



Manual 33
Accelerometry Procedures
ARIC Visit 9

Version 1.0 – 04/27/2021



Accelerometry Procedures
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1 OVERVIEW

Physical activity is objectively assessed using the Actigraph Link accelerometer, an FDA approved, triaxial, water-resistant, wrist-worn device that can be worn 24 hours a day, continuously measuring intensity, duration, and frequency of physical activity. Participants will be fitted with the device during their clinic visit and asked to continue wearing the device at all times for the subsequent 7 days. The accelerometer data will allow for the detection of differences in physical activity and sedentary behaviors.

2 EXCLUSIONS

- Regular use of a walker (cane is OK)

3 EQUIPMENT AND SUPPLIES

- Accelerometer
- Participant instruction sheet
- Pre-paid & addressed padded return envelope

4 ADMINISTRATION

4.1 BEFORE THE VISIT

- Ensure that ActiGraph is charged – note: device must be at least 80% charged to initialize
- Plug the charging station into the 7-port hub using the USB charging cable
- Plug the 7-port hub into an electrical outlet

4.2 DURING THE VISIT

- The Actigraph should be initialized. See Section 6.2 for more details.
- Put the Actigraph on the participant immediately before performing the 2-minute walk test. Record the start time of the 2-minute walk on the ACC form field 3a.
- Go over the Actigraph Participant Instruction sheet with the participant and answer any questions. It can be clarified with the participant that only instances lasting more than 30 minutes need to be recorded in Section 3 of the instructions sheet.
- On the last page of the Actigraph Instructions sheet, there is place for the technician to write in the date and time for “*Your device should be removed from your wrist no earlier than:_____.*” This date and time should be the date and time entered into the Actilife software per Section 6.2 (item 5b) of this manual.
- Complete items 1, 2, 3, 4 on the ACC form

4.3 AT THE END OF THE VISIT

- Give the participant the Actigraph Instruction form and the postage-paid padded mailer and remind him/her of the instructions (wear 24/7, note time and reason if the device is removed, mail the completed Actigraph Instruction form back with the accelerometer in the mailer)

4.4 AFTER THE VISIT – RECEIPT AND UPLOAD

- If the accelerometer has not been returned to the clinic within 2 weeks of the visit, call the participant and remind him/her to mail it back, along with the Accelerometry Completion form
- Once the accelerometer has been received, upload the data.

5 TRAINING AND CERTIFICATION

Training will take place locally, either by ACHIEVE staff or experienced local staff.

The examiner requires no special qualifications or experience to perform this assessment.

Training will include:

- Read and study the manual
- Practice on other staff or volunteers
- Discuss problems and questions with local expert or QC officer

Certification will include:

- Complete training requirements
- Recite exclusions
- Conduct exam on two volunteers:
 - According to protocol, as outlined in this manual

6 PHYSICAL ACTIVITY MONITORING - ACTIGRAPH

This section describes how to charge the Actigraph Link, prepare it for data collection (initialize it), and download the data collected.

The Actigraph GT9X Link (Actigraph Corp, Pensacola, FL) is an FDA-approved medical device (FDA 510(K): K080545) that we will use as a measure of physical activity, rest/activity rhythms, and sleep.

Please note that the Software for initialization, downloading, and processing the data is called ActiLife. This software should be installed on one computer at each site.

6.1 CHARGING THE BATTERIES

The Link has a rechargeable battery. To charge the Link, place it in the docking station. On the right side of the dock, a yellow light indicates that the watch is currently charging and a green light indicates that the watch is fully charged.

Sometimes, the light on the right side of the dock will remain red when you place the Link on the dock; this indicates that the Link is not charging and that it should be repositioned until either a yellow or green light appears.

