Cheatsheet for Trimble RTK GPS Set-Up

Updated by Caitlin Murphy, March 2010

General Notes:

- Before heading into the field, make sure you have the following equipment:
  - 2 large yellow plastic boxes
  - 1 smaller yellow plastic box
  - 2 yellow canvas bags
  - 1 car battery (with clip-terminals, such as brackets, butterfly nuts, etc.)
- COIL AND UNCOIL CABLES HAND-OVER-HAND (do not twist cables)
- Use a fresh car battery every day for the base station
- Take extra batteries for fixed GPS receiver and carry extras with you for the rover
- Charge receiver batteries every night
  - Recharge in center slot
  - Takes ~8 hours
  - EXPLICITLY TURN GPS RECEIVERS OFF WHEN DONE
- Connect battery last when setting up base station
- Make sure radio antenna bag is stored on top in car
- Be gentle with pole tip – breaking it will affects height measurement
- Be gentle with cords
- Base GPS receiver has a history of turning itself off towards the beginning of the survey, usually the hand-held controller is smart enough to tell you when this happens

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I. Setting up the Radio Antenna:

1. Set up yellow tripod roughly level (can step on corners and press them into ground).
2. Pull small black plate out of side pocket of the yellow antenna bag; it will be placed between the tripod and the antenna.
3. Assemble antenna and screw onto tripod.
   a. NOTE: the antenna includes 4 pieces, 3 of which are found in the antenna bag. The final piece is cable (I-3), which has a funny piece at one end that connects the antenna pole to the antenna.
   b. Choose longer tip for antenna
   c. Fully extend antenna pole and lock in position
4. Hang amplifier (yellow box with ridges on one side, labeled Trimmark 3) on tripod.
5. Plug in radio antenna to the port marked “Radio antenna” on the amplifier using the antenna cable (I-3). This connection MUST BE MADE BEFORE THE BATTERY IS CONNECTED TO THE AMPLIFIER (otherwise, it ***fries!***).
6. Attach one end of the long black coaxial cable with 7-pin Lemo connector to the I/O port of the amplifier (instruction continues below, II-10).
7. Plug the yellow cable with the big, 2-pin Lemo on one end and car battery connectors on the other into the center port of the amplifier. DO NOT YET CONNECT TO THE BATTERY.

II. Setting up the base GPS Antenna:

1. Set up the orange tripod roughly level and centered over benchmark (e.g. a nail)
2. Mount the tribrach on the tripod
3. Center and level the tribrach
    a. Crossways (2 knobs away from bubble)
    b. Long level (by bubble)
4. View through sidepiece to see/place benchmark
5. If the benchmark is not centered, this must be corrected
    a. Have the tribrach loose and translate the piece until the benchmark is centered (it is important to translate and not rotate, rotation will ruin the leveling you have done)
    b. If you cannot physically center the benchmark, move the tripod and repeat steps 3-5
    c. If you can center the benchmark but lose your leveling, repeat steps 3-5 as needed
6. Remove brass GPS antenna adapter from tribrach and screw into the larger Zephyr GPS antenna; screw the *long* right-angled connector cable (II-9) into the antenna
7. Mount the GPS antenna on the tribrach by tightening the side screw; measure the slant height from the benchmark to the bottom of the notch on the antenna rim in 3 places – should be +/- 1 mm – otherwise, remove the antenna and re-center / re-level tribrach
8. Find the GPS receiver that you CAN hang (i.e. has a silver clip on the back) on the tripod and REMOVE THE BATTERIES
9. Hang this GPS receiver on the tripod and connect the long right angle cable (II-9) to the GPS receiver using the spot marked “GPS”
10. Connect the second end of the long black cable with the 7-pin Lemo connector (from I-6) to the GPS receiver (radio symbol).

III. Setting up the Rover :

1. Screw together the rover rod (NOTE: there is a base-tip that is in the smaller yellow box).
2. Run the short cable with right angle connectors (III-2) through the track at top of pole.
3. Slide the hollow radio antenna over cable (III-2) and onto pole.
4. Attach the small Zephyr GPS antenna to top of pole and connect short right angle cable (III-2).
5. Put the GPS receiver bracket (small, grey plastic) on lower half of pole. (May already be done.)
6. Insert 2 fully charged batteries into the final free GPS receiver, making sure both battery indicator lights (“A” and “B”) light up. Then turn off the receiver until start of survey (IV.5).
7. Clip receiver onto the receiver bracket (III-5). (You’ll need to fold black butterfly-tabs toward the receiver to lock on; hold receiver until you know it is secured to the pole). Connect the GPS antenna cord (III-2) to the GPS receiver (look for appropriate picture).
8. Connect hollow radio antenna to GPS receiver using a short yellow cord with blue ends (III-8).
9. Add bracket for holding the controller (black metal).

