Balloon Tether System Instructions

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# Hardware Setup

* Attach the tether fishing rod assembly to a weighted box or other heavy object in an outside area free of nearby obstacles.
* Connect both cables from the rod assembly to the tether control electronics box, and provide power to the box with an extension cord.
* Position the tether rod so the tip of the pole is facing downwind (may have to be adjusted if the wind direction shifts significantly).
* Attach a serial cable to the central db9 serial port connector on the tether control electronics box’s datalogger (labeled RS-232). Connect the other end to the laptop/computer.
* Tune the radio receiver to the iMet radiosonde frequency that will be used, and attach an audio cable from its output to the laptop/computer microphone port. Select “line-in” as the device if Windows asks.
* Set the toggle switch in the electronics box for manual control, and test out the up/down switches to make sure the motors are functioning properly while keeping tension on the string. Make sure the in-line magnet is a little ways out from the tip of the rod, as it will cause a failsafe stop if it gets sucked into the first rod loop.
* Set the toggle switch back to automatic mode after attaching the balloon and package to the string.

# Software Setup

* The SkySonde Server, SkySonde Client, and Balloon Tether Control programs should be installed on the laptop/computer. If not, contact Allen Jordan (allen.jordan@noaa.gov, 303-497-4781) or Emrys Hall (emrys.hall@noaa.gov, 303-497-4288).
* Open up SkySonde Server first, then SkySonde Client and Balloon Tether Control.
* Enter in the flight information to SkySonde Client and press OK.
* Set Balloon Tether Control’s “COM Port” setting to the tether control serial cable’s port (usually COM1 for laptops with an actual db9 rs-232 serial port).
* At this point, the iMet radiosonde and ozonesonde package should be assembled and turned on to see data coming through the system.
* Attach the instrument package and balloon to the tether line when ready. Once the balloon and package are attached, set the toggle switch to automatic mode.

# Using the Balloon Tether Control Program

* Before starting a tether flight, type in the station altitude and desired balloon ceiling (max tether altitude).
* Use the “Options->Offset Tether Box Pressure” menu item to offset the tether box pressure to match the radiosonde pressure while on the ground. This is important for the automatic stop condition.
* Pressing “Start Automatic” will begin an automatic up/down cycle. The balloon will move up to the balloon ceiling altitude above surface, then turn around and come down until it is close to the surface pressure and the movement stops.
* Use the “Up” and “Down” buttons for manual control when not in automatic mode. This can be used to bring the balloon closer to surface for instrument maintenance after each up/down cycle (or just use the manual toggle switch settings in the tether electronics box).
* The “Stop” button will stop any tether movement in any mode.
* If the balloon is already in the air when the start auto button is pressed, a dialog will pop up asking how the profile should be resumed:
	+ **Restart Auto**: Restart the geopotential altitude calculations and begin an up/down cycle as usual.
	+ **Up**: Move up looking for the balloon ceiling threshold (geopotential calculations are NOT restarted), then do a normal down/descent and stop.
	+ **Down**: Move down until the pressure threshold is hit (geopotential calculations are NOT restarted, though it doesn’t matter for the stop condition).
* If the balloon altitude decreases for a long time when it should be moving up in automatic mode, a warning will be displayed. This could indicate that the end of the tether reel has been reached, and the cable started to wrap around the other direction. If this is the case, press the stop button and use the manual up/down movements to reverse this and bring the balloon back down.
* If the balloon moves too close to the fishing rod, a magnetic safety trip will activate and all tether movement will stop. This is an emergency stop condition to prevent damaging the reel, and shouldn’t be used in normal tether operation (stop the balloon manually before it reaches the safety trigger). If this happens, use the manual switches in the tether control box to move the magnet away from the sensor before resuming automatic control.