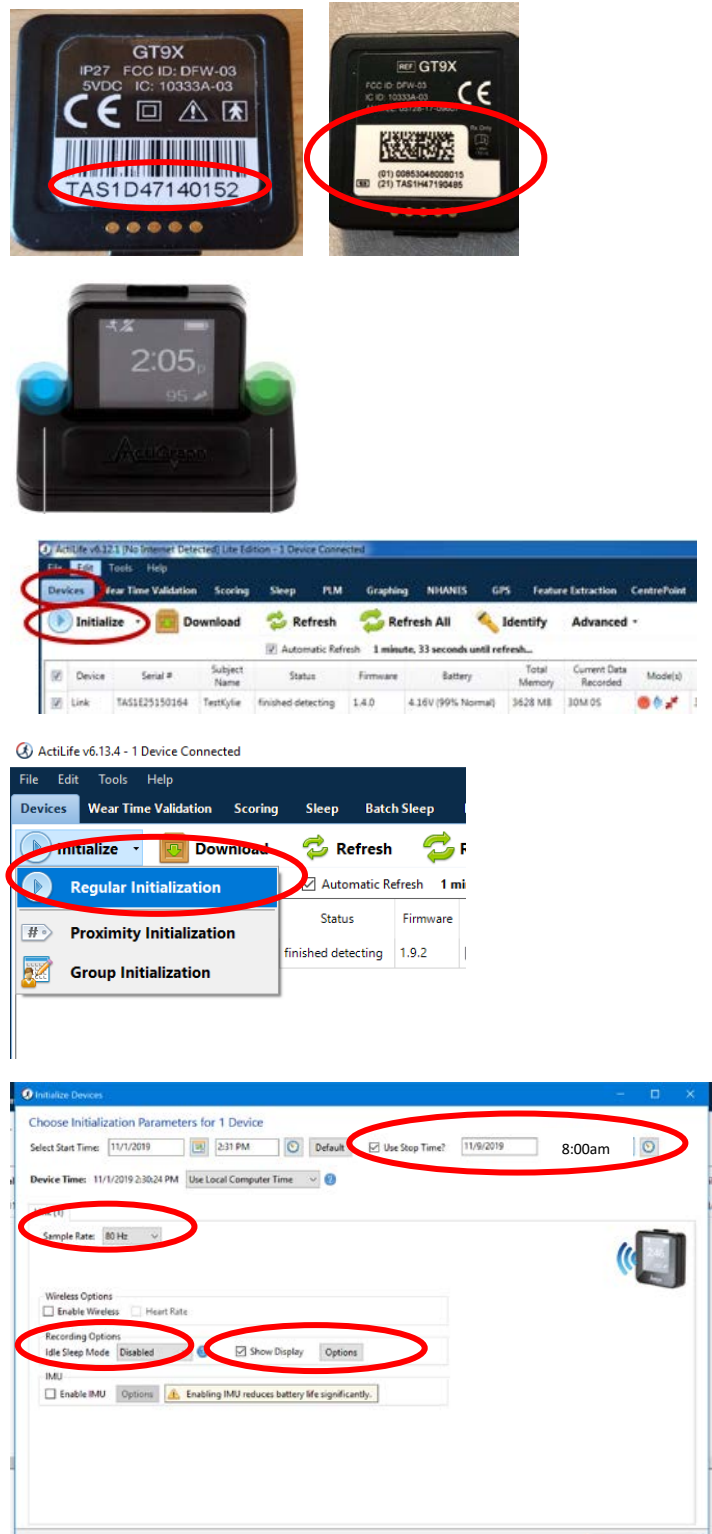
Important: Make sure the device is a minimum of **95%** charged prior to use.



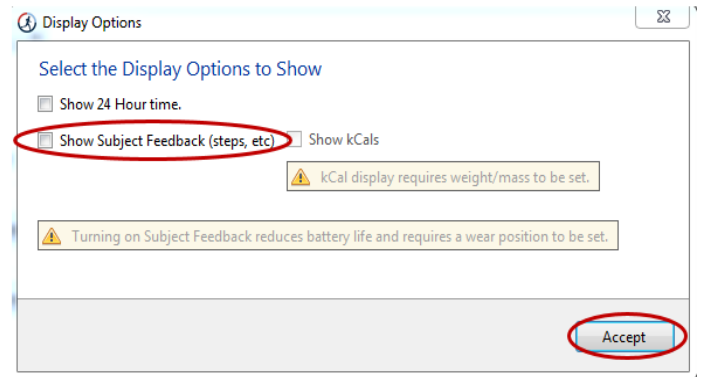
6.2 PREPARING THE LINK FOR DATA COLLECTION: INITIALIZATION

Note: Actigraph Link must be at least **80%** charged to initialize.

