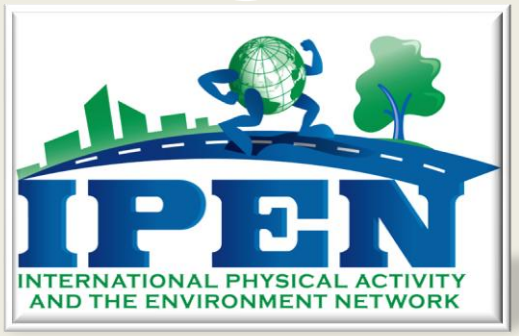
IPEN Adolescent Accelerometer Data Collection Training



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Overview

PART 1: OVERVIEW FOR EVERYONE

- Coordinating Center Roles
- IPEN Adolescent Accelerometer Data Collection Guidelines

PART 2: PRE-DATA COLLECTION TRAINING

- About the Actigraph
- Preparing for data collection
- Charging, Initializing, & Delivering
- Compliance Tips and Prompting
- Tracking

PART 3: POST-DATA COLLECTION TRAINING

- Downloading and Converting Data
- Screening Data
- Electronic tracking
- Data transfer
- Quality Control

PART 4: DATA PROCESSING TRAINING

Coordinating Center Roles

- Provide Training & Materials
  - Training slides and Manual
  - Tracking database
  - Wearing log and instructions
  - http://ipenproject.org/Adol_materials.html
- Accelerometer loans (limited number)
- Quality control
  - Check files and tracking database for first 50 participants
  - Provide ongoing assistance and monitoring
- Will process all accelerometer data in a standard way

IPEN Adolescent Accelerometer Data Collection Guidelines

- Accelerometer Model
- Data Filter
- Epoch
- Nonwear definition
- Valid Wearing Day definition
- Valid Wearing Week definition
- Wearing Time and School Schedule Log
- Tracking
- Major holidays and school breaks (summer break)

IPEN Adolescent Accelerometer Data Collection Guidelines

- Accelerometer Model:
  - Any of the following ActiGraph models are fine: 7164/71256, GT1M, GT3X, GT3X+, wGT3X+ or ActiTrainer
  - They are not necessarily interchangeable devices, but we aren't able to require all countries to use the same model
  - We will adjust for model type in analyses

Can use any "Actigraph" model

IPEN Adolescent Accelerometer Data Collection Guidelines

- Filter:
  - **MUST USE the Low Frequency Extension** with new generation Actigraphs (GT1M, ActiTrainer, GT3X, GT3X+). Doesn't apply to old generation devices.
  - Apply during initialization with GT1M & GT3X
  - Apply during or post-download with GT3X+

See LFE paper in adults:
Cain KL, Conway TL, Adams MA, Husak LE, Sallis JF. Comparison of older and newer generations of ActiGraph accelerometers with the normal filter and the low frequency extension. International Journal of Behavioral Nutrition and Physical Activity 2013, 10:51.
http://www.ijbnpa.org/content/pdf/1479-5868-10-51.pdf

- The Coordinating Center conducted a model/filter comparison study
- 27 adolescents wore a 7164 and GT3X+ on the same belt for 3 days in free-living environment
- Data are showing that the 7164 and GT3X+Normal filter are not comparable (e.g., 9 min/day less MVPA with the GT3X+)
- Applying the Low Frequency Extension reduces these differences!

IPEN Adolescent Accelerometer Data Collection Guidelines

- Epoch:
  - Recommendation is to collect data with the shortest epoch your memory/battery will allow (for the GT1M & GT3X)
  - Epoch will be applied during or post-download with GT3X+
  - **Aggregate data to <u>30 seconds</u> for IPEN** (for consistency with data already collected)

use 30 second epoch for pooled data set

IPEN Adolescent Accelerometer Data Collection Guidelines

- Nonwear definition:
  - Recommendation is **60 minutes of consecutive 0's** to define nonwear time for all models

- The Coordinating Center conducted a 'sitting' study to determine a sensitive nonwear definition in youth
- 27 adolescents wore a 7164 and a GT3X+ on the same belt while sitting watching TV for 90 minutes. Observers verified participants stayed seated
- Data are showing that 100% of sedentary time during long sitting bouts would be detected with a 60 minute nonwear definition (7164 and GT3X+LFE) compared to only 89% with 20 minutes and 93% with 30 minutes

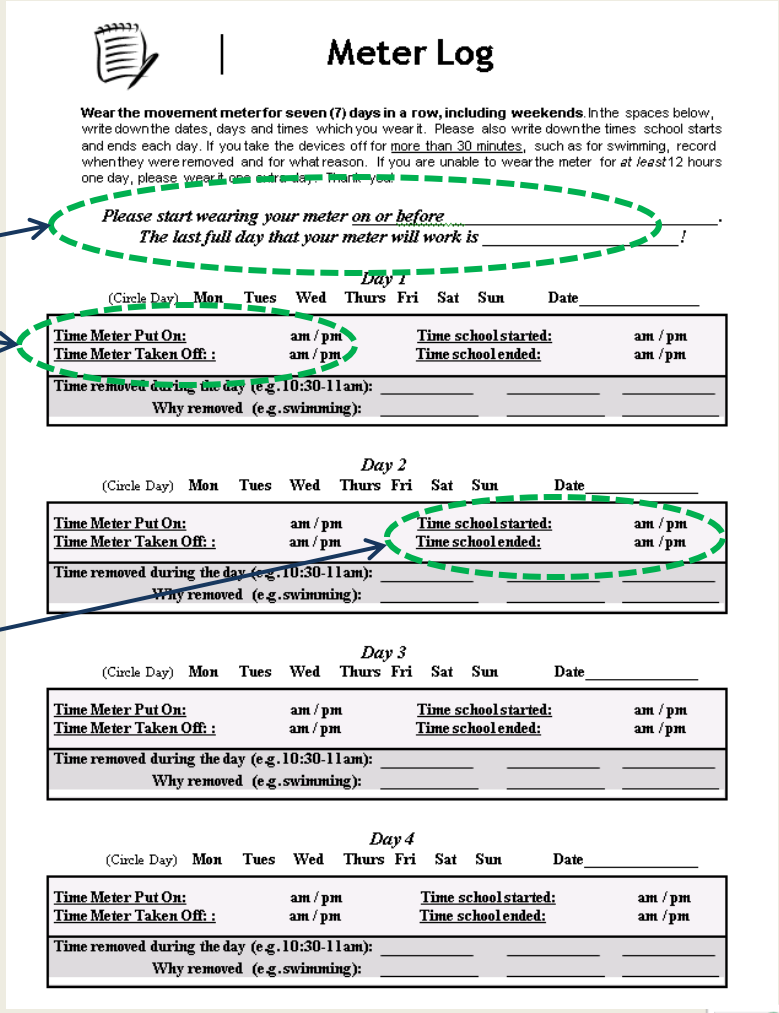
IPEN Adolescent Accelerometer Data Collection Guidelines

- Valid Wearing Day definition:
  - Weekday: **10 wearing hours** (commonly used and based on a balance between feasibility and enough data to represent usual daily activity patterns)
  - Weekend: **8 wearing hours** (based on feedback from IPEN Adolescent investigators that this would be necessary to ensure good compliance on the weekends)
- Valid Wearing Week definition:
  - Give participants 7 full wear days (e.g., pick up on 9th day)
  - Use MeterPlus to screen for **5 valid days, including 1 weekend**
  - **Ask for rewear** for however many additional days are needed

Rewears boosted compliance rates in the US study from 66% to 86%!

IPEN Adolescent Accelerometer Data Collection Guidelines

- Accelerometer Wearing and School Times Log:
  - Participant completes
  - 'Due dates' may help with compliance
  - Report days worn and times put on and off
    - Helps researcher with screening/processing the data
    - Helps participants with remembering to wear the accelerometer
  - Report school start and end times
    - Can use to filter data for in-school and out of school times



Meter Log

Wear the movement meter for seven (7) days in a row, including weekends. In the spaces below, write down the dates, days and times which you wear it. Please also write down the times school starts and ends each day. If you take the devices off for more than 30 minutes, such as for swimming, record when they were removed and for what reason. If you are unable to wear the meter for *at least* 12 hours one day, please wear it one extra day. Thank you!

Please start wearing your meter on or before _____.
The last full day that your meter will work is _____!

Day 1

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:	am / pm	Time school started:	am / pm
Time Meter Taken Off: :	am / pm	Time school ended:	am / pm
Time removed during the day (e.g.10:30-11am):			
Why removed (e.g.swimming):			

Day 2

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:	am / pm	Time school started:	am / pm
Time Meter Taken Off: :	am / pm	Time school ended:	am / pm
Time removed during the day (e.g.10:30-11am):			
Why removed (e.g.swimming):			

Day 3

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:	am / pm	Time school started:	am / pm
Time Meter Taken Off: :	am / pm	Time school ended:	am / pm
Time removed during the day (e.g.10:30-11am):			
Why removed (e.g.swimming):			

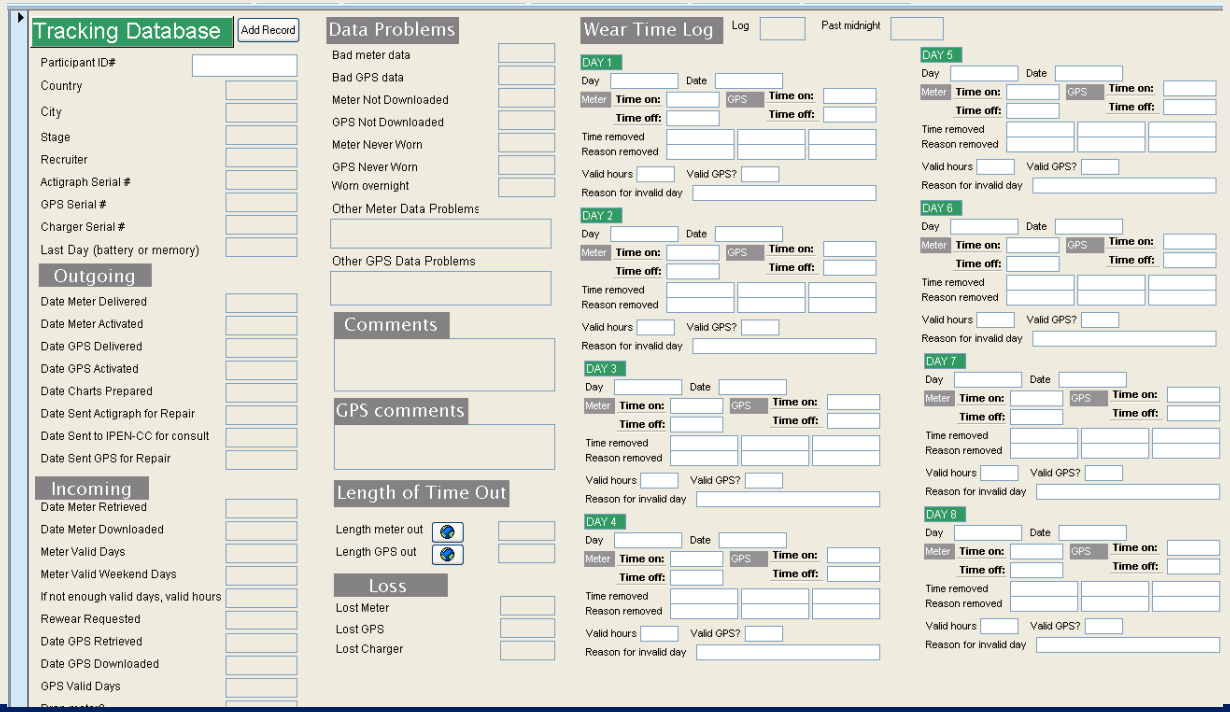
Day 4

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:	am / pm	Time school started:	am / pm
Time Meter Taken Off: :	am / pm	Time school ended:	am / pm
Time removed during the day (e.g.10:30-11am):			
Why removed (e.g.swimming):			

IPEN Adolescent Accelerometer Data Collection Guidelines

- Tracking:
  - IMPORTANT: Record researcher days (i.e., drop off days, pick-up days) so they cannot be confused with participant wearing days when processing the data
  - Record compliance decisions, data problems, etc.
  - Coordinating Center will provide an Access database to track these things



IPEN Adolescent Accelerometer Data Collection Guidelines

- Major holidays and school breaks:
  - Activity patterns tend to be different during major holidays and school breaks (e.g., summer break)
  - Therefore, we will NOT collect data during these time periods

‘typical’ activity patterns (non-holidays, school sessions)

‘atypical’ activity patterns (major holidays, summer break)

PART 2: PRE-DATA COLLECTION

- About the Actigraph
- Preparing for Data Collection
- Charging, Initializing, & Delivering
- Compliance Tips and Prompting
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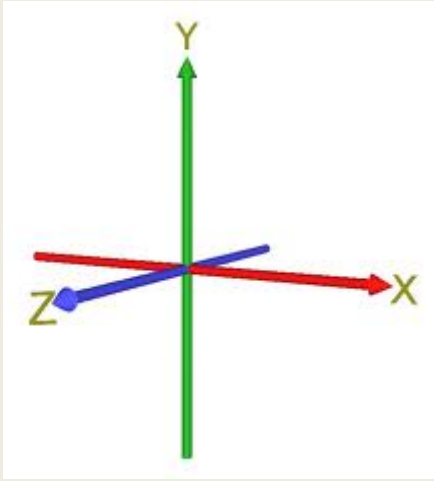
How the accelerometer determines PA intensity

- It contains a motion sensor known as an “accelerometer” that monitors the occurrence and degree of motion.
- A signal is produced. The magnitude and duration of the signal depends on the amount of motion.
- The activity signals are filtered to eliminate non-human movement.
- Signals are summed across a user-defined interval called an “epoch”
- Output is a “count” per epoch. Higher count = greater activity intensity

ActiGraph GT3X

No longer available from ActiGraph

- Can collect data in 1, 2, or 3 planes of movement (vertical, horizontal and medial-lateral) – *however, for IPEN we will only use the vertical axis.*
- Must select filter and epoch when initializing
- Water resistant (not waterproof!)
- USB connection for charging, initializing and downloading
- Lithium battery lasts about 20 days before needing to be charged (GT3X, 16MB)
- Minutes spent in different intensity categories (e.g., sedentary, light, moderate)



ActiGraph GT3X+

Same as the GT3X except…

- Collects raw data and epoch and filter are applied when downloading
- Lithium battery lasts about 30 days before needing to be charged (GT3X+ 512MB, 30 Hz)

Available from Actigraph for $250 each

How the accelerometer works: what you tell participants

- It records overall movement, much like a pedometer
- It's harmless – it runs on a battery, like your watch
- There isn't an 'on' and 'off' switch
- You don't need to be an 'active' person for the device to work
- There is no screen to look at
- It can't tell what type of activity you're doing**
- It can't tell where you are, it's not a tracking device**
- I've worn it myself and nobody even noticed**
- It is expensive for researchers, but has no street value**

***might be especially important when talking with teenagers*

How the accelerometer works: DO NOT tell participants

- The accelerometer will tell us how much you exercise, walk, jog, etc.
- Make sure to move a lot while you're wearing the device!
- You live in a walkable neighborhood so we expect the accelerometer to show you'll be walking a lot
- The accelerometer can tell if you're sitting around watching TV, doing yoga, working on your computer, etc.
- It's OK to remove the accelerometer when you're not doing much since we're mostly interested in physical activity

PART 2: PRE-DATA COLLECTION

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What do you need?

- Actigraphs
  - Label each device
  - Inventory in database
  - Price = $250 each
- Charging hub
  - Need a charging schedule and location
  - 7 can charge at a time
  - Price = $25
- Belts, clips
  - Purchase from Actigraph or make your own
  - ¾” webbing material (www.joann.com) and dual-adjustable side release buckles(www.plastic-buckle.com)
  - Have different sizes
  - Belts should be washed (hand-washed or cold cycle, no tumble drying) after each wear

What do you need?

- Actilife
  - initialize, download and create graphs
  - Price = $995
  - www.theactigraph.com
- MeterPlus
  - screen for usable data and create variables to analyze
  - Price = $695
  - www.meterplussoftware.com
- Tracking database
  - 4 functions:
    - Keep inventory of devices
    - Track location and outcomes of every device deployment
    - Data entry for wearing logs
    - Track participant contacts and data collection activities
  - Access database available to download from website

Determining Inventory Needs

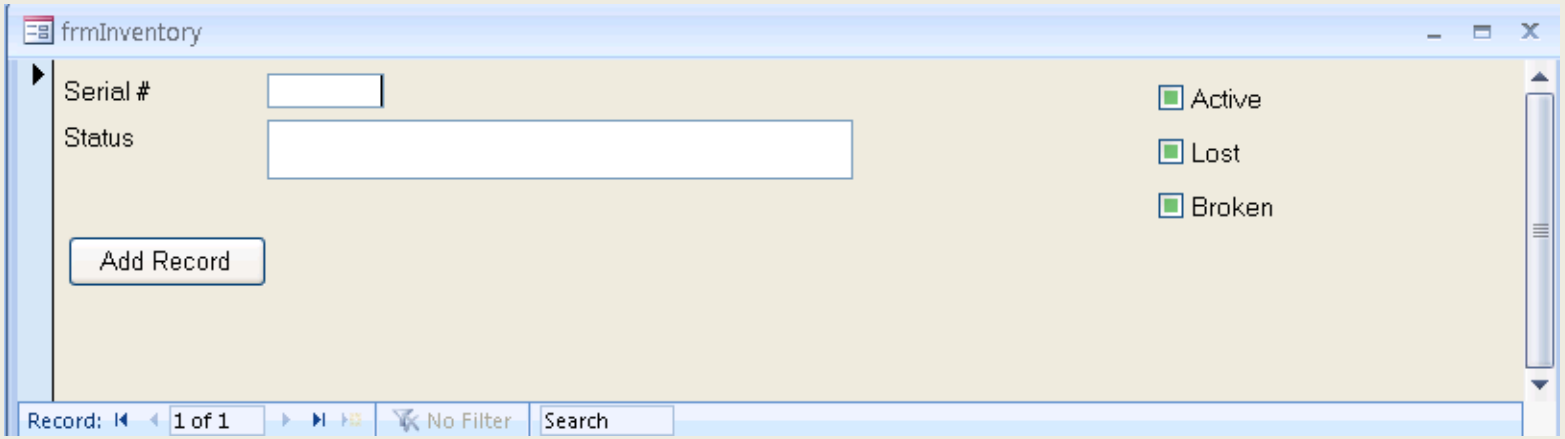
- A 7-day wear ties up 1 device for 11-14 days
  1 day prep + 1 pre-wear day + 7 day wear + 1-4 post wear days +1 day download/charge

- How many devices do we need for a 4 month data collection period and 250 participants? Answer is **34**

  X = # days data collection/[days used per person] **X = (120/12) = 10**
  Y = X * [loss rate] **Y = (10*.03) =.30**
  Z = X-Y **Z = (10 - .30) = 9.7**
  # participants to measure [final sample + rewears] **250 + (250*.3) = 325**
  Inventory = # of participants to measure/Z **Inventory = (325/9.7) = 33.5**

*Assumptions: 3% loss rate; 30% re-wear rate; average 12 day device time

Device Inventory Form



Staffing

- At least a 50% FTE will be needed to manage the equipment initialization and downloading (can include prompt calling)
- At least a 50% FTE is needed for data management (includes data screening, compliance decisions and tracking)
- Data collectors – determine how many you will need based on sample size and length of data collection

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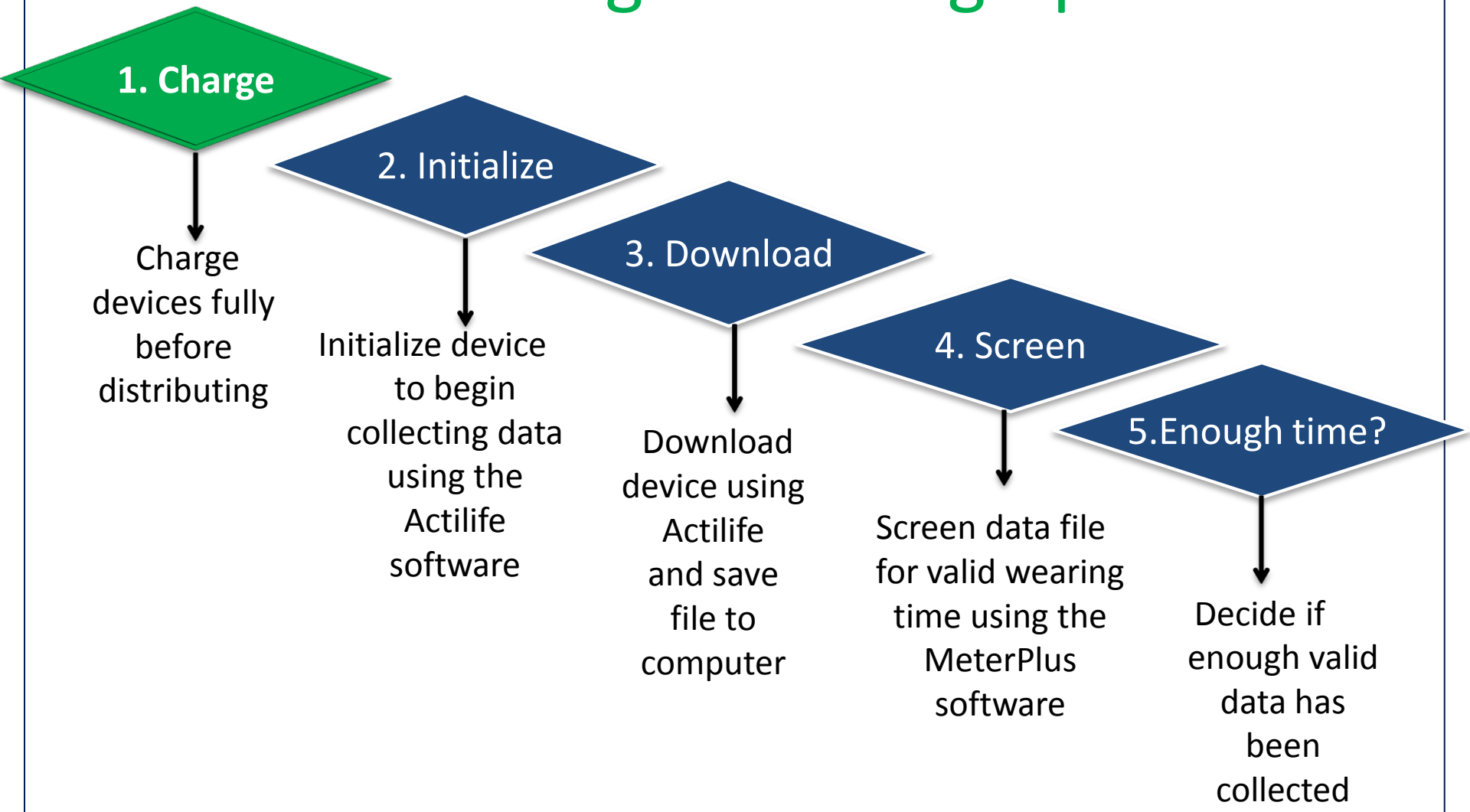
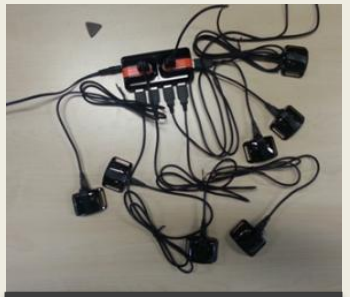
Stages of Actigraph



Charging

- Storage capacity exceeds battery life, so getting a unit charged is ALWAYS the primary concern
- Charging (& downloading) is done via a USB 2.0 port
- USB hub to charge up to 7 devices at same time

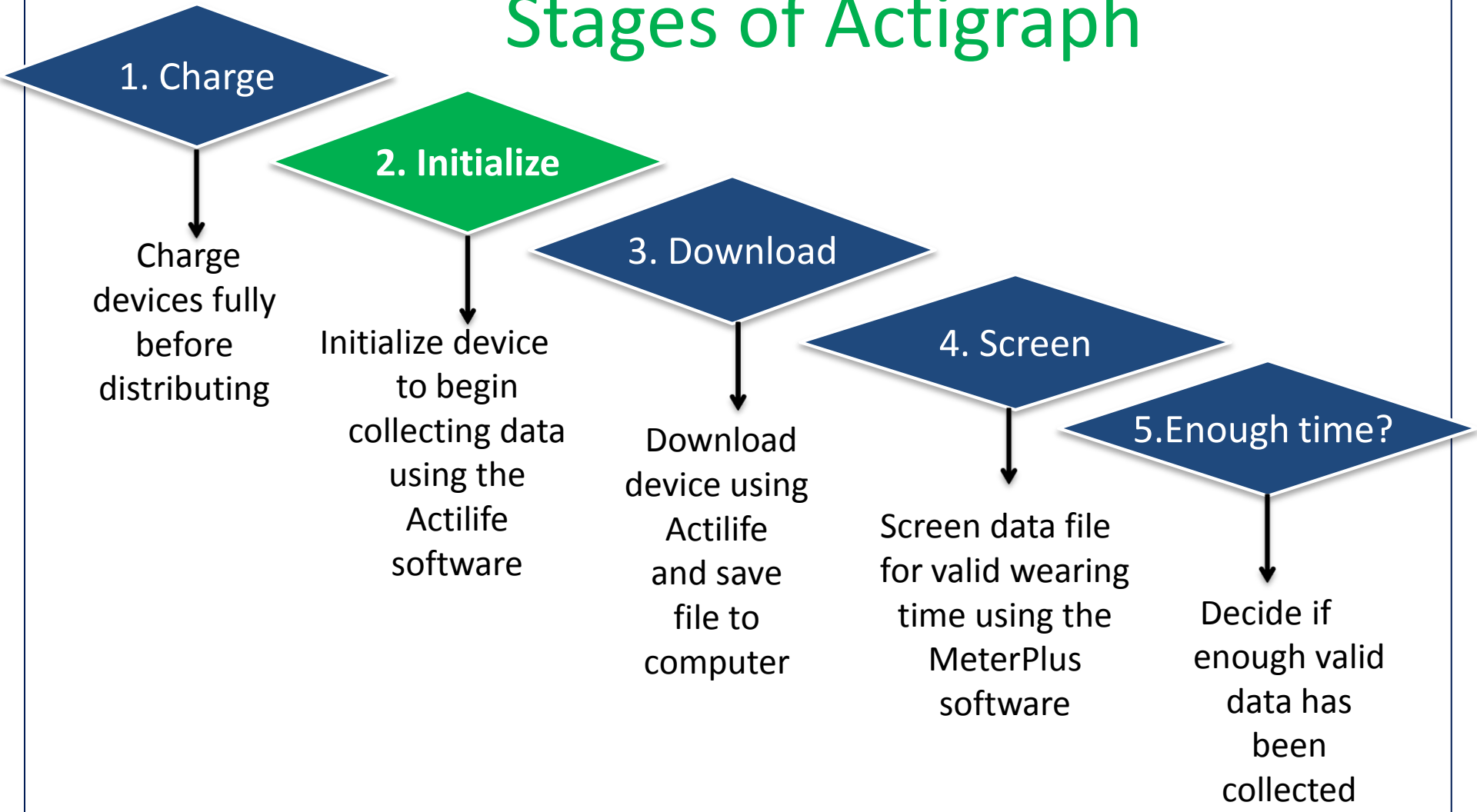


the “Octopus”

- Connect USB hub straight to socket if possible. If not, can be connected to computer to charge.
- Full charge takes less than 3 hrs (batt status = >4v). Less than 3.1v and device will NOT have sufficient power to download or initialize.
- LED will
  - FLASH while charging
  - LIT when fully charged
  - FLASH w/ initialized but not yet collecting
  - FLASH TURNS OFF when collecting data

NOTE: The device CAN be put on charge while still collecting data (device will just record zero counts)

Stages of Actigraph



Initializing

- The **ActiLife** software & drivers must be installed on any computer on which ActiGraph initialization and/or downloading will occur
- Connect device(s) using USB cord
- Select some data collection parameters
- Schedule start date and time of device data collection

  Recommendation is to initialize accelerometer to start recording the day AFTER expected delivery to participant. This gives the participant a day to get used to the device before data are recorded and reduces the chance that the delivery day will be confused with a valid wearing day.

Memory and Battery Considerations

Raw Data	GT3X+ (256MB)		GT3X+ (512MB)	
Sample Rate (Hz)	Battery Life (Days)	Memory Limit (Days)	Battery Life (Days)	Memory Limit (Days)
30	19.0	21.4	31.0	42.7
40	17.5	16.0	27.5	32.0
50	16.0	12.8	24.5	25.6
60	14.0	10.7	22.5	21.4

GT3X+ battery life and memory limit with different sample rates based on 16 hrs Active 8 hrs idle (low power mode).

