

**ACCELEROMETRY - Memphis****TABLE OF CONTENTS**

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## ACCELEROMETRY

### 1. Background and rationale

Physical inactivity is an important health risk factor and strongly related to disability, morbidity, and increased risk of mortality. Therefore, accurate estimates of physical activity are crucial for both clinical and public health applications. In epidemiological studies, physical activity data are typically collected through self-report. The commonly used methods of survey and self-report frequently yield physical activity data that are inaccurate and limited. Self-reported physical activity suffers from significant reporting bias attributable to a combination of social desirability bias, and estimating frequency and duration of physical activity is cognitively challenging, especially among older adults. The development of accelerometry as an objective measure of physical activity has opened up new possibilities for studying all intensity levels of physical activity levels from completely sedentary to vigorous activity over a number of days. An accelerometer measures the existence and intensity of motion in terms of “counts.” Data can be collected in short epochs (e.g., 1, 15, 30, or 60 seconds). The devices are small, easy to use, and can store data for multiple days. The accelerometer counts can be used to classify motion as sedentary, low intensity, moderate intensity, and high intensity based on cutoff points derived from validation studies. In addition, whether these cutoffs are appropriate for use in old age is unclear. Thus, rather than applying these cutoff points, the raw data can also be used to evaluate patterns of physical activity.

### 2. ActiGraph equipment and supplies

- ActiGraph GT3X+
- ActiGraph waist belt for hip worn device
- ActiGraph wrist strap
- USB hub charging station



ActiGraph  
GT3X+



Waist belt



Wrist (arm) strap

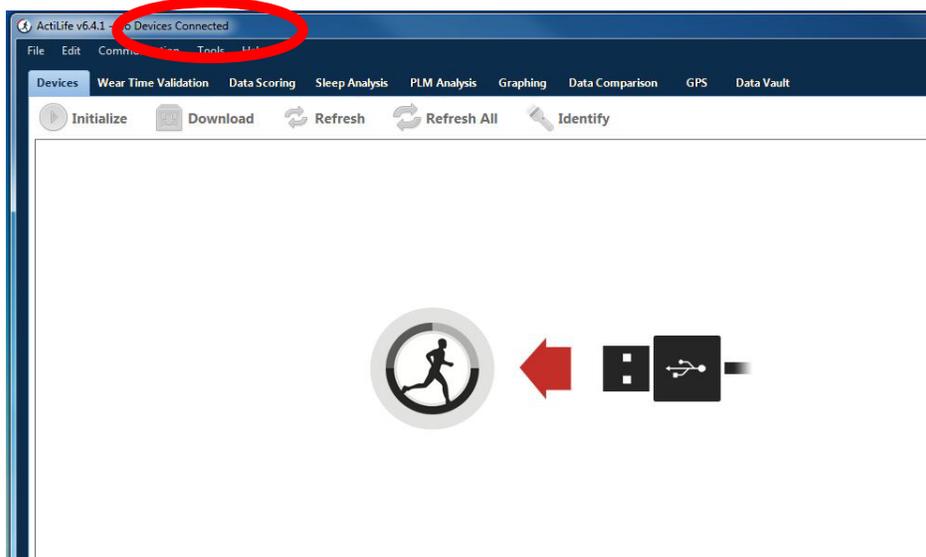


USB hub charging station

## 2.1 ActiGraph setup

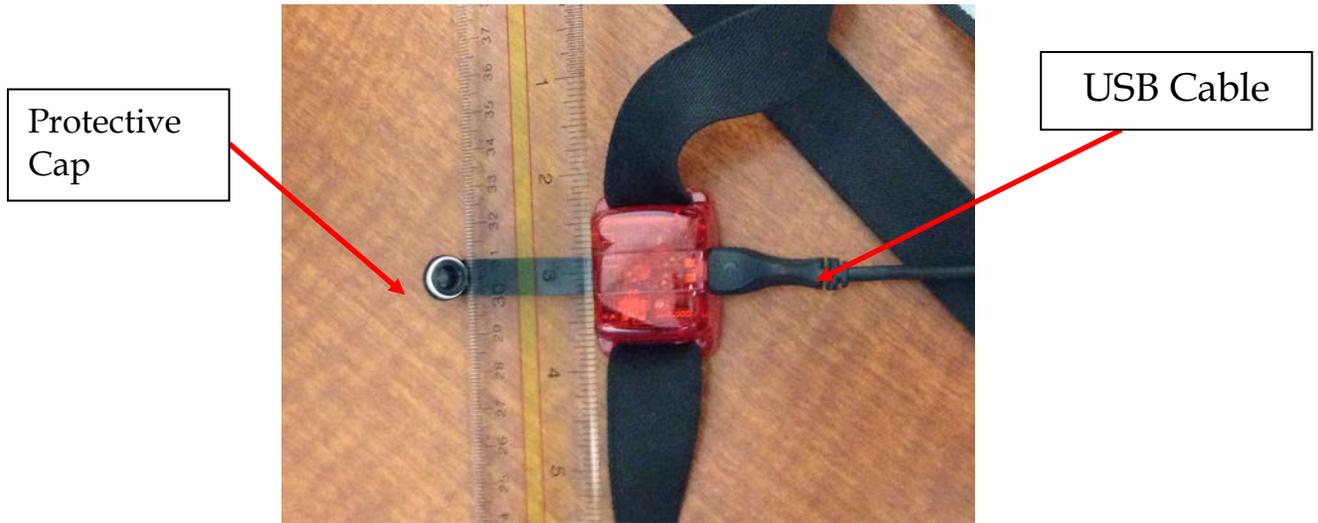
The initial set up of the ActiGraph devices must be done before the participant comes in for the first clinic visit. **The device for the hip and the device for the wrist are the ActiGraph GT3X+.** Instructions for setup of hip and wrist devices are the same unless noted below. Hip and wrist devices cannot be set up or initialized at the same time. We suggest that the hip device be initialized first. When hip device initialization is complete, begin initialization of wrist device by repeating instructions in section 2.1.1 below and using settings indicated for the wrist device.

Start the ActiLife software.



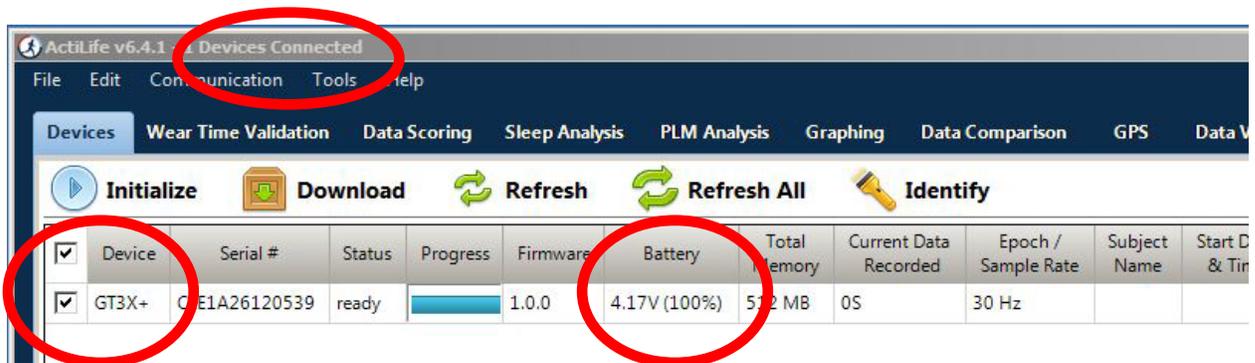
### 2.1.1 Connect device to computer

Plug the ActiGraph GT3X+ into the USB Port using the USB cable. You must first unscrew the protective cap (i.e., black circle) from the side of the ActiGraph GT3X+ to expose the connection port for inserting the USB cable. A penny or flat-head screw driver can be used to open the protective cap.