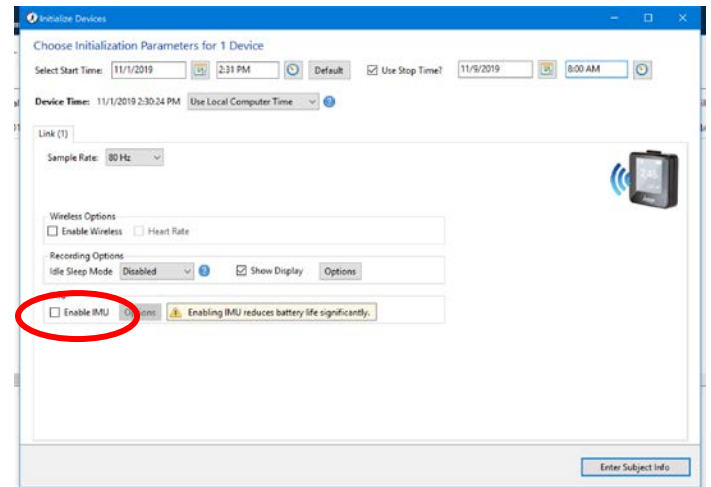
1. Obtain a watch that has been fully charged
 - a. Scan the watch's serial number, located on the back of the Link below the barcode, into field 2 of the ACC form
2. Plug the Link dock into the computer's USB port
 - a. The light should turn green- indicating a full charge
 - b. If the light is red or yellow, then use a different watch
3. Open the ActiLife program
 - a. Allow the computer ~1 minute to recognize the device
4. In the menu bar of ActiLife, click on the Devices tab
 - a. Click on the "Initialize" tab
 - b. Click on the "Regular Initialization" subheading
5. An **Initialize Devices** window will appear
 - a. The "Select Start Time" field will automatically populate with a time two minutes in the future. **No action is necessary to change the start time.**
 - b. Check "Use Stop Time?"
 - i. Set the stop time to 8:00pm on the 7th day the participant wears the watch. **For example, if today (T) is November 1st, the stop time will be 8:00pm November 8th (T+8). If today is January 29th, the stop time will be 8:00pm February 4th.**
 - c. Make sure the device time agrees with the local computer time
 - d. Set "Sample Rate" to 80 Hz
 - e. Set "Idle Sleep Mode" to Disabled
 - f. Check "Show Display"
 - g. Click "Options"



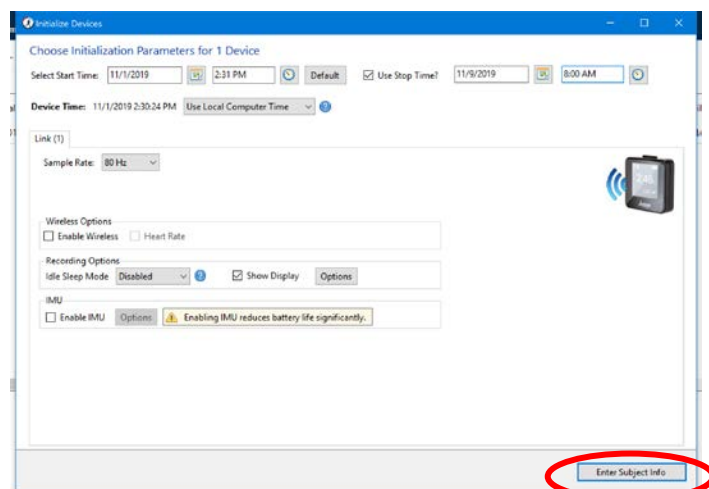
6. A **Display Options** window will appear
 - a. Make sure “Show Subject Feedback (steps, etc)” is **not** checked
 - b. Click on “Accept”