Raw Data	GT3X+ (256MB)		GT3X+ (512MB)	
Sample Rate (Hz)	Battery Life (Days)	Memory Limit (Days)	Battery Life (Days)	Memory Limit (Days)
30	12.5	21.4	21.0	42.7
40	11.5	16.0	19.5	32.0
50	10.5	12.8	18.0	25.6
60	9.5	10.7	16.5	21.4

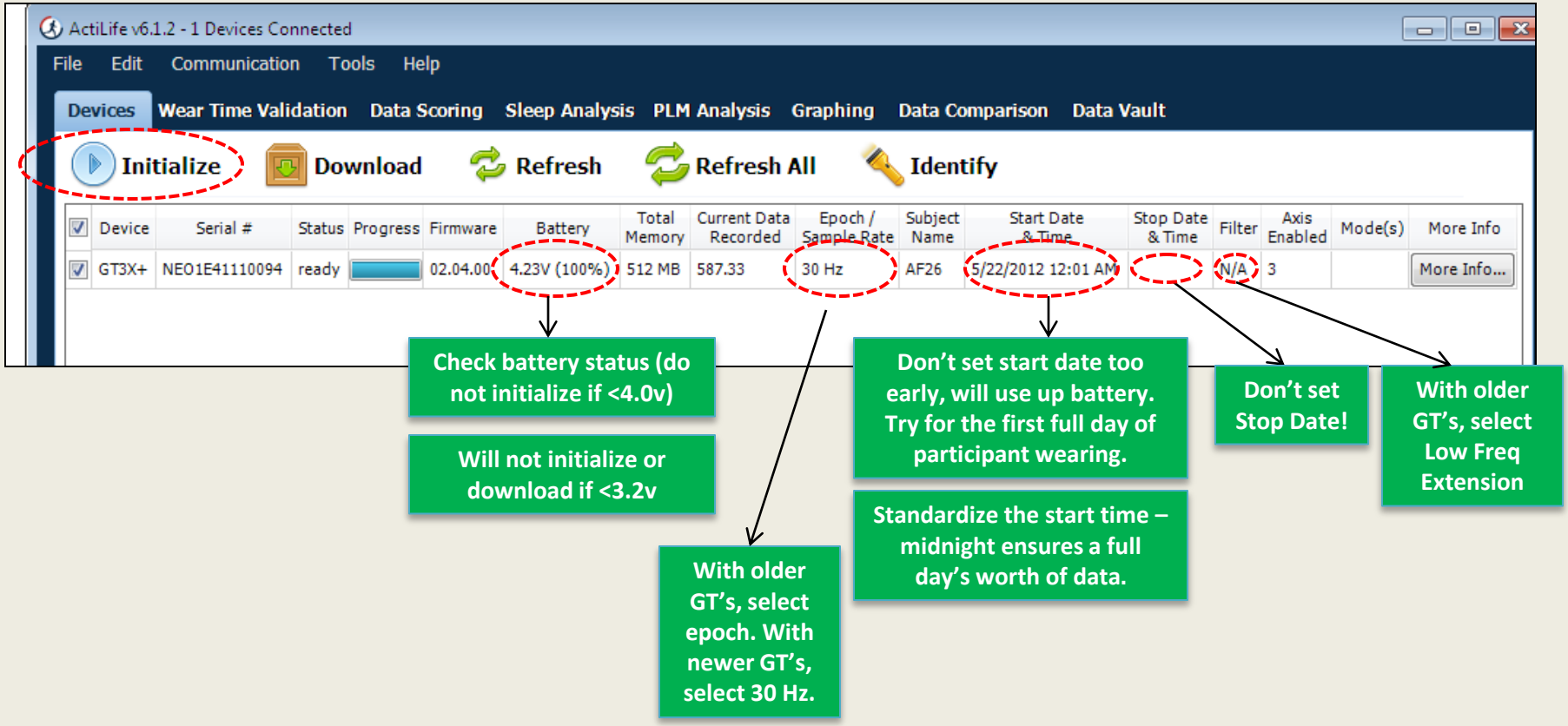
GT3X+ battery life battery life and memory with different sample rates after **a 10 day delay-before-starting**.

3 selections	GT3X (4MB)		GT3X (16MB)	
Epoch	Battery Life (Days)	Memory Limit (Days)	Battery Life (Days)	Memory Limit (Days)
1	14	7.8	21	31.4
5	14	39.2	21	156.8
15	14	117.6	21	470.3
30	14	235.1	21	940.6

5 selections	GT3X (4MB)		GT3X (16MB)	
Epoch	Battery Life (Days)	Memory Limit (Days)	Battery Life (Days)	Memory Limit (Days)
1	14	5.2	21	20.9
5	14	26.1	21	104.5
15	14	78.4	21	313.5
30	14	156.8	21	627.0

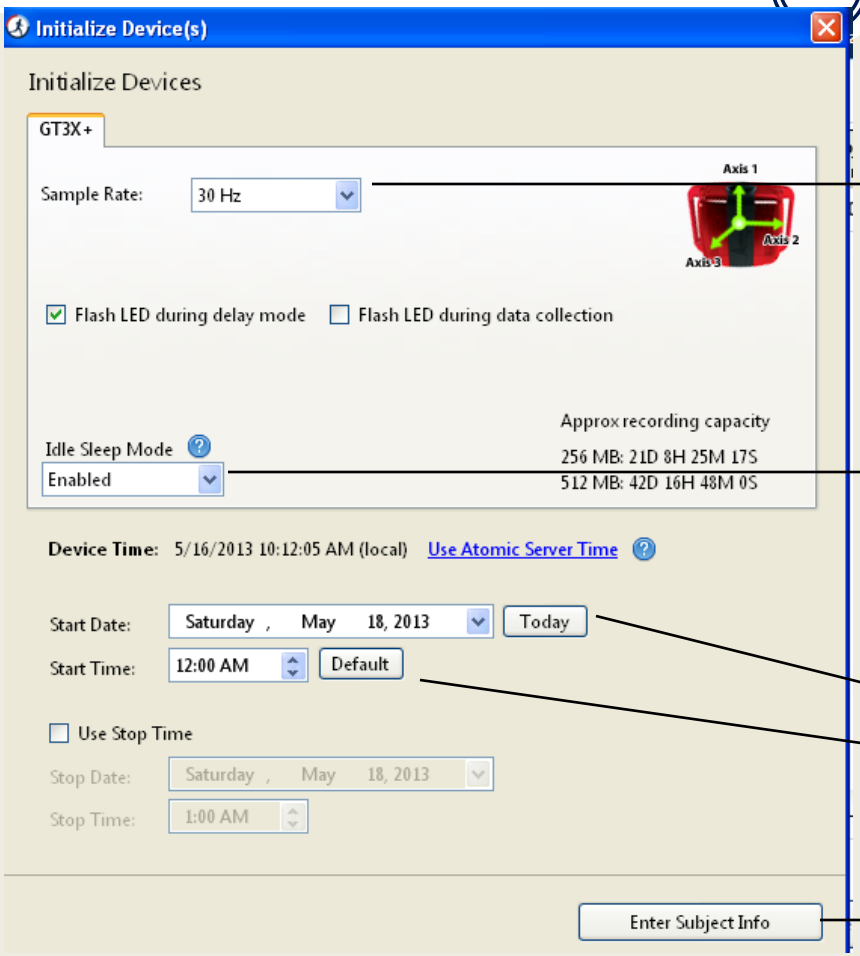
GT3X battery life and memory limit with different selections and epoch lengths

Initializing



Initializing GT3X+

Our testing shows no difference in data with Idle Sleep Mode enabled or disabled



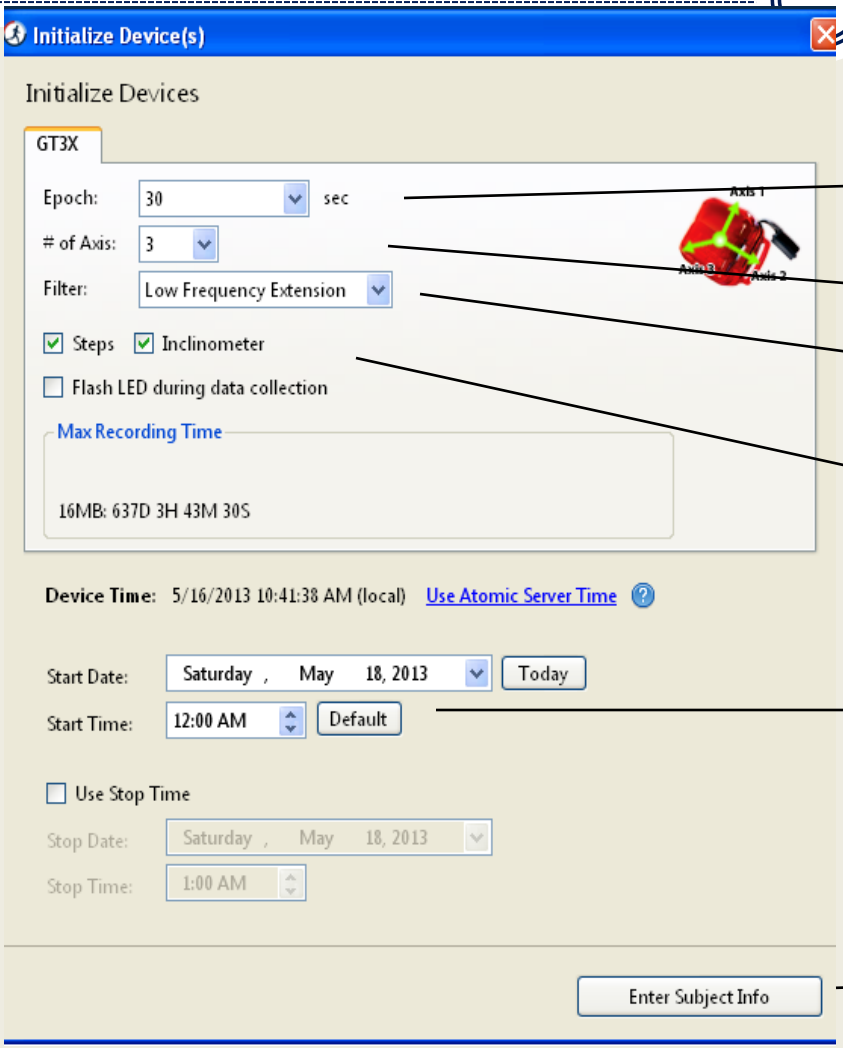
1. Select 30 Hz

2. Enable Idle Sleep Mode (ONLY *if you need to save battery*). Devices will enter a low power state after experiencing 10 seconds of inactivity. Device will check once per second for activity and 'wake up' if needed. Otherwise '0' activity counts will be recorded during sleep mode when the AGD file is created. This saves battery.

3. Select start date and time. Usually first full day of participant wearing (not delivery day)

4. Enter participant Identification number

Initializing GT3X



1. Select 30sec Epochs or shorter if you have enough memory

2. Number of Axis= 3

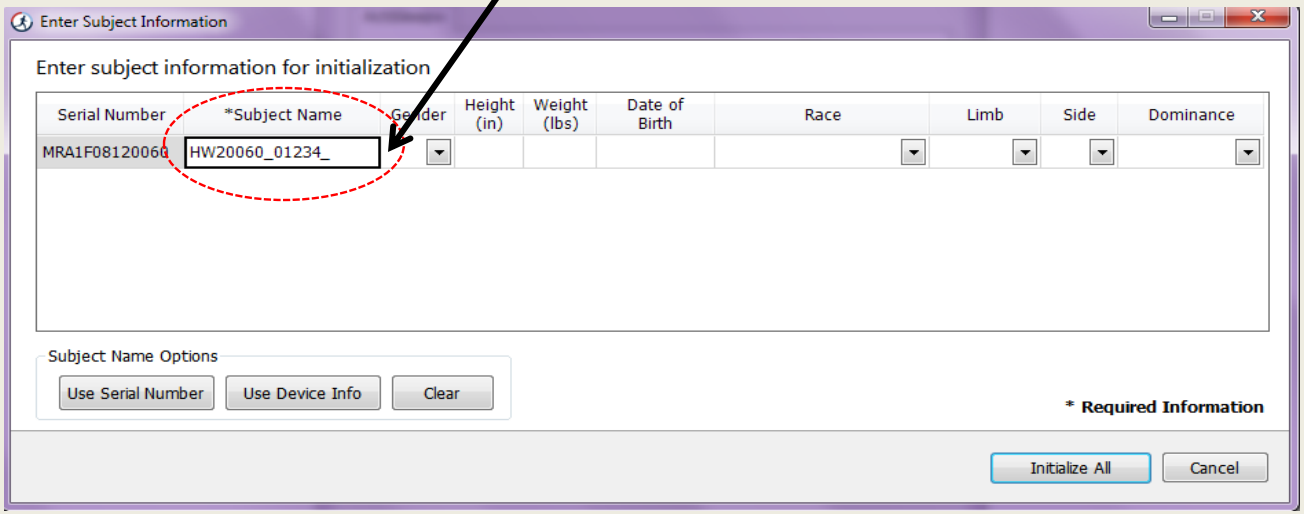
3. Select Low Frequency Extension

4. Check Steps and Inclinometer (only if you have enough memory – these will likely not be used)

5. Select start date and time. Usually first full day of participant wearing.

6. Enter participants Identification number

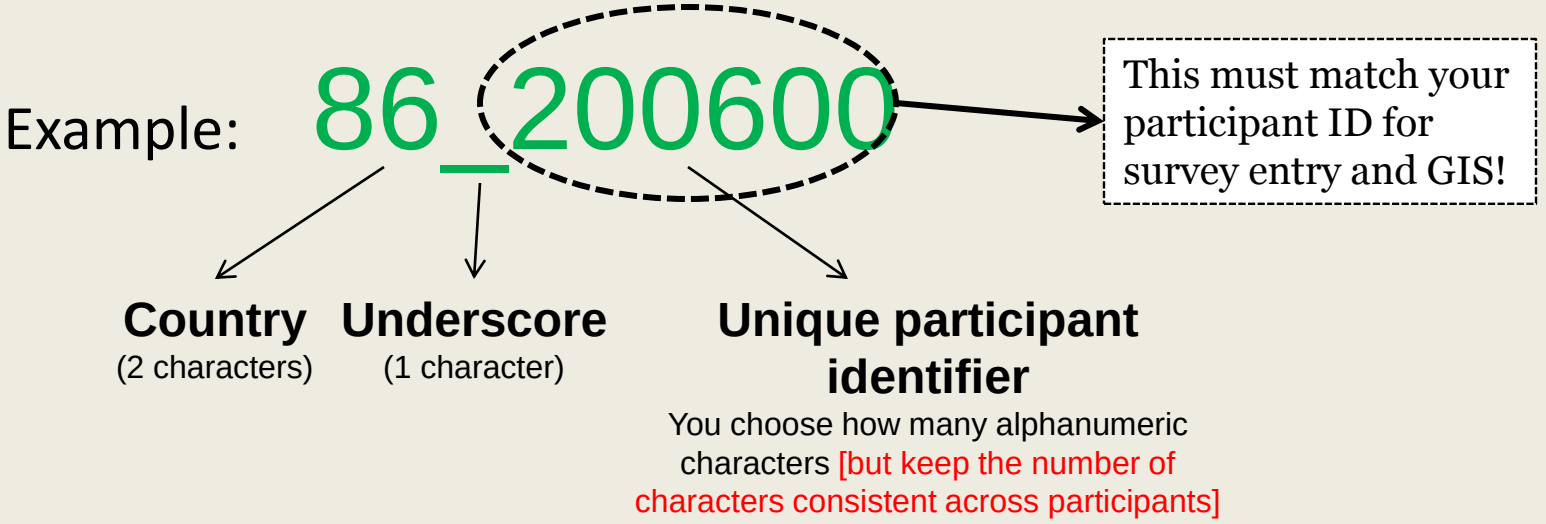
Only field that is required
Use File naming convention



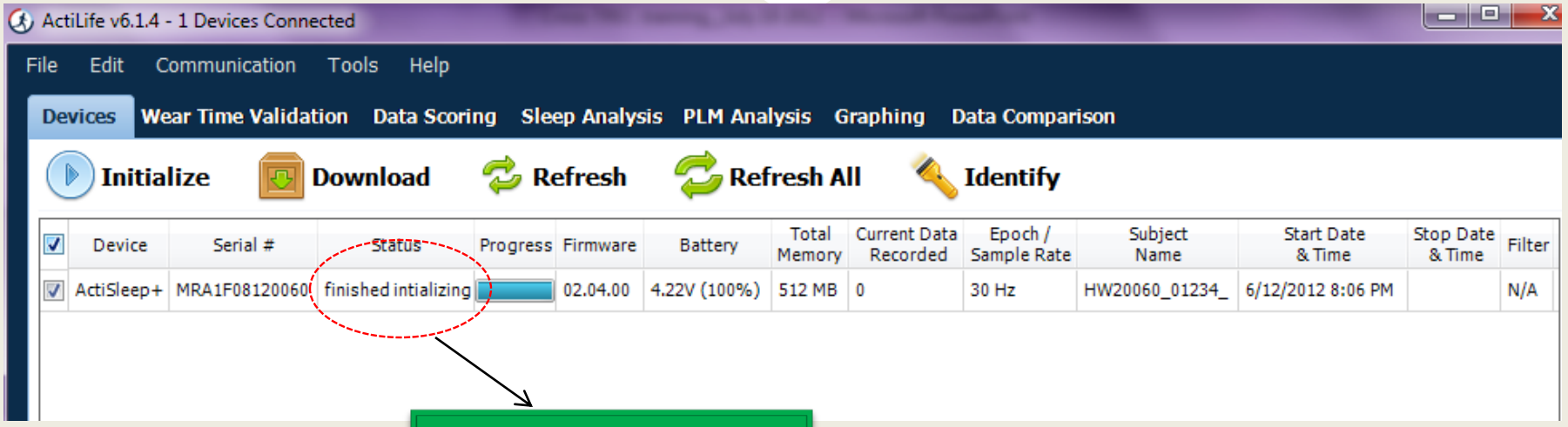
- The accelerometer filename is the only way the Coordinating Center will be able to identify your files and link to surveys, GIS data, etc.
- If you know your participants before initializing, name the files at this stage. If you do not (i.e., field-based recruitment), name the files when downloading. DO NOT WAIT UNTIL LATER TO NAME YOUR FILES WITH PARTICIPANT IDs. THIS COULD INTRODUCE ERROR.

IPEN file naming convention

- IPEN will use a consistent file naming convention to identify all accelerometer files
- It is required that this file name is exactly the same as the ID number used for survey and GIS data. Exactly the same means EXACTLY THE SAME!
- All file names need to begin with your country code (=international calling code) and an underscore



Initializing



You're done!

LED light always flashes prior to data collection

Logistics for in-person delivery

- Linking Actigraph serial number to participant in the field
  - In field assign serial # to participant ID #
  - Make sure this information is entered into database when return to office
- Assigning drop-off and pick-up visits
  - Pick up scheduled on 8th wearing day (9 days after delivery) IF participant didn't start late or miss any days.
- Data screening in the field
  - Laptops with software
  - Remember, you can't count the day you are screening as a wear day
  - Rewears – use same device? Enough memory/battery?

Delivery of Actigraph: Talking Points

How to wear the meter
- Wear for 7 complete days
- Wear for all waking hours – at least 12 hours every day
- DON'T WEAR TO BED AT NIGHT!!!!!!
- Need to start right away – battery will only last 20 days
- We will ask for a re-wear if don't get enough wearing time
- Go about your normal activities - don't do anything different
- Have a letter for coaches, teachers, etc. if needed
- Need to be in town, staying at your primary residence when wearing

Tips for compliance
- Put next to bed or cell phone where you will see it first thing each morning
- Complete meter log each day as a reminder
- Show Excel graphs of what wearing and non-wearing days look like

Incentives
- Will receive after receiving survey and 7 valid meter days
- Will trade incentive for study materials

How to care for meter
- Valuable for research; no monetary value
- **Don't get meter wet! It is NOT WATERPROOF!**
- Don't let anyone else wear it – it's only for you.

Stay in contact
- Someone from our office will call you the day after tomorrow to check on you
- Call with any questions
- Ask for cell phone and permission to send text messages
- If you miss a day or partial day, add on a day at the end and let us know. If you miss more than one day, call us and we'll let you know what to do

Delivery of Actigraph: Checklist

- Make link between device serial number and participant
- Show participant the graphs of compliant and noncompliant data patterns
- Offer to provide personalized graphs to participants when they are done
- Adjust belt to fit participant and show them how to wear it
- Make sure participant can start right away – no travel plans and staying at primary residence for the week. Don't want wearing when staying outside the neighborhood
- Give participant meter log and explain
- Give participant meter instructions and review
- Give participant your contact information
- Make sure all talking points are covered

Attaching the Belt & Wear position

- Suggest several different size belts (30”, 40”, 50” – ask participant which size they want)
- Take off one half of the buckle, thread through device
- Worn on waist, over right hip, snug fit
- Over or under clothing

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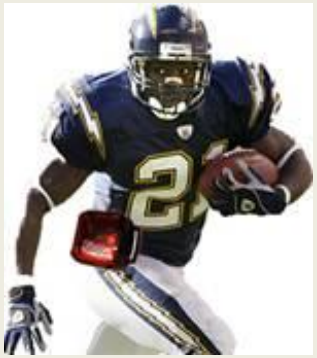
Compliance Elements

- Graphs
- Instruction sheets with dates
- Wearing log
- Calls/Emails/Texts/Mailings– new studies coming out showing that texting reminders works well!
- Scheduling and tips for weekend compliance
- Letter to schools and coaches
- Stickers (although adolescents might not think these are “cool”!)
- Incentive (adolescents want money!)

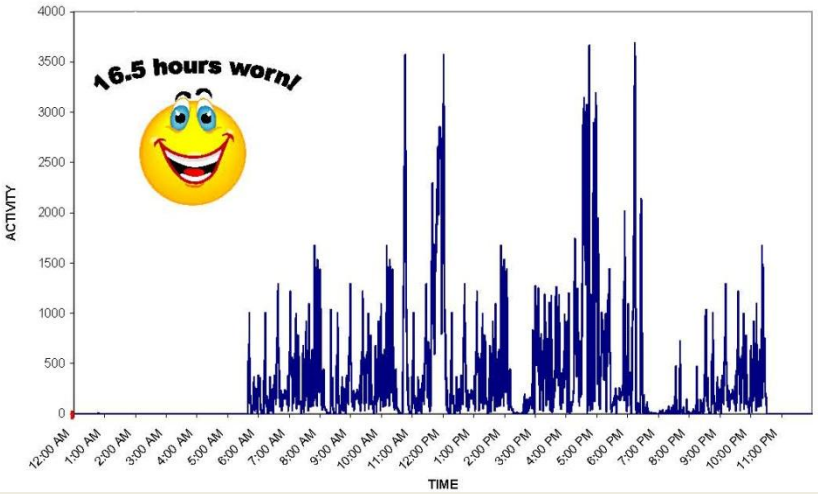


Graphs

USE GRAPHS at device drop off

"We can see if you don't wear the device for long enough"

"We will need to ask you to wear it again"

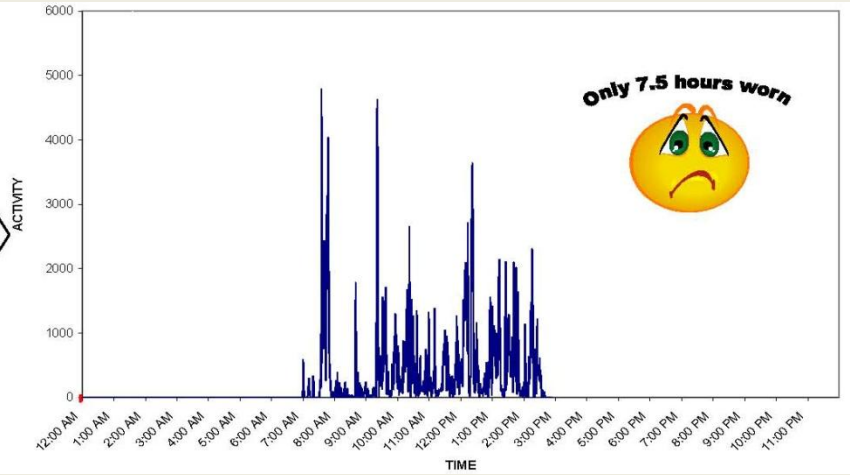


This person did a great job of wearing their meter!

As you can see on the graph, they put it on when they woke up at about 6:00 in the morning, and kept it on until about 10:30 at night.

This person would have to wear the meter again.

They put it on when they woke up at about 7:00 in the morning, but took it off at about 2:30 in the afternoon.



Instructions

- How to wear meter
- Increase valid wearing time expectations
- Provides an end date

How to Wear the Activity Meter

This small activity meter records general movement and allows us to get a better idea of your overall activity level. We will **not** be able to tell what kind of specific activity is happening. At first, the belt may feel slightly awkward, but after a few hours, you will probably get used to it and not notice it as much. It is **extremely** important for our study that you wear the meter properly. If it is not worn properly, we may have to send it back for you to wear again. Please follow these instructions carefully:

- Wear the meter attached to the belt around your waist, just above your **right** hipbone. You can wear it either underneath or on top of your clothing.
- Wear the meter so that the star sticker is facing **up.**

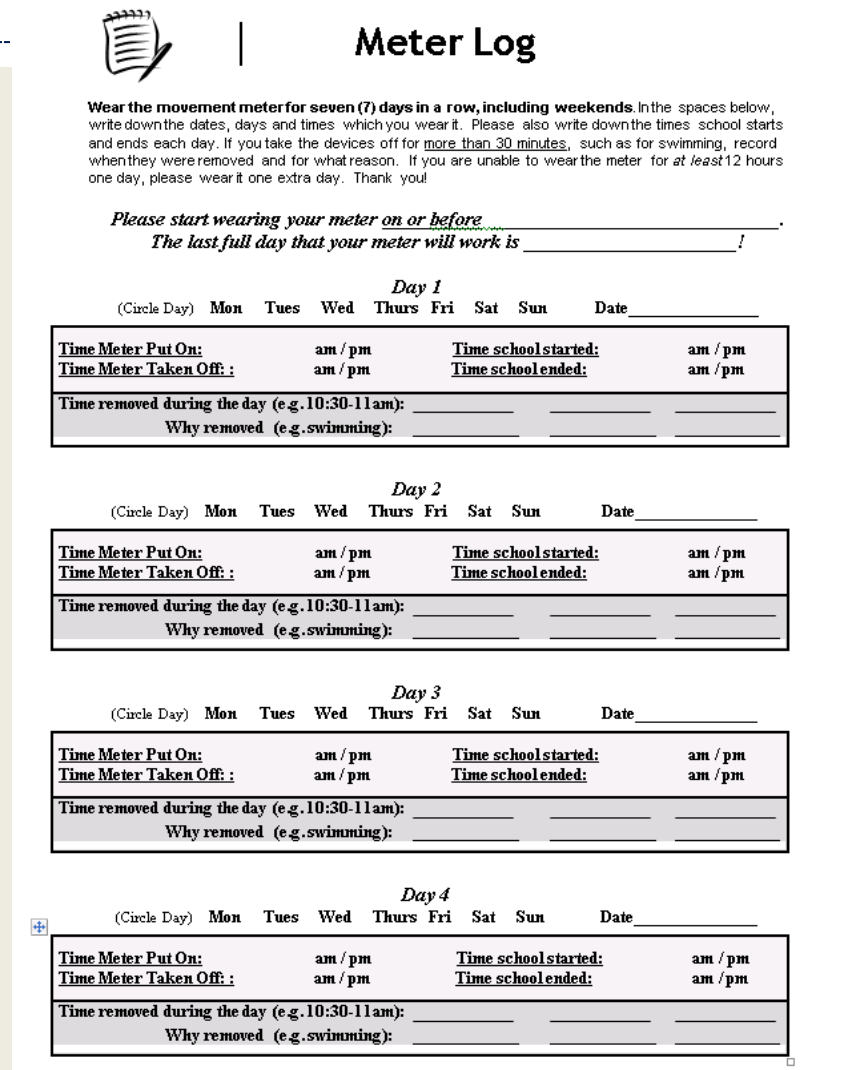
- Wear the meter **snug** against your body. If you have to, you can adjust the belt by pulling the end of the strap to make it tighter. Or, to loosen the belt, push more of the strap through the loop. **Wear the belt tight enough so that the meter does not move when you are being active.**
- Please **put it on first thing in the morning --** either just after you get out of bed or just after you shower or take a bath in the morning.
- **Do not submerge the meter in water** (swimming, bathing, etc.)
- Keep the activity meter on all day (unless swimming or in the water).
- At night, **take it off right before you go to bed**. **You should be wearing the meter for *at least* 12 hours each day.**
- Do not let anyone else wear it.

- **The meter has a very short battery life.**
- **The last full day that it will work is _____. If you cannot begin wearing it by _____, please call 1-877-440-4832 as soon as possible!**

There is no "ON" or "OFF" switch that you need to worry about turning on or off every day. The activity meter runs on a battery and is programmed to run continuously without you needing to turn it on. Please do not try to open the activity meter.

Log

- Provides a daily assignment that might serve as a wearing reminder
- Can be helpful when processing data
- Will use school start and end times to filter accelerometer data (e.g., MVPA outside of school hours)
- Tracking database will include form for data entry
- Might not have perfect compliance with the log so may be a need to collect school times directly from schools



Meter Log

Wear the movement meter for seven (7) days in a row, including weekends. In the spaces below, write down the dates, days and times which you wear it. Please also write down the times school starts and ends each day. If you take the devices off for more than 30 minutes, such as for swimming, record when they were removed and for what reason. If you are unable to wear the meter for *at least* 12 hours one day, please wear it one extra day. Thank you!

Please start wearing your meter on or before _____.
The last full day that your meter will work is _____!

Day 1

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:		am / pm	Time school started:		am / pm
Time Meter Taken Off: :		am / pm	Time school ended:		am / pm
Time removed during the day (e.g. 10:30-11am):					
Why removed (e.g. swimming):					

Day 2

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:		am / pm	Time school started:		am / pm
Time Meter Taken Off: :		am / pm	Time school ended:		am / pm
Time removed during the day (e.g. 10:30-11am):					
Why removed (e.g. swimming):					

Day 3

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:		am / pm	Time school started:		am / pm
Time Meter Taken Off: :		am / pm	Time school ended:		am / pm
Time removed during the day (e.g. 10:30-11am):					
Why removed (e.g. swimming):					

Day 4

(Circle Day) Mon Tues Wed Thurs Fri Sat Sun Date_____

Time Meter Put On:		am / pm	Time school started:		am / pm
Time Meter Taken Off: :		am / pm	Time school ended:		am / pm
Time removed during the day (e.g. 10:30-11am):					
Why removed (e.g. swimming):					

Prompting Material Return

Phone calls

- First calls at the beginning of wearing to remind of criteria and proper wearing (Days 2 & 5)
- Prompt calls weekly after that

Emails/Text Messages

- Use in combination with phone calls

Mailings/Visits

- Can send return mailing materials to encourage sending back, send a reward letter or stop by participants home

DON'T GIVE UP!

