

Addendum A: Optional Battery Backup System for the Kryos Control

Introduction:

The Kryos control operates on 24 VAC power. As an option, however, the control can also operate on battery power to provide up to 72 hours of continuous service without AC power. The system is designed for full operational service during a power failure, including full solenoid valve operation. The battery backup system can be ordered from Taylor-Wharton and should be factory installed.

Differences between the regular Kryos and the battery backed Kryos:

Please see the chart below for the differences between the two systems.

| | Regular Kryos | Battery Backed Kryos |
|--------------------------------|---------------------------------|---|
| Solenoid Valve | 24 VAC solenoid | 12 VDC solenoid |
| Wall Transformer | 24 VAC/ 40 Voltamps output | 16.5 VAC/ 40 Voltamps output |
| Battery | None | 17amp-hour |
| Battery Extension Cable | None | Connects battery to control board |
| Software | V4.0 | V4.0 |
| Control Board (1) | Black 2-pin solenoid valve plug | Red 2-pin solenoid valve plug & Red 3-pin battery plug. |

- (1) The control board for the battery backup is quite different than the control board for the regular Kryos in that a number of parts are either removed or changed. The best way to tell if the control is a battery backed unit or a regular unit is to look at the valve connector.

Operation:

The software is designed such that if power is lost and a battery-backed control is in place, the control detects the loss of power and continues to operate from the battery. If power is lost, a "Battery Backup" message appears on the display, the alarm beeper sounds and the red LED starts to flash. After a short period of time (approximately 10 seconds) the display panel will go dark to conserve power, however the red LED will continue to flash and the beeper will continue to sound until it is muted. The display can be brought back at any time by pressing any button on the front panel.

The control will continue to monitor the system, record logs and operate the valve until the battery runs too low. Original specifications required that the battery run, fully operational, for at least 72 hours. Battery backup mode is treated by the control as an alarm condition. This means that the remote alarm will be triggered after a period of time as defined by the user.

Note: We strongly recommend that all Cryo-Storage systems be connected to a redundant alarm, a building alarm system or a dialer. This insures that someone is notified if an error condition persists.

The DC solenoid valve requires that the battery be connected for the system to work properly. If the battery is disconnected or completely discharged the valve operation and the control operation may be affected. In particular, if the control is calling for a

fill, the solenoid will be called to open. Opening the solenoid takes a substantial inflow current, which the solenoid may “steal” from the control if it cannot get sufficient power from the battery. This in turn will “fool” the control into believing that a power failure has occurred, which will cause the control to reset and the valve to close. This will occur over and over again. If a battery-backed control keeps turning itself on and then off, try recharging the battery by following the steps below.

Battery Charging: The Kryos control has a circuit that trickle charges the battery. This provides a fully charged battery for the times when it is needed yet keeps it from being damaged by overcharging. If the battery should become discharged, the following steps should be followed to charge it.

- 1) Turn the control off using the Power button on the front panel of the Kryos. Even though the control is turned off, the battery will still be recharged.
- 2) Check all connections to the Kryos, especially the harness plug, the wall transformer and the battery extension cable. The wall transformer should be plugged into the wall and providing an output of 16.5 VAC.
- 3) Wait for 30-60 minutes. After this time period, the battery should have enough power to run the control and continue charging the battery.

Battery Life:

The life of the battery will vary according to many factors including use and storage temperature. The lead-acid batteries have an expected life of 3 to 5 years. For full functionality of your Cryo-Storage system we recommend that the lead-acid battery be changed every 3 years.