Bartington Grad 601-2 Transport, Set up and Operation

By Andrew Creekmore, with excerpts, as noted, (used with permission)
from Jason T. Herrmann's guide available at:
Herrmann, Jason. 2011. Using the Bartington Grad 601 with Two Sensors in the Field.CAST Technical Publications Series. Number 2563. http://gmv.cast.uark.edu/scanning/using-the-bartington-grad-601-with-two-sensors-in-the-field/. [Date accessed: 3 March 2016]. [Last Updated: 26 December 2012].
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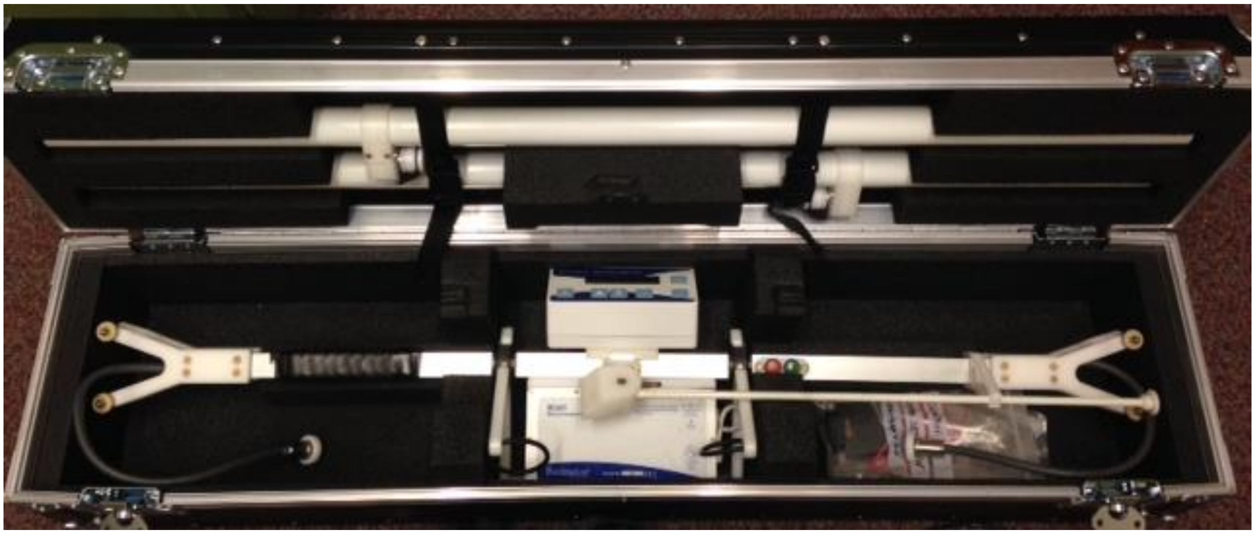
Users should also consult the Bartington Grad601 Instruction Manual and set-up video for additional information, specifications, photographs, and set-up procedures:
https://bartingtondownloads.com/wp-content/uploads/DS1800.pdf