Prompt Calls

- Calls made on Days 2 and 5 *(text/email if don't reach participant)*
  - Reminder to wear
  - Check if on schedule
  - Troubleshoot problems or delayed wearing
  - Answer questions

- What to do if participant started late, hasn't started, can't find meter

  Considerations:
  - Battery life
  - Re-visit schedule
  - Likelihood of better outcome if do it again
  - How believable the person is

- What to do if can't reach participant by visit or phone
  - KEEP TRYING! Persistence usually pays off.
  - Leave postage-paid envelopes for them to send meter back to you
  - Stress to them that someone else is waiting to wear the meter
  - Offer reward as LAST resort (we can send you an example)

Call Schedule

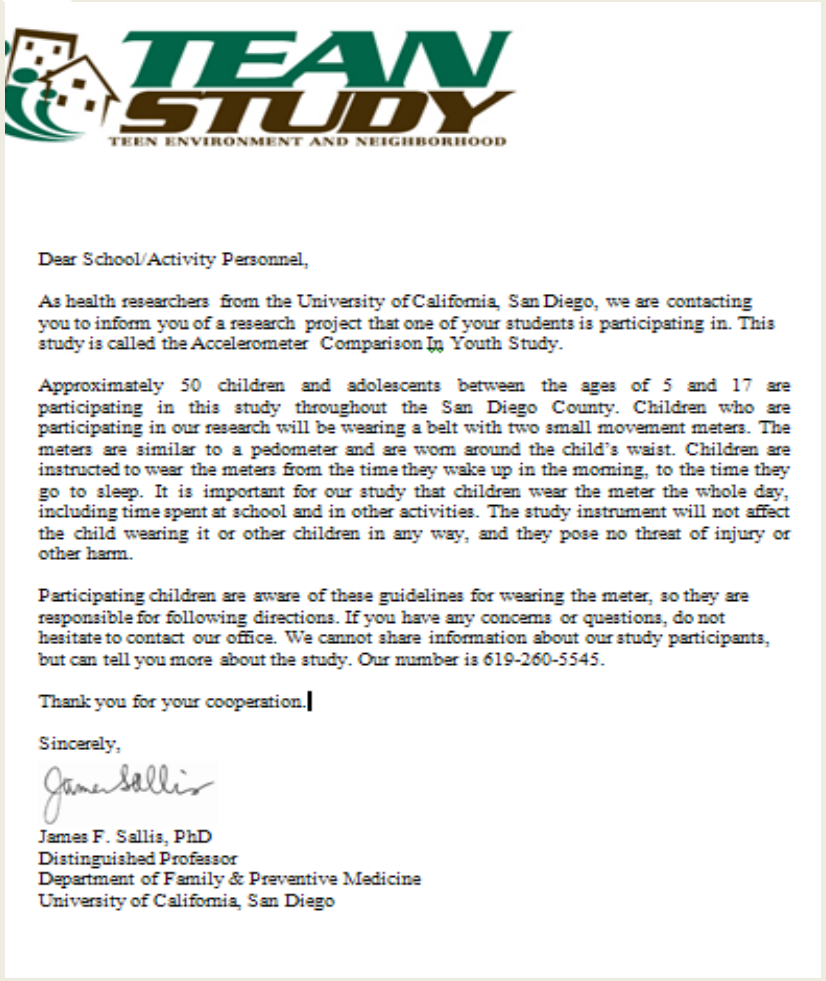
Action (MC=meter check-in call; MR=meter reminder call; PC=prompt call)	Length of time before next contact
Make your MC call the day after you expect your participant to receive the meter.	Schedule next call for 3 days later.
Make your MR call to check in again and make sure the participant started wearing the meter.	Schedule next call for 5 days later.
Make your PC1 call (first prompt call).	Schedule your next call for 1 week later.
Make your PC2 call.	Schedule your next call for 1 week later. If local, offer a home pickup.
Make your PC3 call and send an email if possible.	Schedule your next call for 1 week later.
Make your PC4 call and mail a return envelope (#1).	Schedule your next call for 1 week later.
Make your PC5 call.	Schedule your next call for 1 week later.
Make your PC6 call and send an email if possible.	Schedule your next call for 1 week later.
Make your PC7 call.	Schedule your next call for 1 week later.
Make your PC8 call and mail another return envelope (#2).	Schedule your next call for 2 weeks later.
Make your PC9 call.	Schedule your next call for 2 weeks later.
Make your PC10 call and send an email if possible.	Schedule your next call for 2 weeks later.
Make your PC11 call.	Schedule your next call for 2 weeks later.
Make your PC12 call and mail another return envelope.	Schedule your next call for 2 weeks later and continue calling until at least 6 months have passed.
At this point, the meter has been out for at least 6 months and 3 envelopes have been sent. Consult a supervisor about the next steps.	Continue calling if you have had contact with participant and think continued attempts will help. A reward letter is an option but only if nothing else helps. The reward is usually comparable to the incentive they would have received for completing the study.

Scheduling and tips for weekend compliance

- Lower compliance on weekends, so recommend starting toward the end of the week, if feasible, so don't compound the problem with subject fatigue/loss of interest
- Emphasize importance of wearing for complete days on the weekends
- Reminder to put on first thing even if sleep late and to wear right up until bedtime
- Reminder to back on if remove for swimming

Letter for teachers, coaches

- Explains accelerometer and study
- May help reduce device removals for school, sports, etc.



TEEN STUDY
TEEN ENVIRONMENT AND NEIGHBORHOOD

Dear School/Activity Personnel,

As health researchers from the University of California, San Diego, we are contacting you to inform you of a research project that one of your students is participating in. This study is called the Accelerometer Comparison In Youth Study.

Approximately 50 children and adolescents between the ages of 5 and 17 are participating in this study throughout the San Diego County. Children who are participating in our research will be wearing a belt with two small movement meters. The meters are similar to a pedometer and are worn around the child's waist. Children are instructed to wear the meters from the time they wake up in the morning, to the time they go to sleep. It is important for our study that children wear the meter the whole day, including time spent at school and in other activities. The study instrument will not affect the child wearing it or other children in any way, and they pose no threat of injury or other harm.

Participating children are aware of these guidelines for wearing the meter, so they are responsible for following directions. If you have any concerns or questions, do not hesitate to contact our office. We cannot share information about our study participants, but can tell you more about the study. Our number is 619-260-5545.

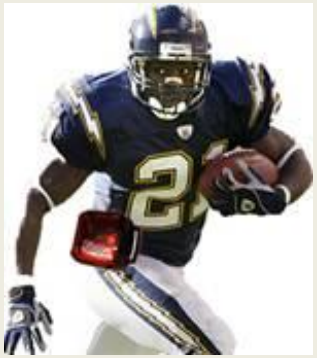
Thank you for your cooperation.

Sincerely,

James F. Sallis, PhD
Distinguished Professor
Department of Family & Preventive Medicine
University of California, San Diego

Stickers, Incentives

- Stickers of popular music/sports figures wearing ActiGraphs were a hit with young kids… but maybe these are not 'cool' enough for teenagers
- Money on the other hand has worked very well as an incentive for adolescents!

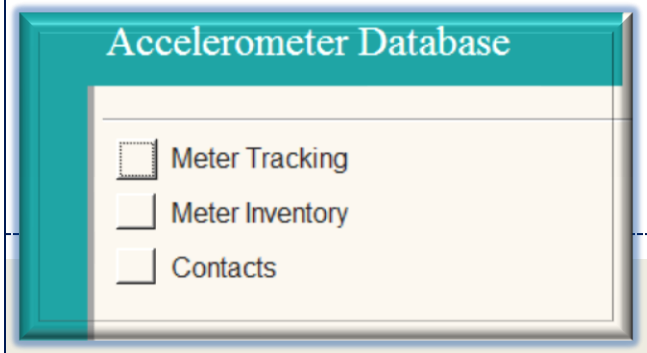


Delivery and Compliance Training

- Data collectors wear Actigraph for several days so they can speak from experience
- Role playing for delivery of Actigraph & compliance
- Provide checklist of talking points but not necessarily scripted
- Emphasize importance of the details (serial numbers, participant IDs, dates)
- Role playing for re-wear requests

PART 2: PRE-DATA COLLECTION

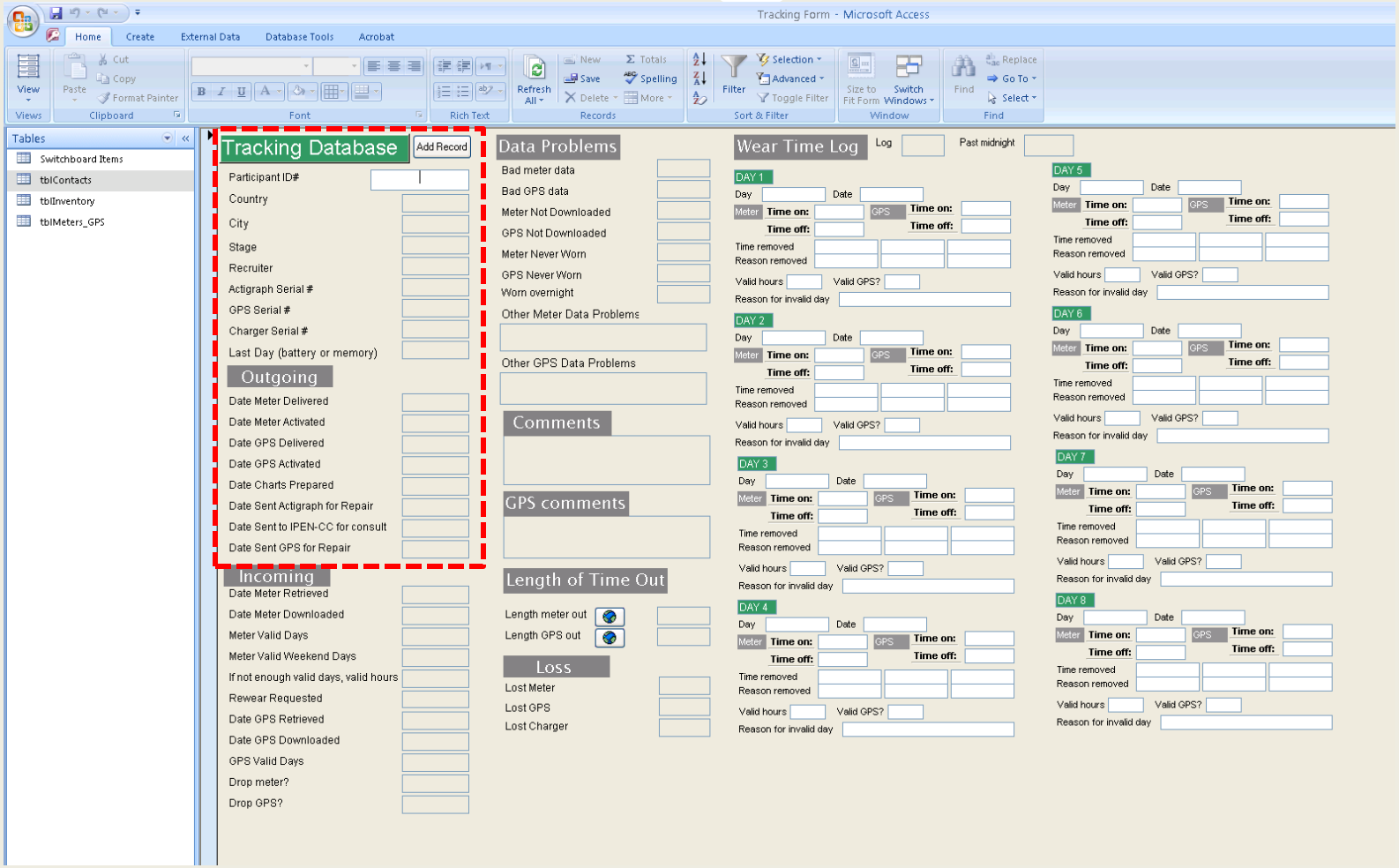
- About the Actigraph
- Preparing for Data Collection
- Charging, Initializing, & Delivering
- Compliance Tips and Prompting
- Tracking



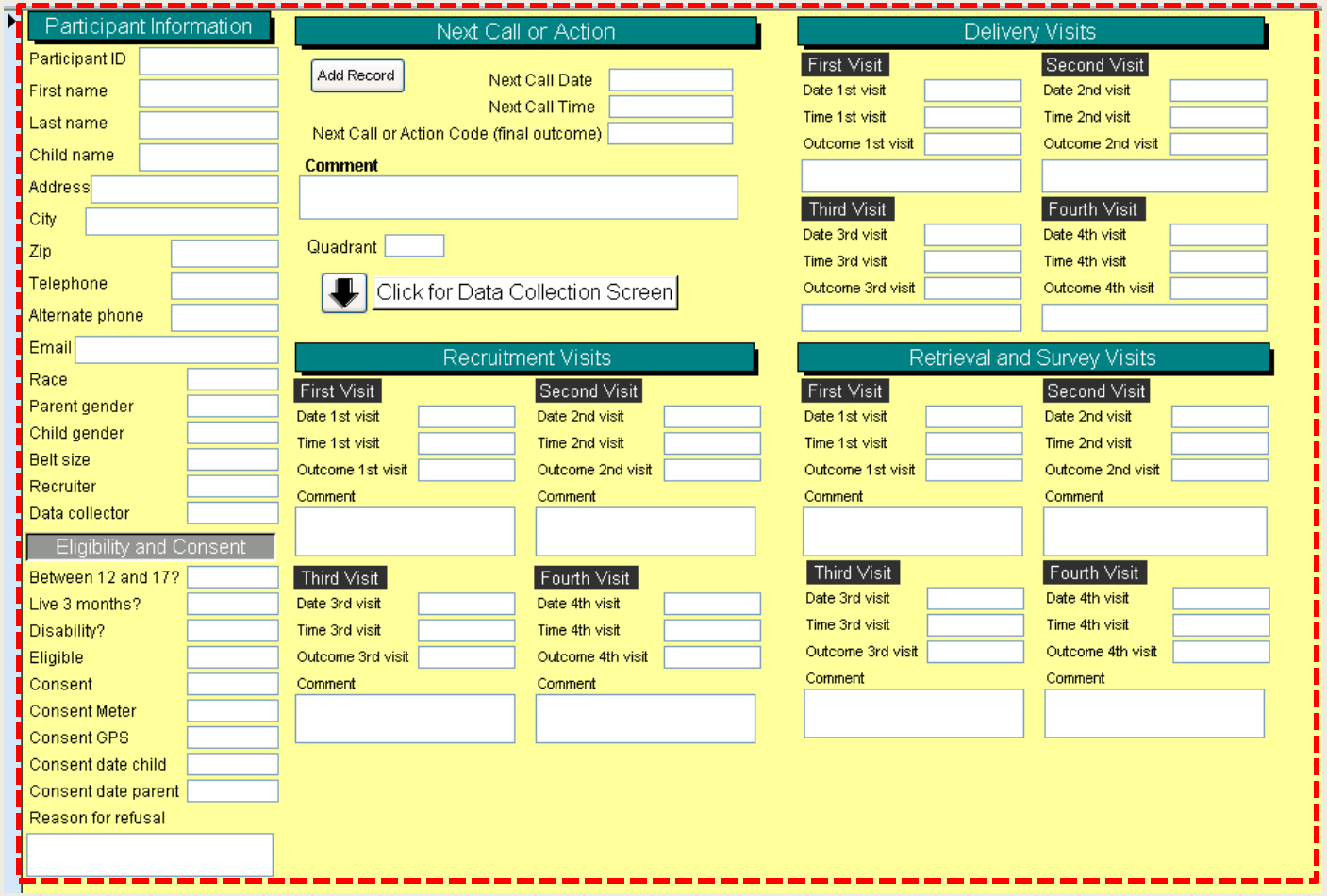
Access Tracking Database

- Two functions: Track devices and track people
  - Device (tracking & inventory) form to track dates, wearing time, history of devices
    - Queries to track return times, problem units, compliance rates, outstanding units
    - Used by person initializing and screening meter files
    - Also includes place to enter information from logs
  - Participant (contacts) form to track visits, phone calls, etc.
    - Queries to track recruitment numbers and rates, demographics, history of participant in study
    - Used by person doing recruitment and/or managing and scheduling data collectors
- Tracking some things in 2 places is a good quality control practice

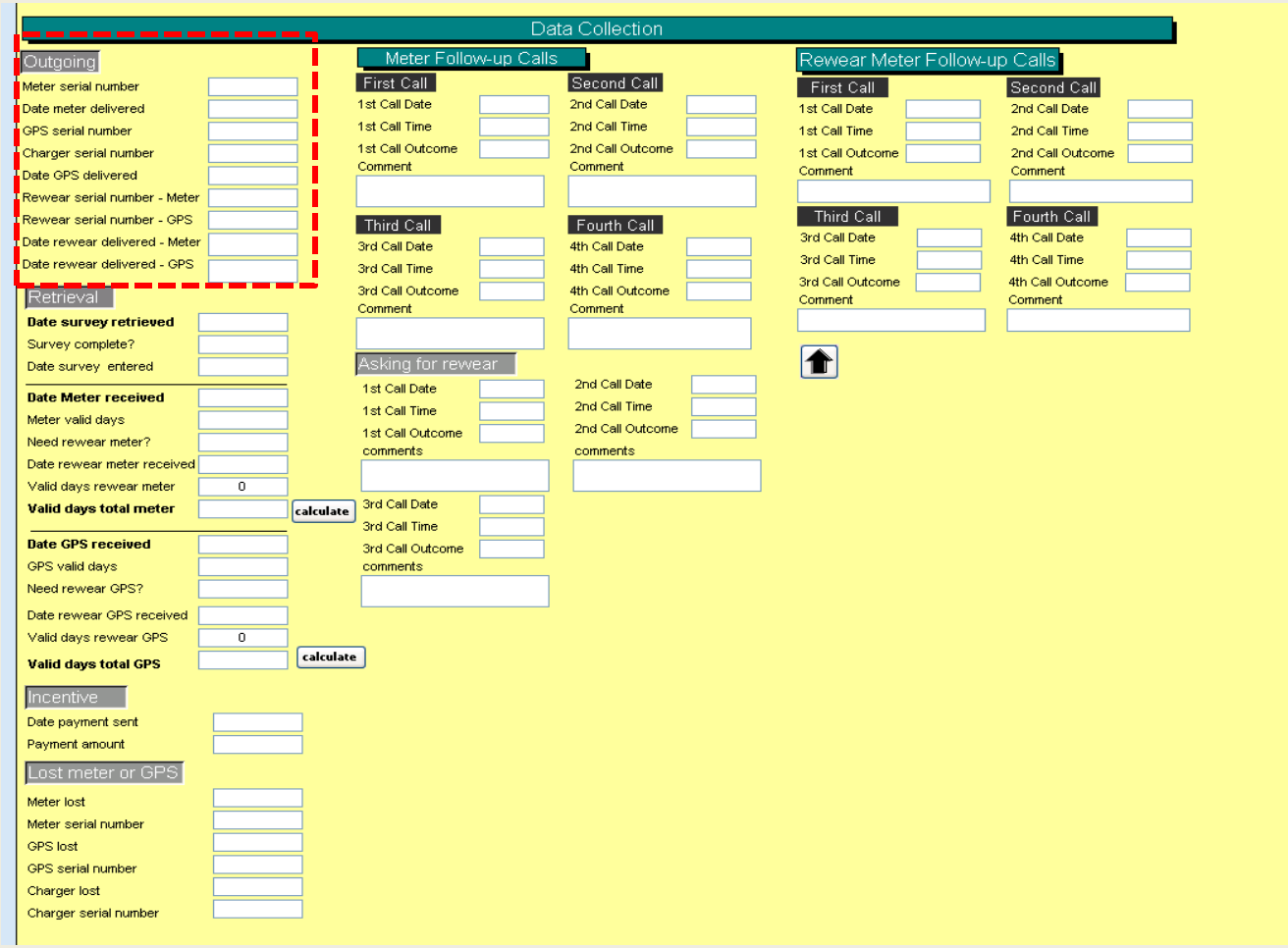
Tracking Outgoing Devices



Track Recruitment and Visits



Track data collection and prompts

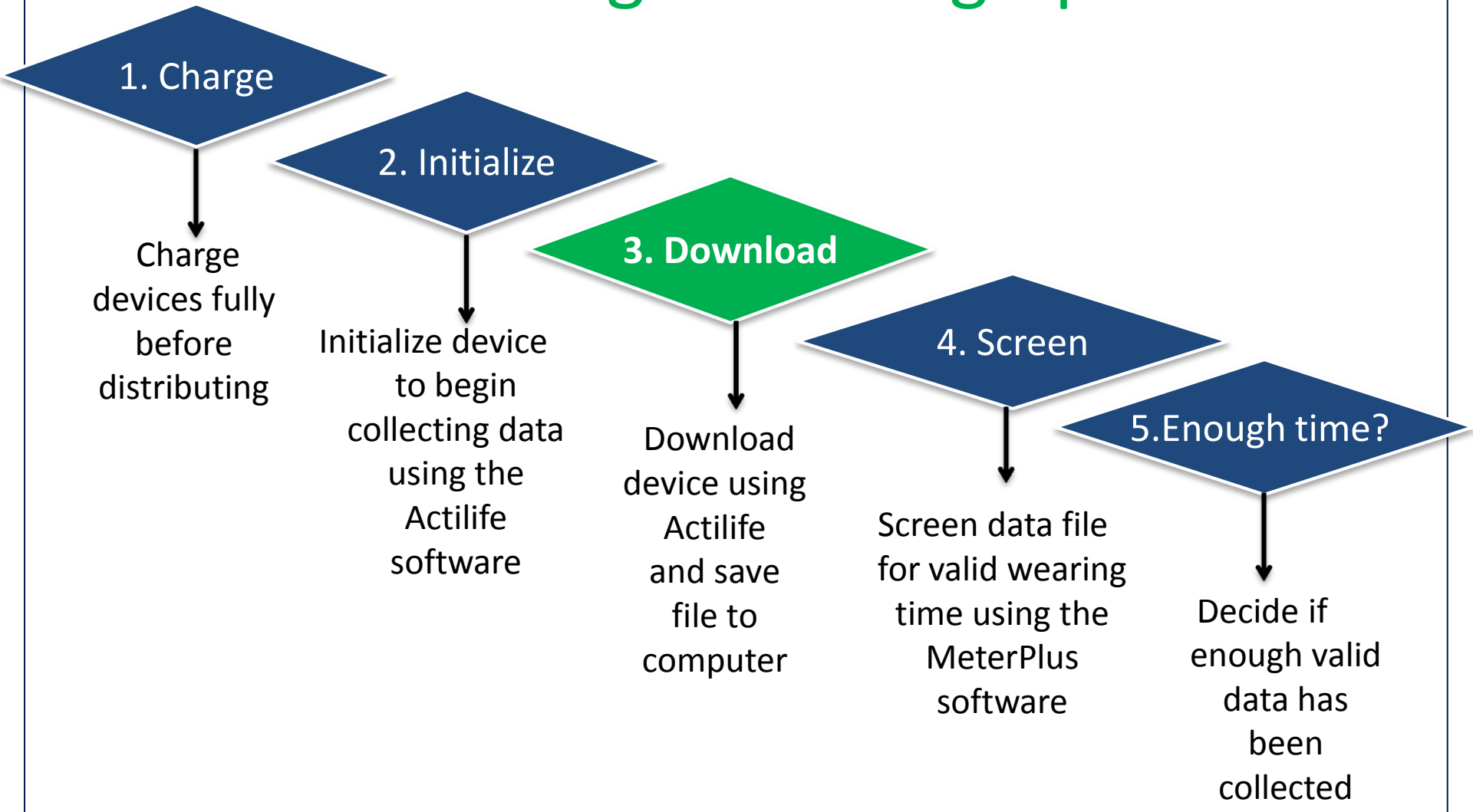


PART 2 COMPLETED!
NEED TO STRETCH? EAT???

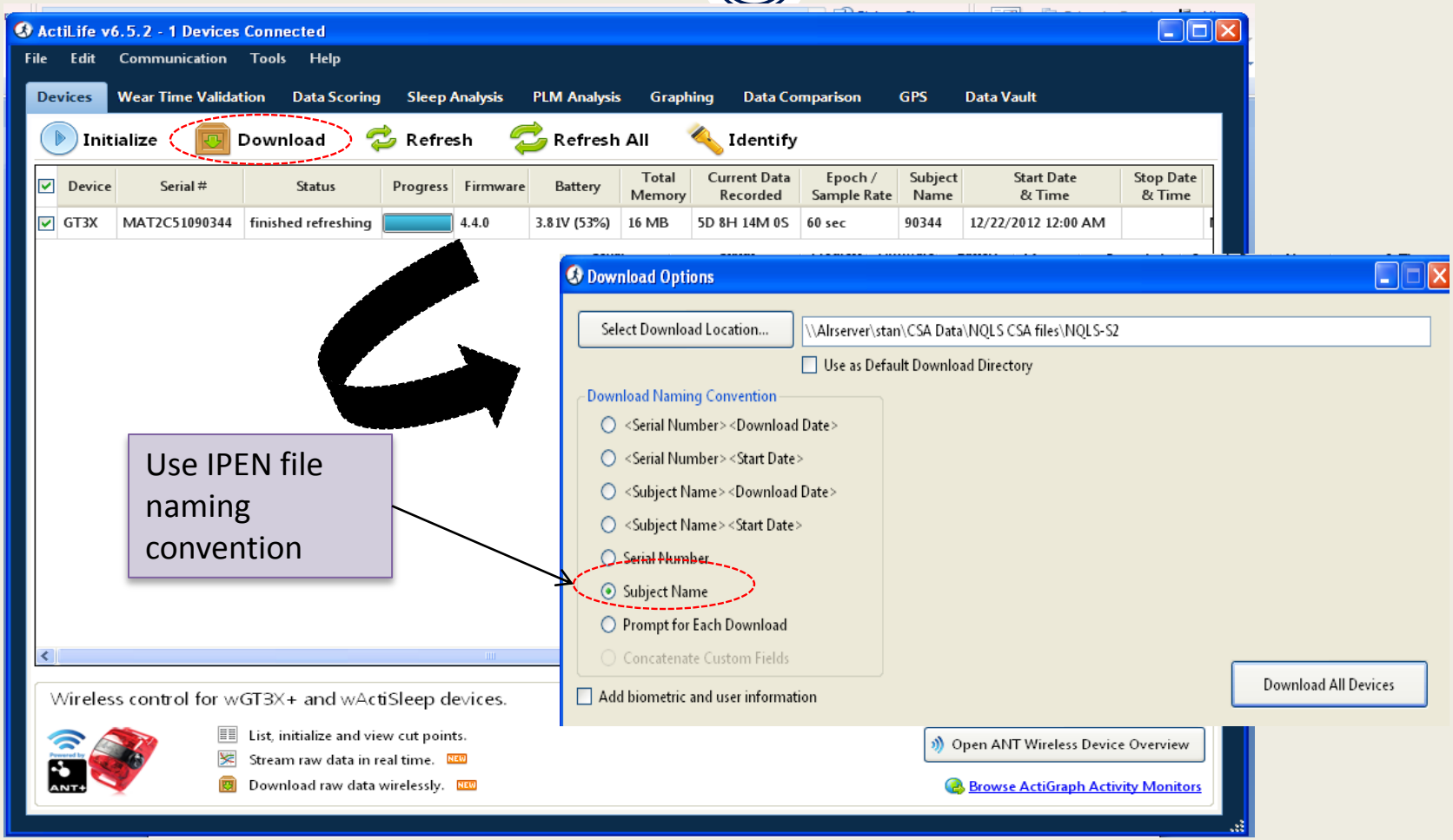
PART 3: POST-DATA COLLECTION

- Downloading and Converting Data
- Screening Data
- Electronic Tracking
- Data Transfer
- Quality Control