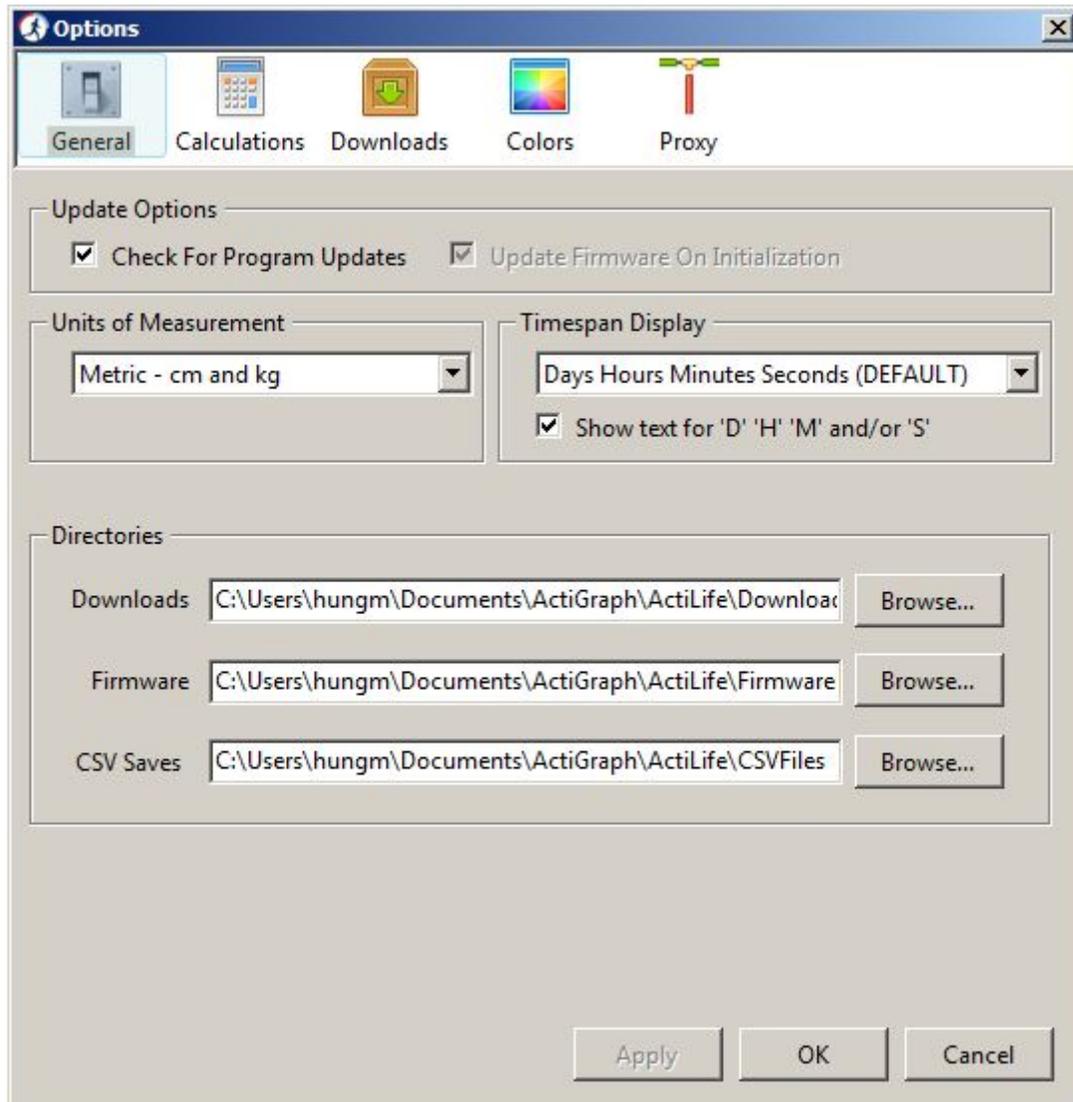


The ActiGraph GT3X+ connected to the USB cable.

Software will recognize the device and indicate “Device Connected” at top of window. Please note that Battery should be at 100% prior to assigning device to a participant. You may need to check the box next to the Device column to select the device before starting the initialization process.



The first time ActiLife software is used at your field center, it may be necessary to reset the “Units of Measure” to metric to allow entry of height in centimeters (cm) and weight in kilograms (kg) later in the device initialization process. Click on “Tools” from menu at top of ActiLife main window, Select Options, and use the pull-down menu for Units of Measure to select “Metric – cm and kg” as is pictured below. Click on Apply, then click on OK.



Both HIP and WRIST accelerometers:

To start initialization of the device, click on the “Initialize” button (NOTE: The ActiGraph must be plugged into the USB Port before clicking this button). Set the following in the Initialize Devices window:

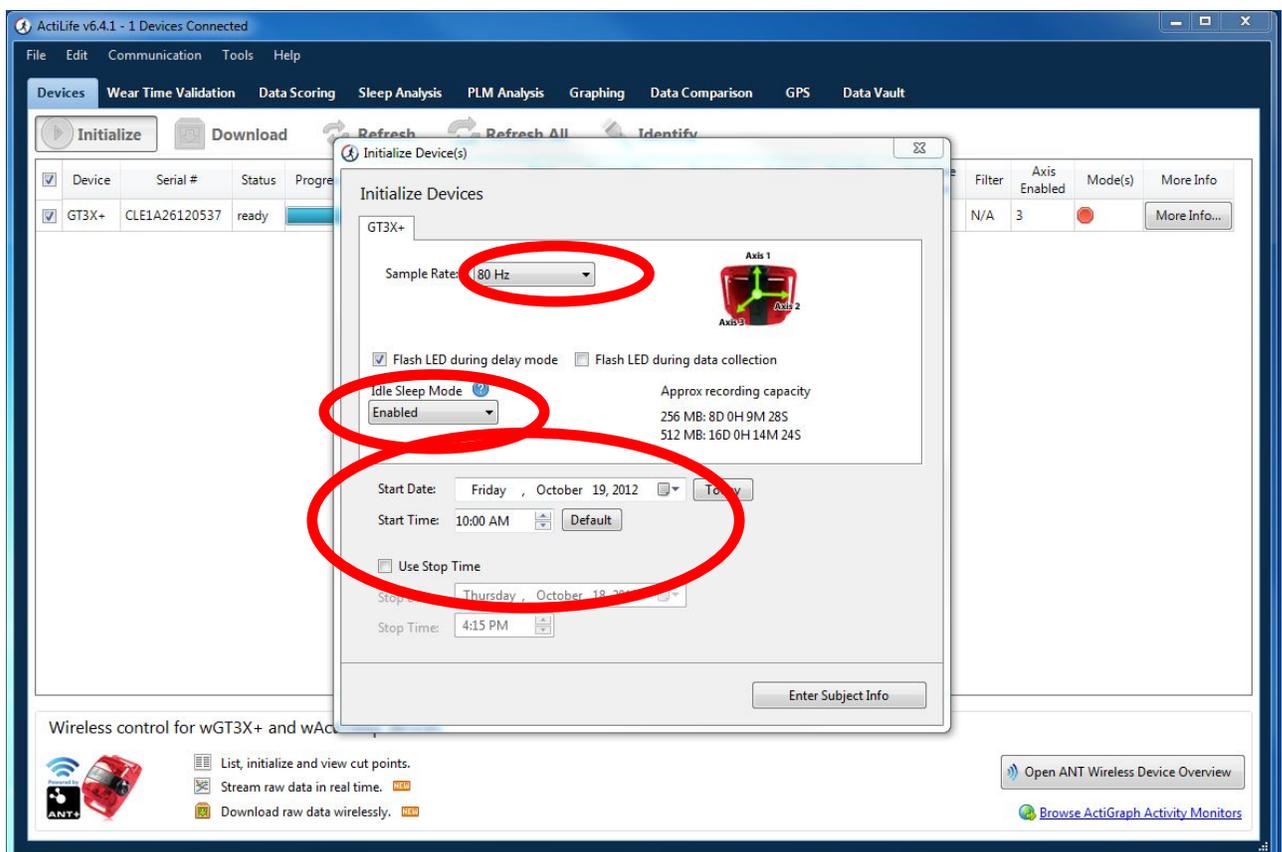
Sample Rate: 80 Hz.

Idle Sleep Mode: Enabled.

Start Date: Enter Date and Time of Participant’s HEALTH ABC CLINIC or HOME VISIT for the current year’s visit.

This should be used to check that the monitor **will begin recording** at the correct time.

Click on the “Enter Subject Info” button to complete this step.



**HIP** Accelerometer Settings:

“Enter Subject Information for Initialization” screen will open. Enter the following:

**Subject Name:** enter the Participant’s field center code (HA for Memphis) and their 4-digit Health ABC ID number.

**Gender:** enter male or female.

**Height:** enter height in cm from height recorded in cm in Year 16 Clinic Workbook (you’ll need to change mm to cm; e.g., 1524 mm would be 152 cm). If this is a home visit, find the participant’s last height measurement on the Data from Prior Visits Report.

