GeoVista Winch Documentation

University of Kansas

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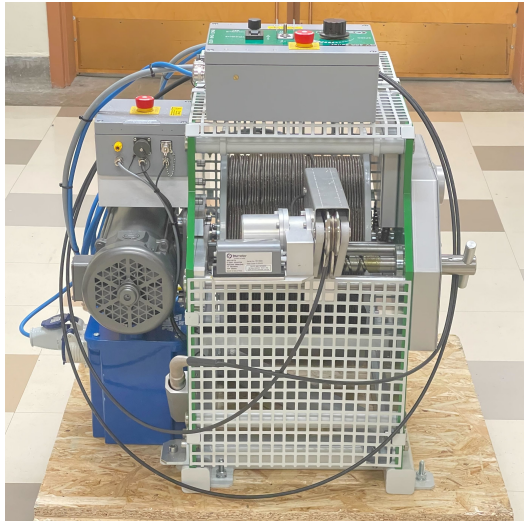
About This Documentation

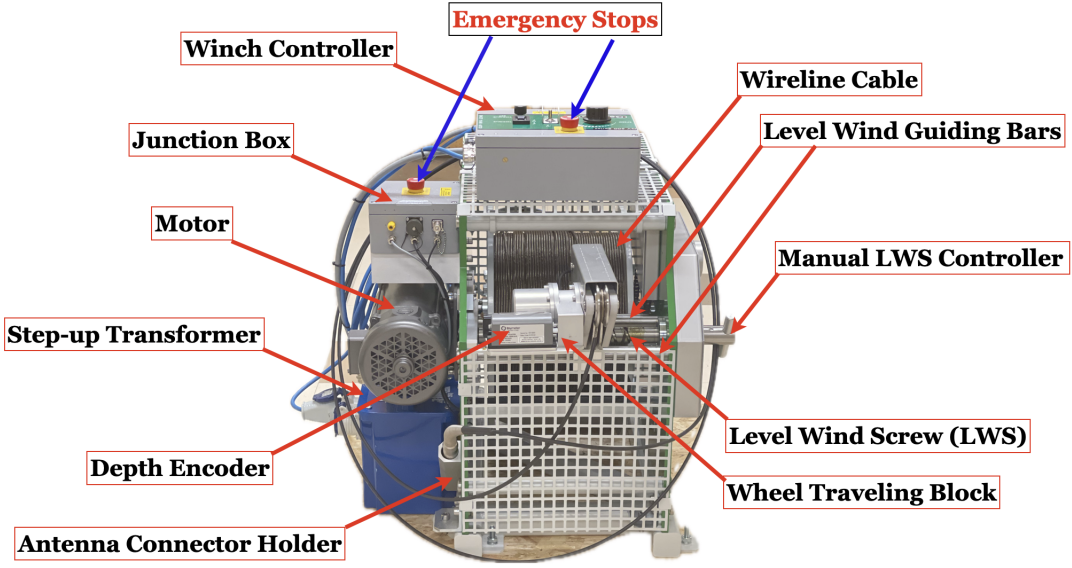
This is documentation on GeoVista Winch (model **GV530**) intended for use for RNO-G pulser calibration. There are certain mandatory safety measures that must be followed during operation. This does not include details about the internal electronics and circuits. The operation and maintenance of the winch should be fairly straightforward for a two-person team.

As of this writing, the winch should arrive in a wooden box; after removing the top of the box and also a front panel for the cable feed, the winch should be operable inside the box itself, which will also insulate the motor against penetration from blowing snow. A 2 kW Honda generator should be made available for operation of the winch in the field. To avoid too much power derating in the field, it may be advisable to similarly place the generator in its own box. An Arctic Oven tent may be used for comfort of the winch operators.