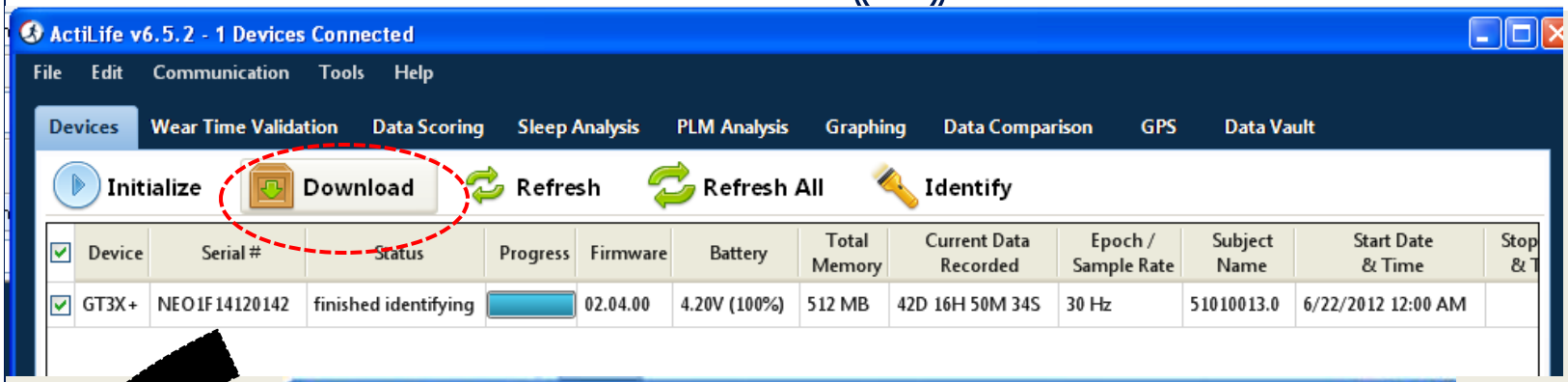
Stages of Actigraph

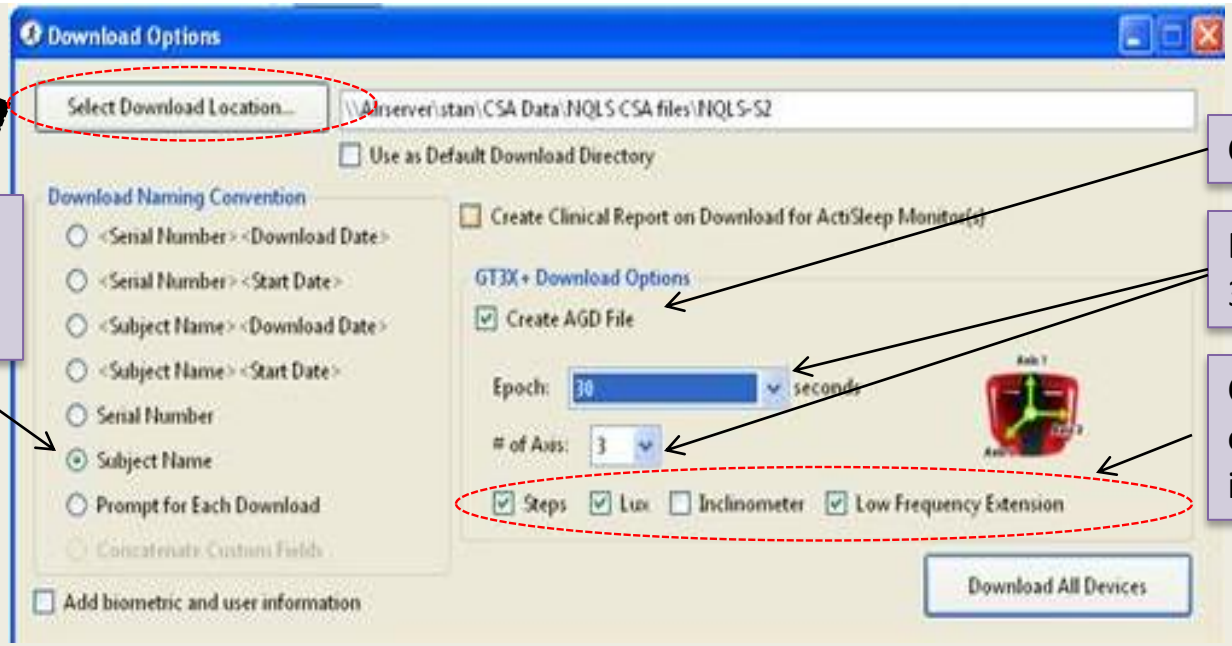


Downloading data from GT3X



Downloading data from GT3X+





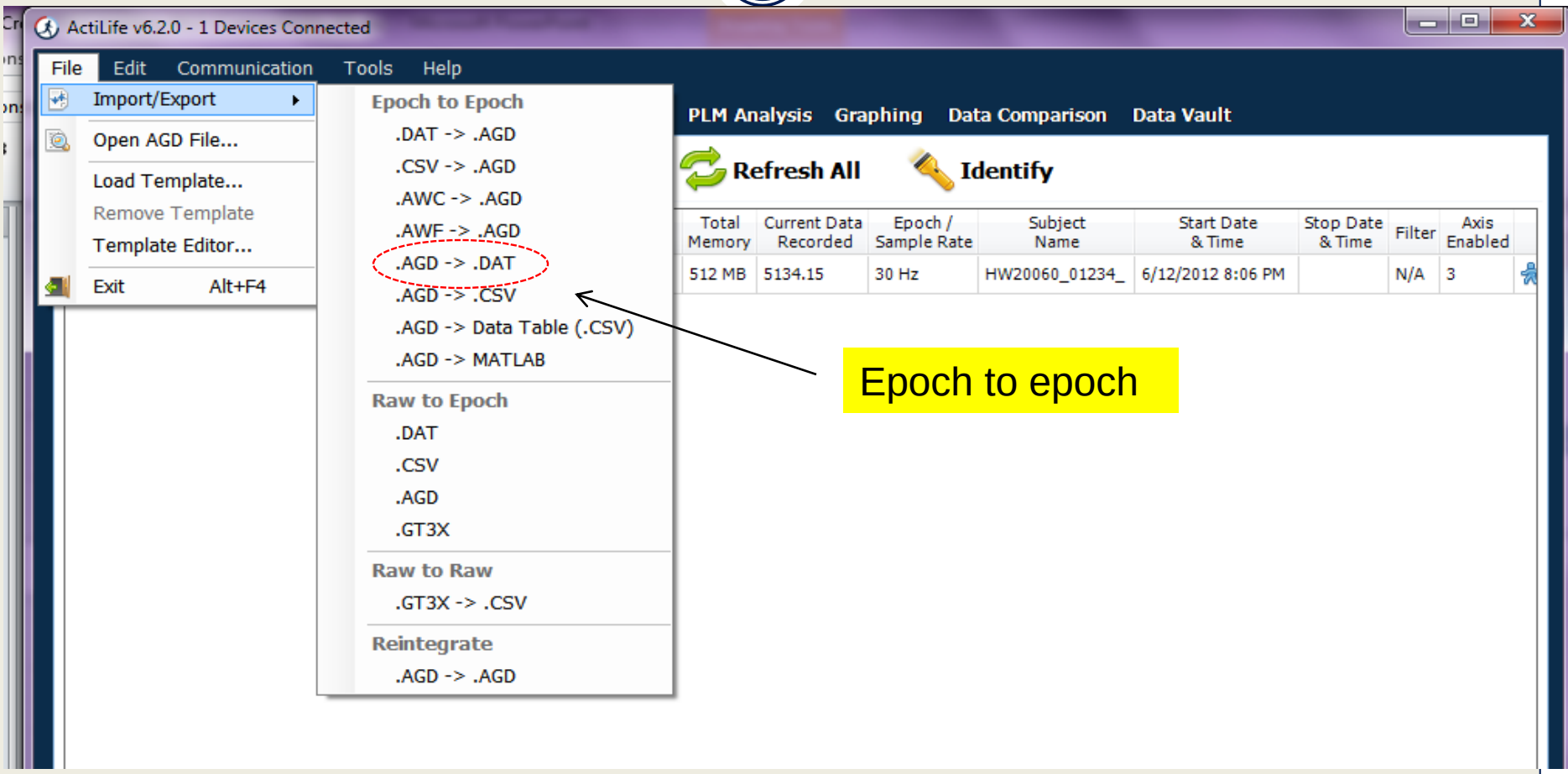
Use IPEN file naming convention

Create AGD file

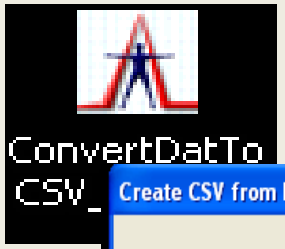
Epoch = 30s
3 axis

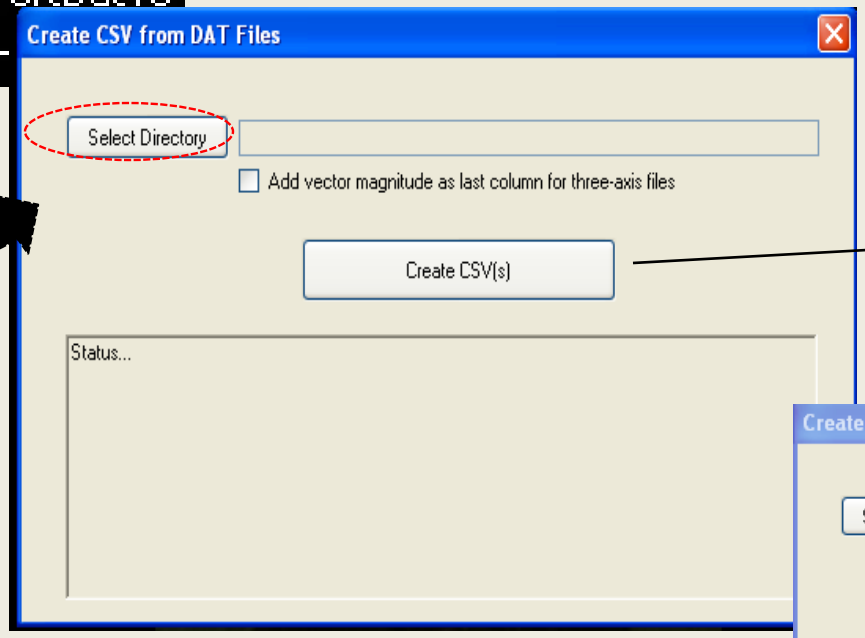
Check all download options EXCEPT inclinometer

AGD to DAT

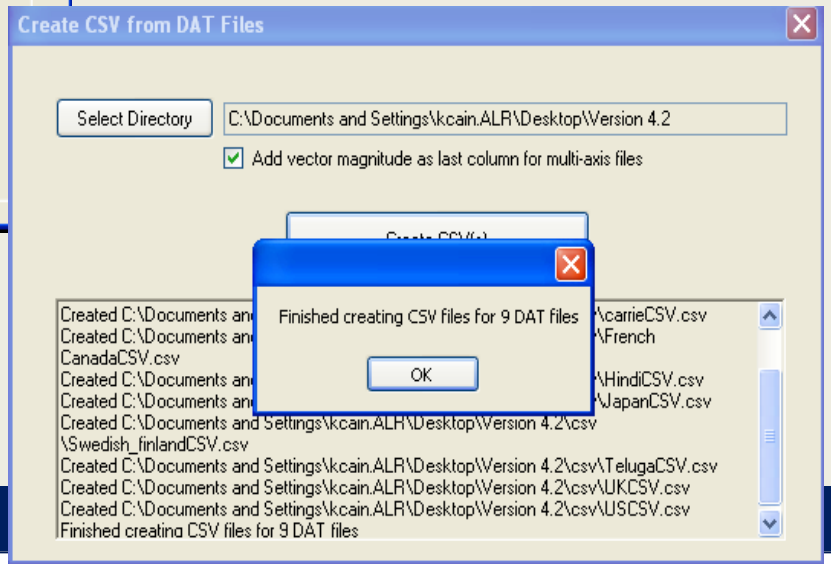

ActiLife v6.2.0 - 1 Devices Connected
File
Edit
Communication
Tools
Help
Import/Export
Open AGD File...
Load Template...
Remove Template
Template Editor...
Exit
Alt+F4
Epoch to Epoch
.DAT -> .AGD
.CSV -> .AGD
.AWC -> .AGD
.AWF -> .AGD
.AGD -> .DAT
.AGD -> .CSV
.AGD -> Data Table (.CSV)
.AGD -> MATLAB
Raw to Epoch
.DAT
.CSV
.AGD
.GT3X
Raw to Raw
.GT3X -> .CSV
Reintegrate
.AGD -> .AGD
PLM Analysis
Graphing
Data Comparison
Data Vault
Refresh All
Identify
Total Memory
Current Data Recorded
Epoch / Sample Rate
Subject Name
Start Date & Time
Stop Date & Time
Filter
Axis Enabled
512 MB
5134.15
30 Hz
HW20060_01234_
6/12/2012 8:06 PM
N/A
3
Epoch to epoch

DAT to CSV

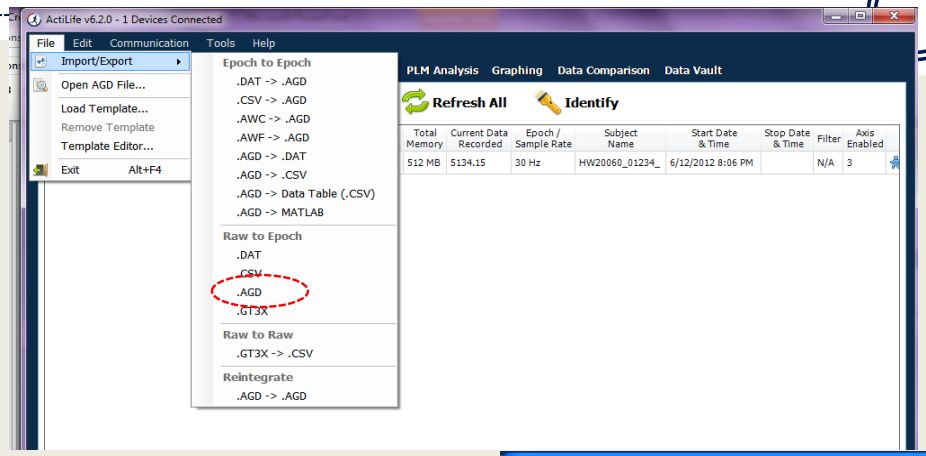




After converting an AGD file to DAT use the DAT converter to create a CSV file

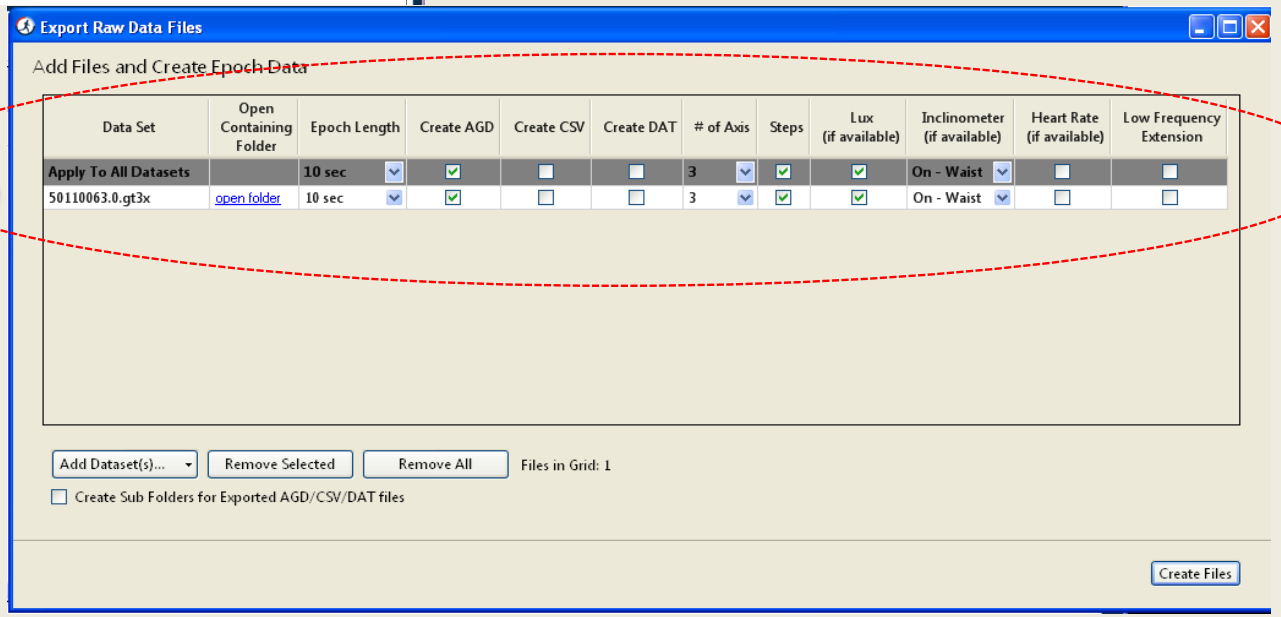


Raw to AGD (GT3X+ only)

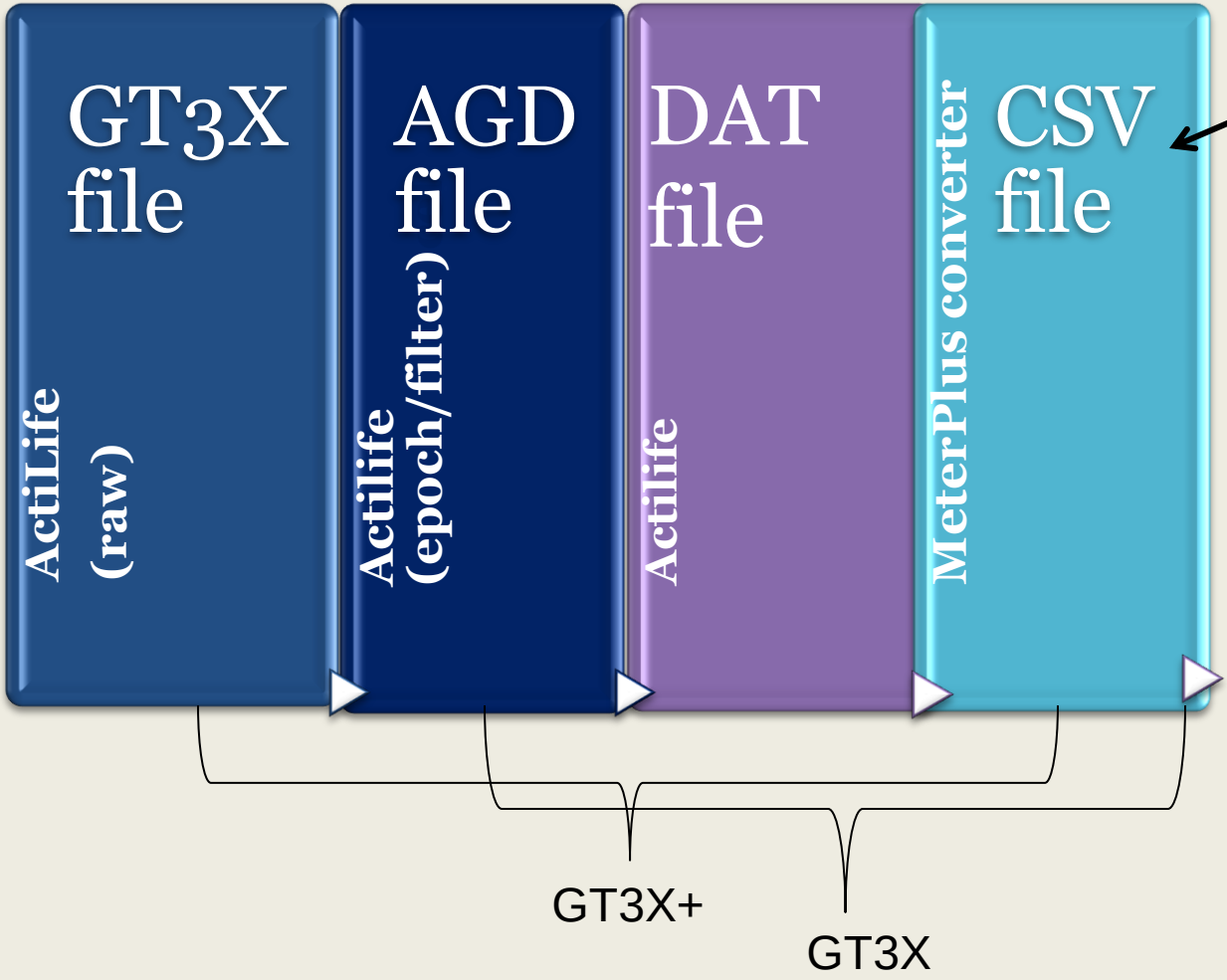


NOTE: you can go back and re-create the AGD file from the raw data file as many times as you want

Change in protocol: Mark Inclinometer as "OFF"



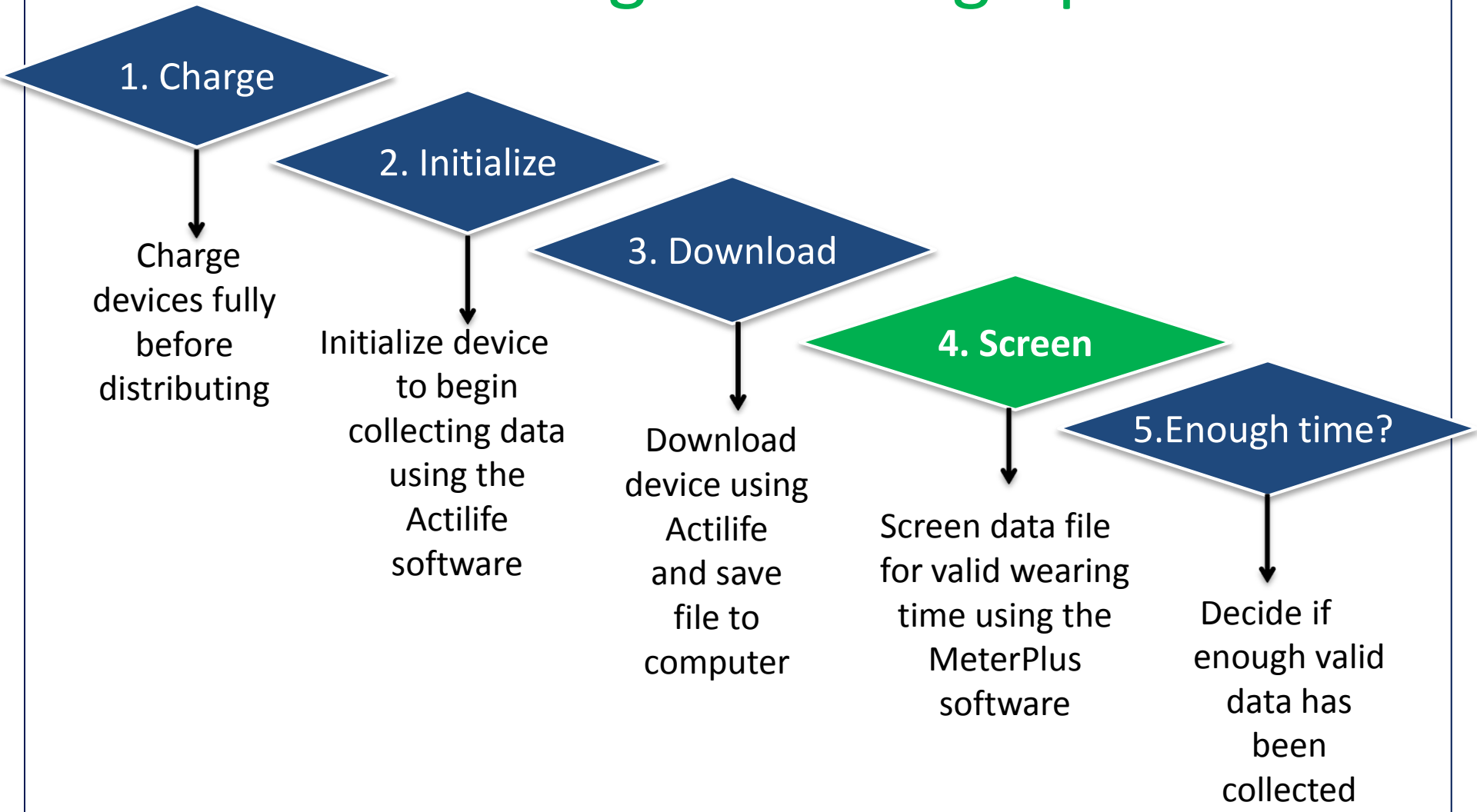
File Conversions – Actilife to MeterPlus



The CSV files are what you will transfer to the Coordinating Center

SANTECH, INC. MeterPlus Version 4.3

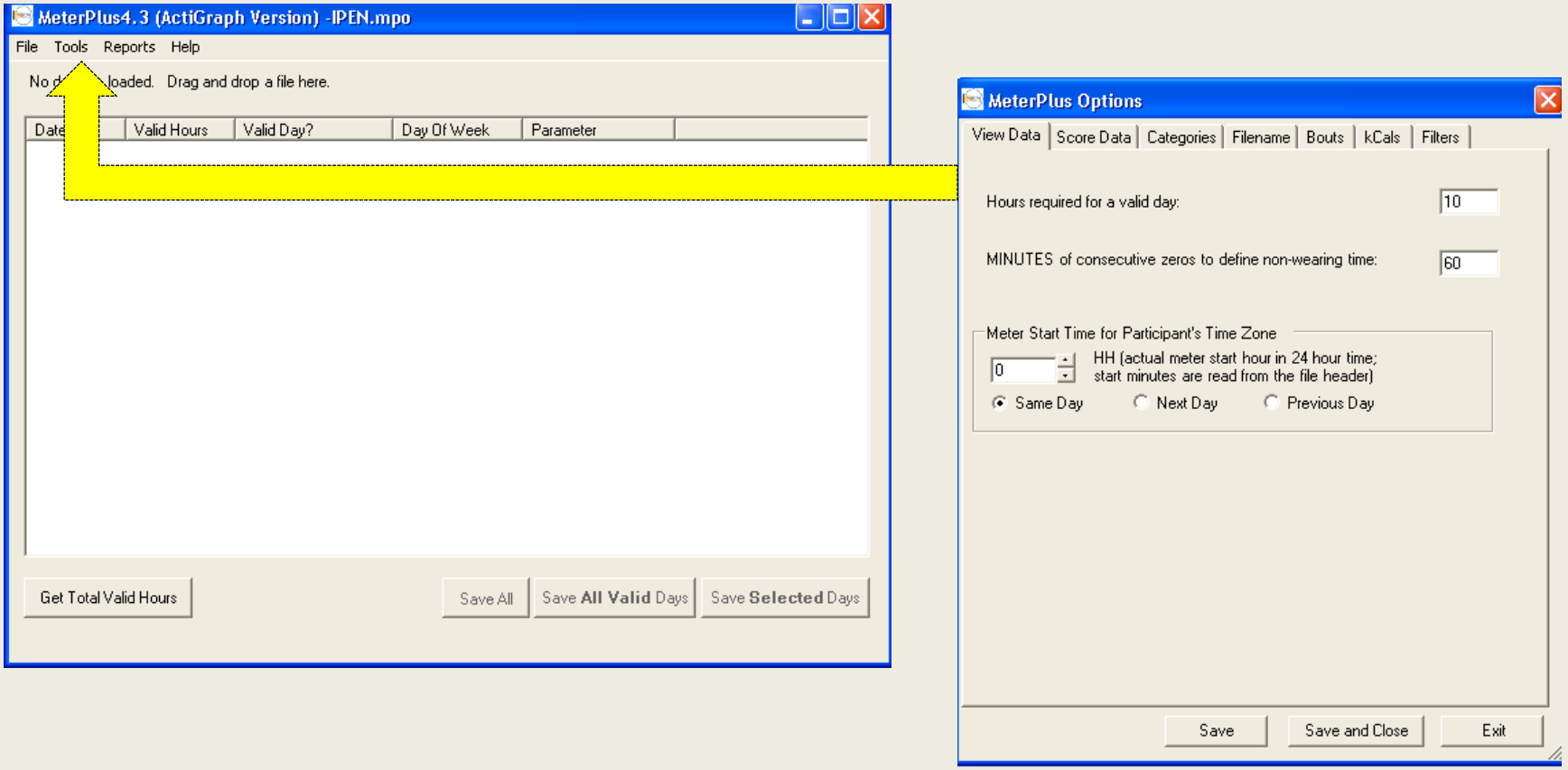
Stages of Actigraph



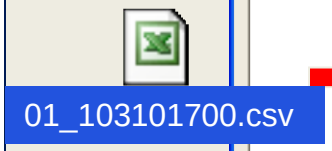
Data screening

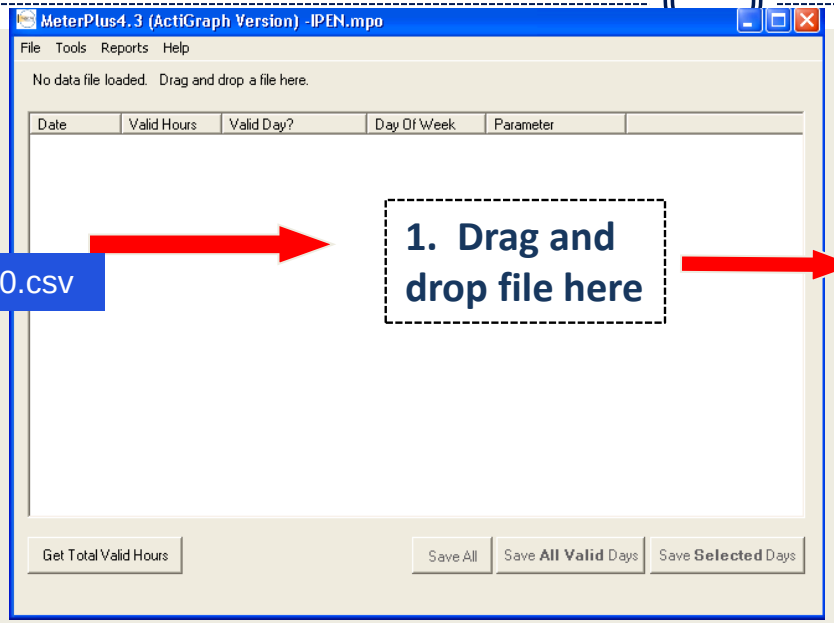
- Looking for valid wear time & device malfunction
  - Invalid days and non wear days are not always obvious, screening catches this
- Screen data right away
  - Stop using faulty devices!
  - Ask for rewear quickly if needed
- Need dedicated staff person

