PK-04: A **Robust**, **Inexpensive** Solution for **Alarm Monitoring** of Freezers, Incubators, and Other Biobank Equipment Based on Readily Available, Easy to Deploy **Home Alarm Equipment**

A Step by Step Guide

Introduction

Introduction: Ensuring the integrity of specimen storage infrastructure is paramount in biorepositories, yet the customized nature of many monitoring solutions often leads to substantial costs and limited lifespans. Remarkably, residential burglar alarms possess a range of attributes that render them ideal for professional biorepository monitoring applications. With a resilient design engineered to withstand potential threats, these alarms guarantee uninterrupted performance. Furthermore, their well-established, dependable technology supports round-the-clock operation, while offering automated notifications such as email or SMS, and seamless integration with call centers and customizable phone trees.

Our implementation involved monitoring 11 incubators, 7 -80°C freezers, 3 refrigerators, a cold room, and an equipment room (refer to Figure 5 for the latter devices). This cost-effective solution had an initial expense of roughly $500 and a monthly fee of $10, covering connectivity between the panel and the self-monitoring service. The alert mechanisms, including SLACK, email, and SMS, have demonstrated remarkable reliability and durability. Over an eight-year period, no failures of monitored devices have been overlooked. In academic environments like UCLA, CSHS, and USC, where departmental resources may be inadequate for maintaining commercial solutions, this system was first deployed at USC when $20,000 was unavailable for repairing a malfunctioning monitoring system.

Limitations: While this solution is uncertified and lacks temperature logging capabilities, it presents a highly accessible option for biospecimen protection, given its affordability and features.

Source: The equipment mentioned in this poster can be found on websites such as www.alarmgrid.com and www.geoarm.com, without endorsement. At the time of writing, SimplySafe and Ring do not offer the necessary connectivity to implement this solution.

Step 1: Assess your installation.

Here are some of the important characteristics for successful implementation:

- ☐ WiFi, Cellular or Neither:
  - ☐ Do you need **active monitoring**?
    Pros/Cons: The pro is that this would be the cheapest option. There would be zero monthly cost to the system, **HOWEVER**, the only alert you would get for a failed device would be an audible alarm. This may be sufficient if all you need is to provide a central location for an audible alarm for decentralized equipment. (**Note:** you *can* configure the device to make a phone call, or, to trigger a dialer such as a **Sensaphone** if you have a "plain old telephone" wall jack).

    Assuming you want active monitoring, functionally there is no difference between WiFi and cellular – you are mostly balancing price and robustness for your needs. E.g., for us, WiFi is sufficient because any event that takes out WiFi for us already triggers a response.

  - ☐ Do you have/want WiFi?
    - ☐ Can an "unsecured" device join your WiFi?
    - ☐ Can a device join your WiFi with only a "password"?
    - ☐ Are you ok if your system depends on the WiFi being operational to provide alarm notifications?

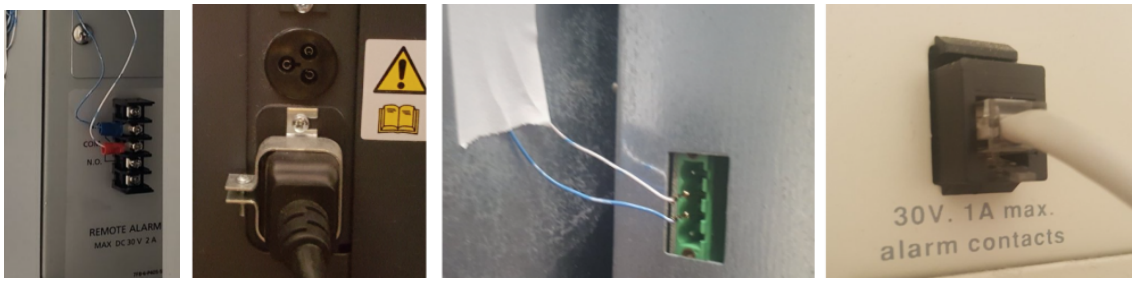
    If all statements are "yes", this option is cheaper and more accessible than cellular. Typical active monitoring costs $10/month (USD).

  - ☐ Do you have/want Cellular?
    - ☐ Is cellular monitoring supported for your region?

    For cellular monitoring in the States, the typical cost would be $10 for the active monitoring and an additional $20 for the cellular service (total $30 USD)

- ☐ Does your equipment provide alarm relay contacts?

  Most equipment designed for laboratory use that has integrated alarming mechanisms will typically also have external relay contacts that will be triggered when the alarm condition occurs. While there are other mechanisms to connect your equipment, this will be the most facile.



When looking at your connections, you are looking to find the **normally closed** contacts. These are the contacts that are connected together when the machine is not in alarm. This is important for robustness – anything that breaks the loop of wire will end up triggering an alarm – be it an actual alarm, or, if the wire becomes disconnected.