After You Open The Crate

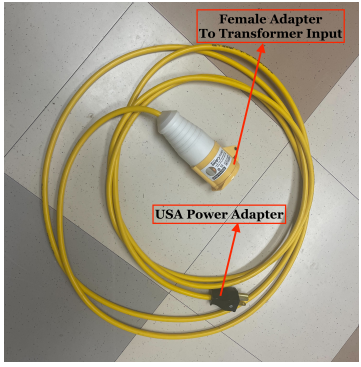
After the crate is unboxed (lifted up), you will find the winch in a condition similar to that shown. The first thing to do before connecting to power is identifying its parts and position the winch.

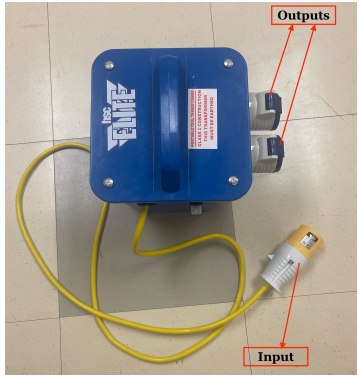



Emergency Stops
Winch Controller
Wireline Cable
Junction Box
Level Wind Guiding Bars
Motor
Manual LWS Controller
Step-up Transformer
Level Wind Screw (LWS)
Depth Encoder
Wheel Traveling Block
Antenna Connector Holder

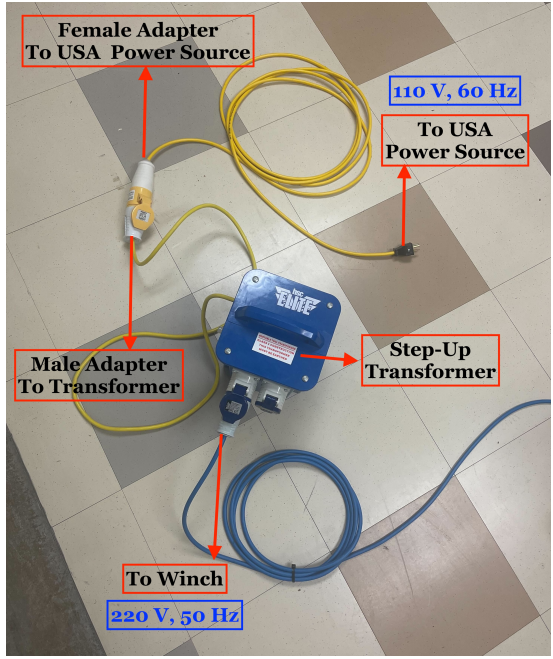
Important Notes On Power Supply

- The winch is manufactured in UK and operates in 220 V, 50 Hz source.
- It has a 3-pin UK-style adapter for power supply.
  - You can directly connect with such source and adapter, if available. (The main BAS drill may use such a power source).
  - To connect with a USA-style 3-pin USA source (110 V, 60 Hz), use the USA adapter and step-up transformer set as shown below.



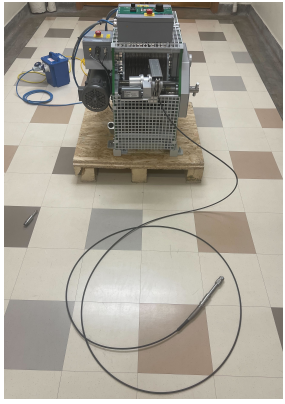


- Make the connection as shown in the right picture.
- Make sure the connections are tight! Loose connection might generate arcs and sparks and burn the connectors' pins.
- **There is no dedicated power switch on this winch. So, connect with power only when everything is ready for operation.**
- The transformer has two outputs. You can use either one for powering the winch. We recommend using the left one.