Screening data – Program Settings

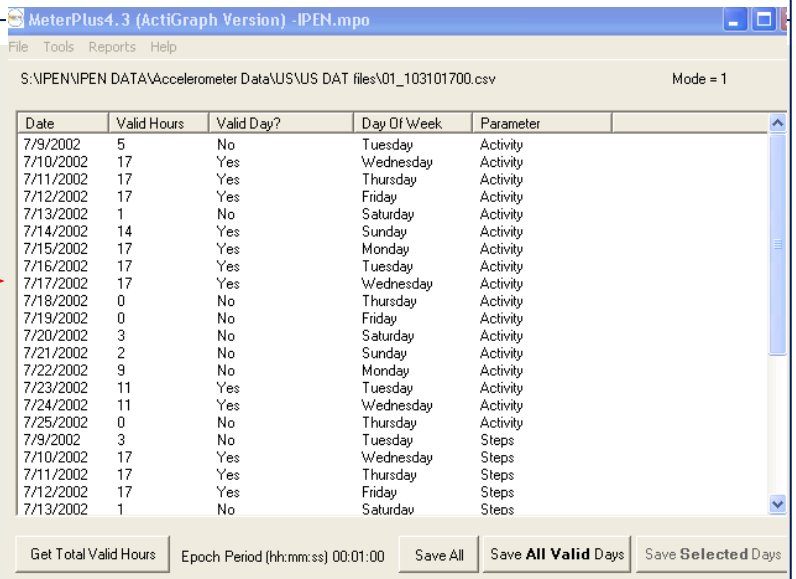


Screening data – Open file

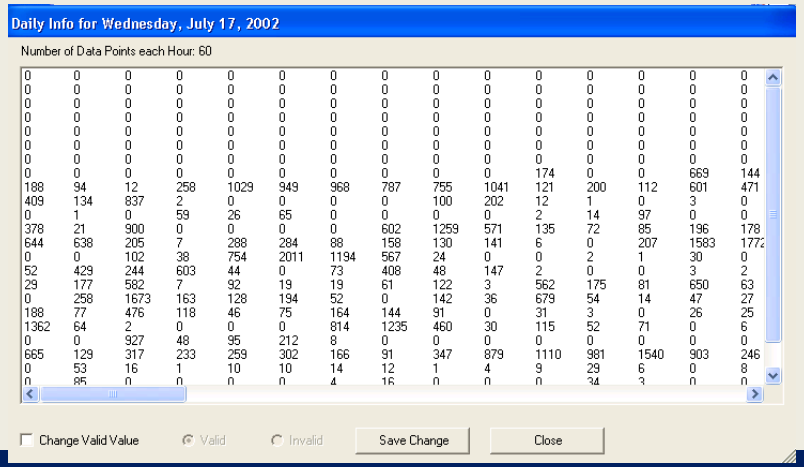




1. Drag and drop file here



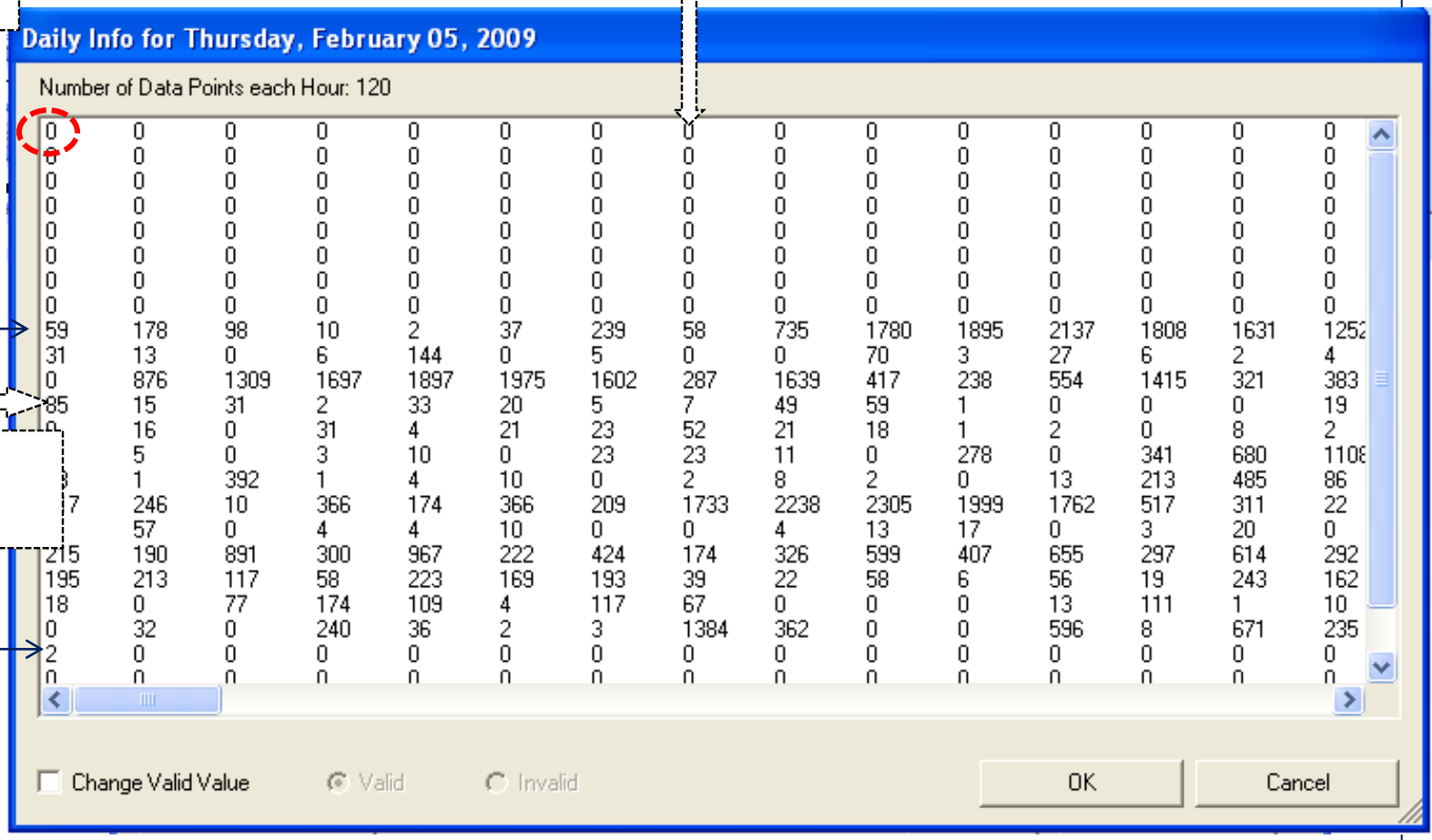
2. Data displayed in list format



3. Click day open for detailed view of epoch-level data

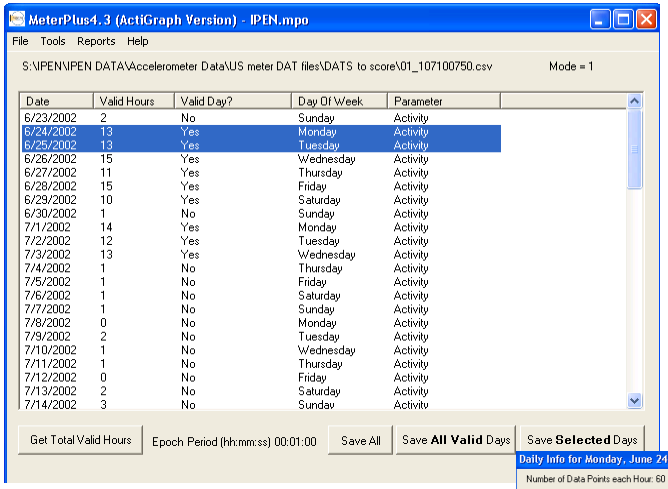
Top left cell is ALWAYS MIDNIGHT

One column is ALWAYS 1 epoch (in this case 30s)



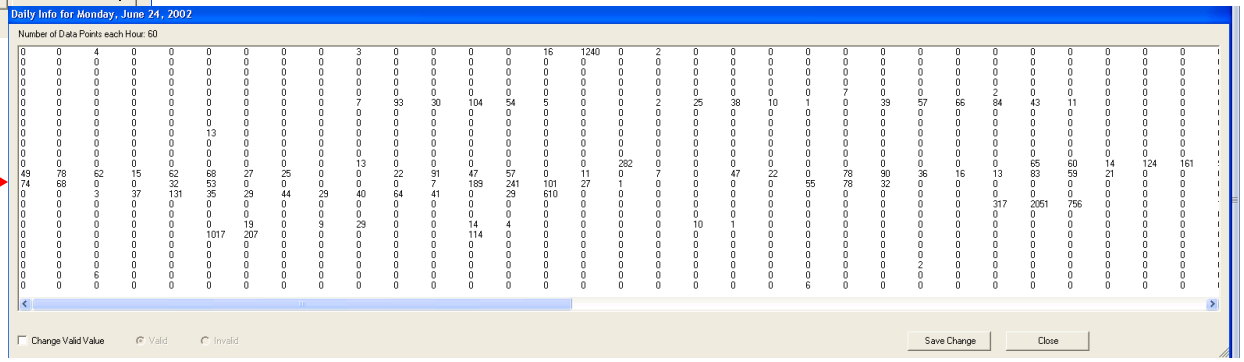
One line is ALWAYS 1 hr

- 1 min epoch: 60 data points per hour (per case)
- 30s epoch: 120 data points/hr
- 15s epoch: 240 data points/hr
- 1s epochs: 3600 data points/hr

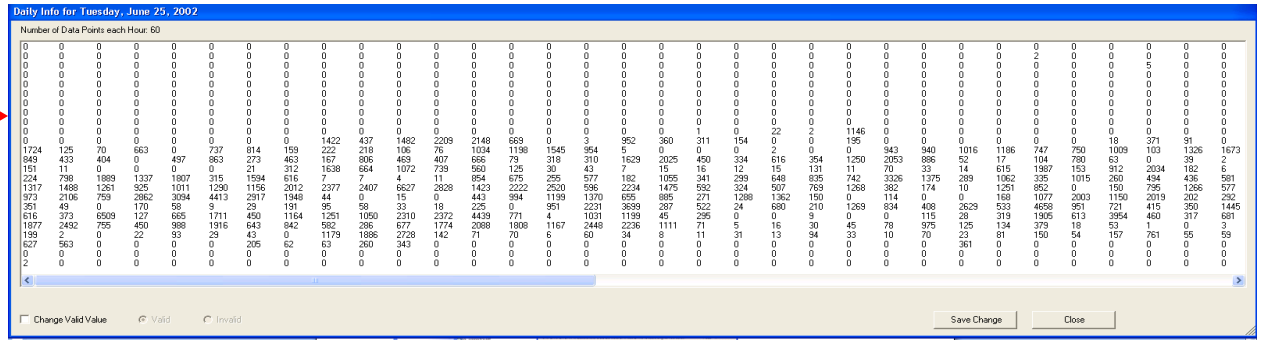


WHY LOOK AT EPOCH-LEVEL DATA?
Can't distinguish between wear and nonwear days from the list view

13 hours (NONWEAR)



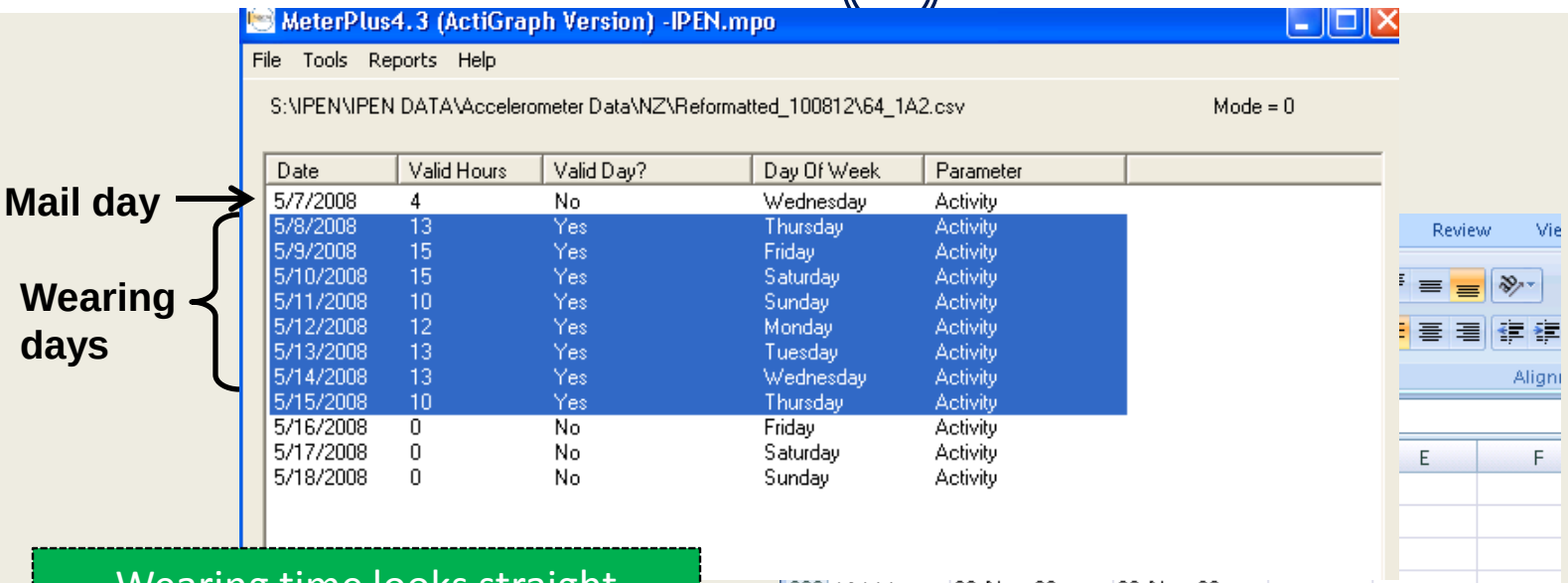
13 hours (WEARING)



Examples of data

- Wearing time that matches documentation of wear dates – SAVE
- Wearing time that is outside of documented wear dates – MAY SAVE OR NOT SAVE
- Non-wearing time that may look like wearing time on the surface (e.g., mail days) – DO NOT SAVE
- Overnight wearing – FLAG/RENAME FILE
- Types of malfunction/Invalid data – FLAG and SEND FOR CONSULT
- Questions/uncertainty – FLAG and SEND FOR CONSULT

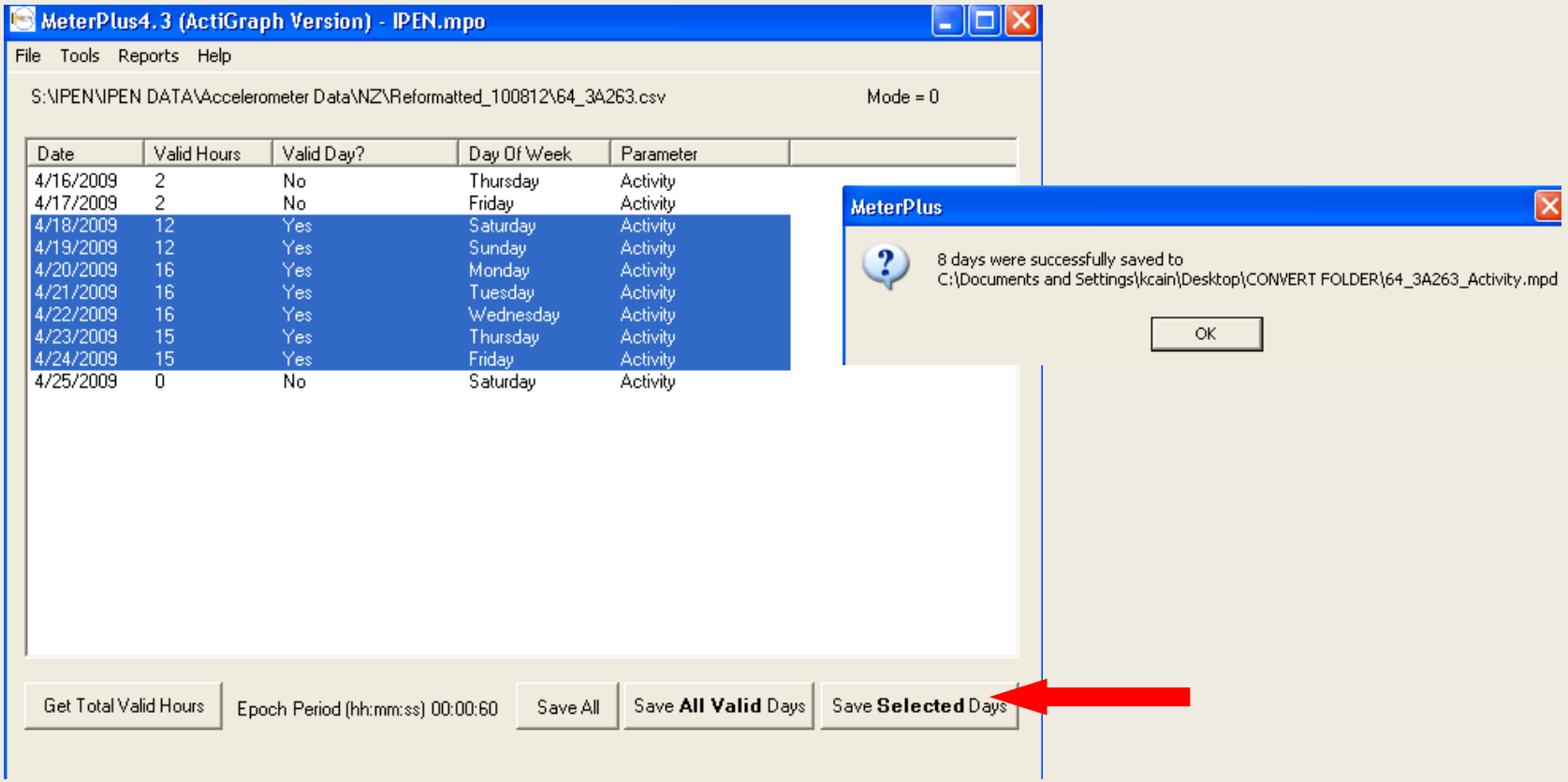
Wearing time, matches wear dates -SAVE



Wearing time looks straight forward. Use log to match up days AND do a manual check of each wearing day to validate wearing time. What you see in the data overrules what is reported on log *(e.g., 8 days may be reported on the log but you see 7 days so it is "7").*

Saving wear time

You select the days to be scored based on documented wear dates and your observations of the data



Typical wearing day

Daily Info for Thursday, August 22, 2002

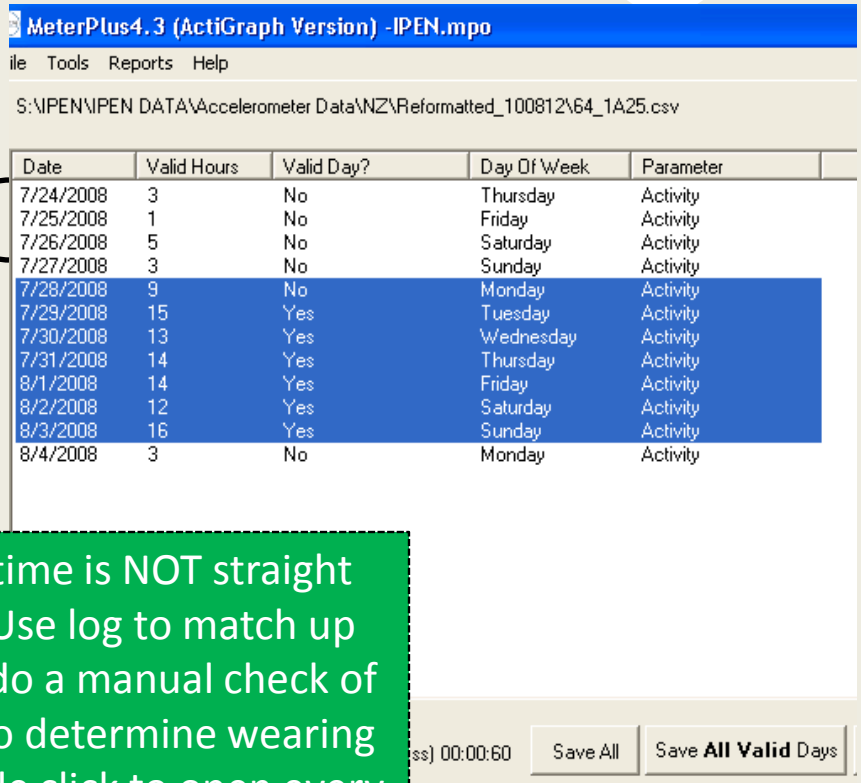
Number of Data Points each Hour: 60

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
198	164	344	148	311	108	207	76	14	86	25	68	127	260	95
20	37	77	211	12	24	0	10	0	4	11	0	0	0	0
6	4	0	5	0	0	8	8	2	0	0	0	0	0	0
87	2	0	195	315	0	11	15	20	19	13	71	49	4	6
5	0	253	1131	951	182	251	6	1480	831	90	11	0	162	269
83	0	280	76	86	194	138	28	150	426	12	513	173	246	39
202	15	195	132	223	382	196	45	101	782	1239	757	1213	3832	704
0	0	0	0	0	0	0	12	423	469	1133	488	392	197	816
894	1063	900	386	760	208	537	90	160	265	1079	558	1332	1090	862
469	873	1338	1963	2133	1079	684	1093	1347	2070	662	334	531	846	1231
768	159	385	1634	1898	2009	539	2076	2167	2225	310	321	3136	2675	616
525	772	639	132	149	125	33	49	99	98	490	638	261	126	34
544	1022	319	239	310	0	15	0	1	26	83	38	0	43	7
0	0	1	4	0	0	0	0	0	0	127	0	0	0	9
0	0	28	2	0	0	1	104	0	0	0	0	0	6	0
0	0	0	0	0	0	236	314	894	584	342	35	419	291	159

☐ Change Valid Value   ◉ Valid   ○ Invalid   OK   Cancel

This is a typical wearing day. There are rows of zero counts during sleep and the activity starts at the 7th row, or 7am. There are low counts throughout but they are sporadic and they're not consecutive. This is a very typical pattern and would likely have 13 or 14 valid hours of wear time.

Wearing time, doesn't match wear dates – ONLY SAVE DOCUMENTED WEAR DATES



Mail days

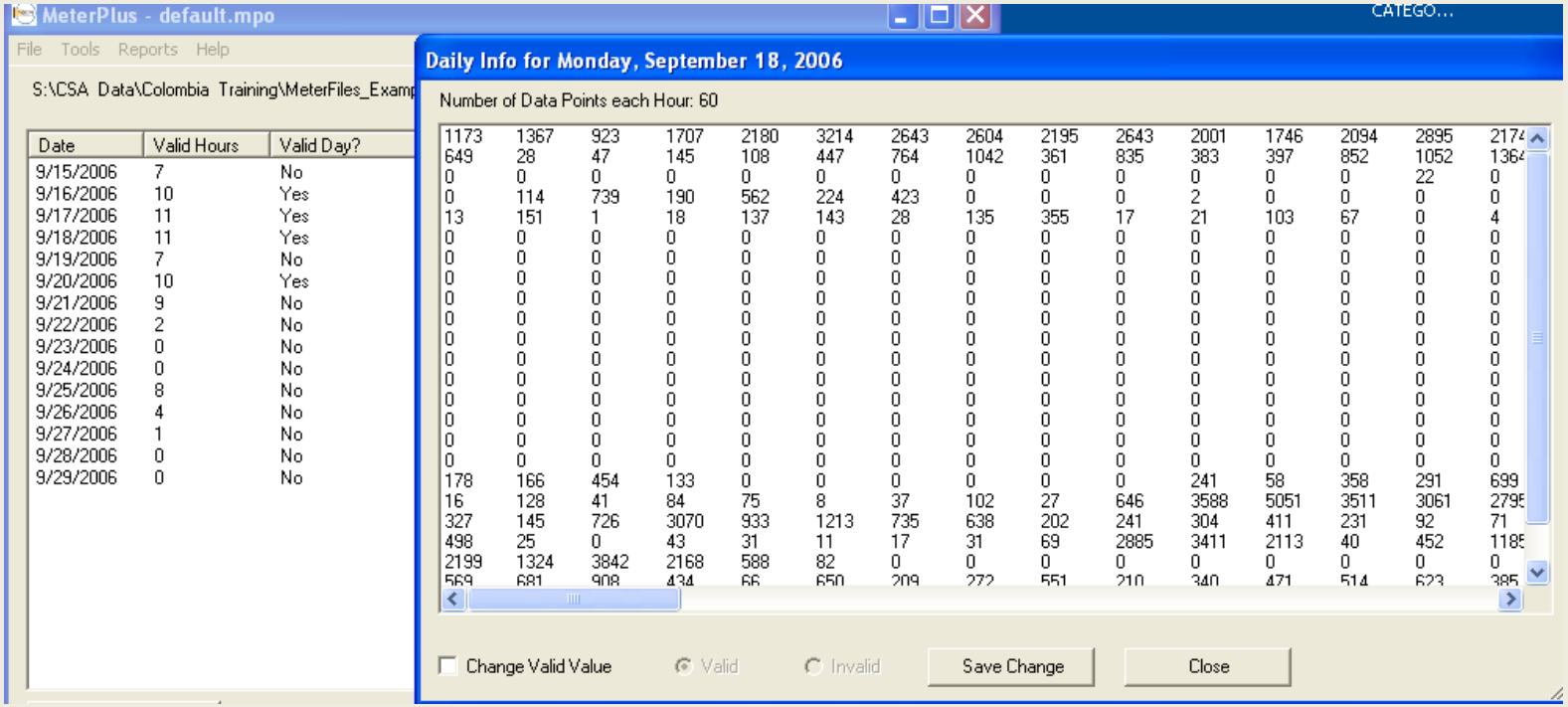
Observed wearing days

Wearing time is NOT straight forward. Use log to match up days AND do a manual check of each day to determine wearing time (double click to open every day with any valid hours). When in doubt, ONLY SAVE DOCUMENTED WEAR DATES

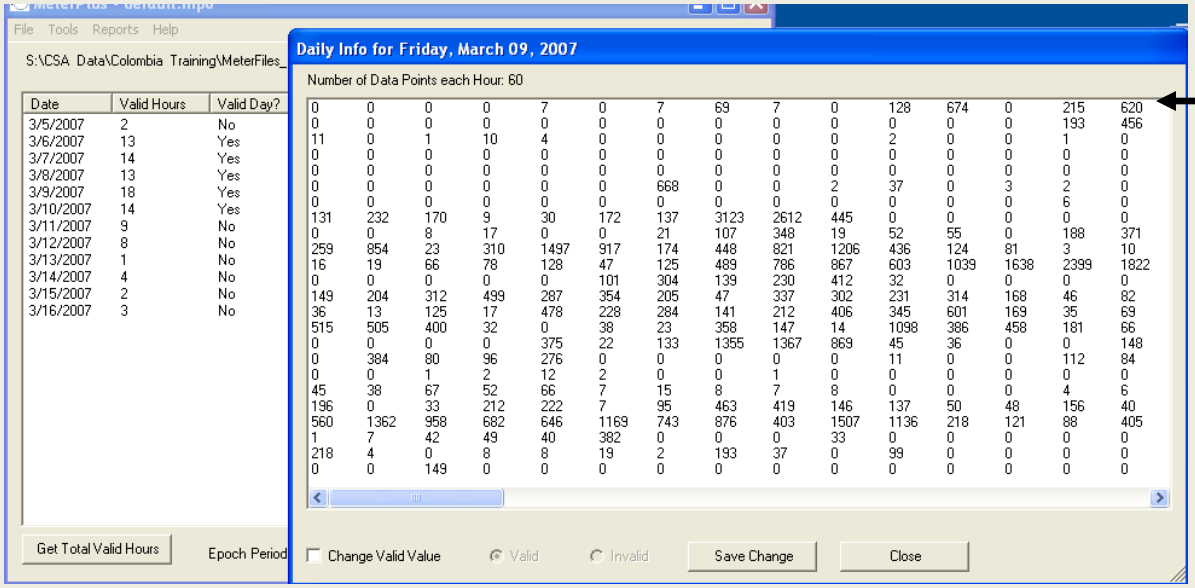
Documented wearing days

	A	B	C	D
1	Identity	StartDateToUse	EndDateToUse	Notes
940	1A119	24-Nov-08	1-Dec-08	
941	1A12	30-Jun-08	3-Jul-08	
942	1A144	9-Jan-08	15-Jan-09	
943	1A15	4-Aug-08	12-Aug-08	
944	1A19	4-Aug-08	12-Aug-08	
945	1A2	8-May-08	15-May-08	
946	1A20	14-Jul-08	20-Jul-08	
947	1A21	13-Jul-08	21-Jul-08	
948	1A23	21-Jul-08	27-Jul-08	
949	1A25	29-Jul-08	3-Aug-08	
950	1A26	2-Aug-08	5-Aug-08	
951	1A28	3-Aug-08	9-Aug-08	
952	1A29	3-Aug-08	10-Aug-08	
953	1A3	9-May-08	15-May-08	
954	1A31	10-Aug-08	18-Aug-08	

Shift worker - SAVE



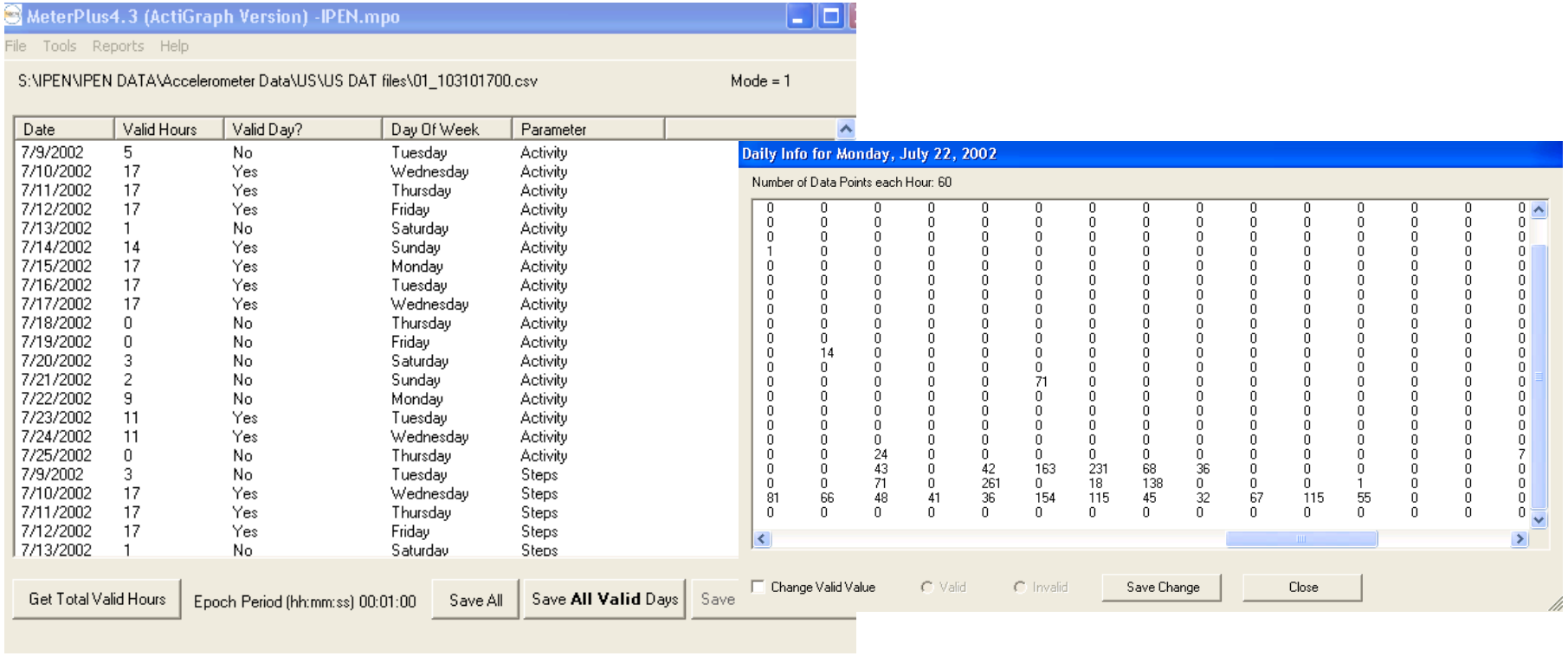
Overnight wearing



Low counts of activity (typically <500 per minute) recorded overnight indicating the meter was worn during sleep. Flag these files in the tracking database so they can be cleaned later. In IPEN Adult, we manually replaced data collected during sleep with “0” values.