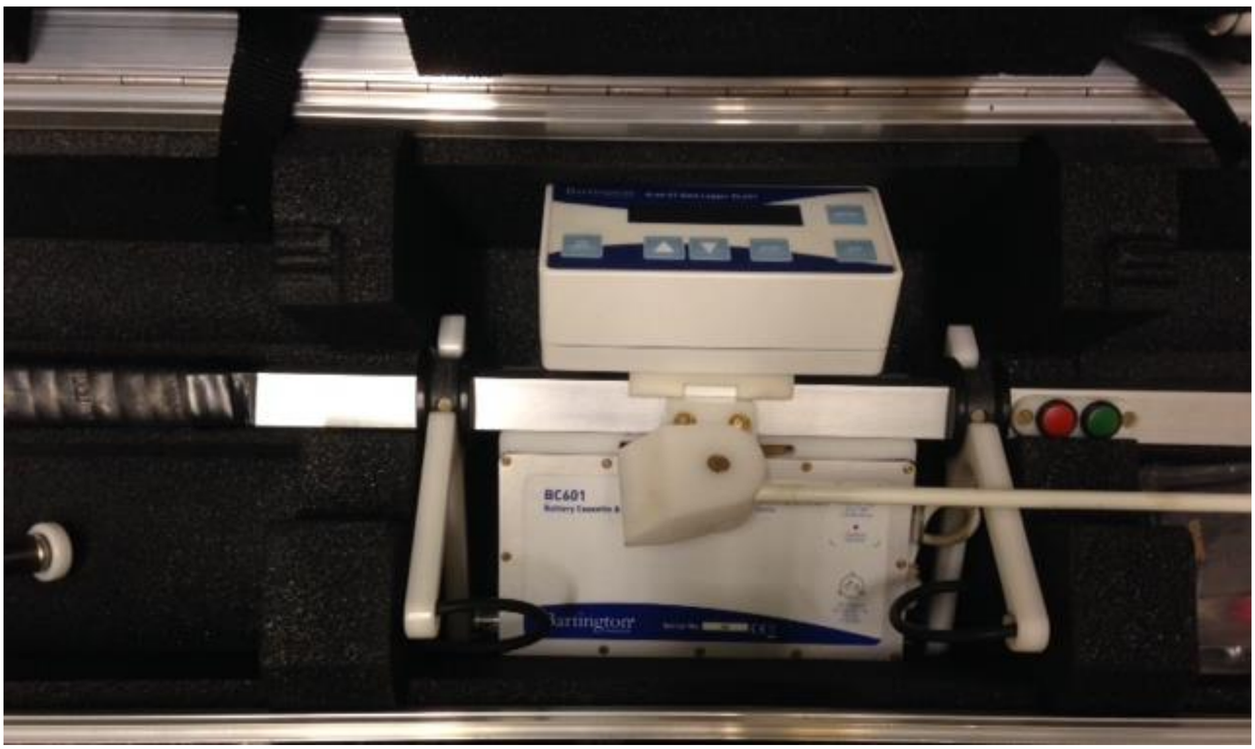
Transport and handling.

The Grad 601-2 should be transported in its secure, padded case. It should not be transported, even for short distances, fully assembled, in an automobile, truck etc. The Grad601-2 sensors will become out of alignment or suffer serious damage if not transported properly. Please use special care in the transport and operation of this instrument; factory recalibration is costly.

Packing

The Grad 601-2 fits in its case fully disassembled or with the battery and data logger still attached to the frame for rapid field set-up (see photo below for proper alignment). I do not recommend packing it with the battery and logger on the frame for long distance travel or shipping as it seems to place extra stress on the logger and battery attachments because they press against the sides of the case quite firmly. The two sensors fit into the top of the case, held in place by straps. The beam fits into the bottom of the case. If disassembled, the data logger, battery, and other accessories fit in the crevices around the beam in the bottom of the case. These should be wrapped in padded foam to limit shifting during transport. Be sure that the items in the bottom of the case are packed such that they do not stick up above the edge of the case because anything that protrudes up will press into the sensors in the lid when closed. Place foam or other padding to fill the space between the contents of the bottom of the case and the sensors in the lid. Use foam to ensure that the sensors will rest on something soft and supportive when the lid is closed, as opposed to resting on the kickstand, backpack buckle, or other hard material that could damage them during transport.





Proper position of the instrument in its custom case with the beam components fully assembled.

Assembly

- Here is a short video of the assembly and calibration process: https://www.youtube.com/watch?v=0XCJvHhXnpQ&t=182s
- If possible, lay down a clean tarp on which to assemble the instrument. The tarp protects the instrument from debris and moisture, catches any screws or parts that may fall during assembly, and provides a rapid moisture cover in case of a sudden rain storm.
- After removing the instrument from case, close the case to prevent it from catching dust and debris while you are surveying (and put it in the shade – the sun heats up the black case very quickly, and melts the glue holding the foam padding in place). Lay the beam flat on the tarp with the start / stop (red / green) buttons and kickstand to your right. Be sure that the abdominal buffer (black plastic tube that swivels around the beam at the battery / data logger attachment) is rotated to rest above the kick stand. To test this orientation, check to see that the kickstand can be deployed freely without needing to move the abdominal buffer.
- If the battery and logger are not already attached to the frame, once the abdominal buffer is set, remove the screw cover knobs from the battery screws, insert the battery screws through the beam and attach the data logger to the opposite side. Take care to avoid pinching the cables inside the beam as you inset the battery screws through the beam. The battery should be oriented so that the label faces the operator with the green / red controller buttons (integrated into the beam) to the right of the operator. Be sure that the data logger is seated upon the beam properly (plastic base should fit on beam). Be careful to adjust the screw dials evenly – tighten them the same amount – or the data logger will jam as it is tightened.
- After the data logger and battery are attached to the beam, attach the sensors, battery, and beam control cable to the data logger. In each case take care to note the notches or prongs for each connector so that you insert them properly. If the connection seems difficult, resists tightening, or gets misaligned, back out the screw and try again. Do not force the connections. If a connection is difficult be sure that there is enough slack in the line to make the connection at the proper angle. The sensor cables can be extended by pushing and pulling extra length through the beam. The left sensor cable attaches to the left side of the data logger, the right cable to the right.
- After you make all connections, lay the beam on the tarp so that the senor holder clamps are oriented parallel to the ground. Insert each sensor into the holder clamp by loosening the clam screw (this may take some effort) and gently sliding the sensor into the clamp. The sensors should be oriented with the serial numbers on the top of the sensor, and the lower-numbered sensor on the left end of the beam (from the operator's perspective). Consistently attach the lower numbered sensor to the left side and your data will be more consistent if the sensors have slightly different drift or calibration.
- After inserting each sensor to approximately the same level, tighten the sensor holder clamps slightly until they grip the sensor. **BE CAREFUL – DO NOT OVERTIGHTEN THE SENSOR CLAMPS; TO DO SO COULD CRACK THE SENSOR HOUSING.** Now remove the sensor plug caps and attach the sensor cords (grey cable). The sensors should be oriented so that the arrows on the top of the plug attachments face the direction of travel (operator's forward gaze).
- Now that everything is attached, raise the instrument up and support it by its kickstand. At this point you should put on the backpack and attach it to the instrument via the black rubber loops.