**Weight:** enter weight in kg recorded in Year 16 Clinic or Home Visit Workbook.

**DOB:** this can be left blank to comply with HIPPA regulations.

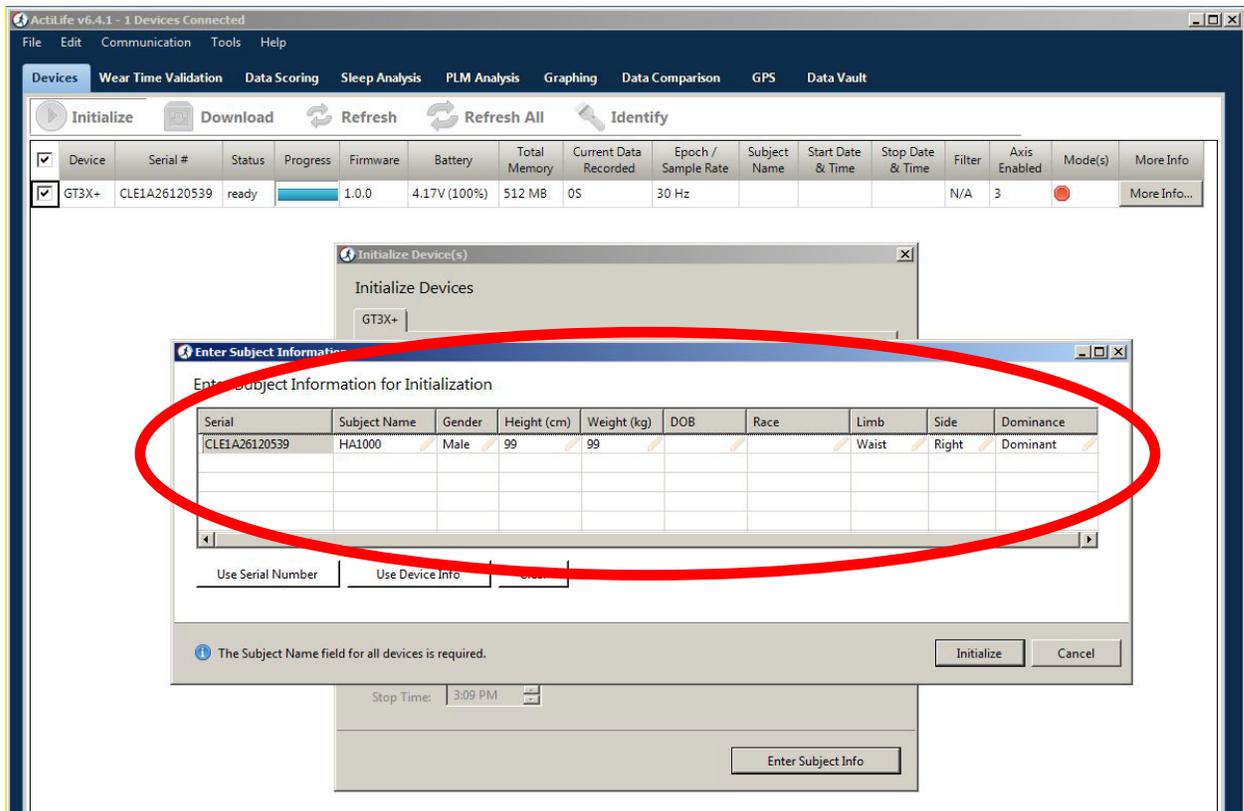
**Race:** this can be left blank.

**Limb:** select WAIST.

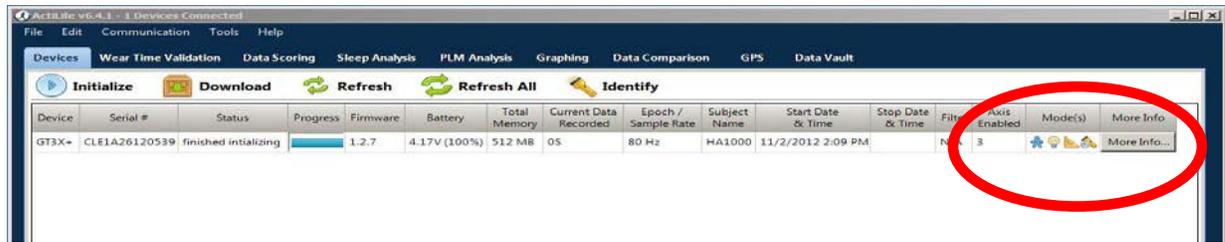
**Side:** enter RIGHT (all waist monitors will be worn on the right hip).

**Dominance:** Check Data from Prior Visits Report for “which hand does participant use to write with.” If it is “right,” enter DOMINANT for right hip (waist). If it is “left,” enter NONDOMINANT for right hip (waist).

Click on “Initialize” button at bottom of “Enter Subject Information” screen to complete this step.



Note that once the hip accelerometer is initialized, the Mode(s) for data collection should be those in the red circle below. You will also see the Participant's ID number and the set start date and time.



**Wrist** Accelerometer Settings:

“Enter Subject Information for Initialization” screen will open. Enter the following:

**Subject Name:** enter the Participant’s field center code (HA for Memphis) and their 4-digit Health ABC ID number.

**Gender:** enter male or female.

**Height:** enter height in cm from height recorded in cm in Year 16 Clinic Workbook (you’ll need to change mm to cm; e.g., 1524 mm would be 152 cm). If this is a home visit, find the participant’s last height measurement on the Data from Prior Visits Report.

**Weight:** enter weight in kg recorded in Year 16 Clinic or Home Visit Workbook.

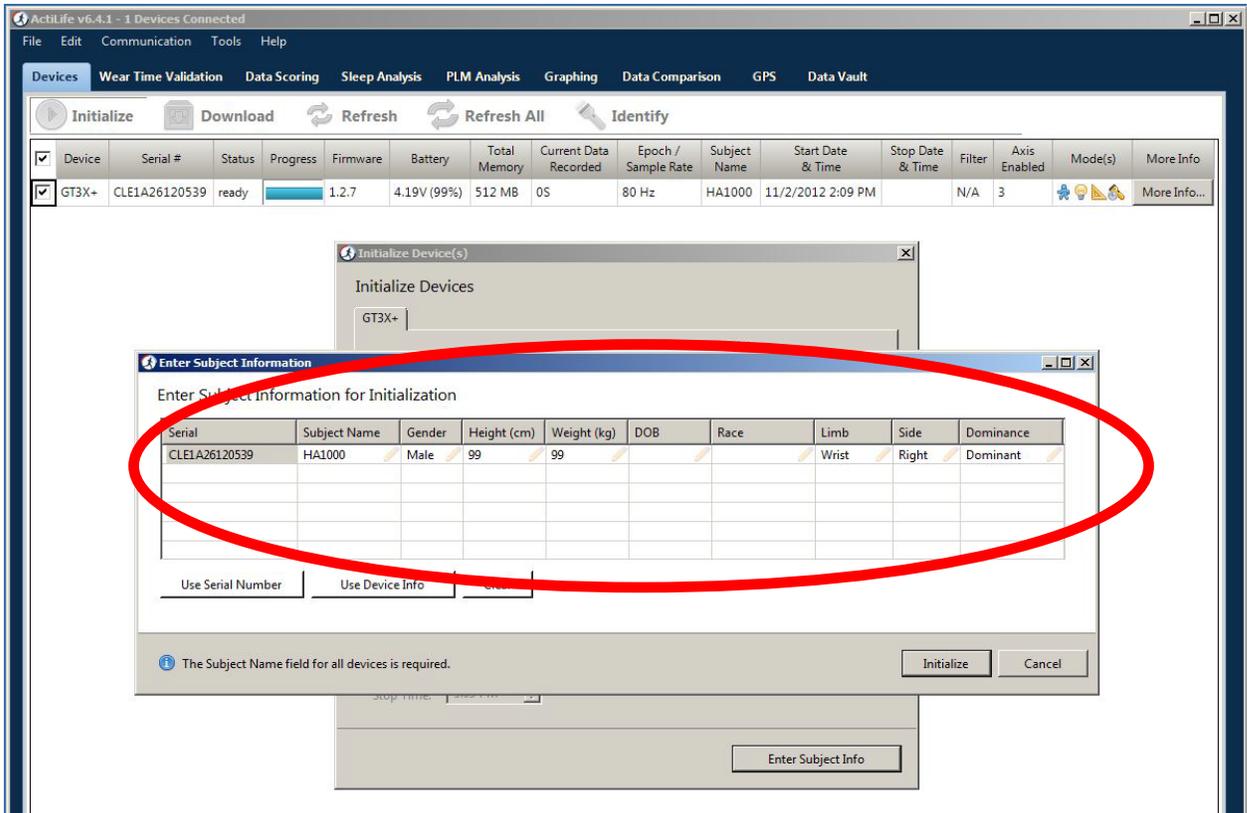
**DOB:** this can be left blank to comply with HIPPA regulations.