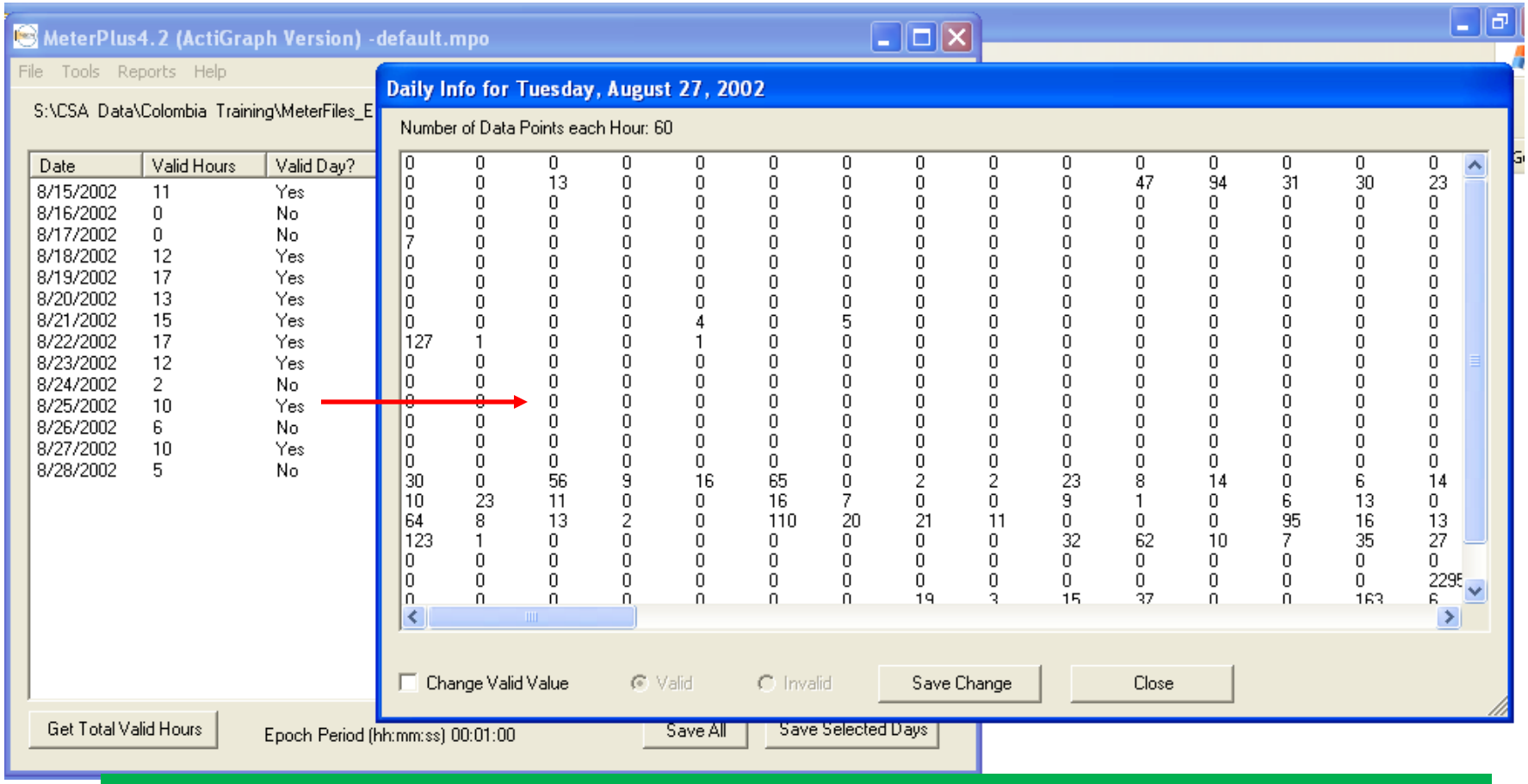
FLAG THIS PARTICIPANT IN THE TRACKING DATABASE!

Non-wearing day



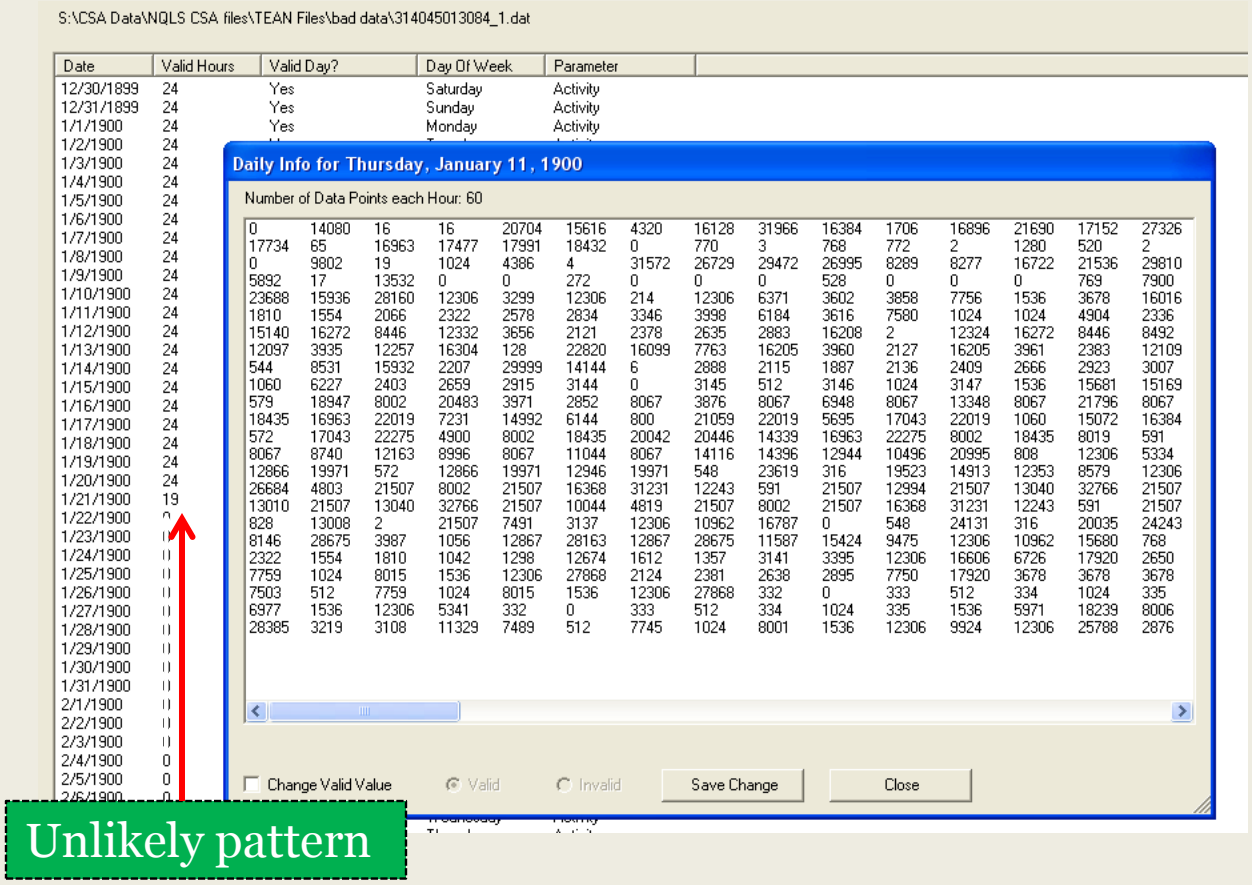
This day has 9 valid hours but is NOT wearing time. There are a lot of zero counts and low values. The counts are sporadic and do not follow the typical wear time pattern.

Non-wearing day (mail day)– DO NOT SAVE



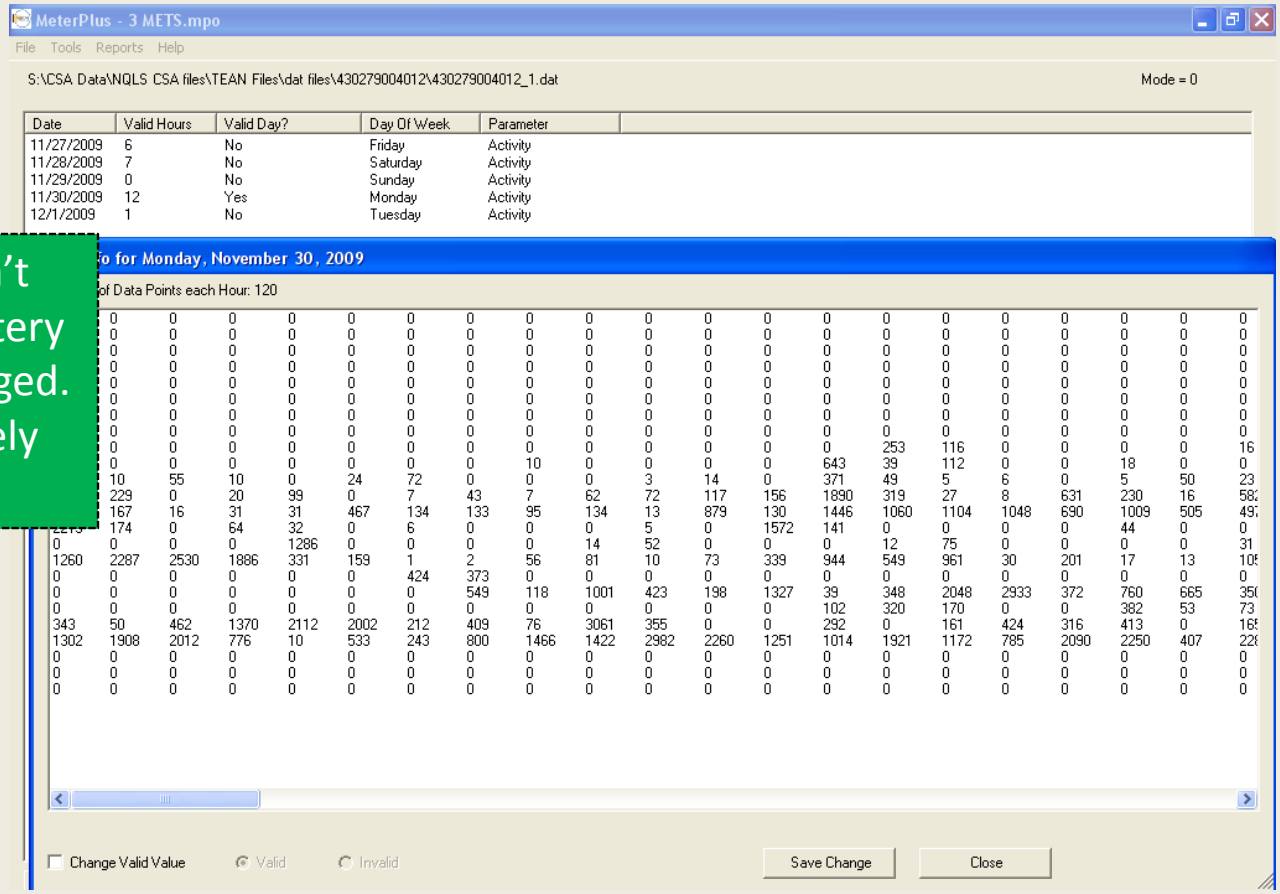
This day is found in between wearing days and has 10 valid hours but is NOT wearing time. There are a lot of zero counts and low values. The counts are sporadic and do not follow the typical wear time pattern.

Red flag – 24 valid hours



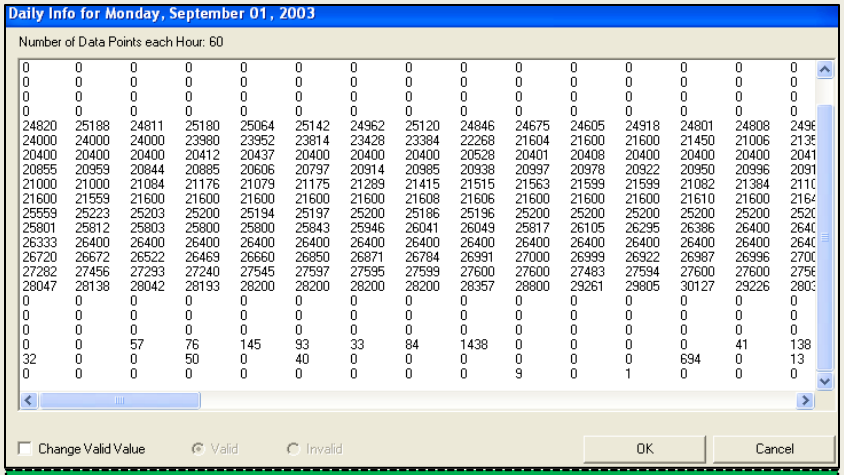
Red flag – stops recording after 5 days

This wouldn't happen if battery was fully charged. Device is likely defective.

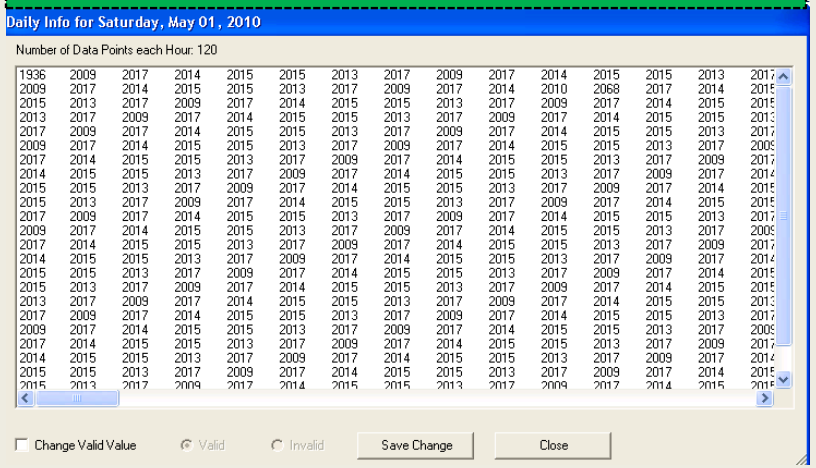


Examples of invalid data (device malfunction)

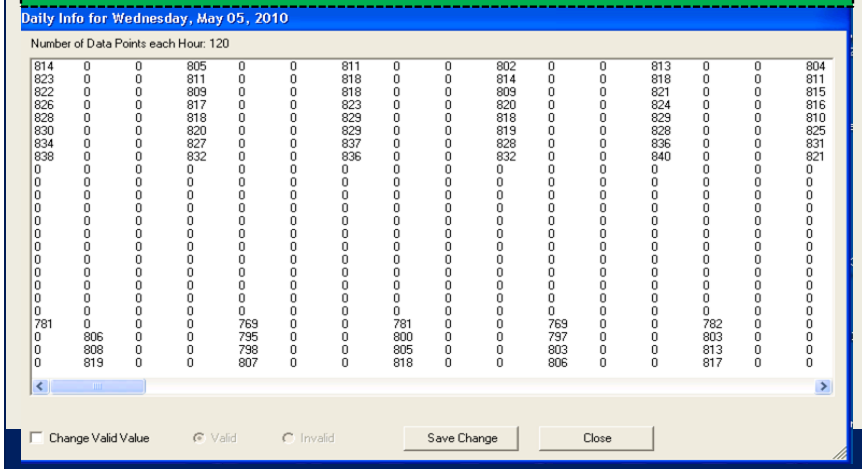
Counts >16,000, don't have to fill entire day



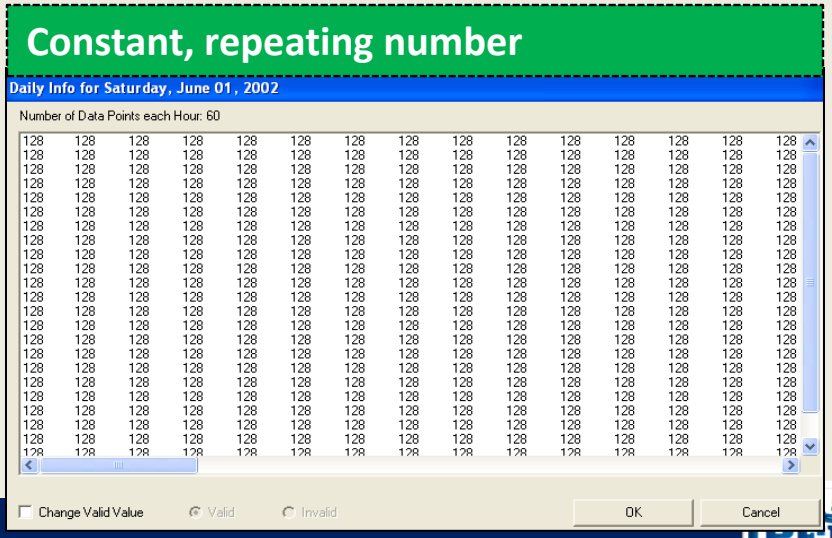
Constant, repeating within a range



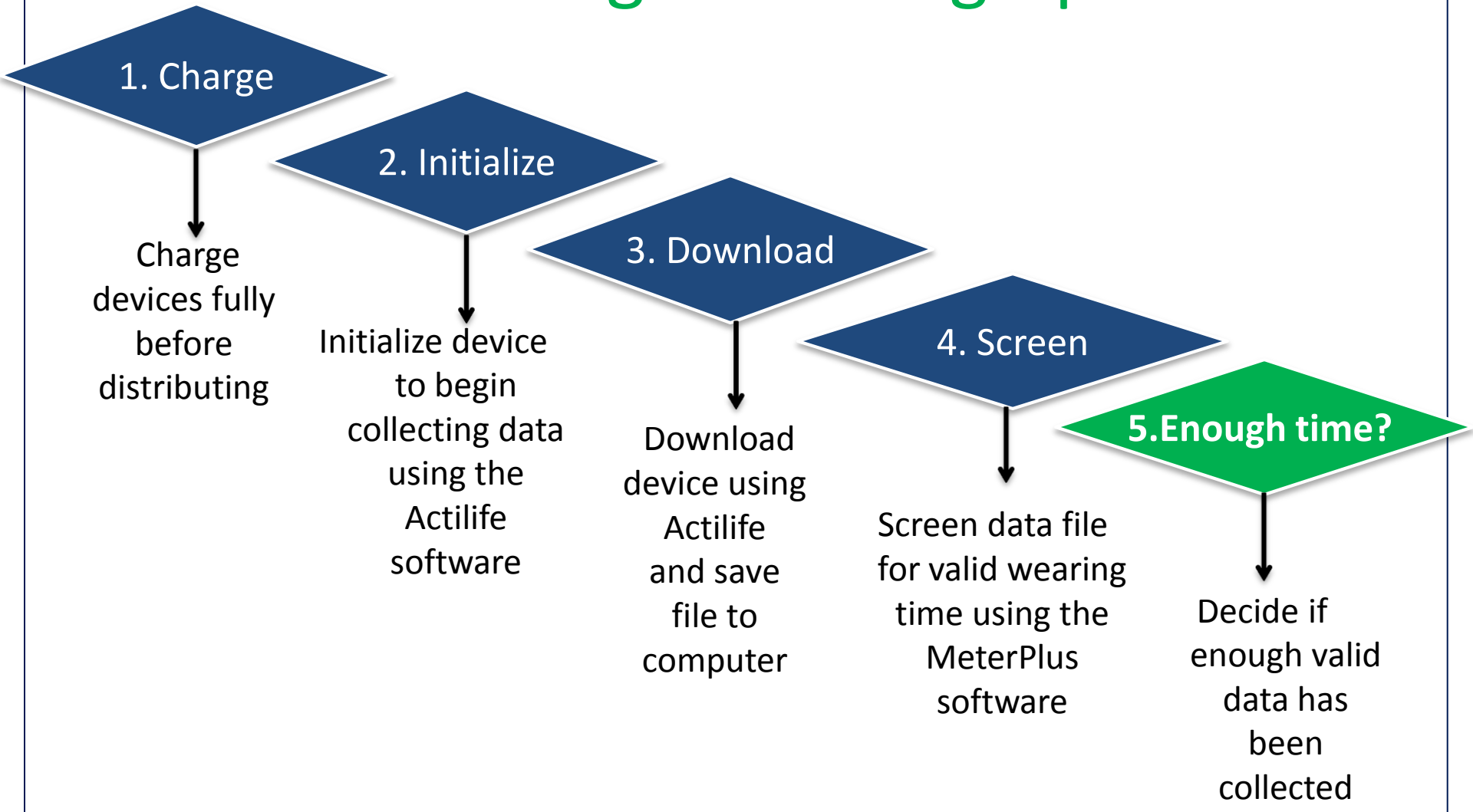
Other strange data patterns



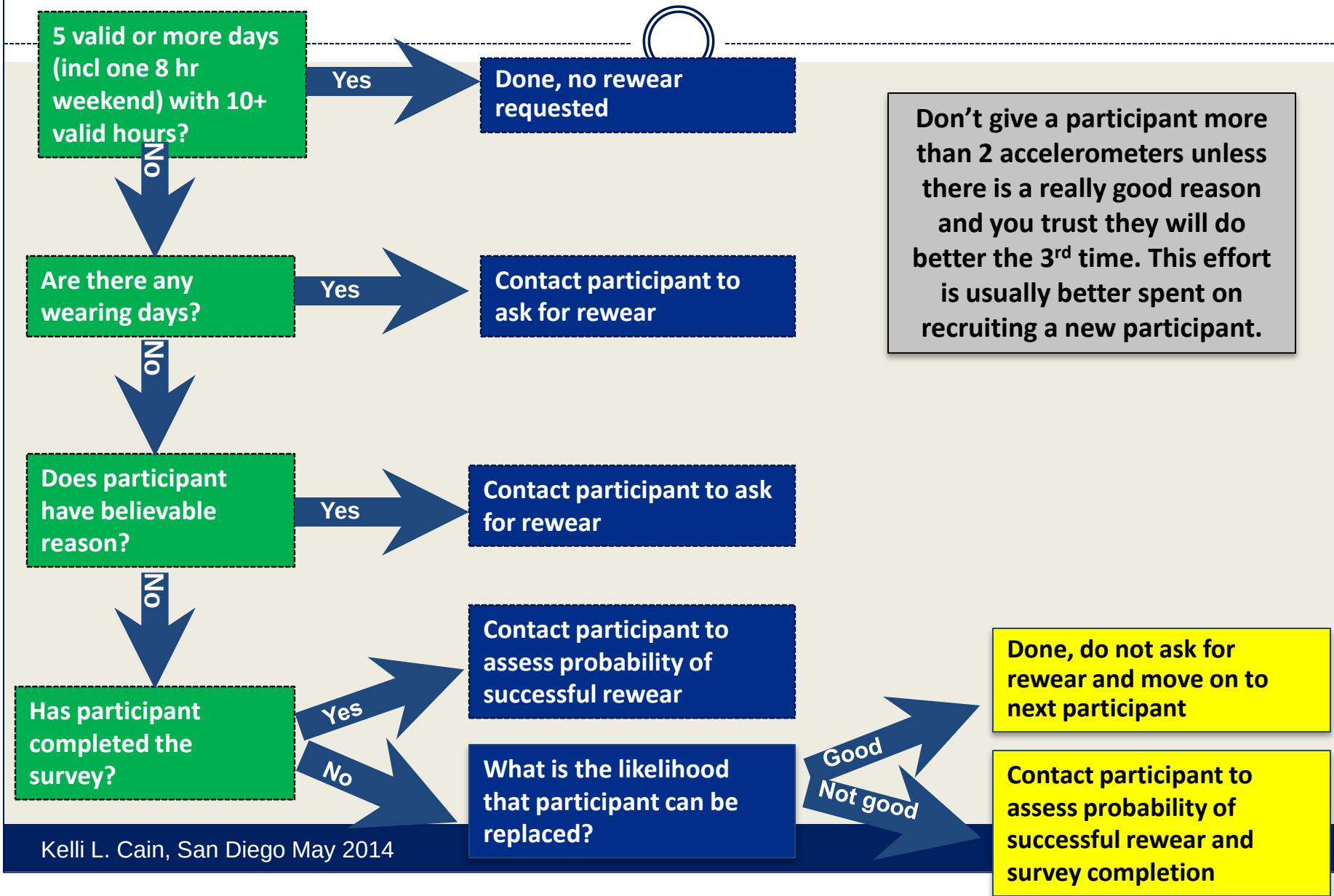
Constant, repeating number



Stages of Actigraph



Rewear Decision



Don't give a participant more than 2 accelerometers unless there is a really good reason and you trust they will do better the 3rd time. This effort is usually better spent on recruiting a new participant.

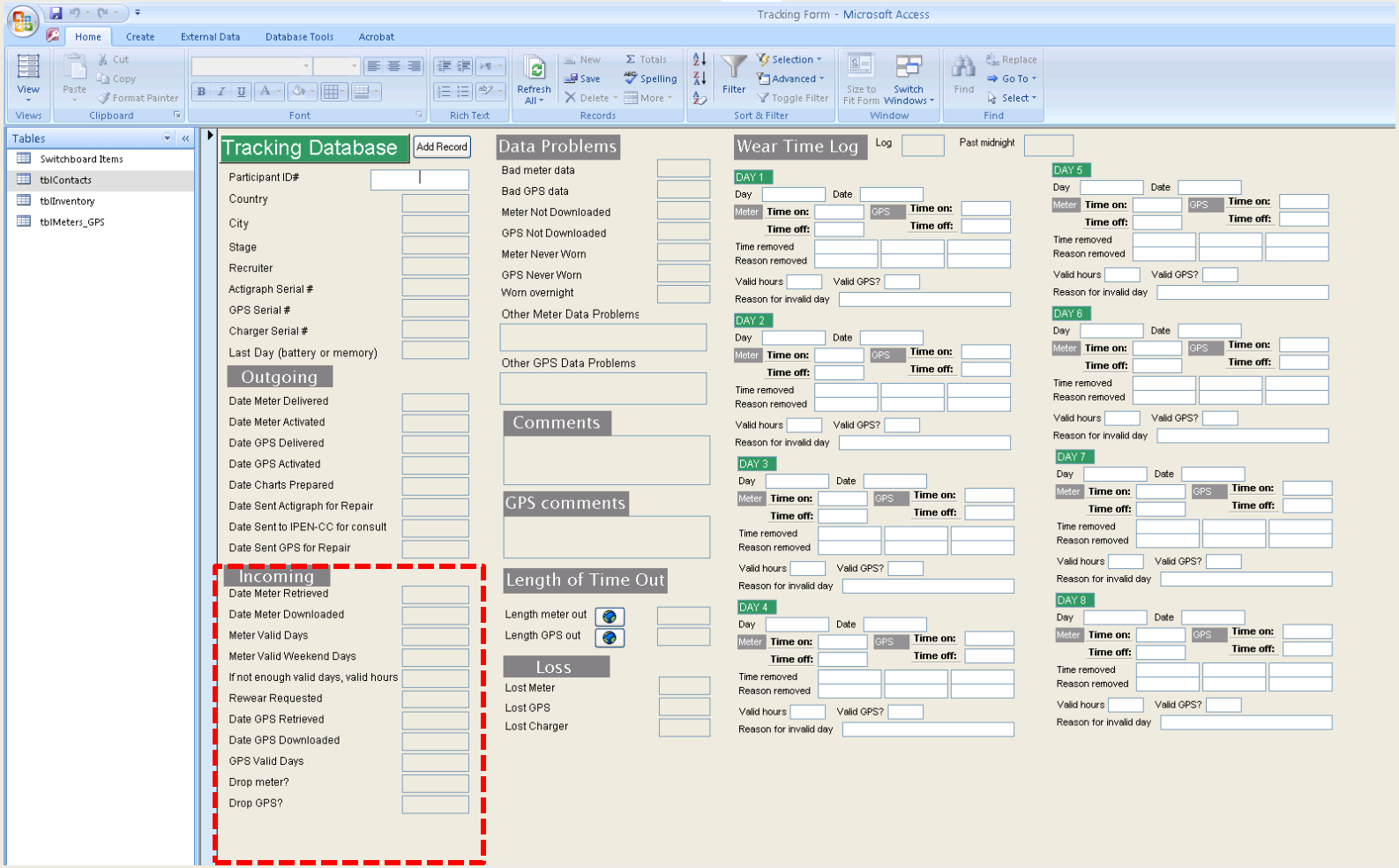
Rewears (sample script in manual)

- Data manager will make decision if rewear is needed
- Ask participant for rewear
  - Reminder that re-wear is part of study requirements
  - Data checked by manager, not your decision
  - Either not enough useable data or equipment malfunction
  - Will ask for number of days to make 7 total (including 2 weekend days)
  - Personal favor, really want to keep them in the study, can pay extra incentive if equipment malfunction
- Rewear delivery
  - Give tips on how can do better this time
    - Keep on until right before bedtime, put on first thing in the morning, remember to put it back on after swimming, bathing.