Alternatively, attach the backpack to the instrument first and then crawl under it to put it on. Once you have the backpack on and the instrument assembled, lift it up and observe the orientation of the sensors. If you have an assistant, ask that person to check the orientation of the sensors and make adjustments as necessary to ensure that they are set at the same height, facing forward (arrows pointing forward), and secured with the clamps. Set the sensor height so that the bottom of the sensor is approximately 20cm above the ground surface when held freely by the operator (i.e. not when hanging from the backpack). If you need to carry the instrument over brush or other obstacles of a consistent height that is significantly more than 20cm above the ground surface, then you may wish to set the sensors higher on the beam to minimize strain on the arms while carrying. **BE CAREFUL – DO NOT OVERTIGHTEN THE SENSOR CLAMPS; TO DO SO COULD CRACK THE SENSOR HOUSING.**

- When you are putting away the instrument follow the above steps in reverse but also wipe down the sensors and such with a soft cloth to avoid storing or transporting the instrument with dirt and moisture.

Field Operation

NOTE: the latest version of the data logger requires the user to select NMEA or standard grid setup at boot-up. For the procedures described here, choose the grid setup. Selecting NMEA will turn the data logger into an analog-to-digital converter, and data must be recorded (output) to an external data logger supplied by the user.

IF YOU HAVE NOT ALREADY DONE SO, AT THIS POINT CHECK THE OPERATOR AND ALL ASSISTANTS FOR ANY METAL ITEMS THAT COULD INTERFERE WITH DATA COLLECTION. These include underwire bras, eyelets in shoes, items in pockets, rivets in pants, zippers, metal buttons or brims in hats, jewelry or piercings, and metal eyeglasses. If you are unsure of the content of a piece of clothing, bring it close to a sensor and see if the value changes. An easy way to be sure if anyone has metal is to use a **pin-pointer**, commonly used in conjunction with metal detector surveys. I use the Garret Pro-Pointer: http://www.amazon.com/Garrett-Pin-Pointer-Pro-Pointer/dp/B005D4V27S/ref=sr_1_2?ie=UTF8&qid=1438620730&sr=8-2&keywords=pin+pointer

This handy device detects metal within a few inches of its sensor and is easier to use and read (it beeps loudly when metal is present) than trying to hold the uncalibrated magnetometer up to individuals to see if the readings change. Of course, this device will identify all metal, not just ferrous metal that can interfere with the magnetometer.

NOTE: *Although many types of* ***glasses*** *may have little observable impact upon the data, ideally one should avoid wearing metal glasses. I wear non-conductive, metal-free safety glasses, with prescription transition lenses so I have sunglasses too!*

https://rx-safety.com/2013/12/prescription-safety-glasses-non-conductive/

Acclimation and calibration station set-up

Once the instrument is assembled turn it on and rest it on its kickstand. Leave it on for 15-20 minutes so that it has time to acclimate to the ambient temperature and conditions. While you are waiting for the instrument to acclimate, assemble the items necessary to establish a calibration station. These include a plastic chair or stool, 5 pvc flags or wooden stakes, and a compass.