☐ Does your facility span an unusually large distance or is the construction particularly difficult for wireless communication?

If so, you may need to consider alarm range booster equipment.

Step 2: Acquire Hardware/Select Provider

Our initial installation was based on the Honeywell Lynx system (5210). Technology is always changing, The important features are as follows:

☐ The alarm control unit provides active monitoring via **WiFi** or **Cellular** as determined above.
☐ Sensors have a **hard-wired** separate zone that is compatible with the alarm control unit that supports a **normally-closed** loop.

Example configurations, not that the vendor is not important:

- Zwave Based:
  Honeywell Home PROA7PLUSController (~$230)
  Honeywell SiXCT Contact Sensors (~$24/ea)

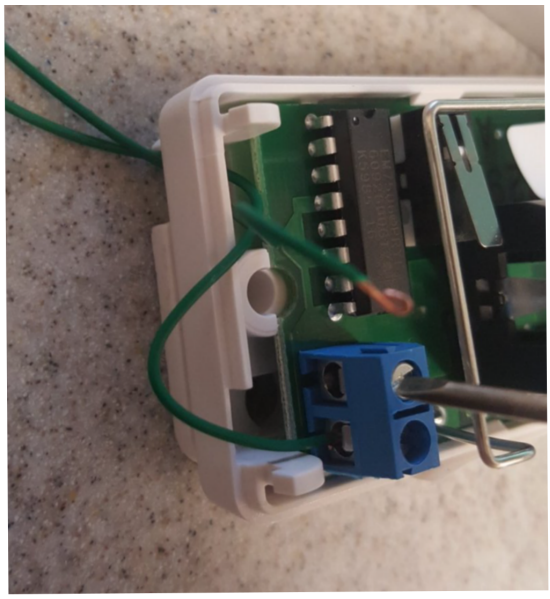
- Legacy 345 MHZ (shown in poster)
  Honeywell Lynx 5210 (~$200)
  Honeywell 5816 Contact Sensors (~$24/ea)

Providers will all route their communication through Honeywell/Resideo, so, the initial vendor does not matter. We use **GeoArm** but **AlarmGrid** and other vendors will work just as well. They will all use the **TotalConnect** app that you put on your phone and require a login to the **totalconnect.com** website.

Step 3: Configure Panel/Connect Sensors

Here are the steps to get your panel going:

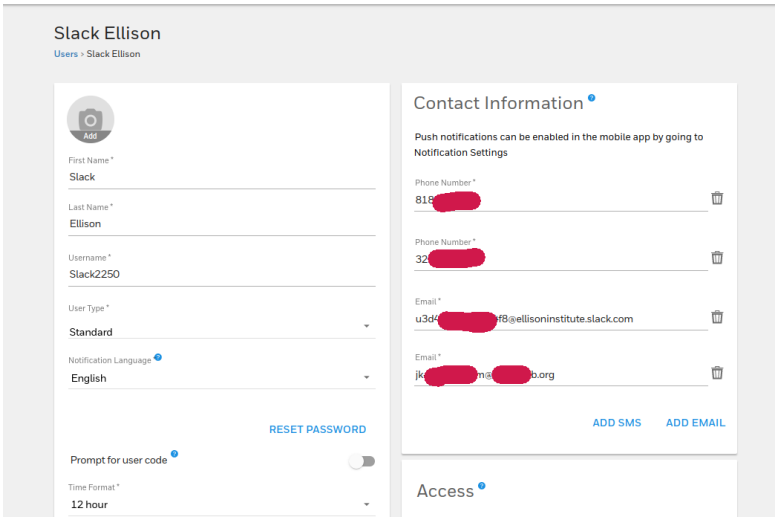
- ☐ Follow instructions to power on panel and connect to your service provider – The vendor will be quite helpful for this.
- ☐ Pair sensors to the panel.
  For the **LYNX** here are the steps:
    - ☐ Go into installer mode (Tools, enter installer code)
    - ☐ Zone, add new, pair sensor
    - ☐ Name the zone something useful (e.g. Freezer 1)
    - ☐ **IMPORTANT**, the zone type is normally “entry” or “door” or something similar. Remember, these systems are configured as home alarm systems – so, they have a concept of “Armed” and “Disarmed”. The problem with these types of zones is that they provide no alerts when the system is disarmed – **you want to select a zone type that will provide notifications even when the system is not in an “armed” state**, I select the “**Day/Night**” zone
- ☐ Sensors need to be hard wired to the relay contacts
    - ☐ Cat 5 cable is a great “scrap” source for thin twisted pair wire
    - ☐ After connection (which probably sounded many alarms) you should actually make the device go into alarm to confirm that it works



