Installing, testing and updating DTAG-4 tags

Mark Johnson
3 December 2016
markjohnson@st-andrews.ac.uk

- If you want to check a tag that has been delivered to you in test mode, go to section 1.
- If you want to install drivers and operate a DTAG-4, go to section 2.
- If you want to setup a DTAG-4 or offload data and already have drivers installed, go to section 3.
- If you need to update software on a DTAG-4, go to section 4.
- If you want to learn about the configuration settings for DTAG-4, see document: d4_configuration.pdf.
- If you want to learn how to work with recordings made by a DTAG-4 see document: d4_data.pdf.

1. Test mode

DTAGs may be delivered pre-configured allowing them to be attached directly to an animal without field configuration. There is however a small possibility that the software in the tags is corrupted by x-ray machines used in airports (hand luggage, checked luggage and shipped boxes may all be inspected by x-ray). To detect corruption, the tags may be configured with a test mode allowing the full software to be run for a short interval as if under field conditions. Test mode is triggered by plugging the tag briefly into a USB port on a PC using the provided D4-USB dongle. The PC must be powered but does not need to have any software installed. A green light (orange in older versions) will illuminate in the tag while USB is connected and will extinguish when USB is disconnected. If the tag software is functional, the same light will illuminate again after 10 seconds. It will stay lit for about 1-2 seconds and will then flash briefly 3 times at approximately 5 s intervals. The tag will then go back to sleep waiting for its pre-configured wakeup condition. The tag is now ready to use. The test procedure (i.e., plugging and unplugging USB) can be repeated as many times as required. If the lights do not flash in the above sequence, it could mean that the software is corrupt and must be re-installed. Installing new software requires first that you install drivers for the tag on your PC (see section 2). Then you will need to run the d4host software on your PC to talk with the tag (see section 3). Note that if the test mode has not been enabled in the tag, plugging and unplugging USB will not trigger the light sequence described above and so there is no indication as to whether the tag is in good state or not. If in doubt, check with whoever sent the tag as to whether test mode was enabled. If the test mode fails and re-installation is required, please report this to the above email address along with the transport method that the tag underwent (e.g., hand carry, checked luggage, courier).

2. Installing drivers

The DTAG-4 uses the same USB drivers as the Soundtrap manufactured by Ocean Instruments. If you are already using Soundtraps on your computer, you are ready for DTAG-4. If not, install the Soundtrap software from www.oceaninstruments.co.nz. On the home page select the Support tab and the Software Download menu item. Select the 32 bit or 64 bit version of the software as appropriate (you can find out which type of operating system your computer is using by entering 'system' in the Start -> Search box (Windows 7 bottom left corner of screen) or Search box (Windows 8 or 10) and then selecting 'System' or 'System Information' from the search results. Look for 'System Type' in the system summary information that is shown). Right click on the software you want to download and select 'save link as'. Then navigate to the directory in which you saved the software and double click on the SoundTrapHostInstaller... file that was saved. Note that the install software may be downloaded with a .msi.txt suffix which will prevent it from running. If the installer will not run when you double click on it, make sure that file name extensions are displayed in your folder view (in Windows 8 and 10, click on View at the top of the folder screen and then tick the box next to File Name Extensions; in Windows 7, click on Organize at the top of

the folder screen, select Folder and Search Options and then in the View tab, make sure that Hide Extensions for Known File Types is not ticked). Once the Soundtrap installer is running, accept the default installation configuration and wait for installation to complete. A SoundTrap Host icon will appear on your desktop. This is the user interface you would use to communicate with a SoundTrap recorder but NOT with a DTAG. The DTAG user interface is called d4host and you can download this from: www.soundtags.org/dtags/dtag-toolbox. Select d4host in the download list and save the zip file on your PC in a convenient directory. Unzip the file by double-clicking on it and selecting 'Extract all files'. A sub-directory called d4host will be created containing the d4host.exe program along with other software tools for the DTAG-4. You are now ready to communicate with the tag.