- When the instrument is acclimated turn it on and set it to scanning mode. If you have not already done so, go to the parameters menu and turn audio to "off" unless you want the instrument to alarm or beep as you are scanning. You may set the threshold very high to avoid the beeping but turning it off is usually more effective.
- Walk around the area until you find a place where the nT values do not vary by more than about 1-2 nT in a 2m X 2m area, when facing the same direction (i.e. do not spin around, but walk forward, back, and side to side while facing the same direction).
- Also check at least 2m in all directions outside the 2X2m quiet space you identified, just to be sure that there are not any large metal objects in the vicinity.
- Once you are satisfied set up the calibration station by putting a flag in the center of the quiet area and using the compass to set up pvc flags or other markers at the cardinal points (N-S-E-W) around the center flag. I use PVC flags from Baseline Equipment for this as well as other geophysics work: http://www.baselineequipment.com/4-x-5-flag-24-inch-plastic-staff If the ground is particularly hard, you may wish to use a plastic drip irrigation riser stake to hold the flags upright: https://store.rainbird.com/pfrrs-12-in-polyflex-riser-7-in-stake.html
- Have an assistant help you establish the flags properly to be sure that they are closely aligned with the proper directions.
- Now place the plastic stool or chair in the center of the reference station and begin the calibration procedure. Be sure that your plastic chair or stool is stable – some are flimsy and the legs will bend and collapse under you as you change directions for calibration. *Note: it is not required to use a stool but it can improve calibration in cases where it is difficult to locate a magnetically quiet or neutral location.*

Calibration procedure

Here is a short video of the assembly and calibration process:
https://www.youtube.com/watch?v=0XCJvHhXnpQ&feature=youtu.be
Before beginning calibration, go to the parameters menu and turn the audio to "off." You will need to turn audio back on after the procedure is completed. The calibration procedure is a combination of automatic adjustments and poses the operator must follow. Throughout the entire process the operator should hold the instrument steady, at the same height, and avoid wobbling or dipping to either side. The procedure begins facing north. On the data logger select "adjust instrument" and follow the instructions. In between each beep and instruction you will see the readings changing as they are adjusted by the data logger. When you get to the step that says "invert magnetometer" simply twist the beam to invert the instrument while keeping it in the same location / elevation. At the end of this

procedure, set the instrument to scan mode and observe the readings while facing north. Both sensors should read around 0.0 nT.

Reference point (excerpted from instructions by Jason Herrmann, see above)
With the Grad 601-2 strapped to the harness, go to the start point of your survey and stand as if you are ready to begin survey. Take note of the readings at this point while the Grad 601-2 is scanning. After several grid squares, come back to this point and see if you get similar readings. If they are different by more than 0.5nT, you will want to adjust the gradiometer again before continuing.

Setting Parameters (excerpted from instructions by Jason Herrmann, see above)
Use the arrow keys to navigate the menu in the data logger and press STEP to cycle through the options for each menu item. The individual parameters and available settings are explained below with the standard selection in **bold**:
<u>Pace:</u> the walking pace of the operator. **Most surveys are between 0.7 and 1.0** secs. Since the data you record is an average of almost continuous variation sensed by the instrument during data collection, the slower you walk, the smoother your data will be.
<u>Grid Size:</u> select the size of grid – 10 x 10, **20 x 20**, 30 x 30 or 40 x 40m.
<u>Start:</u> select the starting direction of the grid, N, NE, E, SE, S, SW, W or NW. This depends on your grid orientation. If your grid is oriented north and you are starting in the southwest corner then you may want to select N or NW as your starting direction.
<u>Pattern:</u> select the traverse pattern to be followed – Parallel or **ZIGZAG**.
<u>Lines/m:</u> select the required number of data lines per meter – 1, **2** or 4. Two (**2**) lines per meter is standard (50cm transect spacing).
<u>Samples/m:</u> select the number of samples per meter along each line – 1, 2, 4 or **8**. **8** samples per meter is the standard setting, but is not available for grids of 40 x 40m.
<u>Range:</u> select the full scale range of **100nT** (resolution 0.03nT) or 1000nT (resolution 0.1nT).
<u>Audio:</u> select the audio output for scanning and survey operations – off or **ON**.
<u>Volume:</u> select volume – **HIGH** or low.
<u>Threshold:</u> select the deviation in nT at which the alarm is required to operate during a scan operation – increments in units, tens and hundreds and thousands of nT. When the field deviates by the level selected, the ALARM message will be shown in the display for the appropriate sensor, and the audio output rate will start to increase. The audio tone varies from the value set to about ten times this value. This depends on the background values at your survey site. **100nT** is generally a safe threshold.
<u>Sensors:</u> select the number of sensors to be used – 1 or **2**
<u>Reject:</u> select the frequency of 50Hz (Europe and most of Asia) or **60Hz** (North America) to reduce noise in the data.