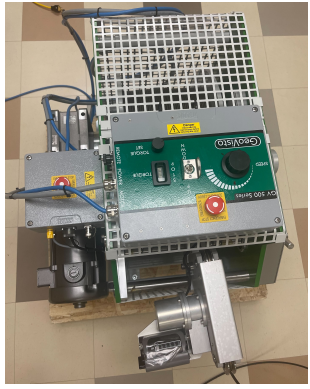


Let's Have A Look From All Sides

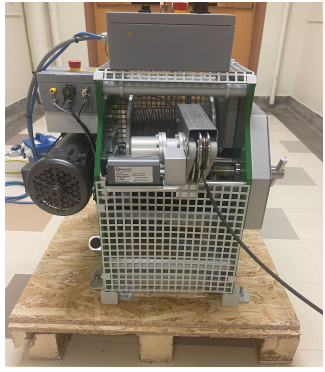
After the connections are made and cables are unwrapped, inspect the winch once. It should look somewhat like the follwing from all sides.



Typical View

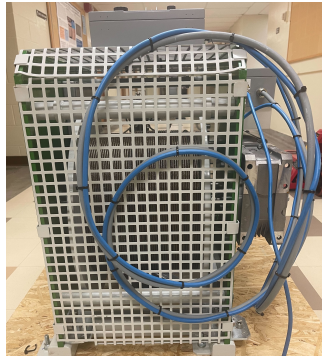


Top View

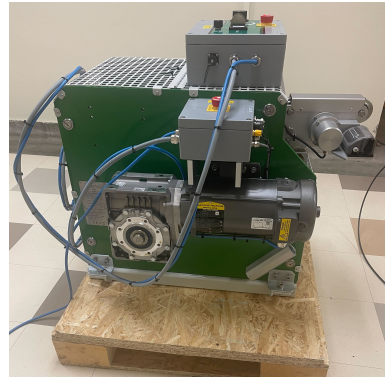


Front View

Right View



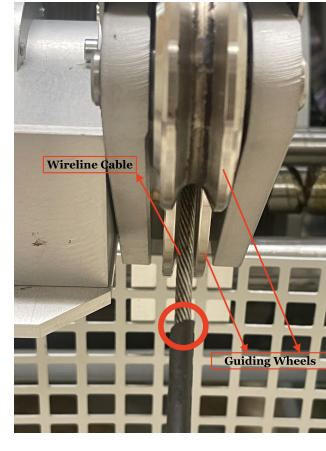
Back View



Left View

The Wireline Cable

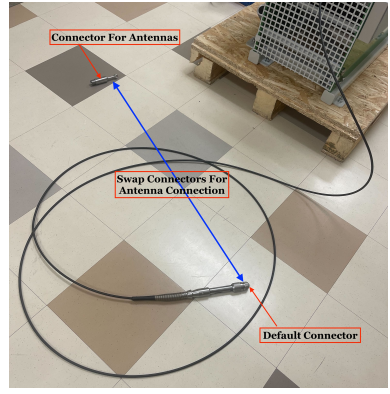
The 750-m GV530 metallic **wireline cable** spools the antenna (and/or other loads) up and down a borehole. It is guided through a system of **guiding wheels** and spooled up and down in a systematic manner by the **wheel traveling block** and **level winds**. **There must ALWAYS be tension on the cable to ensure proper spooling/unspooling, otherwise the cable will (irrevocably) tangle!**



Extended Cable & Connector Holder

The wireline cable has an extended part; same metal cable shielded with black plastic insulation. **This part of the cable is not to be spooled up.** The winch is supposed to be kept at a distance (from the borehole) equal to its length. The default 'logging' connector on the cable will need to be replaced with the 'eyelet connector' (connector for antenna), which will then attach to the GUNK PVA transmitter.