**Race:** this can be left blank.

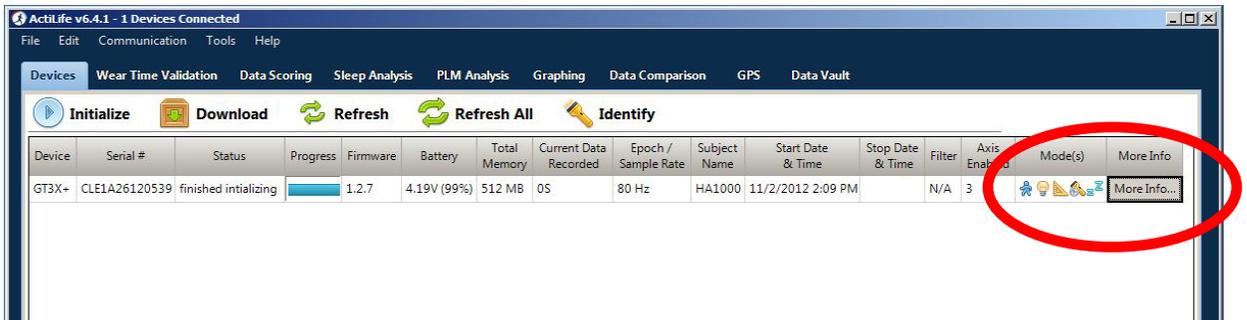
**Limb:** select WRIST.

**Side**

**Dominance:** Check the Accelerometer Screener and Distribution Form for “hand used to write with” and enter accordingly for indicated side. Have participant wear accelerometer on their dominant side (the side used to write with) unless contraindicated. Enter DOMINANT for the device. Click on “Initialize” button at bottom of “Enter Subject Information” screen to complete this step.



Note that once the wrist accelerometer is initialized, the Mode(s) for data collection should be those in the red circle below. The sleep or “ZZ” mode is now activated because the wrist device should be worn during sleep. You will also see the Participant’s ID number and the set start date and time.



Both HIP and WRIST accelerometers:

Disconnect the ActiGraph from the USB Cable. The devices' green LED light may flash intermittently until the monitor starts recording data, then the light will cease to flash; i.e., no flashing when the GT3X+ is not connected to the computer via a USB indicates that the monitor is collecting data.

Congratulations! You are now ready to place the ActiGraph devices on the participant and collect activity data!

## 2.2 Complete the Accelerometer Screener and Distribution form

At the clinic or home visit, when you give the participant the hip and wrist ActiGraph devices, complete the Accelerometer Screener and Distribution form (Page M27, Questions #3 and #4). Record the participant's Health ABC ID#, Acrostic, Staff ID# of person completing the form; whether or not the participant received a hip and wrist ActiGraph, reason the participant didn't receive either hip or wrist ActiGraph, if applicable; the last five digits of the serial number of the hip ActiGraph and the wrist ActiGraph, the date the ActiGraph was initialized, set to start recording, and time the accelerometer(s) were set to start recording.

## 3. Placement of ActiGraph

### HIP

The hip-worn ActiGraph comes with a waistband that will be worn around the hip. It should be worn on the right hip (as close as possible to the **iliac crest**). It is important that the accelerometer is fastened tightly to the belt or measurements will be inaccurate. The accelerometry can be worn either over or under clothing. Also, it is important that the accelerometer is worn in exactly the SAME POSITION EACH DAY. In the correct position, as pictured below, the USB port faces down.



**The end with black circle is always facing down.**

**WRIST**

In Memphis, only one wrist ActiGraph will be worn. Using the Velcro wrist-strap, fasten the ActiGraph monitor to the participant's dominant wrist. It is important that the accelerometer is fastened tightly to the strap and stays firmly in place or measurements will be inaccurate. The wrist monitor should be worn as a wrist watch is worn. It is important that the strap is fastened tightly so that the accelerometer does not slide or turn around the wrist. The black circle (protective USB cap) should face toward the participant's hand.



**The end with black circle faces toward the hand.**

**4. Eligibility, safety issues and exclusions**

Participants may be ineligible for the accelerometry measurement due to poor cognitive function. Check the Data from Prior Visits Report to see if participant's last TICS score from the quarterly phone interviews was 20 or lower.

There are no general safety issues for the accelerometry measurement.

**5. Measurement procedures**

The ActiGraph GT3X+ will begin to record movement at the pre-set "Start" date and time as described in section 2.1 above. Participants need only to wear the device as prescribed. There are no buttons, knobs, or dials for them to adjust during the 8 days during which they will wear the device.

**Participants should not wear the HIP device during sleep, bathing or showering, and swimming.**

**The WRIST device should be worn all day and all night, including during sleep, but not during bathing, showering, or swimming.**

**5.1 Explain accelerometry to participant**

On the day of the participant visit the examiner will explain the research project to the participant:

Script: "The purpose of this exam is to measure physical activity in older adults. We're interested in studying the relationship between a person's normal physical activities and their ability to do daily tasks."

If the participant agrees to enter the study then the examiner will explain how to wear the accelerometers and then fit the elastic belt for the participant's hip device and the arm-strap for the wrist device.

## 5.2 Accelerometer placement and instructions

1. Fit the belt around the participant's waist, per guidance in section 3 and explain:

Script: "You will wear two accelerometers – one on your hip and one on your wrist. Think of each of these as a tiny, very expensive electronic diving board. When you move, the "diving board" bounces. Creating useful information from the "diving board" recordings requires sophisticated computer software. Your activity is based on the bounce rate and bounce height. When you return the monitors to us, the recordings will be downloaded into a secure computer that will translate them into meaningful physical activity information.

The first accelerometer is on a belt to monitor your physical activity. First we will need to fit you for the monitor belt. If you'll please raise your arms, I'll put this belt around your waist. Now remember, the monitor is supposed to be just above your right hip, directly under your right armpit, and the belt will be worn on your natural waist with the buckle in front (examiner should have belt snug now with the monitor just above the right hip directly under the participant's right armpit). Is that comfortable? OK, now do you see where the monitor is above your right hip, directly under your right armpit, with the belt buckled in front? That is where you should wear it each day, and you can wear it underneath your clothing against your skin or on the outside of your clothing. The thing that matters is that you wear it in the same place every day like we have it now. **Make certain the black circle faces down.**

You also want to make sure that the monitor is snug against your hip and that it doesn't flop around. If it begins to loosen, you can tighten the belt by pulling the end through the buckle like so (examiner demonstrates by pulling elastic through buckle to tighten).

The second accelerometer is worn like a watch on your wrist and will also monitor your activity. The black circle on the monitor should face towards your hand. Remember that you should wear this all day and night, even when you are sleeping. You can take it off when you are bathing or swimming, but please remember to put it back on when you are finished with bathing or swimming."

2. Present and explain the Activity Monitor Log to the participant (Appendix 1).  
The examiner should record the days and dates that the participant will be wearing the accelerometer on this monitor log.

Script: "OK, now we're going to talk about when you're supposed to wear the monitors and how to keep track of them. The wrist accelerometer should be worn 24 hours a day but

not when you are showering, bathing, or swimming. You should put the hip accelerometer on when you wake up and take it off at night before you go to bed. Other than that you must wear it all day. The only time you should take the hip monitor off during the day is if you take a shower, bath, or participate in any pool or other water activities. So, please remember to wear the monitor all day and every day for 8 days in a row, starting today. Now if you look at this Activity Monitor Log, you can see at the top that I have marked each day and date that you are supposed to wear the monitors. In the spaces below on Day 1, Day 2, etc., please enter the time you put the hip monitor on in the morning and the time you take the hip monitor off at night. Remember you will wear the wrist monitor all day and while you are sleeping. If you happen to forget to wear the monitor on any day, you should write that on the monitor log page by making a note in the margin, and wear the monitor an extra day to make up for the one you missed. Be sure to record the actual dates you wore the accelerometers on your monitor log. For example, if you skipped Day 2 and the date that had been recorded at the clinic for Day 2 was 11/5/13, you would wear the accelerometer on 11/6/13, cross out 11/5/13, and record 11/6/13 directly beneath the crossed out date in the Day 2 section since 11/6/13 is the second day you wore the accelerometer. Each day after that, you should cross out the date already recorded and record the correct date directly below the crossed out date.”