Collecting Data (excerpted from instructions by Jason Herrmann, see above)
Remember, this set of instructions assumes that you have already set up your survey grid and that you are using two sensors mounted one meter apart.

1. Stand at the “lower left” corner of your survey square where the end of your first transect would be the ‘top’ of the survey square. Face the survey direction. If your transects are oriented to the north, this would be the southwest corner. Be sure to start all surveys in the same corner.
2. If you are surveying with two sensors and plan a map that has transects that are spaced at 50cm, you will need to pass over the grid so that the survey transects shuffle together during survey. On your first transect, you would walk a line that is 75cm from the corner. Your return transect would be 1.25m from the corner.

3. Press ENTER or the green button on the trapeze when you begin a line. If you have set the parameters correctly and walked at the correct pace the Grad601-2 will beep every time you pass over a meter mark on your survey rope and beep twice at the end of the transect.
4. Press ESC or the red button on the trapeze to stop survey during a traverse.
5. If you have made a mistake, you can delete the current line (or if completed, the last line) by navigating to BACK ONE TRAV and pressing ENTER. You will delete another line every time you press ENTER.
6. Continue the survey until the square is finished. Stopping during survey could introduce some unwelcome interference into your data.

Take a Break (excerpted from instructions by Jason Herrmann, see above)
It is okay to leave the Grad 601-2 on if you are going to take a short break. When not surveying, please try to leave the instrument in the shade. If there is no shade cover, at least protect the data logger/data logger with a cloth to protect it from the sun.
Turn the Grad 601-2 off if you are taking a longer break, say for second breakfast or lunch. You will need to re-adjust the instrument when you begin survey again.

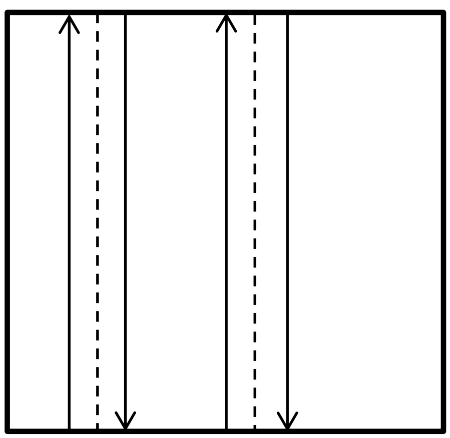
Andy's comment: if you collected a lot of data I recommend downloading it before turning off the instrument. I have periodically encountered errors upon restart that resulted in a loss or corruption of stored data.

Surveying: additional procedures
After you have calibrated the instrument you may begin surveying. Before you start, be sure that you have downloaded and deleted all data collected previously. Also be sure that you set the required parameters: grid size, sample interval (per meter) and traverse interval. In order to ensure that you collect data as accurately as possible, test walk a few lines and adjust the metronome / sample rate as necessary for the current terrain. Many operators use marked ropes, flags, or tape measures (non-metallic) to help them walk at the proper pace along the line. When collecting data, rather than starting at the baseline, **begin walking a meter or so behind (i.e. before your cross it) of the baseline and press the green start button on the beam as you cross the baseline**. This will ensure that your pace is steady from the very beginning of each line. Field setup of guidelines will vary by operator and research parameters, but in all cases you should strive to carry the instrument so that it records data (beeps) accurately each meter along a transect. To minimize operator errors carry the instrument at the same height across each grid, and avoid dipping or leaning as you walk. Think of your body as a suspension system and walk in small rather than large steps. If there are dips or bumps along the ground try to absorb them with your body and keep the instrument steady. If your arms become tired rest them by letting the instrument hang from the pack at the end of a line before starting the next line. You may also vary your grip between overhand and underhand.