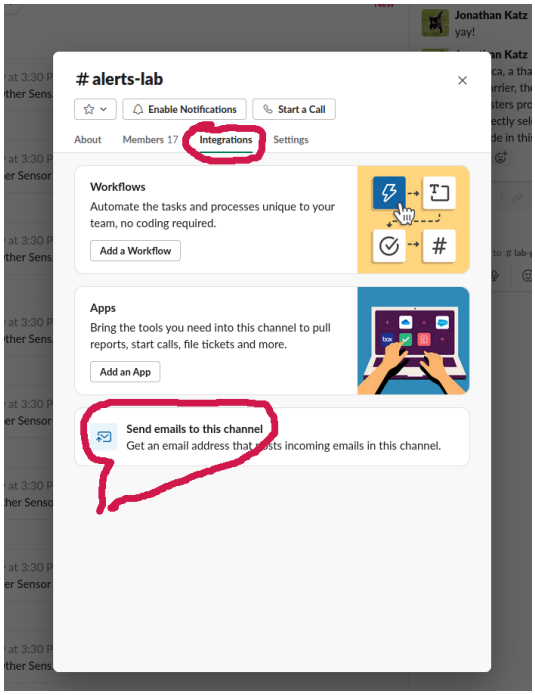
Step 4: Configure Alarm Alerts

All alarm alerts will be through the **totalconnect2.com** web interface.

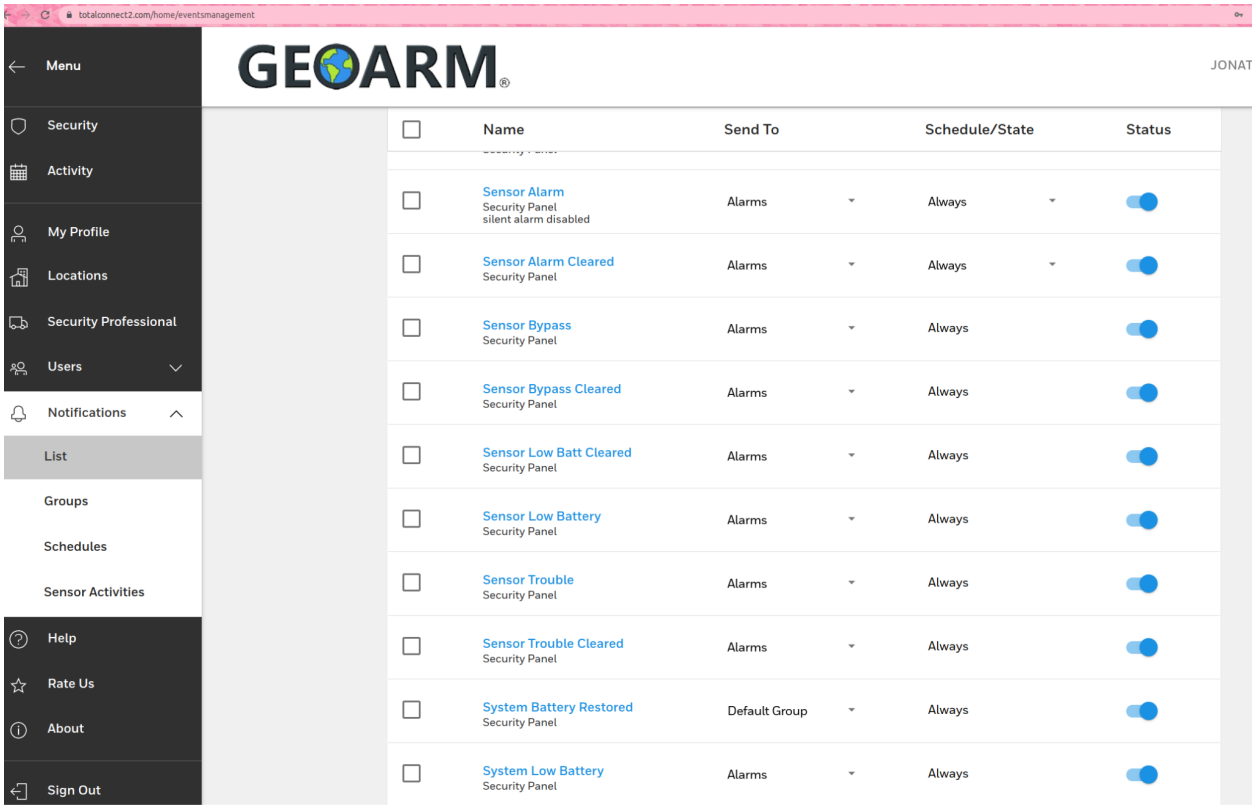
- ☐ Create a user (or users) to receive the alerts
- ☐ Add email addresses and phone numbers



To have your alerts go to “Slack” you need to set up an email address for the channel:



☐ Make sure you have alerts configured to go to your users.



Questions?

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https://reprints.katzlab.org/isber-2023-alarm/