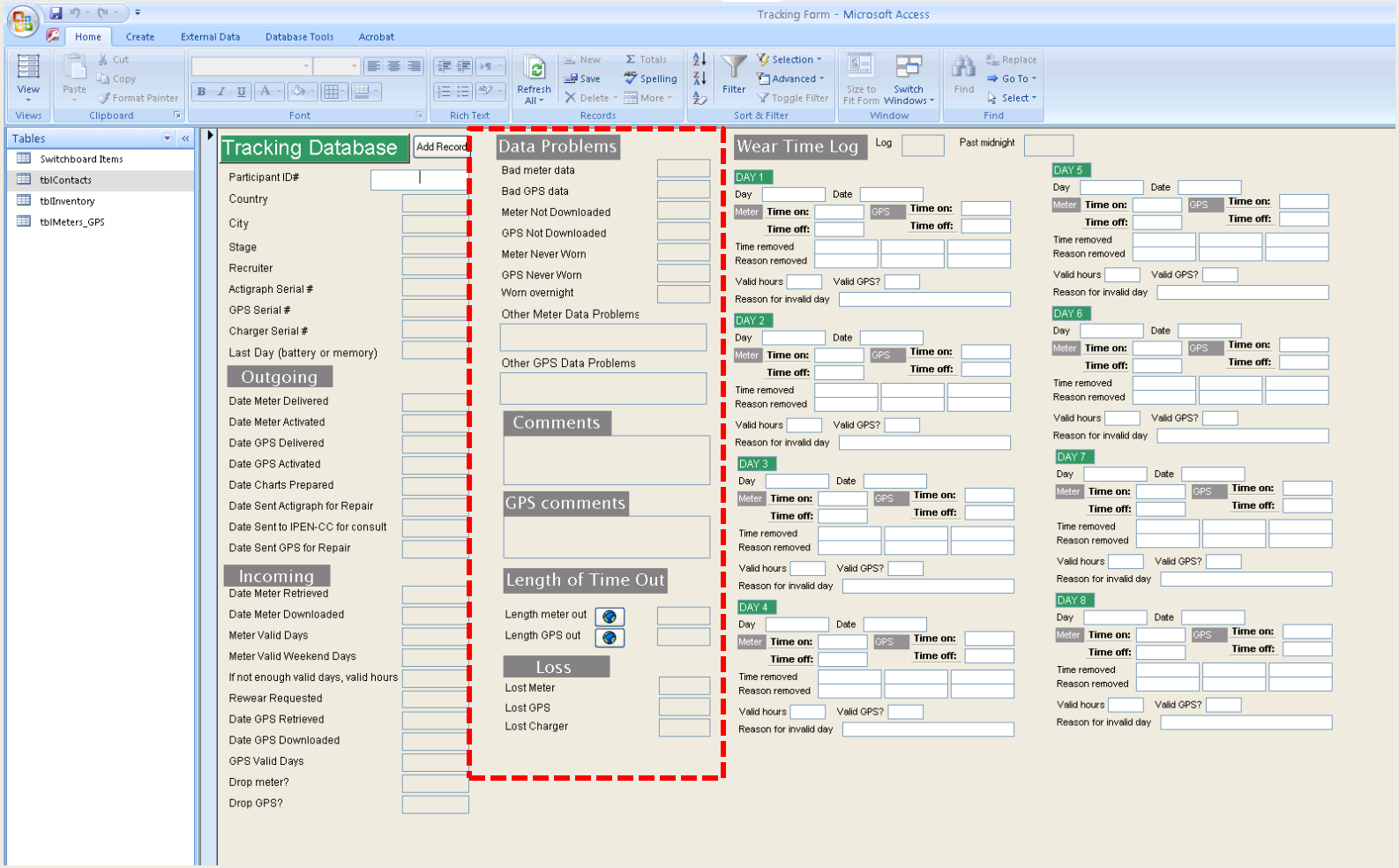
PART 3: POST-DATA COLLECTION

- Downloading Data
- Screening Data
- Electronic Tracking
- Data Transfer
- Quality Control

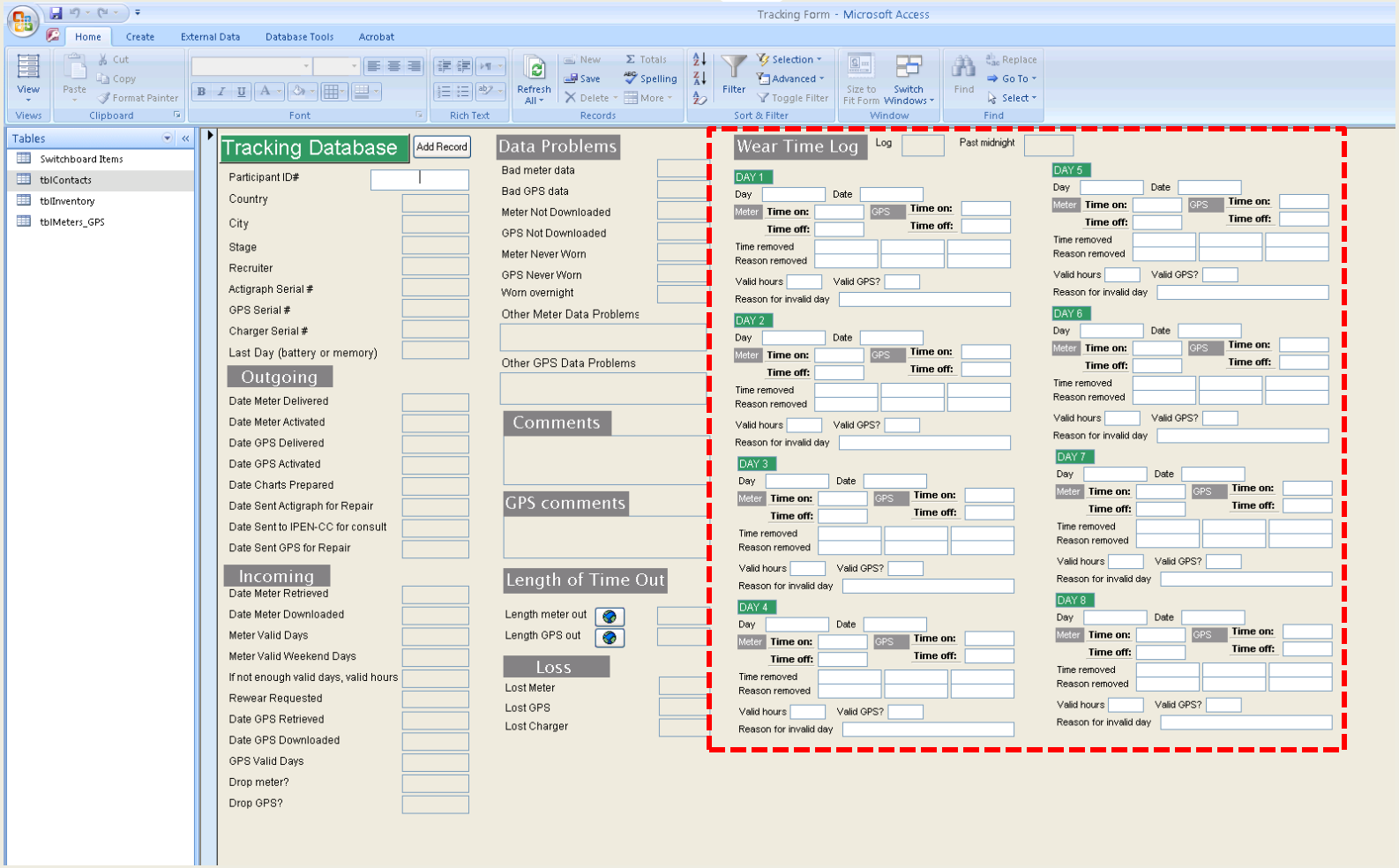
Tracking Incoming Devices and Wear Time Screening



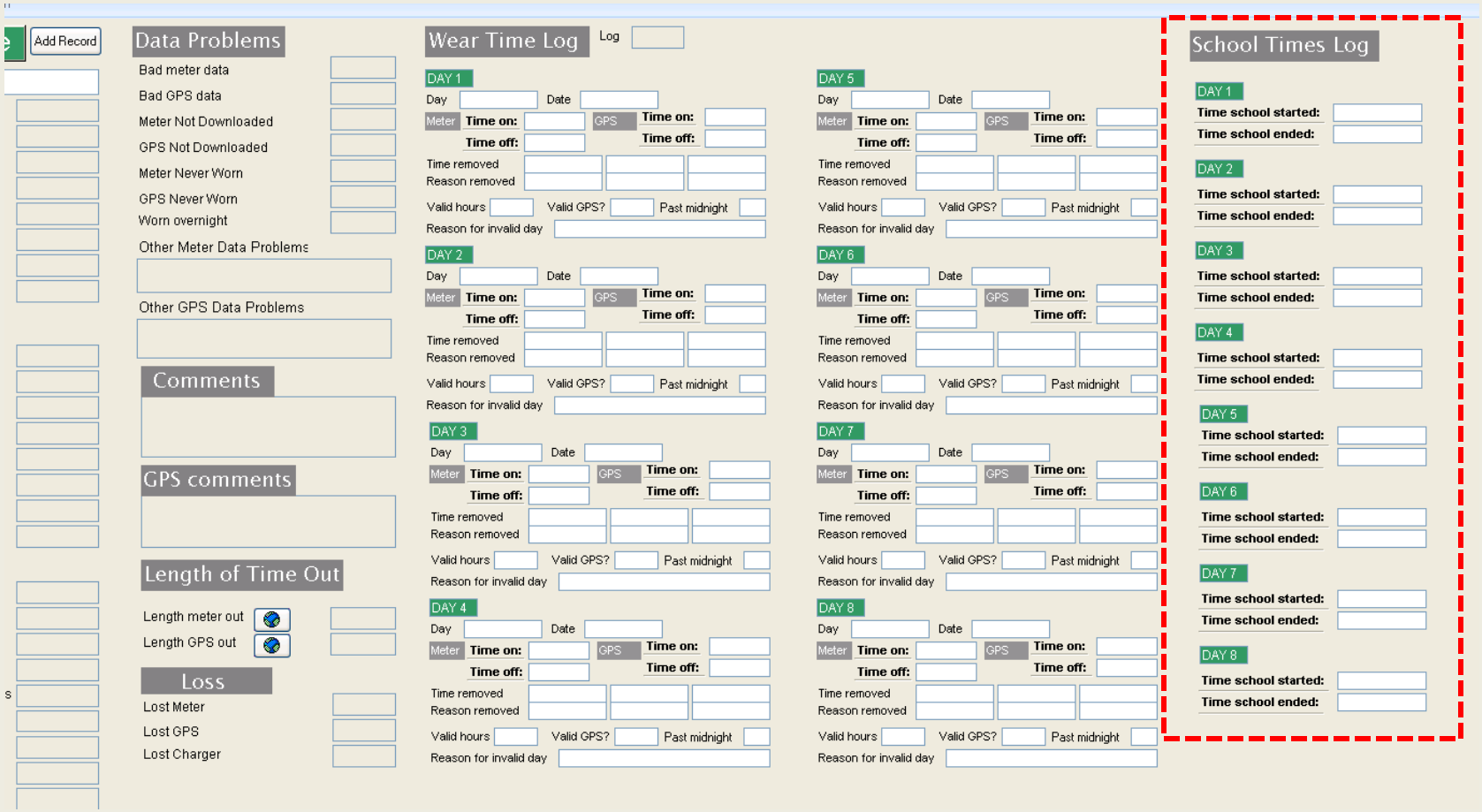
Tracking Data Problems, Time Out and Device Loss



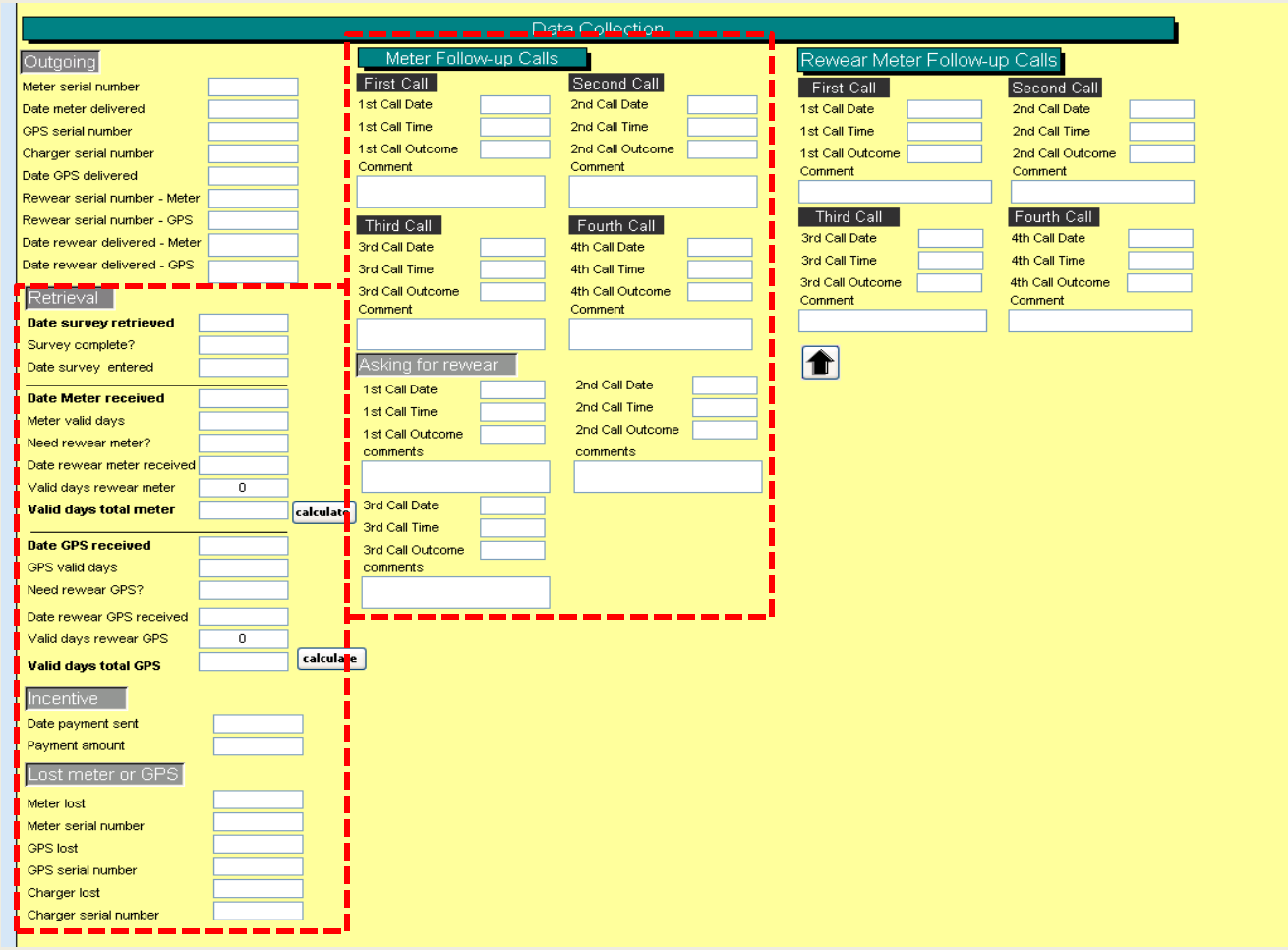
Log Entry form



School Times Entry form

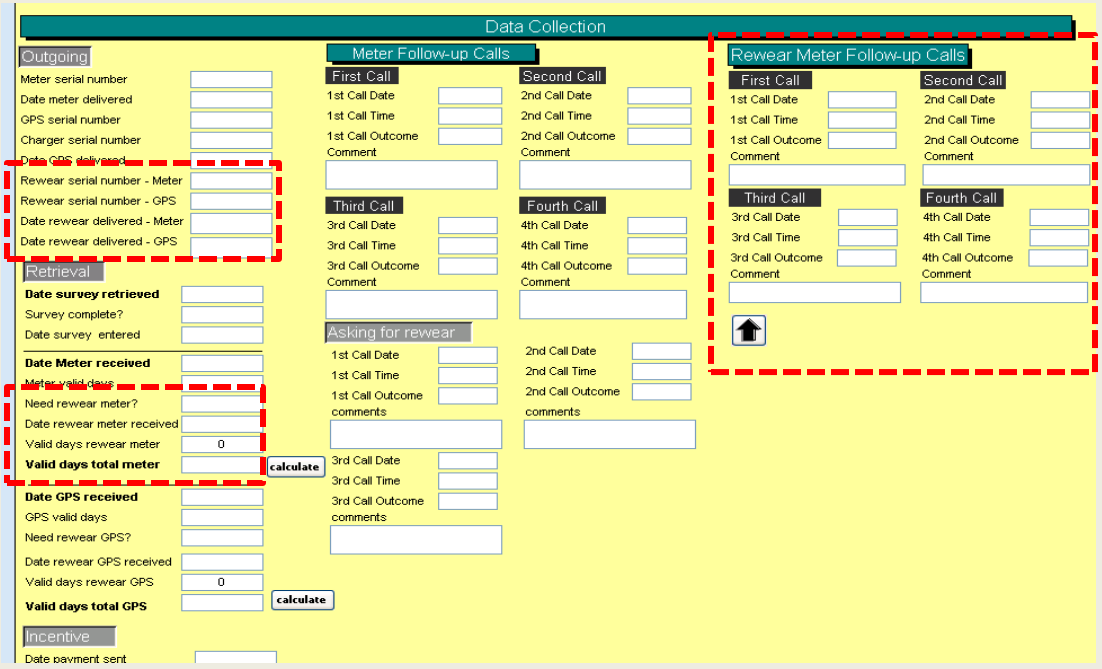


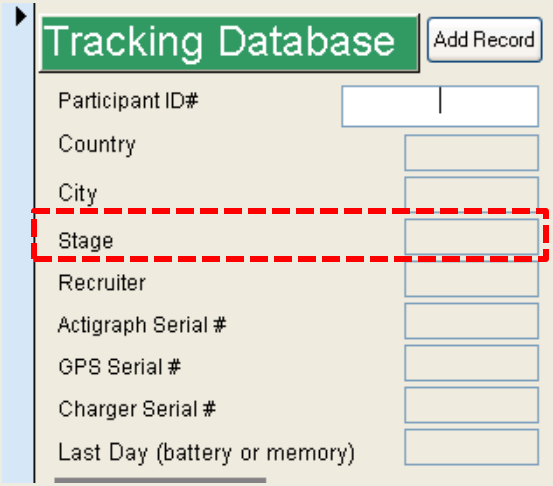
Track data collection and prompts



Tracking rewear

- Track rewears in participant database
- Remember to add a <u>new record</u> to meter tracking database for all re-wears
  - Stage (1=1st wear and 2=2nd wear)
  - Accelerometer filename also needs to reflect stage ("_2" at the end for rewear)





PART 3: POST-DATA COLLECTION

- Downloading Data
- Screening Data
- Electronic Tracking
- Data Transfer
- Quality Control

Data Transfer

- Weekly transfer of all accelerometer files to IPEN-CC
  - Send CSV files that you used for screening (not AGD files)
    - 30 second epoch
    - Low Frequency Filter applied
  - Back-up & quality control
- Kelli Cain will be contact (kcain@ucsd.edu)
- Zip software
  - All DAT files in one folder and zipped using WinZip if possible
  - Name folder with “Date”
  - Also send a copy of Tracking Database with meter logs entered
- Dropbox
  - Kelli will send you an invitation to join a folder used only for data transfer for your site

PART 3: POST-DATA COLLECTION

- Downloading Data
- Screening Data
- Electronic Tracking
- Data Transfer
- Quality Control

Quality Control

- Actigraph Data Screening Checking
  - Ideally, same person would screen all the data
  - Regular reliability checks should be conducted by managers and investigators
  - IPEN-CC will also check a % of all files and encourage you to also send ambiguous files for consultation
    - **Nobody becomes an expert in a few months so we encourage and expect to be consulting you about ambiguous files and cases**
- Database Management
  - Recruitment database checked weekly for cases that have fallen between the cracks (next action not coded, dates are mistyped, person not being contacted anymore, etc.)
  - Query of outstanding units prepared weekly and each is reviewed to be sure that appropriate action is being taken to retrieve

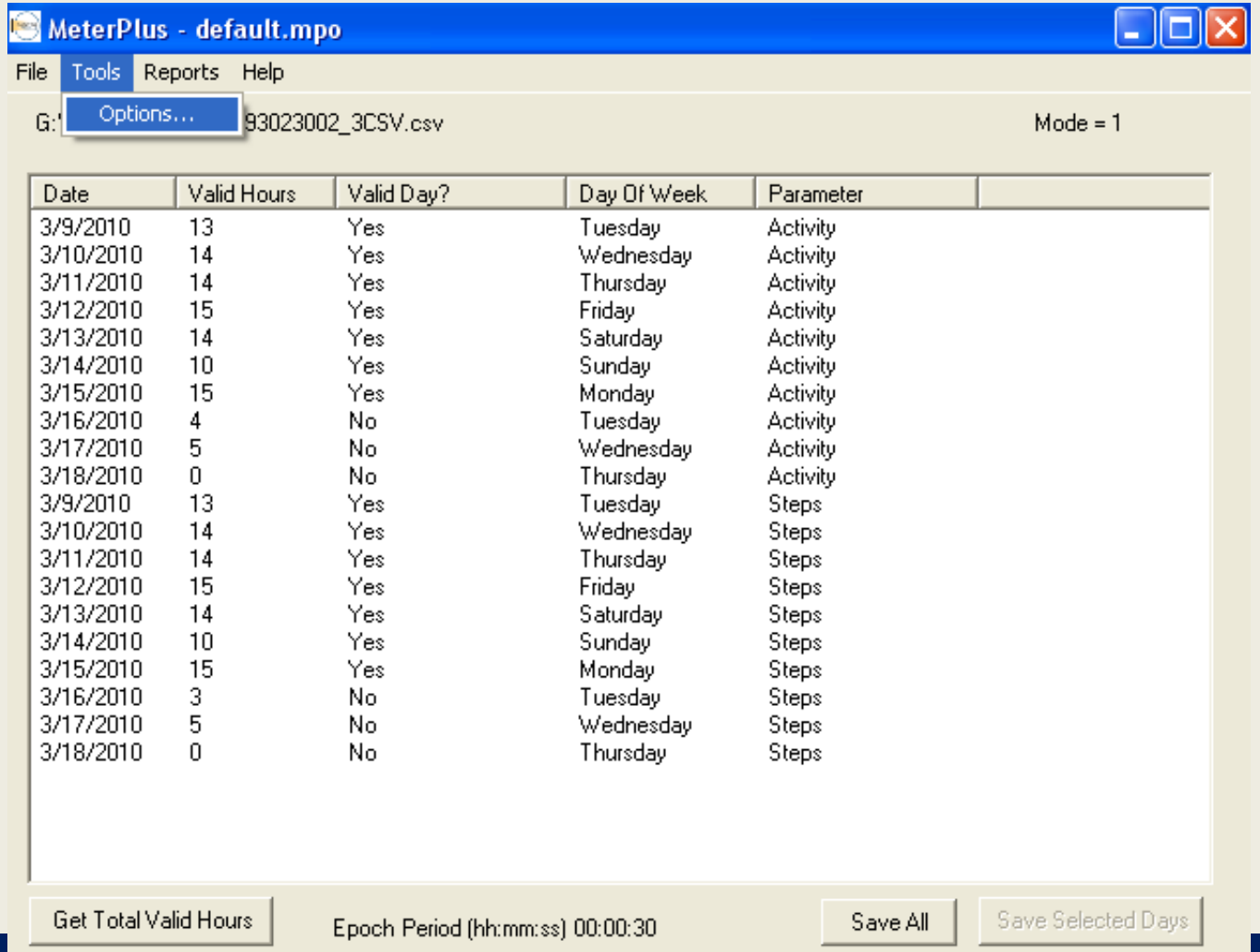
Certification

- Certification materials available
- Re-train if necessary and try again
- Can give conditional certification, meaning you will check most of their work until it is acceptable
- For data collectors, role playing is most important piece – can they explain it well, remember all the key points, answer general questions.
- For data managers, technical proficiency, understanding of how to use tracking database and decision-making about valid wearing time are the most important.

PART 3: POST-DATA COLLECTION

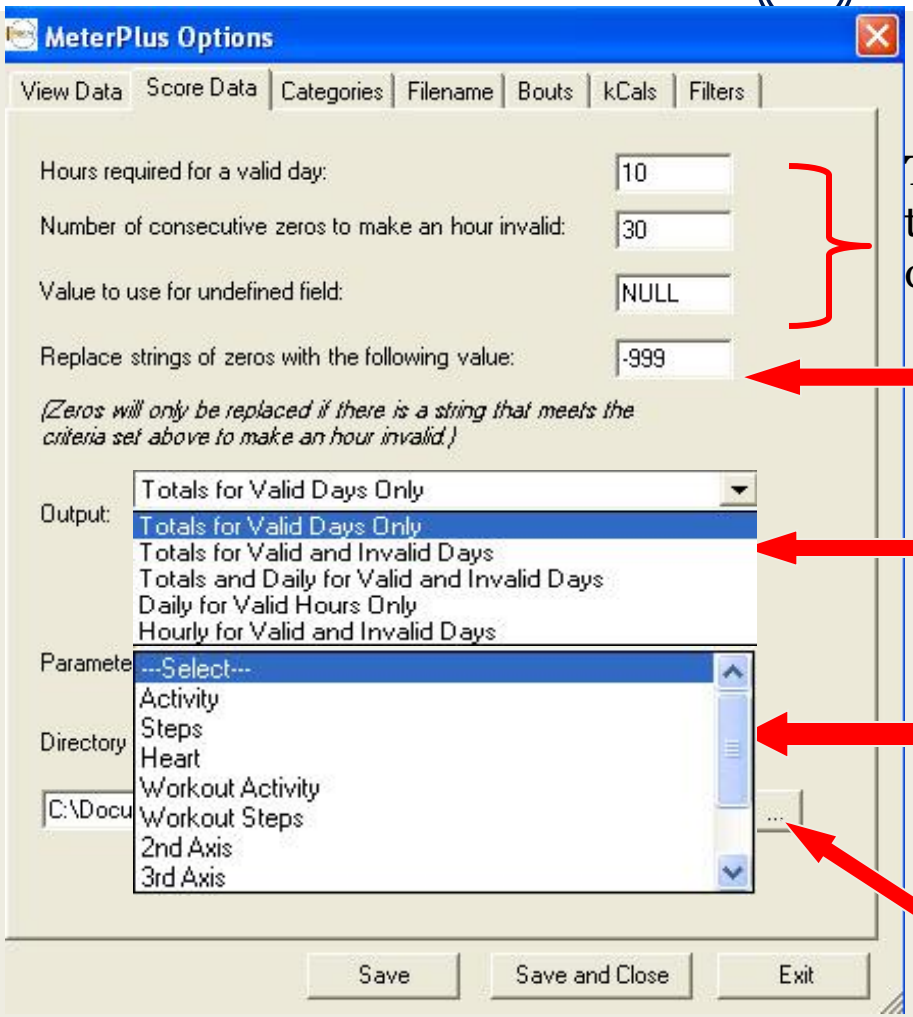
- Downloading Data
- Screening Data
- Electronic Tracking
- Data Transfer
- Quality Control
- Data Scoring for your own country

Data Scoring



Date	Valid Hours	Valid Day?	Day Of Week	Parameter
3/9/2010	13	Yes	Tuesday	Activity
3/10/2010	14	Yes	Wednesday	Activity
3/11/2010	14	Yes	Thursday	Activity
3/12/2010	15	Yes	Friday	Activity
3/13/2010	14	Yes	Saturday	Activity
3/14/2010	10	Yes	Sunday	Activity
3/15/2010	15	Yes	Monday	Activity
3/16/2010	4	No	Tuesday	Activity
3/17/2010	5	No	Wednesday	Activity
3/18/2010	0	No	Thursday	Activity
3/9/2010	13	Yes	Tuesday	Steps
3/10/2010	14	Yes	Wednesday	Steps
3/11/2010	14	Yes	Thursday	Steps
3/12/2010	15	Yes	Friday	Steps
3/13/2010	14	Yes	Saturday	Steps
3/14/2010	10	Yes	Sunday	Steps
3/15/2010	15	Yes	Monday	Steps
3/16/2010	3	No	Tuesday	Steps
3/17/2010	5	No	Wednesday	Steps
3/18/2010	0	No	Thursday	Steps

Program



The definition of "wearing" is controlled by the user to exclude periods of time when the device was removed.

Non-wearing time within valid days is coded as such during this cleaning process. We use -999.

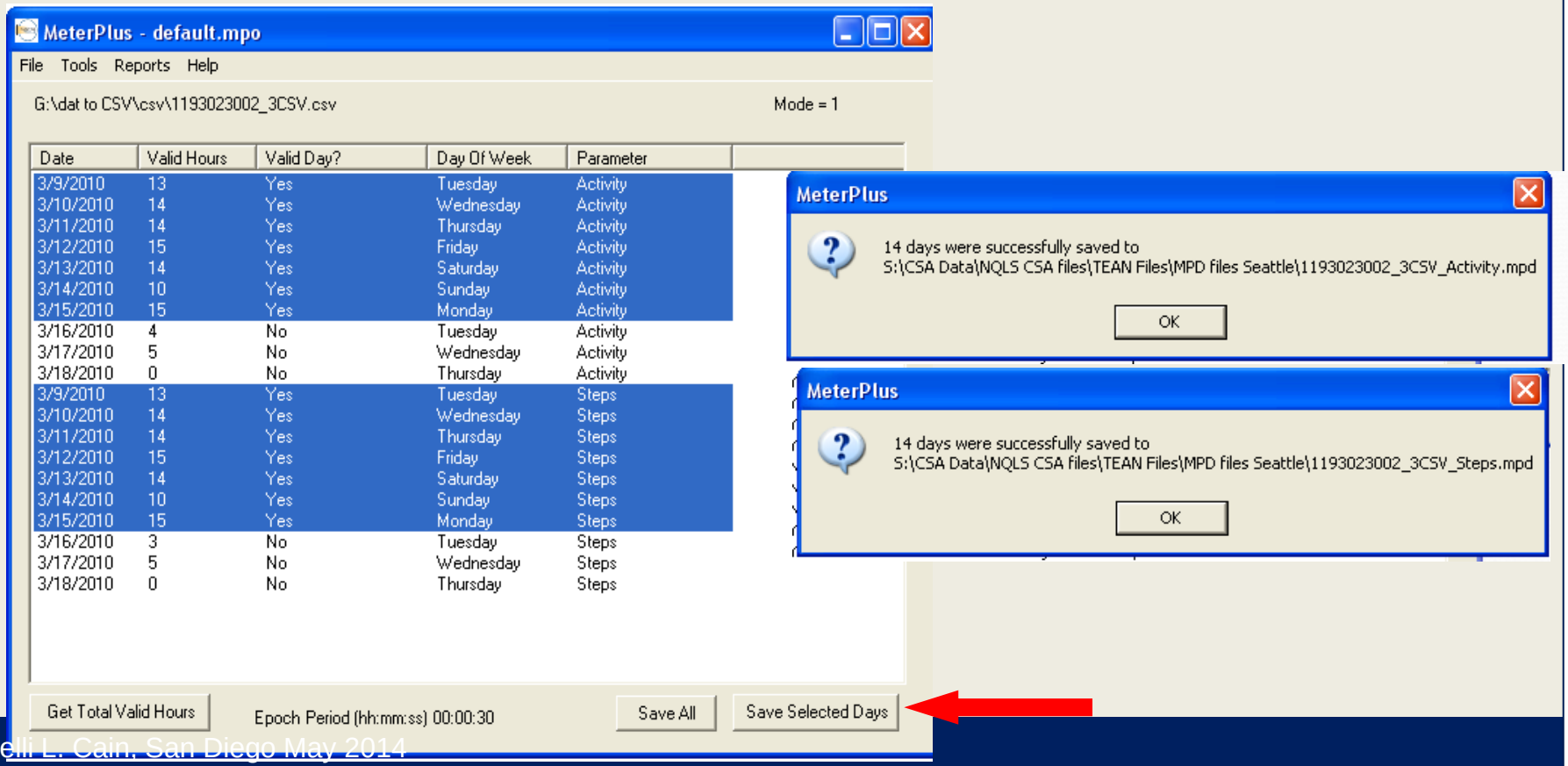
Select level of output: Summary, Daily, Hourly, for valid days only or all days.

The type of data to be scored is selected here. Activity refers to single plane activity and be analyzed for IPEN.

Browse for location to save cleaned files (MPD)

Saving wear time

You select the days to be scored. We recommend saving ALL wearing time. DO NOT save “drop-off” or “pick-up” day.