7. The **Display Options** window will close
 - a. Make sure “Enable IMU” is **not** checked



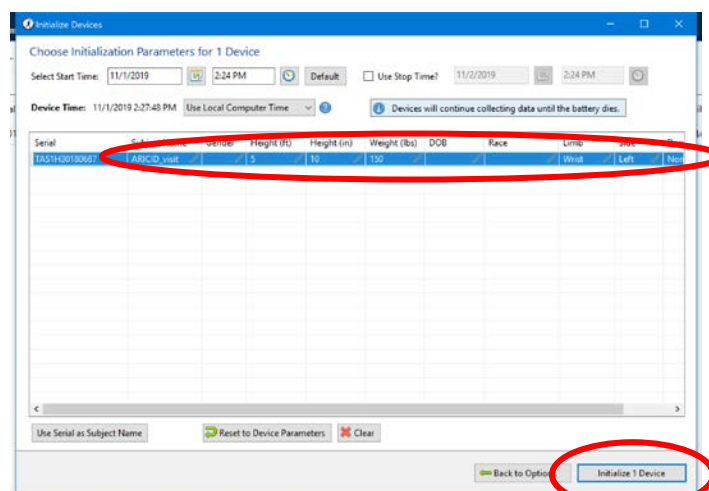
8. Click on “Enter Subject Info” on the Initialize Devices window.



9. An **Initialize Devices** window will appear. Many of the data items needed in this window will come from the CDART Participant Snapshot report. Handedness is available for participants who came in for Visit 2. If handedness is missing, the participant will need to be asked.

- The serial number of the Link will auto-populate
- Under “Subject Name”, scan the ARIC cohort ID number from the barcode provided by the CC.
- Under “Height” enter participant’s height (from the Snapshot report)
- Under “Weight” – leave blank
- Under “Limb” select wrist
- Under “Side” select either right or left (from the Snapshot report)
- Under “Dominance” select Non-Dominant
- Leave “DOB” and “Race” blank
- Click on “Initialize 1 Device”

10. The device is now configured and ready for use participant use.



6.3 INSERTING THE LINK INTO THE STRAP

Ensure that the Link is placed in the wrist band so that the notches in the device line up with the notches in the wristband. **The device should “click” into the socket. Make sure that the device sits tightly in the wristband.**