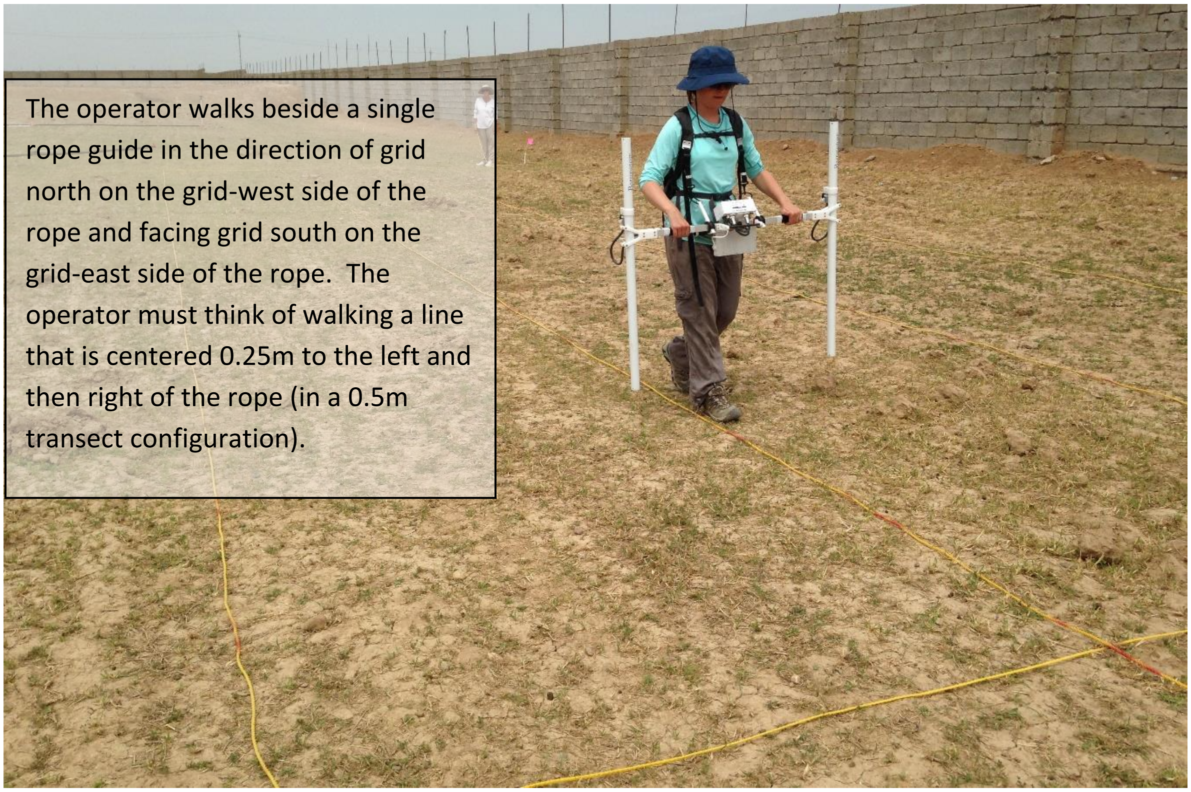
Using rope guides
With the dual-fluxgate system the operator walks in the center of the beam while the sensors record data to the left and right of the operator. This arrangement makes it tricky to use rope guides because you either need to use two ropes simultaneously, one under the path of either fluxgate, or a single rope directly in the operator's path (i.e. in between the two fluxgate sensors). Placing the rope in the operator's path is problematic because you are then stepping or tripping on the rope as you collect data.

My solution is to offset the guide ropes east or right of the SW corner of the grid by the width of the operator's footsteps. Thus the operator walks beside a single rope guide (where the rope would have been if not offset to grid-east), walking in the direction of grid north on the grid-west side of the rope and facing grid south on the grid-east side of the rope. For this to work and keep data accurately positioned, the operator must think of walking a line that is centered 0.25m to the left and then right of the rope (in a 0.5m transect configuration; other configurations should be adjusted accordingly). See the image below for an illustration of this procedure.

Note: to determine the appropriate rope spacing for your transect spacing, consult the last few pages of the Bartington Grad 601-2 operator's manual, which has illustrated walking paths for multiple sample intervals. If you are collecting transects spaced 0.5m or 0.25m apart then you will end up with a somewhat unexpected pattern in which you collect two or more transects closely-spaced, followed by a transect gap of over 1m.



NOT TO SCALE
Arrows = traverses
Dashed line = rope guide offset from SW corner by the width of the operator's stride.



The operator walks beside a single rope guide in the direction of grid north on the grid-west side of the rope and facing grid south on the grid-east side of the rope. The operator must think of walking a line that is centered 0.25m to the left and then right of the rope (in a 0.5m transect configuration).

