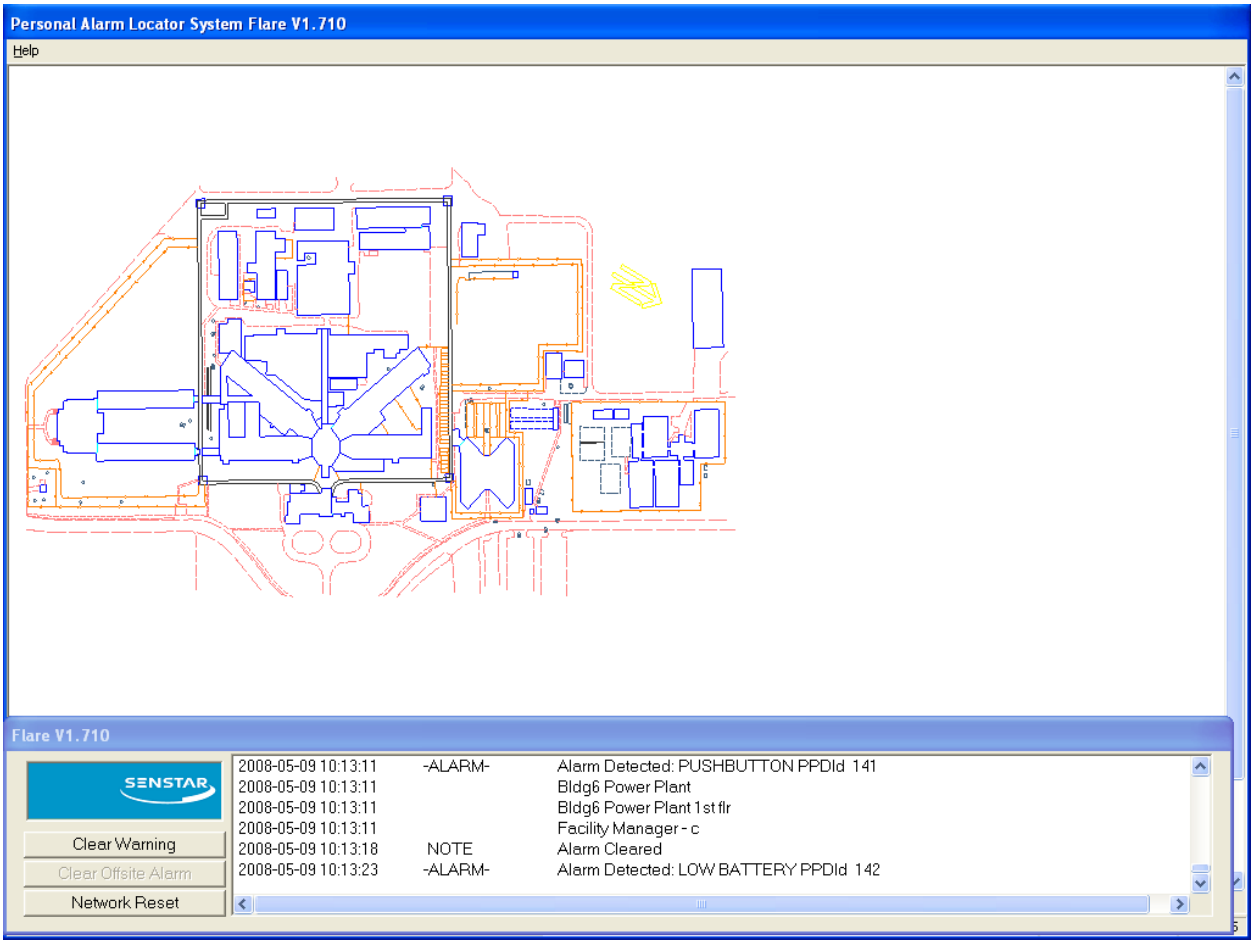

Figure 3.7.1 - Low PPD Battery Warning

System Unstable Warning

The Flare system regularly performs background self-tests of all elements of the system. The Minor Self Test (MiST) and Major Self Test (MaST) events are listed in the message box when they occur. Any resulting minor error conditions are not displayed on the main operations screen and are instead logged to a maintenance diagnostic file. The diagnostic file can be reviewed by a maintenance technician to verify that there is no persistent or accumulated minor errors.