3. Explain the accelerometer monitor return process.

Script: "OK, now I need to tell you how to return the monitors. Here is a pre-addressed, pre-paid FedEx mailing envelope that you will use to return the monitor. It is very important to know that only FedEx can accept this envelope. The post office or UPS won't take it. You will put the monitors, the belt, and wrist-strap inside the envelope along with your completed Activity Monitor Log and make sure it's sealed securely. Then you can take the envelope to a FedEx-Kinko's store, drop it in a FedEx drop box, or call the FedEx number at the bottom of the Activity Monitor Log instruction sheet and schedule FedEx to come pick up the package for you. The easiest way to return the envelope is to call FedEx and schedule a time to pick up the package from your home."

4. Hand the participant the Activity Monitor Log instructions (page 1 of Activity Monitor Log packet) (Appendix 1). At this time, the examiner will answer any questions the participant may have and provide them with the site phone number to call if they have any questions after they leave the site. This phone number should be written out at the bottom of the instructions page of the Activity Monitor Log.
5. Record the dates that the monitor should be worn on the Activity Monitor Log (Day 1 through Day 8), place in an envelope and give to the participant to take with them. The participant will continue to wear the monitors home so the first day the monitors will be worn from the time the participant is fitted with these monitors.

The pre-labeled FedEx return envelope can be used to hold the forms.

## 6. ActiGraph returned to field center

Every Monday the site coordinators will check their site-specific visit-specific ActiGraph Accelerometer Tracking Sheet for accelerometers that are overdue. The site coordinator will be responsible for calling the participant and reminding them to return the accelerometer package to the field center using the pre-labeled FedEx [or other express mail carrier] envelope they were given.

### 6.1 Complete the ActiGraph Return form

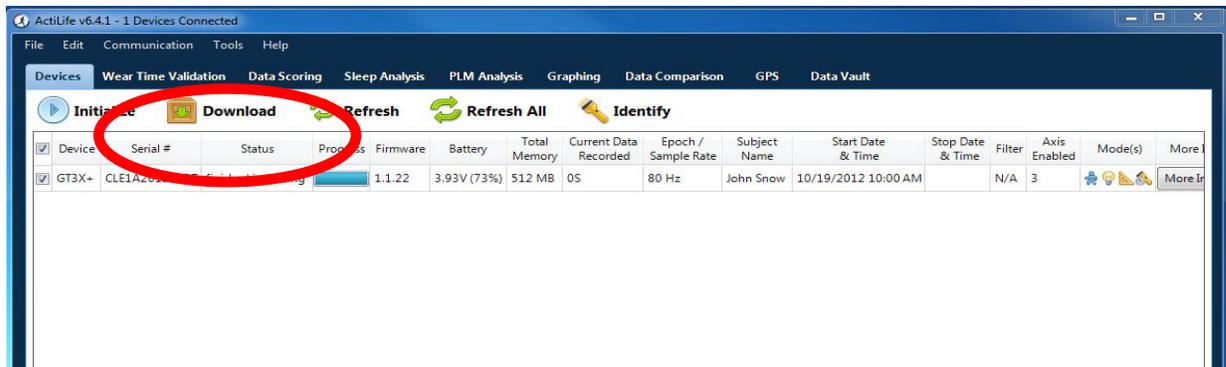
Eight days after the ActiGraph was given to the participant, it should be returned by express mail courier such as FedEx. When device is received back at the clinic, complete the Accelerometer Return form.

### 6.2 Download the data using the following methods

Follow these steps to download your collected data from the ActiGraph:

Start the ActiLife software. Plug in the USB cable.

Press the Download Data button (NOTE: The ActiGraph must be plugged into the USB Port before clicking this button).



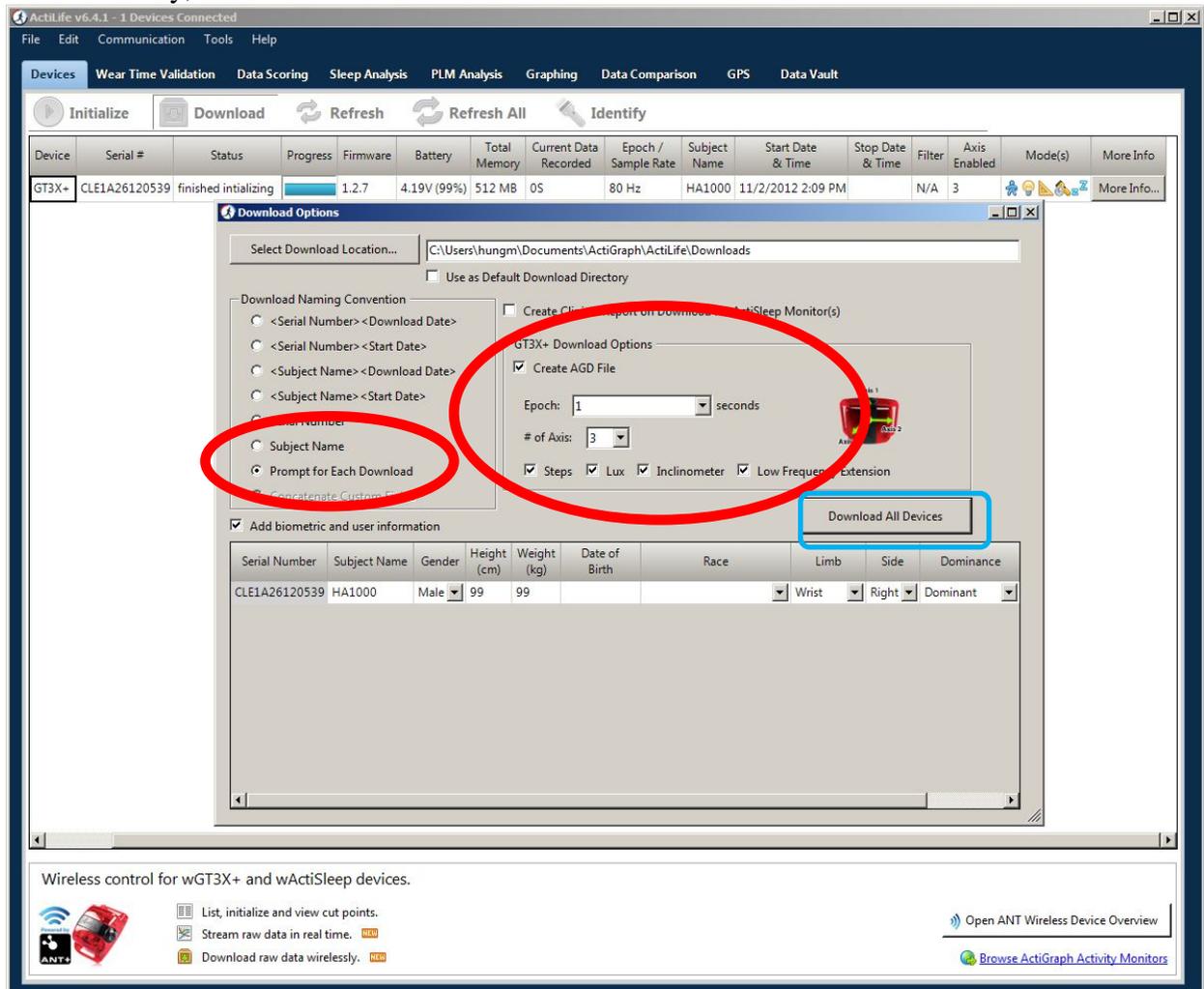
Select or enter the following settings (circled in red below),

Download Naming Convention: select “Prompt for Each Download” (this will allow you to enter a unique filename that uses Health ABC ID and Acrostic for the participant)

GT3X+ Download Options:

- Click on box for “Create AGD File”
- Epoch: select “1”
- # of Axis: select “3”
- Click on box for Steps
- Click on box for Lux
- Click on box for Inclinometer
- Click on box for Low Frequency Extension

Finally, click the “Download All Devices” button:



When prompted for the file name for the download, please use the Health ABC Participant’s ID number (e.g. HA1000) and the word “hip”, for example, “HA1000hip”, or “Rwrist,” or “Lwrist” , for example, “HA1000Rwrist” and “HA1000Lwrist”.