Key points

- If you make a mistake, such as finishing a line too early or too late, press stop (red button) then 'escape' in order to reach the menu from which you can delete a line or a single reading. For more complex adjustments, such as 'dummying' a line or area, consult the Grad 601-2 user manual.
- At the end of each grid push the green power button to save the grid and press it again to start the next grid.
- NOTE: the memory of the Grad 601-2 is limited. The number of grids you can collect before you must download varies depending upon grid size, sample rate and transect spacing. Consult the instruction manual and bring a laptop for downloading if you expect to collect a lot of grids (e.g. 20 grids is the max for 20m X 20m grids collected at 0.5m transect spacing and 8 samples / m).
- NOTE: The Grad 601-2 should not be used in rain. If it becomes wet wipe it dry with a soft cloth and remove it from the wet environment. Users should bring tarps and cloths to the field if rain is anticipated, and be prepared to evacuate to a dry disassembly area quickly.

<u>DATA DOWNLOADING</u>

Options for downloading or processing BartingtonGrad601-2 data:

You may download data from the Grad 601-2 using either the Bartington Grad601-2 download software or another program such as Terrasurveyor. To do so you need to attach the USB – serial adapter cord. Once download is complete, inspect and then back-up all data before deleting data from the instrument. Sometimes downloading gets interrupted or corrupted. If this happens, or if the data look corrupted when you check them in the software, run through the download procedure again.

1) Downloading with Terrasurveyor: Download the trial version of Terrasurveyor from this web site: https://dwconsulting.nl/terrasurveyor64/ It is fully functional for 30 days but image exports say "trial" With this software you can download, combine, process, and export this data to a variety of formats. To download data from the instrument: insert the software lock dongle if necessary (although free trial versions of software are often fully functional for 30 days). Follow the steps in the program menu to download the data.

2) Downloading with Bartington's download software, Grad601_V316: Download the software from this location: http://www.bartingtondownloads.com/software/ This software only downloads data from the instrument. It must be processed in another software package.

Downloading steps when using the GRAD 601_V316 software (excerpted from instructions by Jason Herrmann)

a) Make sure you have the Bartington Gradiometer download utility installed on your computer. This small program can be downloaded from Bartington Instruments' website or installed from a disk that should be packed with the gradiometer. http://www.bartingtondownloads.com/software/
b) Connect the computer to the Grad 601-2 via the serial port in the back of the Gradiometer. Use a serial to USB connector if your computer does not have a serial port (as most new laptops do not). If you are using a serial to USB cable, be sure to install the proper driver for the cable before attempting to download.
c) Activate the Bartington download utility.
d) Choose OUTPUT DATA from the menu on the Grad 601-2 data logger. When you do, the screen should read WAITING FOR PC.
e) Identify the correct COM port for download. If you just installed a driver for a cable, you were probably notified which port the driver was applied to.
f) Choose the data format for download. XYZ format is recommended, as it is the most versatile and can be recognized by most programs.
g) Hit START when you are ready to download and watch the bytes pour in!
h) The download software will ask you to save the data when you are finished. Generally, you will want to Save All files, and save them with a unique identifier. One recommended file naming strategy is to save data with a name that includes the date they were collected and the sequential number of the grid square collected. For example, data from the first three grid squares collected on January 13 would be saved as 01-13-01, 0113-02 and 01-13-03. To save all the grids from January 13 in this scheme, enter "01-13-" in the windows explorer window when prompted to choose a name for the files. The grid number will automatically be added after the dash.
i) You will get two files for each grid square, a .dat file that will hold the data and a .hdr file that has the parameters for each grid square.

DATA PROCESSING

You need to determine the appropriate processing steps and parameters for your site, but there are some general guidelines you can follow to get started. These steps should not be followed rigidly or without thought because site conditions and data characteristics may require that you omit, add, or reorder the steps listed here. These functions / procedures are available in Terrasurveyor, Geoplot, and other software. Here I describe them as they appear in Terrasurveyor, original version (NOT YET UPDATED FOR TERRASURVEYOR 64). If you are using other software then simply look around for a function with the same or similar name or effect. In Terrasurveyor these functions are listed to the left of the viewing area. Many of these processes have multiple parameters that you can change – you should try different parameters and inspect the results but be sure that you understand what each process is doing to the data or you may end up with a pretty (or ugly!) result that is not true to the data.

1) You must first begin a new site and import the grids, then COMBINE your grids using the “assemble grids” function when your site folder is active. Simply drag and drop the grids into their proper place in the composite. Remember that north is to the right in this software.