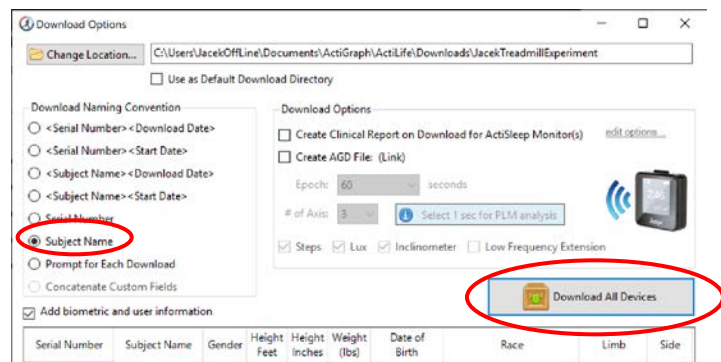
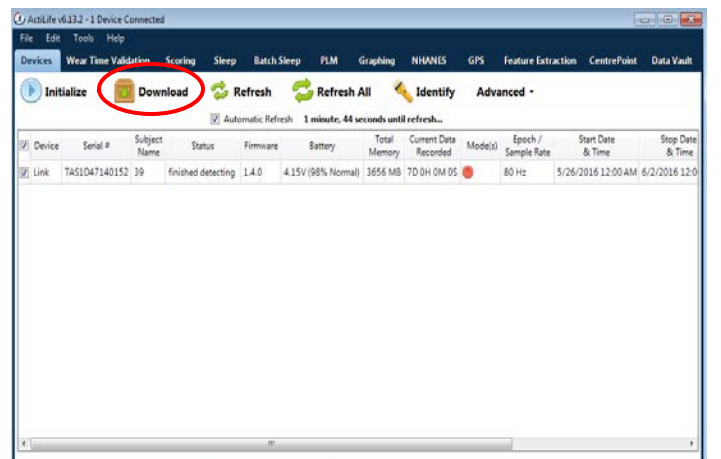
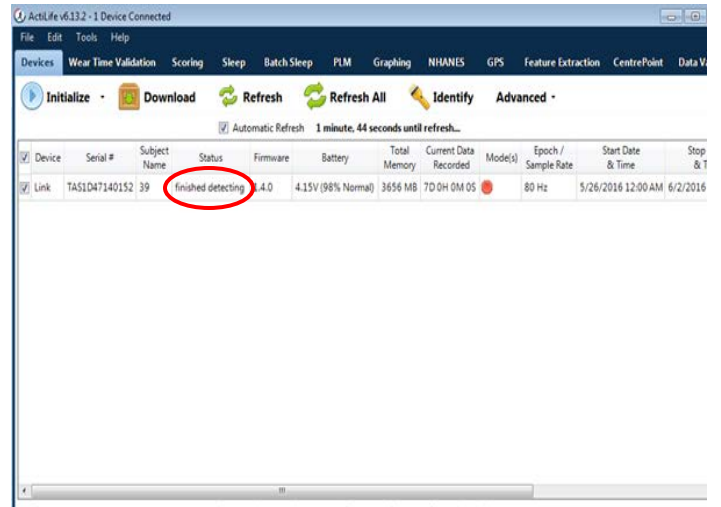


6.4 CLEANING THE ACTIGRAPH LINK

The Actigraph Link should be cleaned between participants. When a participant has returned the Link after data collection is complete, clean the Link and its wristband thoroughly with an isopropyl alcohol wipe, use a soft toothbrush to loosen debris as needed, then rinse and dry.

6.5 DOWNLOADING THE LINK DATA

1. Plug in Link and Dock
2. Plug the Actigraph dock into your computer's USB port
3. Open the ActiLife program
 - a. Allow the computer a few moments to recognize the device. When the computer has recognized the device, the status on the "Devices" tab will indicate "finished detecting".
4. Click "Download" in "Devices" tab
5. Select the appropriate file path where the data will be saved
 - a. Make sure the "Subject Name" field is selected under "Download Naming Convention"
 - b. **Do not** check any boxes under "Download Options"
 - c. Click "Download All Devices". This will create an ActiLife **.gt3x** file



6. Download the file to the local data storage server.
7. Once downloaded, also upload the .gt3x file to the designated OneDrive folder for your site.
8. The file should be named with the first letter of the site followed by the 6-digit participant ID. For example, for Forsyth a correct name would be F152001.gt3x (see example to the right)

Name	Modified	Modified By	File Size	Sharing
Forsyth Uploads	January 15	Jacek Urbaneck	6 Items	Shared
Jackson Uploads	January 15	Jacek Urbaneck	4 Items	Shared
Minnesota Uploads	January 15	Jacek Urbaneck	12 Items	Shared
Washington Uploads	January 15	Jacek Urbaneck	4 Items	Shared

Name	Modified	Modified By	File Size	Sharing
F152001.gt3x	Tuesday at 1:03 PM	Barbara J. Anderson	348 MB	Shared
F186618.gt3x	Tuesday at 1:10 PM	Barbara J. Anderson	322 MB	Shared
F186626.gt3x	Tuesday at 1:07 PM	Barbara J. Anderson	322 MB	Shared
F231763.gt3x	Tuesday at 1:30 PM	Barbara J. Anderson	349 MB	Shared
F231809.gt3x	Tuesday at 1:34 PM	Barbara J. Anderson	349 MB	Shared
F302155.gt3x	Tuesday at 12:55 PM	Barbara J. Anderson	323 MB	Shared

