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1. **PURPOSE & SCOPE:**

Asset/research preservation is one of Washington University School of Medicine's (WUSM) highest priorities. Critical laboratory equipment such as refrigerators, freezers, and incubators contain specimens, reagents, samples, stem cells, etc., that may be difficult or impossible to replace or duplicate. Laboratory equipment is mechanical appliances that will eventually struggle to maintain temperature setpoint for various reasons or fail. If there is not immediate, reliable notification when these events occur, the failure can be catastrophic for a laboratory.

Currently, the Computer Room monitors well over 300,000 different points (temperature, pressure, equipment operating parameters, alarm status, etc.) in the many buildings around campus. With new buildings being erected and existing building control systems being upgraded, the Computer Room will likely be monitoring well over 400,000 points.

To ensure the highest possible reliability of freezer monitoring systems and associated alarm notification, all new and existing refrigerator and freezer monitoring systems will be responsible for each department to purchase, install, and maintain.

The purpose of this guideline is to provide a general understanding of the freezer monitoring systems and provide our customers with a clear set of actionable guidelines that will ensure valuable research and assets are preserved in the event of a mechanical malfunction, power outage, etc.

1. **ACRONYMS & DEFINITIONS:**
	1. WashU IT – Washington University Information Technology
	2. OFMD – Operations & Facilities Management Department
2. **DEPARTMENT RESPONSIBILITIES:**
	1. Each department's responsibility is to purchase, install, and maintain laboratory equipment monitoring systems proportional to the stored materials' value.
	2. Departments may consult with OFMD or third-party vendors to identify the appropriate monitoring level for the materials being stored.
	3. Departments may use OFMD or third-party vendors to install, setup, and commission laboratory equipment monitoring systems. The cost of this service will be the responsibility of the department.
	4. Departments will be responsible for periodically testing the laboratory equipment monitoring system to ensure that it is still functional. The department will identify the frequency of the testing.
	5. Departments will be responsible for the location and quantity of required IP drops required for the laboratory equipment monitoring systems. Departments will be responsible for the cost to have WashU IT install and activate the data drops.
3. **RECOMMENDED LABORATORY MONITORING SYSTEMS:**
	1. Control by Web (web-enabled line of programmable controllers).
	2. Sensaphone (web-enabled line of programmable controllers).
4. **TYPICAL APPLICATIONS FOR LABORATORY EQUIPMENT MONITORING:**
	1. Low-temperature freezers (e.g., -80°C freezers).
		1. Freezer alarm status.
		2. Freezer temperature. Depending on the freezer model, a temperature probe may need to be purchased and installed on the freezer.
		3. In some cases, for 120V freezers, utility power can be monitored.
	2. Incubators:
		1. Temperature. Depending on the incubator model, a temperature probe may need to be purchased and installed in the incubator.
		2. Depending on the incubator and specified options, it may be possible to monitor CO2 levels in an incubator.
	3. Additional monitoring capabilities:
		1. Units can monitor various analog (temperature, pressure, level, etc.) and digital signals (equipment status, power status, etc.).
5. **TYPICAL INSTALLATION REQUIREMENTS:**
	1. Install and activate IP data drop(s):
		1. Each monitoring unit requires an IP data drop installed and activated in the vicinity of the monitoring unit. Depending on the user's needs, several freezers can be tied into a single monitoring unit. A request is submitted to WashU IT to install the data drops. WashU IT will coordinate with the point of contact to identify the installation requirements, cable routing, activation, etc.
	2. Configure the monitoring unit:
		1. The monitoring unit needs to be configured for the specific application, including the following:
			1. The IP address needs to be assigned to the device.
			2. The specific configuration of the analog and digital inputs needs to be defined in the monitoring unit.
			3. Email addresses and mobile numbers of critical stakeholders notified in an alarm condition need to be defined.
	3. Provide power to the monitoring unit:
		1. A plug-in transformer may supply power plugged into a nearby 120V receptacle.
		2. Depending on the monitoring unit, PoE (Power over Ethernet) may also be supplied, which would not require a nearby 120V receptacle. In this case, power is provided through the IP drop.
		3. In some cases, it may make sense to have power supplied by both PoE and a plug-in transformer. In this case, the monitoring unit can monitor if the circuit feeding the laboratory equipment has lost power (e.g., the associated breaker has tripped), assuming the same circuit feeds the transformer.
6. **TYPICAL CAPABILITIES:**
	1. The laboratory monitoring units have built-in web servers and can be set up, monitored, and controlled using a web browser. Depending on the product, there may be small monthly subscription fees. Some products have no subscription fees. Since the products are web-based, no software is required to set up and configure the units.
	2. Some units support peer-to-peer communication. In this case, the monitoring units can be linked such that all of the equipment being monitored can be viewed on a single web page.
	3. Logging and graphing of monitored analog and binary inputs.
	4. Send email alerts based on user-defined conditions.
	5. Authorized users (e.g., lab manager and PI) can configure each monitoring unit via each unit's web page. The alarm notification can easily be modified as people need to be added or removed from the notification list.

OFMD will be happy to assist the departments in this process. Please call the Facilities Engineering Support Supervisor at 314-362-1591 for support.