3. Communicating with DTAG-4

When the SoundTrap drivers are installed on your PC, plug in the D4-USB dongle to the tag and connect it by cable to your PC. A green light (orange in older versions) should illuminate in the tag. Note that the D4-USB dongle is polarized to avoid incorrect insertion. One pin in the socket is blocked and the dongle is thicker on one side (the printed circuit board side) of the socket than on the other. Make sure that the dongle is inserted into the USB connector on the DTAG in a way that matches these polarizing features. Once the tag is connected to the PC, run d4host.exe, e.g., by double-clicking on the icon. A black screen will open with a sequence of messages as the PC looks for, finds and reboots the tag. Eventually, a set of information about the tag will appear followed by a menu of options. Note that currently only one DTAG at a time can be plugged into the same computer. Also, although the SoundTrap device drivers are used by the DTAGs, do not use the SoundTrap Host program to talk to DTAGs. Likewise, do not use d4host.exe to talk with SoundTraps. These two devices require different user interface software. Finally, it is also not possible to have both a DTAG and a SoundTrap plugged into the same computer. These limitations will be removed in later versions of the software.

The following menu options are available in d4host:

1 Get directory	Show a list of files generated by the tag. Files are given sequential numbers rather than names and the list includes the start and approximate end time of each file (the information shown about each file changes if the full menu mode is selected using menu option t).
2 Read files	Offload one or more files to the host PC. You will be asked to enter the file numbers to be downloaded. You can enter a range of files e.g., 5-17 or a list e.g., 3,4,6. You will then be asked for the name base for the files. The file number in three digit format (e.g., 017) will be automatically appended to this name. The offloaded files will be in DTG archive format which can be expanded using d4read.exe.
3 Erase files	Erase one or more files. You will be asked to enter the file numbers to be downloaded. You can enter a range of files e.g., 5-17 or a list e.g., 3,4,6. Note that memory is only freed up when the last files in the directory are erased. Erasing only earlier recordings will not free the memory until the most recent recordings are erased. Warning: once a file is erased it is NOT possible to un-erase it. Make sure you have two backup copies of valuable recordings and that each offloaded file has the correct size before erasing files on the tag.
4 Battery	Show the tag version, battery voltage and charge status. Two voltages are given. The first is for the built-in battery and the second is the voltage available for charging from the USB connection. The charge status is 0% for a strongly discharged battery and 100% when charging is complete. Ignore this number if the internal battery is not rechargeable (see menu option s if you are unsure which type of battery you have).
5 Set data directory	Allows you to define where recordings are saved to. Enter the full path

name of the directory you want to use, e.g.: C:/bartholomew/dtag. Unfortunately pasting is not supported in this window so you have to type in the path.

6 Save directory Save a complete listing of the files in the DTAG. This will generate a CSV (comma separated variable) file that can be read in a text editor or spreadsheet. The columns will be the file number, start time, end time and size. If the full menu mode is selected, additional columns related to the location of the files in memory will be shown.

7 Load application Update the application software in the tag. This will automatically erase the code memory in the tag and read code from a file called _app.bin in the same directory as d4host.exe. The new application will run the next time that the tag wakes up to record.

8 Get application info Show the name, date uploaded and date last modified of the currently installed application.

9 Save status Generate a file describing all of the current settings, recordings and capabilities in the tag. The file is in XML format and can be displayed in most browsers and text editors. This menu option is useful to store a record of how a tag is configured before a deployment e.g., in case you need to check when it should by recording or should release.

c Configure Enter the configuration menu. This is used to set the conditions under which the tag will start and stop recording, and what it will record. See document d4_configuration for details on this menu.

d Download deployment Download all of the files in a deployment. A deployment often generates multiple files in the tag because individual files are constrained to be less than 700 MB and less than 2^{31} audio samples for compatibility with audio analysis software. These files can be offloaded using menu option 2 but this is not robust to a USB communication failure. Menu d provides a robust offload which can be resumed after a failure. After selecting d, enter the numbers of the files generated in the deployment from the directory listing. Then give the base name of the deployment, e.g., mn17_123a. The files will be offloaded sequentially and the file number in three digit format (e.g., 017) will be automatically appended to the base name. The offloaded files will be in DTG archive format which can be expanded using d4read.exe. An XML file named after the deployment name (e.g., mn17_123adat.xml) will also be generated containing the current settings and capabilities of the tag as well as a directory list of the files in the deployment. Offloading can be paused at any time by typing any character. Select menu option d again to resume an incomplete offload. In the event of a USB communication failure (e.g., due to the USB dongle detaching from the tag), reattach the dongle, restart d4host.exe and select menu d to resume offload. Note that this only works within the same computer - you cannot resume an offload that was started on another computer.

s Show device attributes Show the capabilities of the tag including its audio sensitivity and bandwidth, maximum pressure, battery capacity and recharge time, and VHF frequency (if applicable).

t Toggle mode Show or hide the full menu. The default is to show the short menu but pressing t will reveal additional maintenance options which should only be used by expert users or when told to do so. Pressing t again will revert to the short menu. In the full menu mode, the directory display (menu 1) is also changed to include information about where in the memory files are stored.