The ActiLife Lifestyle Software will begin to download the data from the ActiGraph GT3X+. Two files will be saved from each device:

1. file ending in AGD (the data processed in 1 second epochs)
2. file ending in CMNT (the raw data)

Note: If you get an error message with “File already exists. Do you want to replace it?” Click “No.” This means that the file extension was not correct. Change file name to what you wish to save it as, then click save, otherwise data will be overwritten.

## Epoch period

The ActiGraph collects and reports physical activity in “counts” and then can be used to estimate time spent at different intensity levels. Counts are simply the summation of the accelerations measured during the epoch period. The GT3X+ ActiGraph measures changes in acceleration 30 times each second. When one-minute cycles are used, 1,800 measurements are summed and that value is written to memory at the end of the one-minute interval.

Activity counts represent a quantitative measurement of activity over time. Think of epochs as the resolution of the recorded data. The lower the epoch the greater resolution of data you will get.

The following epoch lengths are available: 1, 2, 5, 10, 15, 30, 60, 120, 180, and 240 seconds. Raw data is also available.

Lower epoch periods provide greater resolution, but also produce more data that must be recorded and stored on the device per day. Therefore, epoch periods dictate the number of days of continuous recording that can be stored. For one-second epoch periods and three-axis acceleration monitoring, approximately seven days and twenty-four hours of continuous data can be recorded.

**In Health ABC we will be using 1 second epochs for free-living conditions.**

## 7. Description of equipment

### 7.1 ActiGraph technical specification

The GT3X+ activity monitor accurately and consistently measures and records time varying accelerations ranging in magnitude from approximately 6 to -6 G's. The acceleration signal, represented by an analog voltage, is sampled and digitized by a twelve-bit (12) Analog to Digital Converter (ADC) at a rate of thirty times per second (30 Hertz), but can be increased to as many as 100 times per second (100 Hertz). For Health ABC, we will use a setting of 80 Hertz. Once digitized, the signal passes through a digital filter that band limits the accelerometer to the frequency range of 0.25 to 2.5 Hz. This frequency range has been carefully chosen to detect normal human motion and to reject motion from other sources. The digital filter yields an output signal that responds linearly to changing accelerations within the pass band. Each sample is summed over a user-specified interval of time called an ‘epoch.’

The primary hardware components of the GT3X+ include a 16-bit microcontroller with on chip 12 bit ADC, 512 Megabyte (MB) of NON VOLATILE FLASH memory, a solid-state accelerometer, voltage regulator, and a battery charger. A rechargeable 3.7V Lithium Ion Polymer battery supplies power. Battery life, defined as the time between battery charges, can last as long as 31 days.

The GT3X+ is capable of collecting activity data from three axes. With triple axis mode enabled the unit collects acceleration data in the vertical axis, horizontal axis right-left, and horizontal front back.

## Battery

The GT3X+'s rechargeable Lithium Ion battery is capable of providing power for 31 days without a recharge. Recharging is automatic and is accomplished by connecting the GT3X to any standard USB port. Charging time will depend on the battery life, but will typically not exceed **four hours** for a fully depleted battery.

Note: If a PC is not available or if multiple ActiGraphs need to be recharged, a self-powered USB hub can be used. By using this method, it is possible to daisy chain hubs such that 127 GT3X+s can be recharged at once.

**\*If charging multiple GT3Xs by way of a USB hub, it is recommended that the hub not be connected to the computer. If connected to the computer, each GT3X connected will attempt to communicate with the computer and could potentially cause instability issues with the computer.**

## Data Storage

The ActiGraph GT3X contains 512 MB (four megabytes) of non-volatile FLASH memory for data storage. The number of days that data can be collected during continuous wear time depends on various parameters, including epoch period and number of axes (single, dual, or three).

## USB connection

The GT3X+ utilizes an industry standard USB 2.0 interface for both data transfer and battery charging. Data transfer rate is set to 115,200 bps with no parity, one (1) stop bit, eight (8) data bits and no handshaking.

### **MINIMUM SYSTEM REQUIREMENTS**

Operating System: Windows 2000 Professional with SP4 / XP Home or Professional Edition  
Internet Access

FULL ADMINISTRATOR RIGHTS (see your IT Department)

Microsoft Office with Excel 2000/XP in English US or English UK in order to analyze data

Graphics: at least 256 colors; Small Fonts

Screen Resolution: 800x600 or 1024x768

Serial Port or USB Connection (Adapter Required)

Processor Speed: 300MHz Pentium

Memory: at least 32MegaBytes

Hard Drive: at least 32Mb available

The GT3X+ has five distinct operational modes. They consist of Active, Low Battery, Halt, Recovery, and USB/Charging.

### ***Active***

Active mode is the normal operating mode of the GT3X. During this mode, the device is on, collecting data.

### ***Low Battery***

The GT3X enters the Low Battery mode automatically when the battery voltage drops below a factory programmed threshold. It is identical in behavior and action to the Active mode, except the LED flashes two times every three seconds. Once the device has entered this mode, a battery charging sequence must be initiated within three and a half (3 ½) hours or the GT3X will enter the Halt mode.

### ***Halt***

In this mode, the GT3X will preserve the previously collected data, quit taking subsequent data, flash the LED three times every three seconds, and will enter a very low power state. The GT3X will enter Halt mode 3 ½ hours after Low Battery mode is entered if a battery recharge is not initiated. The device must be either re-initialized or restarted after Halt mode is entered if the user wishes to continue use of the GT3X. Note that if a recharge is not initialized in a timely manner, the battery will completely discharge. In this scenario, the device is rendered unusable until the battery is recharged.

### ***USB/Charging***

The USB/Charging mode is entered each time the GT3X is connected to a PC by way of the USB port. When in this mode, the GT3X will automatically stop taking data, and the battery will automatically begin charging (if needed). Assuming the ActiGraph drivers for the GT3X have been installed on the PC the user may communicate with the device via the application. If the GT3X is placed in Halt mode by the user (see “pushbutton” section) it will remain in Halt mode even after it is disconnected from the PC.

## LED Reference Chart

ActiGraph GT3X+ Connected to PC	
<b>Red LED (Fault Indicator)</b>	
2 Flashes	Li-Ion Battery is Faulty
3 Flashes	A hardware failure occurred while recording data. Contact customer support at <a href="mailto:support@theactigraph.com">support@theactigraph.com</a>
<b>Green LED</b>	
1 Flash	Battery Charging
Multiple Flashes	Communicating with PC via USB
Steady On	Battery Fully Charged
ActiGraph GT3X+ Not Connected to PC	
<b>Red LED (Fault Indicator)</b>	
No Flashing (LED Off)	Normal operating condition or battery dead
2 Flashes	Low Battery (use ActiLife Lifestyle software to check for remaining battery life). The unit needs to be recharged.
3 Flashes	- Unexpected Battery Failure (Temporary battery power loss) or - Battery Level has fallen below 3.1V and the unit has entered Halt Mode
<b>Green LED</b>	
No Flashing (LED Off)	Actively collecting data ("Flash Mode" disabled) or battery dead
1 Flash	- Delay before start mode (the LED always flashes prior to starting data collection) - Actively taking data ("Flash Mode" enabled – not recommended)
2 Flashes	N/A
3 Flashes	- End of memory reached (Device no longer collecting data) - Battery died while unit was in delay before start mode (no data collected on device)
Note: The Red LED will ALWAYS flash to indicate LOW BATTERY regardless of whether "Flash Mode" is enabled or disabled. If a "stop time" (optional) has been reached, the Green LED will stop flashing all together regardless of its previous state.	

**Installing ActiGraph software:** You may need administrative privileges to install this software. Contact your computer support staff to help with the installation if you do not have installation privileges.

Exit all programs and open an internet browser.

1. Go to <http://www.actigraphcorp.com/support/software/actilife/> .
2. Click the Download ActiLife 6 button (it is green). This will begin the download of the file "actilife6.5.1setup.exe". (exe file name may be different if newer versions have been released). You may want to note where this file is downloaded/saved on your computer.
3. Double-click on the file ""actilife6.5.1setup.exe" to begin installation. The Setup Wizard will prompt you for any additional installation information that is required.
4. When prompted, enter the ActiLife Access Code provided by NIA or by ActiGraph Corporation.