If the MiST determines that a certain defined amount of hardware has stopped responding, a Flare System Unstable fault condition is declared and an audible alert will sound. This alert is silenced with the Clear Warning button. If an unstable condition occurs, the operator procedure may be to alert the maintenance staff or to evaluate the severity of the warning. To review the conditions causing the warning the operator may be given access to the diagnostics function to run a manual MiST, which will indicate the number of devices that are not responding.

If no corrective action is taken, the unstable condition is likely still active and will re-occur upon the next MiST. When the condition is active, alarm location accuracy and even detection (if much hardware is off-line) will be degraded in the areas supported by the affected hardware.

There may be procedures that active users should be notified immediately and the system removed from service. Maintenance personnel should be contacted and a pre-designated System Down plan implemented.

3.7.2 Clear Offsite Alarm

Off-site alarms are alarms, which originate from PPD transmitters, which have been registered for use only at specific off-site locations. When a transmission ID is detected from one of these PPDs, the Flare system does not attempt to resolve the location using the normal locating algorithm and no graphical location is presented. Instead, the location presented in the message box is a pre-defined text description of where the PPD was designated for use and an audible alert will sound. No matter where that ID PPD actually is, the system will report alarms originating from that ID as having come from the off-site description that it was issued. Therefore, it is imperative that off-site PPD transmitters are only used at their off-site locations.

To process an off-site alarm, follow procedures for the response to the described location. To clear it, click on the Clear Offsite Alarm button.

Off-site alarms are typically used to cover extra fringe areas where a PPD transmission can be reliably detected but there may not be enough responding sensors to deliver the required location accuracy. Despite the name, these may not be actually off-site areas.

The System Administrator may designate PPD IDs 1045 to 1049 for use outside the perimeter fence. Likewise, they assign IDs 1050 to 1055 for use on the facility roof. Then, when an officer or staff member needs to access the roof, they should carry with them a PPD in the range of 1050 to 1055. If they encounter trouble and press the button on the PPD, the system will display an off-site alarm from ID 1050 - ROOF. Similarly, if PPDs 1045 to 1049 are activated, the system will display ID 1045 - Outside Fence.

3.7.3 Network Reset

This button will cause reset messages to be broadcast throughout the Flare hardware network. This will soft reboot all devices that receive the communication and remove all queued alarm and stored device statuses. This is very similar to the reset performed at system initialization. This can be used when sensor(s) communications are restored and the sensors have old alarms queued. This function will invalidate any current alarm location processing. It should not be used on potentially valid alarm events.

3.8 Other Warnings

Two other warning messages can appear in the message box. These will not be accompanied by an audible warning tone. The system clears these conditions automatically without any action required by the operator. Here is sample text for these warnings:

2014-05-08 17:19:51 | WARNING | Single-sensor alarm - cleared. Sensor 12, PPD ID = 791

2014-05-08 17:19:57 | WARNING | Invalid PPDId - cleared: Sensor Address = 16

Single-sensor alarm:

The Flare system requires two of its sensors to receive a PPD transmission to declare a valid alarm for locating. If only one sensor reports an alarm it is usually because that one sensor is late reporting an alarm event that has just been processed. The PPD ID is listed to help evaluate the event. The sensor is listed so that if there are persistent single sensor alarms from a particular sensor then this sensor condition can be reported to maintenance for review.

Invalid PPD ID:

The invalid PPD ID value of 65535 can indicate a PPD ID modulation was decoded by a sensor, but the ID did not fall within the range programmed into that sensor.

It can also indicate that a sensor has received an un-modulated transmission (a signal without a PPD ID). These conditions should be reported to maintenance for review.