Maintenance options appearing in the full menu:

Do not use these features unless instructed to do so.

b Load boot code to eeprom	Update the boot software stored in EEPROM. See section 4.
e Read eeprom	Read the contents of the eeprom to a binary file. Debugging use only.
f Flash parameters	Used to check if all memory chips are installed. Debugging use only.
r Read application	Read the flash code memory to a binary file. Debugging use only.
c Flash clear	Do not use! Debugging use only.
g Get bad blocks	Do not use! Debugging use only.
m Set bad blocks	Do not use! Debugging use only.
o Get attributes	Generate a file in the d4host directory with the tag attributes.
p Set attributes	Update the tag attributes from a file.
w Program MSP	Update the wakeup software stored in the MSP. See section 4.
v Read MSP code version	Check the current version and date of the wakeup software.

4. Updating software

DTAGs contain 3 separate pieces of software each of which must be downloaded to the tag. The software components are called: 'wakeup', 'reboot', and 'app'. Details on the function of each, how to diagnose that it is working correctly, and how to update it are given below.

Wakeup: This software controls when the tag starts up and stops recording. It also runs the VHF beacon and keeps track of time. The software resides in FRAM (non-volatile ferro-electric RAM) in the wakeup microprocessor. If the wakeup software is not working correctly, the tag will not wakeup and record irrespective of the settings in the configuration menu. The name and date of the currently installed wakeup software can be found by selecting the complete host menu in d4host by typing the letter t and then typing the letter v. To install new wakeup software you need to use a D4 USB dongle with a 9V battery clip. Put a 9V battery on the clip and plug the dongle into the tag and PC as usual. Select t in d4host for the complete menu and then menu option w. You will be asked to press the backdoor button. This is the push button on the D4 USB dongle. Press it firmly and hold it while also pressing any key on the PC keyboard. Then release the backdoor button and press another key on the PC keyboard. The wakeup software should now load and this will take several seconds to complete. When loading is complete, unplug the USB connector from the PC leaving the dongle plugged into the tag. Press and release the backdoor button to restart the new wakeup software. Plug the USB connector back into the PC and run d4host. Select menu option t followed by option v to report the name and date of the wakeup code. Check that the date matches the date on the file _msp.txt in the d4host directory. You should now test the tag by configuring it to start immediately and then unplugging the dongle. The tag should immediately illuminate the green light for 1-2 seconds. If this happens, the wakeup code is functioning. Stop the tag recording by plugging in the dongle once more and configure it as required.

Reboot: This software is run whenever the tag starts up and is needed to read in the app software from flash memory. It resides in an EEPROM on the tag. The reboot software should only need to be updated under rare circumstances. To do so, select the complete host menu in d4host by typing the letter t. The full menu should show an option b. Select this and the reboot code will be automatically updated from a file called _eeprom.bin in the same directory as d4host.exe. To test the reboot code, follow the same test procedure as for the app code - both software components must be functioning for this test to complete.

App: This is the application software that the tag runs to acquire and record data from its sensors. The app is stored in the flash memory in the tag and information on the currently installed app is returned when you select menu option 8 in d4host. To test the app code, use the configuration menu (menu option c) to setup the tag to record immediately. Unplug the USB and the tag should immediately illuminate the green light for 1-2 seconds followed by 3 brief flashes of the same light. If this happens, the app code is functioning. Stop the tag recording by plugging in the dongle once

more and configure it as required. To install a new version of the app code, select menu option 7. This will automatically erase the flash memory used to store the app and will then copy a file called _app.bin from the same directory as d4host.exe into the flash memory. Note that only the app part of the flash memory will be altered - any data recordings will be unaffected; likewise erasing data recordings will not affect the app part of the memory. To update the tag to a new application code, change the name of the software file to _app.bin and put it in the d4host directory before selecting menu option 7. When this is complete, check that the date of modification and installation are correct by selecting menu option 8. Finally perform a test on the new code as described above.