5. Open the ActiLife software on your computer and change the Units of Measure to "Metric," Timespan Display to "Days Hours Minutes Seconds (DEFAULT)," and the Download Directory to whatever folder your Field Center has decided upon for saving the data. Then click Accept.

ActiGraph Customer Support can be reached at 1-877-497-6996 if you have any trouble or questions.

## 8. Data backup and transfer

Data should be backed up every day onto a CD at the field center. Also, the data should be sent via secure e-mail to the NIH at least once per week. Review Appendix 4 to see instructions for sending files through secure e-mail to the NIH. The files should be named using the following convention:

For Memphis: MEMAG*mmddy*.zip for the ActiGraph data, where *mmddy* is the date transmitted.

## 9. Quality assurance

### 9.1 Training and certification

The examiner requires no special qualifications or experience to perform this assessment. Training should include:

- Read and study manual
- Attend Health ABC training session on techniques (or observe administration by experienced examiner)
- Practice on other staff or volunteers
- Discuss problems and questions with local expert or QC officer

### 9.2 Certification requirements

- Complete training requirements
- Conduct exam on two volunteers while being observed by QC officer:
  - According to protocol, as demonstrated by completed QC checklist

### 9.3 Quality assurance checklist

#### Before giving ActiGraph to participant

- HIP ActiGraph is fully charged
- HIP ActiGraph is initialized with HABC Participant ID# and other information
- WRIST ActiGraph fully charged
- WRIST ActiGraph initialized with HABC Participant ID# and other information

#### Placement of ActiGraph on participant

- Accelerometry explained to participant
- Participant instructed about how to wear HIP ActiGraph and shown how to place hip accelerometer correctly directly above the participant's right hip, under the armpit. When the accelerometer is worn correctly on a belt, the USB port faces down.
- Participant instructed about how to wear WRIST ActiGraph and shown how to place wrist accelerometer correctly on their wrist with the USB port facing their hand.
- Activity Monitor Log explained correctly
- Correctly records the dates that accelerometers should be worn on Activity Monitor Log
- Procedure for returning accelerometers explained to participant
- Complete packet compiled for participant
- Participant asked if they have any questions
- Completes Accelerometer Screener and Distribution form
- Reviews forms for completeness

#### After return of ActiGraph (repeat steps for HIP and WRIST devices)

- HIP ActiGraph properly connected to USB cable
- Download button clicked on ActiLife Software for HIP device
- HIP data saved properly
- WRIST ActiGraph properly connected to USB cable
- Download button clicked on ActiLife Software for WRIST device
- WRIST data saved properly
- Reviews 8-day Activity Monitor Log to see if completely filled out, partially filled out, or not filled out at all
- Accelerometer Return form completed

Appendix 1 Activity Monitor Log (including example for Day 1 [of 8])



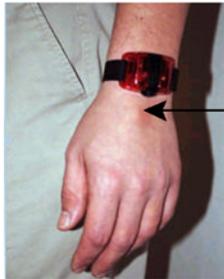
**ACTIVITY MONITOR LOG**

*Thank you* for agreeing to wear activity monitors on your hip and wrist.

**What do I need to do?**

- ◆ Wear the hip and wrist monitor for 7 consecutive days. Don't worry about whether you are active or spend a lot of time reading and resting. The monitors record all of your activities, even sitting.
- ◆ Put the hip monitor on after you get up in the morning, either under or over your clothes. Wear it on your right hip, in line with your right armpit. Wear the belt at your natural waistline with the buckle in front, so it is in the same position each day.
- ◆ Record in this Activity Monitor Log the time you put the hip monitor on (right after getting up) AND the time you take it off (right before you go to sleep).
- ◆ Wear the wrist monitor like a watch on the arm you use to write. Wear the wrist monitor day and night, even when you are sleeping.

**The end with the black circle faces down.**



**When do I take the monitors off?**

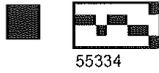
- ◆ Take the hip monitor off before you go to bed for the night, BUT continue wearing the wrist monitor (it will continue to collect information while you are sleeping).
- ◆ Take off both the hip and wrist monitor if you go swimming, take a bath, or take a shower, BUT please remember to put them back on once you dry off.

	<u>Hip</u> monitor	<u>Wrist</u> monitor
During bathing / showering	<b>Remove</b>	<b>Remove</b>
When going to bed at night	<b>Remove</b>	<b>Wear</b>

- ◆ Please fill in this Activity Monitor Log every day!
- ◆ Please be sure to return the monitors and this Activity Monitor Log by placing them in the pre-addressed, pre-paid FedEx mailing envelope that we gave you.

**Questions?** Please call the Health ABC clinic \_\_\_\_\_ at \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_.

*Activity Monitor Log, Memphis  
Version date 7/16/2013*



Health  
ABC

HABC Enrollment ID #	Acrostic	Visit Year
HB0001	DDUC	● 16

DAY 1 HIP MONITOR LOG

1. Today's date: 06 / 03 / 2013  
Month Day Year

2. Day:  Monday  Tuesday  Wednesday  Thursday  Friday  Saturday  Sunday

3. Time I put hip monitor on (right after getting up): 06 : 07  am  pm

4. Time I took hip monitor off (right before going to sleep): 11 : 45  am  pm

REMINDER: WRIST MONITORS SHOULD BE WORN WHILE SLEEPING.

Hip Monitor Log  
Version 2.0, 5/3/2013  
HZ



Appendix 2 Accelerometry Screening and Distribution Forms



#28

HABC Enrollment ID #	Acrostic	Visit Year	Date Form Completed	Staff ID#
H [ ][ ][ ][ ][ ][ ]	[ ][ ][ ][ ][ ]	● 16	[ ][ ] / [ ][ ] / 2 0 1 Month Day Year	[ ][ ][ ]

**ACCELEROMETER SCREENER AND DISTRIBUTION**

1. Is the participant unable to move either of their arms due to paralysis, amputation, or other reason?

Yes       No

a. Which arm does the participant have difficulty moving?

Right       Left       Both Right and Left

**NOT eligible for wrist accelerometer. Go to Page M27, Question #3.**

2. Which hand has the participant used to write with?

*(Examiner Note: Refer to Data from Prior Visits Report.)*

Right

Left

Both Right and Left

Don't know

Have participant wear accelerometer on Right wrist unless contraindicated.

Have participant wear accelerometer on Left wrist unless contraindicated.

Have participant wear accelerometer on Right wrist unless contraindicated.

Have participant wear accelerometer on Right wrist unless contraindicated.

**Examiner Note: See Question #1 above for contraindications.**



HABC Enrollment ID #	Acrostic	Visit Year	Staff ID#
H [ ] [ ] [ ] [ ] [ ]	[ ] [ ] [ ] [ ]	● 16	[ ] [ ] [ ] [ ]

#29

**ACCELEROMETER SCREENER AND DISTRIBUTION**

3. Did the participant receive an accelerometer for the wrist?

Yes

No

a. Record last five digits of serial number:  
[ ] [ ] [ ] [ ] [ ]

b. Date wrist accelerometer was initialized:  
[ ] [ ] / [ ] [ ] / 2 0 1 [ ] [ ]  
Month Day Year

c. Date wrist accelerometer set to start recording:  
[ ] [ ] / [ ] [ ] / 2 0 1 [ ] [ ]  
Month Day Year

d. Time wrist accelerometer set to start recording:  
[ ] [ ] : [ ] [ ]  am  pm  
Hours Minutes

e. On which wrist will participant wear accelerometer?  
 Right  Left

Why didn't participant receive an wrist accelerometer?  
*(Examiner Note: Mark all that apply.)*

Participant not eligible due to arm paralysis, amputation

Physical/medical problem other than arm paralysis, amputation  
*(Please specify: \_\_\_\_\_ )*

Cognitive impairment

Participant refused

No device available

Equipment problem

Other *(Please specify: \_\_\_\_\_ )*

4. Did the participant receive an accelerometer for the hip?

Yes

No

a. Record last five digits of serial number:  
[ ] [ ] [ ] [ ] [ ]

b. Date hip accelerometer given to participant:  
[ ] [ ] / [ ] [ ] / 2 0 1 [ ] [ ]  
Month Day Year

c. Date hip accelerometer set to start recording:  
[ ] [ ] / [ ] [ ] / 2 0 1 [ ] [ ]  
Month Day Year

d. Time hip accelerometer set to start recording:  
[ ] [ ] : [ ] [ ]  am  pm  
Hours Minutes