IV. Conducting a Survey:

1. **Powering up:**
    a. Attach the yellow Trimble battery pack to port #2 of the GPS receiver attached to the Base GPS Antenna. NOTE: use this battery pack *instead of* the car battery here!
    b. The big, 2-pin Lemo power cable should already be attached to the back of the radio amplifier. Now, attach the leads of the power cable to the battery (making sure to match the lead & pin colors).
    c. Check that the displays on base receiver and radio amplifier turn on.
2. Connect yellow handheld TSCe controller/datalogger (C-DL) to base GPS receiver using short black 6-pin Lemo cable
3. Turn on the TSCe C-DL (navigate the TSCe by tapping the screen with a stylus)
    a. Run the *Survey Controller* program. Confirm that the receiver and TSCe are communicating by checking the upper right corner of the screen – the number of satellites will be displayed there if communication is occurring.
    b. Create a New Job: Single-tap *Files*; Select *Job Management*, then *New*. Assign a job name, highlight *Select coordinates from library*; hit *Enter*. Choose appropriate *UTM zone* (11 for CA) and the *WGS 84* datum; Hit *Store*. The top of the main screen should now display the job name.
    c. Begin base-station transmission: Select *Survey* → *RTK* → *Start base receiver*; Screen reads *Starting survey*. Type in an ID for the base (preferably all numeric) and hit *Key In*, followed by *Here*, and then *Store*. Type in antenna slant height measured under II.7 above. Confirm that transmit delay = 0 ms. Hit *Enter*. The screen will read *Starting Survey* again; then disconnect the TSCe when prompted. (If you have inserted a compact flash card into the base receiver, press the blue button on the base receiver to begin storing data on the card)
4. Insert the TSCe C-DL into the vice-bracket on the rover pole (see III.9 above) and attach firmly by tightening the bracket-knob.
5. Turn on the receiver attached to the rover pole.
6. Connect the handheld controller to port 1 on the rover GPS receiver using short black 6-pin Lemo cable. Again confirm connection by checking for the display of the number of satellites in the upper-right corner of the screen. Also confirm that the antenna height is 2 m, measured to the bottom of the small Zephyr antenna.
7. Start Survey:
    a. Select *Survey* → *RTK* → *Start Survey*
    b. Confirm that the (roving) antenna height is set to 2.0 m.
    c. Now record the observation: Give the point an ID (preferably numerical, so the program can automatically increment the point names); Confirm method is *Topo point.* Make sure

that the rod is level, Hit *Measure*. Stay in place until the rover initializes (seconds to minutes). When the RMS misfit is 1-2 cm, hit *Store*.

8. End Survey:
    a. Hit *Esc* to go to the main screen.
    b. Select *Survey → RTK → End Survey.*
    c. This will turn off receivers on both the base and rover. Double check and if not turned off, do so manually.
    d. Pack and stow everything into the yellow suitcases and cloth bags.

V. Downloading Trimble Data to laptop:

Be sure you are using the appropriate computer for data downloading. Ideally, you want to use Field 16, which has Trimble Geomatics Office loaded on it. Alternatively, you can get your data off of the controller using Field 11 or 18, which has Trimble Data Transfer loaded on it. (Note: after getting your data onto Field 11 or 18, you'll have to transfer it to Field 16 for plotting.) Make a folder for the day's data in the appropriate directory (within RTKGPS folder).

Va. Downloading data using Trimble Data Transfer (Field 11 or Field 18)

1. Connect Trimble controller to laptop using the computer-logger power cable (with a 7-pin Lemo, serial cable, and charger). Note: it is a good idea to charge the controller while transferring the data!
2. On the laptop, go to *Start → Programs → Trimble Data Transfer → Data Transfer*
    a. Under *Device* select "Survey Controller on COM 1"
    b. Select the *Receive* tab
3. Turn on the controller and start the Survey Controller Software
    a. Go to *Files → Import / Export → Trimble PC Communications*
4. In Data Transfer, click *Connect* (an icon with a cable and a green check mark)
    a. Click *Add*, and select the appropriate job
        i. Files of type "Survey Controller Filers"
        ii. File Format "SDR33 Format DC File"
        iii. Click *Open*
    b. Click *Transfer All*
    c. Once the transfer is complete, disconnect and power off the controller (but leave it charging)
5. You will now need to transfer your *.dc file to Field 16 to use Trimble Geomatics Office.

Vb. Downloading data using Trimble Geomatics Office (TGO) (Field 16)

1. Connect Trimble controller to laptop using the computer-logger power cable (with a 7-pin Lemo, serial cable, and charger). Note: it is a good idea to charge the controller while transferring the data!
    a. Start the Survey Controller Software
2. Open Trimble Geomatics Office (TGO)
3. Start a new project
    a. Give it a name; including the date is recommended
    b. Be sure to save it in the folder for the day's data
    c. For project properties, choose ANYTHING BUT the *default* (say, *metric*), then hit *OK*.

   d. Hit okay
4. Click on Import on left panel
   a. Go to Survey Device
   b. Select the appropriate device (*Survey controller).*
   c. Hit *Open*
   d. On the controller (in the Survey Controller Software) go to *Files → Import / Export → Trimble PC Communications*
   e. The laptop should now show the data files from the Controller.
   f. Select the appropriate data file
      i. Files of type "Survey Controller Files"
      ii. File Format "DC File v10"
      iii. Click *Open*
5. TGO should now show your data in map view.

To export data from Trimble Office so it can be used in Excel and ArcMap.

6. Export data to Arc file
   a. Go to file
   b. Go to export
   c. Select the GIS tab
   d. Select 'Arcview shape files (points and lines)'
   e. Hit okay
   f. Hit okay

7. Export data to ASCII file
   a. Go to file
   b. Go to export
   c. Select the Custom tab
   d. Select Ge111 if it is there (info should be around on how this is formatted)
   e. Hit okay
   f. Save appropriately