Connector Holder



Extended Cable

Step 4

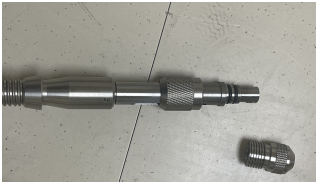
Step 1

Step 5

Step 2

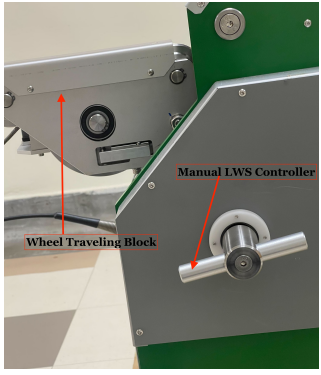
Step 6

Step 3

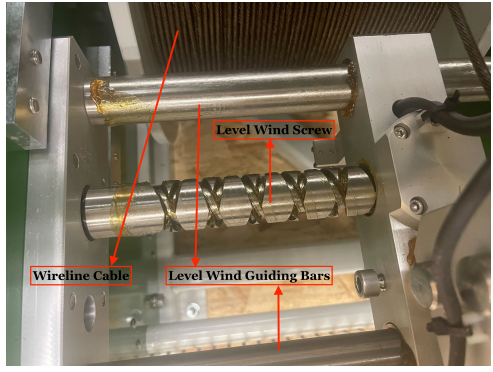


Wheel Traveling Block & Level Winds

As the cable gets spooled up or down, the wheel traveling block slides over the **level wind screw (LWS)** and two **level wind guiding bars**. If the cable is not aligned with the traveling block, it can be adjusted to slide manually with the help of **manual LWS controller**. This can be done by pressing the controller and rotating clockwise (slide right to left) or counterclockwise (slide left to right).



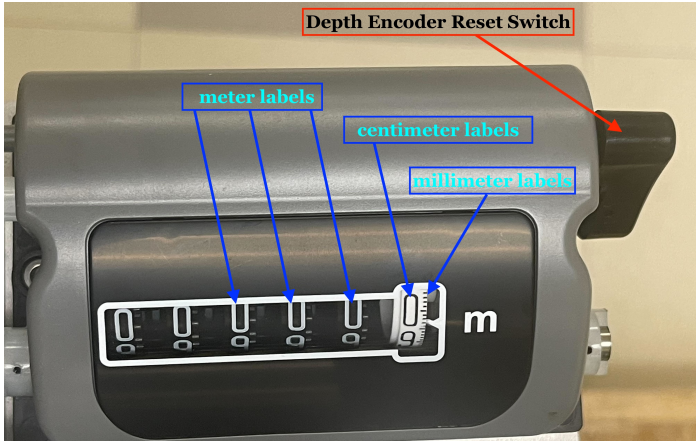
Wheel Traveling Block



Level Winds

The Depth Encoder

The wheel traveling block hosts a depth encoder which gives a very precise "mm" reading on cable length (it's not clear if this accounts for cable stretching). There is a **reset switch** which should be avoided if possible. A clockwise twist of this switch brings the reading back to " 0 m" no matter how much cable is spooled down!



Motor & Junction Box

These two parts will do their own jobs. The Junction box connects all the electrical parts of the winch including the depth encoder, torque gauge, motor controller, wireline cable and input connections. The motor controls speed of spooling. **DO NOT** unscrew/open the lids of the motor or junction box when the power is on. The **emergency switch** on the junction box can be used to stop the winch completely. To turn back on, twist the emergency switch knob clockwise.

Motor **Junction Box**

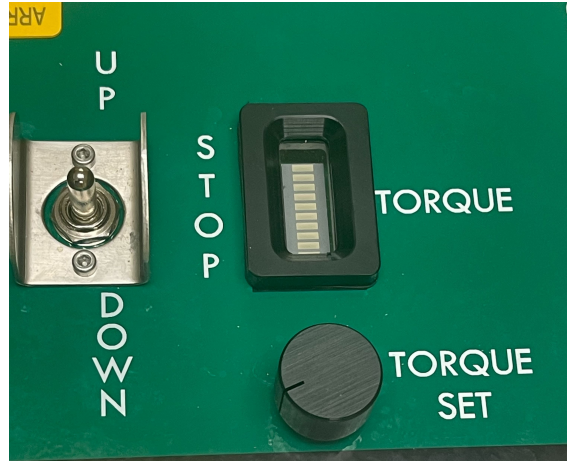
The Winch Controller

This is the main component, which controls cable lowering/raising. It relies on a comprehensive electronics board to control the winch.