Why didn't participant receive a hip accelerometer?  
*(Examiner Note: Mark all that apply.)*

Physical/medical problem  
*(Please specify: \_\_\_\_\_ )*

Cognitive impairment

Participant refused

No device available

Equipment problem

Other *(Please specify: \_\_\_\_\_ )*

Appendix 3 Accelerometer Return Form

HABC Enrollment ID #	Acrostic	Date Form Completed	Staff ID #
H [ ] [ ] [ ] [ ] [ ] [ ]	[ ] [ ] [ ] [ ] [ ] [ ]	[ ] [ ] / [ ] [ ] / 2 0 1	[ ] [ ] [ ] [ ]
		Month Day Year	

**Health ABC** **ACCELEROMETER RETURN**

Visit Year: ● 16

**WRIST ACCELEROMETER**

1. Date participant returned wrist accelerometer to clinic:

[ ] [ ] / [ ] [ ] / 2 0 1  
Month Day Year

Wrist accelerometer not returned

2a. Date wrist accelerometer data downloaded from device to computer:

[ ] [ ] / [ ] [ ] / 2 0 1  
Month Day Year

b. Staff ID# of examiner who downloaded wrist accelerometer data:

[ ] [ ] [ ]

**HIP ACCELEROMETER**

3. Date hip accelerometer returned to Field Center:

[ ] [ ] / [ ] [ ] / 2 0 1  
Month Day Year

Hip accelerometer not returned

4a. Date hip accelerometer data downloaded from device to computer:

[ ] [ ] / [ ] [ ] / 2 0 1  
Month Day Year

b. Staff ID# of examiner who downloaded hip accelerometer data:

[ ] [ ] [ ]

5. Was Activity Diary returned?  Yes  No

a. Were any entries made on the Activity Diary?

Yes  No

Accelerometer Return Form  
Version 1.0, 7/16/2013  
MX

## Appendix 4 Data Backup and Transfer

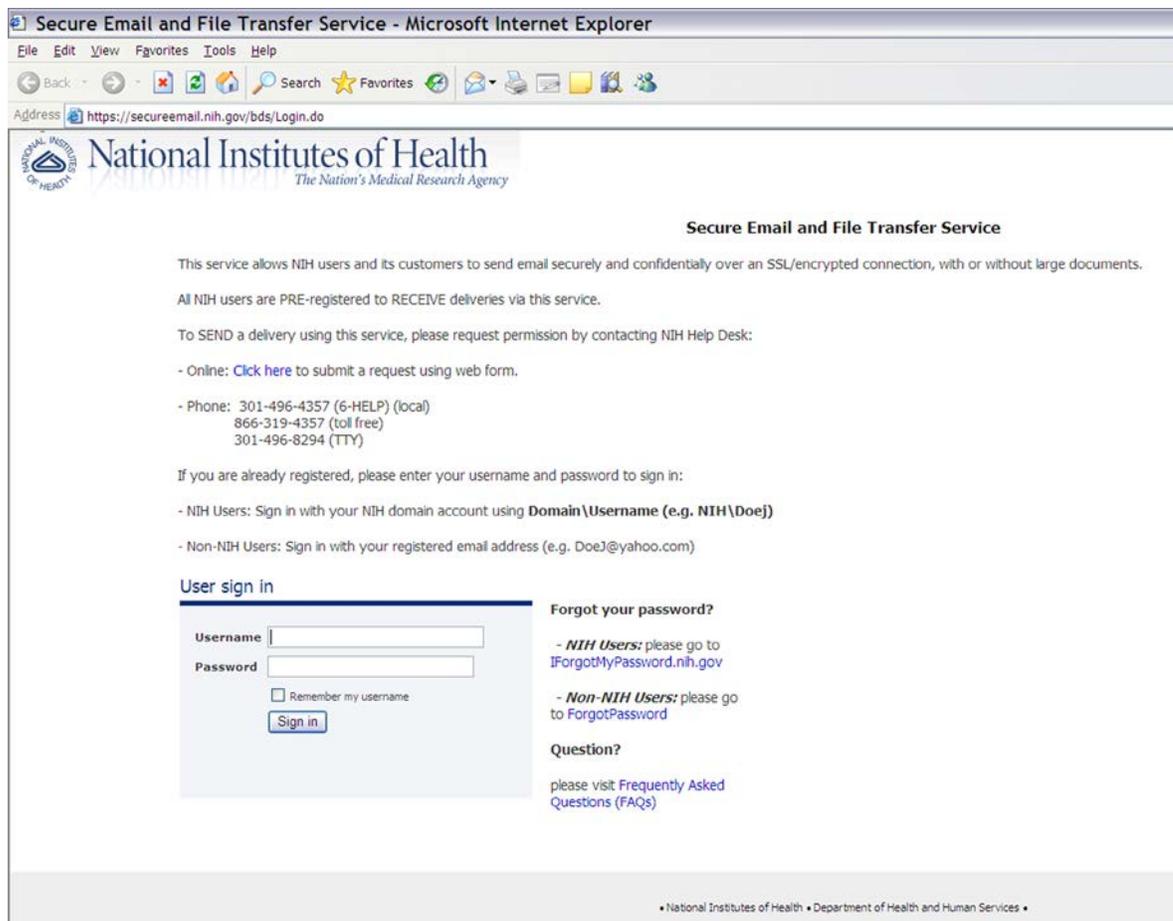
Data should be backed-up onto a CD at the end of every day.

For each participant, there are six files, three with the extension \*.agd and three with the extension \*.cmnt. These are stored in C:\Program Files\ActiGraph\ActiLife\files. These must be copied individually onto a CD.

Once a week, transfer the data via secure e-mail to the NIH. See instructions below.

Go to the following website:

<https://secureemail.nih.gov/bds/Login.do>



The screenshot shows a web browser window titled "Secure Email and File Transfer Service - Microsoft Internet Explorer". The address bar displays "https://secureemail.nih.gov/bds/Login.do". The page header features the NIH logo and the text "National Institutes of Health The Nation's Medical Research Agency". The main content area is titled "Secure Email and File Transfer Service" and contains the following text:

This service allows NIH users and its customers to send email securely and confidentially over an SSL/encrypted connection, with or without large documents.

All NIH users are PRE-registered to RECEIVE deliveries via this service.

To SEND a delivery using this service, please request permission by contacting NIH Help Desk:

- Online: [Click here](#) to submit a request using web form.
- Phone: 301-496-4357 (6-HELP) (local)  
866-319-4357 (toll free)  
301-496-8294 (TTY)

If you are already registered, please enter your username and password to sign in:

- NIH Users: Sign in with your NIH domain account using **Domain\Username** (e.g. **NIH\Doej**)
- Non-NIH Users: Sign in with your registered email address (e.g. **Doej@yahoo.com**)

**User sign in**

Username:   
Password:   
 Remember my username

**Forgot your password?**

- **NIH Users:** please go to [IforgotMyPassword.nih.gov](http://IforgotMyPassword.nih.gov)
- **Non-NIH Users:** please go to [ForgotPassword](#)

**Question?**

please visit [Frequently Asked Questions \(FAQs\)](#)

At the bottom of the page, it says: "National Institutes of Health • Department of Health and Human Services •"

Follow instructions for submitting a request for permission. Once registered, clinic staff will send data in zip files to Caroline Phillips ([PhillipC@nia.nih.gov](mailto:PhillipC@nia.nih.gov)), using the file naming convention described below. NIH Secure email only allows attachments to be 2 GB in size or smaller. Please send as many NIH Secure emails as are necessary to transmit the data for all participants for whom new data is available in a single week.

Zip File naming conventions:

MEMAG*mmddy*.zip for the ActiGraph data, where *mmddy* is the date transmitted.

## References:

Yaffe K, Haan M, Byers A, Tangen C, Kuller L. Estrogen use, APOE, and cognitive decline: evidence of gene-environment interaction. *Neurology*. 2000;54(10):1949-54.

C.A. de Jager, M.M. Budge, R. Clarke. Utility of TICS-M for the assessment of cognitive function in older adults. *Int J Geriatr Psychiatry*. 2003;18:318–324