7 EXPORT AND RESULTS REPORTING

7.1 ACTILIFE SUMMARY FILES

A technician at JHU reviews and processes the gt3x files, which creates the accelerometry summary file. The summary file should be created weekly based on the gt3x files received in that week's batch. The file is named "ARIC_ACR_YYYYMMDD.csv", is saved as a comma-separated values format file, has one row per cohort ID, and always has XX columns. Included in that row are summary variables and results values that are reported to the participant. The first column contains the COHORTID, followed by the initialization date and all of the data. The last column contains the variable "processing_successful". The value of 'processing_successful' is typically 'Y', unless there was an error or corrupt file in which the JHU technician is unable to generate summary results. If a gt3x file for a given participant is corrupt or otherwise not analyzable, the technician creates a row in the .csv file for that cohort ID, with the variable called "processing_successful" having a value of 'N' and the remaining variables are blank. [See xx codebook and yy specifications for more details on the contents of this .csv file.]

The content of the csv looks like this:

cohortid	date	time	size_bytes	sn	n_days	n_valid_days	wear_time_on_valid_days	processing_successful
J606559	12/17/2019	9:50:00	424142	TAS1H12190014	9	7	1440 ...	Y
J607615	12/19/2019	9:15:00	422428	TAS1H12190012	9	7	1440 ...	Y
M606559	12/9/2019	11:15:00	392224	TAS1F28170996	8	6	1402.333333 ...	Y
M607041	12/12/2019	10:45:00	419679	TAS1F36160972	9	7	1440 ...	Y
M607109	12/12/2019	13:45:00	407939	TAS1F28170985	9	7	1440 ...	Y
M607201	12/16/2019	9:45:00	397004	TAS1E49150068	9	6	1394.5 ...	Y
F654321								N

The variables that are included in the ARIC Accelerometer Results Report are listed in brackets within Appendix 1. Physical Activity Results Report Template.

The technician at JHU transfers the ARIC_ACR_YYYYMMDD.csv file to the ARIC CC once per week according to instructions provided by the ARIC CC.

7.2 RESULTS REPORTING

A one-page accelerometry results report will be available in CDART approximately 2 weeks after the ActiLife.gt3x file is transferred to JHU's OneDrive. The results report is available for download to pdf or to print. The status of the results can be confirmed using the CDART results status report. The results may be printed from the current visit's "Summary of Results Report". Once the results have been printed and sent to the participant, field center staff update Section C of the RAR form with the date the report was sent for Type of Results = B: Accelerometer'.

8 APPENDICES

8.1 APPENDIX 1. PHYSICAL ACTIVITY RESULTS REPORT TEMPLATE



Physical Activity Results

Participant Name: _____ [CIU1b CIU1d] _____

ID:

Date Started: mm/dd/yyyy [date = ACR1]

Days Worn: [n_valid_days = ACR6] days

Thank you for taking part in this study at our Field Center. We appreciate your willingness to join us in this important study. We have reviewed the data from your accelerometer. The findings are below:

Activity Data

Physical Activity

Regular physical activity is beneficial to health at all ages. Consult with your physician about the types of activities that are appropriate for your health status.

Average amount of time spent physically active per day:

X hours Y minutes

[time_spent_active = ACR13]

Average amount of time spent engaged in moderate-to-vigorous physical activity per day: **X hours**

Y minutes [mvpa_report =

ACR101]

Sleep Data

Sleep Duration

Sleeping on average between 6-9 hours per night is recommended; however it is common for older adults to sometimes sleep less or more.

Average sleep duration: **X hours Y minutes**

[average_total_sleep_time = ACR93 converted from minutes]

Sleep Efficiency

Sleep efficiency is a measure of how well you sleep during the night. It is the ratio of the total time spent asleep during night compared to the total amount of time spent in bed. A higher percentage is better; healthy older adults average 80% or more.

Average sleep efficiency: **YY% [average_efficiency = ACR90]**

Thank you again for your participation in this study.