Open the composite that you created in step 1. You will process and save various versions of this composite but in Terrasurveyor you can always adjust what you have done by selecting left button MODIFY and then deleting or reordering processing steps.

2/3) DESPIKE
A good start is to remove spikes in the data using the DESPIKE function and various box sizes. These are very isolated, unusually high values that often correspond to metal debris on or near the surface. By removing or clipping these early in the processing procedures you minimize their impact on the other filters you will run. However, in some cases these spikes are important data that you need to leave in the data or at least examine before removal. For example the spikes may indicate areas of modern disturbance that you need to record. On historic sites they may represent important artifacts or midden areas. Personally I find that despike functions are not particularly useful for my interpretation of the data.

2/3) DESTRIPE / ZERO-MEAN/MODE/MEDIAN TRAVERSE
This function will adjust the means of adjacent traverses in order to remove striping in the data that comes from operator posture and the effect of zig-zag data collection.
NOTE: in some cases you may wish to run this function <u>before</u> despike. Try it both ways and see how it impacts your data.

4) DE-STAGGER
Data staggering is caused by offsets in the data recording location along each traverse due to the fact that it is nearly impossible for an operator walking in zag-zag pattern to cross the meter mark in exactly the same place each time. This stagger can be corrected by applying de-stagger to an entire data set, or by selecting specific areas for correction. The latter can be especially useful in cases where different operators collected data in a composite, introducing different stagger patterns in their grids. In order to determine the appropriate de-stagger settings, try different de-stagger parameters and view the effect on the data. Note: you can destagger the entire dataset at once or select single grids or sub-grid areas to de-stagger.

5) CLIP

Clipping data removes very high and / or very low data, permitting lower-contrast data to become more visible / enhanced. When clipped the high values do not disappear, they merely get capped at a certain value. Thus an area that read 65 nT before clipping will read 20 if clipped to 20 nT, whereas an area that read 18 nT before clipping will still read 18 nT if clipping was set to any value above 18 nT.
NOTE: you may wish to clip again later in the processing order, or clip again. Trial and error and careful consideration of its effect on your data are necessary to determine the best approach.

ADDITIONAL STEPS. The order in which you use these will depend on your specific data set. I recommend trying different orders and parameters, keeping in mind the effect on the data, not just the appearance.

- REPLACE
  Sometimes it is necessary to remove very high and or very low values by replacing them with other values. Unlike clipping, which just caps a value at a cut-off point, this function removes the data and replaces it with that you specify, either a dummy non-value, an average, etc. This function is especially useful if you have tremendously high-value and large-scale features that make it difficult to examine the rest of the data, or which mess up the other filters / functions. For example if you have a gas pipeline running through the middle of your data it will create a massive high-low chain through the data and will still skew the other filters even if clipped. In this case you could search from say +/- 20 nT to +/- 5000 nT and replace these values with the dummy value. This will remove any data over or under +/-20 nT and leave a background color in the empty space (which is assigned dummy values in the data). Sometimes this application turns the data into swiss cheese and is not helpful, but it is worth trying in some cases, and can be useful if you want to examine only high or low values separately. For example you could replace all data from 1 to 5000 nT, leaving only very low value data, or from -1 to -5000 nT, leaving only high value data.

- HIGH / LOW PASS FILTER
  These filters remove high or low value data based on a filter box and function type that you define in the dialogue box. High pass filters remove large trends, such as geology in the background that may obscure smaller features, while low pass filters have a smoothing effect on the data.

- DESLOPE
  May be useful if your data was collected on a steep hill that caused slope-effect, or large trends in the data.

- INTERPOLATION
  This function generates new data points between existing data points based on mathematic formulas. This is primarily a visualization tool that will help you see patterns. Remember that it creates artificial, if carefully calculated data, and too much interpolation can turn a small data spike into a large feature, so be very intentional in your use of this. In general it is most useful to interpolate data so that it has an

even sample size in both the X and Y directions. For example if you collected 8 samples / m in the Y direction but 0.5m samples / transect spacing in the X direction, you could interpolate in the X direction to increase the samples to 8 / m.
Note: it may be necessary to interpolate to an even sample size before running some filters or functions.

- EXPORT or SAVE AS
  You may wish to export data at any stage in the process, from a single grid to raw or processed composite. Exporting allows you to import the data into another software package, such as Surfer. You may also export or save images of the data at any stage, generating jpg, TIFFs or other images for use in presentations or analysis.

- In addition to these functions there are numerous other processing or presentation steps you can use as needed. Trial and error will help you determine their effect on the data.