- The winch controller houses a number of useful switches and knobs namely, the speed controller, spooling direction switch, over torque cut-out, etc.
- It also has the second **emergency switch** that can be used to stop the winch completely. To turn back on, twist the emergency switch knob clockwise.
- It also has a remote control unit which can make the winch useful for one person operation. We have not made that functional yet (one of the wires is the Earth wire (yellow and green), the live wire is brown, and the neutral is blue; the remote-control unit could be powered by the transformer OUT)
- **DO NOT** unscrew/open the lid when the power is on.

- The winch can be operated as slow as 1 cm/sec and as fast as 15 m/min. We also tested that the speed increases almost linearly rotating the “speed knob” clockwise.
- The white labelled bars (from smallest to largest) are just indicating increase in speed. Those are not the actual labels for minimum and maximum speeds. The actual operation initiates below the smallest bar and goes above the longest one.
- **Once the winch is stopped using an emergency switch or “STOP mode”, always ‘return to the lowest speed level’ to restart the winch.**

- Torque controller is there to limit over-tension (e.g., if the load gets stuck, to prevent damage)
- There are 10 LED lights (**7 green**, **3 red**) indicating increasing tension from **green** to **red**. The winch will automatically stop if all **3 red** LEDs are lit.
- You must set the "Torque Set" to allow **6-7 green** LEDs each time when logging up depending on the normal tension of the specific run being performed. Rotating the knob counterclockwise decreases the sensitivity and will reduce the number of illuminated LEDs.
- **"UP"**: for spooling up, **"DOWN"**: for spooling down, and **"STOP"**: for stop spooling.



Safety & Warnings

- **Always keep tension on the cable** when spooling in and out, even during testing. If you do not, the cable will unravel on the drum and cause damage to the winch.
- **DO NOT over-rotate the speeding knob forcefully beyond it's normal limit**. This will cause the screw to loosen and the speeding knob to malfunction.
- **Run the winch at a slow speed** unless otherwise you have to operate at the fastest speed.
- Always have visual contact with the winch and **USE EMERGENCY STOPs whenever needed**. There is no number limit on using these stops.
- **The winch controller is splash proof but not water proof**. So, extra care should always be taken to ensure it is not exposed to water and not damaged by mishandling.
- **Avoid using the reset switch on depth encoder** unless otherwise have to.
- **Apply lubricant** on the level wind screw and guiding bars for smoother runs.
- **DO NOT spool up the extended cable** to avoid damaging the shield.
- **Keep the cable clean** after each run.

Operational Notes

1. We envision that, as the winch is being lowered into the 400-m hole, a separate receiver antenna (Rx) will be simultaneously co-lowered on coaxial cable into one of the two nearby IDP test holes; this antenna can be either the 'fat' GUNK, or perhaps an RNO-G VPol (and HPol, if time allows!) antenna.
2. This testhole-Rx should be plugged into the UChicago R&S RTA4000 1GHz BW digital scope, which hopefully can plug into one of the Honda generator outputs. Assuming the scope provides time stamps for its triggers (this should be verified, and the scope t0 should be recorded at the start of the run), it should be possible for the scope to freely run and collect triggers continuously during Tx descent into the 400-m hole.
3. In any case, we recommend lowering the Tx at 10 meter increments (ideally beginning at the highest possible elevation above the surface, with the Rx similarly elevated), then taking 2 minutes of data at z=0, z=–10 m, z=-20 m, etc, down to z=-120 m, after which 20 m increments should be fine, until z=-240 m, then 30 m increments until the bottom of the 400-m hole is reached.

Contacts

We hope that this guide is sufficient for the smooth and easy operation of this winch. But the internal electronics and circuits, although reliable, is unpredictable. In case of any confusion and operational difficulties, please don't hesitate to contact us:

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A companion document reviews the operation of the battery powered GUNK-PVA transmitter, including the IDL signal generator, which is connected to the eyelet-end of the winch and produces the calibration signal itself.