Pointers

- Scan, take a snapshot of a day (don't get caught up in the minutes, step back and look at the day as a whole)
- Trust your judgment and if in doubt, set file aside to look at later
- Make a schedule and stick to it (e.g., four sessions, 30 files each --- 9-10am, 11-12pm, 2-3pm, 4-5pm)
- Get into a rhythm with the dragging and clicking and keep it up as long as possible (BUT recognize when decision making is slipping and take a break)
- Try not to fall behind, rushing at the end leads to poorer decision making

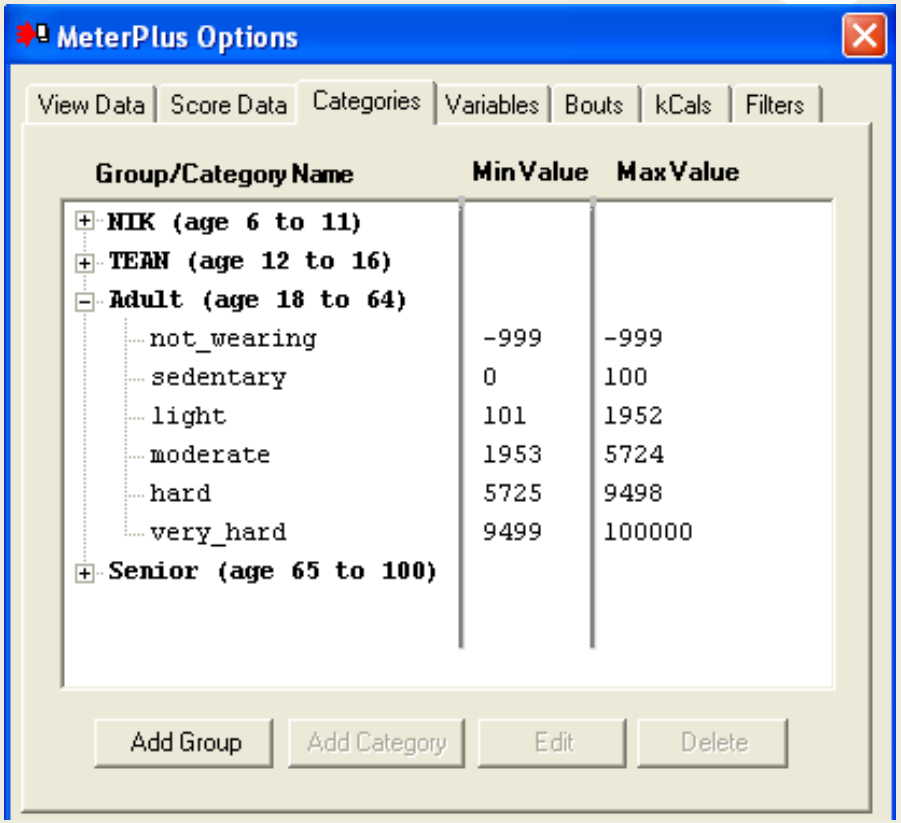
Combining re-wear files

- Clean each wear file and save wear days
- Open each MPD file in Notepad
- Copy data from 2nd wearing to end of 1st wearing file
- Change number of days in the header
- Save combined file, rename and delete 2nd MPD file

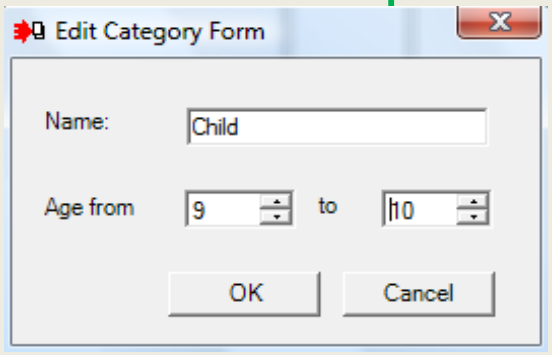
Scoring Data (MPD files)

- There are a few things to configure in MeterPlus before batch scoring your files
  - Cut-points
  - Filename variables
  - Energy Expenditure
  - Bouts
  - Time Filters

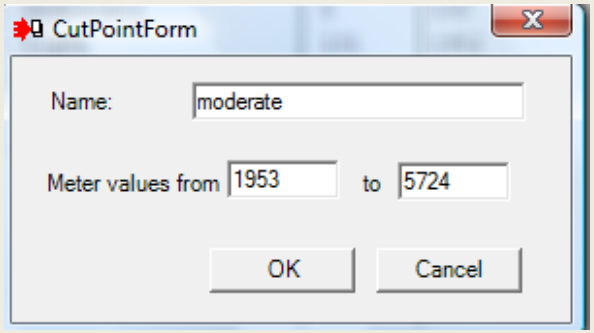
Programming cut-points (Tools/Options)



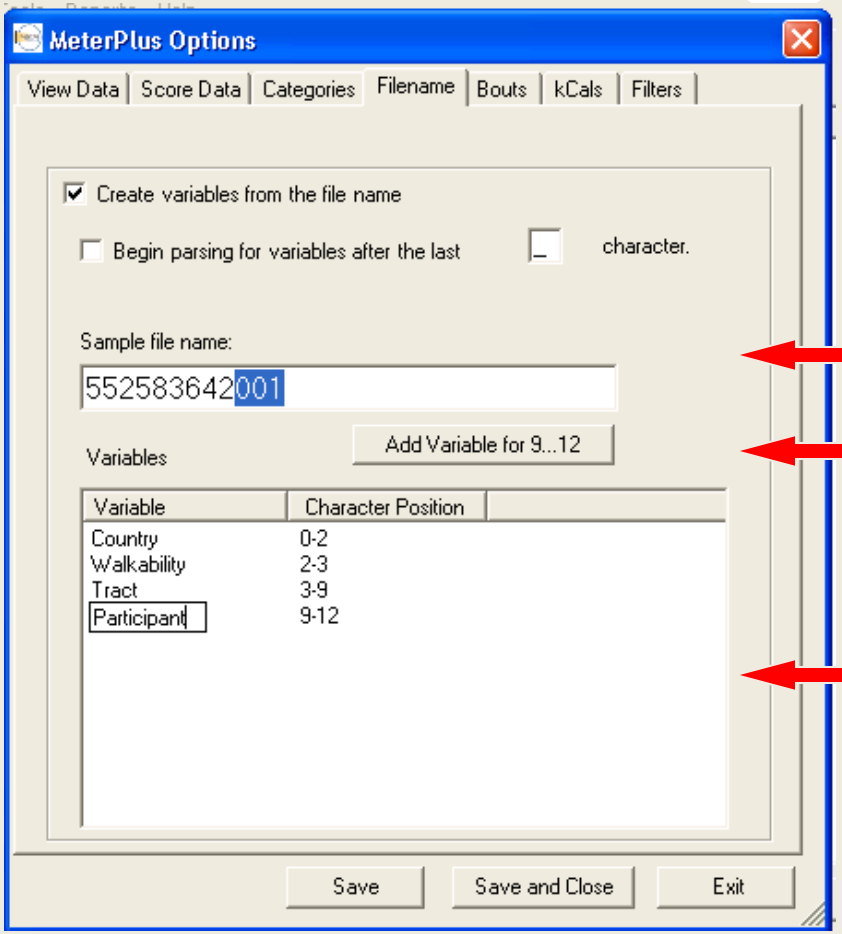
Create Groups



Add/Edit Cut-points



Filename variables (Tools/options)

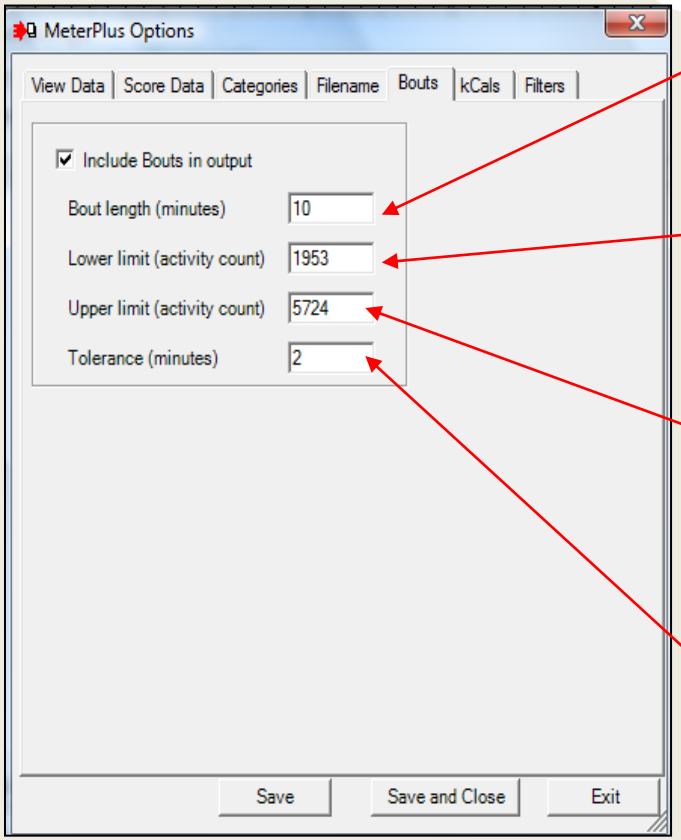


Enter sample file name (ADD)

Designate character positions

Name your variables

Settings for bouts (Tools/Options)



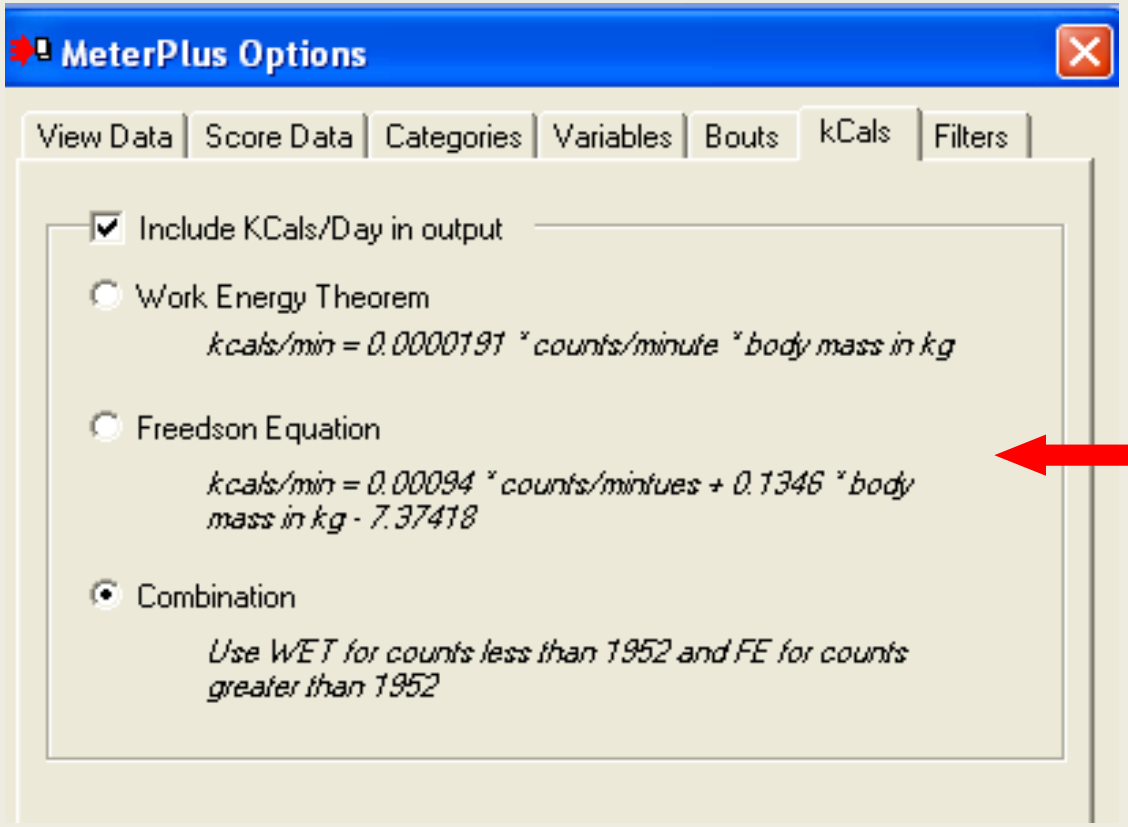
10 minute bout

Moderate activity lower threshold cut-point for adults (Freedson) for 60s epoch

Moderate activity upper threshold cut-point for adults (Freedson) for 60s epoch

2 minute interruption allowed (bout forgiveness)

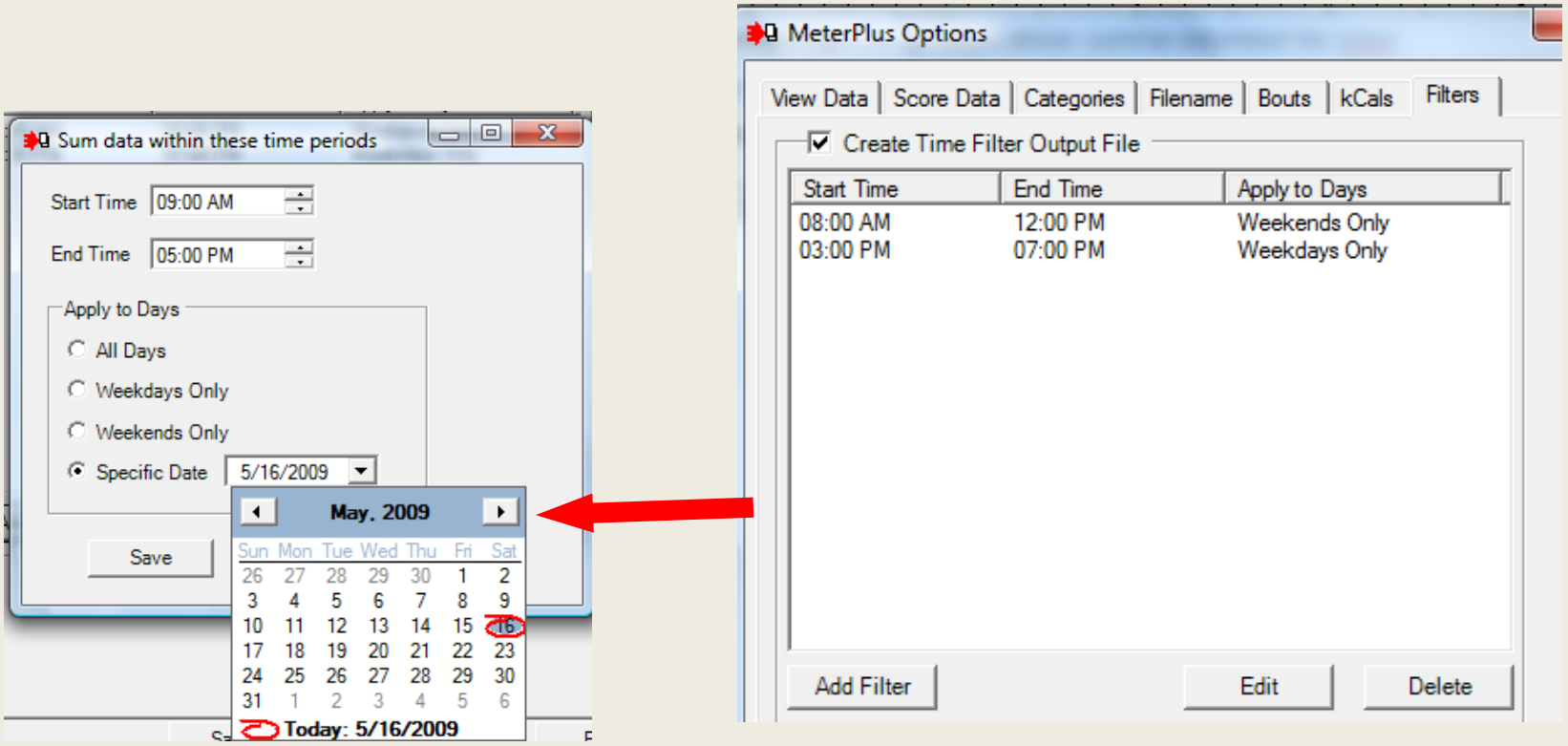
Energy expenditure (Tools/Options)



Choice of 3 algorithms

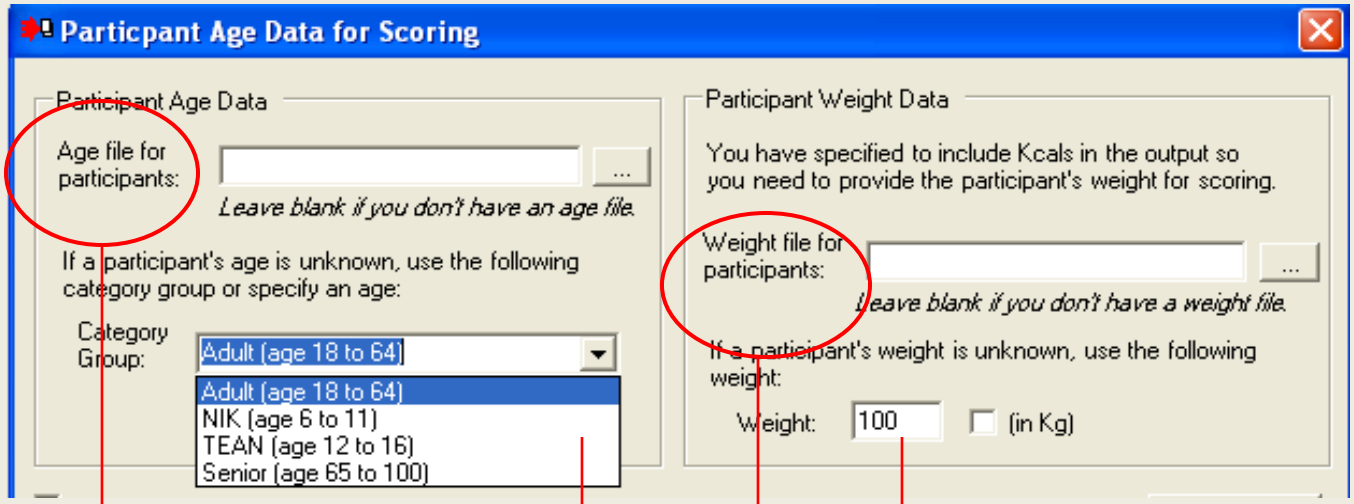
Time filters (Tools/Options)

Select days of the week & times per day (e.g., after-school hours) to summarize activity.



Age and weight files (Reports/Scoring)

Link to subject age and body weight files to use age-defined cut-points within the same batch (i.e., age-specific scoring) and different body weights for energy expenditure calculations.



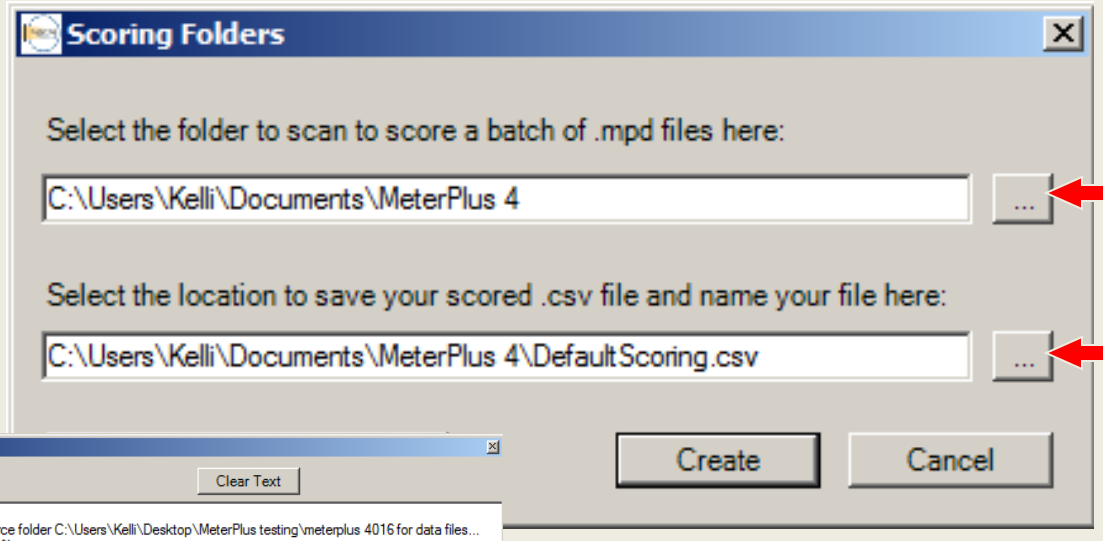
Use subject age to apply different cutpoints within the same batch

OR Select a group of cutpoints to use for your entire sample

Use subject body weight for energy expenditure calculations

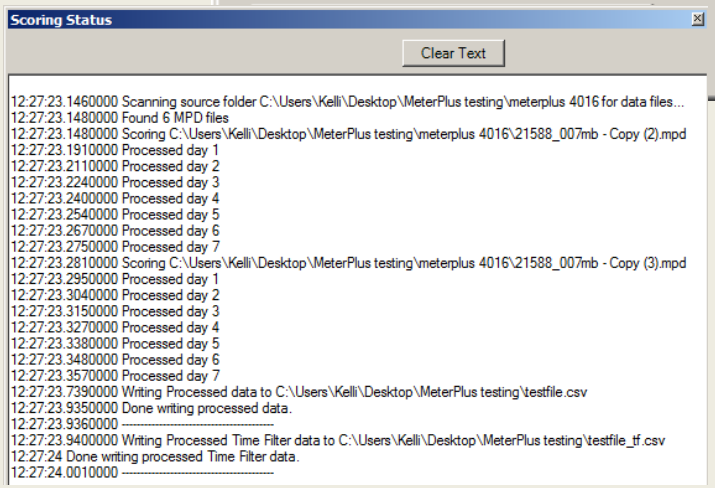
OR Select a weight to be used for your entire sample

Batch scoring (Reports/Scoring)



Where to find individual files to process

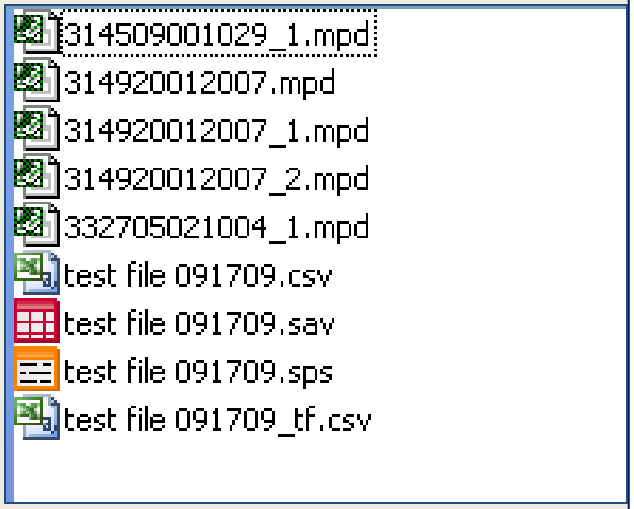
Where to save processed CSV file for entire sample



One step → Create

Output

File type	Description
CSV	Comma-delimited file containing the results of the batch scoring including activity counts, step counts, bouts and energy expenditure.
TF.CSV	Comma-delimited file containing the time-filtered activity variables only
SPS	Syntax file that will import data into SPSS
SAV	SPSS file created after running the SPS syntax or importing into SPSS directly



Activity, Bouts, EE variables

Activity

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	SN	city	neighbo	walka	group	id	Filename	Date	TotDays	VldDays	VldHours	TotVdnot_wearin	TotVdsedent	TotVdligh	TotVdmod	To
2	50168	1	1	1	0	7310	101107310.DAT	11/12/2003	8	8	102	5434	3585	2404	93	
3	51165	5	33	1	0	0210	533100210.dat	11/24/2005	8	8	97	5915	4510	1087	8	
4	50293	6	15	4	0	0120	6154100120.dat	1/22/2008	7	7	89	4808	3438	1720	114	
5																

Serial number, start date, # valid days & hours, number of epochs in each activity category across all valid days.

Bouts

	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ
1	D1_bout_num	D1_bout_length	D1_bout_avg	D1B1_st_time	D1B1_end_time	D1B2_st_time	D1B2_end_time	D1B3_st_time	D1B3_end_time	D1B4_st_time
2	1	14	14	11/12/2003 13:47	11/12/2003 14:01	NULL	NULL	NULL	NULL	NULL
3	1	10	10	11/24/2005 9:00	11/24/2005 9:10	NULL	NULL	NULL	NULL	NULL
4	4	119	29.75	1/22/2008 0:00	1/22/2008 0:17	1/22/2008 6:59	1/22/2008 8:07	1/22/2008 8:32	1/22/2008 8:55	1/22/2008 9:53
5										
6										

Number of bouts, total and average length of bouts, start and end times of each bout.

Energy Expenditure

	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT
1	Tot_kcal	KCal_mean	KCal_peak	KCal_not_w	KCal_sedentary	KCal_light	KCal_moderate	KCal_hard	KCal_very_hard	D1Date	D1Day	D1vday	D1vh
2	1195.47	149.43	224.58	0	49.81	1145.66	0	0	0	11/12/2003	Wednesday	1	5
3	463.31	57.91	95.95	0	31.55	431.76	0	0	0	11/24/2005	Thursday	1	1
4	863.27	123.32	167.77	0	33.68	829.59	0	0	0	1/22/2008	Tuesday	1	8
5													

Total, mean & peak caloric expenditure, caloric expenditure in each activity category.

Output: Activity variables

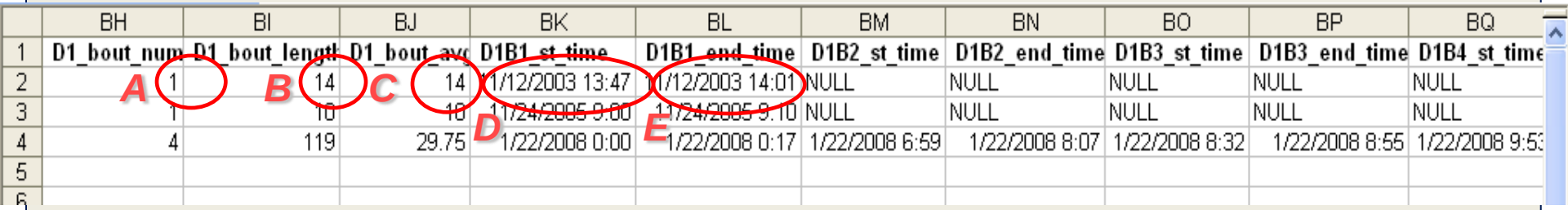
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SN	city	neighbo	walka	group	id	Filename	Date	TotDays	VldDays	VldHours	TotVdnot_wearin	TotVdsedent	TotVdligh	TotVdmod
2	50168	1	1	1	0	7310	101107310.DAT	11/12/2003	8	8	102	5434	3585	2404	93
3	51165	5	33	1	0	0210	533100210.dat	11/24/2005	8	8	97	5915	4516	1087	8
4	50293	6	15	4	0	0120	6154100120.dat	1/22/2008	7	7	89	4808	3438	1720	114
5															

A B C D E F G

Start date, number of valid days, number of valid hours, and number of epochs in each activity category across all valid days.

A. *Date* = 1/22/2008 is first day of wearing time that was saved
B. *VldDays* = 7 valid days in file
C. *VldHours* = 89 valid hours
D. *TotVdNot_wearing* = 4808 epochs of not wearing time across the 7 valid days
E. *TotVdsedentary* = 3438 epochs of sedentary activity across the 7 valid days
F. *TotVdlight* = 1720 epochs of light activity across the 7 valid days
G. *TotVdmoderate* = 114 epochs of moderate activity across the 7 valid days

Output: Bouts variables



	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ
1	D1_bout_num	D1_bout_length	D1_bout_avg	D1B1_st_time	D1B1_end_time	D1B2_st_time	D1B2_end_time	D1B3_st_time	D1B3_end_time	D1B4_st_time
2	1	14	14	11/12/2003 13:47	11/12/2003 14:01	NULL	NULL	NULL	NULL	NULL
3	1	10	10	11/24/2005 9:00	11/24/2005 9:10	NULL	NULL	NULL	NULL	NULL
4	4	119	29.75	1/22/2008 0:00	1/22/2008 0:17	1/22/2008 6:59	1/22/2008 8:07	1/22/2008 8:32	1/22/2008 8:55	1/22/2008 9:53
5										
6										

A B C D E

Number of bouts, total and average length of bouts, start and end times of each bout.

A. *D1_bout_num* = 1 bout of activity in Day 1 for this subject

B. *D1_bout_length* = Total bout length in Day 1 is 14 minutes

C. *D1_bout_avg* = Average bout length in Day 1 is 14 minutes

D. *D1B1_st_time* = The 1st bout in Day 1 started on 11/12/03 at 13:47

E. *D1B1_end_time* = The 1st bout in Day 1 ended on 11/12/03 at 14:01

Output: Energy expenditure variables

	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
1	Tot_kcal	KCal_mean	KCal_peak	KCal_not_w	KCal_sedentary	KCal_light	KCal_moderate	KCal_hard	KCal_very_hard	D1Date	D1Day	D1vday
2	1195.47	149.43	224.58	0	49.81	1145.66	0	0	0	11/12/2003	Wednesday	1
3	463.31	57.91	95.95	0	31.55	431.76	0	0	0	11/24/2005	Thursday	1
4	863.27	123.32	167.77	0	33.68	829.59	0	0	0	1/22/2008	Tuesday	1
5												

A B C D E F

Total caloric expenditure, mean caloric expenditure, peak caloric expenditure and caloric expenditure in each activity category.

A. *Tot_kcal* = 1195.47 calories spent in activity across all valid days
B. *KCal_mean* = 149.43 calories spent on average across all valid days
C. *KCal_peak* = 224.58 peak calories spent on a day
D. *KCal_sedentary* = 49.81 calories spent in sedentary activities across all valid days
E. *KCal_light* = 1145.66 calories spent in light activities across all valid days
F. *KCal_moderate* = 0 calories spent in moderate activities across all valid days

Output: Time-filtered variables

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Filename	1Day	1Date	D1T1_st_t	D1T1_end	D1T1_epo	D1T1_not	D1T1_sed	D1T1_ligh	D1T1_mo	D1T1_har	D1T1_very	D1T2_st_t	D1T2_end	D1T2_
2	101107310	Wednesd	11-12-200	07:00 AM	11:00 PM	960	301	609	45	6	NULL	NULL	NULL	NULL	NULL
3	533100210	Thursday	11-24-200	07:00 AM	11:00 PM	960	120	722	118	1	NULL	NULL	NULL	NULL	NULL
4	615410012	Tuesday	01-22-200	07:00 AM	11:00 PM	960	361	427	167	6	NULL	NULL	NULL	NULL	NULL
5															
6															
7															

A

Activity counts during each defined time period, within each activity category, for each day of data.

A. *D1T1_moderate* = 6 epochs of moderate activity occurring during 7am & 11pm on day 1, Tuesday Jan. 22nd